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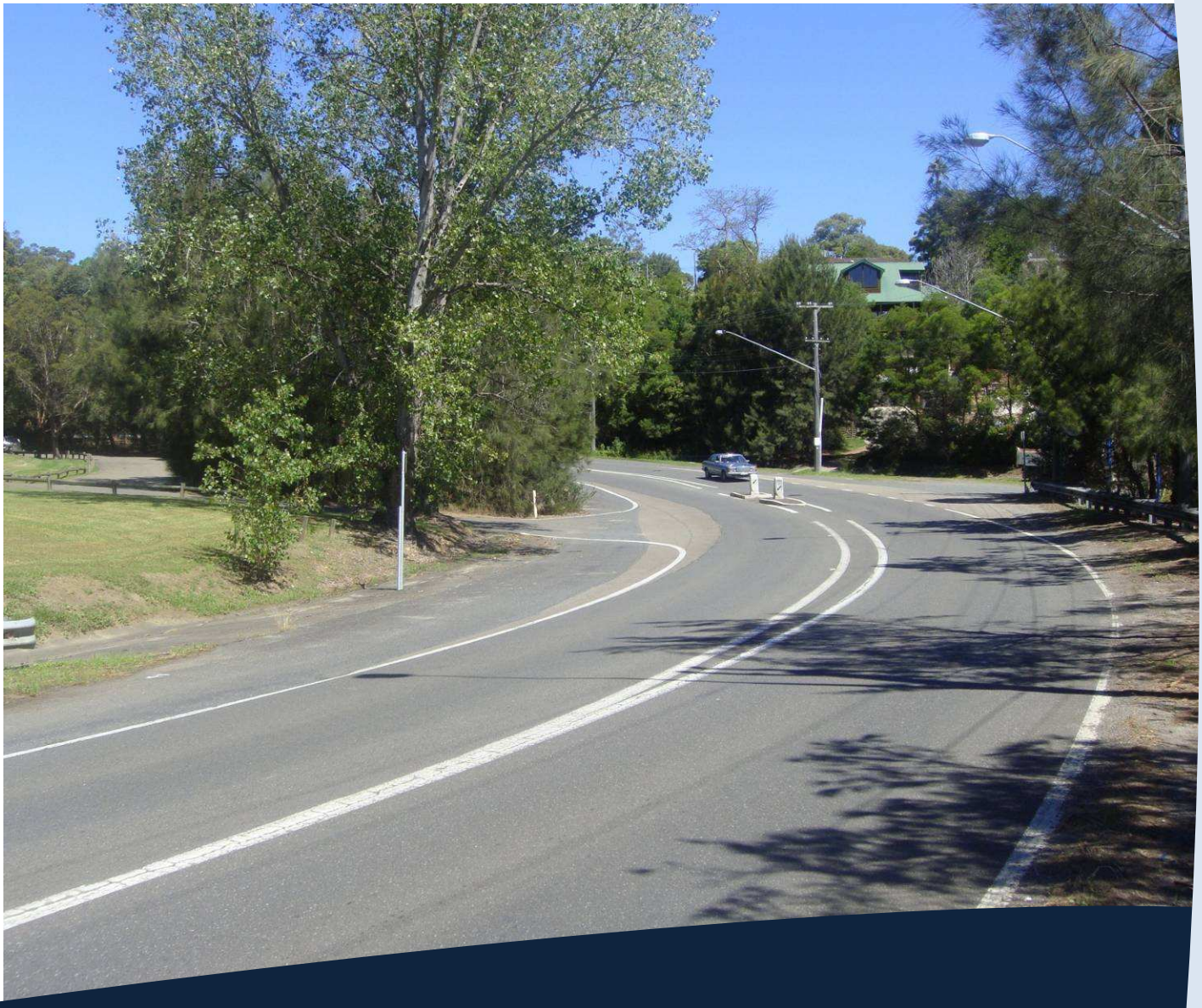

Pittwater Road from High Street to Epping Road - Upgrade and Shared User Path

Review of Environmental Factors

LJ2954/Rep2724

Prepared for The City of Ryde

July 2011

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2	Final	July 2011	Caroline Bathje	CB	Kester Boardman	IKB

Declaration

This Review of Environmental Factors provides a true and fair review of the proposed activity in relation to its likely effects on the environment in accordance with Part 5 (Section 111) of the *Environmental Planning and Assessment Act*, 1979. It addresses to the fullest extent possible all matters affecting or likely to affect the environment as a result of the proposed activity.

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I have examined this Review of Environmental Factors and the declaration and accept the Review of Environmental Factors on behalf of The City of Ryde.

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Table of Contents

Declaration ..... **ii**

1 Introduction **1**

1.1 Background 2

1.2 Scope of Works 3

1.3 Data Sources 4

1.4 Methodology 5

1.5 Document Structure 6

2 Proposed Works **7**

2.1 Need 7

2.1.1 Road Works 7

2.1.2 SUP 9

2.2 Objectives of the Project 9

2.3 Alternatives 10

2.3.1 Option 1 – Do nothing 11

2.3.2 Option 2 – Provide a road upgrade and a SUP along the section of Pittwater Road between Epping Road and High Street in accordance with Council's proposed 2011 concept design. 11

2.3.3 Option 3 – Provide a road upgrade and a SUP with an alternative route (submitted by the local community) to Council's proposed concept design. 13

2.3.4 Option 4 – Provide a road upgrade and a SUP on the eastern side of Pittwater road between Epping Road and High Street. 14

2.3.5 Option 5 – Provide a road upgrade with an on-road cycling path and retaining the existing pedestrian path along the section of Pittwater Road between Epping Road and High Street. 15

2.4 Options Assessment 15

2.5 The Preferred Option 16

2.6 Indicative Construction Methodology 17

3 Statutory Planning and Legislative Requirements **19**

3.1 Environmental Planning and Assessment Act 1979 19

3.2 Protection of the Environment Operations Act 1997 19

3.3 Roads Act 1993 20

3.4 Environmental Planning Instruments 20
3.4.1 State Environment Planning Policy (Infrastructure) 2007 20
3.4.2 State Environmental Planning Policy No 19 – Bushland in Urban Areas 20
3.4.3 State Environmental Planning Policy No 44 – Koala Habitat Protection 21
3.4.4 State Environmental Planning Policy No 55 – Remediation of Land 21
3.4.5 *Guidelines for development adjoining Department of Environment and Climate Change land* 21
3.5 Regional Environment Plans 21
3.6 Local Environment Plan 22
3.7 Development Control Plan 24
3.8 Other Pollution Control Legislation 24
3.9 Terrestrial Ecology 24
3.10 Aquatic Ecology 25
3.11 Water 25
3.12 Heritage 25
3.13 Geology and Soils 26
3.14 Waste Minimisation 26
3.15 Other relevant requirements and policies 26
3.16 Summary of Permits, Approvals and Licences 27
4 Consultation 31
4.1 Statutory Consultation 31
4.2 Community Consultation 35
4.2.1 Community Engagement Activities 35
4.2.2 Summary of Community Workshop 36
4.2.3 Environmental Issues arising from community consultation 36
5 Environmental Assessment 45
5.1 Physical Environment 45
5.1.1 Topography, Geology and Soils 45
5.1.2 Climate and Air Quality 50
5.1.3 Hydrology and Water Quality 52

5.2 Biotic Environment Assessment 62
5.3 Social Environment 67
5.3.1 Utilities and Services 67
5.3.2 Energy Use and Greenhouse Gas Emissions 69
5.3.3 Noise and Vibration 70
5.3.4 Heritage and Archaeology 76
5.3.5 Traffic and Access 80
5.3.6 Hazards 83
5.3.7 Visual Landscape 84
5.3.8 Waste 86
5.3.9 Socio-Economic Considerations 86
5.4 Cumulative Environmental Effects 86
6 Environmental Safeguards and Management 89
6.1 Summary of Environmental Safeguards 89
6.2 Environmental Management Plans 94
7 Conclusions 95
7.1 Summary of Consideration of Environmental Factors 95
8 References 99
9 Qualifications 102

List of Tables

Table 3.1: Summary of Requirements for Permits, Approvals and Licences 28
Table 4.1: Stakeholder Consultation Responses Summary 31
Table 4.2: Community environmental comments and issues raised during the consultation process and response in REF. 37
Table 5.1: Environmental Parameters Considered 45
Table 5.2: Soil Landscapes at the Site of Proposed Works (After: Soil Conservation Service of NSW, 1983) 46
Table 5.3: Catchment and Stormwater Delivery Characteristics for creeks in the LGA which are part of a water quality monitoring program (Sydney Water, 2010) 55
Table 5.4: GPT capture performance summary. 59
Table 5.5: Schedule of rock excavation works. 72

Table 5.6: Examples of Types of Vibration (after DEC, 2006) 74

Table 5.7: Recommended standard work hours for construction work (DECCW 2009) 76

Table 6.1: Environmental Safeguards and Management 89

Table 7.1: Summary of Consideration of Environmental Factors 95

List of Figures

Figure 1.1: Location of proposed works, blue line represents Pittwater Road (Aerial: Bing, 2011). 1

Figure 1.2: Map of Local Government Areas in the vicinity of the proposed works (Aerial: Bing, 2011). 3

Figure 2.1: Example of failing pavement. 8

Figure 2.2: Example of an unsafe edge break. 8

Figure 2.3: Example of irregular road surface 9

Figure 3.1: City of Ryde LEP 2010 zoning for study area, blue line represents Pittwater Road. 23

Figure 5.1: Acid Sulfate Soils Risk Map for the study area (Aerial: Bing, 2011) 48

Figure 5.2: Indicative Dominant Sources of Air Pollution for the City of Ryde LGA (Source: National Pollutant Inventory, 2009) 51

Figure 5.3: Waterways in the vicinity of the Proposed Works 54

Figure 5.3: View of sediment pond along East Parade, Eastwood (within Ryde Local Government Area) 57

Figure 5.4: Close-up view of sediment pond along East Parade, Eastwood. 57

Figure 5.5: Proposed bioswale structures adjacent to Pittwater Road (approximate locations). 60

Figure 5.6: Proposed water quality improvement devices adjacent to Pittwater Road (approximate locations). 61

Figure 5.7: Total NSW emissions in 2008 – 165 Million tonnes CO_2e 70

Figure 5.8: Local street network surrounding proposed works site (Source: Google Maps, 2011) 81

Appendices

Appendix A Site Photolog
Appendix B Stakeholder Responses
Appendix C Design Details
Appendix D Flora and Fauna Assessment
Appendix E Community Consultation report
Appendix F Arborist Report

Glossary and Abbreviations

AHIMS	Aboriginal Heritage Information Management System.
AHIP	Aboriginal Heritage Impact Permit. Issued by DECCW under Section 90 of the *National Parks and Wildlife Act 1974*.
AHO	Aboriginal Heritage Office.
Ambient Noise	The all-encompassing noise within a given environment. It is the composite of sounds from many sources, both near and far.
Amenity	Those features of an area that foster its use for various purposes.
Animal	Any animal, whether vertebrate or invertebrate, and at whatever stage of development.
ARI	Average Recurrence Interval
ASS	Acid Sulfate Soil(s)
Background Noise	The underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is removed. This is described using the L_{A90} descriptor.
Biota	Living organisms.
Bird	Any bird that is native to, or is of a species that periodically or occasionally migrates to Australia, and includes the eggs and the young thereof and the skin, feathers or any other part.
BoM	Bureau of Meteorology.
CAMBA	China-Australia Migratory Bird Agreement
Catchment	The area draining to a site. It always relates to a particular location and may include the catchments of tributary streams as well as the main stream.
CEMP	Construction Environment Management Plan
CMA	Catchment Management Authority.
dB	Abbreviation for decibel – a scale used in sound measurement. It is equivalent to 10 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure.
dB(A)	A value used for 'A-weighted' sound pressure levels. 'A' frequency

	weighted is an adjustment made to sound-level measurement to approximate the response of the human ear.
DCP	Development Control Plan
DEC (now OEH)	Department of Environment and Conservation,
DECC (now OEH)	Department of Environment and Climate Change
DECCW (now OEH)	Department of Environment, Climate Change and Water
DII (now DPI)	Department of Industry and Investment
DoP (now DoPI)	Department of Planning
DoPI	Department of Planning and Infrastructure
DPI	Department of Primary Industries
Ecosystem	A community of living organisms, together with the environment in which they live and with which they interact.
EIA	Environmental Impact Assessment. An assessment of the impact of a proposed development.
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
Endangered Fauna	Protected fauna of a species under Schedule 1 or 2 of the *Threatened Species Conservation Act*, 1995.
EPA	Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act, 1979*
EPBC Act	*Environmental Protection and Biodiversity Conservation Act, 1999*.
Environmental Planning Instruments	LEPs and SEPPs, which describe the current planning status and/or future developments of an area.
ESCP	Erosion and Sediment Control Plan
ESD	Ecologically Sustainable Development. Development that does not interfere with the short and long-term well-being, health and viability of ecosystems.
Extraneous Noise	Noise resulting from activities that are not typical of the area. Atypical activities may include construction, and traffic generated by holiday periods.

	Normal daily traffic is not extraneous noise.
Fauna	Any mammal, bird, reptile or protected amphibian.
Fish	All or any of the varieties of marine, estuarine or freshwater fishes (whether indigenous or not) and their young, fry and spawn and unless contrary intention be expressly state or the context otherwise requires, includes crustacean and oysters and all marine, estuarine and freshwater animal life.
FM Act	*Fisheries Management Act 1994*
GPT	Gross Pollutant Trap
Habitat	The places in which an organism lives and grows.
Invertebrate	Animal without a backbone.
JAMBA	Japan-Australia Migratory Bird Agreement
L_{Aeq}	Equivalent continuous noise level. The level of noise equivalent to the energy average of noise levels occurring over a defined measurement period.
LALC	Local Aboriginal Land Council
LEP	Local Environment Plan
LGA	Local Government Area
LMP	Landscape Management Plan
NPWS (part of OEH)	National Parks and Wildlife Service
NPW Act	*National Parks and Wildlife Act, 1974*
NSW	New South Wales
NV Act	*Native Vegetation Act, 2003*
OEH	Office of Environment and Heritage
PAD	Potential Archaeological Deposit
PASS	Potential Acid Sulfate Soils
PEMP	Project Environmental Management Plan

PoEO Act	*Protection of Environment Operations Act, 1997*
Receiver	A noise sensitive location.
REP	Regional Environment Plan
Reptile	A snake, lizard, crocodile, tortoise, turtle or other member of the class reptilian (whether native, introduced or imported), and includes the eggs and the young thereof and the skin or any other part thereof.
Riparian Vegetation	Vegetation growing along banks of rivers.
ROKAMBA	Republic of Korea-Australia Migratory Bird Agreement
RTA	Roads and Traffic Authority
Runoff	That proportion of rainfall that drains off the lands surface.
SEPP	State Environmental Planning Policy
Sedimentation	The act or process of depositing sediment, especially by mechanical means of matter suspended in a liquid.
SUP	Shared User Path
TMP	Traffic Management Plan
TSC Act	*Threatened Species Conservation Act, 1995*
Vertebrate	Animal with a backbone.
VMP	Vegetation Management Plan
WARR Act	*Waste Avoidance and Resource Recovery Act, 2001*
WM Act	*Water Management Act 2000* (replacing the repealed *Rivers and Foreshores Improvement Act 1948*)
Water Quality	The suitability of the water for various purposes, as measured by the concentration or level of a wide variety of contaminants.

1 Introduction

This Review of Environmental Factors (REF) was prepared in accordance with Part 5 (Section 111) of the *Environmental Planning and Assessment Act 1979* (EP&A Act) by Cardno for the City of Ryde (Council).

The REF assesses the environmental impacts of proposed road upgrade works which include the construction of a Shared User Path (SUP) along Pittwater Road, from High Street, Gladesville to Epping Road, North Ryde. **Figure 1.1** shows the general location of the works.

In order to improve safety and access for pedestrians, cyclists and motorists, the upgrade works include the widening of the carriageway and provision of emergency vehicle/break-down lanes, provision for cyclists and pedestrians, landscaping and drainage improvements.

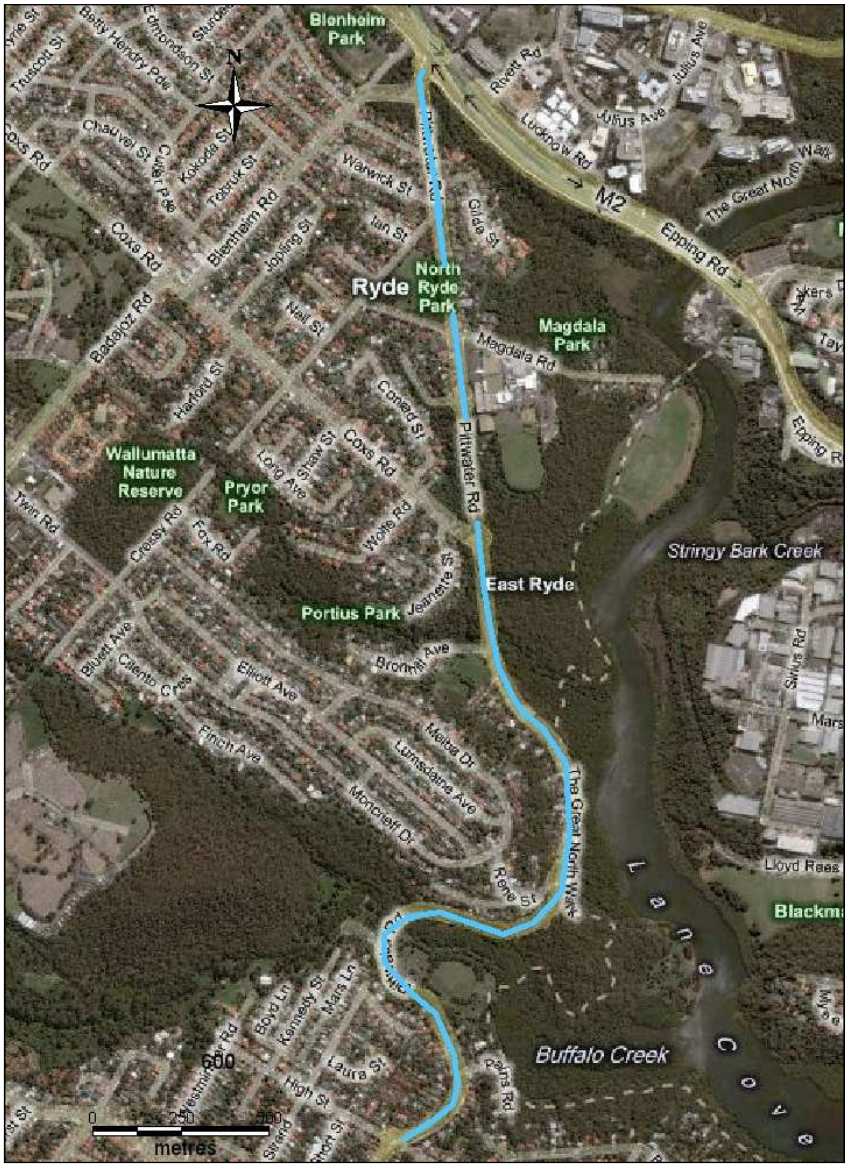

Figure 1.1: Location of proposed works, blue line represents Pittwater Road (Aerial: Bing, 2011).

The proposed works are being carried out under Division 25, Subdivision 1, Clause 94 "Development permitted without consent" of the *State Environmental Planning Policy (Infrastructure) 2007* and hence require determination under Part 5 of the EP&A Act (**Section 3.4.1**). Council is acting as both the proponent and the nominated determining authority for the proposed works.

The works are expected to be progressively staged over a period of 5 years and are estimated to cost around $2.5 million. Each stage of works will take place as funding is available to The City of Ryde.

1.1 Background

In August 2010, the City of Ryde (Council) formally adopted the *Draft Four Year Delivery Plan 2011-2015* and the *Operational Plan for 2011/12* as parts of the overall *Draft Ryde 2021 Community Strategic Plan* to create a blueprint for the future of the City of Ryde. These documents identify the objectives and projects to be delivered for the improvement of Ryde. Council is obligated to comply with the objectives in these plans, which includes spending approximately $64.9 million, between 2011 and 2015, on its "City of Connections" scheme.

The City of Connections program aims to deliver better access and connection to, from, and within the City of Ryde for its residents, visitors and workers. The upgrade of Pittwater Road provides an opportunity to support the Council in achieving this goal, and will provide safer and improved traffic flow for all road users.

In addition, extensive community consultation was undertaken during the preparation of *The Ryde Bicycle Strategy and Masterplan 2007* (hereafter referred to as 'the Strategy'). The strategy was developed to determine improvement plans for people who ride bicycles for transport, health and fitness. It suggested several programs to encourage and develop cycling in Ryde. The Strategy presented a system of 139km of bicycle routes (including the proposed route along Pittwater Road) in order to improve bicycle access throughout the municipality through the incorporation of bicycle friendly design and construction criteria into:

- Streets, roads, intersections and crossings;
- Traffic calming, street closures and speed reduction schemes; and
- Local residential streets and community facilities.

The works are to take place on Pittwater Road between Epping Road and High Street in the Ryde Local Government Area (LGA), (Hunter's Hill LGA is partially delineated by Pittwater Road) (**Figure 1.2**). The proposed works are located within the Sydney Region of the Roads and Traffic Authority (RTA) and in the City of Ryde LGA.

Figure 1.2: Map of Local Government Areas in the vicinity of the proposed works (Aerial: Bing, 2011).

1.2 Scope of Works

This REF has been prepared to identify potential environmental impacts and any required mitigation measures to manage any negative impacts associated with the road improvement and the Shared User Path (SUP) works along the 3.1km of Pittwater Road. This REF has been based on the concept designs shown in **Appendix C**.

The proposed upgrade of a 3.1km section of Pittwater Road is bounded by Epping Road, North Ryde to the north, and High Street, Gladesville to the south. This section of Pittwater Road is currently two lanes (bidirectional) with some roadside parking.

The following provides a general overview of the proposed works along Pittwater Road between High Street and Epping Road:

- Widening of the road carriageway to incorporate two lanes (bidirectional) with an emergency vehicle/break-down lane on either side (for the majority of the 3.1km). Breakdown lanes are to provide refuge for broken down vehicles, and passage for emergency vehicles. They will not be used for parking or for additional traffic lanes.
- Construction of an off-road SUP along the entire section of road that follows the alignment of the existing footpath in most areas;
- Upgrade to kerb and guttering where required along the length of road;
- Resurfacing of road in areas where required;
- Guardrails will be replaced in sections where the existing guardrail condition is unsatisfactory;
- Protective barriers will be provided between the SUP and the roadway;
- Realignment of driveways to desired levels where required; and
- Installation of sedimentation ponds and a new gross pollutant trap.

Trimming and removal of vegetation in some locations is also proposed to provide sufficient space for the upgraded infrastructure.

1.3 Data Sources

The following documents have previously been prepared for sections of Pittwater Road, which are the subject of this REF, and have been used in this assessment:

- Review of Environmental Factors (REF) for the section of road between High Street and Rene Street – prepared by Cardno in 2009;
- REF for the section of road between Bronhill Avenue to Carramar Avenue – prepared by The City of Ryde (Council) in 2010; and
- Flora and Fauna Assessment for the section of road between Cox's Road and Bronhill Avenue – prepared by Ecological Australia (2010).

The following designs have been prepared for the road upgrade and SUP works:

- Concept design between High Street and Rene Street – prepared by Cardno;
- Concept design between Rene Street and Bronhill Avenue – prepared by The City of Ryde;
- Concept design between Bronhill Avenue and Carramar Avenue – prepared by The City of Ryde; and
- Concept design between Carramar Avenue and Epping Road – prepared by The City of Ryde.

These design documents have been collated and are provided in **Appendix C** (Plans 1-22).

The following specialist studies were commissioned by Council to support the REF:

- Eco Logical Australia (2011) *Pittwater Road Upgrade: Epping Road to High Street Ryde, Flora and Fauna Assessment* (**Appendix D**);
- GHD (2011) *Community and Stakeholder Engagement Report* (**Appendix E**); and
- MacKay Tree Management (2011) *Tree Survey/Arborist Report: An Audit of Existing Trees* (**Appendix F**).

1.4 Methodology

The preparation of this REF involved a review of relevant documents, desktop database searches and site inspections to identify relevant environmental issues pertaining to the site of the proposed works.

Relevant documents were primarily those listed in **Section 1.3**. Searches of the following databases formed part of the investigations:

- NPWS Wildlife Atlas;
- NPWS Critical Habitat Register;
- Threatened Species Listings;
- Aboriginal Heritage Information Management System Database;
- Contaminated Lands Register;
- EPBC Act Protected Matters Database;
- DoPI Major Projects Register;
- PlantNet Weeds Database;
- Australian Heritage Register;
- NSW State Heritage Register;
- Section 170 Heritage Registers (RTA, Sydney Water);
- RTA Traffic Volume Maps;
- Bureau of Meteorology;
- Australian Bureau of Statistics;
- National Pollutant Inventory;
- Soil Profile Attribute Data Environment; and
- Native Title Tribunal website.

The results of these database searches can be found in **Section 5**.

A site inspection was conducted on 27 May 2011 (with previous site inspections carried out on 17 April 2009 and 20 May 2009 between High Street and Rene Street). Photographs of the site can be found in **Appendix A**.

Stakeholder consultation was undertaken to gain input from government agencies and the community in regards to the upgrade works. Stakeholder responses are provided in **Appendix B**.

A Flora and Fauna Assessment for the works has been prepared by Eco Logical Australia and provided in **Appendix D**.

Community Consultation was undertaken by GHD Pty Ltd (GHD) as described in **Appendix E** and summarised in **Section 4**.

An arborist report was prepared to identify all trees that may be directly impacted by the proposed works and can be found in **Appedix F**.

1.5 Document Structure

The assessment provided in this REF is structured in accordance with Part 5 (Section 111) of the EP&A Act and is as follows:

- Project Needs and Alternatives (**Section 2**);
- Legislative, Policy and Planning Context (**Section 3**);
- Consultation (**Section 4**);
- Environmental Impact Assessment (**Section 5**);
- Environmental Safeguards and Management (**Section 6**); and
- Conclusions (**Section 7**).

2 Proposed Works

2.1 Need

Pittwater Road is a major thoroughfare connecting Victoria Road to Epping Road. This section of Pittwater Road has high levels of traffic during peak periods. This section of the road does not currently have emergency vehicle/breakdown lanes, and in the event of breakdown or emergency can experience significant congestion and delays as emergency vehicles or tow trucks are unable to bypass traffic, and stricken vehicles cannot be removed from the traffic lane.

The City of Ryde is proposing to undertake the upgrade works in order to enhance and improve safety and access for pedestrians, cyclists and motorists along this section of Pittwater Road. Council has been progressively widening Pittwater Road, having completed a section from Cressy Road to Carramar Avenue which included construction of a kerb and gutter, footpaths and an on-road bicycle lane (City of Ryde, 2009). Pittwater Road is in need of further upgrades because of its deteriorating conditions, and high usage by motorists, cyclists and pedestrians.

As outlined in **Section 1.1**, the *Draft Four Year Delivery Plan 2011-2015* and *Draft Ryde 2021 Community Strategic Plan* both require Council to spend $64.9 million on its City of Connections program, which includes upgrading the section of Pittwater Road between Epping Road and High Street. These plans are part of a collective blueprint for the future of the City of Ryde which includes improved roads, safe public access, additional public spaces and a connection to, from and within the City of Ryde.

2.1.1 Road Works

Sections of Pittwater Road to be upgraded are classified as a “Condition Grade 5: Unserviceable” road (Ryde City Council classification). It incorporates tight curves, discontinuous pedestrian access and a lack of kerb and guttering (with lengths of open dish drains at the edge of the road pavement). Sections of the pavement are failing or have already failed, meaning that it has an irregular surface, large potholes, edge breaks and widespread cracking (>5mm) in the pavement (see **Figures 2.1 – 2.3**). The failing road is compromising user safety and has an unacceptable appearance. Other traffic safety issues associated with the existing road include:

- Lack of emergency vehicle/breakdown lanes;
- Undefined drainage on sections of Pittwater Road;
- Limited lines of sight through certain sections of the road;
- Lack of pedestrian/cycle/bus facilities;
- Existing pavement for the majority of the road is at or beyond its serviceable life; and
- Numerous driveways and entrances on a steep grade.

Figure 2.1: Example of failing pavement.

Figure 2.2: Example of an unsafe edge break.

Figure 2.3: Example of irregular road surface.

2.1.2 SUP

Currently, there are a limited number of safe and accessible bicycle and pedestrian routes around the City of Ryde, and the inclusion of a SUP as part of the road upgrade is in line with the City of Connections program and *the Ryde Bicycle Strategy and Masterplan 2007*.

A SUP along Pittwater Road would mean greater connection around the city and improved connections with other local SUP routes, such as the one along Epping Road which in turn leads to a connective route to metropolitan Sydney. A SUP would also offer improved safety benefits to cyclists who currently share the road with other traffic. The existing pedestrian path along sections of Pittwater Road is intermittent and the pavement is in poor condition. A SUP would offer pedestrians a continuous and safe route around the City of Ryde. In addition, there are no existing off-road cycleways along this section of Pittwater Road making it unsafe for cyclists who chose to cycle on-road and unsafe for motorist who are forced to avoid them. Pittwater Road has limited lines of sight through certain sections of the road which can make it difficult for motorists and cyclists to share the road corridor safely.

A SUP would provide a safe route for cyclists to use and would reduce the likelihood of cyclist/motorist collisions.

2.2 Objectives of the Project

The overall aims of the proposed works are to improve the section of Pittwater Road between Epping Road and High Street. Key objectives are to:

- Repair the failing road;
- Provide emergency vehicle access along the road at all times;
- Provide breakdown lanes;
- Ensure that the community can safely and conveniently drive, park, cycle or walk around The City of Ryde;

- Provide a safe path for access to the Field of Mars, Buffalo Creek Reserve and to places of work (such as businesses in North Ryde and Macquarie Park, or Macquarie University);
- Provide a safe off-road path north of High Street for cyclists for both commuting and accessing the children's' cycle path in Buffalo Creek Reserve;
- Improve stormwater management, for example by installing suitable water treatment devices;
- Provision of a safe road shoulder that allows for the separation of vehicles from pedestrians and cyclists. This will also involve the elimination of the hazard of open drains to vehicles and cyclists;
- To protect the adjacent salt marshes and local ecological communities; and
- Fulfil The City of Ryde's commitments to the *Four Year Delivery Plan 2011-2015,* the *Draft Ryde 2021 Community Strategic Plan,* and the *Ryde Bicycle Strategy and Masterplan 2007*.

More specific project objectives are:

- To provide a design for upgrading the access for pedestrians and cyclists in accordance with The City of Ryde and Australian Standards;
- To provide a design which balances the needs of all road users in the community;
- To improve the safety of drivers, pedestrians and cyclists; and
- To improve the surface and subsoil drainage.

It is noted that project objectives **do not** include the provision for additional traffic carrying lanes. The road upgrade component of this project relates to maintaining efficiency and safety of existing Council assets, and not to increasing traffic carrying capacity.

2.3 Alternatives

Five alternatives or "options" have been considered for the proposed works:

- Option 1 – Do nothing;
- Option 2 – Provide a road upgrade and a SUP along the section of Pittwater Road between Epping Road and High Street in accordance with Council's proposed 2011 concept design (shown in **Appendix C**);
- Option 3 – Provide a road upgrade and a SUP with an alternative route. This option considers three alternatives (options 3a, 3b, and 3c) for the route to be taken by the SUP;
- Option 4 – Provide a road upgrade and a SUP on the eastern side of Pittwater road between Epping Road and High Street;
- Option 5 – Provide a road upgrade with an on-road cycling path and retaining the existing pedestrian path along the section of Pittwater Road between Epping Road and High Street.

Each of these options is considered in turn in **Sections 2.3.1-2.3.5**.

2.3.1 Option 1 – Do nothing

If the City of Ryde's road upgrade and SUP proposal does not proceed, the objectives of the *Draft Four Year Delivery Plan 2011-2015, Draft Ryde 2021 Community Strategic Plan* and the City of Connections scheme would not be achieved. Pedestrians and cyclists using the existing carriageway will continue to experience safety risks and have limited access, whilst motorists will continue to be exposed to a range of traffic hazards.

Should the proposed works not proceed, the following outcomes would be expected:

- Accessibility for cyclists and pedestrians would remain at current levels;
- No emergency vehicle access/breakdown lane would be provided;
- Drainage and stormwater facilities would not be improved;
- The objectives of the *Draft Four Year Delivery Plan 2011-2015, Draft Ryde 2021 Community Strategic Plan*, the *Ryde Bicycle Strategy and Masterplan* and the City of Connections scheme would not be achieved; and
- The condition of the carriageway will continue to deteriorate, and road failure of sections currently classified as being of a Condition Grade 5 can be expected to fail in the short term.

Council have an obligation to maintain Pittwater Road in a safe condition. Taking no action will not achieve this, and the Do Nothing option is therefore not considered a viable option.

2.3.2 Option 2 – Provide a road upgrade and a SUP along the section of Pittwater Road between Epping Road and High Street in accordance with Council's proposed 2011 concept design.

Option 2 is the proposed upgrade to the 3.1 kilometre section of Pittwater Road between Epping road and High Street according to the current concept design plans shown in **Appendix C**, noting that:

- Following community consultation Plan 14 will be amended as shown to avoid removal of 2 mature street trees, and
- Following a detailed flora and fauna assessment conducted by Eco Logical Australia Pty Ltd (Eco Logical), a proposed bridge for the SUP over Buffalo Creek (Plan 6) has been removed from the design to avoid a small area of high value saltmarsh in the vicinity. An alternative SUP crossing of Buffalo Creek is now proposed which will cantilever the SUP off the existing road bridge, and will avoid any impacts to the saltmarsh.

The proposed works include kerb and gutter construction and associated stormwater piping and culvert installation, driveway reconstruction, road widening, the provision of a new SUP along the western side of the carriageway and the construction of a shared pedestrian and cycleway bridge over Buffalo Creek. The road upgrade works would also provide an important emergency vehicle/breakdown lane.

The following provides a summary of the upgrade works (broken down into four sections):

High Street to Rene Street (Council Plans 1-8) (Appendix C):

- New kerb and guttering works (as required);
- General resealing work and some heavy patching (as required);

- Realign driveways and access points (as required);
- Narrow the SUP to accommodate the existing power poles (as required);
- Excavation of rock face near Pains road (Plan 2 and Plan 3) to accommodate the SUP;
- One power pole currently located on the north eastern side of the intersection with Pains Road will be relocated by 3 metres (Plan 3);
- One power pole currently located on the western side of Pittwater Road (100 metres south of the Cox' Road roundabout) will be relocated to accommodate a dish drain (Plan 4);
- Field of Mars Car park to be upgraded to accommodate the SUP;
- Provision of an SUP crossing at Buffalo Creek by cantilevering the SUP off the existing road bridge;
- Existing traffic island at Rene Street intersection is to be cut back to accommodate the SUP (Plan 8); and
- New median island to be constructed near the Rene Street roundabout (Plan 8);
- Additional excavation into the rock face is required near the Rene Street intersection (plan 8).

Rene Street to Bronhill Avenue (Council Plans 9-12) (Appendix C):

- New kerb and guttering works (as required);
- Pittwater Road to be line marked to direct one lane of traffic in each direction and addition of a 1.5-2m wide breakdown lane on each side of the road; and
- The footprint of the existing footpath will be widened to 2.5 metres to accommodate the SUP.

Bronhill Avenue to Carramar Avenue (Council Plans 13-16) (Appendix C):

- Road widening to accommodate two vehicle lanes and two breakdown lanes;
- The footprint of the existing footpath will be widened to 2.5 metres to accommodate the SUP;
- The area between the SUP and roadway (nature strip) will be landscaped;
- Addition of four stormwater sedimentation ponds between Bronhill Avenue and Cox's Road (Plan 13 and Plan 14);
- Removal of one tree (White mahogany) (Plan 15);
- Addition of one Gross Pollutant Trap (Plan 15);
- Reconstruction of the existing median island on Pittwater Road at Carramar Ave intersection (Plan 16);

Cox's Road to Epping Road (Council Plans 17-22) (Appendix C):

- Overall kerb and guttering works, line marking and resurfacing works (as required);
- Pittwater Road to be line marked to direct one lane of traffic in each direction and addition of a 1.5-2m wide breakdown lane on each side of the road;
- The SUP will be built along the general route of the existing footpath through this section along Pittwater road by widening the current path to 2.5 metres (except near North Ryde Park and the intersection of Pittwater and Epping Roads as there is not an existing footpath) (refer to Plan 22); and
- Vegetation trimming will be required along some areas to accommodate the SUP.

This option is considered consistent with relevant Council policies and strategies, and ensures that the following will be provided:

- Improved access for cyclists and pedestrians;
- Emergency vehicle/breakdown lanes;
- Improved drainage and stormwater facilities; and
- Improved road surfaces, gutters and kerbs.

Although residents have voiced concern over the potential hazards created by SUPs and driveway ingress and egress, this is the preferred option. Mitigation measures to minimise the hazards and risks identified are included in **Section 5.3.6**, or will be addressed during the detailed design by Council, or through ongoing bicycle safety education to be undertaken by Council.

2.3.3 Option 3 – Provide a road upgrade and a SUP with an alternative route (submitted by the local community) to Council's proposed concept design.

In addition to the route suggested in Option 2, three alternative options for the route to be taken by the SUP have been considered. All three options would provide improved drainage and stormwater services and provide the benefits of having a SUP such as better access for cyclists and pedestrians.

One option (Option 3a), submitted by Friends of Kitty's Creek on 23 February 2010 and the Ryde Environmental Group on 2 March 2010, would consist of the same proposed road upgrade works as for Option 2, but the SUP would have an alternative route between Cox's Road and Carramar Ave in order to avoid the removal of a White Mahogany tree (Plan 15) and would only widen the road on the eastern side of Pittwater Road in this area.

Option 3a was discussed within Council and was not considered to be a viable option as the only available alternative route is to divert the SUP from Pittwater Road to extend behind Martin Reserve via Carramar Avenue and Coxs Road, and eventually back to Pittwater Road. This would add approximately an extra 800m to the SUP route, and is likely to have greater ecological impact as a result of impacts to the flora of Martin Reserve. Further, from an ecological perspective, the White Mahogany this route seeks to avoid is described by MaKay Tree Management (2011) as having a medium/low retention value, and as being infested with arboreal termites with extensive decay along the basal cavity (**Appendix F,** Tree 34).

It is also noted that the additional length of the SUP would make Option 3a more expensive. In addition, only widening the Pittwater Road on the eastern side through this section would not provide for sufficient emergency vehicle/breakdown lanes.

A second alternative route (Option 3b,suggested by the residents in the Community Workshop held on 2 June 2011) proposed that the SUP would cross over from the western side to the eastern side of Pittwater Road between 286-324 Pittwater Road via cycle/pedestrian crossings (which would avoid driveway adjustments) and then return back to the western side.

Option 3b necessitates that cyclists cross Pittwater Road twice. This will require two signalised crossing points, and will disrupt traffic, cycle and pedestrian flows. In addition to

the irregularities in traffic flows, the safety of cyclists and pedestrian SUP users would be comprised by requiring additional crossings of Pittwater Road. Due to the additional disruption to traffic flow and safety concerns, this option is not considered a viable option.

The third option (option 3c) was proposed by the Ryde Environmental Group to avoid the White Mahogany tree (Plan 15) and would divert the SUP route from Pittwater Road onto Cressy Road through to the Field of Mars Reserve. The SUP would rejoin Pittwater Road near the Field of Mars Reserve from where it would continue up to High Street. No map of the proposed route was provided, however several possibilities for this general alignment were considered by the project team.

Option 3c was not considered to be viable for a number of reasons. These include:

- Unlike Pittwater Road, Cressy Road does not have a pedestrian path already demarcated, thus, requiring additional construction works to dig out a new path, and a greater works footprint;
- All the general alignments considered involve a considerably longer route than the route which follows Pittwater Road for its entire length;
- There is likely to be significant disturbance to vegetation in the Field Of Mars reserve and other natural areas. Although not assessed in detail, the vegetation disturbance which would be required is expected to be significantly greater than if the SUP follows the line of Pittwater Road;
- The diversion involves some steep grades, and is therefore less appealing to cyclists; and
- The negligible impacts of removing the White Mahogany and its low retention value do not justify the increase costs for re-aligning the SUP.

Changing the path of the SUP and the extent of road widening required in order to avoid the white mahogany tree described in options 3a and 3c could be cost prohibitive and more damaging to the environment as they would have to go through reserve areas (Martin Reserve for Option 3a and Field of Mars for Option 3c). The eastern side of Pittwater Road contains National Parkland and incursions on that land are not possible and will prohibit option 3a. Additionally, steep grades along Cressy road would rule out option 3c.

2.3.4 Option 4 – Provide a road upgrade and a SUP on the eastern side of Pittwater road between Epping Road and High Street.

This option is to upgrade the 3.1 kilometre section of Pittwater Road between Epping road and High Street by making improvements to the kerbs, gutters, associated stormwater piping, culverts, road widening, the provision of a SUP along the eastern side of the carriageway and the construction of a shared pedestrian and cycleway crossing over Buffalo Creek on the eastern side of Pittwater Road.

This option was proposed as a possible means to avoid potential conflicts between users of the cycleway and residents accessing their properties, and the need for driveway reconstruction.

This option is not considered to be feasible as the majority of the eastern side of Pittwater Road is adjacent to Lane Cove National Park and construction works are not permitted in the

National Park. In addition, even if such works were permitted, the removal of native trees in the National Park required to implement this proposal (and possible impacts on fauna) would make it ecologically undesirable.

There are also safety issues associated with constructing the SUP on the eastern side of the road as, in places, it has a steep embankment which would be hazardous to construction workers and users of the SUP.

2.3.5 Option 5 – Provide a road upgrade with an on-road cycling path and retaining the existing pedestrian path along the section of Pittwater Road between Epping Road and High Street.

This option proposes to upgrade the 3.1 kilometre section of Pittwater Road between Epping road and High Street and add an on-road cycling path. This option would provide improvements to the kerbs, gutters, associated stormwater piping, culverts, road widening, and would at least partially address resident concerns over combined cycleway/driveway access and driveway reconstruction. The option would not meet the objectives of the *Draft Four Year Delivery Plan 2011-2015, Draft Ryde 2021 Community Strategic Plan* and the City of Connections scheme as no SUP would be provided for the local community. Additionally, this option would not allow for a seamless integration with the bicycle networks in adjoining Council areas in order to ensure good regional and local connectivity. The SUP has been consistently adopted within the City of Ryde and this Option would not meet the standard of SUPs already been put in place throughout Ryde.

In comparison to an off-road cycle path (SUP), an on-road cycling path is potentially more hazardous to both cyclist and motorist users. Unlike off-road SUPs, there is little, if any, separation between cyclists and motorists. Regular or experienced commuter rides may prefer this option as they will not have to slow down for pedestrians, but recreational cyclists would be disadvantaged.

This option is considered technically feasible, but the option is not preferred due to inconsistency with Councils accepted policies and strategies, and safety issues arising from on-road cycling.

2.4 Options Assessment

As Option 1 and Option 5 would not meet the objectives of the *Draft Four Year Delivery Plan 2011-2015, Draft Ryde 2021 Community Strategic Plan* and the City of Connections scheme, these options were not considered any further. These alternatives would not meet community demand for a SUP and would deprive cyclist and pedestrian stakeholders of the transportation, health, recreation and safety benefits of a SUP.

The alternative routes for the SUP proposed in Option 3, were not considered to be a viable solution by the Council design team, primarily because they would lead to additional, and potentially greater environmental impacts than under Option 2. In addition, they do not allow for the seamless integration with bicycle networks in adjoining Council areas in order to ensure sufficient regional and local connectivity.

As the majority of the eastern side of Pittwater Road is adjacent to Lane Cove National Park and construction works are not permitted in the National Park, Option 4 was not assessed any further.

Option 2 was reassessed by Council in June 2011 in response to the local community's dissatisfaction over tree removal. Council agreed to redesign the concept design plans along the stretch between Carramar Road to Bronhill Ave to minimise tree removal along this stretch of road (Plan 14 in **Appendix C**). However, the White Mahogany tree between Cox's Road and Carramar Ave could not be avoided and will be removed (Plan 15 in **Appendix C**). It is noted that although locally rare, this tree has a medium/low retention value, is infested with arboreal termites and has extensive decay along the basal cavity (Tree 34 in **Appendix F**).

It has been possible to alter the design in order to avoid the removal of two mature trees (as indicated on Plan 14 in **Appendix C**), and the final design will retain these two trees.

In addition, following a detailed flora and fauna assessment conducted by Eco Logical Australia Pty Ltd (Eco Logical Australia), a proposed bridge for the SUP over Buffalo Creek (Plan 6) has been removed from the design to avoid a small area of high value saltmarsh in the vicinity. An alternative SUP crossing of Buffalo Creek is now proposed which will cantilever the SUP off the existing road bridge, and will avoid any impacts to the saltmarsh.

2.5 The Preferred Option

Option 2 is the preferred alternative because it is expected to provide the most suitable outcome for stakeholders whilst keeping negative environmental and social impacts to a relative minimum. **Appendix C** shows the general arrangement plan for this Option and provides details of design drawings, noting that Plan 14 indicates that the design will be modified during detailed design in order to avoid the mature trees. The proposed bridge over Buffalo Creek noted on Plan 6 will also be replaced during final design with an alternative SUP crossing which will be cantilevered off the existing road bridge in order to avoid a small area of high value saltmarsh in the vicinity.

Under Option 2, widening Pittwater Road and upgrading the kerbs and gutters will allow for improved safety for motorists as well as increasing drainage efficiency. The proposed SUP will fulfil the Council's obligations under the *Draft Four Year Delivery Plan 2011-2015* and *Draft Ryde 2021 Community Strategic Plan* and the *Ryde Bicycle Strategy and Masterplan* by providing better access and connection to, from and within The City of Ryde for its residents, visitors and workers.

This alternative would also meet community demand for a SUP and would provide cyclist and pedestrian stakeholders with the transportation, health, recreation and safety benefits of a SUP.

Stated community objections to the plan include safety (pedestrians, cyclists, and motorists), increased traffic, the loss of important vegetation, preservation of important fauna habitat at Kitty's Creek Reserve and noise impacts during rock excavation and road construction.

Safety concerns have been addressed in **Section 5.3.6** and include community, cyclist and motorist education and the use of appropriate signage for cyclists and motorists. Additionally speed limits for cyclists could also be introduced along sections of the SUP to reduce the risks of cyclist/pedestrian, cyclist/cyclist and cyclist/motorist incidents.

Traffic mitigation measures have been addressed in **Section 5.3.5** and include the recommendation that a Traffic Management Plan should be prepared by Council as part of the Construction Environmental Management Plan (CEMP) to ensure motorists are aware of changed traffic conditions and the provision of appropriate alternative routes if necessary. Appropriate signage should be erected along Pittwater Road, as well as at each intersection of side roads with Pittwater Road to warn motorists to be cautious of construction traffic and alert them to changed traffic conditions.

Habitat loss mitigation measures are addressed in **Section 5.2** and centre around retaining native vegetation wherever possible.

Concerns over noise impacts during construction works have been addressed in **Section 5.3.3** and include the preparation of a Noise and Vibration Management Plan to be developed as part of the CEMP prior to the commencement of the proposed works to address issues associated with construction noise and vibration.

2.6 Indicative Construction Methodology

The following gives a brief overview of the method of construction that is likely to be employed if the proposed works proceed according to the preferred option (Option 2) shown in **Appendix C**.

- Site establishment, with a mobile caravan to provide basic amenities for workers being located off Pittwater Road, most likely in the car park of the Field of Mars Reserve;
- Setting up temporary erosion and sediment control measures;
- Setting up temporary traffic control measures;
- Utility service adjustments and relocation, including the movement of two power poles;
- Excavation of pavement for the SUP and earthworks including some excavation of the adjacent rock face so as to widen the existing path between High Street and Rene Street;
- Trench excavation for stormwater drainage;
- Placement of stormwater and subsoil drainage pipes and construction of pits;
- Installation of water quality improvement devices (GPT and sediment basins);
- Backfill and compaction of trenches;
- Placement and compaction of pavement materials;
- Cantilevering the SUP off the existing road bridge over Buffalo Creek, with the trimming and removal of planted vegetation as required;
- Overlaying concrete for kerbs, guttering and the cycleway;
- Overlaying concrete for property adjustments in the form of driveway reconstructions;
- Replacement of the existing island at the intersection of Pittwater Road and Rene Street;
- Line-marking and the installation of road signs; and
- Landscaping and revegetation of disturbed terrain via the use of turf and planting where required.

The works are expected to be progressively staged over a period of 5 years and are estimated to cost around $2.5 million. Each stage of works will take place as funding is available to The City of Ryde.

All construction is to be in accordance with Council's Development Control Plan, with particular reference to Section 8.1 of the DCP (Construction Activities).

3 Statutory Planning and Legislative Requirements

This section of the REF provides a brief overview of the key planning instruments and legislation relevant to the proposed works.

3.1 Environmental Planning and Assessment Act 1979

This REF has been prepared in accordance with the *Environmental Planning and Assessment Act 1979* (EP&A Act 1979), which aims to encourage proper management, development and conservation of natural and artificial resources to ultimately promote the environment and the economic and social welfare of the community. In addition to this, it seeks to promote the sharing of responsibility between state and local government and facilitate public involvement in the planning and assessment process. The proposed works are not classified as designated development as defined under Schedule 3 of the *Environmental Planning and Assessment Regulation* 2000.

The EP&A Act (1979) defines the assessment process which must be followed for different types of project. The proposed works on Pittwater Road fall under Part 5 of the Act and in this case, The City of Ryde is the proponent and the determining authority. Under Part 5 of the EP&A Act (Section 111) there is a duty for determining authorities to consider the environmental impacts of proposed activities. The specific aspects of these environmental considerations are detailed in Clause 228 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation). All requirements of Clause 228 are addressed in this REF.

3.2 Protection of the Environment Operations Act 1997

The *Protection of Environment Operations Act 1997* (PoEO Act) aims to protect, enhance and restore the quality of the environment in New South Wales, to reduce risk to human health and promote mechanisms that minimise environmental degradation. An Environmental Protection Licence (EPL) may be required from the Office of Environment and Heritage (OEH) if any of the activities associated with the proposed works are determined to be a Scheduled Activity under Schedule 1 of the Act.

Road Construction activities are listed under Schedule 1 of the Act:

> *"meaning the construction, widening or re-routing of roads, but does not apply to the maintenance or operation of any such road. The activity to which this clause applies is declared to be a scheduled activity if it results in the existence of 4 or more traffic lanes (other than bicycle lanes or lanes used for entry or exit) for at least:*
>
> *(a) Where the road is classified, or proposed to be classified, or proposed to be classified, as a main road (but not a freeway or tollway) under the Roads Act 1993:*
>
> *(i) 3 kilometres of their length in the metropolitan area."*

The proposed works will result in widening to 4 traffic lanes (2 standard motorist lanes and 2 emergency vehicle/breakdown lanes) for the works. It was unclear at the time this REF was prepared if the additional emergency vehicle/breakdown lanes are considered traffic lanes

under Schedule 1 of the Act. If the breakdown lanes are considered by OEH to be traffic lanes, an EPL will be required for the proposed works. Further consultation by Council with OEH has been recommended to resolve this issue.

3.3 Roads Act 1993

The objectives of the *Roads Act 1993* are:

- To set out the rights of members of the public to pass along public roads;
- To set out the rights of persons who own land adjoining a public road to have access to the public road;
- To establish the procedures for the opening and closing of a public road;
- To provide for the classification of roads;
- To provide for the declaration of the RTA and other public authorities as roads authorities for both classified and unclassified roads;
- To confer certain functions (in particular, the function of carrying out road work) on the RTA and on other roads authorities;
- To provide for the distribution of the functions conferred by this Act between the RTA and other roads authorities; and
- To regulate the carrying out of various activities on public roads.

Pittwater Road is classified as a public road and The RTA must grant consent or concurrence under the *Roads Act 1993*.

3.4 Environmental Planning Instruments

A review of all State Environmental Planning Policies (SEPPs) and relevant policies as they apply to the planning and environmental impacts of the proposed works has been undertaken. Those which are relevant to the project are described in the sections below.

3.4.1 State Environment Planning Policy (Infrastructure) 2007

SEPP (Infrastructure) (2007) details the consultation and environmental assessment categories required for Infrastructure developments.

Under SEPP (Infrastructure), consent under Part 4 of the *EP&A Act* is not required for the proposed road upgrade in accordance with Clause 94 (Development permitted without consent), where 'consent' means development consent under Part 4 of the EP&A Act and any other type of consent, licence, permission, approval or authorisation required by or under an Environmental Planning Instrument (EPI).

The associated pedestrian and cyclist infrastructure is classified as exempt development under the SEPP (Clause 97) as it will be carried out by or on behalf of a public authority in connection with a road or road infrastructure facilities.

3.4.2 State Environmental Planning Policy No 19 – Bushland in Urban Areas

SEPP 19 (Bushland in Urban Areas) is in place to protect and preserve bushland within urban areas in NSW. Clauses 6 and 7 of SEPP 19 (Urban Bushland) requires Council determination under Part 5 of the *EP&A Act* for the disturbance of any bushland in urban

areas zoned or reserved for public open space which will occur as part of this proposal (**Section 5.2**). In this case, The City of Ryde Council will be the determining authority.

3.4.3 State Environmental Planning Policy No 44 – Koala Habitat Protection

SEPP 44 (Koala Habitat Protection) aims to provide for the proper conservation and management of koala habitat, and applies to all land not dedicated or reserved under the *National Parks and Wildlife Act 1974* or the *Forestry Act 1916*. The site of the proposed works is not located in any of the LGAs specified in the SEPP. Furthermore, the area of vegetation to be disturbed by the proposed works is relatively small and is not likely to be koala habitat. The trees proposed for removal (**Appendix C**) were not identified as species consumed by koalas.

SEPP 44 is therefore not considered relevant to the proposed works.

3.4.4 State Environmental Planning Policy No 55 – Remediation of Land

SEPP 55 (Remediation of Land) relates to the remediation of contaminated land in NSW. SEPP 55 was assessed for its relevance to the proposed works. A search of the OEH Contaminated Lands Register on 30 May 2011 revealed no evidence of contaminated land in the project area, however as areas within close proximity to the site were used as landfill in the 1950s, the activation of this SEPP could occur if contaminated land is encountered during proposed construction (**Section 5.1.1**).

3.4.5 *Guidelines for development adjoining Department of Environment and Climate Change land*

The OEH manage land acquired, reserved or dedicated under the *National Parks and Wildlife Act 1974*. This includes areas such as national parks, historic sites, nature reserves, Aboriginal areas, karst conservation areas, regional parks and state conservation areas.

As this project has the potential to impact on Lane Cove National Park, the proponent is to refer to the *Guidelines for development adjoining Department of Environment and Climate Change land*. The *Guidelines* recommend that Councils and other consent authorities should consider the following issues when assessing proposals adjoining DECC (now OEH) land, particularly how they could impact on the reserve:

- Erosion and sediment control;
- Stormwater run-off;
- Management implications, pests, weeds, edge effects;
- Fire and the location of asset protection zones;
- Boundary encroachments;
- Visual, odour, noise, air quality impacts and amenity; and
- Threats to ecological connectivity.

3.5 Regional Environment Plans

There are no Regional Environmental Plans which affect the proposed site of works.

3.6 Local Environment Plan

Local Environment Plans (LEPs) provide a statutory framework under the *EP&A Act 1979* and ensure that local needs and interests are taken into account when planning for development. The City of Ryde currently has a Draft LEP 2011 which is still a working document and has not yet been adopted. The current environmental planning control document for the City of Ryde is the Ryde Local Environmental Plan 2010. The current land zoning map within the Ryde LGA is shown in **Figure 3.1.** Under this Planning Scheme, the proposed works are located along Pittwater Road which is adjacent to land zoned Public Recreation (RE1), Private Recreation (RE2), Medium Density Residential (R3), National Parks and Nature Reserves (E1), and Environmental Conservation (E2). **Figure 3.1** shows the zoning for the Ryde LGA only (Hunters Hill LEP zoning is not shown). The adjacent Hunters Hill LGA, under the Hunters Hill LEP No.1, has similar zoning classifications, namely E1, and E2.

It is noted that as the works are being undertaken under the provisions of ISEPP (2007), zoning under the LEP is not directly relevant to this project, however it is included here to provide useful context.

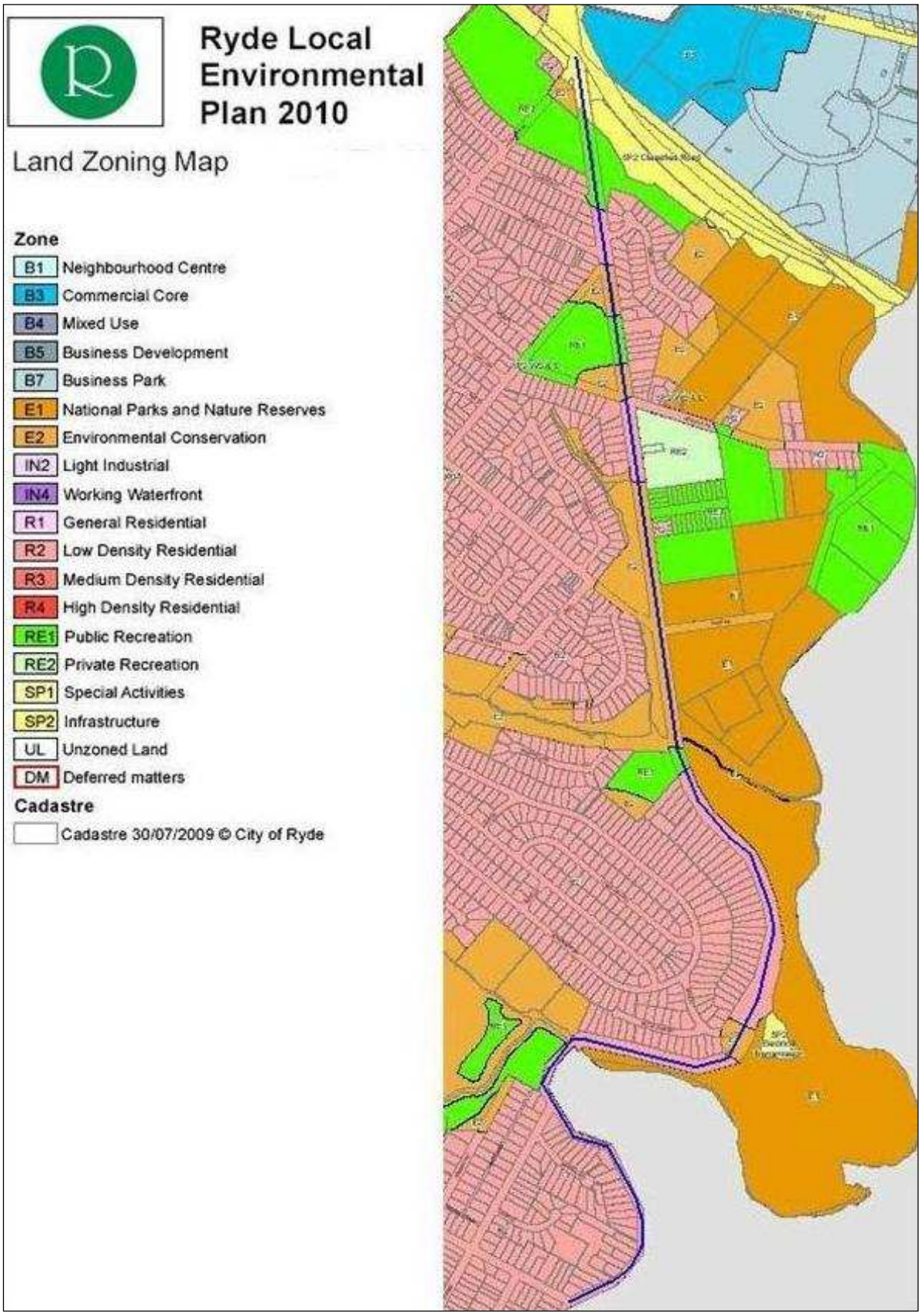

Figure 3.1: City of Ryde LEP 2010 zoning for study area, blue line represents Pittwater Road.

3.7 Development Control Plan

The City of Ryde Development Control Plan (DCP) 2010 is the most recent planning instrument implemented by Council to guide development approvals. This document provides details of the various standards, policies and guidelines adopted by Council for development in the Ryde Local Government Area. Council adopted The City of Ryde Development Control Plan 2010 on 16 June 2009 and the Plan came into effect on 30 June 2010. Section 8.1 (Construction Activities) of Council's DCP includes guidelines for matters such as erosion and sediment practices, tree preservation and traffic management in relation to construction sites and activities. Any construction activity associated with the works should be undertaken in accordance with this section of Council's DCP.

3.8 Other Pollution Control Legislation

The *Pesticides Control Act* 1999 states that pesticides must be registered by the National Registration Authority for Agriculture and Veterinary Chemicals (NRA). The NRA therefore regulates the sale of pesticides; whilst the EPA (OEH) enforces proper use of pesticides after the point of sale to minimise the impacts on health, the environment and trade. Permits for "off label" use may be obtained under the existing legislation, however Penalty and Clean-up notices will be issued for the improper use or management of pesticides.

The *Environmentally Hazardous Chemicals Act* 1985 governs the use and disposal of potentially hazardous chemicals and waste material. Any use and/or removal of hazardous chemicals and material defined under this Act require licensing and must be appropriately declared.

3.9 Terrestrial Ecology

The proposal does not require consideration of the *Native Vegetation Act 2003* because urban areas, including those within The City of Ryde Local Government Area, are excluded from the provisions of the Act.

The *EP&A Act 1979* requires that the impacts that any proposed activity may have upon threatened species, populations or ecological communities and their habitats are assessed. Lists of threatened species, populations and ecological communities are contained in Schedules 1 and 2 of the *Threatened Species Conservation Act 1995*. These matters are assessed in **Section 5.2** of this REF.

Consideration of Commonwealth Legislation is also required. The *Environment Protection and Conservation (EPBC) Act 1999* requires that approval be obtained from the Minister for any action that is likely to have an impact on matters of national significance. The *EPBC Act 1999* regulates any development or activity if it is likely to have a significant impact on matters of national environmental significance, activities taken on or affecting Commonwealth Land, and the activities of Commonwealth Agencies. Matters of national significance include world heritage, wetlands of international importance and listed threatened species or communities.

The *Noxious Weeds Act 1993* was implemented to regulate the impacts and spread of weeds within NSW. The Act governs the control of weeds which requires declaration as a noxious weed, classification and removal. Land which is privately occupied requires

implementation of appropriate noxious weed controls under Part 4 of the *Noxious Weeds Act 1993*. Penalties apply if the occupier fails to comply.

3.10 Aquatic Ecology

The *Fisheries Management Act 1994* requires approval to be obtained from the Department of Primary Industry (Fisheries) (DPI) for any works taking place within 50m of aquatic habitats. Also under the *Fisheries Management Act 1994*, a permit must be gained from the DPI (Fisheries) to harm mangroves, where "harm" means gather, cut, pull up, destroy, poison, dig up, remove, injure, prevent light from reaching or otherwise harm the marine vegetation, or any part of it. It is considered that approvals from Fisheries will be required for:

a) Works within 50m of aquatic habitat, and

b) Harm of mangroves.

3.11 Water

The management of water in NSW is governed in accordance with the *Water Management Act 2000* which repeals and replaces a number of related Acts, primarily the *Rivers and Foreshore Improvement (RFI) Act 1948*, and now regulates all construction activities in proximity to waterways. Principles set out in the Act generally aim to preserve and/or restore water sources, floodplains, and water dependant ecosystems (including groundwater and wetlands). The Act also encompasses the protection of habitats, animals and plants which benefit from water or are potentially affected by managed activities. Furthermore, the quality of all water sources must be protected and where possible enhanced. A controlled activity approval is required from the Office of Environment and Heritage (OEH) for any excavation to be carried out on land within a prescribed distance from a waterfront (40 metres). However, clause 39A(1) *Water Management (General) Regulation* 2004 states that all public authorities and local councils are to be exempt from Section 344 (1)(a) of the *Water Management Act 2000* and are not required to obtain controlled activity approval. Therefore, the City of Ryde Council, as the proponent of the works, is not required to obtain an approval under this Act.

3.12 Heritage

Heritage within NSW can be placed generally into two categories: Aboriginal heritage and non-Aboriginal heritage. The *Heritage Act 1977* provides protection for natural and cultural heritage by providing for the listing of heritage items or places on the State Heritage Register and providing for the making of interim heritage orders for the protection of heritage items or places. Under the *Heritage Act 1977*, it is an offence to harm relics protected by Interim Heritage Orders, the State Heritage Register or environmental planning instruments. Furthermore, the removal of a relic requires an excavation permit from the Heritage Council (Farrier *et al*., 2004).

The *National Parks and Wildlife Act 1974* (*NPW Act*), administered by OEH, is the primary legislation for the protection of Aboriginal cultural heritage in NSW. Part 6 of the *NPW Act* provides specific protection for Aboriginal objects and places. A section 87 Permit or a section 90 Consent under the NPW Act issued by the Director General of the OEH should be obtained if impacts on Aboriginal objects and places are anticipated.

It is the proponent's duty to examine relevant heritage registers for the sites in the proposed area of works for potential Aboriginal and non-Aboriginal heritage values. This REF includes such examination of registers which is further discussed in **Section 5.3.4**.

It is noted that there is a requirement under the NPW Act for Council to perform and plan the works, applying due diligence to the potential impacts on aboriginal heritage. The assessment and proposed mitigation measures set out in this REF are intended to meet this requirement.

3.13 Geology and Soils

The *Soil Conservation Act 1938* is associated with the preservation of soils and prevention of erosion within a parcel of land. The appointment of a conservation commissioner is primarily to control and protect; proclaimed works, notified catchment areas, rivers, lakes, dams, creeks, lagoons and marshes from the effects of soil erosion, land degradation, siltation and sedimentation. Notice may be issued if the commissioner is of the opinion that the land holder has done or is likely to do something that will ultimately lead to land degradation.

The *Contaminated Land Management Act 1997* outlines the assessment criteria and management of contaminated land which poses significant risk to human health or the environment. Under the Act, a person or persons (or a public authority) will be held responsible as an outcome of land contamination. OEH is responsible for declaring the land as 'Contaminated' and will give notice to end the declaration, once satisfied that the land poses no further risk.

3.14 Waste Minimisation

The *Waste Avoidance and Resource Recovery Act 2001* is the key legislation pertaining to waste management in NSW. No permits are required under the Act, though the responsibilities of land occupiers are clearly defined with regards to waste production/management and natural resource usage. The Act makes reference to 'waste strategies' including minimization and disposal along with efficient use and disposal of natural resources.

3.15 Other relevant requirements and policies

The *Draft Ryde 2021 Community Strategic Plan* is a long term strategy for the local Ryde community and aims to ensure that the City of Ryde lives up to the goals of the community, while meeting the challenges of the future. The City of Ryde will use this Plan as a foundation of all of its decisions, resource allocation and activity over the next decade. The Plan is a key document in keeping the Council's asset management obligations (for roads, parks, drainage, etc.) on track.

The *Draft Four Year Delivery Plan 2011-2015* (which includes the *Operational Plan for 2011/12*) is the next step in implementing and delivering the *Draft Ryde 2021 Community Strategic Plan*. This is part of the City of Ryde's collective vision to create a blueprint for the future of the city. The *Draft Four Year Delivery Plan* describes how the *Draft Ryde 2021 Community Strategic Plan* underpins the vision that the City of Ryde is the place to be for lifestyle and opportunity at your doorstep. The *Draft Four Year Delivery Plan* is Council's

commitment to the community and illustrates how Council will actively meet the opportunities and challenges of the City of Ryde between 2011 and 2015.

The *Operational Plan for 2011/12* details Council's planned projects for the financial year and their associated expenditure. The plan has allocated $290,000 for the 2011-2012 financial year to the City of Ryde's *Paths and Cycleways Program*, which includes the addition of a SUP along this section of Pittwater road. The plan has also allocated $4,470,000 for the *Roads Program*, which includes the upgrade works along Pittwater Road.

3.16 Summary of Permits, Approvals and Licences

A list of the full range of requirements for approvals, licenses and permits associated with the identified legislation relevant to the project is provided in **Table 3.1**.

Table 3.1: Summary of Requirements for Permits, Approvals and Licences

Legislation	Authority	Relevance to the Project	Approval / Licence / Other Requirements
Contaminated Land Management Act 1997	OEH	Action is required if any contaminated land is verified, which presents 'a significant risk of harm'.	Report to OEH if contaminated land identified. None currently identified (**Section 5.1.1**)
Environmental Planning and Assessment Act 1979	DoPI	Approval from government is required to ensure proper management of natural and artificial resources, promote the environment and the economic and social welfare of the community.	No consent under Part 4 required. Determination under Part 5 required.
Environment Protection and Biodiversity Conservation Act (EPBC)1999	Commonwealth	Approval from the Department of the Environment, Water, Heritage and the Arts is required if any significant impacts are expected on items of national environmental significance or significant impacts on Commonwealth Land.	No approvals or licences required.
Fisheries Management Act 1994	DPI (Fisheries)	Works within 50 m of an aquatic habitat (i.e. adjacent to Buffalo Creek).	Concurrence from DPI and a Part 7 Permit may be required for the construction of the SUP crossing over Buffalo Creek. The required bridge works are seen to be occurring within a riparian area which includes the existence of mangroves (**Section 5.2**). A Part 7 permit is required to harm mangroves.
Heritage Act 1977	Heritage Branch (DoPI)	Relates to non-Indigenous historic artefacts and / or sites (older than 50 years), if found.	An excavation permit may need to be obtained from the NSW DoPI if any heritage items will be impacted and are found to be over 50 years old (**Section 5.1.1**).
National Parks and Wildlife Act 1974	OEH	A permit is required to disturb or destroy any Aboriginal objects or places, or for the removal of any detected threatened species. The OEH manage land acquired, reserved or	Should any Aboriginal object be detected during the works a S90(2) Consent to destroy, deface or damage an Aboriginal object or place would need to be obtained if the object cannot be avoided.

Legislation	Authority	Relevance to the Project	Approval / Licence / Other Requirements
		dedicated under the *National Parks and Wildlife Act 1974*. This includes areas such as national parks, historic sites, nature reserves, Aboriginal areas, karst conservation areas, regional parks and state conservation areas.	As this project has the potential to impact on Lane Cove National Park, the proponent is to refer to the *Guidelines for development adjoining Department of Environment and Climate Change land*.
Native Vegetation Act 2003	OEH	Loss of any native vegetation as a result of the proposed works	As the proposed works are being carried out within an urban area, no approvals are required.
Noxious Weeds Act 1993	DPI	Removal and disposal of noxious weeds must be carried out appropriately.	No permits or approval required but Council will have responsibility for removal and proper disposal.
Pesticides Act 1999	OEH	Any pesticides to be used on site during the construction phase are to be stored and handled in accordance with the provisions of the Act.	Labelling requirements for pesticides to be adhered to. Certificates for use of restricted pesticides.
Protection of the Environment Operations Act (PoEO 1997)	OEH	Road construction activities associated with the proposed works are determined to be a Scheduled Activity under Schedule 1 of the Act. Noise, Air and Water Pollution and Waste Management for scheduled activities or activities that may cause water pollution.	No approvals or licences required for pollution. The proposed works will result in widening to 4 traffic lanes (2 standard motorist lanes and 2 emergency vehicle/breakdown lanes) for the works. It was unclear at the time this REF was prepared if the additional emergency vehicle/breakdown lanes are considered traffic lanes under Schedule 1 of the Act. If the breakdown lanes are considered by OEH to be traffic lanes, an EPL will be required for the proposed works. Further consultation by Council with OEH has been recommended to resolve this issue.

Legislation	Authority	Relevance to the Project	Approval / Licence / Other Requirements
Waste Avoidance and Resource Recovery Act (WARR) 2001	OEH	The Proposal would use resources and generate waste, and as such needs to consider the Resource Management Hierarchy in the Act.	No approvals or licences required.
Rural Fires Act 1997	NSW Rural Fire Service	Obligation to manage present and future risk of bushfire.	No approvals or licenses required.
Soil Conservation Act 1938	OEH	Alteration of the land may lead to increased erosion hazard and follow on effects within catchment water bodies.	No approvals or licenses required. Commissioner may issue notices if works are considered to induce significant erosion effects. Erosion control practices are to be maintained in accordance with the Act.
Threatened Species Conservation Act 1995	OEH	Prohibition on harming or damaging any threatened species, populations, community or their habitat.	No license for the proposed works is expected to be required.
Water Management Act 2000	OEH	Construction of temporary earthworks or structure across an area. Works are within protected waters or within 40 metres of top of bank. Water extraction from waterways for dust suppression.	Approval is not required as the works will be conducted by Council. It has been assumed that no water will be extracted from the adjacent wetland areas for dust suppression, or any other purpose.
SEPP 19 (Urban Bushland)	OEH	Disturbance of any bushland in urban areas zoned or reserved for public open space.	Approval for the disturbance of bushland will be required by The City of Ryde Council.
Roads Act 1993	RTA	Carrying out works in, on or over a public road.	The RTA must grant consent or concurrence under the *Roads Act 1993.*

4 Consultation

4.1 Statutory Consultation

Consultation with relevant statutory stakeholders was undertaken by Cardno in the context of preparing the REF only via letter correspondence. The following stakeholders were consulted:

- Hunters Hill Council;
- Office of Environment and Heritage (OEH);
- Department of Planning and Infrastructure (DoPI);
- Heritage Branch of DoPI;
- Department of Primary Industries (DPI) – Fisheries;
- Metropolitan Local Aboriginal Land Council (MLALC);
- National Parks and Wildlife Service (NPWS); and
- Sydney Metropolitan Catchment Management Authority (SMCMA).

Table 4.1 provides a summary of the responses received from stakeholders. Full responses are provided as **Appendix C.**

Table 4.1: Stakeholder Consultation Responses Summary

Issue / Comments	Addressed in REF
Fisheries (under the DPI)	
Consideration should be given to the following matters regarding the *Fisheries Management (FM) Act 1994:*	
- Erosion and sedimentation impacts to aquatic habitats during construction;	**Section 5.1.3**
- Direct harm of saltmarsh, mangrove or riparian habitats during construction;	**Section 5.2**
- Blockage of fish passage during construction and from the design of waterway crossings;	**Section 5.2**
- Impacts to the water quality of the Lane Cove River from stormwater runoff during and following construction;	**Section 5.1.3**
- Impacts to aquatic habitats resulting from acid sulfate soil management; and	**Section 5.1.1**
- Where the harm of marine vegetation cannot be avoided, a permit under s.205 of the FM Act will be required for these works.	**Section 5.2**
OEH	
The OEH advised that the key environmental issues that need to be addressed in the REF are:	
- Aboriginal cultural heritage;	**Section 5.3.4**
- Air quality (construction);	**Section 5.1.2**
- Biodiversity;	
- Impacts on threatened species and/or populations; and	**Section 5.2**
- Impacts on endangered ecological communities (EECs);	**Section 5.2**
- OEH Estate;	
- Land adjacent to National Park;	**Section 3.4.5**
- Noise and vibration impacts;	**Section 5.3.3**
- Soils;	**Section 5.1.1**
- Water quality;	**Section 5.1.3**

- Surface and ground waters; - Resource and waste management; - Energy conservation and greenhouse gas emissions reduction; and - Site contamination.	**Section 5.1.3** **Section 5.3.8** **Section 5.3.2** **Section 5.1.1**
The REF is to be supported by robust investigations; provide a detailed analysis of the nature and scope of project environmental impacts; and examine proposed measures to avoid and, where necessary, mitigate those impacts.	**Noted**
OEH advised that the project has the potential to impact on Lane Cove National Park and has referred the proponent to the *Guidelines for development adjoining Department of Environment and Climate Change land* in the preparation of the REF.	**Section 3.4.5**
OEH advised that a community consultation program should be implemented prior to the commencement of any project works. The REF should outline the preparation and implementation of a community consultation and notification process for the project, including a 24 hour complaints handling system. Community consultation should cover issues of noise impacts and disruptions to services, including road and pedestrian access.	Community consultation is discussed in **Section 4** and **Appendix E**. Council maintains a complaints system which will be used for this project. This enables an individual to lodge their grievance with customer service, who then pass it onto the Project Development team for action. Application of this system to the project will be a requirement of the CEMP.
This project may be considered a "scheduled activity" under the *Protection of the Environment Operations Act 1997 (POEO Act)* and may require an Environmental Protection Licence (EPL). Schedule 1 of the POEO Act should be referred to when addressing this issue. The REF should address the requirements of the POEO Act determining the extent of each impact and provide sufficient information to enable OEH to determine appropriate limits for the EPL, if required.	**Section 3.2** and **3.16**
DoPI The department supports the projects because it is consistent with the NSW State Planning directions to provide safer roads (Direction S7) and improve efficiency of the road network (Direction E7) and Action C5.7 of the Metropolitan Plan for Sydney 206 which requires the NSW Bike Plan 2010 to be implemented.	**Noted**
Consideration should be given to the following elements of the *Cycling Aspects of Austroads Guides* (CAAG) and the *NSW Bicycle Guidelines*: - Path width; - Shared use; and - Safety barriers. DoPI advised that consideration should be given to the CAAG parameters for bicycle path offsets from roundabouts for the following areas: - The roundabout at Pittwater Road/High Street (Plan 1); - The roundabout at Pittwater Road/Entrance to Buffalo Creek Reserve	It has not been possible to meet all recommended elements of the CAAG and NSW Bicycle Guidelines due to the existing environmental and social constraints of the site. The design philosophy has

(Plan 5); - The roundabout at Pittwater Road/Rene Street (Plan 8); - The crossing of Carramar Ave roundabout (Plan 16); and - The crossing of Magdala Road roundabout (Plan 17); Consideration should be given to avoiding bending out the bicycle path crossing of Brohill Road from Pittwater Road (as indicated by Plan 12). The CAAG advises that a bent out crossing treatment is only suitable where; - Motor vehicle storage is possible; - Where there is room for a minimum offset of 7 metres; and - Where smooth curves (30m) can be achieved. DoPI advised that consideration should be given to relocating the exiting power pole on the south side of Bronhill Ave at Pittwater Road as it obstructs motorists' view of cyclists and pedestrians attempting to cross Bronhill Ave. This is in line with the *NSW Bicycle Guidelines*. DoPI advised that the crossing of Cressey Road (Plans 19 and 20) is not required to be bent out. DoPI suggested the crossing could make use of the existing median island, similar to the proposed treatment of crossings at Warwick Street and Clarence Street in order to avoid crossing the driveway of 204 Cressey Road. Consideration should be given to smoothing out the proposed bend in the path on the south side of Clarence Street crossing, to match the treatment at the north side of Clarence Street, in line with CAAG, p.101 "the use of tight curves can introduce maneuvers that require the cyclist's attention at a point where their attention should be focused on the crossing and approaching vehicles." Consideration should be given to the crossing of Blenheim Road as it is not required to be bent out (Plan 22). However, a new median island could be included to provide safety for cyclists and pedestrians.	been to integrate practical safety measures into the design, and wherever possible, the guidelines have been met. The concept design has been prepared in accordance with all statutory requirements. A safety management plan will be prepared once a final option is selected.
SMCMA SMCMA's staff resources do not generally permit detailed input into relatively small scale projects such as this. The SMCMA advised that they have detailed (approx 1:4000 scale) maps showing vegetation communities across the region and advised that Council would have access to that information. The SMCMA works with its partners and the community, especially through local councils, to promote the importance of biodiversity, native vegetation and other natural resource issues in this region. The Catchment Action Plan (available on the SMCMA's website at www.sydney.cma.nsw.gov.au provides a ten year strategic plan for natural resource management in the region. From a biodiversity perspective the CAP seeks to enhance ecological resilience and connectivity of bushland and aquatic habitats. Works such as those proposed could impact on those aims and appropriate steps to mitigate the impact should be incorporated into the project if it is to proceed.	**Noted** **Noted**
Heritage Branch of DoPI Council should ensure that the following matters are addressed at a minimum: - Confirmation of items of heritage significance located within, and adjacent to, the proposed development area and their listing, or other status. This should include a review of the statements of significance	**Section 3.12**.

for these items and additional research completed where information is lacking.
- Assessment of impacts to heritage significance, including potential archaeological significance consistent with Heritage Council guidelines, in particular:
  - Statements of Heritage Impact available on the Heritage Council website: www.heritage.nsw.gov.au/docs/hm_statementsofhi.pdf
  - Assessing Heritage Significance available on the Heritage Council website:www.heritage.nsw.gov.au/docs/assessingheritagesignificance.pdf
- Outline proposed mitigation measures where impacts have been identified including the evaluation of the effectiveness and reliability of these measures.
	No known heritage items of significance will be impacted by the proposed works, see **Section 3.12**. However, it is noted that should this change, requirements under the Heritage Act 1977 should be reviewed and the Heritage Branch should be consulted.
	Section 3.12

The above-mentioned material should be prepared by a suitably qualified heritage consultant and archaeological consultant for matters related to archaeology.	**Noted**
It should be noted that the Heritage Council is an approval authority under the *Heritage Act 1977* for any development on items listed on the State Heritage Register (SHR). In some cases where impacts to heritage are minor, exemptions from the need to obtain approval may be endorsed.	No known heritage items of significance will be impacted by the proposed works, see **Section 3.12**. However, it is noted that should this change, requirements under the Heritage Act 1977 should be reviewed and the Heritage Branch should be consulted.
The Heritage Council is also an approval authority and issues permits for disturbance or excavation of any land in NSW (whether listed or not on the SHR) that is likely to contain archaeological 'relics'. There are two types of applications, depending on whether the site is listed on the State Heritage Register or not. In cases where impacts are minor, exceptions from the need to obtain permits may be considered.	**Noted**
Hunters Hill Council At the preparation of this report no response was received.	**N/A**
MLALC At the preparation of this report no response was received.	**N/A**
NPWS At the preparation of this report no response was received.	**N/A**

4.2 Community Consultation

Community consultation was undertaken by GHD in mid 2011. This section summarises and addresses the results of community consultation which are relevant to the potential environmental impacts of the project.

A full report on the community consultation process and outcomes can be found in **Appendix E**.

4.2.1 Community Engagement Activities

The key objectives of the community involvement activities were to:

- Ensure that a diverse range of the local community and stakeholders are informed about the project and given the opportunity to provide feedback;
- Provide stakeholders with an opportunity to ask questions and to identify areas of concern with respect to the project;
- Ensure that all relevant concerns and issues raised by the community and stakeholders are considered in the development of the REF;
- Implement a planned approach to community and stakeholder communications; and
- Effectively and proactively identify and manage local issues

Engagement activities already completed, as well as those that are proposed for the future are as follows:

Phase 1 – project inception from 28 April 2011

- Establishment of a project 1800 number and email facility;
- Preparation of a Community and Stakeholder Consultation Strategy; and
- Development of contact and issue database.

Phase 2 – obtaining feedback: from 23 May 2011

- Delivery of community newsletter outlining the proposal and an workshop (on 2 June 2011) to local residents;
- Provision of information about the project on the City of Ryde's website;
- Promotion of an online community survey;
- Preparing and distributing a letter to various stakeholders and government agencies;
- Meetings with Ryde Environment Group, Friends of Kittys Creek and the Ryde Hunter's Hill Flora and Fauna Preservation Society;
- Telephone discussion with representatives from Bike North;
- Information about the project included in the City of Ryde's City View publication (which is included in an edition of The Northern District Times);
- Signage installed along Pittwater Road to advertise the project and consultation process; and
- An interactive community workshop on 2 June 2011: about 25 people attended.

Phase three – presenting the REF: future

GHD has been engaged to prepare the report in **Appendix E** for Council officers, prepare a Preferred Outcomes Report for Council and then prepare and distribute a final community newsletter to residents.

4.2.2 Summary of Community Workshop

A community workshop was held on the 2 June 2011 at the North Ryde RSL Club, between 6pm and 9pm. It was run in four parts:

- Background to the project and presentation of the concept design;
- Question and answer session to clarify the current concept design;
- Interactive workshop session; and
- A review of the results of the interactive workshop session.

The issues and concerns of the community that were identified during the interactive workshop session are summarized below:

- Traffic and road condition concerns;
- Road safety concerns;
- Safety barrier concerns;
- Speed concerns;
- Stormwater quality concerns;
- Stormwater drainage concerns;
- Usage of the SUP;
- Position of the SUP;
- Driveway repositioning;
- Safety for cyclists;
- Vegetation trimming;
- Tree removal;
- Rock face excavation;
- Impacts on Kitty's Creek;
- Landscape restoration;
- Cost of the project; and
- Notifications to residents.

4.2.3 Environmental Issues arising from community consultation

A summary of the environmental concerns, the section of the REF in which the concerns have been addressed and the section in **Appendix E** where the concern has been raised, are all listed below in **Table 4.2**.

Table 4.2: Community environmental comments and issues raised during the consultation process and response in REF.

Issue / Comments	Addressed in REF	Section in Appendix E
Traffic and Road Safety		
› Road resurfacing is currently required.	**Section 2.1** and **Section 2.2**: Sections of the pavement are failing or have already failed which is compromising user safety and has an unacceptable appearance. One of the overall goals of the proposed works is to improve the road surface and structure between Epping Road and High Street.	**Section 3.1.1**
› Traffic volume along Pittwater Road has gone down but congestion has gone up.	The works are not expected to significantly alter the volumes of traffic using the road. Once the works are complete, improved traffic flow is expected, especially in the event of vehicle breakdowns and accidents as the addition of breakdown lanes will enable broken down vehicles to be removed from the traffic flow, and for the passage of emergency / recovery vehicles. The improved carriageway condition will also allow for safer and better flowing traffic.	**Section 3.1.1**
› Who has the right of way when a cyclist at speed crosses a driveway when a car is backing out? Safety issue/liability.	A risk management plan needs to be created to address such issues as right-of-way and SUP safety. Driveway hazards could be reduced by community, cyclist and motorist education and the use of appropriate signage for cyclists and motorists. Speed limits for cyclists could also be introduced along sections of the SUP to reduce the risks of cyclist/pedestrian, cyclist/cyclist and cyclist/motorist incidents. Segregation of pedestrians and cyclists on the SUP using clear lane markings and signage, and providing ample room for pedestrians and cyclists to share the path without incident (ideally the SUP should be 3-4m in width) are desirable, however it is noted that this is not possible along all sections of the SUP. This issue will be considered during the detailed design stage and through ongoing bicycle safety education undertaken by Council.	**Section 3.1.1**
› The Shared User Path (SUP) needs separation from the road.	**Section 2.1**and **Section 2.5**: The preferred option is for a SUP which is separated from the road.	**Section 3.1.1**
› Increased traffic since Lane Cove tunnel (traffic light signal for left hand turn)	This is an existing / historic issue, and will not be addressed directly by this REF. This issue will be considered in the detailed design stage.	**Section 3.1.1**
› Corner of Pittwater Road and Epping Road traffic signal	This is a design/safety issue and not relevant to the REF.	**Section 3.1.1**
› Concern that Pittwater Road will eventually be widened for future traffic.	There are no plans to increase the number of traffic carrying lanes, now or in the future.	**Section 3.1.1**
› Why aren't there extra lanes being added in if it's a road 'upgrade' to reduce congestion.	Refer to **Section 2.5**. It is noted that project objectives do not include the provision for additional traffic carrying lanes. The road upgrade component of this project relates to maintaining efficiency and safety of existing Council assets, and not to increasing traffic carrying capacity.	**Section 3.1.1**
› 2 comments referring to traffic calming devices to be used on Pittwater Road.	This is a design/safety issue and not relevant to the REF.	**Section 3.1.1**

Issue / Comments	Addressed in REF	Section in Appendix E
› Rene Street is a blind corner to traffic on the right.	This is a design/safety issue and not relevant to the REF.	**Section 3.1.1**
› 50 km/h limit from High Street to Epping Road needed (especially High Street to Rene Street).	This is a design/safety issue and not relevant to the REF.	**Section 3.1.1**
› Concern with speed of cars along narrow area at Pittwater Road from Buffalo Creek to High Street.	This is a design/safety issue and not relevant to the REF.	**Section 3.1.1**
The "S bend" 25km/h speed guideline is ignored.	This is a design / safety / enforcement issue and not relevant to the REF.	**Section 3.1.1**
Stormwater		
› Is the Gross Pollutant Trap (GPT) an appropriate water quality control device?	In addition to the new GPT there are 4 new sediment basins proposed. Together they provide a greater level of water quality control than currently exists. Specifications of the GPT are provided in **Section 5.1.3**.	**Section 3.1.2**
› How do we minimise surface water that runs off and maximise infiltration?	The installation of improved stormwater collection systems along the edge of Pittwater Road provides an opportunity for improved water quality control, as water quality control devices can be installed at points where flow has been concentrated prior to discharge. The design includes for the installation of a permanent GPT which is expected to contribute to an increase in water quality within the creek system, noting that the GPT will treat only a small proportion of total flow entering the system.	**Section 3.1.2**
› Details of biodiversity requested between Coxs Road and Bronhill Avenue.	**Section 5.2**: A study was undertaken by Eco Logical Australia to establish the existing ecological conditions at the site and to identify any ecological impacts in relation to the proposed activity. The full Eco Logical Assessment report can be found in **Appendix D**.	**Section 3.1.2**
› 4 comments regarding the impact that increased volume of freshwater will have on: • Mangroves • Saltmarshes.	No part of the works, including the proposed pedestrian and cycle crossing over Buffalo Creek is anticipated to have any long-term hydraulic impacts upstream or downstream of the site. The proposed works will not affect the size of the catchment which drains to the local Creek system (**Figure 5.3**), and ultimately through the saltmarsh to the Lane Cove River, and the volume of water entering the creek system is therefore expected to be unchanged as a result of the works.	**Section 3.1.2**
› Effort should go to addressing situation in existing creeks and channels (long term commitment).	This comment is not directly relevant to this REF, however it is noted that this is currently being undertaken under a catchment program.	**Section 3.1.2**
› Drainage to Kittys Creek and salt marshes - want more guarantee that more finer filtration than pollutant traps will be provided.	In addition to the new GPT there are 4 new sediment basins proposed. Together they provide a greater level of water quality control than currently exists.	**Section 3.1.2**
SUP (need and location)		
› Why a SUP?	**Section 2.1**: A SUP is in line with the City of Connections program and the *Ryde Bicycle Strategy and Masterplan 2007*. Currently, there are a limited number of safe and accessible bicycle and pedestrian routes around the City of Ryde. A SUP along Pittwater	**Section 3.1.3**

Issue / Comments	Addressed in REF	Section in Appendix E
	Road would mean greater connection around the city and improved connections with other local SUP routes. A SUP would also offer improved safety benefits to pedestrians and cyclists. The existing pedestrian path along sections of Pittwater Road is intermittent and the pavement is in poor condition.	
› Have SUP from Epping Road to Buffalo Creek Reserve Park on the eastern side of road, and 5 other comments recommending moving cycle path to the other side of the road.	**Section 2.3.4**: This is not considered to be feasible as the majority of the eastern side of Pittwater Road is adjacent to Lane Cove National Park and construction works are not permitted in the National Park. In addition, even if such works were permitted, the removal of native trees in the National Park required to implement this proposal (and possible impacts on fauna) would make it ecologically undesirable. There are also safety issues associated with constructing the SUP on the eastern side of the road as it has a steep embankment which would be hazardous to construction workers and users of the SUP. Additionally, the SUP cannot be located on the eastern side of the road because it does not provide connection to side streets and paths at both ends.	**Section 3.1.3**
› Re-position SUP. Do not need to build all of SUP along Pittwater Road, or consider alternative bike path away from Pittwater Road.	These alternative alignments are considered in **Section 2.3.3**.	**Section 3.1.3**
		Section 3.1.3
› If the SUP is built, Council will need to make sure it is used.	Noted	**Section 3.1.3**
› How is the 'shared' path going to work?	This issue will be considered in the detailed design stage and through ongoing bicycle safety education undertaken by Council.	
		Section 3.1.3
› Bike plan is out dated which questions the validity of the SUP.	The proposed works are in line with Council's current strategies and objectives (**Section 2.2**)	
Residents		
› Would not mind a footpath, but no cyclists.	This is a design/safety issue and outside the scope of the REF.	**Section 3.1.3**
› 3 comments relating to issues with cars entering/exiting driveways especially if you are reversing onto the street; there is a concern that cars won't see the cyclists.	These issues are a design/safety issue and outside the scope of the REF, however it is noted that a risk management plan needs to be created to address such issues as right-of-way and SUP safety. Driveway hazards could be reduced by community, cyclist and motorist education and the use of appropriate signage for cyclists and motorists. Speed limits for cyclists could also be introduced along sections of the SUP to reduce the risks of cyclist/pedestrian, cyclist/cyclist and cyclist/motorist incidents. Segregation of pedestrians and cyclists on the SUP using clear lane markings and signage, and providing ample room for pedestrians and cyclists to share the path without incident (ideally the SUP should be 3-4m in width) are desirable, however it is noted that this is not possible along all sections of the SUP. These issues will be considered during the detailed design stage and through ongoing bicycle safety education undertaken by Council.	**Section 3.1.3**
Pedestrians		
› Several comments concerned that the SUP will be a danger for	This issue is a design/safety issue and outside the scope of the REF, however it is noted that a risk management plan needs to be	**Section 3.1.3**

Issue / Comments	Addressed in REF	Section in Appendix E
pedestrians.	created to address such issues as right-of-way and SUP safety. Driveway hazards could be reduced by community, cyclist and motorist education and the use of appropriate signage for cyclists and motorists. Speed limits for cyclists could also be introduced along sections of the SUP to reduce the risks of cyclist/pedestrian, cyclist/cyclist and cyclist/motorist incidents. Segregation of pedestrians and cyclists on the SUP using clear lane markings and signage, and providing ample room for pedestrians and cyclists to share the path without incident (ideally the SUP should be 3-4m in width) are desirable, however it is noted that this is not possible along all sections of the SUP. This issue will be considered during the detailed design stage and through ongoing bicycle safety education undertaken by Council.	
› Will there be an increase in noise? If so will there be a sound barrier?	**Section 5.3.3**: Once works are complete it is considered unlikely that the upgraded road will be a source of increased noise and vibration in comparison to existing levels. For the construction phase of the proposed works, noise and vibration is anticipated to have an impact on nearby receptors. Rock cutting activities are expected to be the greatest single source of construction noise and vibration, however noise and vibration will also be generated by a range of road construction vehicles and machinery. It is recommended that a Noise and Vibration Management Plan be developed prior to the commencement of the proposed works to address issues associated with construction noise and vibration.	**Section 3.1.3**
Cyclists		
› Safe facility for cyclists needed	**Section 2.1** and **Section 2.5**: The preferred design is to provide a safe off-road SUP for use by cyclists	**Section 3.1.3**
› Worried about the speed cyclists will be travelling at.	This issue is a design/safety issue and outside the scope of the REF, however it is noted that a risk management plan will be created to address SUP safety once an option has been agreed and commissioned. This issue will be considered in the detailed design stage and through ongoing bicycle safety education undertaken by Council.	**Section 3.1.3**
› Remove raised traffic calming humps to ensure a safe path of travel for cyclists transitioning from road to the SUP.	This issue will be considered in the detailed design stage to be undertaken by Council.	**Section 3.1.3**
› Worried that motorcyclists may use SUP if road becomes congested.	This is a design/safety issue and not relevant to the REF.	**Section 3.1.3**
› All concrete driveway laybacks along the route should have their lips ground down to provide a safe transition for bicycles entering or leaving the path at an acute angle.	This issue will be considered in the detailed design stage to be undertaken by Council.	**Section 3.1.3**
› The path is shown 'indented' at some intersections (e.g. Bronhill Rd, Clarence St, Blenheim Rd, Carramar Rd and Magdala Rd).	This issue will be considered in the detailed design stage to be undertaken by Council.	**Section 3.1.3**

Issue / Comments	Addressed in REF	Section in Appendix E
This moves cyclists out of the sight-line of motorists turning into these roads and increases the possibility of a collision.		
› Can the Council provide full size bicycle logos in the centre of all traffic lanes approaching the roundabout to indicate the likely presence of bicycles?	This issue will be considered in the detailed design stage to be undertaken by Council.	**Section 3.1.3**
› On the service road (near No.200) the Council needs to provide protection at the deep drain.	This issue will be considered in the detailed design stage to be undertaken by Council.	**Section 3.1.3**
› Suggested that all proposed bollards on the SUP be removed as they are a major contributor to cyclist injuries.	This issue will be considered in the detailed design stage to be undertaken by Council.	**Section 3.1.3**
› Use non-slip coloured pavement paint on the section of the SUP that goes through the existing car park.	This issue will be considered in the detailed design stage to be undertaken by Council.	**Section 3.1.3**
› Safety issue at the Bronhill Ave intersection – need to provide protection at the edge of the SUP at the top of the retaining wall and side of the bridge.	This issue will be considered in the detailed design stage to be undertaken by Council.	**Section 3.1.3**
› Remove vegetation and install concave mirrors on the intersection with Epping Road to improve visibility of the bus lane.	This issue will be considered in the detailed design stage to be undertaken by Council.	**Section 3.1.3**
› Need to modify existing concrete refuge island to ensure a minimum 2m bicycle storage length.	This issue will be considered in the detailed design stage to be undertaken by Council.	**Section 3.1.3**
Vegetation – trimming, tree removal		
› Cumulative loss is a concern	**Section 5.2**: considers biodiversity and connectivity issues.	**Section 3.1.4**
› East/West and North/South biodiversity corridor.	**Section 5.2**: considers biodiversity and connectivity issues.	**Section 3.1.4**
› Consultation with the right people in National Park and Wildlife Service is important .	**Section 4.1**: NPWS has been contacted and invited to provide comment on this REF. No comment has yet been received.	**Section 3.1.4**
› Section at North Ryde Park – result in disturbance to the existing canopy and eventual planting of section as biodiversity corridor.	**Noted**: Following the community consultation workshop, Council has decided to avoid the removal of two trees and have amended Plan 14.	**Section 3.1.4** **Section 3.1.4**

Issue / Comments	Addressed in REF	Section in Appendix E
› Removing vegetation along Buffalo creek reserve won't increase visibility.	Noted	
› Animals coming out of National Park & entering Kittys Creek & other areas need habitat preserved. › Sugar gliders need trees in this area.	Eco Logical Australia (**Appendix D**) found that the areas impacted, which included habitat for flora and fauna species, were not considered to represent a significant portion of key habitat such that it would significantly impact these threatened / migratory species through the disruption to their breeding cycles. The majority of habitat elements present in the study area would not be impacted by the proposal. Further, works would not isolate any currently interconnecting areas of habitat, impact on habitat critical to the survival of species, introduce diseases, or result in the introduction of invasive species that are harmful to any species potentially present.	**Section 3.1.4**
› Trees are corridor into Lane Cove and National Park.	**Section 5.2**: The proposed works require minimal tree removal. The majority of habitat elements present in the study area would not be impacted by the proposal, including Lane Cove National Park. Further, works would not isolate any currently interconnecting areas of habitat, impact on habitat critical to the survival of species, introduce diseases, or result in the introduction of invasive species that are harmful to any species potentially present	**Section 3.1.4**
› Noise to neighbours when trees are removed along the rock-face.	**Section 5.3.3** considers noise and noise mitigation measures.	**Section 3.1.4**
Rock Excavation Aboriginal heritage issue with rock face.	**Section 5.3.4**: There are no known Aboriginal Heritage values which will be affected by the works. Chance discovery protocols will be maintained and followed during the works.	**Section 3.1.4**
› Lane Cove National Park and Field of Mars are heritage items in the LEP.	**Section 5.3.4**: It is not expected that any known heritage items including Lane Cove National Park and Field of Mars will be significantly impacted by the proposed works.	**Section 3.1.4**
› Worried about rocks slippage once work commences close to Imperial Avenue.	This is a safety/design consideration and not relevant to the REF.	**Section 3.1.4**
Restoration and Landscaping › 4 comments referring to the use of endemic vegetation for re-planting.	**Section 5.2** and **Section 5.3.7**: Council has advised that locally propagated species will be used. It is recommended that where possible, all native tree and plant species must be retained, and following completion of the works, all areas which have been disturbed by the works should be restored (e.g. re-vegetated) with endemic species as soon as practicable.	**Section 3.1.5**
› Effort during construction to minimise siltation to the surrounding creeks.	**Section 5.1.3**: An Erosion and Sediment Control Plan (ESCP) must be approved before commencement of the works and must be followed by the appointed contractor. This will cover issues relating to the erosion of exposed soils and sedimentation within surrounding creeks.	**Section 3.1.5**
› The two creek lines are important areas for birds and possums; trees should replace those removed. Consideration to fauna crossing the road.	**Section 5.2**: Eco Logical Australia found that the areas impacted, which included habitat for flora and fauna species, were not considered to represent a significant portion of key habitat such that it would significantly impact these threatened / migratory species through the disruption to their breeding cycles. The majority of	**Section 3.1.5**

Issue / Comments	Addressed in REF	Section in Appendix E
	habitat elements present in the study area would not be impacted by the proposal. Further, works would not isolate any currently interconnecting areas of habitat, impact on habitat critical to the survival of species, introduce diseases, or result in the introduction of invasive species that are harmful to any species potentially present.	
› Loss of visual and acoustic privacy (especially loss of tree aspect).	**Section 5.3.7**: All works will occur within the existing road reserve, and in general it is anticipated that the proposed works will not have a major impact on the visual amenity of the site. In the longer term there will be minor changes in visual amenity associated with the removal of trees along the edges of Pittwater Road including a White Mahogany (Plan 15). Although a number of trees will be removed, the visual landscape will not be substantially affected as vegetation removal will be minimal. Additionally, once works are complete it is considered unlikely that the upgraded road will be a source of increased noise and vibration in comparison to existing levels.	**Section 3.1.5**
› Replace with trees or shrubbery on the borderlines.	**Section 5.2**: Following completion of the works all areas which have been disturbed by the works should be restored (e.g. re-vegetated) as soon as practicable.	**Section 3.1.5**
› Over-road crossing for animals needed.	**Section 5.2**: Eco Logical Australia found that the areas impacted, which included habitat for flora and fauna species, were not considered to represent a significant portion of key habitat such that it would significantly impact these threatened / migratory species through the disruption to their breeding cycles. The majority of habitat elements present in the study area would not be impacted by the proposal. Further, works would not isolate any currently interconnecting areas of habitat, impact on habitat critical to the survival of species, introduce diseases, or result in the introduction of invasive species that are harmful to any species potentially present.	**Section 3.1.5**
Sufficient replacement or more flora than there, creating a 'corridor effect'.	See above.	**Section 3.1.5**
› 2 comments regarding the amelioration for eco-system damage.	**Section 5.2**: It is recommended that where possible, all native tree and plant species must be retained, and following completion of the works, all areas which have been disturbed by the works should be restored (e.g. re-vegetated) with endemic species as soon as practicable.	**Section 3.1.5**
Design questions		
› Is the breakdown lane needed?	**Section 2.1**: Once the works are complete, improved traffic flow is expected, especially in the event of vehicle breakdowns and accidents as the addition of breakdown lanes will enable broken down vehicles to be removed from the traffic flow, and for the passage of emergency / recovery vehicles. The improved carriageway condition will also allow for safer and freer flowing traffic.	**Section 3.1.6**
› Bicycle path should be relocated with former study and community consultation regarding location.	**Section 2.3** discusses alternative options which have been considered, and explains why the current proposal is the preferred option.	**Section 3.1.6**
		Section 3.1.6

Issue / Comments	Addressed in REF	Section in Appendix E
› Road surface bad at Plan 4 area.	Noted	
› Rationale for plan 15?	This is a design consideration and not relevant to the REF.	**Section 3.1.6**
› Why do you need the extra pavement on Plan 16?	This is a design consideration and not relevant to the REF.	**Section 3.1.6**
› Request for a metal barricade on the corner of Rene St.	This is a safety/design consideration and not relevant to the REF.	**Section 3.1.6**
› Need to do a technical review of bike plan.	This is not relevant to the REF.	**Section 3.1.6**
› Upgrade is a "Trojan horse" to make this a 4 lane road.	It is noted that project objectives do not include the provision for additional traffic carrying lanes. The road upgrade component of this project relates to maintaining efficiency and safety of existing Council assets, and not to increasing traffic carrying capacity.	**Section 3.1.6**
Cost		
› Concerned about cost of project.	These comments are not relevant to the REF.	**Section 3.1.6**
› Cost of the pre-cost structure.		**Section 3.1.6**
› Council required for crossovers?		**Section 3.1.6**
› Is the RTA gong to share the costs?		**Section 3.1.6**
› No cost benefit analysis is being done.		**Section 3.1.6**
Other Environmental Assessment Comments		
› Move SUP to east side of road and widen the whole road to the maximum possible area where required	**Section 2.3.4**: This is not considered to be feasible as the majority of the eastern side of Pittwater Road is adjacent to Lane Cove National Park and construction works are not permitted in the National Park. In addition, even if such works were permitted, the removal of native trees in the National Park required to implement this proposal (and possible impacts of fauna) would make it ecologically undesirable. There are also safety issues associated with constructing the SUP on the eastern side of the road as it has a steep embankment which would be hazardous to construction workers and users of the SUP.	**Section 3.1.6**
› Between Rene Road and Pittwater Road - Why widen the road?	**Section 2.1**: There is a lack of emergency vehicle/breakdown lanes along the corridor. Once the works are complete, improved traffic flow is expected, especially in the event of vehicle breakdowns and accidents as the addition of breakdown lanes will enable broken down vehicles to be removed from the traffic flow, and for the passage of emergency / recovery vehicles. The improved carriageway condition will also allow for safer and freer flowing traffic.	**Section 3.1.6**

5 Environmental Assessment

This section identifies the environmental impacts associated with the construction and operation of the proposed works along Pittwater Road. The environmental assessment methodology used in this REF includes:

- A review of the existing environment based on a site inspection, background database (desktop) searches, published information and relevant specialist studies;
- An assessment of environmental impacts which can be expected to result from construction and operation of the project; and
- The identification of broad mitigation measures to address the identified environmental impacts (**Section 6**).

The factors taken into consideration within the environmental assessment are shown in **Table 5.1**.

Table 5.1: Environmental Parameters Considered

Impact Assessment Category	Environmental Parameters
Physical Environment	Topography, Geology and Soils (including site contamination) Climate and Air Quality Water Quality and Hydrology
Biotic Environment	Flora and Fauna
Social Environment	Assets, Utilities and Services Noise and Vibration Heritage and Archaeology Traffic and Access Hazards Visual Landscape Resource and Waste Management Socio-Economic Factors
Cumulative Impacts	Cumulative Environmental Effects

5.1 Physical Environment

The physical environment forms the basis for both the biotic and social environment and is therefore of significance when assessing the environmental effects of the proposed works along Pittwater Road.

5.1.1 Topography, Geology and Soils

Soils at the site are comprised of fluvial, colluvial and erosional sediments with underlying geology from both the Wianamatta Group Shales and Hawkesbury Sandstones. Examination of the 1:100,000 Soil Map (Soil Conservation Service of NSW, 1983) demonstrated that the site is comprised of the Lane Cove, Hawkesbury, Gymea and to a lesser degree, Glenorie soil landscapes (Soil Conservation Service of NSW, 1983).

The relevance of different soil types to the project is that each soil type has different characteristics, and presents different environmental risks. The soil landscapes in the study area were assessed for their possible limitations to the proposed works. The soils and the limitations associated with these landscapes are listed in **Table 5.2**.

Table 5.2: Soil Landscapes at the Site of Proposed Works (After: Soil Conservation Service of NSW, 1983)

Soil Landscape	Underlying Geology	Soils	Limitations
Lane Cove	Wianamatta Shales and Hawkesbury Sandstone	› Deep *Alluvial Loams*; › Various buried alluvial and marine soils.	› Flooding; › High erosional hazard; and › Seasonal waterlogging.
Hawkesbury	Hawkesbury Sandstone	› Shallow, discontinuous *Lithosols/Siliceous Sands*; › Earthy Sands, Yellow Earths and some Yellow Podzolic soils along fractures; › Localised Yellow and Red Podzolic Soils; › *Siliceous Sands* and secondary *Yellow Earths* along drainage lines.	› Extreme soil erosion hazard; › Mass movement (rock fall) hazard; › Steep slopes; › Rocky outcrop; › Shallow; › Stony; › Highly permeable soils; and › Low soil fertility.
Gymea	Hawkesbury Sandstone	› Shallow to moderately deep *Yellow Earths* and *Earthy Sands*; › Shallow *Siliceous Sands*; › *Gleyed Podzolic Soils*; › *Yellow Podzolic Soils*; › *Siliceous Sands* and *Leached Sands* along drainage lines.	› Localised steep slopes; › High soil erosion hazard; › Rocky outcrop; › Shallow, highly permeable soil; and › Very low soil fertility.
Glenorie	Wianamatta Shales	› Shallow to moderately deep *Red Podzolic Soils*; › Moderately deep *Red and Brown Podzolic Soils*; › Deep *Yellow Podzolic Soils*; and › *Yellow Podzolic* soils, *Humic Gleys* and *Gleyed Podzolic* soils along drainage lines.	› High erosion hazard; › Localised impermeable highly plastic subsoil; and › Moderately reactive.

Although the proposed works would have a relatively small impact on the surrounding soils, the limitations of the above soil landscapes should still be considered. In particular, it is noted that all soil landscapes present have a high or extreme erosion hazard, and there is, therefore, a possibility that soil erosion could occur, resulting in adverse impacts on downstream aquatic environments.

Acid Sulfate Soils

Examination of data from Geoscience Australia revealed there is a high probability that acid sulfate soils may be found at or near the ground surface within parts of the site of proposed works (**Figure 5.1**). There are also areas of disturbed terrain in the vicinity of proposed works (**Figure 5.1**). Council's Draft 2011 LEP mapping shows similar results, with the site located on Class 2 potential acid sulfate soils, meaning that works below the natural ground

surface require development consent under the conditions of the Draft 2011 LEP (overridden by SEPP (Infrastructure) (**Section 3.4.1**)). The potential for underlying acid sulfate soils is to be expected due to the close proximity of the site to a water body and the occurrence of underlying marine and fluvial sediments. If the proposed works are carried out, caution should be exerted when any excavation takes place and an Acid Sulfate Soils Management Plan should be prepared and implemented if such soils are encountered.

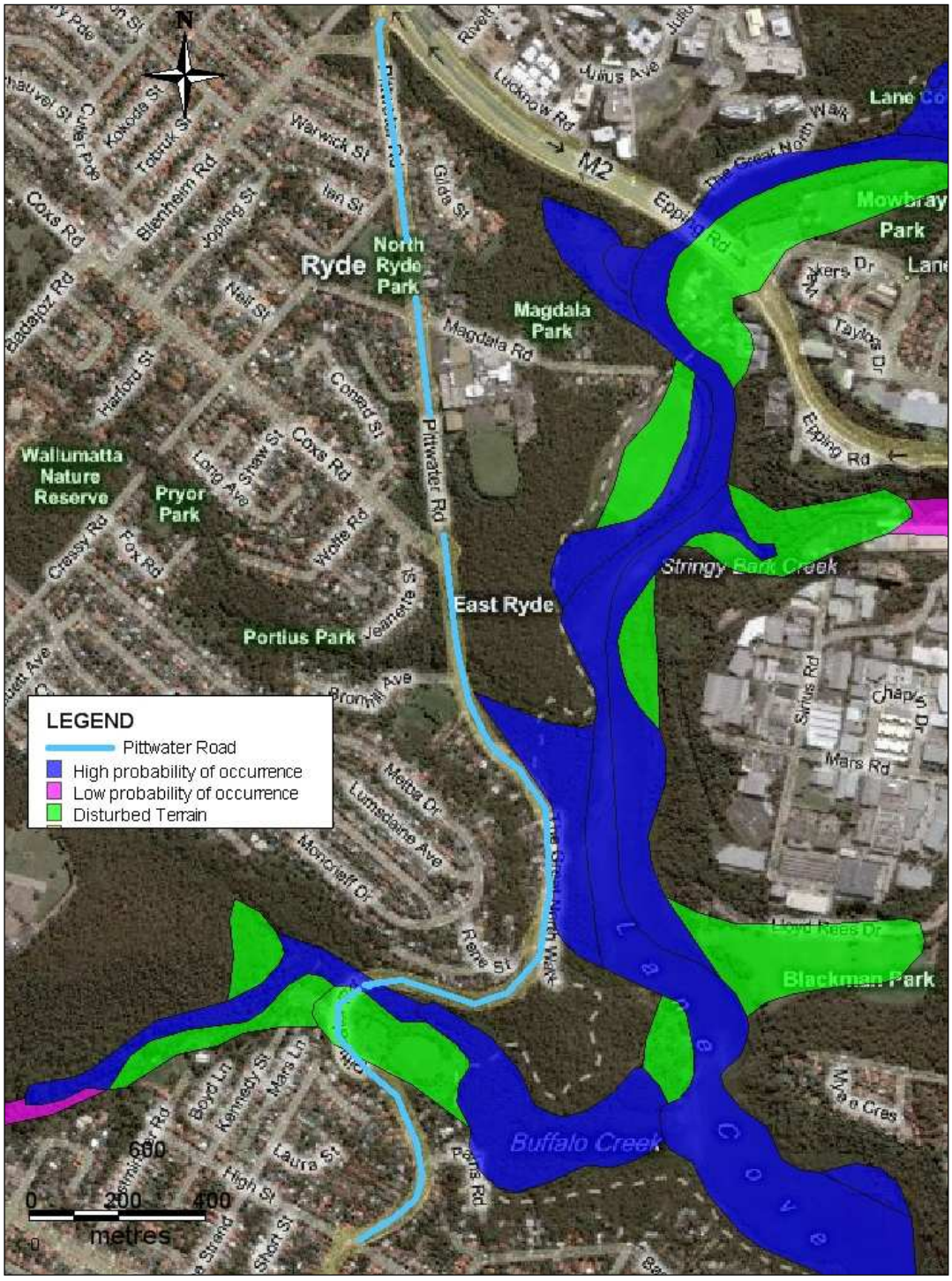

Figure 5.1: Acid Sulfate Soils Risk Map for the study area (Aerial: Bing, 2011).

Contaminated Lands

A search of the Contaminated Lands Register on 30 May 2011 found no sites of contaminated land for the Ryde LGA. For the Hunters Hill LGA, two sites were identified, however these are not in close proximity to the proposed works (approximately 3km away) and will therefore, not be impacted by, or impact on the proposed works.

It must be noted that there are limitations to the Contaminated Lands Register and other areas may be contaminated that are not on the register. Parts of East Ryde near Buffalo Creek were previously utilized as a landfill area in the 1950's (Biosphere Environmental Consultants, 2006 and NSW Government, 2009). As such, potential contaminated sites may be uncovered during the construction phase. Although it is considered unlikely, the proposed works, the prospect of encountering contaminated land should not be discounted, particularly if excavated material requires disposal.

Salinity

A search of the NSW Natural Resource Atlas (NRAtlas) map for salinity hazard showed there should be no risk of encountering saline soils during excavations at the works site, and a comprehensive study into the salinity potential in the area has therefore not been completed.

In addition, the presence of the highly permeable soils of the Hawkesbury Sandstones suggests that saline soils are unlikely to be unearthed during earthworks. Mitigation measures set out below should be implemented in the event that saline soils are uncovered.

Potential Impacts

Since the site is already highly modified, the proposed works will not have a significant impact on site topography. The nature of the soils and geology means that the proposed works may have the following impacts:

- Erosion of exposed soils during construction;
- Exposing acid sulfate soils during construction;
- Exposing saline soils during construction (low likelihood); and
- Encountering contaminated lands during construction.

Mitigation Measures

Due to the location of the site, acid sulfate soils may be encountered during excavation. An adequate acid sulfate soils management plan should be prepared and included in the Construction Environmental Management Plan (CEMP) in accordance with the Acid Sulfate Soils Management Advisory Committee (ASSMAC) guidelines (ASSMAC, 1998). The plan should also incorporate measures to ensure neutralization of the disturbed soils prior to re-use or disposal, and to monitor and manage run-off from any disturbed areas of acid sulfate soils.

The work area presents a low risk of saline soil being encountered, however, if saline soils are encountered, excavated material would be stockpiled in soil horizons and, if required, returned in the same order for site fill in order to ensure saline soils do not become exposed.

If the proposed works are undertaken, erosion and sedimentation risks should be addressed in an Erosion and Sediment Control Plan (ESCP), which should be in accordance with the *Managing Urban Stormwater – Soils and Construction* (DECCW, 2008) (also known as Volume 2 of the 'Blue Book', Volume 1 being Landcom, 2004). The ESCP is to be included in the CEMP. Use of erosion control devices and structures, such as sediment fencing and

traps, in accordance with *Managing Urban Stormwater: Soils and Construction* will help to minimise impacts of the proposed construction.

If contaminated lands are encountered during the proposed works the soils will need to undergo chemical assessment in order to classify the type of waste, in accordance with OEH's *Waste Classification Guidelines* (DECC, 2008a). Once the waste is properly classified, appropriate management options for it can be considered, as required under the PoEO Act and the associated regulations. The OEH should be consulted regarding further guidance on managing specific waste types.

No contaminated material should be removed from the site without first being tested, and a suitable disposal method determined.

5.1.2 Climate and Air Quality

The closest Bureau of Meteorology automatic weather station to the site is the Riverview Observatory. Based on Climate Statistics for Australian Locations (http://www.bom.gov.au accessed 30 May 2011), mean daily maximum temperatures ranged from 16.7ºC in July to 26.6ºC in January, whilst mean daily minimum temperatures ranged from 6.4ºC in July to 17.7ºC in February. The wettest period for the area is between January and June, with the highest average monthly rainfall recorded in March (125.9mm). The driest period of the year on average is between August and September, with the lowest average monthly rainfall recorded in September (62.3mm). Wind data for the Riverview Observatory weather station shows that average wind speeds in the afternoon (3pm) are substantially higher than in morning (9am). Average afternoon wind speeds tend to be higher in the summer months (>18km/h).

The City of Ryde LGA and the suburbs of Gladesville, East Ryde and North Ryde are predominantly comprised of residential land. Air quality within the general area (based on monitoring stations located in Chullora, Linfield and Rozelle) appears to be compliant with recommended levels, with daily and hourly maxima for air quality parameters generally being well below daily and hourly average National Environment Protection Measure (NEPM) standard levels (where specified) (EPA, 2007). **Figure 5.2** shows the indicative main sources of air pollution for the Ryde LGA, with motor vehicles being the primary contributor.

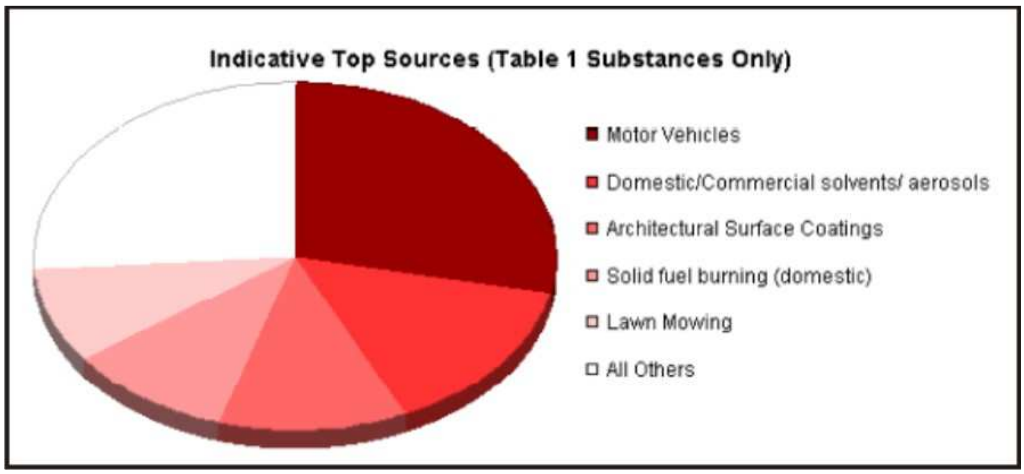

Figure 5.2: Indicative Dominant Sources of Air Pollution for the City of Ryde LGA (Source: National Pollutant Inventory, 2009)

Potential Impacts

Neither the construction nor operational phases of the proposed works are expected to significantly affect the climate or air quality within the local area or the wider City of Ryde LGA.

However, there is some potential for a small increase in dust associated with earthworks and rock cuttings required for construction. Given the limited scope of the proposed works, dust would be restricted to a localized area. The work site itself would be affected, as would some of the adjacent residential and recreational areas on the eastern and western sides of Pittwater Road. Strong winds have the potential to transport dust into the wider area, and there is a greater chance of increased dust pollution during afternoon periods in summer when winds are generally at their strongest. Due to the nature and scale of the works, widespread dust pollution is not anticipated.

During the construction phase of the proposed works, a slight increase in the number and frequency of heavy vehicles along Pittwater Road can be expected as construction vehicles make their way to and from the site. Consequently, a short-term and small increase in local exhaust emissions may occur during the construction period.

The works will not introduce any new traffic lanes, and in the operational phase, it is therefore not anticipated that there will be any significant increase in vehicle usage of the new road. In contrast, the proposed SUP may lead to an increase in bicycle use as an alternative to automotive vehicles. There may therefore be some potential for a localized reduction in air pollution during the operational phase of the works. However, resulting emissions reductions are likely to be negligible. More information on traffic dynamics is given in **Section 5.3.5.**

Mitigation Measures

It is considered unlikely that the proposed works, or any resulting changes in traffic movements would have a significant environmental impact upon air quality and climate, however, mitigation measures to minimise impacts have been suggested below:

- Regular servicing of construction equipment is advised to help minimise exhaust emissions, and for the same reason, engines should not be left idling unnecessarily;
- Where possible, it is recommended that recycled and/or low energy construction materials be considered for use in the road upgrade. In particular, recycled pavement materials may be suitable for kerbs and guttering which do not need to be as durable as road carriageways; and
- The use of recycled pavement materials may also have associated financial benefits in terms of cost-effectiveness.

In order to mitigate dust impacts, is the following mitigation measures have been recommended:

- Regular, scheduled visual inspections of weather conditions and dust levels should be conducted during the construction phase in accordance with the site CEMP;
- Work which may generate dust should cease during periods of strong winds (above 20km/h);
- The speed limits of both public and construction vehicles along any sections of unsealed roads should be restricted in order to reduce any additional dust generation; and
- As rock cutting/breaking can generate dust, weather conditions should be assessed during excavation and rock removal activities should not take place under strong wind conditions that can raise excessive dust.

Care with stockpiled material during storage, transportation and removal will prevent unnecessary dust pollution (e.g. covering loose material). Dust suppression techniques may be employed for any exposed surfaces and stockpiled materials. However, these techniques must be in accordance with the *Water Management Act* 2000 and may require a license from the NSW Office of Water (NOW) if water is to be extracted from or released into local creeks (note that the creeks in close proximity to the site are estuarine). It is not anticipated that extensive water-based dust suppression will be necessary for the proposed works. All working areas should also be stabilized as soon as practicable in order to minimise the generation of dust.

No significant detrimental effects to air quality within the region are expected during the operational phase of the proposed works.

5.1.3 Hydrology and Water Quality

The proposed works are located in the Lane Cove River catchment. The Lane Cove River, a tributary of the Parramatta River, drains to Port Jackson east of Greenwich Point. The Lane Cove River drains an established urbanized catchment and is impacted by urban runoff and point sources of pollution from sewer overflows (Preston, 2008).

Areas near Buffalo Creek were previously utilized as a landfill site (**Section 5.1.1**), and as such, water quality in certain areas may also be affected by leachate, whilst the middle section of the Lane Cove River, from Fig Tree Bridge to Sugarloaf Point, was also heavily dredged for commercial sand from the late 1950's to 1974 (NSW Government, 2009).

Several watercourses can be found in close proximity to the site of the proposed works:

- Lane Cove River
- Pages Creek;
- Marlins Creek
- Kitty's Creek;
- Strangers Creek; and
- Buffalo Creek.

Buffalo Creek, a tributary of the Lane Cove River, converges with Strangers Creek, another tributary, on the western side of Pittwater Road and flows underneath the carriageway in a west-east direction, as indicated by **Figure 5.3**. Kitty's Creek also flows underneath Pittwater road in a west-east direction. Marlins Creek converges into Kitty's Creek on the western side of the carriageway, and Pages Creek flows into the Lane Cover River on the eastern side of the carriageway. The watercourses in the vicinity of the proposed works are influenced by the tidal changes within the Lane Cove River (Biosphere Environmental Consultants, 2007) and are shown in **Figure 5.3**.

Figure 5.3: Waterways in the vicinity of the Proposed Works.

Maintaining water quality within the catchment is integral to sustaining the aquatic ecosystem and surrounding catchment ecology. Moderate to heavy urbanization within the Lane Cove catchment has lead to a decline in water quality over time (Sydney Water, 2009). Nutrient rich stormwater can encourage the growth of noxious aquatic flora which will often out-compete native riparian vegetation. Recreational use of the Lane Cove River has also been restricted in places due to pollution and negative impacts on water quality.

The City of Ryde Council currently has a water quality monitoring program which targets five main creek systems within the LGA. These are identified in **Table 5.3**. Buffalo Creek is one of the monitored creeks where both biological and chemical testing takes place. Results of this water quality monitoring program show that Buffalo Creek is affected by poor water quality. Indicative water quality results for Spring 2008 indicate that at that time a large majority of samples taken from Buffalo, Archers, Shrimptons, Porters and Terrys Creeks, did not meet ANZECC (2000) guidelines for the protection of aquatic ecosystems for Total Oxidized Nitrogen, Total Nitrogen, Dissolved Oxygen and Ammonium (NH_4), although levels varied between creeks (Sydney Water, 2010).

Results from the most recent sampling report (Autumn 2010) indicate that urban pollution transport is having an impact on in-stream water quality in the creeks (Sydney Water, 2010). This impact is indicated by low levels of dissolved oxygen and high levels of nutrients, especially nitrogen forms. The average stream health in Buffalo Creek has increased slightly since Spring 2008, when average stream health was significantly lower than previous recordings (Sydney Water, 2010). It was suggested in the Spring 2008 report (Sydney Water, 2009) that the loss of taxa and decline in stream health resulted from a smothering effect by fine sediment that had run-off from development in the upper catchment. Sydney Water (2010) advised that this decline could be reversed if the source of sediment is controlled.

Table 5.3: Catchment and Stormwater Delivery Characteristics for creeks in the LGA which are part of a water quality monitoring program (Sydney Water, 2010)

Creek	Catchment Area (ha)	Total Length of Pipe (m)	Total Number of Pipe Outlets
Archers	286	19310	65
Shrimptons	555	41797	74
Buffalo	546	33336	62
Porters	225	15797	16
Terrys	1012	47952	89

Potential Impacts

No part of the works, including the proposed pedestrian and cycle bridge over Buffalo Creek is anticipated to have any long-term hydraulic impacts upstream or downstream of the site. The location of the proposed SUP crossing over Buffalo Creek has been adjusted to avoid a saltmarsh in the vicinity Buffalo Creek by cantilevering the SUP off the existing road bridge. Using this method of construction, no new bridge supports or structures will be required within or adjacent to Buffalo Creek. During the proposed construction phase, there is not

expected to be any disruption of water flow that obstructs fish passage in the creek during vegetation removal and/or trimming.

The proposed works will not affect the size of the catchment which drains to the local Creek system **(Figure 5.3**), and ultimately through the saltmarsh to the Lane Cove River. The volume of water entering the creek system is therefore expected to be unchanged as a result of the works, and as volumes will be unchanged, changes in salinity within the creek and saltmarsh system are not expected to occur.

The road upgrade will increase the impervious area in the catchment, and includes the installation of kerbs, guttering and associated culvert and pipe upgrades. This means the route the stormwater will take to reach the creeks will be altered in some areas. Given the very low area of impervious surface in relation to the high area of vegetated surface in the catchment, this change is expected to be insignificant, and changes to freshwater flow regimes are not expected to have any impact on the downstream aquatic ecosystems (including the areas of mangrove and saltmarsh).

The installation of improved stormwater collection systems along the edge of Pittwater Road provides an opportunity for improved water quality control, as water quality control devices can be installed at points where flow has been amalgamated prior to discharge. The design includes for the installation of a permanent Gross Pollutant Trap (GPT) which is expected to contribute to an increase in water quality within the creek system, noting that the GPT will treat only a small proportion of total flow entering the system.

During the construction phase, the proposed works have the potential to reduce stormwater quality through pollution resulting from spills or poorly maintained erosion or sedimentation controls. Smothering from sediment during the construction phase of the works should not occur if a suitable ESCP is developed and observed, and appropriate erosion and sediment measures are utilized. No sewerage is expected to be generated by the works.

As shown on **Figure 5.7**, four sediment ponds are proposed within the Road Reserve alongside Pittwater Road. Photographs of existing sediment ponds installed by Council at Eastwood are provided in **Figure 5.4** and **Figure 5.5**.

Figure 5.4: View of sediment pond along East Parade, Eastwood (within Ryde Local Government Area).

Figure 5.5: Close-up view of sediment pond along East Parade, Eastwood.

Mitigation Measures

As this project has the potential to impact on Lane Cove National Park, the proponent is to refer to the *Guidelines for development adjoining Department of Environment and Climate Change land*. The *Guidelines* recommend that Councils and other consent authorities should consider the following issues when assessing proposals adjoining DECC (now OEH) land, particularly how they could impact on the reserve with reference to:

- Erosion and sediment control;
- Stormwater run-off;
- Management implications, pests, weeds, edge effects;
- Fire and the location of asset protection zones;
- Boundary encroachments;
- Visual, odour, noise, air quality impacts and amenity; and
- Threats to ecological connectivity.

An Erosion and Sediment Control Plan (ESCP) must be approved before commencement of the works and must be followed by the appointed contractor. This will cover issues relating to the erosion of exposed soils and sedimentation within the creek.

Although spills are unlikely the following mitigations measures are to be put in the CEMP:

- Refuelling of vehicles should be undertaken in designated areas, located away from water courses and with suitable bunding;
- Fuel and other hazardous materials should not be transported to or stored on the site wherever possible;
- If there is an unavoidable requirement for fuel on site, the fuel must be contained within an impermeable container (e.g. plastic bin or bunded area) with a capacity of at least 150% of the total volume being transported or stored;
- A spill kit should also be kept on site during the construction phase ready for development in the unlikely event of a spill; and
- The CEMP should identify appropriate strategies for managing the alteration of water flow and temporary stormwater piping.

The proposed design includes the installation of a new GPT, two new bioswales and four new sedimentation ponds (**Figure 5.6** and **Figure 5.7**) which will improve water quality by acting as a sedimentation and filtration system for stormwater during both the construction and operational phases. These systems have been designed to drain the road catchment and treat road pollutants to help in meeting the City of Ryde's pollutant reduction targets. The installation of the proposed water quality improvement devices is likely to have a positive impact on water quality in the long term operational phase.

The GPT will treat a flow rate of up to 80 litres/s flow rate and the capture performance parameters are outlined in **Table 5.4**.

Table 5.4: GPT capture performance summary.

Pollutant Items	Removal Efficiency
Suspended Solids (TSS)	Up to 70%
Total Phosphorous (TP)	Up to 30%
Total Nitrogen (TN)	Up to 0%
Gross Pollutants (>5mm)	Up to 98%
Sediments > 0.215mm	Up to 95%
Fine Sediments > 75 microns	Up to 90%
Heavy Metals	Up to 80%
Hydrocarbons, Oils and Grease	Up to 82-94%

The proposed Pittwater Road drainage system between Cox's Road and Carramar Road will be directed to the GPT unit and treated stormwater will be discharged into Kitty's Creek via sandstone rock lined rip rap and a headwall in order to prevent erosion at the point of discharge. Additional run-off generated due to the proposed Pittwater Road upgrade is negligible compared to the overall upstream catchment area. It is noted that a similar unit has recently been installed at Portius Park, and although it is not related to the proposed works, it does provide water quality benefits at Kitty's Creek.

It is important to note that the GPT will require regular cleaning in order to continue functioning efficiently, and provision for this will be made in Councils maintenance budget and schedule.

Figure 5.6: Proposed bioswale structures adjacent to Pittwater Road (approximate locations).

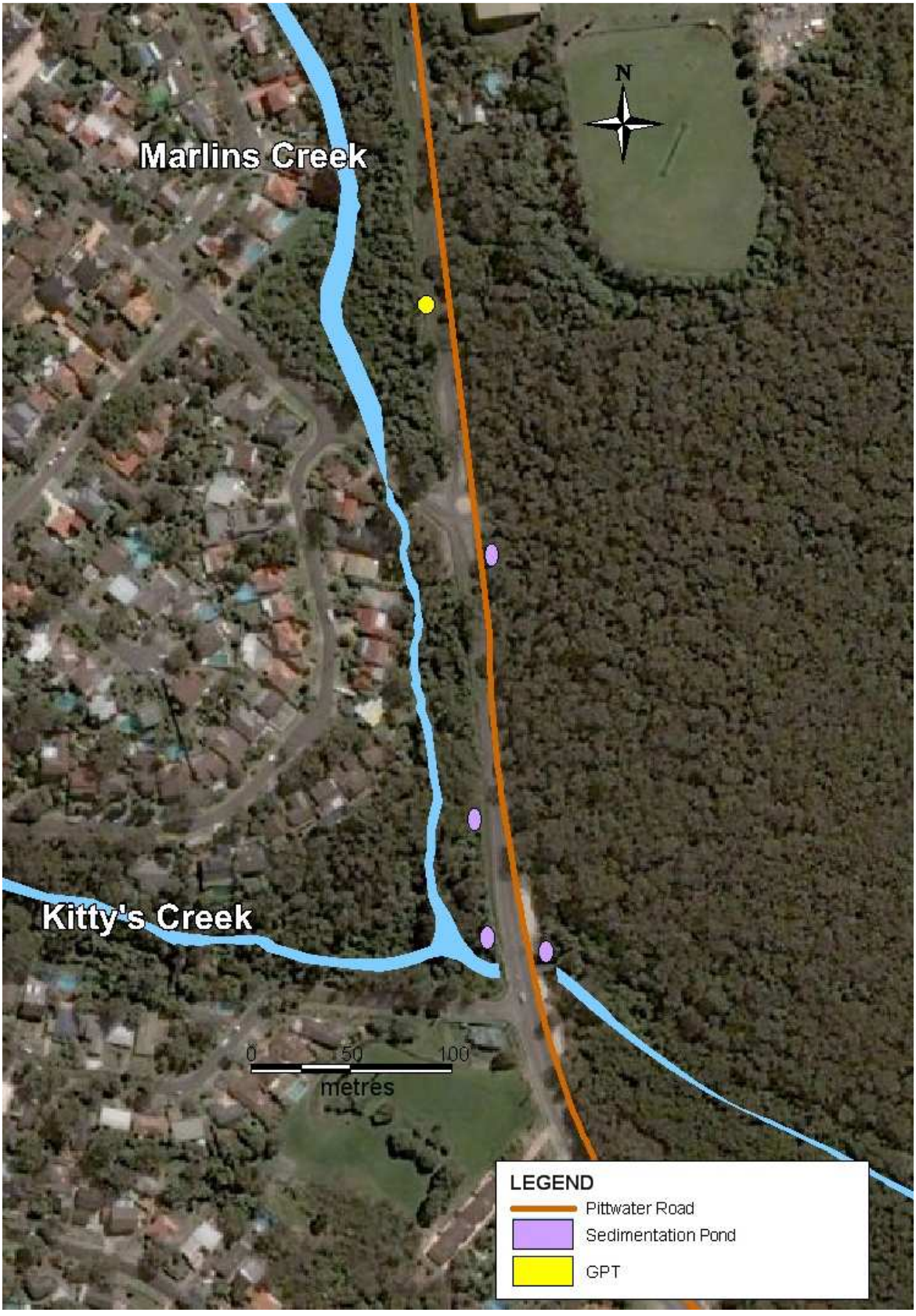

Figure 5.7: Proposed water quality improvement devices adjacent to Pittwater Road (approximate locations).

5.2 Biotic Environment Assessment

A study was undertaken by Eco Logical Australia to establish the existing ecological conditions at the site and to identify any ecological impacts in relation to the proposed activity. The study included a review of available literature and searches of relevant online databases supported by field visits and collection and identification of flora samples.

Fieldwork in support of the report was undertaken by two Eco Logical Australia ecologists, on 27th May 2011. The survey traversed the entire length of the subject site focusing on areas where remnant vegetation and potential fauna habitat were present, and the trees marked for removal, to collect site-specific data pertaining to the vegetation communities and habitat values for threatened flora and fauna potentially occurring in the study area.

The full Eco Logical Australia Assessment report can be found in **Appendix D**.

Existing Environment

According to Eco Logical Australia (2011), the site of the proposed works is part of a highly modified wider environment which incorporates urbanized areas and a mixture of indigenous and non-indigenous flora species. On a temporal scale, the ecology of the area has changed substantially since European settlement as native flora species and vegetation communities have in many places been cleared and/or displaced by weed species.

Field surveys by Eco Logical Australia found that much of the remnant vegetation in and adjacent to the subject site comprised dry sandstone vegetation, with mangroves and saltmarsh present where Buffalo Creek intersected with Pittwater Road on the eastern part of the Field of Mars. Vegetation communities further from the subject site, for example downstream of the creek lines crossing Pittwater Road, were not confirmed.

Habitat elements in the subject site included edge and open habitat, with foraging and sheltering resources for nectar and insect dependant species (birds, bats and arboreal mammals eg. gliders) provided in tree canopies within and overhanging the subject site, and foraging habitat for these species provided in the open areas adjacent to remnant vegetation and maintained lawns. Some sheltering and foraging habitat was present in canopy, mid-storey and ground cover vegetation growing on the sandstone rock face north of the Field of Mars. Seeping sandstone covered with leaf litter was present north of the Field of Mars. Mangrove habitat with standing brackish water was present where Buffalo Creek drained the Field of Mars.

Vegetation Communities

Appendix D contains an assessment of the vegetation communities which are present in the works area prepared by Eco Logical Australia. They note that pre-existing vegetation mapping completed by the National Parks and Wildlife Service (NPWS) and the Sydney Metropolitan Catchment Management Authority (SMCMA) is conflicting and difficult to decipher. While it was difficult to validate vegetation communities as classified in previous mapping, the number of positive diagnostic species, in conjunction with the position of the patches in the landscape, the characteristics of vegetation communities, and features of

some of the vegetation communities, such as their occurrence on steep sandstone or gullies, allowed vegetation communities in and adjacent to the subject site to be determined.

Vegetation communities in the subject site are shown in Figures 3-5 of **Appendix D** and were determined as:

- Sydney Sandstone Ridgetop Woodland;
- Mangrove / Saltmarsh Complex;
- Coastal Sandstone Sheltered Peppermint-Apple Forest (CSSPAF);
- Coastal Enriched Sandstone Sheltered Forest (CESSF);
- Coastal Sandstone Foreshores Forest (CSFF);
- Coastal Enriched Sandstone Moist Forest (CESMF);
- Coastal Alluvial Bangalay Forest (CABF);
- Estuarine Swamp Oak Forest (ESOF); and
- Estuarine Mangrove Forest.

Too few diagnostic species were identified on a patch of vegetation located on the north side of Bronhill Ave (at the intersection with Pittwater road) to validate any vegetation community with certainty. However, it could not be ruled out that the vegetation community comprised Coastal Alluvial Bangalay Forest (part of the EEC Swamp Sclerophyll Floodplain Forest on Coastal Floodplains of the NSW north Coast, Sydney Basin and South East Corner Bioregions).

The level of confidence in assigning to vegetation communities was not high; however, the vegetation communities mapped by the SMCMA are closely related and grade into one another, with some communities showing extremely similar floristics. They also mostly belong to the same state-wide vegetation class (Sydney Coastal Dry Sclerophyll Forests), thus demonstrating their close affiliations to one another. It is possible that vegetation was not correctly validated. However, given the similarities of many of the dry sandstone vegetation communities in the SMCMA vegetation mapping, the correct validation of the vegetation communities as classified for the SMCMA mapping is not considered of vital importance.

A fuller description of vegetation communities found in the study area can be found in **Appendix D**.

Flora Species

An arborist report was prepared to identify and document the health of all trees within the zone where impacts of the works may be expected up to 5.5m from the western edge of Pittwater Road) by MacKay Tree Management (2011). The findings of the report are presented in full in **Appendix F**.

An assessment of the potential for threatened flora species to occur in the study area and a list of species previously recorded within the locality has been included in **Appendix D**.

A list of flora observed during the site inspection is included in **Appendix D**. A total of 143 flora species comprised of 97 native and 46 exotic species, were identified.

No threatened flora species were recorded during the field survey, however, 10 threatened flora species were considered as having the potential to occur within the study area (**Appendix D**).

Thirteen listed noxious species for the Ryde area (including 3 noxious species for the whole of NSW) were observed within or directly adjacent to the subject site. These were:

- Salix sp. (Willows): Class 5 noxious weed in the whole of NSW and in the Ryde LGA;
- *Cardiospermum grandiflorum* (Balloon Vine): Class 4 noxious weed in the whole of NSW and in the Ryde LGA;
- *Rubus fruticosus* (Blackberry): Class 4 noxious weed in the whole of NSW and in the Ryde Local Government Area (LGA);
- *Asparagus aethiopicus* (Asparagus Fern): Class 4 noxious weed in the Ryde LGA;
- *Asparagus plumosus* (Climbing Asparagus Fern): Class 4 noxious weed in the Ryde LGA;
- *Cinnamomum camphora* (Camphor Laurel): Class 4 noxious weed in the Ryde LGA;
- *Lantana camara* (Lantana): Class 4 noxious weed in the Ryde LGA;
- *Ligustrum lucidum* (Large-leaf Privet): Class 4 noxious weed in the Ryde LGA;
- *Ligustrum sinense* (Small-leafed Privet): Class 4 noxious weed in the Ryde LGA;
- *Ochna serrulata* (Ochna): Class 4 noxious weed in the Ryde LGA;
- *Olea europaea* subsp. cuspidata (African Olive): Class 4 noxious weed in the Ryde LGA;
- *Phyllostachys aurea* (Fishpole Bamboo): Class 4 noxious weed in the Ryde LGA; and
- *Tradescantia fluminensis* (Trad): Class 4 noxious weed in the Ryde LGA.

Fauna

An assessment of the potential for threatened / migratory fauna species to occur in the study area and a list of species previously recorded within the locality has been included in **Appendix D**.

No threatened fauna species were recorded during the field survey, however based on database searches, other records, presence of suitable habitat, and professional judgment, Eco Logical Australia identified 16 threatened fauna species and a number of migratory species considered to have the potential to occur within the study area **(Appendix D**).

A list of fauna observed during the site inspection is included in **Appendix D**. A total of 15 fauna species (12 birds, 2 mammals and 1 frog) were identified.

Potential Impacts

The following summarises the impacts considered:

- Loss of exotic ground cover within the area proposed for road upgrade works;
- Loss of remnant vegetation, including within a possible EEC (Swamp Sclerophyll Forest (SSF)), and weeds/exotic vegetation for new sedimentation basins;
- Loss of planted vegetation (*Allocasuarin sp.*) above Buffalo Creek where it exits the Field of Mars;

- Removal of one young *A. bakeri (Narrow Leaved Apple*) shown on Plan 19 of **Appendix C** and identified as tree 47 in **Appendix F**. It is described by MacKay Tree Management (2011) as a rare species, but in declining condition and reduced health. It is also noted that due to soil compaction, its growing habitat is unsuitable;
- Removal of one mature *E. acmenoides* (White Mahogany) shown on Plan 15 of **Appendix C** and identified as tree 34 in **Appendix F**. It is described by MacKay Tree Management (2011) as a significant tree, but infested with aboreal termites and with extensive decay on its basal cavity;
- Impact on other trees in the vicinity through impact on root systems as described by MacKay Tree Management (2011) in **Appendix F**;
- Loss of vegetation on the rock escarpment between Rene and High Streets;
- Loss of sections of the rock escarpment between Rene and High Streets (420 m^3);
- Loss of tree branches overhanging Pittwater Road between Rene Street and the Field of Mars;
- Loss and modification of habitat for flora and fauna species;
- Minor trimming to mangrove vegetation where the SUP crosses Buffalo Creek, (should it obstruct the path);
- Noise disturbance and vibration from the construction works; and
- The possible introduction of sediments and nutrients into remnant bushland

Assessments of Significance were applied by Eco Logical Australia to those TSC Act listed species and communities, EPBC Act listed species and communities and species that occurred or had the potential to occur in the study area and had the potential to be impacted by the proposed works. The complete assessments can be found in **Appendix D**.

Eco Logical Australia conclude that:

- The majority of habitat elements present in the study area would not be impacted by the proposal or vegetation removal;
- The proposed works would have a positive effect and minimise impacts to the study area through the establishment of sediment and erosion controls, and water flow and quality controls in upstream areas;
- Works will not isolate any currently interconnecting areas of habitat;
- The Swamp Oak Floodplain Forest and Coastal Saltmarsh Complex (SOFFCS Complex) in the area downstream of Kitty's Creek will not directly or indirectly be impacted on by the proposed works as a rock-lined sedimentation basin is proposed to be installed downstream of Kitty's Creek where it crosses Pittwater Road to prevent the movement of sediments into Kitty's Creek; and
- Council has advised that changes to flow volumes as a result of kerb and guttering parts of Pittwater Road will be negligible.

Mitigation Measures

The following mitigation measures are recommended to protect flora and fauna and to prevent the spread of weeds from the works site:

- Where possible all native tree and plant species must be retained as they are likely to provide habitat for existing fauna;
- Only the trees that have been discussed in this REF should be trimmed or removed. Trimming of over-hanging trees along Pittwater Road must be undertaken in a responsible manner, and the removal of tree branches must be kept to the necessary minimum;
- All tree pruning works should be undertaken by a Certification 3 arborist;
- Measures are to be implemented to prevent damage or injury to existing trees, plants and other vegetation that are to be retained within or adjacent to the proposed works. In order to assist in the protection of trees to be retained, temporary fencing should be erected around trees where possible, in accordance with Ryde Council's DCP. This should extend to the trees which may be impacted by the access of work vehicles to and from the site;
- Tree Protection Zones (TPZs) defined in **Appendix F**, should be observed during construction activities in order to prevent damage to roots of trees along the road which are to be retained;
- No structures are to be built on Lane Cove National Park land or Boobajool Reserve;
- If an animal dwelling is discovered in or adjacent to a tree to be removed or trimmed, work must cease immediately so that appropriate management actions can be undertaken where necessary; and
- It is recommended a certified wildlife handler be present on site to assist in the safe removal of any displaced wildlife. If any native animals are injured during the construction process, the local wildlife rescue service (WIRES) should be contacted.

It is illegal to destroy any part of a mangrove plant without gaining prior consent from DPI, and mangroves must therefore not be removed or harmed until required permits have been obtained. DPI Permit conditions must be adhered to during the construction phase of the proposed works.

Environmental safeguards relating to mangrove trimming include the following:

- Disturbance of mangrove roots (pneumatophores) should be avoided where possible;
- Trimming should take place from the creek banks rather than in the creek where possible;
- Trimming should take place over a short period of time (e.g. 1 day) so as to minimise ongoing impacts;
- The contractor should employ a qualified ecologist or arborist on site to oversee mangrove trimming; and
- All debris and removed portions of mangrove trees should be removed from the creek immediately and disposed of appropriately off-site.

Removal and disposal of noxious weeds is to be undertaken in accordance with the *Noxious Weeds Act 1993*. Specific removal techniques for noxious weeds include:

- Removal of the seeds / fruit and bag (prior to other removal techniques);
- Removal of small seedlings by hand;
- Using chemical treatments, cutting and painting or injection with undiluted glyphosphate;

- Physical removal with minimum disturbance to the surrounding environment;
- Herbicide applied by injection, direct application or controlled spraying used in accordance with the Registered Label, Permit or Pesticide Order;
- Biological controls that are approved by the Commonwealth Scientific and Industrial Research Organisation (CSIRO); and
- When spraying in or near watercourses, ensure that herbicides registered for use in or near waterways are used, or that the appropriate licences are obtained which include conditions to minimise the impact on the environment.

Erosion and sediment control measures should be implemented as described in **Section 3.13** in order to reduce any impacts on fauna and help reduce the likelihood of weed dispersal. It is also important that these sediment controls, if used in the surrounding creeks, allow for fish movements downstream. Sediment control measures should only remain in the creeks for the necessary period of time.

It is recommended that, where possible:

- Wherever possible works should be undertaken during the drier months (August to November) so as to minimise weed proliferation;
- Where appropriate, washing of trucks is recommended to prevent contamination from other areas, particularly if trucks are coming from non-local areas; and
- Revegetation taking place on site should be undertaken using species local to the area in accordance with Native Plants of the Ryde District – Species List (City of Ryde, 2005).

A Vegetation Management Plan should be established within the CEMP to ensure mitigation measures to protect existing native vegetation are observed.

5.3 Social Environment

5.3.1 Utilities and Services

Existing Environment

As the project design has not yet been finalized, a complete services survey has not yet been undertaken for the whole area of the proposed works. It is noted however that a 'Dial Before You Dig' survey was completed in 2009 for the section of works between Rene Street and High Street, the results of which have been considered in the designs for this section of the works.

The following key utilities and services are known to be present in the area.

- Above ground power cables and light poles line both sides of Pittwater Road;
- Overhead sewerage aqueduct near the entrance to the Field of Mars Reserve. The aqueduct traverses Buffalo Creek aerially for approximately 180 metres in a south-westerly direction. The sewerage main is subterranean apart from this exposed section and largely follows Pittwater Road until Pains Road where the main heads in an easterly direction. In addition there are multiple lower pressure sewer mains (and property connections) located at various points along the length of Pittwater Road;

- An electricity substation at the southeast corner of the Rene Street and Pittwater Road intersection;
- A secondary gas main runs under Rene Street and continues in the east/west direction under Pittwater Road;
- Potable water mains intermittently run the length of Pittwater Road.

During the finalization of the design, and before any construction work is commenced, a service survey will be undertaken and all services/utilities will be located. This will enable appropriate action to be implemented so as to protect all of the utilities, and to minimize any disruption to supply which may result from implementation of the works.

A Dial Before You Dig survey should be conducted prior to any construction for the full length of the proposed works.

Potential Impacts

The detailed design of the project will seek to avoid disruption to utilities wherever possible, and in general it is not anticipated that utilities will be substantially affected.

It is recognized however that during the construction phase of the proposed works utility supply may be interrupted for short periods of time, for Health and Safety reasons. In particular, it is anticipated that electricity supply will be interrupted during the proposed relocation of two power poles as described below and shown in **Appendix C**:

- The light pole currently located on the north eastern side of the intersection with Pains Road will be relocated by 3 metres away from the intersection; and
- The power pole currently located on the western side of Pittwater Road, approximately 100 metres south of the proposed roundabout, will be relocated away from the road by 0.3 metres.

These works would be carried out in conjunction with the electricity supplier; and works will be scheduled to minimise the period of disruption to the greatest extent practicable.

General construction activities such as the operation of machinery, excavation, rock cutting, near or under major services (overhead electrical cables) and underground services and utilities can be a hazard and risk to the safety of construction workers, local residents, the public and the environment.

The overhead sewerage aqueduct which traverses Buffalo Creek on the western side of Pittwater Road will not be altered or disrupted if the proposed works proceed.

It is anticipated that the proposed works will have a long tern positive impact on stormwater systems and drainage (see **Section 5.1.3**). This is due to the proposed installation of guttering along sections of Pittwater Road which do not currently have gutters, and associated upgrades to drainage systems including piping from the gross pollutant trap on the western side of Pittwater Road, the installation of two bioswales and four sediment ponds, which are all expected to help maintain or improve water quality.

Once the works are completed, the project will have no negative long-term impacts on utilities or services.

Mitigation Measures

A Utilities Management Plan for the proposed works must be prepared by Council and observed, particularly for the relocation of power poles and any works near gas lines or water mains. This plan is required to consider both the Health and Safety implications of the project for the construction workers, and the potential impacts on local residents. More information on hazards is provided in **Section 5.3.6**.

Council maintains a complaints system which should be used for this project. This enables an individual to lodge their grievance with customer service, who then pass it onto the Project Development team for action. Application of this system to the project should be a requirement of the CEMP.

Where disruption to utilities and services cannot be avoided:

- An investigation would be undertaken to determine the location of utilities, infrastructure and services within the construction impact corridor;
- Consultation with the services and utilities providers would be ongoing throughout the project;
- The contractor must investigate the nature and location of the utilities proposed to be relocated and consult with the relevant authorities prior to moving;
- Works will be scheduled to keep the period of disruption to the minimum time necessary to safely complete the works;
- Residents affected by the works will be notified in writing at least 2 weeks in advance of the planned disruption;
- Employ the daily use of a gas detector prior to and during construction to detect potential emissions arising from nearby gas pipelines;
- Markers will be installed to highlight the location of high hazard services in the field; and
- Risk identification will include the location of buried cabling and piping and aboveground poles and the substation.

5.3.2 Energy Use and Greenhouse Gas Emissions

Existing Environment

At the time of writing this report, there was no energy use and greenhouse gas emissions data available for the study area, as such; statistics for NSW were used to report the existing environment.

Estimates of Australia's greenhouse gas emissions are produced by the Australian Department of Climate Change and Energy Efficiency. NSW emissions in 2008 (the latest year of data) were just below 165 million tonnes CO2e, with stationary energy (generating heat and electricity) the largest contributing sector. This represents just fewer than 28 per cent of Australia's total emissions. **Figure 5.7** graphically displays the total emissions for NSW in 2008.

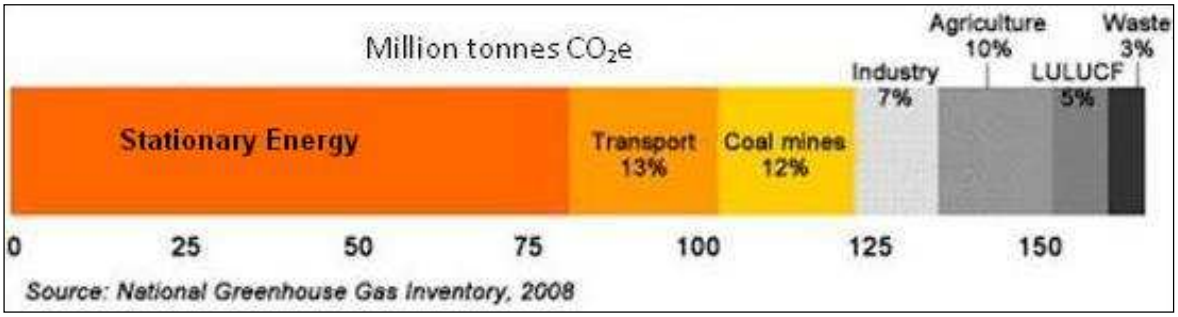

Figure 5.8: Total NSW emissions in 2008 – 165 Million tonnes CO_2e

Potential Impacts

In the long term, the Pittwater Road upgrade will result in fewer overall emissions as vehicles will have reduced idling periods along the road due to improved traffic flow. Additionally, the creation of a safe cycling and pedestrian path may increase the number of travellers choosing to walk or cycle to, from and around Ryde rather than drive, thereby reducing per capita greenhouse gas emissions. These emission reductions are expected to be small, relative to existing emissions.

The road works, construction of the SUP and construction personnel's' facilities will result in short term energy and greenhouse gas emissions from the construction process and fuel, materials and energy required to product the new infrastructure. The operation of trucks and workers' vehicles will have associated fuel usage and greenhouse gas emissions although these would be offset by the long term road efficiency savings of an improved traffic flow.

Mitigation Measures

By improving the traffic flow of Pittwater Road and decreasing the number of motorists (due to SUP usage), overall efficiency on the road will be improved and emissions will be reduced.

Design and procurement strategies should be implemented to reduce greenhouse gas emissions and energy usage during construction and operational phases. For example, energy efficient lighting systems should preferentially be used along the SUP route.

5.3.3 Noise and Vibration

Existing Environment

The OEH is responsible for the regulation of noise related issues, primarily through the enforcement of requirements outlined in the *Protection of the Environment Operations Act 1997* (PoEO Act 1997). Guidelines to manage the impacts of construction-related noise are set out in the *New South Wales Construction Noise Guideline Draft for Consultation August 2008* (DECC, 2008b).

In the area of proposed work, Pittwater Road is primarily neighboured by a mixture of lands zoned as Public Recreation (RE1), Private Recreation (RE2), Medium Density Residential (R3), National Parks and Nature Reserves (E1) (**Figure 3.1**).

The residential properties are mainly located on the western side of Pittwater Road, with parklands consisting of the Field of Mars Reserve, Martin Reserve, Portius Park and North Ryde Park on the western side and Nundah Reserve, Yinnell Reserve, Boobajool Reserve, Lane Cove National Park and Buffalo Creek Reserve to the east.

The primary noise receptors are considered to be the residential properties along the western, southern and northern edge of Pittwater Road. These properties vary in distance from Pittwater Road, with the closest dwelling being located approximately 10 metres from the road perimeter. The primary existing background noise and vibration source is from traffic along Pittwater Road, and it is noted that the long term traffic noise levels are not expected to be significantly altered as the capacity of the road is not being increased by the works.

Three houses (155, 157 and 159 Pittwater Road, Gladesville) which are about 10 metres away from the kerb on the eastern side of Pittwater Road were identified as being heritage items listed by Hunters Hill Council (**Section 5.3.4**), and are in a location which may be subject to vibration impacts as a result of rock cutting. These sites may be adversely affected by vibration, however it is anticipated that the works causing this vibration in this section of the carriageway will be carried out on the western side of Pittwater Road, approximately 20 metres away from the façades of these houses.

According to the RTA Traffic Volumes Map available online (RTA, 2008) the proposed works do not require a traffic noise assessment under clause 102 of SEPP (Infrastructure) as the traffic volume along Pittwater Road before and after the proposed improvements is not large enough to necessitate one. However, noise and vibration has been assessed for the construction phase of the works and mitigation measures are recommended below.

Potential Impacts

Once works are complete it is considered unlikely that the upgraded road will be a source of increased noise and vibration in comparison to existing levels.

For the construction phase of the proposed works, noise and vibration is anticipated to have a short term impact on nearby receptors.

Noise from Rock Cutting Activities

Rock cutting activities are expected to be the greatest single source of construction noise and vibration, however noise and vibration will also be generated by a range of road construction vehicles and machinery at all work locations.

There will be a maximum of 10-15 days of rock excavation staggered between High Street and Rene Street along Pittwater Road. Approximately **420m^3** or **1,157** tonnes of rock will be excavated. The areas in which of rock excavation works will occur, and the volume of rock which will be removed are shown in **Table 5.5**.

Table 5.5: Schedule of rock excavation works.

Chainage number (as seen in Appendix C)	Length of excavation (metres)	M^3 of rock to be excavated	Tonnes of rock excavated
75-100	25	12.5	34
125-135	10	5	14
170-210	40	80	220
295-310	15	7.5	21
335-470	135	270	743
720-795	75	30	83
1050-1065	15	15	42
	TOTAL	**420**	**1158**

Up to 75 trucks with a carrying capacity of 16-20 tonnes each will be used to transport the excavated rock material to Council's tip at Porters Creek. Material will be taken away daily and no stockpiles will be left on site.

Sensitive receptors that are likely to be most adversely affected by noise from rock excavation have been identified as the following residences:

- Property numbers 143-173 Pittwater Road (western side) which are located up to 20m away from proposed rock excavation;
- Property numbers 188-218 Pittwater Road (eastern side) which are located up to 20m away from proposed rock excavation;
- Property numbers 155, 157 and159 Pittwater Road, noting that these are locally listed heritage items (located upwards of 20 metres away from proposed rock excavation);
- 202 and 204 Pittwater Road (located 10 to 15 metres away from proposed rock excavation); and
- Residences along Imperial Avenue which back onto Pittwater Road (located approximately 10 to 20 metres away from proposed rock excavation).

These receptors may be impacted by noise and vibration generated by rock excavation, grading and other work activities and heavy vehicle (including construction vehicle) movement along Pittwater Road.

Noise Impact Assessment

When assessing the impact of noise generated by the construction of the proposed works, consideration of the following factors is required:

- Existing land uses and ambient noise levels;
- Noise source level, mode of operation and duration of operation;

- Location of noise receptors in relation to construction works and the presence of noise softening measures (e.g. barriers in the form of buildings or variations in topography) between the source and receptor; and
- Sensitivity of the receiving environment.

Potential noise receptors surrounding the works area are primarily located in the form of residences, Lane Cove National Park and local reserve areas along the entire road corridor (a minimum of 10 metres from the site).

Noise Sources and Guideline Values

Sources of noise during the construction phase may include excavators, graders, rollers and other heavy vehicles used to transport materials throughout the construction site, with the additional use of rock breaking equipment at locations shown in **Table 5.5**.

DECC (2008b) gives a range of indicative A-weighted sound pressure levels (L_{Aeq}) at 10 metres and measured in dB(A), for certain types of equipment. According to DECC (2008b) indicative A-weighted sound pressure levels for equipment likely to be used during the works are as follows:

- Excavator 69-89 dB(A);
- Rockbreaker 90 dB(A);
- Truck 79 dB(A);
- Concrete pump truck 75-85 dB(A);
- Asphalt paver 75-84 dB(A); and
- Vibratory roller 75-84 dB(A).

DECC (2008b) has also stipulated a noise guideline of 75 dB(A) which equates to the 'highly noise affected' management level for construction noise received at residences. Although the general construction noise is likely to result in noise under this guideline, maximum noise levels, as indicated by the list of equipment likely to be used above, are likely to be higher than 75 dB(A), and potentially as high as 90 dB(A) if a rockbreaker is used during rock excavation operations. Hence the residences approximately 10 m distant from the proposed works, as the closest noise receptors, would be classified as 'highly noise affected'.

The 'highly noise affected' level represents the point above which there may be strong community reaction to noise (DECC, 2008b). It is therefore recommended that various mitigation measures be employed to reduce the overall noise impact on surrounding residences.

Vibration Impact Assessment

It is possible that there could be some vibration effects on the three heritage houses on the eastern side of the carriageway (155-159 Pittwater Road), as well as at other receptors in close proximity to the rock excavation works.

Guidelines for vibration are set out in *Assessing Vibration: a Technical Guideline* (DEC 2006). When dealing with construction vibration, the effects on buildings can be divided into three broad categories:

- Those in which the occupants or users of the building are inconvenienced;
- Those in which the integrity of the building or the structure itself may be prejudiced; and
- Those where the building contents may be affected.

Individuals can detect building vibration values that are well below those that can cause any risk of damage to the building or its contents, i.e. the level of vibration that affects amenity is lower than that associated with building damage (DEC, 2006).

Vibration may be continuous (with magnitudes either remaining constant or varying over time), impulsive (in shocks) or intermittent (with the magnitude of each event being either constant or varying over time). Examples of typical types of vibration and their sources are shown in **Table 5.6**.

Table 5.6: Examples of Types of Vibration (after DEC, 2006)

Continuous Vibration	Impulsive Vibration	Intermittent Vibration
Machinery, steady road traffic, continuous construction activity (such as tunnel boring machinery).	Infrequent activities that create up to 3 distinct vibration events in an assessment period, e.g. occasional dropping of heavy equipment, occasional loading and unloading.	Trains, nearby intermittent construction activity, passing heavy vehicles, forging machines, impact pile driving, jackhammers (more than three vibration events within an assessment period).

Vibration during construction on the site is likely to be associated with heavy vehicles including rock excavators. Therefore vibration issues are considered likely to be intermittent.

When assessing intermittent vibration, DEC (2006) recommends the use of vibration dose value (VDV). The screening method outlined in the DEC (2006) guideline was used to evaluate the likely vibration at 10 m from the site to represent the closest residences from the works. DEC (2006) gives the example of a vibratory roller being used for construction in close proximity to a receiving building for 5 hours on one day. Cardno used this as a comparable assessment to the vibration experienced by receiver residences in the vicinity of the proposed works. The total VDV for the vibratory roller equates to 0.74 $m/s^{1.75}$ which exceeds both the preferred VDV value of 0.2 $m/s^{1.75}$ and the maximum value of 0.4 $m/s^{1.75}$ as described by DEC (2006).

From Heggies Australia (2006) and DEC (2006), it has been inferred that sensitive receptors, particularly those up to 30 metres away from the works (including the properties mentioned above which will be in the vicinity of rock excavation) will be affected by vibration. Vibration mitigation measures are therefore required, particularly during high vibrational periods such as rock excavation sessions.

It is noted that although vibration is likely to have some impact on the surrounding residences, the mobile nature of the construction works between High Street and Rene Street will mean that no one property is exposed to noise and vibration for an extended period of time.

Noise and vibration levels following completion of the works are not expected to alter substantially from existing levels since the road upgrade is not likely to increase traffic

volumes along this section of Pittwater Road. Cycleway patronage is not expected to have any significant impact on noise or vibration. Overall, no substantial long term noise or vibration impacts are expected to be generated following completion of the proposed works.

Mitigation Measures

During the construction phase of the road upgrade, the measures to minimise the daytime and night-time impacts of construction-related noise set out in the DECCW (2009) *Interim Construction Noise Guideline* and the RTA (2001) *Environmental Noise Management Manual* should be adhered to.

Council maintains a complaints system which should be used for this project. This enables an individual to lodge their grievance with customer service, who then pass it onto the Project Development team for action. Application of this system to the project should be a requirement of the CEMP.

It is recommended that a Noise and Vibration Management Plan be developed as part of the CEMP prior to the commencement of the proposed works to address issues associated with construction noise and vibration, for both daytime and night-time roadwork. Mitigation measures should include:

- Limit works to daylight hours where possible;
- Perform noisy and vibration generating work during less sensitive time periods where possible;
- Use low-noise plant and equipment, and ensure equipment has quality mufflers installed;
- If possible and necessary establish noise shields and barriers for immediate residences;
- Establish a register for noise and vibration complaints and utilise the existing Council complaints system to receive complaints;
- Ensure all complaints are investigated and a response is provided;
- Where possible, use construction methods that are quieter and emit low vibrations;
- Ensure only well maintained equipment is used;
- Rock or concrete breaking is only to be undertaken during weekday daytime hours, preferably during school holidays; and
- Pre-construction dilapidation surveys should be undertaken of properties which may be affected by the rock excavation to enable any impacts to be quantified effectively.

All feasible and reasonable measures should be taken to minimise construction noise where possible. The City of Ryde should communicate with the affected residents before the commencement of works to clearly explain the duration and noise/vibration level of the works and describe any respite periods that will be provided.

Recommended standard hours for construction work, as reported by DECCW (2009), are:

Table 5.7: Recommended standard work hours for construction work (DECCW 2009)

Work Type	Recommended Standard hours of Work
Normal construction	Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays or Public Holidays
Blasting	Monday to Friday 9am to 5pm Saturday 9am to 1pm No blasting on Sundays or Public Holidays

5.3.4 Heritage and Archaeology

Existing Environment

Aboriginal Heritage

A search of the Aboriginal Heritage Information Management System (AHIMS) on 30 May 2011 found that there are 60 Aboriginal objects or places recorded within the search area around the site (the length of the study area with a 200m buffer zone). These sites are:

- 4 rock engravings (pigment or engraved);
- 2 shelters with art;
- 3 artefacts on open camp sites;
- 6 shelters with artefacts;
- 6 middens;
- 5 middens on an open camp site;
- 19 earth mound shelters with middens;
- 7 axe grinding grooves;
- 2 habitation structures;
- 1 potential archaeological deposit (PAD);
- 1 shell, and;
- 4 sites described as “shelter with art” and “shelter with midden”.

The majority of these sites are located outside of the works area, with only 3 records near the proposed construction areas along Pittwater Road. One artifact site is located on the edge of Field of Mars within 30m of the proposed construction works. A midden located at the western edge of Sugarloaf Point, is approximately 70m east from the proposed construction works. Additionally, there is an axe grinding groove record 30m from one of the proposed sedimentation ponds.

The following qualifications apply to an AHIMS search:

- AHIMS only includes information on Aboriginal objects and Aboriginal places that have been provided to the OEH;
- Large areas of New South Wales have not been the subject of systematic survey or recording of Aboriginal history. These areas may contain Aboriginal objects and other heritage values which are not recorded on AHIMS;
- Recordings are provided from a variety of sources and may be variable in their accuracy. When an AHIMS search identifies Aboriginal objects in or near the area it is

recommended that the exact location of the Aboriginal object be determined by re-location on the ground; and
- The criteria used to search AHIMS are derived from the information provided by Cardno to the OEH and the OEH assumes that this information is accurate.

During a visual inspection at the site on the 27 May 2011, no Aboriginal objects or places were observed or located, however the database search results show that there is potential for Aboriginal objects to be located in the area of proposed works.

The site of the proposed works falls into the Metropolitan Local Aboriginal Land Council area. A search on the Native Title Tribunal's website revealed that, in NSW, two Native Title determinations have been reached. Neither of these covers the area of proposed works. It is also noted that there is an application for Native Title which covers the Ryde LGA, along with 29 other LGAs in the Sydney Metropolitan Area and greater NSW. This application was lodged in 1997 and is still active and awaiting determination.

Non-Aboriginal Heritage

Searches were performed using various online heritage databases in order to identify any heritage items within the area of proposed works. A search of the Australian Heritage Database found two heritage items to be within 1km of the site of proposed works. These are:

- Hunters Hill Conservation Area; and
- Parramatta and Lane Cove Rivers Landscapes.

The Hunters Hill Conservation Area is a Registered Heritage Place that comprises a large portion of the Hunters Hill LGA. Due to the distance between Pittwater Road, and the Hunters Hill Conservation Area, the proposed works will not directly affect this heritage site. However, as the works are proposed to take place adjacent to, and upstream of, this LGA, care must be taken to avoid any indirect impacts that may result.

The Parramatta and Lane Cove Rivers Landscapes heritage item is classed as an Indicative Place on the Register of the National Estate and covers about 9000ha, comprising the Parramatta and Lane Cove Rivers from North Rocks Road and De Burghs Bridge respectively, to Greenwich and including areas along the banks of both rivers. Due to the distance from the site of proposed works to either of these rivers, it is not anticipated that there will be any visual impacts on the landscapes associated with either the Parramatta or the Lane Cove River.

The City of Ryde's Planning Scheme shows that a large portion of the Field of Mars is considered to be of archaeological significance. The area of proposed works does not extend into this area and so an excavation permit under Section 139-146 of the *Heritage Act 1977* is not required from the Heritage Council at this stage.

A search on the State Heritage Register revealed six heritage items listed by Local Government and State agencies within the study area, these are:

- Sugarloaf Point;
- Boobajool Reserve;
- Electricity Transformer/Substation (293 Pittwater Road);
- Field of Mars Wildlife Reserve;
- Heritage houses at 155,157,159 Pittwater Road, Gladesville; and
- Rock shelter near Kitty's Creek.

Direct impacts on these site are not anticipated, however indirect impacts may occur if mitigation measures are not undertaken, particularly those associated with water management (**Section 5.1.3**) as these items could be affected by changes to stormwater flow. Mitigation measures associated with noise and vibration impacts (**Section 5.3.3**) should be implemented for the heritage houses located at 155, 157 and 159 Pittwater Road, Gladesville as they are located directly adjacent to the proposed works. However, it is anticipated that the works causing vibration in this section of the carriageway will be carried out on the western side of Pittwater Road, approximately 20 metres away from the façades of these houses.

The Maritime Heritage website was also searched for heritage sites in the vicinity of proposed works. None were identified.

A search of other Heritage registers operating under section 170 of the *Heritage Act 1977* was performed. No heritage items on the RTA Heritage and Conservation Register were found to be in the area of proposed works. A search on the Sydney Water Heritage and Conservation Register found six heritage sites in the combined area of Ryde and Hunters Hill LGAs. None of these are within close proximity to the site of proposed works.

Remains of a former sandstone bridge over Buffalo Creek were evident on an inspection to the site of the proposed works on the 27 May 2011. These remnants are located on the northern banks of Buffalo Creek and adjacent to Pittwater Road, but the site was not found in any of the heritage database searches. Similarly, a sandstone culvert is located approximately 100m south of the roundabout and was not found on the heritage databases. It is possible that the bridge remains and culvert could be over 50 years old, meaning that these items would be classified as a relic and be protected under the *Heritage Act 1977*. Neither the bridge or the culvert are expected to be directly impacted by the works, however, it is noted that should this change, requirements under the *Heritage Act 1977* should be reviewed.

Potential Impacts

Aboriginal Heritage

Although no Aboriginal Heritage items have been identified in the immediate vicinity of proposed works, AHIMS results suggest that items of significance may be uncovered during the proposed construction phase. An unexpected finds protocol should be maintained and followed during the works in order to ensure that impacts on unknown items are minimized.

Non-Aboriginal Heritage

The Hunters Hill Conservation Area lies in the adjoining Hunters Hill LGA. Although no direct impacts will affect the Conservation Area due to the distance from the proposed works, indirect impacts may occur. In particular, there is a risk that construction works may contribute to siltation and reduced water quality downstream (e.g. in Buffalo Creek in Hunters Hill LGA) unless appropriate mitigation measures are undertaken. These indirect impacts also apply to the Sugarloaf Point heritage item.

Vibration is considered to be a possible impact on the locally listed heritage houses within the Hunters Hill LGA, and at other receptors along Pittwater Road. It is recommended that a Dilapidation Survey be carried out in order to assess the existing stability of the at risk houses so that a subsequent post-works survey can ascertain any structural changes. See **Section 5.3.3** for more information and mitigation measures for vibration.

There is some potential for a small increase in dust associated with earthworks required for the proposed construction. The dispersal of small amounts of dust during the proposed construction phase is not expected to cause substantial damage to the heritage sites. This is in part due to the relatively small amount of dust that is anticipated to be produced if the proposed works go ahead and also in part because most dust types can be easily removed from receiving surfaces. Dust mitigation measures can be found in **Section 5.1.2**.

Mitigation Measures

Aboriginal Heritage

The contractors and all staff contracted to undertake construction works should be informed and made aware of their responsibilities in the event that any Aboriginal objects are identified. If any Aboriginal objects and / or places are located during the construction phase, all work should cease in the vicinity of the find. Council's Project Manager and the OEH should be contacted. If skeletal material is identified then NSW Police also need to be contacted.

Should any Aboriginal objects be uncovered during the works, an Aboriginal Heritage Impact Permit (AHIP) under Section 90 of the Act will need to be obtained if the object cannot be avoided.

Non-Aboriginal Heritage

Mitigation measures described elsewhere in this document for dust control, sediment control, water quality and noise and vibration management will minimise the environmental impact at all heritage locations.

Final designs for the project should ensure that the bridge remains and culvert in the vicinity of Buffalo Creek are not impacted by the works.

In addition to the above mitigation measures, Council may wish to consider signage along the route of the SUP to identify and describe heritage items in the vicinity. This applies only to non-Aboriginal Heritage items, since Aboriginal sites are protected under the *National Parks and Wildlife Act 1974* and site location information is subject to restricted access.

5.3.5 Traffic and Access

Existing Environment

The existing street network in the area surrounding the site is shown in **Figure 5.9**.

Pittwater Road is classed as a Secondary Road under the *Roads Act 1993* and is managed as a Regional Road under the RTA's Schedule of Classified Roads (RTA, 2011). Regional Roads are routes of secondary importance between State Roads and Local Roads which perform a sub-arterial function in major urban areas (RTA, 2008b). In this case, Pittwater Road acts as acts as a major thoroughfare for the suburbs of East Ryde and Gladesville.

Street parking is available along some sections of Pittwater Road, excluding the vicinity of the Field of Mars Reserve and Buffalo Creek Reserve driveways. It was noted during field inspections, that vehicles were parked on the section of Pittwater Road immediately north of High Street, and on the western side of the road between Bronhill Avenue and Coxs Road. No parking was observed along the section of Pittwater Road between Buffalo Creek and Rene Street. This is likely due to the lack of residences nearby, and safety considerations including the number of vehicles using the road and the small sight distances, especially around tight bends.

The existing condition of Pittwater Road is considered to be poor, with the carriageway failing in many locations as described in **Section 2.1** and shown by photographs in **Appendix A.**

Traffic delays are known to occur along Pittwater Road during peak journey times, and it has been noted that the carriageway does not currently include breakdown lanes, and as a result broken down vehicles cannot be moved from the carriageway, and progress of emergency vehicles along the road is relatively slow.

On a site inspection on 27 May 2011, a visual inspection of Pittwater Road found the carriageway to be quite busy, with pedestrians having to wait some time before being able to cross the road. In particular, vehicles travelling around the tight curves of the road (forming an "S" shape on Plans 4 and 5 in **Appendix C**) have poor visibility of pedestrians, and, similarly, pedestrians have poor visibility of approaching vehicles.

A previous site inspection (19 April 2009) found that Buffalo Creek Reserve was very popular with children and their families. Parking in Buffalo Creek Reserve presented a problem, as available parking spaces were all occupied and vehicles were being parked in non-designated areas. Vehicles were also being parked across the Road in the Field of Mars Reserve car park and families with young children and prams were crossing the road at this intersection.

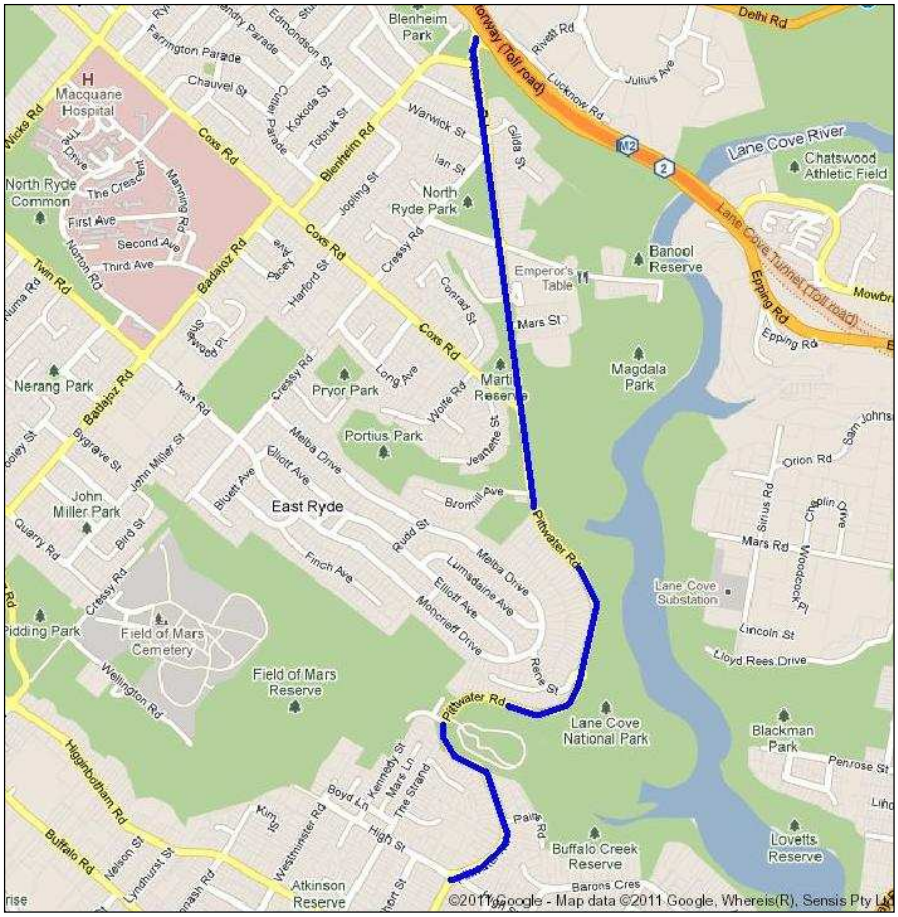

Figure 5.9: Local street network surrounding proposed works site (Source: Google Maps, 2011)

Potential Impacts

The works are not expected to significantly alter the volumes of traffic using the road. Once the works are complete, improved traffic flow is expected, especially in the event of vehicle breakdowns and accidents as the addition of breakdown lanes will enable broken down vehicles to be removed from the traffic flow, and for the passage of emergency / recovery vehicles. The improved carriageway condition will also allow for safer and better flowing traffic.

As the two additional traffic lanes will be strictly used as motor vehicle breakdown lanes and emergency vehicle access lanes, parking availability will be reduced along Pittwater Road. However, as observed on the site visit, there was very little parking along the road corridor due to low visibility for drivers and safely concerns of the tight bends in the road. Restricting the parking along Pittwater Road will have a positive impact on road safety as the number of cars parking in dangerous areas will be reduced.

During the proposed construction phase of works, there is likely to be a small increase in the volume of trucks travelling along Pittwater Road. Due to the stop and start nature and slow movement of these construction trucks, there may be an impact on the flow of everyday

traffic whilst the trucks manoeuvre around the site. This impact is expected to be minimal, and of short duration.

Up to 75 trucks with a carrying capacity of 16-20 tonnes each will be used to transport the excavated rock material to Council's tip at Porters Creek. Material will be taken away daily and no stockpiles will be left on site.

It is Council procedure to use mobile caravans sited away from major public roads during road construction activities to provide required contractor amenities. There will be no construction compounds or stockpiles required along Pittwater Road during the works. This is expected to help to keep traffic disruption during the works to a minimum. Sitting of the caravan has yet to be determined; however it is likely that this will be in the existing Field of Mars carpark, or at another similar off-road location.

The works are not expected to have any impact on the ability of pedestrians to cross the road.

It is noted that a number of comments received during the community consultation process related to safety issues associated with potential conflicts between motorists and users of the SUP. These issues are predominantly design/safety issue which fall outside the scope of the REF; however it is noted that a risk management plan will be created to address SUP safety once a final design has been prepared.

Mitigation Measures

A Traffic Management Plan should be prepared by Council as part of the CEMP to ensure motorists are aware of changed traffic conditions and the provision of appropriate traffic controls and alternative routes if necessary. The Traffic Management Plan should include a consideration of how disruption can be avoided at peak travel times.

Additional mitigation measures to include in the CEMP are listed below:

- Appropriate signage should be erected along Pittwater Road, as well as at each intersection of side roads with Pittwater Road to warn motorists to be cautious of construction traffic and alert them to changed traffic conditions;
- Where required, residents of these streets should also be informed of any changes to accessibility and parking;
- In accordance with Council policy, provision for the parking of construction vehicles and the site office should be made available, at a location which will have a minimal impact on public traffic using Pittwater Road or the surrounding roads. It is understood that these actions will be the responsibility of Council;
- The proposed works should be scheduled to ensure the majority of construction vehicle movements occur in off-peak traffic times (e.g. avoid the start and end of school hours);
- When possible, vehicles will remain on-site during work hours, parked near the site office area within a suitable locked compound; and
- A risk management plan should be created to address SUP safety once an option has been agreed and commissioned.

It is also recommended that a traffic, pedestrian and parking study be carried out to ascertain whether further access and parking improvements are necessary.

Council maintains a complaints system which should be used for this project. This enables an individual to lodge their grievance with customer service, who then pass it onto the Project Development team for action. Application of this system to the project should be a requirement of the CEMP.

5.3.6 Hazards

Existing Environment

Several hazards exist around the site of proposed works including:

- The presence of motor vehicles, cyclists and pedestrians using Pittwater Road, and surrounding roads;
- Physical hazards to road users, including tight bends, and a deteriorating road pavement;
- Utilities including electricity, gas, water and sewerage (**Section 5.3.1**);
- Bushfire, particularly in the vicinity of Field of Mars Reserve which is classified as being bushfire prone by the City of Ryde.
- Steep slopes present along sections of Pittwater Road;
- Poisonous or harmful fauna associated with the natural environment surrounding sections of Pittwater Road.

Potential Impacts

The proposed works are expected to reduce the long term hazard associated with use of the road by motorists through the improvement of the carriageway condition, and the provision of breakdown lanes which will enable broken down vehicles to be removed from the traffic.

There are numerous potential hazards associated with the proposed works including:

- Traffic movement, which poses a hazard to construction workers, pedestrians and motorists during the construction period;
- The movement of heavy machinery poses a potential hazard for pedestrians and motorists;
- The felling and trimming of trees which may pose a hazard to pedestrians, motorists, construction workers and buildings in the works area;
- Damage to utilities and services during excavation;
- Falling rock, and unexpected rock face or land movement during the rock excavation works;
- Safety and health risks associated with sewer overflows and stormwater outlets;
- Potential risk of increased erosion to creek banks during construction which may lead to subsidence;
- Hazards created by SUPs and driveway ingress and egress; and
- Pedestrian and cyclist collision hazards on the SUP.

Mitigation Measures

A Risk Management Plan will be required prior to commencement of works which adequately considers and addresses each of the hazards identified above, and the Plan must be followed by all contactors. The plan should be approved by Council.

It is recommended that the Risk Management Plan should include the following measures to reduce the risk of hazards during the construction period:

- Fencing off the active work site;
- Facilitating pedestrian movement safely around the active works area with temporary walkways;
- Adequate signage for motorists and pedestrians warning them of the construction site;
- Signage to warn pedestrians and motorists of tree felling activities;
- Making construction workers aware of hazards before they enter the site;
- A Traffic Management Plan;
- Ensuring that all staff are competent, and have received the appropriate training for the task they are undertaking.

In addition to the construction related risks, it is recommended that the Risk Management Plan should consider the following measures to reduce the risk of hazards during the long term operation and use of the road and SUP:

- Driveway hazards could be reduced by community, cyclist and motorist education and the use of appropriate signage for cyclists and motorists. (This has been successfully implemented in Lane Cove Council area along the Epping Road SUP);
- Speed limits for cyclists could also be introduced along sections of the SUP to reduce the risks of cyclist/pedestrian, cyclist/cyclist and cyclist/motorist incidents;
- Segregation of pedestrians and cyclists on the SUP using clear lane markings and signage; and
- Providing ample room for pedestrians and cyclists to share the path without incident (ideally the SUP should be 3-4m in width, however it is noted that this is not possible along all sections of the SUP).

It is noted that not all hazards and risks identified can be addressed in this REF, and that a number of additional hazards and risks will be considered in the detailed design stage and through ongoing bicycle safety education to be undertaken by Council. This particularly applies to the risks of collision involving users of the SUP.

5.3.7 Visual Landscape

Existing Environment

The section of Pittwater Road proposed for the road upgrade and the addition of a SUP is adjacent to both residential development and parkland areas which exist on either side of the road. The visual landscape can be described as urbanised, however the presence of estuarine and terrestrial vegetation along Kitty's Creek, Field of Mars and Buffalo Creek means there are natural elements incorporated into the streetscape, despite being in an anthropologically modified environment. The verge along Pittwater Road varies along the

length of the proposed works, and includes mature trees in places, as well as driveways, kerbs, grass and street lights.

Potential Impacts

All works will occur within the existing road reserve, and in general it is anticipated that the proposed works will not have a major impact on the visual amenity of the site.

There will however be some localised short term impacts during construction, and some localised longer term changes associated with tree removal which is described below.

During the construction phase there may be some elements of the work that detract from the visual landscape. These include:

- An increased number of heavy vehicles in the area;
- Temporary fencing and signage associated with the works;
- Building materials or rubbish piles at the active work site (noting that Council policy is to remove these at the end of each day).

All these construction related impacts are expected to be relatively small and short term.

In the longer term there will be minor changes in visual amenity associated with the removal of trees along the edges of Pittwater Road including a White Mahogany (Plan 15). Although a number of trees will be removed, the visual landscape is not expected to be substantially affected as vegetation removal will be minimal.

It is also noted that the rock excavation works proposed will create a minor change to the visual environment between High Street and Rene Street. Rock excavation in these areas is expected to increase safety by improving lines of sight, and widening the carriageway at a point where it is constrained with tight bends and steep slopes.

Overall, the road upgrade and addition of the SUP will not substantially alter the overall visual amenity values of the area since Pittwater Road is an existing structure and the SUP will follow the route of the existing road.

Mitigation Measures

The concept design has been prepared, and modified in order to prevent the loss of trees along Pittwater Road wherever possible. In particular, design changes have enabled two mature trees (shown on Plan 14) to be retained. Detailed design will be completed with the same philosophy of minimising tree loss and changes to visual impact wherever practicable.

During the construction works the following mitigations measures are to be followed:

- Care is to be exercised to minimise the visual impact of proposed construction works wherever possible; and
- Contractors are to follow Council policy that any rubbish/waste resulting from the works is loaded directly onto a truck and removed from the site at the end of each day.

Following the completion of works:

- All machinery and unnecessary signage and fencing should be removed from the site as soon as practicable; and
- All areas which have been disturbed by the works should be restored (e.g. re-vegetated with native species) as soon as practicable.

5.3.8 Waste

It is likely there will be relatively little waste generated from the project. Council policy which will be applied to this project is that any rubbish/waste that is generated and that cannot be re-used on-site should be transported off-site at the end of each day to a suitable waste management/recycling facility, and there will therefore be no stockpiling of materials at the active construction site overnight. It is likely that waste from the upgrade works will be taken to the Council waste facility at Porters Creek where materials which can be reused will be recovered prior to disposal. This will both minimise waste disposal resulting from project implementation, and help with maintaining visual amenity as described in **Section 5.3.7**.

In order to minimise waste, Council should consider specifying the use of construction materials that minimise the use of unnecessary packaging. It is also recommended that, where possible, recycled construction materials are considered for use. Any waste materials that are generated should be segregated at source and sent to appropriate recycling outlets. Recycling facilities should also be made available to staff during the construction phase.

5.3.9 Socio-Economic Considerations

Given the scale of the project, it is considered unlikely that the road upgrade and construction of the adjacent SUP will have any significant negative impact on the socio-economic conditions of the local community. Some positive social impacts are expected however since the SUP is likely to create a more accessible and therefore more social environment for local residents.

5.4 Cumulative Environmental Effects

A search of the NSW Department of Planning and Infrastructure Register of Major Projects on 8 June 2011 found that there are currently 36 major projects planned in the Ryde LGA.

Six of these have not yet been determined. These are:

- Royal Rehabilitation Centre Sydney: MP 08_0054 (Mod 2) - Health Facility and Associated Community, Open Space and Infrastructure Works;
- Royal Rehabilitation Centre Sydney: MP 08_0054 (Mod 3) - Health Facility and Associated Community, Open Space and Infrastructure Works;
- Meadowbank Employment Area: MP09_0216 - Concept Plan - Mixed Use Residential, Commercial/Retail Development, Meadowbank & Ryde;
- Meadowbank Employment Area: MP09_0219 - Project Application - Residential Development, Ryde;
- 396 Lane Cove Road & 1 Giffnock Avenue, Macquarie Park: MP09_0209 - Concept Plan - Mixed use commercial and retail development; and
- 1-9 Allengrove Crescent, 116a-122b Epping Road, 259-263 Lane Cove Road, North Ryde: MP10_0037 - Residential Development.

The other 30 major projects have been determined or gazetted. These are:

- 120-128 Herring Road, Macquarie Park: MP09_0218 - Project Application - Mixed use Residential/Retail Development;
- 120-128 Herring Road, Macquarie Park: MP09_0195 - Concept Plan - Mixed Use Residential/Retail Development;
- 120-128 Herring Road, Macquarie Park: MP09_0217 - Project Application – Subdivision
- Macquarie University: MP 10_0032 Australian Hearing Hub;
- Royal Rehabilitation Centre Sydney: MP 08_0054 MOD 1 Health Facility Civil Infrastructure Modifications;
- M2 Upgrade: DA 051-07-2010 - SEPP 64 Advertising Signage;
- M2 Upgrade: Project Application - M2 Motorway Upgrade;
- Macquarie University: Modification 08_0032(2) - Cochlear HQ;
- Royal Rehabilitation Centre Sydney: MP 07_0100 Modification 1 - Royal Rehabilitation Centre Sydney – Subdivision;
- 63-77 West Parade, West Ryde: MP09_0029 - 63-77 West Parade, West Ryde;
- Macquarie University Private Hospital: MP06_0172 MOD 6 – Signage;
- Macquarie University: State Significant Site Listing;
- Macquarie University: Concept Plan 06_0016;
- Macquarie University Private Hospital: Modification 06_0172 (5) – Subdivision;
- Macquarie University Private Hospital: Modification 06_0172 (4) - Internal works and fitout;
- Macquarie University Modification: 08_0032(1) - Cochlear HQ;
- Macquarie University: Modification 07_0113(1) – Library;
- Macquarie University Private Hospital: Modification 06_0172 (3) - Internal, external and facade modifications to building;
- Macquarie University: Project Application 08_0032 - Cochlear Global;
- Royal Rehabilitation Centre Sydney: MP 08_0054 Health Facility;
- Macquarie University Private Hospital: Modification 06_0172 (2) - internal and external design changes;
- Royal Rehabilitation Centre Sydney: Superlot Subdivision;
- Macquarie University: Project Application 07_0113 – Library;
- Macquarie University Private Hospital: Modification 06_0172 (1) - Pedestrian bridge;
- West Ryde Station: Mixed-use development adjacent to West Ryde Station;
- Macquarie University: Macquarie University Library - relocation of thermal energy storage (TES) tank MOD 2;
- Macquarie University Private Hospital: Project Application 06_0172;
- Lane Cove Tunnel: Modification 4;
- Royal Rehabilitation Centre Sydney: State Significant Site; and
- Royal Rehabilitation Centre Sydney: Concept Plan 05_0001.

A search was also performed for the adjacent Hunters Hill LGA, where it was found that there is one major project awaiting determination:

- 7-9 Nelsons Parade, Hunters Hill: Remediation of 7-9 Nelson Parade, Hunters Hill.

Due to both the geography in relation to major works in both Ryde and Hunters Hill LGA, and the scale of the proposed development, it is unlikely that the proposed works will have any cumulative effect in conjunction with any of these projects. In particular, 19 of the current 36 major projects in the Ryde LGA are located at Macquarie University and Macquarie Park which are both over 2.5 kilometres away from Pittwater Road.

It is recommended however that due consideration is given to these projects when determining the CEMP and other various Management Plans, particularly with respect to traffic movement.

6 Environmental Safeguards and Management

6.1 Summary of Environmental Safeguards

Environmental Safeguards relating to each of the aspects considered in this REF are summarised in **Table 6.1**.

Table 6.1: Environmental Safeguards and Management

Environmental Parameter	Safeguards
Topography, Geology and Soils	› An Erosion and Sediment Control Plan (ESCP) should be implemented in accordance with with the *Managing Urban Stormwater – Soils and Construction* (DECCW, 2008) (also known as Volume 2 of the 'Blue Book', Volume 1) as part of the Construction Environmental Management Plan (CEMP) for the site and approved by Council before works commence. › Regular inspection of the work site should be undertaken for the duration of construction to ensure that the ESCP is implemented and maintained. › An Acid Sulfate Soil (ASS) Management Plan should be prepared and included in the CEMP in accordance with the ASSMAC guidelines (ASSMAC, 1998). › If any saline or contaminated soils are exposed during the works then Council's Superintendent should be notified and appropriate management plans should be prepared. › No contaminated material should be removed from the site without first being tested, and a suitable disposal method determined.
Air Quality	› Dust pollution should be minimised by using dust suppression measures where necessary. Transported and stored material must be adequately covered to ensure that dust pollution is minimised. › Speed limits of both public and construction vehicles along any sections of unsealed roads are to be restricted in order to reduce any additional dust generation. › All machinery will be regularly maintained to ensure that exhaust emissions are minimised. › Dust generating activities are to cease during periods of strong winds (above 20km/h).
Energy Use and Greenhouse Gas Emissions	› Design and procurement strategies should be implemented to reduce greenhouse gas emissions and energy usage during the construction and operational phases. For example, energy efficient lighting systems should preferentially be used along the route.
Hydrology and Water Quality	› Concurrence from DPI (NSW Fisheries) and a Part 7 Permit must be obtained prior to commencement of the proposed works as the SUP crossing over Buffalo Creek will involve works within 50 m of the waterway. › An ESCP must be prepared and followed to the satisfaction of Council in order to mitigate any impacts associated with sedimentation.

Environmental Parameter	Safeguards
	› The potential impact of fuel spills will be managed by conducting the refuelling of machinery in a defined area that is bunded. › In the event of a significant spill in a non-bunded area, a spill kit is to be deployed and Council's Environmental representatives and the OEH are to be advised. › Installation of a GPT, two bioswales and four sediment ponds should be built at locations shown in **Appendix C** in order to both provide protection of watercourses during construction, and increase the long term quality of stormwater drainage. › Council must make provision for the long term maintenance for the new GPT, and for monitoring its performance.
Flora and Fauna	› A Permit must be obtained from the DPI (NSW Fisheries) prior to any disturbance of mangroves in the works area. › Where possible all native tree and plant species will be retained. › Trees to be retained should be protected using temporary fencing. This should also extend to the trees further away from the works which may be influenced by the access of work vehicles to and from the site. › Disturbance of mangrove roots (pneumatophores) should be avoided where possible; › Trimming of mangrove should take place from the creek banks rather than in the creek where possible; › Trimming of mangroves should take place over a short period of time (e.g. 1 day) so as to minimise ongoing impacts; › The contractor should employ a qualified ecologist or arborist on site to oversee mangrove trimming; › All debris and removed portions of mangrove trees should be removed from the creek immediately and disposed of appropriately off-site; › Erosion and sediment control measures will assist in protecting flora and fauna. › All tree pruning works should be undertaken by a Certification 3 arborist; › For the removal of any trees (dead or alive) (especially trees containing hollows) a qualified animal handler should be on-site during the removal or trees to assist with relocating native fauna if required. › Site rehabilitation should be undertaken where necessary, e.g. bank stabilisation to prevent erosion. › Measures should be in place to prevent the transport of weeds in to or out of the works area. › Removal of the seeds / fruit and bag (prior to other removal techniques) and removal of small seedlings by hand; › Using chemical treatments, cutting and painting or injection with undiluted glyphosphate; › Physical removal of weeds with minimum disturbance to the surrounding environment;

Environmental Parameter	Safeguards
	› Herbicide applied by injection, direct application or controlled spraying used in accordance with the Registered Label, Permit or Pesticide Order. When spraying in or near watercourses, ensure that herbicides registered for use in or near waterways are used, or that the appropriate licences are obtained which include conditions to minimise the impact on the environment. › Biological controls that are approved by the Commonwealth Scientific and Industrial Research Organisation (CSIRO); › A Vegetation Management Plan should be established to ensure mitigation measures to protect existing vegetation are enforced and aid in the establishment of new vegetation (either from colonisation or planting). › Revegetation taking place on site should be undertaken using species local to the area in accordance with Native Plants of the Ryde District – Species List (City of Ryde, 2005). › Wherever possible, works should be undertaken during the drier months (August to November) so as to minimise weed proliferation; › Where appropriate, washing of trucks is recommended to prevent contamination from other areas, particularly if trucks are coming from non-local areas; and › Quality of stormwater inputs to the creek should be controlled through the installation of a GPT, two bioswales and four sediment ponds as shown in **Figure 5.6** and **Figure 5.7**.
Utilities and Services	› A Utilities Management Plan shall be established as part of the CEMP for the site and approved by Council's Superintendent before works commence. › An investigation would be undertaken to determine the location of utilities, infrastructure and services within the construction impact corridor prior to completion of a final design, for the road upgrade › Consultation with the services and utilities providers would be ongoing throughout the project; › The contractor must investigate the nature and location of the utilities proposed to be relocated and consult with the relevant authorities prior to moving. › Council maintains a complaints system which should be used for this project. This enables an individual to lodge their grievance with customer service, who then pass it onto the Project Development team for action. Application of this system to the project should be a requirement of the CEMP. › Works will be scheduled to keep the period of disruption to the minimum time necessary to safely complete the works; › Residents affected by the works will be notified in writing at least 2 weeks in advance of the planned disruption; › Employ the daily use of a gas detector prior to and during construction to detect potential emissions arising from nearby gas pipelines; › Markers will be installed to highlight the location of high hazard services in the field; and

Environmental Parameter	Safeguards
	› Risk identification will include the location of buried cabling and piping and aboveground poles and the substation.
Noise and Vibration	› Where possible, the contractor should endeavour to utilise the quietest available work methods. › Council should communicate with the impacted residents by clearly explaining the duration and noise level of the works, and by describing any respite periods that will be provided. › Equipment should be well maintained. › Whenever possible, the recommended standard hours for construction work shown in › **Table** 5.7 should be adhered to. › Works shall adhere to the specified start and finishing times and rock or concrete breaking is only to be undertaken during weekday daytime hours, preferably during school holidays. › Perform noisy and vibration generating work during less sensitive time periods where possible. › A pre-construction dilapidation survey is recommended for those properties (and in particular the heritage properties) which may be affected by vibration during the rock excavation works. › Council maintains a complaints system which should be used for this project. This enables an individual to lodge their grievance with customer service, who then pass it onto the Project Development team for action. Application of this system to the project should be a requirement of the CEMP.
Visual Amenity	› Detailed design should be completed with a philosophy to minimise tree loss and visual impact whenever possible. › Machinery and unnecessary signage/fencing shall be removed at the end of each day. › Any rubbish/waste resulting from the works should be removed off-site at the end of each day. › Impacted work sites shall be remediated as soon as practicable after works have finished in an area.
Waste	› Waste from the upgrade works should be taken to a waste facility where materials which can be reused will be recovered prior to disposal.
Traffic and Access	› A Traffic Management Plan should be established and implemented by Council as part of the CEMP for the site before works commence. This should consider timing of the works to avoid disruption as far as possible, and signage and traffic control requirements. › Appropriate signage should be erected along Pittwater Road, as well as at each intersection of side roads with Pittwater Road to warn motorists to be cautious of construction traffic and alert them to changed traffic conditions. › Where required, residents of these streets should also be informed of any changes to accessibility and parking. › In accordance with Council policy, provision for the parking of

Environmental Parameter	Safeguards
	construction vehicles and the site office should be made available, at a location which will have a minimal impact on public traffic using Pittwater Road or the surrounding roads. It is understood that these actions will be the responsibility of Council. › The proposed works should be scheduled to ensure the majority of construction vehicle movements occur in off-peak traffic times (e.g. avoid the start and end of school hours). › When possible, vehicles will remain on-site during work hours, parked near the site office area within a suitable locked compound. › A risk management plan should be created to address SUP safety once an option has been agreed and commissioned.
Hazards	› Active work sites should be fenced off and secured. › Safe pedestrian movement around the works area with temporary walkways should be facilitated. › A traffic management plan which includes adequate signage for motorists and pedestrians warning them of the construction site should be provided. › Adequate signage to warn pedestrians and motorists of tree felling and rock excavation activities should be provided. › Construction workers should be made aware of hazards before they enter the site, and must have received appropriate training. › Additional hazards and risks identified by community consultation should be addressed by Council during the detailed design, and through a program of ongoing bicycle safety education. Ideas to consider include: › Driveway hazards could be reduced by community, cyclist and motorist education and the use of appropriate signage for cyclists and motorists; › Speed limits for cyclists could also be introduced along sections of the SUP to reduce the risks of cyclist/pedestrian, cyclist/cyclist and cyclist/motorist incidents; › Segregation of pedestrians and cyclists on the SUP using clear lane markings and signage; and › Providing ample room for pedestrians and cyclists to share the path without incident (ideally the SUP should be 3-4m in width, however it is noted that this is not possible along all sections of the SUP).
Aboriginal Heritage	› All staff working on-site shall be made aware of their responsibilities in the event that any Aboriginal objects are identified. › If any Aboriginal objects and / or places are located during the construction phase, all work should cease in the vicinity of the find. Council's Project Manager and the OEH are to be contacted. If skeletal material is identified then NSW Police are also to be contacted. › Should any Aboriginal objects be uncovered during the works, an Aboriginal Heritage Impact Permit (AHIP) under Section 90 of the

Environmental Parameter	Safeguards
	Act will need to be obtained if the object cannot be avoided.
Non-Aboriginal Heritage	› In the event that a non-Aboriginal object is uncovered, work is to cease and the NSW Heritage Office should be contacted. › Final designs for the project should ensure that the bridge remains and culvert in the vicinity of Buffalo Creek are not impacted by the works.

6.2 Environmental Management Plans

In accordance with relevant legislation, the following management plans should be created and implemented during the works as part of the Construction Environmental Management Plan (CEMP):

- Erosion and Sediment Control Plan;
- Dust Management Plan;
- Construction Traffic Management Plan;
- Utility Management Plan;
- Hazard Management Plan;
- Noise and Vibration Management Plan; and
- Vegetation Management Plan.

7 Conclusions

7.1 Summary of Consideration of Environmental Factors

The factors listed in the *EPBC Act* (Commonwealth legislation) and under Clause 228(2) of the *EP&A Regulation 2000* (NSW legislation) have been addressed in **Table 7.1** to ensure that the likely impacts of the Proposal on the natural and built environment are fully considered.

Table 7.1: Summary of Consideration of Environmental Factors

Factor (Commonwealth Legislation)	Impacts
a. *Any environmental impact on a World Heritage property*? A search of EPBC database (10 June 2011) indicated that the proposed works would not affect any World Heritage Properties.	**Nil**
b. *Any environmental impact on wetlands of international importance*? A search of EPBC database (10 June 2011) indicated that the proposed works are located in the same catchment as the Towra Point Nature Reserve Wetlands. However, as these wetlands are located approximately 20km away from Buffalo Creek and the proposed works are limited in scale, it is considered that there will be insignificant impact upon this wetland.	**Nil**
c. *Any environmental impact on Commonwealth listed threatened species or ecological communities?* A search of EPBC database (10 June 2011) indicated that several Commonwealth listed threatened species and one threatened ecological community may occur in the wider area. However, due to the small extent and short duration of the proposed road upgrade and cycleway, it is unlikely that the works will impact on habitat for any of these species.	**Nil**
d. *Any environmental impact on Commonwealth listed migratory species?* A search of EPBC database (10 June 2011) indicated that several Commonwealth listed migratory species possibly occur within the works area. However, due to the previously altered nature of the site, it is unlikely that it will be critical habitat for any of these species. In addition, the removal and trimming of trees required is insignificant in relation to the amount of unaffected habitat.	**Nil**
e. *Does any part of the proposal involve a nuclear action?* No.	**Nil**
f. *Any environmental impact on a Commonwealth marine area?*	**Nil**

Factor (Commonwealth Legislation)	Impacts
A search of EPBC database (10 June 2011) indicated that there are no Commonwealth marine areas within the works area.	
g*. Any direct or indirect effect on Commonwealth land?* No.	**Nil**

Factor (State Legislation)	Impacts
a. *Any environmental impact on a community?* In the short term there would be minor traffic disruptions during construction and an increase in ambient noise and vibration levels along Pittwater Road. There would also be some short term visual and air quality impacts. However, long term benefits including the creation of a safer and more accessible passage alongside Pittwater Road for pedestrians and cyclists are considered to outweigh the short term negative impacts.	**+ve**
b. *Any transformation of a locality?* The proposed works will not greatly transform the area. However, the new cycleway will provide safer access for pedestrians and cyclists.	**Nil**
c. *Any environmental impact on the ecosystems of the locality?* Proposed works involve the removal of a small number of mature trees, some juvenile trees and several shrubs. This is not considered a significant impact upon ecosystems within the locality, and the trees to be removed represent an insignificant proportion of the overall vegetation cover in the area. In addition, the affected trees are mainly streetscape and common garden species. Trees to be removed are not believed to be representatives of remnant vegetation.	**Nil**
d. *Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality?* There may be some minor reductions in aesthetic and recreational quality during the works period, due to machinery, works signage and fencing, and temporary obstruction/diversion of footpaths. However, benefits gained following these works will outweigh any negative impacts, as improvements to the aesthetic and recreational quality of the area will result, particularly from the installation of the shared user path.	**+ve**
e. *Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations*? Although there are six locally-listed heritage items in the vicinity, it is not anticipated that these will be negatively affected if the works proceed with appropriate mitigation measures in place. No other areas/buildings	**Nil**

Factor (Commonwealth Legislation)	Impacts
of significance are within the immediate vicinity of proposed works.	
f. *Any impact on the habitat of any protected fauna (within the meaning of the National Parks and Wildlife Act, 1974)?* A search of the National Parks and Wildlife Atlas database revealed that there have been recorded sightings of threatened or protected fauna within the wider region surrounding the proposed works area. Due to the nature of the work and the previous development of the site it is unlikely that threatened species will be affected by the removal of trees or other activities associated with these works, if carried out with appropriate mitigation measures in place.	**Nil**
g. *Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air*? Due to the small scope of the proposed works, it is perceived that they will not endanger any species of animal, plant or other form of life.	**Nil**
h. *Any long-term effects on the environment*? There will be no long-term impacts on the environment, as only a few trees and shrubs will be removed, and pollution temporarily generated will only be that associated with the operation of machinery.	**Nil**
i. *Any degradation of the quality of the environment*? If appropriately written and implemented, the environmental safeguards described in **Section 6** of this REF will ensure that there will be no degradation of the quality of the environment.	**Nil**
j. *Any risk to the safety of the environment*? Mitigation measures discussed in **Section 6** should negate any risk to the safety of the environment.	**Nil**
k. *Any reduction in the range of beneficial uses of the environment*? The proposal will increase beneficial use of the area through provision of a SUP and improved access to the Field of Mars Reserve and Buffalo Creek Reserve.	**+ve**
l. *Any pollution of the environment*? There will be minor pollution in the form of exhaust emissions, associated with the operation of machinery. However, this will have no significant impact on the environment. Any other potential pollution will be managed by a range of mitigation measures. Pollution entering local watercourses will be reduced following installation of a GPT and other water quality control measures.	**-ve (minor and short term)** **+ve (minor and long term)**

Factor (Commonwealth Legislation)	Impacts
m. *Any environmental problems associated with the disposal of waste*? There are no foreseeable issues with the disposal of waste.	**Nil**
n. *Any increased demands on resources, natural or otherwise which are, or are likely to become in short supply*? The proposed works will not increase demands on resources which are likely to become short in supply.	**Nil**
o. *Any cumulative environmental effect with other existing or likely future activities*? There will be no cumulative environmental impacts with existing or future activities. However other planned activities in the locality should be considered by the Traffic Management Plan.	**Nil**

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9 Qualifications

The report has been prepared on the basis of the following information and assumptions:

- That all information contained within secondary sources referenced is correct;
- That Council's GIS data was correct at the time Cardno received the data;
- That all data from database searches were correct at time of viewing.

Appendix A

Site Photolog

Photo 1: Mangroves looking north at creek adjacent to Field of Mars.

Photo 2: View looking south at creek adjacent to Field of Mars.

Photo 3: Sandstone bridge remnants.

Photo 4: High Street end of Pittwater Road, looking south.

Photo 5:.Intersection of High Street and Pittwater Road, looking north.

Photo 6: Stairs to be retained and connected to the SUP (Plan 2 **Appendix C**).

Photo 7: Part of existing rock face to be excavated, looking south along Pittwater Road (Plans 2 and 3 **Appendix C**).

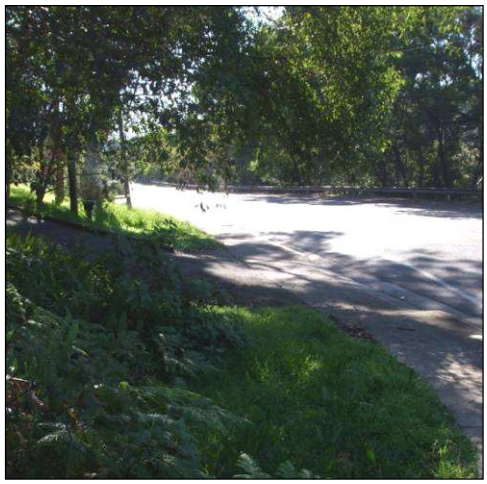


Photo 8: Example of Eucalyptus trees proposed to be trimmed.

Photo 9: Example of water run-off, looking north on Pittwater Road.

Photo 10: Light pole to be relocated (Plan 3 **Appendix C**).

Photo 11: Proposed bioswales area. Light pole to be relocated, looking south from Field of Mars carpark (Plan 4 **Appendix C**).

Photo 12: Looking east from Field of Mars at local park, Buffalo Creek Reserve and new roundabout (Plan 5 **Appendix C**).

Photo 13: Sewer entrance on Field of Mars Reserve, looking south.

Photo 14: North of Rene Street, looking south.

Photo 15: Scrub to be cleared at junction of Rene Street, looking west (Plan 9 **Appendix C**).

Photo 16: Example of sections of existing footpath to be demolished.

Photo 17: View of driveways to be re-aligned, looking north.

Photo 18: *E. acmenoides* (White Mahogany) to be removed, shown on Plan 15 of **Appendix C** and identified as tree 34 in **Appendix F**.

Photo 19: Looking south toward Bronhill Ave.

Photo 20: Location of sedimentation pond on western side of Pittwater Road near Bronhill Ave (Plan 13 **Appendix C**).

Photo 21: Roundabout at Cox's Road intersection, looking east.

Photo 22: *A. bakeri* (Narrow Leaved Apple) to be removed, shown on Plan 19 of **Appendix C** and identified as tree 47 in **Appendix F**.

Photo 23: Drainage outlet to become GPT (Plan 15 **Appendix C**).

Photo 24: Existing stormwater grate to be removed (Plan 15 **Appendix C**).

Photo 25: Roundabout at Carramar Ave (Plan 16 **Appendix C**).

Photo 26: Looking east at Ryde RSL (Carramar Ave roundabout).

Photo 27: Trees north of Carramar Ave likely to require trimming.

Photo 28: Reduce width of SUP to accommodate power pole (Plan 17 **Appendix C**).

Photo 29: Magdala Road roundabout (Plans 17 and 18 **Appendix C**).

Photo 30: SUP to be aligned to avoid trees (Plan 18 **Appendix C**).

Photo 31: Cressy Road intersection.

Photo 32: Warwick Street intersection, scrub likely to be removed (Plan 20 **Appendix C**).

Photo 33: Close up of scrub likely to be removed at Warwick Street intersection.

Photo 34: Looking north towards Clarence Street (Plan 21 **Appendix C**).

Photo 35: Looking north towards Epping Road.

Photo 36: Looking north towards Epping Road (Plan 22 **Appendix C**).

Appendix B

Stakeholder Responses

Our ref: OUT11/9260
Your ref: L2340: CMB

Kester Boardman
Cardno Pty Ltd
Level 3, 910 Pacific Highway
GORDON NSW 2072

Dear Kester,

Road upgrade and cycleway construction along Pittwater Road, North Ryde: Review of Environmental Factors

Thank you for your email dated 31 May 2011 requesting NSW Department of Primary Industries (DPI) - Fisheries comments on the above proposal to be incorporated in a Review of Environmental Factors (REF) for the proposal above.

DPI-Fisheries is responsible for ensuring that fish stocks are conserved and that there is no net loss of key fish habitats upon which they depend. To achieve this, DPI-Fisheries ensures that developments comply with the requirements of the *Fisheries Management (FM) Act 1994* (namely the aquatic habitat protection and threatened species provisions in Parts 7 and 7A of the Act, respectively), and the associated *Policy and Guidelines for Aquatic Habitat Management and Fish Conservation (1999).* In addition, DPI-Fisheries is responsible for ensuring the sustainable management of commercial and recreational fishing in NSW.

Considering the provisions of the FM Act and the above mentioned policy, aspects of this proposal of concern to DPI - Fisheries include potential:

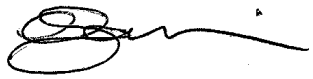
- erosion and sedimentation impacts to aquatic habitats during construction
- direct harm of saltmarsh, mangrove or riparian habitats during construction
- blockage of fish passage during construction and from the design of waterway crossings
- impacts to the water quality of the Lane Cove River from stormwater runoff during and following construction
- impacts to aquatic habitats resulting from acid sulphate soil management

Information requirements that may be of assistance in the preparation of an EA for this proposal are listed in Attachment 1. It is important that the extent of the potential impacts on aquatic and riparian habitats above is addressed in the EA and proposed measures to minimise, mitigate, rehabilitate or compensate such impacts are detailed.

Please note that where the harm of marine vegetation cannot be avoided a permit under s.205 of the FM Act will be required for these works. A permit under s.201 of the FM Act may also be required for any dredging and reclamation activities that may occur below the mean high water mark. Such authorities are only granted after works have been approved.

Should you require any further information concerning this proposal, please contact Carla Ganassin on 9527 8552 or carla.ganassin@industry.nsw.gov.au.

Yours sincerely,



Carla Ganassin
Fisheries Conservation Manager, Aquatic Habitat Protection Unit

31 May 2011

ATTACHMENT 1: NSW DPI - Fisheries Aquatic Habitat Protect Unit's Information Requirements for an Environmental Assessment of the proposed Road Upgrade and Cycleway Construction along Pittwater Road, North Ryde

A: General Requirements

- site address and contact details
- property description (e.g. Lot and DP numbers)
- a clear description of the proposal including details of construction methods and materials
- map(s) of the development area and adjacent areas - this should include nearby waterways, adjacent infrastructure (such as jetties) and land use
- clear photographs of the site, including photographs of any riparian and aquatic vegetation present
- a clear description of the physical and hydrological features of the development area (which may extend upstream and downstream of the development site in the case of flowing rivers or tidal waterways)
- a clear description of aquatic environments including:
    - an aquatic and riparian vegetation survey map of the area which shows the location and/or coverage of saltmarsh, mangrove, seagrass, macroaglae, macrophytes, riparian vegetation and snags,
- details of the nature, timing, magnitude and duration of the proposed disturbance to the aquatic environment
- assessments of predicted impacts upon any threatened species (fish and marine vegetation) (i.e. completion of a 7 part test and/or species impact statement(s)) and other aquatic flora and fauna
- details of any mitigation measures to limit environmental impacts
- details of the general regional context, any protected areas, other developments in the area, and/or cumulative impacts
- In defining the proposal area, discussion must be provided in regard to possible indirect effects of the proposal on species/habitats in the area surrounding the subject site: for example, through altered hydrological regimes, soil erosion or pollution.

Dredging and reclamation activities

- Purpose of works
- Type(s) and distribution of marine vegetation in the vicinity of the proposed works
- Method of dredging to be used
- Timing and duration of works
- Dimension of area of works including levels and volume of material to be extracted or placed as fill
- Nature of sediment to be dredged, including Acid Sulphate Soil, contaminated soils etc
- Method of marking area subject to works
- Environmental safeguards to be used during and after works
- Measures for minimising harm to fish habitat under the proposal
- Spoil type and source location for reclamation activities
- Method of disposal of dredge material
- Location and duration of spoil stockpiling, if planned

Activities that damage marine vegetation

- Type of marine vegetation to be harmed
- Map of distribution and density of marine vegetation
- Reasons for harming marine vegetation
- Methods of harming marine vegetation
- Construction details
- Duration of works/activities
- Measures for minimising harm to marine vegetation under the proposal and details of compensatory habitat development to replace lost vegetation
- Method and location of transplanting activities or disposal of marine vegetation

Activities that block fish passage

- Type of activity eg works in a stream that change flow or morphological characteristics

- Length of time fish passage is to be restricted
- Timing of proposed restriction
- Remediation works

B. Aquatic habitat assessment

The aim of the aquatic assessment should be to define the presence of 'key fish habitat' within the study site, adjacent areas. Some points to consider include:

- description of the water quality (e.g. discolouration, sedimentation, turbidity, pH, dissolved oxygen, nutrients),
- types of surrounding land use (e.g. agricultural, urban, aquaculture),
- description of aquatic habitat components such as stream morphology, in-stream and riparian vegetation, flow characteristics. The condition of the habitat must be described and discussed.
- condition of marine vegetation (i.e. information on type, species, shoot density and/or percentage cover, Is the vegetation continuous or sparse in coverage? What is the aerial extent? Is the vegetation healthy or degraded? Is wrack (dead seagrass or macroalgae) present?),
- presence of any listed threatened or protected aquatic species or 'critical habitat' under the FM Act and EPBC Act.

C. Assessment of likely impacts

- indicate the location, nature and extent of habitat removal or modification (both direct and indirect) which may result from the proposed action;
- discuss the potential impact of the modification or removal of habitat (potential direct and indirect sources of impact are stated in the letter to this attachment);

D. Ameliorative measures

The environmental assessment should consider and provide detail on how the proposal has been or may be modified and managed to minimise impacts and conserve aquatic habitat on the subject site and in the study area.

NSW GOVERNMENT | Office of Environment & Heritage

Your reference: L2340:CMB
Our reference: ED11/702
Our contact: Eileen Cullen (02) 9995 6832

Kester Boardman
Manager Environment and Sustainability
Cardno (NSW/ACT) Pty Ltd
Level 3, 910 Pacific Highway
GORDON NSW 2072

Dear Mr Boardman

I refer to your letter dated 31 May 2011 to the Office of Environment and Heritage (OEH) requesting recommendations for the preparation of a Review of Environmental Factors (REF) for the proposed road upgrade and cycleway construction project along Pittwater Road from Gladesville to North Ryde.

OEH considers that the key environmental issues that need to be addressed by the REF are:

- Aboriginal cultural heritage
- Air quality (construction)
- Biodiversity
  - impacts on threatened species and/or populations
  - impacts on endangered ecological communities (EECs)
- OEH Estate
  - land adjacent to National Park
- Noise and vibration impacts
- Soils
  - sediment and erosion control
  - potential acid sulfate soils
- Water quality
  - surface and ground waters
- Resource and Waste management
- Energy conservation and Greenhouse emissions reduction
- Site contamination

The proponent should ensure that the REF is supported by robust investigations; provides a detailed analysis of the nature and scope of project environmental impacts; and examines proposed measures to avoid and, where necessary, mitigate those impacts.

OEH notes that the project has the potential to impact on Lane Cove National Park. As such OEH refers the proponent to the *Guidelines for developments adjoining Department of Environment and Climate Change land* in the preparation of the REF to minimise direct and indirect impacts on land managed by OEH. This guideline can be located at the following link:
www.environment.nsw.gov.au/protectedareas/developmntadjoiningdecc.htm

PO Box 668 Parramatta NSW 2124
Level 7, 79 George St Parramatta NSW 2150
Tel: (02) 9995 5000 Fax: (02) 9995 6900
ABN 30 841 387 271
www.environment.nsw.gov.au

Further REF requirements in relation to key environmental issues are included at Attachment 1 and a list of guidelines to assess impacts provided at Attachment 2. If you have any questions or wish to discuss this matter further, please contact Eileen Cullen on 9995 6832.

Yours sincerely

G Howard 23 JUN 2011

GISELLE HOWARD
Director Metropolitan Infrastructure
Environment Protection and Regulation
Office of Environment and Heritage
Department of Premier and Cabinet

Attachment 1

OEH's Recommended Review of Environmental Factors Requirements for Pittwater Road

Environmental impacts of the project

1. Impacts related to the following environmental issues need to be assessed, quantified and reported on:
   - Aboriginal cultural heritage
   - Air quality
   - Biodiversity
     - impacts on threatened species and/or populations
     - impacts on endangered ecological communities (EECs)
   - OEH Estate
     - Land adjacent to National Park
   - Noise and vibration impacts
   - Resource and Waste management
   - Soils
     - sediment and erosion control
     - potential acid sulfate soils
   - Water quality - surface and ground waters
   - Resource and waste management
   - Energy conservation and Greenhouse emissions reduction
   - Site contamination

2. These impacts should be assessed in accordance with the additional information outlined below and the relevant guidelines listed in **Attachment 2**.

3. The REF should detail the environmental impacts associated with the both the construction and operational phases of the project including identification of local and regional environmental contexts and potential sensitive receptors.

4. The REF should describe mitigation and management options that will be used to prevent, control, abate or mitigate identified environmental impacts associated with the project and to reduce risks to human health and prevent the degradation of the environment. This should include an assessment of the effectiveness and reliability of the measures and any residual impacts after these measures are implemented.

General construction

A robust community consultation program should be implemented prior to the commencement of any project works. The REF should outline the preparation and implementation of a community consultation and notification process for the project, including a 24 hour complaints handling system. Community consultation should cover issues of noise impacts and disruption to services, including road and pedestrian access.

Licensing requirements

1. On the basis of the information provided, it is not clear whether the project is a scheduled activity: "Road Construction" under the *Protection of the Environment Operations Act 1997* (*POEO Act*) and requires an Environment Protection Licence (EPL). Please refer to Schedule 1 of the *POEO Act* www.legislation.nsw.gov.au/maintop/view/inforce/act+156+1997+cd+0+N

   The REF should address the requirements of Section 45 of the *POEO Act* determining the extent of each impact and providing sufficient information to enable OEH to determine appropriate limits for the EPL, if required.

2. Should project approval be granted and an EPL required, the proponent will need to make a separate application to OEH for an EPL for the proposed activity prior to undertaking any on site works. Additional information is available through the *OEH Guide to Licensing* document (www.environment.nsw.gov.au/licensing/licenceguide.htm).

Noise and Vibration

The REF should include an assessment of noise and vibration impacts during the construction and operation phases. The following guidelines may be useful in the preparation of these assessments:

General

1. Construction noise associated with the proposed development should be assessed using the *Interim Construction Noise Guideline (*DECC, 2009). www.environment.nsw.gov.au/noise/constructnoise.htm
2. Vibration from all activities (including construction and operation) to be undertaken during the project should be assessed using the guidelines contained in the *Assessing Vibration: a technical guideline* (DEC, 2006). www.environment.nsw.gov.au/noise/vibrationguide.htm

Road

3. Noise from new or upgraded public roads should be assessed using the *Environmental Criteria for Road Traffic Noise* (EPA, 1999). www.environment.nsw.gov.au/noise/traffic.htm
4. Noise on public roads from increased road traffic generated by land use developments should be assessed using the guidelines contained in the *Environmental Noise Management Manual* (RTA, 2001)

   www.rta.nsw.gov.au/environment/downloads/environmental_noise_management_manual_v1_0.pdf

Biodiversity

The REF should include a detailed assessment of the likely ecological impact of the project on both terrestrial and aquatic communities and individual species. Likely impacts (both direct and indirect) on any adjoining and/or nearby OEH estate reserved under the *National Parks and Wildlife (NPW) Act 1974*. Refer to the *Guidelines for developments adjoining land and water managed by the Department of Environment, Climate Change and Water* (DECC, 2010).

The REF should include consideration of potential impacts on threatened species, populations and ecological communities that occur in the vicinity of the subject site. Given that Pittwater Road is adjacent to important bushland and wetland corridors along Lane Cove River, including Lane Cove National Park; and crosses Kittys Creek as well as Strangers and Buffalo Creeks, the project has the potential to impact on a number of threatened species that have been recorded in the area. Recent records exist for the following species: Red-crowned Toadlet, Powerful Owl, Barking Owl, Eastern Bent-wing Bat, Varied Sitella, Black Bittern, Grey-Headed Flying Fox, *Epacris purpurascens var. purpurascens*, *Callistemon linearifolius*, *Darwinia biflora* and *Pimelea curviflora var. curviflora*. A number of endangered ecological communities also occur in the vicinity, including Coastal Saltmarsh, Swamp Sclerophyll Forest, Swamp Oak Floodplain Forest and Sydney Turpentine-Ironbark Forest.

The Lane Cove Valley is ranked as having 'very high' fauna significance in the 'Sydney Metro CMA Area Rapid Fauna Habitat Assessment' report (DECC 2008), given its high fauna diversity and habitat diversity with estuarine and bushland areas occurring. The report also lists some of the threats to the fauna values of the Lane Cove Valley. A number of threats, which are classed as contributing a high level of threat, may be increased by this project, including: habitat loss; habitat continuity within the site; water quality, particularly stormwater run off; weed infestation; tree dieback; impacts associated with easements and road crossings; high edge effect particularly from housing encroachment on to fringing bushland areas; loss of hollow bearing trees.

OEH suggests the REF should describe these and other potential threats to fauna values from the project and describe mitigation and management measures proposed to be used to prevent, control,

abate or minimise identified conservation impacts of these threats associated with the project, including an assessment of the effectiveness and reliability of the measures and any residual impacts after these measures are implemented.

A comprehensive field survey of the project area should be conducted and documented in accordance with relevant guidelines, including:

- *Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna - Amphibians* (DECCW, 2009)
- *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities - Working Draft* (DEC, 2004) www.environment.nsw.gov.au/resources/nature/TBSAGuidelinesDraft.pdf
- Threatened species survey and assessment guideline information on www.environment.nsw.gov.au/threatenedspecies/surveyassessmentgdlns.htm

If a proposed survey methodology is likely to vary significantly from the above methods, the proponent should discuss the proposed methodology with OEH (NPWS) prior to undertaking the REF, to determine whether OEH considers that it is appropriate.

Recent (less than five years old) surveys and assessments may be used. However, previous surveys should not be used if they have:

- been undertaken in seasons, weather conditions or following extensive disturbance events when the subject species are unlikely to be detected or present, or
- utilised methodologies, survey sampling intensities, timeframes or baits that are not the most appropriate for detecting the target subject species

unless these differences can be clearly demonstrated to have had an insignificant impact upon the outcomes of the surveys. If a previous survey is used, any additional species listed under the *TSC Act* since the previous survey took place, must be surveyed for.

Determining the list of potential threatened species for the site must be done in accordance with the *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities - Working Draft* (DEC, 2004) and the *Guidelines for Threatened Species Assessment* (Department of Planning, July 2005). The OEH Threatened Species website and the *Atlas of NSW Wildlife* database must be the primary information sources for the list of threatened species present www.environment.nsw.gov.au/threatenedspecies. The BioBanking Threatened Species Database, the Vegetation Types databases (www.environment.nsw.gov.au/biobanking/biobankingtspd.htm and www.environment.nsw.gov.au/biobanking/vegtypedatabase.htm, respectively) and other data sources (e.g. PlantNET, Online Zoological Collections of Australian Museums (www.ozcam.org.au), previous or nearby surveys etc), may also be used to compile the list.

The project should aim to avoid any impacts on threatened flora, fauna or EECs. Any unavoidable impacts will need to be adequately mitigated and/or offset.

Aboriginal cultural heritage

The REF should include a comprehensive assessment of the potential impacts of the construction and operational phases of the project on sites and places of aboriginal cultural heritage (ACH), including areas of archaeological potential. The proponent should ensure that the REF is sufficiently comprehensive to enable the consent authority to determine the extent of the impact(s) of the proposal.

The key ACH issues requiring assessment for this proposal are summarised below:

1. A description of the Aboriginal objects and declared Aboriginal places located within the area of the proposed development.

2. A description of the cultural heritage values, including the significance of the Aboriginal objects and declared Aboriginal places, that exist across the whole area that will be affected by the proposed development, and the significance of these values for the Aboriginal people who have a cultural association with the land.

3. The views of those Aboriginal people regarding the likely impact of the proposed development on their cultural heritage. If any submissions have been received as a part of the consultation requirements, then the report must include a copy of each submission and your response.

4. A description of the actual or likely harm posed to the Aboriginal objects or declared Aboriginal places from the proposed activity, with reference to the cultural heritage values identified.

5. A description of any practical measures that may be taken to protect and conserve those Aboriginal objects or declared Aboriginal places.

6. A description of any practical measures that may be taken to avoid or mitigate any actual or likely harm, alternatives to harm or, if this is not possible, to manage (minimise) harm.

OEH advises that Aboriginal objects are protected under the *NPW Act 1974*. It should be noted that harm to any Aboriginal object requires a separate approval under the *NPW Act*. It is an offence to damage, deface or destroy or cause to permit the damage, defacement or destruction of Aboriginal objects or an Aboriginal Place without the written consent of the CEO OEH, or her delegate. It is in the interest of proponents to ensure that all reasonable precautions are taken to prevent the occurrence of damage to Aboriginal objects.

Please note that recent amendments have been made to the *NPW Act*, including changed definitions and increased penalties to individuals and companies. Further information about the changes and on the Aboriginal Heritage Impact Application process can be found at the following link: www.environment.nsw.gov.au/licenses/Section87Section90.htm

Further information and guidelines for the assessment of Aboriginal cultural heritage are available on the OEH website at:

www.environment.nsw.gov.au/cultureandheritage.htm
www.environment.nsw.gov.au/licences/Consultation.htm
www.environment.nsw.gov.au/licences/internalachpolicy.htm

Aboriginal Heritage Impact Permit (AHIP) application form:

www.environment.nsw.gov.au/licences/ahips.htm

It should be noted that the above advice is a guide only and it is up to the proponent to determine the details and comprehensiveness of the surveys and level of assessment required to form legally defensible conclusions regarding the impacts of the project. The scale and intensity of the proposed development should dictate the level of investigation. It is important that all conclusions are supported by adequate data. If you have any further questions in relation to this matter, please contact Nicole Davis, Archaeologist, on (02) 9995 6834.

Soils

Sediment and Erosion Control

The cycleway construction and road upgrade activities have the potential to impact on the surrounding Lane Cove National Park along with Field of Mars, Buffalo Creek, Kittys Creek and Martin Reserves. Thus adequate implementation and maintenance of sediment and erosion controls is critical.

The REF should include the following information:

- A commitment that a comprehensive Sediment and Erosion Control Plan will be developed and implemented in accordance with the guideline "*Managing Urban Stormwater – Soils and Construction, Volume 2D road construction*" (DECC 2008), to be read and used in conjunction with Volume 1 "*Managing Urban Stormwater: Soils and Construction*" (Landcom 2006).

- Identification of sensitive downstream waterways and wetland areas that may be impacted by the road upgrade activities and construction and operation of the cycleway.

- Assessment of the soil type and potential for erosion; and

- Identification of sites for appropriate erosion and sediment controls (such as sediment basins) during construction to ensure that there is sufficient space allocated for these measures.

- An upgrade of all sediment control devices along Pittwater Road adjacent to the Coastal Saltmarsh EEC and intertidal areas with a view to reduce loads of volumes

OEH guidelines cover a range of different issues regarding stormwater and can be located at the following link: www.environment.nsw.gov.au/stormwater/publications.htm

Acid Sulfate Soils

1. The potential impacts of the development on potential acid sulfate soils must be assessed in accordance with the relevant guidelines in the *Acid Sulfate Soils Manual* (Stone *et al.* 1998) and the *Acid Sulfate Soils Laboratory Methods Guidelines* (Ahern *et al.* 2004).

2. Describe mitigation and management options that will be used to prevent, control, abate or minimise potential impacts from the disturbance of acid sulfate soils associated with the project and to reduce risks to human health and prevent the degradation of the environment. This should include an assessment of the effectiveness and reliability of the measures and any residual impacts after these measures are implemented.

Water Quality - Surface and Ground Waters

The REF for the project should consider the impacts of the project on the water quality impacted upon by the road upgrade and cycleway construction.

- Identify the 'environmental values' and the levels of protection and management goals for aquatic ecosystems including local groundwater and the potential impacts of the project on water quality and the aquatic environment against the established environmental values.

- Identify mitigation and management measures, including stormwater collection, storage and re-use options, proposed to be used to prevent, control, abate or minimise identified water quality impacts associated with the project, including an assessment of the effectiveness and reliability of the measures and any residual impacts after those measures are implemented.

- Examine the integration of construction and operational water quality protection measures into the final stormwater engineering plans and specifications and implementation all necessary measures to achieve optimum water quality outcomes that reflect the environmental values of the receiving waters.

- The REF should include consideration of any sensitive downstream environments that may be affected by the project, including wetlands, mangroves, saltmarsh and riparian zones particularly the impact of mangrove, casuarina and phragmites encroachment on the Saltmarsh EEC which is caused by nutrients, sediments and large volumes of fresh water.

Air Quality

Air quality issues that should be considered in the REF for the construction works include:

- Demonstration of the project's ability to comply with the relevant regulatory framework, specifically the *POEO Act* and the *POEO (Clean Air) Regulation 2010.*

- Emissions of dust generated by activities such as earthmoving, excavation, loading and vehicle traffic (particularly from unsealed roads and surfaces).

- Wind erosion from exposed surfaces and stockpiles.

- Assessment of the impact of exhaust emissions from vehicles and other motorised equipment being operated on-site.

An air quality management plan should be developed for the project to describe proposed mitigation measures and safeguards to control dust generation and to minimise impact on nearby receptors.

Resource and Waste Management
The REF should include an estimation of the quantity of spoil material likely to be generated on the site and consider options for handling, stockpiling reuse/recycling and disposal of soil.

The REF should determine and classify the types of waste material generated and the different disposal strategies for each material in accordance with guidelines: *Waste Classification Guidelines Part 1: Classifying Waste* (DECC, 2008) www.environment.nsw.gov.au/waste/envguidlns/index.htm.

Waste management principles should be applied to each stage of the project's development, including the concept design and construction stages.

The REF should consider waste water treatment measures that are appropriate to the type and volume of waste water generated on site, and which are based on a hierarchy of avoiding generation of waste water; capturing all contaminated water (including stormwater) on the site; reusing/recycling waste water; and treating any unavoidable discharge from the site to meet specified water quality requirements.

When selecting suppliers of construction materials, the proponent should consider the reduction of unnecessary packaging; durable reusable packaging, pallets, crates and drums; and options for recycling.

Wastes should be source separated and sent to recycling outlets. Recycling facilities should be made available to site staff operating from temporary offices near the road or on the road corridor.

Energy Conservation and Greenhouse Emissions Reduction
The REF should:
- Identify, quantify, assess and report on options to minimise energy consumption (particularly during the construction phase).

- Assess, quantify and report on the project related energy and greenhouse gas emissions (as tonnes of CO_2) predicted to be saved by implementing proposed energy minimisation measures.

Site Contamination
The REF should:
- Include a preliminary site contamination investigation in accordance with the guidelines made or approved by EPA under s.105 of the *Contaminated Land Management Act 1997.* The site contamination investigation should include all areas where project associated construction works are to be undertaken.

- Discuss the need for further work to fully assess site contamination and remediate any identified contamination of the site.

Site Establishment
Environmental controls should be established on work sites before the general construction commences. The establishment of key compounds, followed by the progressive opening of construction sites, should only occur after environmental management and community communication systems are operational.

The REF should outline the above process for the project.

Attachment 2 – Guidance Material

Title	Web address
Relevant Legislation	
Protection of the Environment Operations Act 1997	www.legislation.nsw.gov.au/maintop/view/inforce/act+156+1997+cd+0+N
National Parks and Wildlife Act 1974	www.legislation.nsw.gov.au/maintop/view/inforce/act+80+1974+cd+0+N
Threatened Species Conservation Act 1995	www.legislation.nsw.gov.au/maintop/view/inforce/act+101+1995+cd+0+N
Environmental Planning and Assessment Act 1979	www.legislation.nsw.gov.au/maintop/view/inforce/act+203+1979+cd+0+N
Contaminated Land Management Act 1997	www.legislation.nsw.gov.au/maintop/view/inforce/act+140+1997+cd+0+N
Fisheries Management Act 1994	www.legislation.nsw.gov.au/maintop/view/inforce/act+38+1994+cd+0+N
Water Management Act 2000	www.legislation.nsw.gov.au/maintop/view/inforce/act+92+2000+cd+0+N
Licensing	
OEH Guide to Licensing	www.environment.nsw.gov.au/licensing/licenceguide.htm
Aboriginal Cultural Heritage	
Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (2005)	www.planning.nsw.gov.au/DevelopmentAssessments/RegisterofDevelopmentAssessmentGuidelines/tabid/207/language/en-US/Default.aspx
Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW, 2010)	www.environment.nsw.gov.au/licences/consultation.htm
Code of Practice for the Archaeological Investigation of Aboriginal Objects in New South Wales (DECCW, 2010)	www.environment.nsw.gov.au/licences/archinvestigations.htm
Aboriginal Site Impact Recording Form	www.environment.nsw.gov.au/licences/DECCAHIMSSiteRecordingForm.htm
Aboriginal Heritage Information Management System (AHIMS) Registrar	www.environment.nsw.gov.au/contact/AHIMSRegistrar.htm
Air Issues	
Air Quality	
Approved methods for modelling and assessment of air pollutants in NSW (2005)	www.environment.nsw.gov.au/resources/air/ammodelling05361.pdf
POEO (Clean Air) Regulation 2010	www.legislation.nsw.gov.au/maintop/view/inforce/subordleg+428+2010+cd+0+N
Greenhouse Gas	

Title	Web address
The Greenhouse Gas Protocol: Corporate Standard, World Council for Sustainable Business Development & World Resources Institute	www.ghgprotocol.org/standards/corporate-standard
National Greenhouse Accounts (NGA) Factors, Australian Department of Climate Change (Latest release),	www.climatechange.gov.au/publications/greenhouse-acctg/national-greenhouse-factors.aspx
National Greenhouse and Energy Reporting System, Technical Guidelines (latest release)	www.climatechange.gov.au/publications/greenhouse-report/nger-technical-guidelines.aspx
National Carbon Accounting Toolbox	www.climatechange.gov.au/en/government/initiatives/national-greenhouse-energy-reporting/tools-resources.aspx
Australian Greenhouse Emissions Information System (AGEIS)	http://ageis.climatechange.gov.au/
Biodiversity	
BioBanking Assessment Methodology (DECC, 2008)	www.environment.nsw.gov.au/resources/biobanking/08385bbassessmethod.pdf
BioBanking Assessment Methodology and Credit Calculator Operational Manual (DECCW, 2008)	www.environment.nsw.gov.au/resources/biobanking/09181bioopsman.pdf
Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna -Amphibians (DECCW, 2009)	www.environment.nsw.gov.au/resources/threatenedspecies/09213amphibians.pdf
Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities - Working Draft (DEC, 2004)	www.environment.nsw.gov.au/resources/nature/TBSAGuidelinesDraft.pdf
Guidelines for Threatened Species Assessment (Department of Planning, July 2005)	www.planning.nsw.gov.au/DevelopmentAssessments/RegisterofDevelopmentAssessmentGuidelines/tabid/207/language/en-US/Default.aspx
OEH Threatened Species website	www.environment.nsw.gov.au/threatenedspecies/
Atlas of NSW Wildlife	http://wildlifeatlas.nationalparks.nsw.gov.au/wildlifeatlas/watlas.jsp
BioBanking Threatened Species Database	www.threatenedspecies.environment.nsw.gov.au/tsprofile/home_species.aspx
Vegetation Types databases	www.environment.nsw.gov.au/biobanking/vegtypedatabase.htm
PlantNET	http://plantnet.rbgsyd.nsw.gov.au/
Online Zoological Collections of Australian Museums	www.ozcam.org.au/
Threatened Species Assessment Guideline - The Assessment of Significance (DECCW, 2007)	www.environment.nsw.gov.au/resources/threatenedspecies/tsaguide07393.pdf

Title	Web address
Principles for the use of biodiversity offsets in NSW	www.environment.nsw.gov.au/biocertification/offsets.htm
OEH Estate	
Land reserved or acquired under the NPW Act	
List of national parks	www.environment.nsw.gov.au/NationalParks/parksearchatoz.aspx
OEH Revocation of Land Policy	www.environment.nsw.gov.au/policies/RevocationOfLandPolicy.htm
Guidelines for developments adjoining land and water managed by the Department of Environment, Climate Change and Water (DECCW, 2010)	www.environment.nsw.gov.au/resources/protectedareas/10509devadjdeccw.pdf
Noise and Vibration	
Interim Construction Noise Guideline (DECC, 2009)	www.environment.nsw.gov.au/noise/constructnoise.htm
Assessing Vibration: a technical guideline (DEC, 2006)	www.environment.nsw.gov.au/noise/vibrationguide.htm
Australian and New Zealand Environment Council – Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration (ANZEC, 1990)	www.environment.nsw.gov.au/noise/blasting.htm
Industrial Noise Policy Application Notes	www.environment.nsw.gov.au/noise/industrial.htm
Environmental Criteria for Road Traffic Noise (EPA, 1999)	www.environment.nsw.gov.au/noise/traffic.htm
Waste	
Waste Classification Guidelines (DECC, 2008)	www.environment.nsw.gov.au/waste/envguidlns/index.htm
OEH Resource recovery exemption	www.environment.nsw.gov.au/waste/RRecoveryExemptions.htm
Water and Soils	
Acid sulphate soils	
Acid Sulfate Soils Planning Maps	http://canri.nsw.gov.au/download/
Acid Sulfate Soils Manual (Stone et al. 1998)	Manual available for purchase from: www.landcom.com.au/whats-new/the-blue-book.aspx Chapters 1 and 2 are on DoP's Guidelines Register at: Chapter 1 Acid Sulfate Soils Planning Guidelines: www.planning.nsw.gov.au/rdaguidelines/documents/NSW%20Acid%20Sulfate%20Soils%20Planning%20Guidelines.pdf

Title	Web address
	Chapter 2 Acid Sulfate Soils Assessment Guidelines: www.planning.nsw.gov.au/rdaguidelines/documents/NSW%20Acid%20Sulfate%20Soils%20Assessment%20Guidelines.pdf
Acid Sulfate Soils Laboratory Methods Guidelines (Ahern et al. 2004)	www.derm.qld.gov.au/land/ass/pdfs/lmg.pdf This replaces Chapter 4 of the Acid Sulfate Soils Manual above.
Contaminated Sites Assessment and Remediation	
Managing land contamination: Planning Guidelines – SEPP 55 Remediation of Land	www.planning.nsw.gov.au/DevelopmentAssessments/RegisterofDevelopmentAssessmentGuidelines/tabid/207/language/en-US/Default.aspx
Guidelines for Consultants Reporting on Contaminated Sites (EPA, 2000)	www.environment.nsw.gov.au/resources/clm/97104consultantsglines.pdf
Guidelines for the NSW Site Auditor Scheme - 2nd edition (DEC, 2006)	www.environment.nsw.gov.au/resources/clm/auditorglines06121.pdf
Sampling Design Guidelines (EPA, 1995)	Available by request from OEH's Environment Line
National Environment Protection (Assessment of Site Contamination) Measure 1999 (or update)	www.ephc.gov.au/taxonomy/term/44
Flooding and Coastal Erosion	
Floodplain development manual	www.environment.nsw.gov.au/floodplains/index.htm
Soils – general	
Soil and Landscape Issues in Environmental Impact Assessment (DLWC 2000)	www.environment.nsw.gov.au/soildegradation/index.htm
Managing urban stormwater: soils and construction, vol. 1 (Landcom 2004) and vol. 2 (A. Installation of services; B Waste landfills; C. Unsealed roads; D. Main Roads; E. Mines and quarries) (DECC 2008)	Vol 1 - Available for purchase at www.landcom.com.au/content/publication-and-programs/the-blue-book.aspx Vol 2 – www.environment.nsw.gov.au/stormwater/publications.htm
Landslide risk management guidelines	www.australiangeomechanics.org/resources/downloads/
Site Investigations for Urban Salinity (DLWC, 2002)	www.environment.nsw.gov.au/resources/salinity/booklet3siteinvestigationsforurbansalinity.pdf
Local Government Salinity Initiative Booklets	www.environment.nsw.gov.au/salinity/solutions/urban.htm
Water	
Water Quality Objectives	www.environment.nsw.gov.au/ieo/index.htm
ANZECC (2000) Guidelines for Fresh and Marine Water Quality	www.mincos.gov.au/publications/australian_and_new_zealand_guidelines_for_fresh_and_marine_water_quality
Approved Methods for the Sampling and Analysis of Water Pollutant in NSW (2004)	www.environment.nsw.gov.au/resources/legislation/approvedmethods-water.pdf

NSW GOVERNMENT | Planning & Infrastructure

Ms Kester Boardman
Manager Environment and Sustainability
Cardno Pty Ltd
Level 3
910 Pacific Highway
GORDON NSW 2072

11/09685

Dear Ms Boardman

I refer to your letter to the Director General of 31 May 2011 requesting comments on the proposed road upgrade and cycleway construction along Pittwater Road, North Ryde. The Director General has asked me to thank you for your letter and reply on his behalf.

I understand Cardno Pty Ltd has been appointed by Ryde Council to prepare an integrated Review of Environmental Factors (REF) for this project. With this in mind, the department supports this project because it is consistent with the New South Wales State Plan directions to provide safer roads (Direction S7) and improve the efficiency of the road network (Direction E7) and Action C5.7 of the Metropolitan Plan for Sydney 2036 which requires the NSW Bike Plan 2010 to be implemented.

In finalising the REF, please consider the detailed comments at Attachment 1 which consider the proposal in relation to the Cycling Aspects of Austroads Guides (CAAG) and the NSW Bicycle Guidelines.

May I take this opportunity to congratulate Ryde Council for promoting active travel by supporting infrastructure projects such as the one above.

Should you have any queries regarding this matter, please contact Danijela Karac-Cooke, Senior Planner at the Department of Planning and Infrastructure's Sydney Region East Branch on telephone number 02 9228 6207.

Yours sincerely

Grant 22/6/11

Juliet Grant
Regional Director
Sydney Region East

Encl.

NSW GOVERNMENT | Planning & Infrastructure

Attachment 1

Comments on the proposed road upgrade and cycleway construction along Pittwater Road, North Ryde

General

Path width
The proposed cycleway facility appears to be a shared use commuter path. As such consideration could be given to widening the facility to a minimum of 3 metre width where possible, in line with Table 7.5 of *Cycling Aspects of Austroads Guides* (CAAG). It is recognised that this may not be possible in many places.

Shared use
Where the existing footpath is to be retained parallel to the new facility, consideration could be given to segregating pedestrians from cyclists and for the new path to be designated as an exclusive bicycle path. This is indicated by Figure 7.1 (p. 85) of CAAG. Please also refer to Figure 6.1 (p.36) of NSW Bicycle Guidelines for a suitable marking scheme. In locations where an exclusive bicycle path is designated, the minimum width can be reduced to 2.5 metres, as indicated by Table 7.4 (p.88) of CAAG.

Safety barriers
Consideration should be given to safety barriers meeting specifications described in section 4.7 (p.40) of CAAG.

Specific comments on the proposed plans

Roundabout at Pittwater Road/High Street (Plan 1).
Consideration should be given to offsetting the bicycle path from the roundabout at High Street crossing by a minimum of 6 metres as per figure 5.28 (p. 79) of CAAG. Currently a 1 metre offset is proposed.

New roundabout at Pittwater Road/Entrance to Buffalo Creek Reserve (Plan 5)
The bicycle path could be offset from the roundabout at the entrance to the Field of Mars Reserve crossing (West of Pittwater Road) by a minimum 6 metres, in line with figure 5.28 (p. 79) of CAAG. Currently, a 1metre offset is proposed.

The crossing of Pittwater Road towards Buffalo Creek Reserve could also be offset by a minimum of 6 metres from the roundabout and be designated as a shared use path (not a pedestrian only path as indicated on Plan 5). Where a new path will be constructed to the East of Pittwater Road, consideration could be given to increasing this to a 3 metre width from the crossing eastwards to connect with the existing 3 metre ac strip (not 2.5 metre as indicated on Plan 5).

Roundabout at Pittwater Road/Rene Street (Plan 8)
Consideration should be given to offsetting the bicycle path from the roundabout at the Rene Street crossing by a minimum 6 metres, as per figure 5.28 (p. 79) of CAAG. Currently, the proposal on Plan 8 shows a 1m offset. It is acknowledged that the gradient on the North side of Rene Street may preclude this.

Crossing of Bronhill Avenue (Plan 12)
Section 7.6.7 (p.100) of CAAG advises that a bent out crossing treatment is only suitable where:

- motor vehicle storage is possible,
- where there is room for a minimum offset of 7 metres; and
- where smooth curves (30m) can be achieved.

Consideration should therefore be given to avoiding bending out the bicycle path crossing of Bronhill Road from Pittwater Road (as indicated by Plan 12).

Further, bent out treatment at side roads is not recommended for shared use paths. Please refer to Figure 5.12 (p.31) of *NSW Bicycle Guidelines* for a suitable side road crossing treatment.

Consideration should also be given to relocating the existing power pole on the South side of Bronhill Avenue at Pittwater Road as it obstructs motorists' view of cyclists and pedestrians attempting to cross Bronhill Road. This is in line with the NSW Bicycle Guidelines, Figure 5.12, p. 31 "Area between bicycle path and the roadway must be kept clear of any obstacles which hamper visibility on intersection approaches".

Crossing of Carramar Avenue at roundabout (Plan 16)
Please consider the comments provided on Plans 1 and 5 above on the potential to increase the offset from the roundabout.

Crossing of Magdala Road at roundabout (Plan 17)
Please consider the comments provided on plans 1, 5 and 16 above on the potential to increase the offset from the roundabout.

Crossing of Cressey Road (Plan 19 and 20)
The crossing is not required to be bent out (as indicated in plans 19 and 20). Please refer to comments above on Plan 12. The crossing of Cressey Road could make use of the existing median island, similar to the proposed treatment of crossings at Warwick Street and Clarence Street. By this, a crossing of the driveway of 204 Cressey Road can be avoided.

Crossing of Clarence Street
Consideration should be given to smoothing out the proposed bend in the path on the South side of the Clarence Street crossing, to match the treatment at the North side of Clarence Street, in line with CAAG, p.101 "the use of tight curves can introduce manoeuvres that require the cyclist's attention at a point where their attention should be focused on the crossing and approaching vehicles."

Crossing of Blenheim Road (Plan 22)
This crossing is not required to be bent out. However, a new median island could be included to provide safety for cyclists and pedestrians.

Caroline Bathje (Sydney)

From: John Carse [John.Carse@cma.nsw.gov.au]
Sent: Saturday, 25 June 2011 8:51 AM
To: Kester Boardman
Cc: Jenna Hore; Sydney Metro CMA
Subject: Re: Fwd: Consultation - Pittwater Road Upgrade, North Ryde

Mr Boardman

My apologies for the delay in responding to your email and letter.

Thanks you for the opportunity to provide input into this process. Unfortunately the SMCMA's staff resources do not generally permit us to provide such input into relatively small scale projects such as this.

The SMCMA does have detailed (approx 1:4000 scale) maps showing vegetation communities across the region. I believe that Council would have access to that information, but if you believe it would assist your REF, please contact Ms Jenna Hore at this office on 9895 7856 for further information.

The SMCMA works with its partners and the community. especially through local councils, to promote the importance of biodiversity, native vegetation and other natural resource issues in this region. The Catchment Action Plan (available on the SMCMA's website at www.sydney.cma.nsw.gov.au) provides a ten year strategic plan for natural resource management in the region. From a biodiversity perspective the CAP seeks to enhance ecological resilience and connectivity of bushland and aquatic habitats.

Works such as those proposed could impact on those aims and appropriate steps to mitigate the impact should be incorporated into the project if it is to proceed.

Regards

John

John Carse
General Manager
Sydney Metropolitan Catchment Management Authority
Ground Floor, 10 Valentine Ave
Parramatta NSW 2150
PO Box 3720
Parramatta NSW 2124
P: 9895 6272
F: 9895 7330
M:0411 438 906
Website:www.sydney.cma.nsw.gov.au

>>> Sydney Metro CMA 7/06/2011 >>>

>>> Kester Boardman <kester.boardman@cardno.com.au> 31/05/2011 9:46 am >>>
Dear Mr. Carse

Please find attached a stakeholder consultation letter regarding a road upgrade and shared user path construction along Pittwater Road from High Street, Gladesville to Epping Road, North Ryde. We would greatly appreciation your response no later than 21 June 2011.

A hard copy is also being sent by post.

Please do not hesitate to contact me if you have any questions.

Kester Boardman
Manager - Environment and Sustainability
Phone: +61 2 9496 7700
Fax: +61 2 9499 3902
Mobile: +61 412 797 685
Email: kester.boardman@cardno.com.au
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Heritage Council of New South Wales
3 Marist Place
Parramatta NSW 2150
Locked Bag 5020
Parramatta NSW 2124
DX 8225 PARRAMATTA
Telephone: 61 2 9873 8500
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heritage@planning.nsw.gov.au
www.heritage.nsw.gov.au

Contact: Alejandra Rojas
Phone: 02 9873 8559
Fax: 02 9873 8599
Email: alejandra.rojas@planning.nsw.gov.au

Our ref:
File number: 11/10112
B number : B400687

Kester Boardman
Manager Environment and Sustainability
Cardno
Level 3, 910 Pacific Highway
Gordon NSW 2072

Dear Mr Boardman

RE: REF – PITTWATER ROAD - ROAD UPGRADE AND SHARED USER PATH CONSTRUCTION - REQUEST FOR HERITAGE COUNCIL ADVICE

I refer to your letter which informed of the proposed road upgrade and shared user path construction along Pittwater Road - between High Street, Gladesville and Epping Road, North Ryde - and invited comments for consideration in the REF.

Council should ensure that the following matters are addressed at a minimum:

- Confirmation of items of heritage significance located within, and adjacent to, the proposed development area and their listing, or other status. This should include a review of the statements of significance for these items and additional research completed where information is lacking.

- Assessment of impacts to heritage significance, including potential archaeological significance consistent with Heritage Council guidelines, in particular:
  - *Statements of Heritage Impact* available on the Heritage Council website http://www.heritage.nsw.gov.au/docs/hm_statementsofhi.pdf
  - Assessing Heritage Significance available on the Heritage Council website http://www.heritage.nsw.gov.au/docs/assessingheritagesignificance.pdf

- Outline proposed mitigation measures where impacts have been identified including the evaluation of the effectiveness and reliability of these measures.

The above-mentioned material should be prepared by a suitably qualified heritage consultant and archaeological consultant for matters related to archaeology.

It should be noted that the Heritage Council is an approval authority under the Heritage Act 1977 for any development on items listed on the State Heritage Register (SHR). In some cases where impacts to heritage are minor, exemptions from the need to obtain approval may be endorsed.

The Heritage Council is also an approval authority and issues permits for disturbance or excavation of any land in NSW (whether listed or not on the SHR) that is likely to contain archaeological 'relics'. There are two types of applications, depending on whether the site is

listed on the State Heritage Register or not. In cases where impacts are minor, exceptions from the need to obtain permits may be considered.

If you have any further enquiries regarding this matter, please contact Alejandra Rojas on (02) 9873 8559.

Yours sincerely

22-07-2011

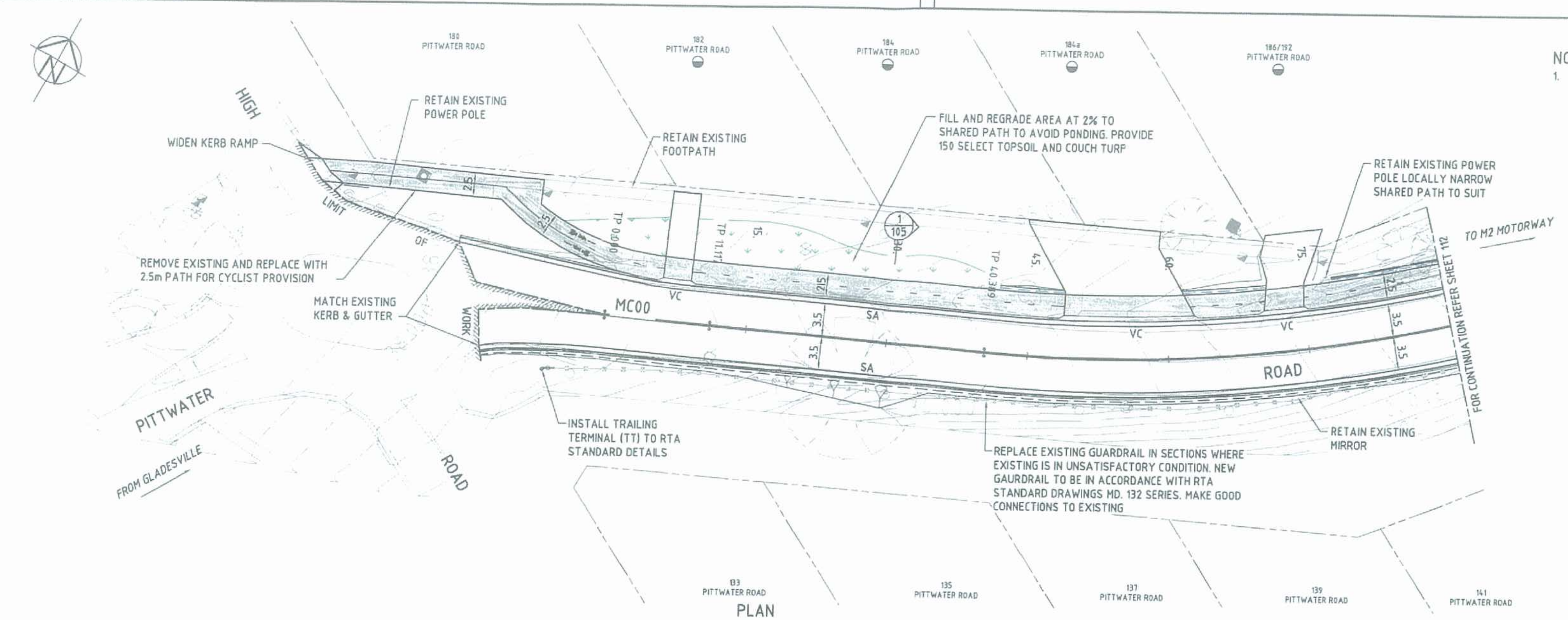
Dr. Siobhan Lavelle OAM
A/Manager – Heritage Conservation Team
Heritage Branch
Office of Environment and Heritage
AS DELEGATE OF THE NSW HERITAGE COUNCIL

Appendix C

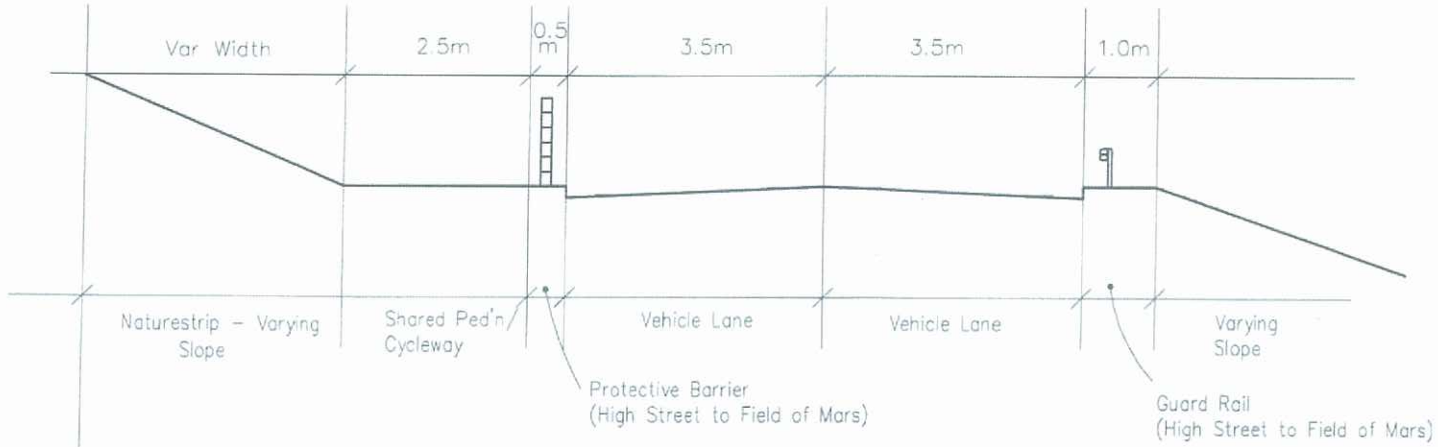
Design Details

NOTES

1. FOR NOTES AND LEGENDS REFER TO SHEET 101.



PLAN
SCALE 1:250



TYPICAL CROSS SECTION

Section
High Street to Field of Mars
Length =550m

PLAN 1

SCALE 1:100 (VERT)
SCALE 1:250 (HORI)

REV	DATE	REVISIONS	DRN	CHK
C	16/10/2009	ISSUED FOR CONSTRUCTION	CM	DA
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A	09/06/2009	ISSUED FOR CONSTRUCTION	DPT	DA

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Telephone (02) 9952 8222

APPROVED:
PROJECT DIRECTOR — DATE
REVIEWED:
PROJECT MANAGER — DATE

	PREPARED	CHECKED
DESIGNED	JH	DA
DRAWN	DPT	DA

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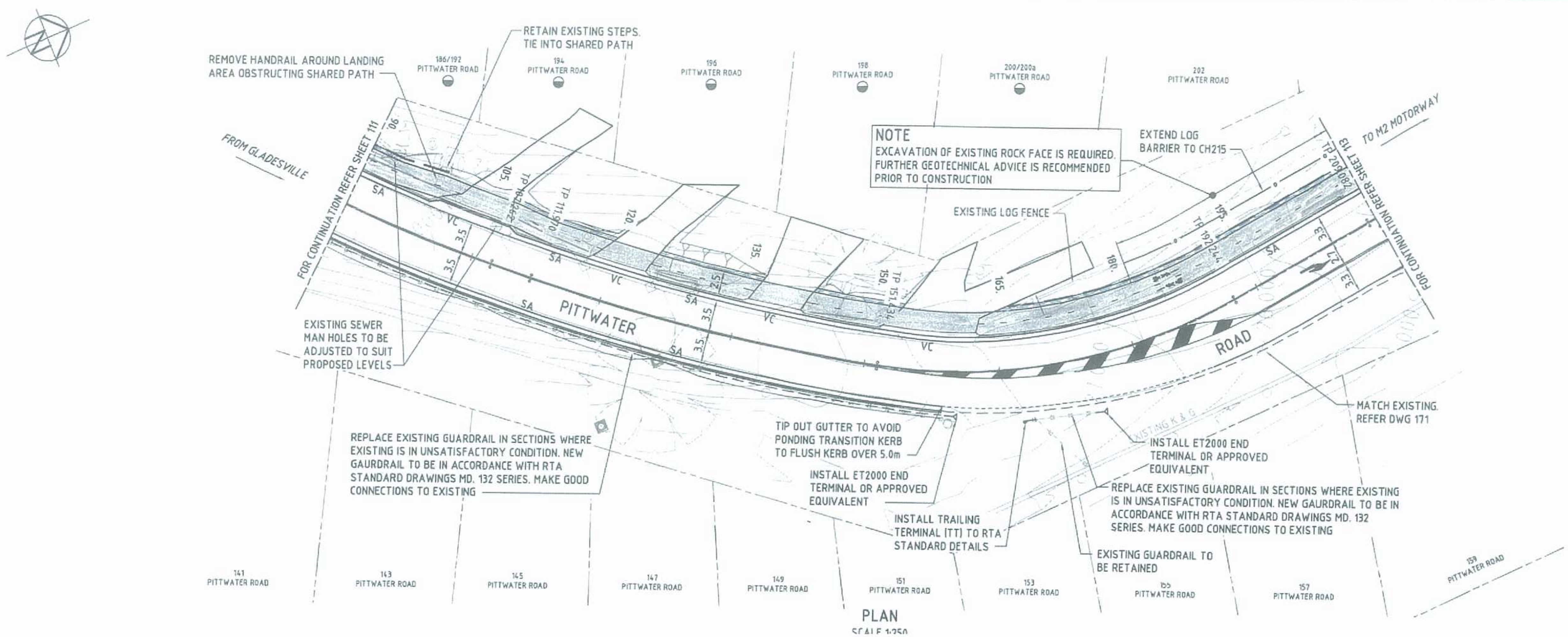
CITY OF RYDE
PITTWATER ROAD UPGRADE, GLADESVILLE
FROM HIGH ST, GLADESVILLE TO RENE ST, EAST RYDE
DETAIL DESIGN
PLAN & LONGITUDINAL SECTION - CH 0 TO CH 90

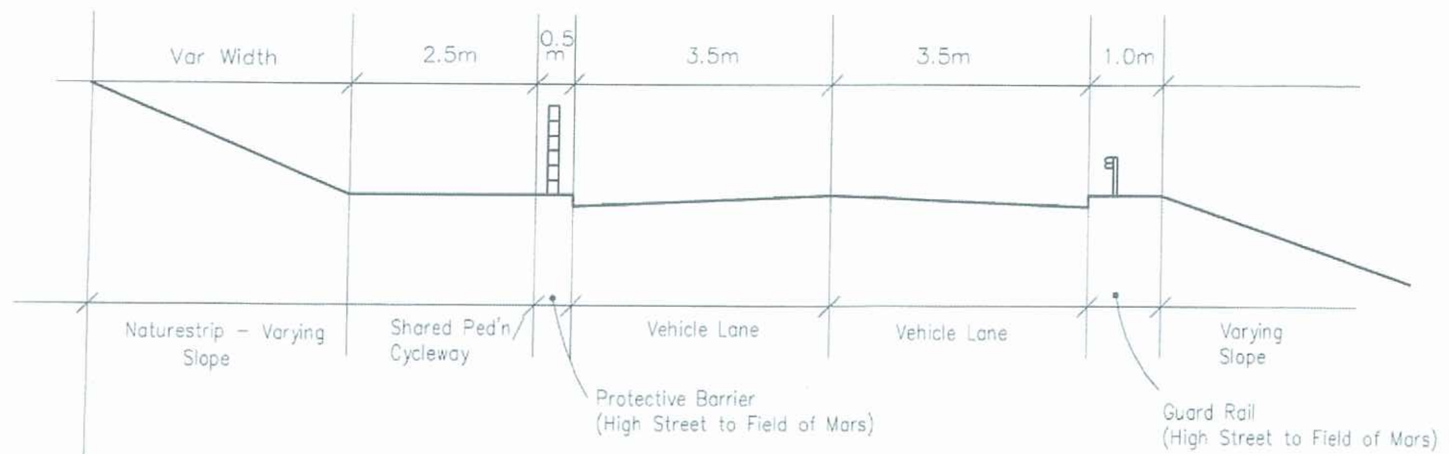
DRAWING STATUS: FOR CONSTRUCTION
DRAWING NUMBER: 600226-111
REV: C

A1 ON ORIGINAL

NOTES
1. FOR GENERAL NOTES AND LEGEND, REFER DRAWING 101



PLAN
SCALE 1:250



TYPICAL CROSS SECTION

Section
High Street to Field of Mars
Length =550m

PLAN 2

SCALE 1:100 (VERT)
SCALE 1:250 (HORI)

REV	DATE	REVISIONS	DRN	CHK
C	16/10/2009	ISSUED FOR CONSTRUCTION	CH	DA
B	24/09/2009	ISSUED FOR CONSTRUCTION	DH	DA
A	09/06/2009	ISSUED FOR CONSTRUCTION	DPT	DA

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	PREPARED	CHECKED
DESIGNED	JH	DA
DRAWN	DPT	DA

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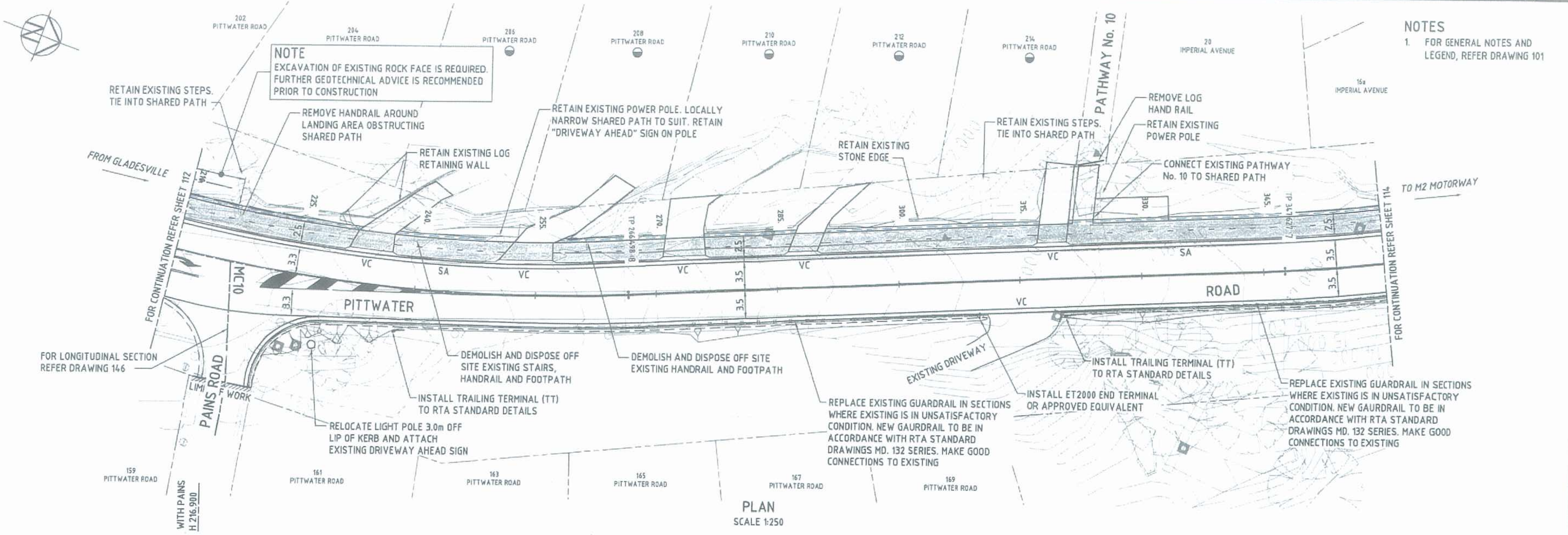
CITY OF RYDE
PITTWATER ROAD UPGRADE, GLADESVILLE
FROM HIGH ST, GLADESVILLE TO RENE ST, EAST RYDE
DETAIL DESIGN
PLAN & LONGITUDINAL SECTION – CH 90 TO CH 210

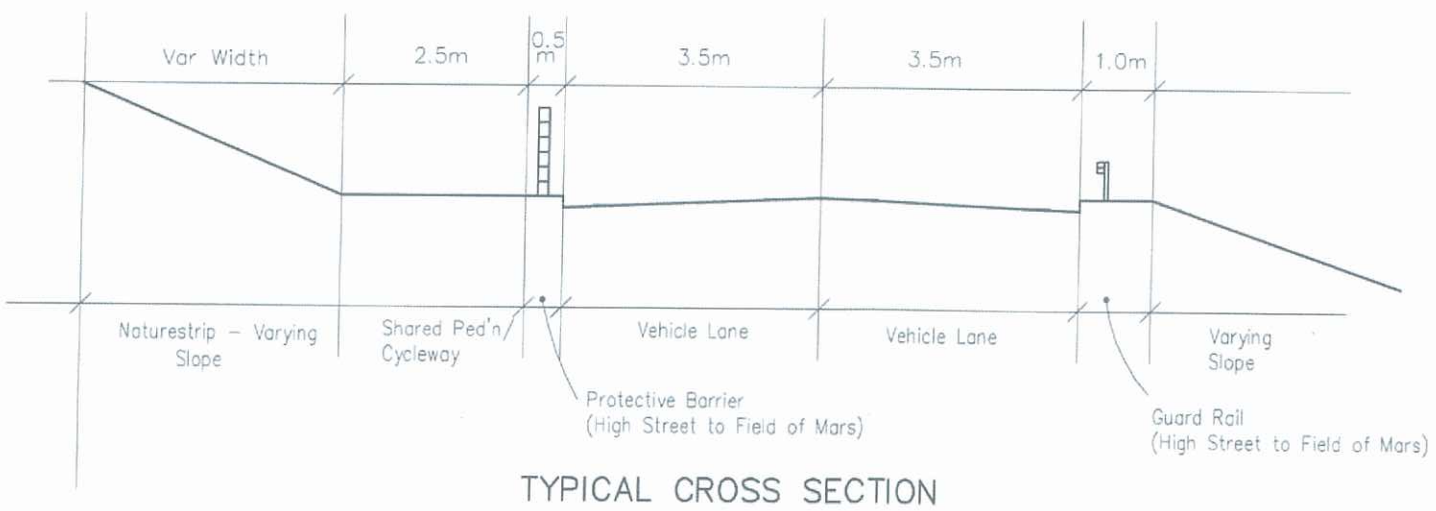
DRAWING STATUS: FOR CONSTRUCTION
DRAWING NUMBER: 600226-112
REV: C

A1 ON ORIGINAL

NOTES
1. FOR GENERAL NOTES AND LEGEND, REFER DRAWING 101



PLAN
SCALE 1:250



TYPICAL CROSS SECTION

Section
High Street to Field of Mars
Length =550m

PLAN 3

SCALE 1:100 (VERT)
SCALE 1:250 (HORZ)

REV	DATE	REVISIONS	DRN	CHK
C	16/10/2009	ISSUED FOR CONSTRUCTION	CH	DA
B	24/09/2009	ISSUED FOR CONSTRUCTION	DH	DA
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City of Ryde
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DESIGNED: JH DA
DRAWN: DPT DA

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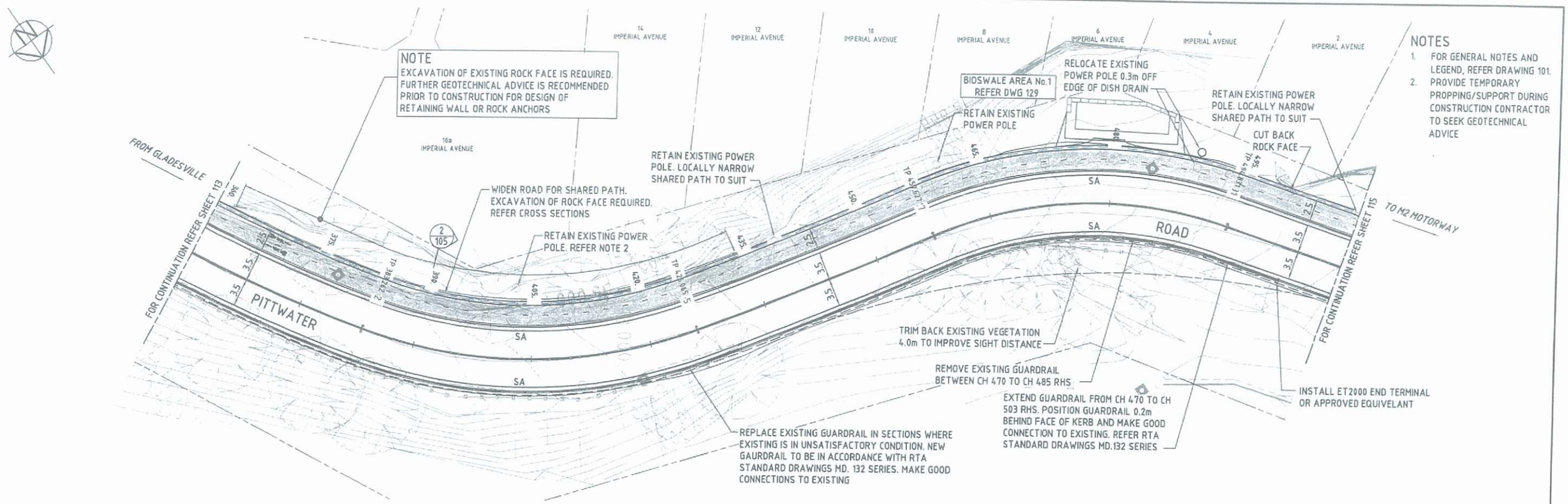
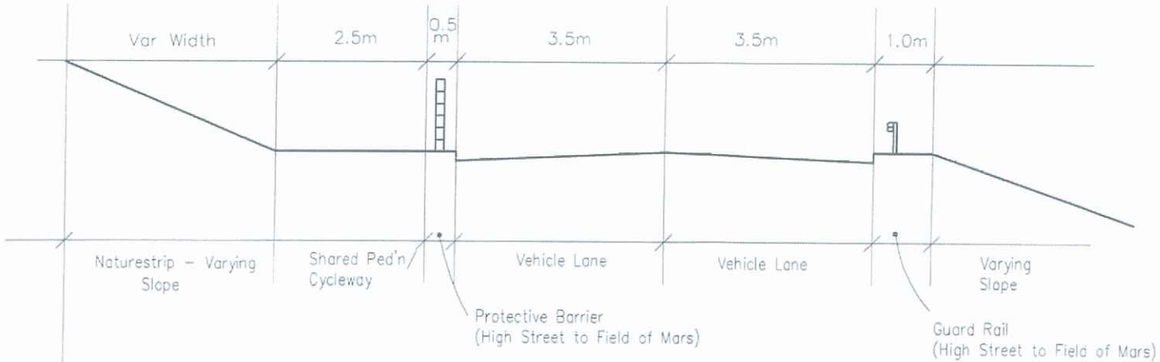
CITY OF RYDE
PITTWATER ROAD UPGRADE, GLADESVILLE
FROM HIGH ST, GLADESVILLE TO RENE ST, EAST RYDE
DETAIL DESIGN
PLAN & LONGITUDINAL SECTION - CH 210 TO CH 360

DRAWING STATUS: FOR CONSTRUCTION
DRAWING NUMBER: 600226-113
REV: C

A1 ON ORIGINAL



PLAN
SCALE 1:250



TYPICAL CROSS SECTION

Section
High Street to Field of Mars
Length =550m

PLAN 4

SCALE 1:100 (VERT)
SCALE 1:250 (HORI)

REV	DATE	REVISIONS	DRN	DES
C	16/10/2009	ISSUED FOR CONSTRUCTION	CH	DA
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	PREPARED	CHECKED
DESIGNED	JH	DA
DRAWN	DPT	DA
REVIEWED		

APPROVED: PROJECT DIRECTOR DATE — PROJECT MANAGER DATE

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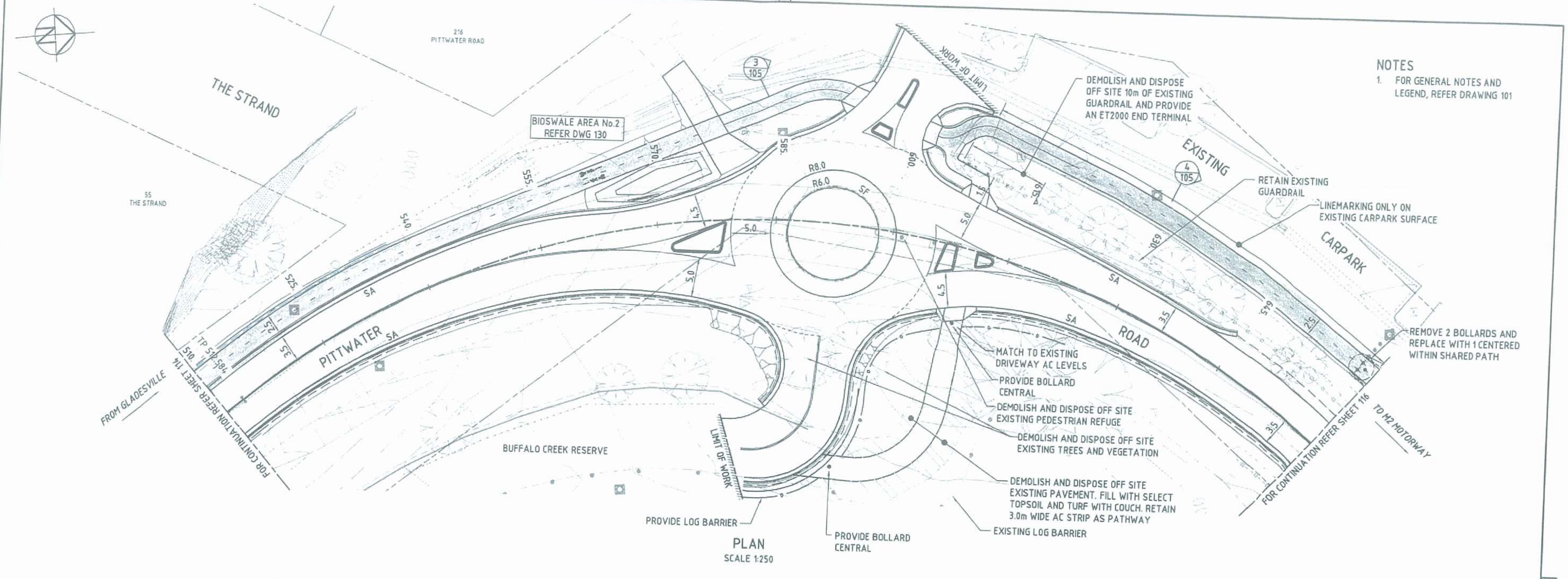
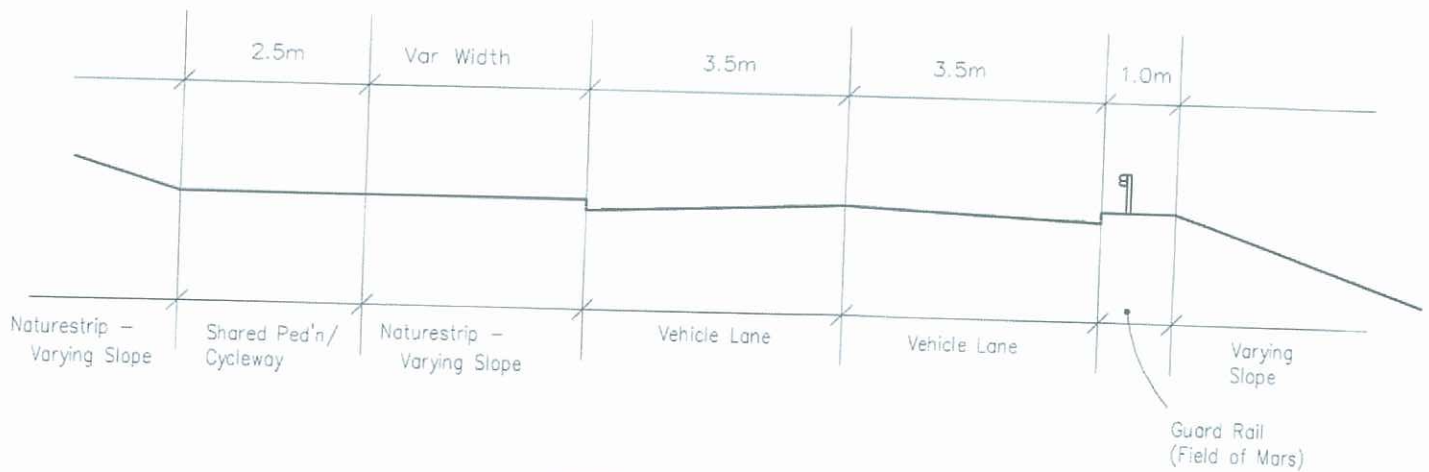
CITY OF RYDE
PITTWATER ROAD UPGRADE, GLADESVILLE
FROM HIGH ST, GLADESVILLE TO RENE ST, EAST RYDE
DETAIL DESIGN
PLAN & LONGITUDINAL SECTION - CH 360 TO CH 510

DRAWING STATUS: FOR CONSTRUCTION
DRAWING NUMBER: 600226-114
REV: C

A1 ON ORIGINAL


NOTES
1. FOR GENERAL NOTES AND LEGEND, REFER DRAWING 101
THE STRAND
PITTWATER ROAD
BIOSWALE AREA No.2 REFER DWG 130
LIMIT OF WORK
DEMOLISH AND DISPOSE OFF SITE 10m OF EXISTING GUARDRAIL AND PROVIDE AN ET2000 END TERMINAL
EXISTING CARPARK
RETAIN EXISTING GUARDRAIL
LINEMARKING ONLY ON EXISTING CARPARK SURFACE
REMOVE 2 BOLLARDS AND REPLACE WITH 1 CENTERED WITHIN SHARED PATH
PITTWATER ROAD
MATCH TO EXISTING DRIVEWAY AC LEVELS
PROVIDE BOLLARD CENTRAL
DEMOLISH AND DISPOSE OFF SITE EXISTING PEDESTRIAN REFUGE
DEMOLISH AND DISPOSE OFF SITE EXISTING TREES AND VEGETATION
DEMOLISH AND DISPOSE OFF SITE EXISTING PAVEMENT. FILL WITH SELECT TOPSOIL AND TURF WITH COUCH. RETAIN 3.0m WIDE AC STRIP AS PATHWAY
EXISTING LOG BARRIER
PROVIDE BOLLARD CENTRAL
PROVIDE LOG BARRIER
BUFFALO CREEK RESERVE
FROM GLADESVILLE
FOR CONTINUATION REFER SHEET 114
FOR CONTINUATION REFER SHEET 116
TO M2 MOTORWAY
R8.0
R6.0

PLAN
SCALE 1:250



TYPICAL CROSS SECTION

Section D
Field of Mars
Length =200m

PLAN 5

SCALE 1:100 (VERT)
SCALE 1:250 (HOR)

REV	DATE	REVISIONS		
C	16/10/2009	ISSUED FOR CONSTRUCTION	CH	DA
B	24/09/2009	ISSUED FOR CONSTRUCTION	DH	DA
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DESIGNED	JH	DA
DRAWN	DPT	DA

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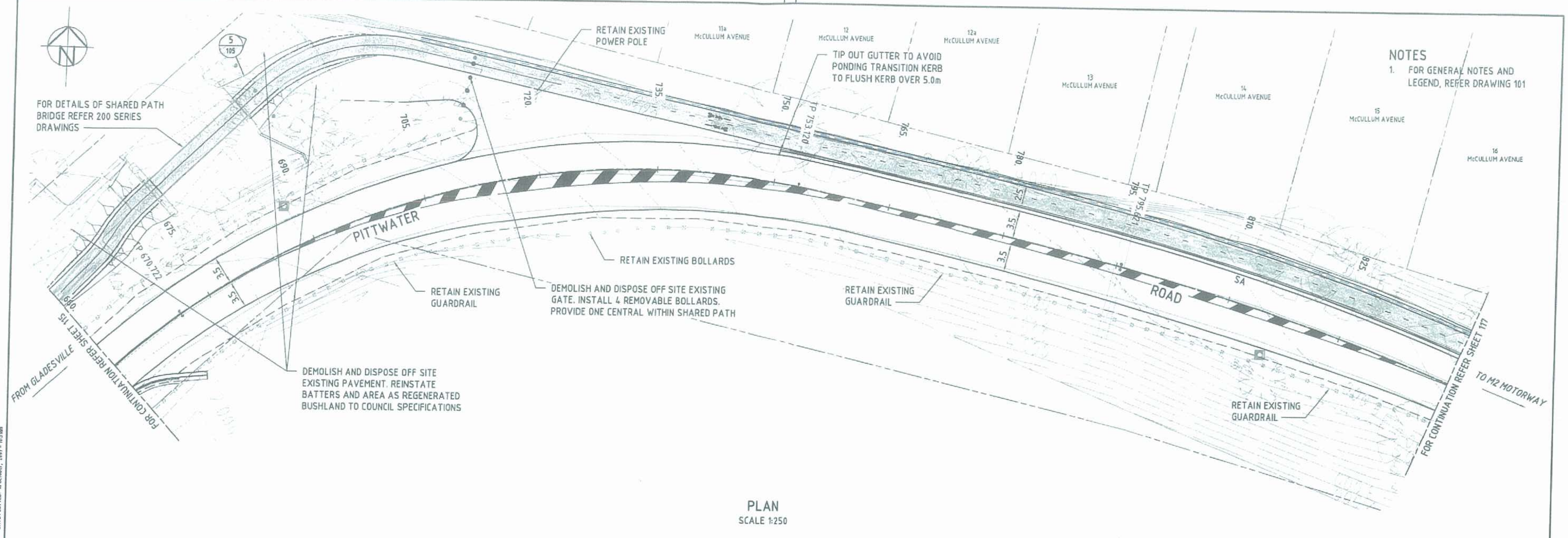
CITY OF RYDE
PITTWATER ROAD UPGRADE, GLADESVILLE
FROM HIGH ST, GLADESVILLE TO RENE ST, EAST RYDE
DETAIL DESIGN
PLAN & LONGITUDINAL SECTION – CH 510 TO CH 660

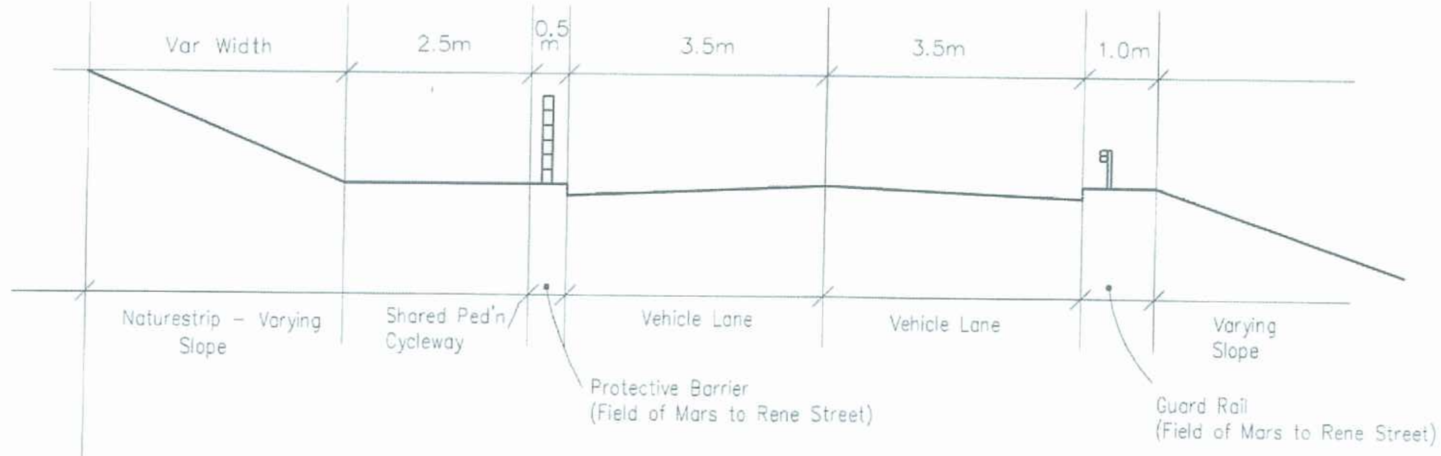
DRAWING STATUS: FOR CONSTRUCTION
DRAWING NUMBER: 600226-115
REV: C

A1 ON ORIGINAL



NOTES
1. FOR GENERAL NOTES AND LEGEND, REFER DRAWING 101

PLAN
SCALE 1:250



TYPICAL CROSS SECTION

Section D
Field of Mars to Rene Street
Length =410m

PLAN 6

SCALE 1:100 (VERT)
SCALE 1:250 (HORI)

REV	DATE	REVISIONS	DRN	CHK
C	16/10/2009	ISSUED FOR CONSTRUCTION	CH	DA
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City of Ryde
ABN 81 621 292 610

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APPROVED:
PROJECT DIRECTOR / DATE

	PREPARED	CHECKED
DESIGNED:	JH	DA
DRAWN:	DPT	DA
REVIEWED:		

PROJECT MANAGER / DATE

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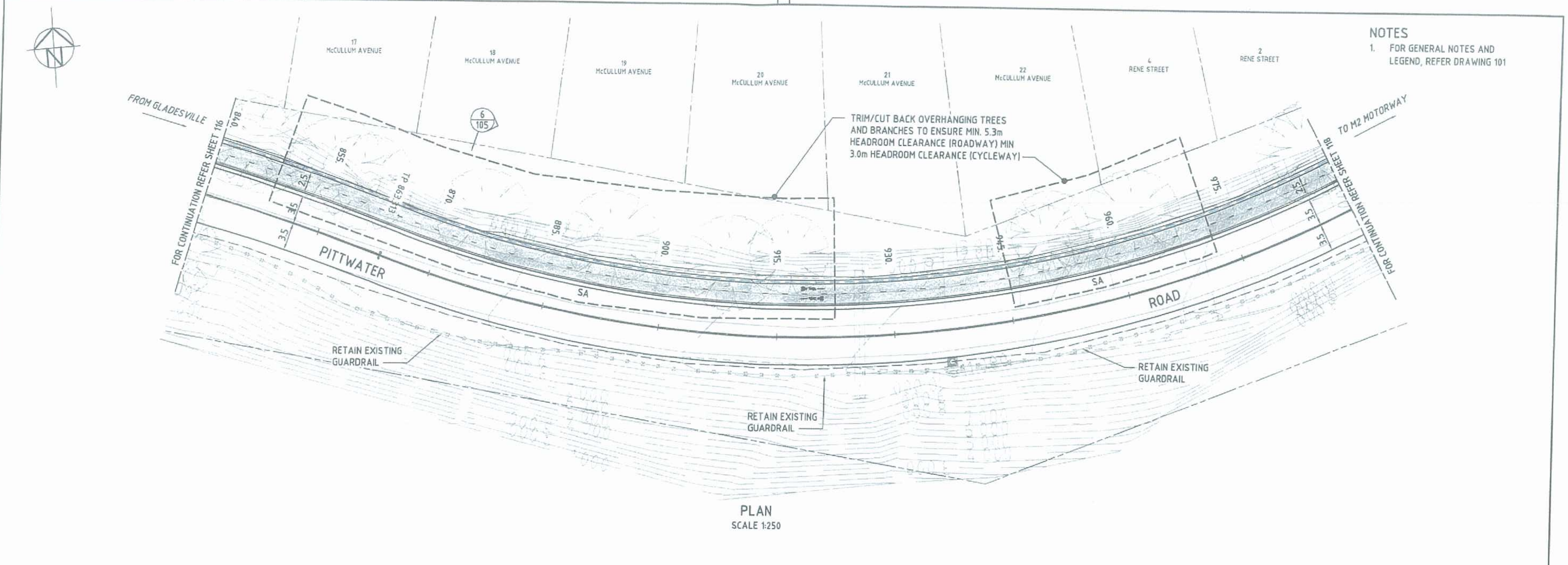
CITY OF RYDE
PITTWATER ROAD UPGRADE, GLADESVILLE
FROM HIGH ST, GLADESVILLE TO RENE ST, EAST RYDE
DETAIL DESIGN
PLAN & LONGITUDINAL SECTION – CH 660 TO CH 840

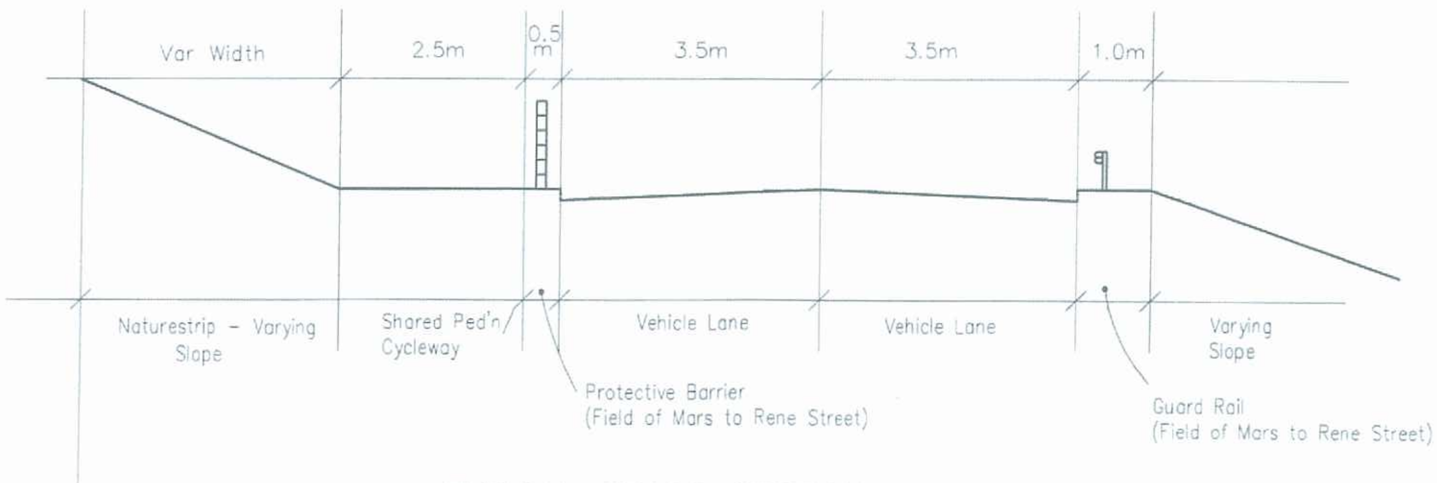
DRAWING STATUS: FOR CONSTRUCTION
DRAWING NUMBER: 600226-116
REV: C

A1 ON ORIGINAL

NOTES
1. FOR GENERAL NOTES AND LEGEND, REFER DRAWING 101



PLAN
SCALE 1:250



TYPICAL CROSS SECTION

Section D
Field of Mars to Rene Street
Length =410m

PLAN 7

SCALE 1:100 (VERT)
SCALE 1:250 (HORI)

REV	DATE	REVISIONS	DRN	CHK
C	16/10/2009	ISSUED FOR CONSTRUCTION	CM	DA
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City of Ryde
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APPROVED: PROJECT DIRECTOR DATE
REVIEWED: PROJECT MANAGER DATE

	PREPARED	CHECKED
DESIGNED	JH	DA
DRAWN	DPT	DA

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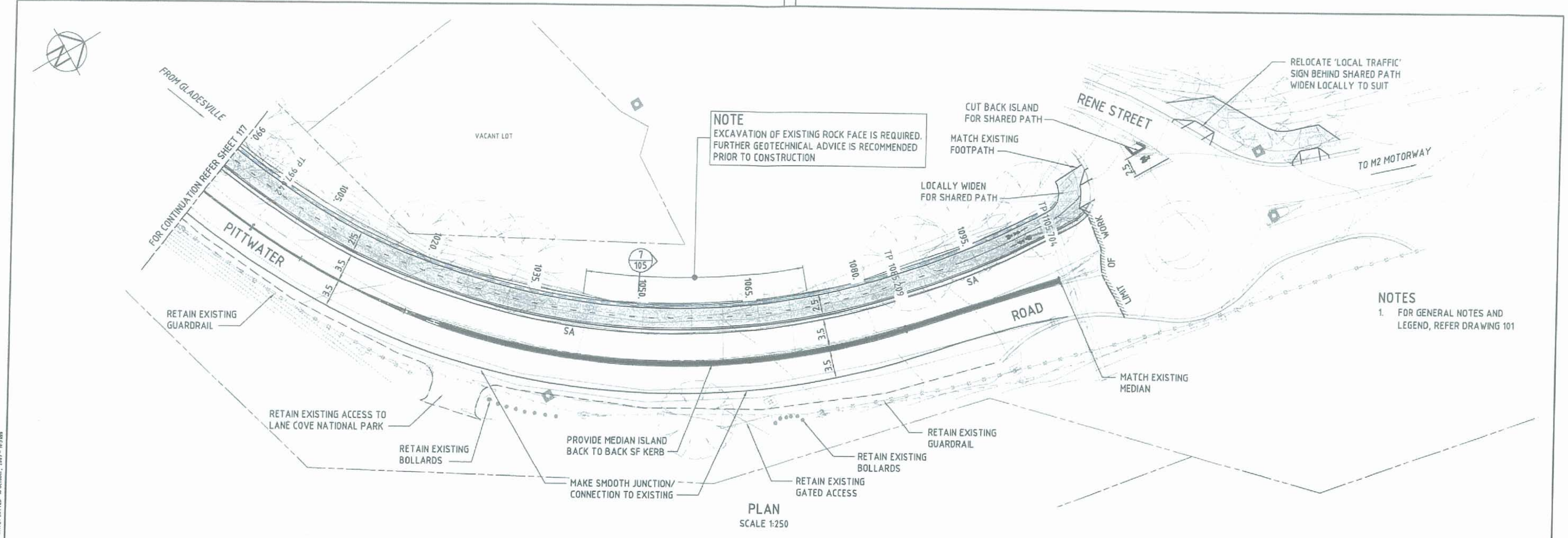
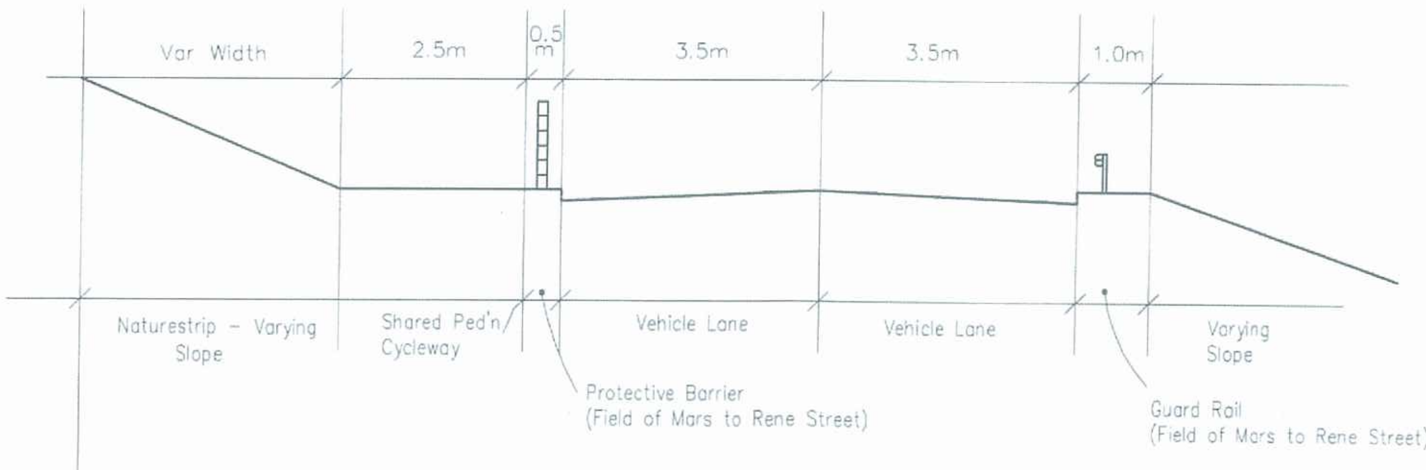
CITY OF RYDE
PITTWATER ROAD UPGRADE, GLADESVILLE
FROM HIGH ST, GLADESVILLE TO RENE ST, EAST RYDE
DETAIL DESIGN
PLAN & LONGITUDINAL SECTION - CH 840 TO CH 990

DRAWING STATUS: FOR CONSTRUCTION
DRAWING NUMBER: 600226-117
REV: C

A1 ON ORIGINAL



PLAN
SCALE 1:250



TYPICAL CROSS SECTION

Section D
Field of Mars to Rene Street
Length =410m

PLAN 8

SCALE 1:100 (VERT)
SCALE 1:250 (HORIZ)

REV	DATE	REVISIONS	DRN	CHK
C	16/10/2009	ISSUED FOR CONSTRUCTION	CH	DA
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	PREPARED	CHECKED
DESIGNED	JH	DA
DRAWN	DPT	DA
REVIEWED		

APPROVED
PROJECT DIRECTOR DATE
PROJECT MANAGER DATE

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Phone (+61 2) 9496 7700 Fax (+61 2) 9499 3902
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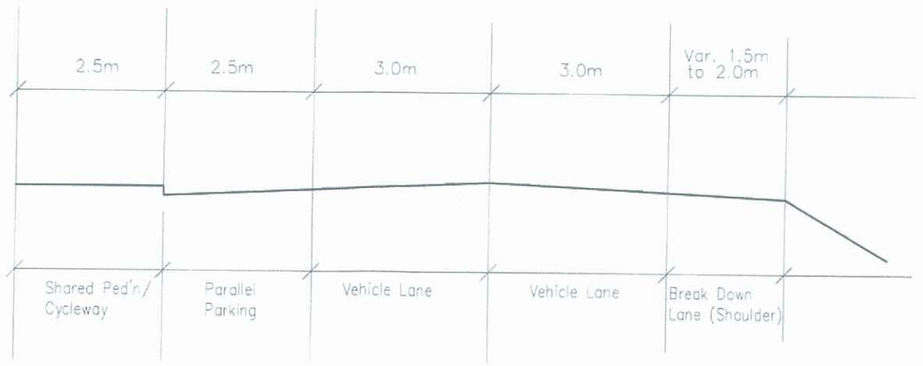
CITY OF RYDE
PITTWATER ROAD UPGRADE, GLADESVILLE
FROM HIGH ST, GLADESVILLE TO RENE ST, EAST RYDE
DETAIL DESIGN
PLAN & LONGITUDINAL SECTION - CH 990 TO CH 1105.704

DRAWING STATUS: FOR CONSTRUCTION
DRAWING NUMBER: 600226-118
REV: C

A1 ON ORIGINAL



Section C
Rene Street to Bronhill Ave
Length = 580m

PLAN 9

City of Ryde

SCALES
Plan 1 :.. 250
Longitudinal Section Horiz 1 :
Vert 1 :
Cross Sections 1 :.. 50

Surveyed GD
Designed
Drawn GD
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GROUP MANAGER PUBLIC WORKS & SERVICES
Date / /

AMENDMENTS

Datum

PITTWATER ROAD
SHARED PATH CONCEPT DESIGN
RENE ST TO BRONHILL AV

SHEET No
No OF SHEETS
PLAN No

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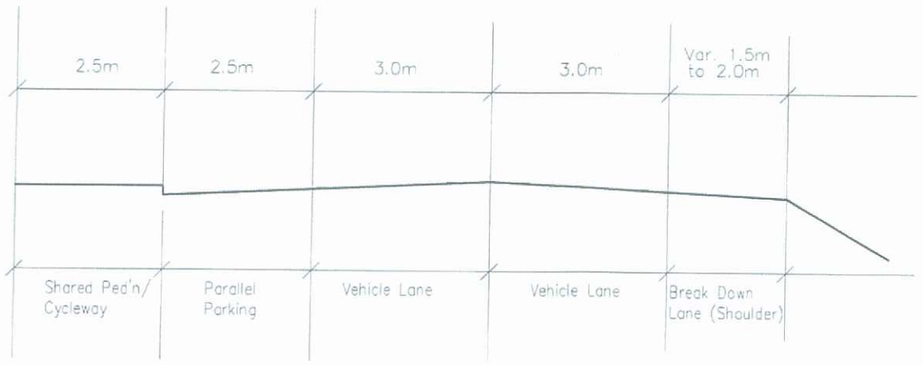

Section C
Rene Street to Bronhill Ave
Length = 580m

PLAN 10

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City of Ryde

SCALES
Plan 1:250 @ A1
Longitudinal Section (Horiz 1:... / Vert 1:...)
Cross Sections 1:50

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Designed
Drawn GD
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Date ../../..

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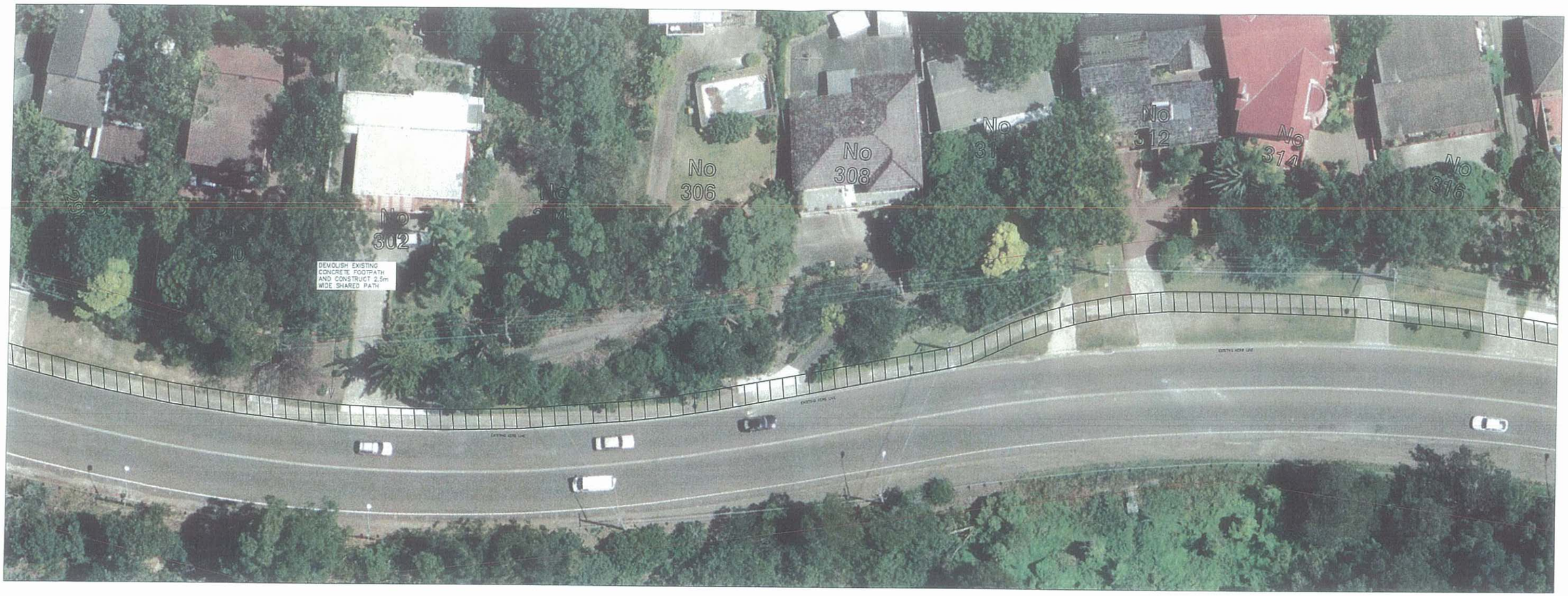
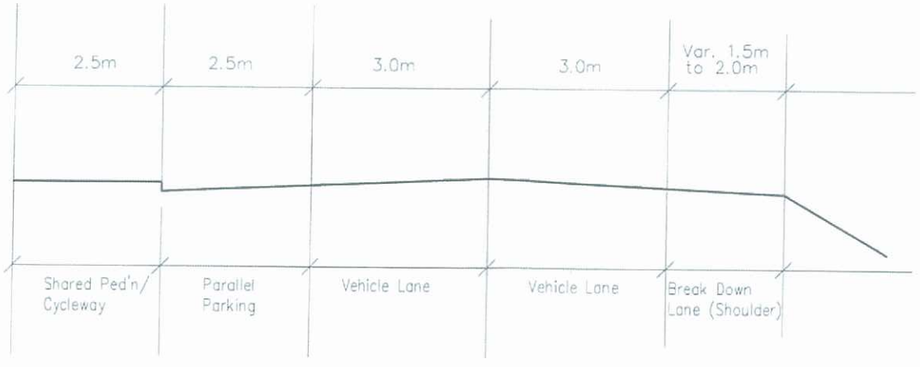
Datum

PITTWATER ROAD
SHARED PATH CONCEPT DESIGN
RENE ST TO BRONHILL AV

SHEET No
No OF SHEETS
PLAN No





Section C
Rene Street to Bronhill Ave
Length = 580m

PLAN 11

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City of Ryde

SCALES
Plan 1 : 250
Longitudinal Sections Horiz 1 : Vert 1 :
Cross Sections 1 : 50

Surveyed GD
Designed
Drawn GD
Checked

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Date / /

AMENDMENTS

Datum

PITTWATER ROAD
SHARED PATH CONCEPT DESIGN
RENE ST TO BRONHILL AVE

SHEET No
No OF SHEETS
PLAN No

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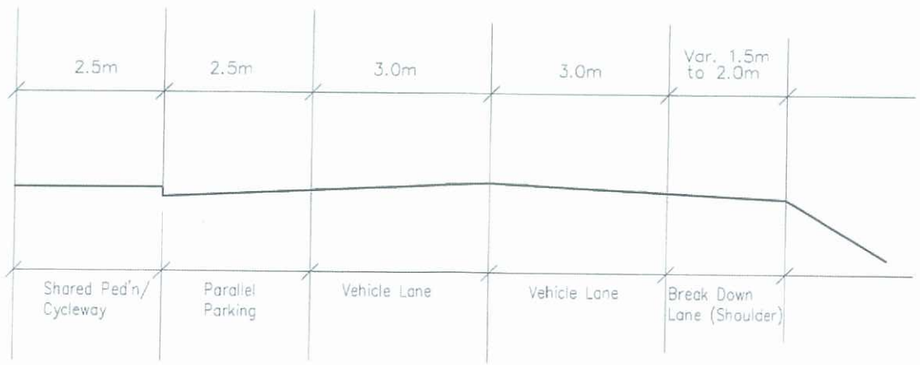
WHERE POSSIBLE UPGRADE INTERSECTION TO IMPROVE PEDESTRIAN AND CYCLIST SAFETY



Section C
Rene Street to Bronhill Ave
Length = 580m

PLAN 12

City of Ryde

SCALES
Plan 1:250 @ A1
Longitudinal Section Horiz 1:...
Vert 1:...
Cross Sections 1:50

Surveyed
Designed GD
Drawn GD
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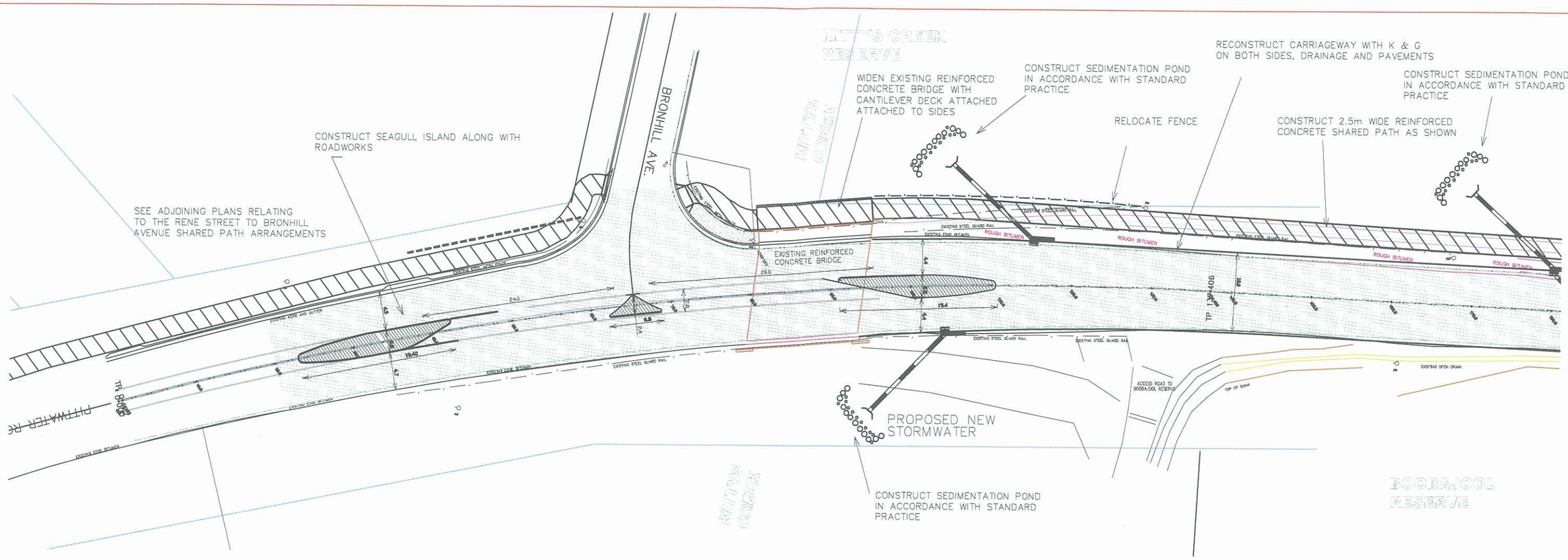
Date / /

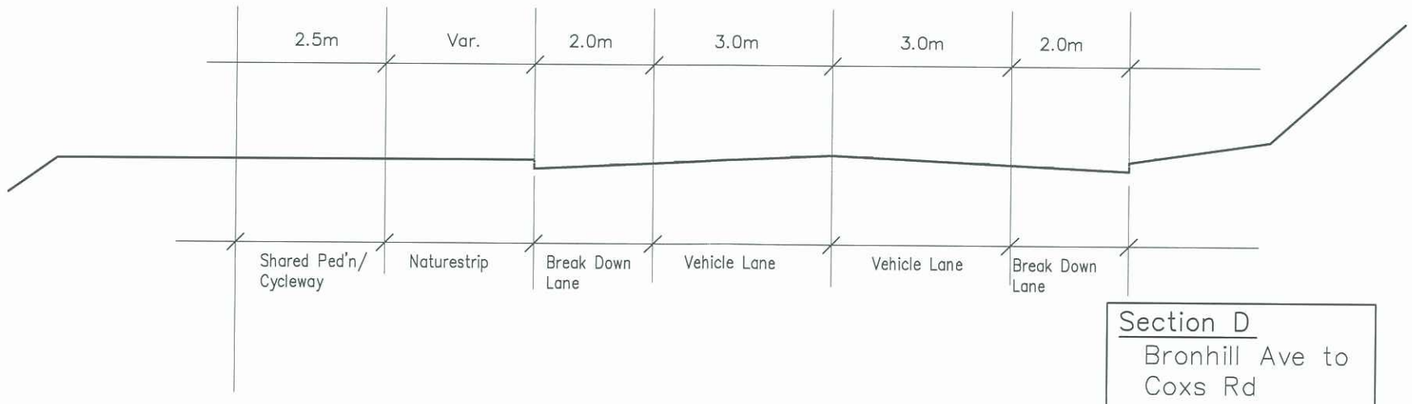
AMENDMENTS

Datum

PITTWATER ROAD
SHARED PATH CONCEPT DESIGN RENE ST TO BRONHILL AV

SHEET No
No OF SHEETS
PLAN No





Section D
Bronhill Ave to Coxs Rd
Length = 260m

PLAN 13

H:\ACAD\JOBS\PITTWATER RD SHARED PATH CONCEPT\PITTWATER BRONHILL TO COXS.dwg

City of Ryde

SCALES
Plan 1 : 200
Longitudinal Section Horiz. 1 : 200 Vert. 1 : 50
Cross Sections 1 : 200

Surveyed: GD
Designed: GD
Drawn: GD
Checked:

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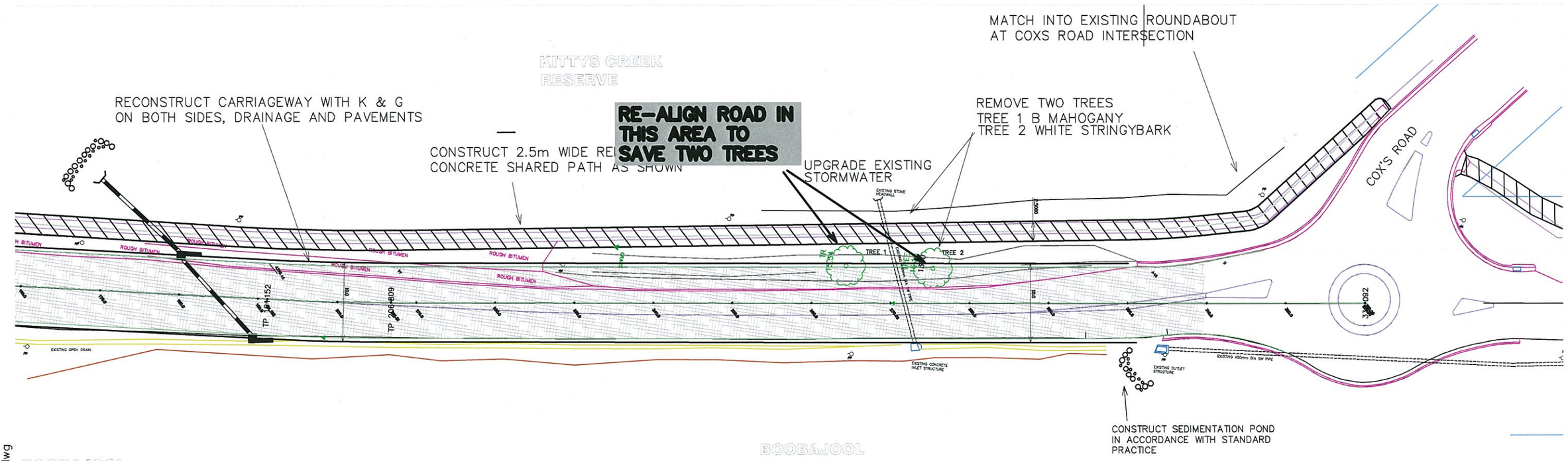
Date : ...../...../.....

AMENDMENTS

Datum : AHD

PITTWATER ROAD
SHARED PATH CONCEPT DESIGN BRONHILL AVE TO COXS ROAD

SHEET No.
No. OF SHEETS
PLAN No.



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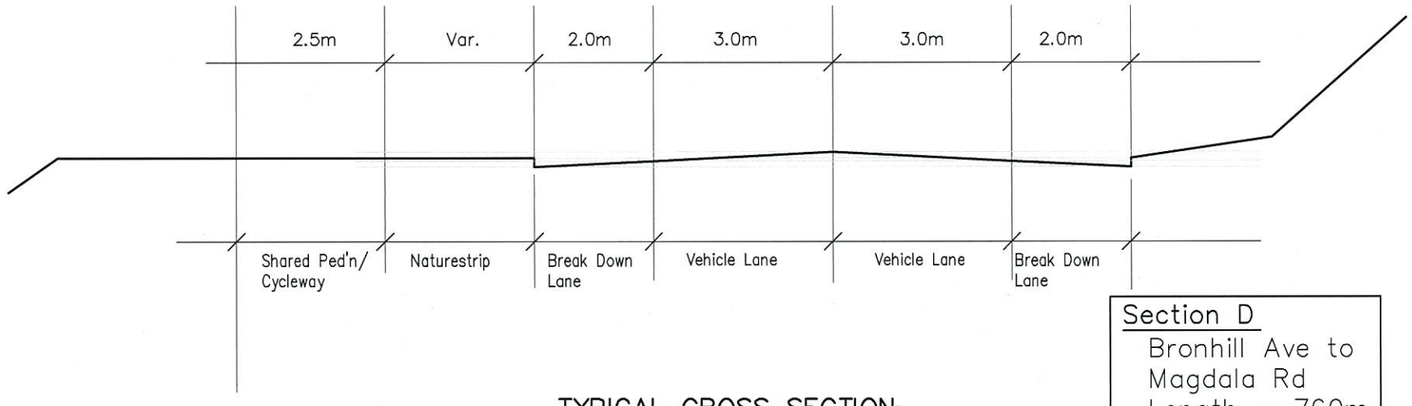
PLAN



TYPICAL CROSS SECTION

Section D
Bronhill Ave to Magdala Rd
Length = 760m

PLAN 14

City of Ryde

SCALES
Plan 1 : 250
Longitudinal Section Horiz. 1 : 250, Vert. 1 : 250
Cross Sections 1 : 250

Surveyed: GD
Designed: GD
Drawn: GD
Checked:

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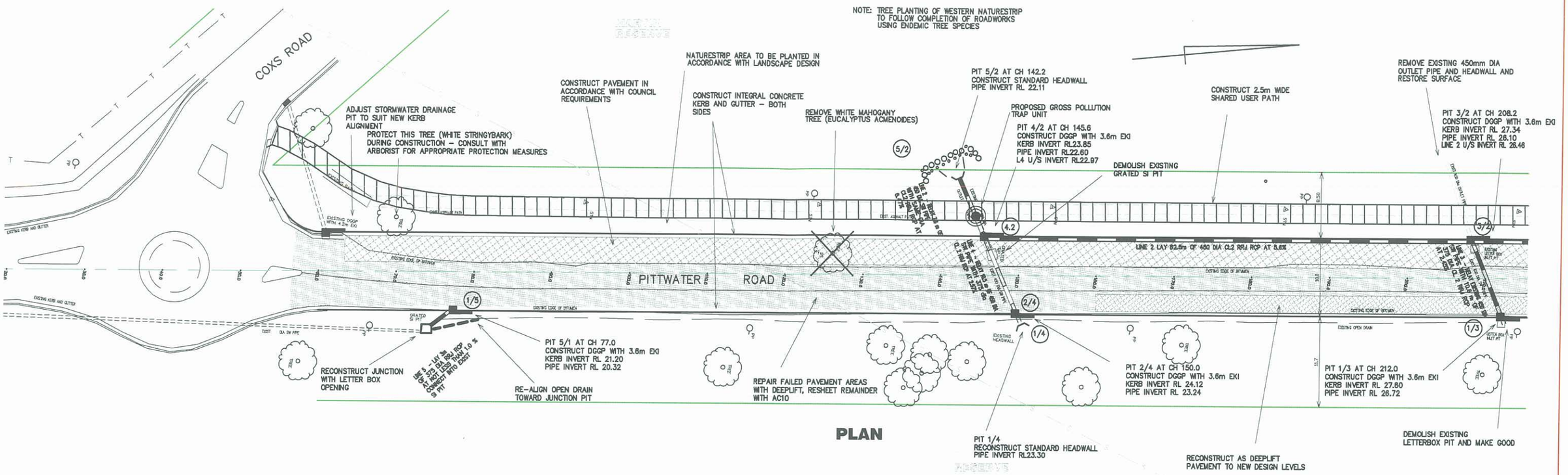
Date : ...../...../.....

AMENDMENTS

Datum : AHD

PITTWATER ROAD
ROAD RECONSTRUCTION BRONHILL AVE TO COXS ROAD

SHEET No.
No. OF SHEETS
PLAN No.



Section D
Coxs Rd to Carramar Ave
Length = 310m

PLAN 15

1. ALL PEGS OFFSET 1.0m TO KERB FACE
2. ADJUST ALL SERVICES TO SUIT DESIGN LEVELS
3. RECONSTRUCT ALL DRIVEWAYS WHERE SHOWN
4. CONSTRUCT STANDARD KERB RAMPS WHERE SHOWN
5. CONNECT HOUSE STORMWATER PIPES TO KERB AND GUTTER AND NEW PIPES
6. KIKUYU TURF TO BE LAID OVER ALL AREAS OF CUT OR FILLED FOOTWAY
7. CONTACT THE HORTICULTURAL OFFICER RE TREE PLANTING WHEN JOB IS NEARING COMPLETION
8. INCREASE CROSSFALL ON FOOTPATH TO 65mm ON FOOTPATH PIT AND AS SHOWN ON PLAN No M424
9. ALL PIPES TO HAVE RUBBER RING JOINTS

City of Ryde

SCALES
Plan 1 : 250
Longitudinal Section Horiz. 1 : 250 Vert. 1 : 100
Cross Sections 1 : 100

Surveyed: FD
Designed: GD
Drawn: GD
Checked:

These plans have been taken to the site & are Approved

GROUP MANAGER PUBLIC WORKS & SERVICES
Date : ...../...../.....

AMENDMENTS

Datum : AHD

PITTWATER ROAD
SHARED PATH CONCEPT DESIGN COXS RD TO CARRAMAR AVE

SHEET No.
No. OF SHEETS
PLAN No.

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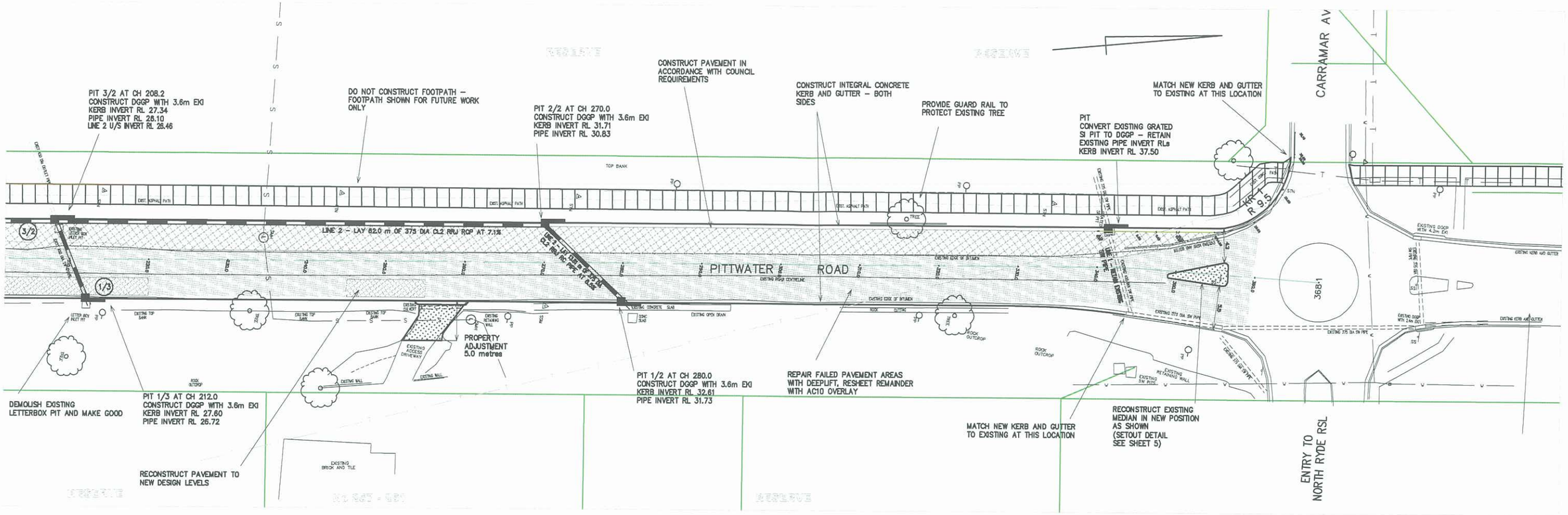

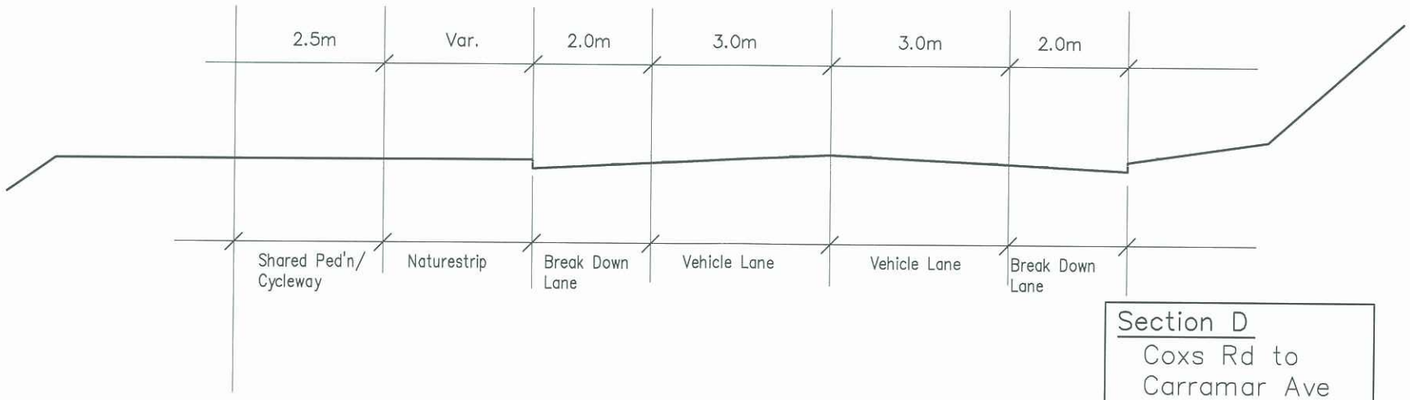

Section D
Coxs Rd to Carramar Ave
Length = 310m

PLAN 16

1. ALL PEGS OFFSET 1.0m TO KERB FACE
2. ADJUST ALL SERVICES TO SUIT DESIGN LEVELS
3. RECONSTRUCT ALL DRIVEWAYS WHERE SHOWN
4. CONSTRUCT STANDARD KERB RAMPS WHERE SHOWN
5. CONNECT HOUSE STORMWATER PIPES TO KERB AND GUTTER AND NEW PIPES
6. KIKUYU TURF TO BE LAID OVER ALL AREAS OF CUT OR FILLED FOOTWAY
7. CONTACT THE HORTICULTURAL OFFICER RE TREE PLANTING WHEN JOB IS NEARING COMPLETION
8. INCREASE CROSSFALL ON FOOTPATH TO 65mm ON FOOTPATH PIT AND AS SHOWN ON PLAN No M424
9. ALL PIPES TO HAVE RUBBER RING JOINTS

City of Ryde

SCALES
Plan 1 : 250
Longitudinal Section Horiz. 1 : 250 / Vert. 1 : 100
Cross Sections 1 : 100

Surveyed: FD
Designed: GD
Drawn: GD
Checked:

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GROUP MANAGER PUBLIC WORKS & SERVICES
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AMENDMENTS

Datum : AHD

PITTWATER ROAD
SHARED PATH CONCEPT DESIGN COXS RD TO CARRAMAR AVE

SHEET No.
No. OF SHEETS
PLAN No.

H:\ACAD\JOBS\PITTWATER RD SHARED PATH CONCEPT\PITTWATER COXS TO CARRAMAR.dwg

WHERE POSSIBLE UPGRADE INTERSECTION TO IMPROVE PEDESTRIAN AND CYCLIST SAFETY

Section D
Carramar Ave to Magdala Rd
Length = 160m

PLAN 17

H:\ACAD\JOBS\PITTWATER SHARED PATH CONCEPT\PITTWATER CARRAMAR TO EPPING.dwg

City of Ryde

SCALES
Plan 1:
Longitudinal Section Horiz 1:
Vert 1:
Cross Sections 1:

Surveyed GD
Designed GD
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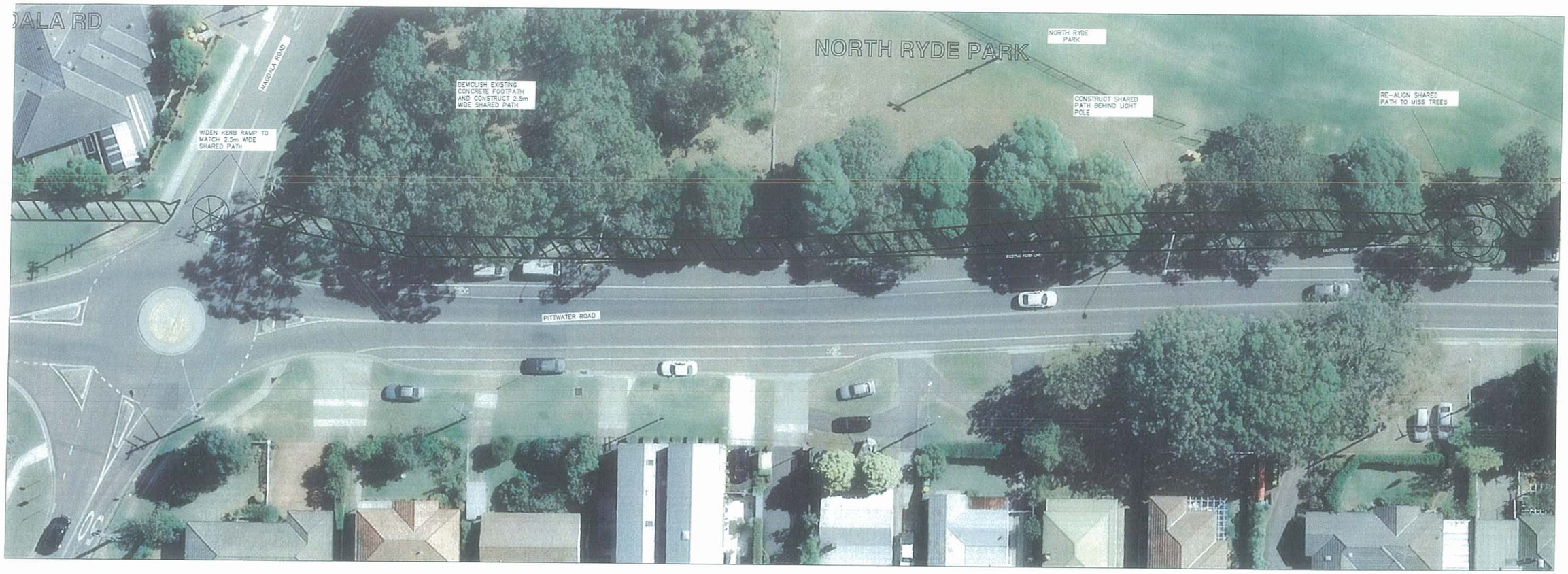
AMENDMENTS

Datum AHD

PITTWATER ROAD
SHARED PATH CONCEPT DESIGN
CARRAMAR AVENUE TO MAGDALA ROAD

SHEET No
No OF SHEETS
PLAN No



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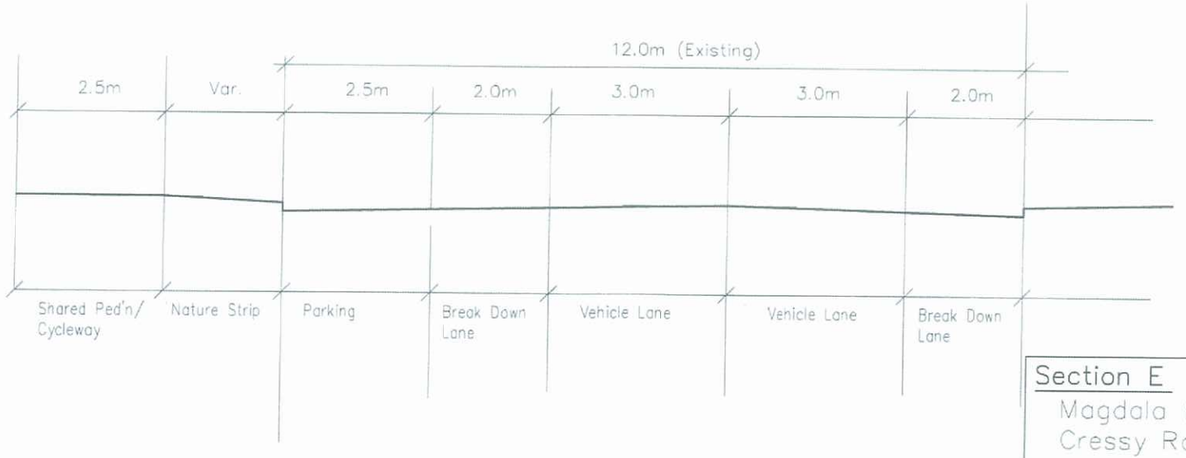

Section E
Magdala Rd to Cressy Rd
Length = 280m

PLAN 18

City of Ryde

SCALES
Plan 1:.....
Longitudinal Section Horiz 1:.....
Vert 1:.....
Cross Sections 1:.....

Surveyed GD
Designed GD
Drawn GD
Checked

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PITTWATER ROAD
SHARED PATH CONCEPT DESIGN
MAGDALA ROAD TO CRESSY ROAD

SHEET No
No. OF SHEETS
PLAN No

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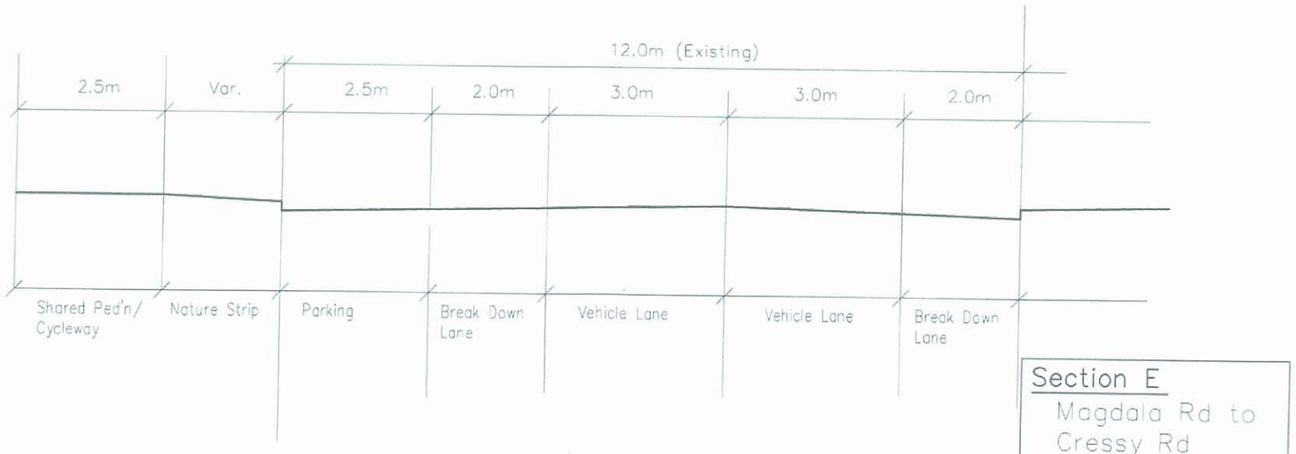
WHERE POSSIBLE UPGRADE INTERSECTION TO IMPROVE PEDESTRIAN AND CYCLIST SAFETY



Section E
Magdala Rd to Cressy Rd
Length = 280m

PLAN 19

City of Ryde

SCALES
Plan 1 :
Longitudinal Section Horiz 1 : Vert 1 :
Cross Sections 1 :

Surveyed GD
Designed GD
Drawn GD
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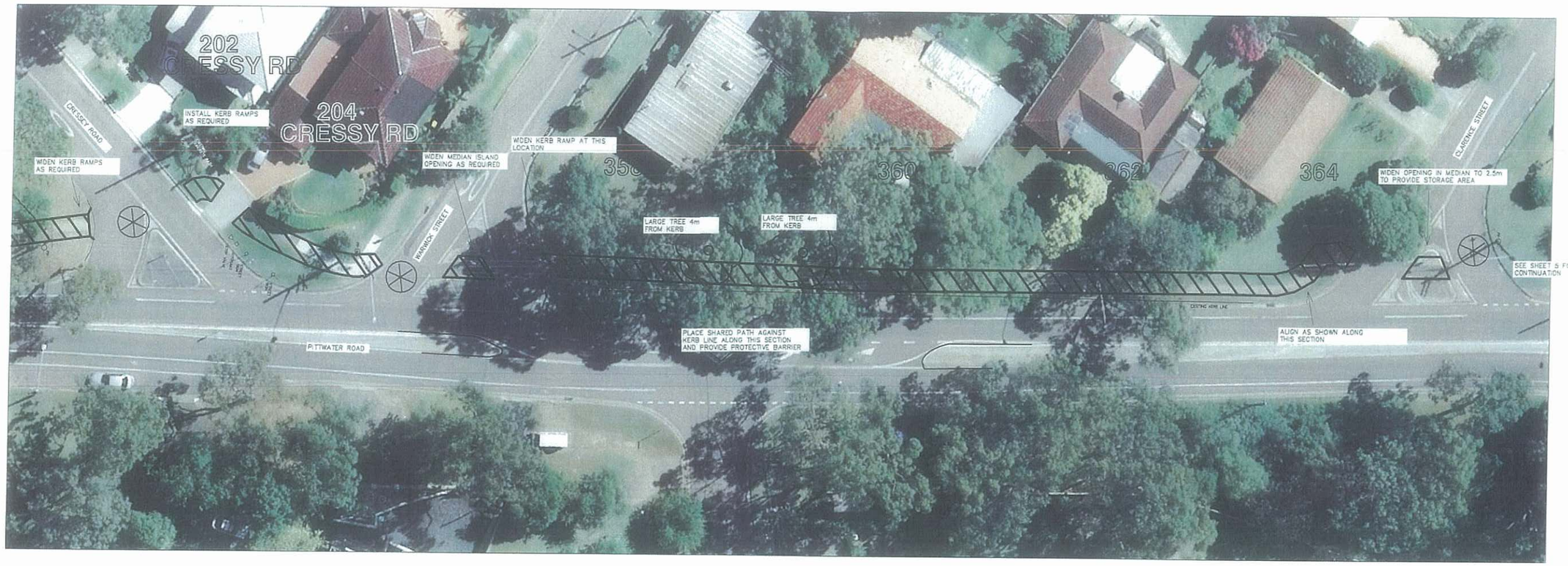
AMENDMENTS

Datum AHD

PITTWATER ROAD
SHARED PATH CONCEPT DESIGN
MAGDALA ROAD TO CRESSY ROAD

SHEET No
No OF SHEETS
PLAN No



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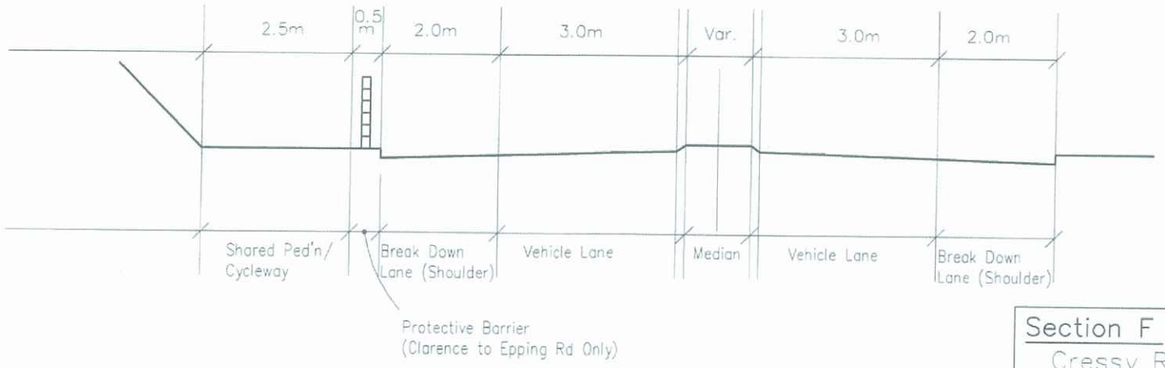

Section F
Cressy Rd to Clarence Street
Length = 140m

PLAN 20

H:\ACAD\JOBS\PITTWATER SHARED PATH CONCEPT\PITTWATER CARRAMAR TO EPPING.dwg

City of Ryde

SCALES
Plan 1:
Longitudinal Section Horiz 1:
(Vert 1:
Cross Sections 1:

Surveyed GD
Designed GD
Drawn GD
Checked

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GROUP MANAGER PUBLIC WORKS & SERVICES
Date / /

AMENDMENTS

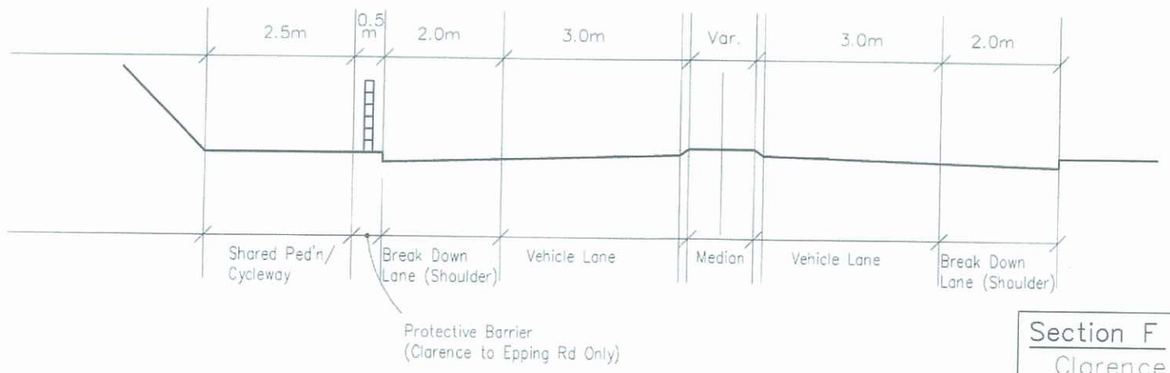
Datum AHD

PITTWATER ROAD
SHARED PATH CONCEPT DESIGN
CRESSY ROAD TO CLARENCE STREET

SHEET No
No. OF SHEETS
PLAN No

WHERE POSSIBLE UPGRADE INTERSECTION TO IMPROVE PEDESTRIAN AND CYCLIST SAFETY

PLAN



SECTION

Section F
Clarence St to Blenheim Rd
Length = 130m

PLAN 21

H:\PITTWATER_CARRAMAR_TO_EPPING_PHOTO_SEPT10\PLAN4

City of Ryde

SCALES
Plan 1:
Longitudinal Section Horiz 1: Vert 1:
Cross Sections 1:

Surveyed: GD
Designed: GD
Drawn: GD
Checked:

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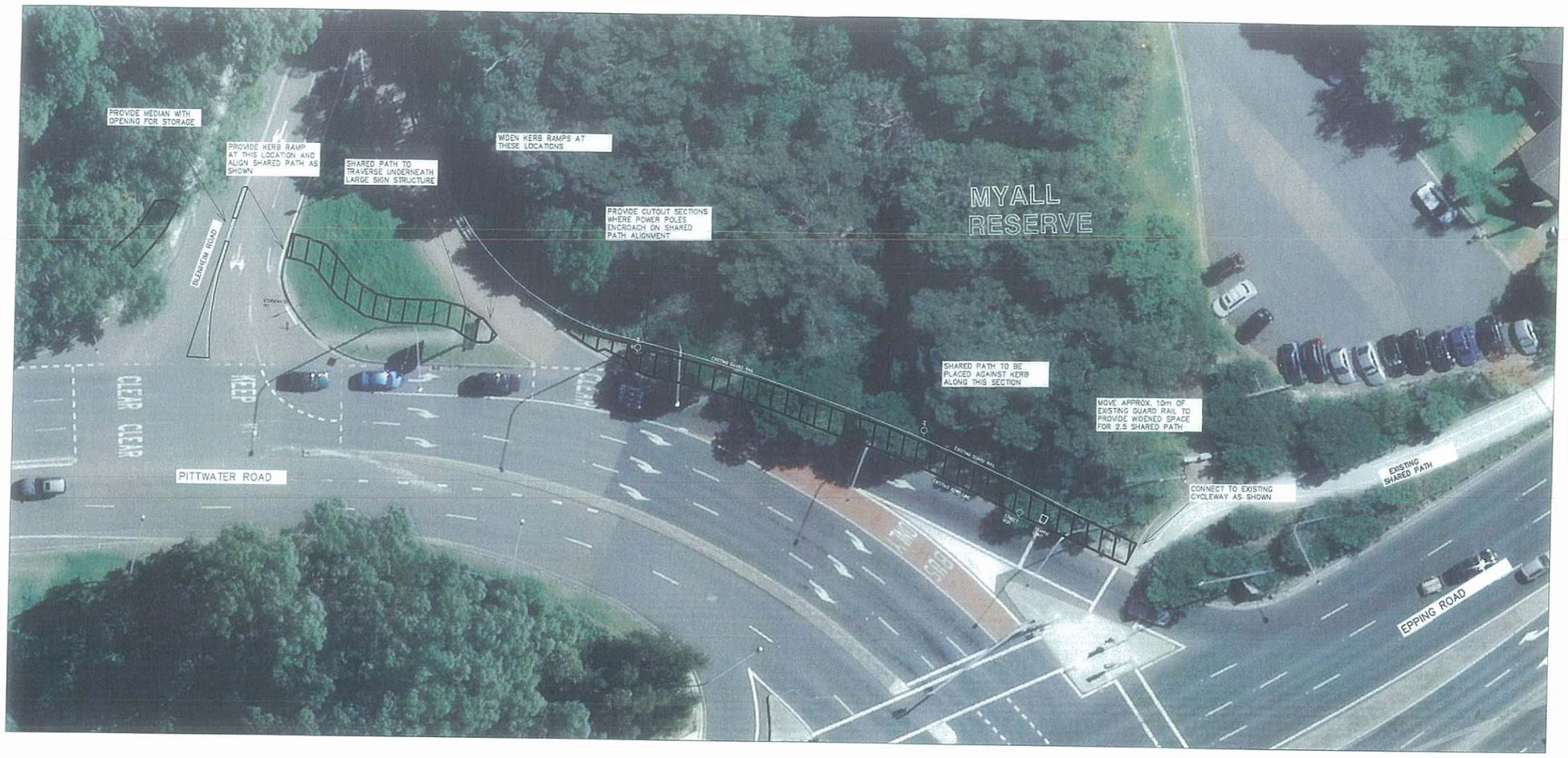
Date / /

AMENDMENTS

Datum AHD

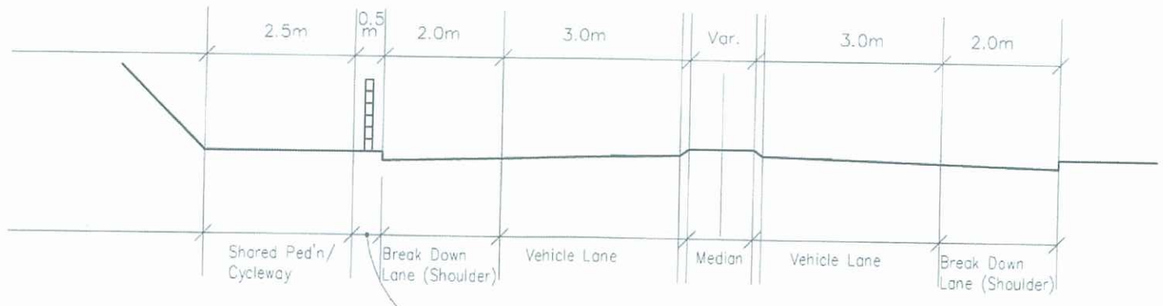
PITTWATER ROAD
SHARED PATH CONCEPT DESIGN
CLARENCE STREET TO BLENHEIM ROAD

SHEET No
No. OF SHEETS
PLAN No



PLAN

WHERE POSSIBLE UPGRADE INTERSECTION TO IMPROVE PEDESTRIAN AND CYCLIST SAFETY



SECTION

Section F
Blenheim Rd to Epping Rd
Length = 100m

PLAN 22

City of Ryde

SCALES
Plan 1:....
Longitudinal Section Horiz 1:.... Vert 1:....
Cross Sections 1:....

Surveyed: GD
Designed GD
Drawn GD
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PITTWATER ROAD
SHARED PATH CONCEPT DESIGN
BLENHEIM ROAD TO EPPING ROAD

SHEET No.
No. OF SHEETS
PLAN No.

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Appendix D

Flora and Fauna Assessment

PITTWATER ROAD UPGRADE: EPPING ROAD TO HIGH STREET, RYDE

Flora and Fauna Assessment

Prepared for
City of Ryde

18th July 2011

DOCUMENT TRACKING

ITEM	DETAIL
Project Name	Pittwater Road Upgrade (Epping Road to High Street, Ryde): Fauna and Fauna Assessment
Project Number	11SYDECO-0057
File location	G:\Synergy\Projects\11SYDECO\11SYDECO-0057 Pittwater Rd Upgrade Flora & Fauna Assessment\Report\Draft Reports
Prepared by	Enhua Lee
Approved by	David Bonjer
Status	DRAFT
Version Number	3
Last saved on	18 July 2011
Cover photos	Left: Pittwater Road north of Bronhill Avenue, facing south. Right: Mangrove vegetation in Buffalo Creek west of intersection with Pittwater Road, facing north. Photos taken on 27/05/11 by Jennifer Fitzgerald.

This report should be cited as 'Eco Logical Australia 2011. *Pittwater Road Upgrade (Epping Road to High Street, Ryde): Flora and Fauna Assessment*. Prepared for City of Ryde.'

ACKNOWLEDGEMENTS

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Contents

1 Introduction 6
1.1 Background 6
1.2 Subject site and Locality 6
1.3 Proposed Works 7
1.4 Report Objectives 8

2 Legislative Requirements 12
2.1 Commonwealth Legislation 12
2.1.1 Environment Protection and Biodiversity Conservation Act 1999 12
2.2 State Legislation and Policies 12
2.2.1 Environmental Planning and Assessment Act 1979 12
2.2.2 Threatened Species Conservation Act 1995 13
2.2.3 Fisheries Management Act 1994 13
2.2.4 Water Management Act 2000 13
2.3 Local Government Plans 14

3 Methods 15
3.1 Data Audit and Literature Review 15
3.2 Site Inspection 16
3.3 Survey Limitations 17

4 Results 19
4.1 Vegetation Communities 19
4.2 Habitat Elements 24
4.3 Flora 27
4.4 Fauna 27

5 Impact Assessment 29
5.1 Methods 29
5.1.1 Impact Assessment- TSC Act Listed Species 29
5.1.2 Impact Assessment- EPBC Act Listed Species 30
5.2 Results 31
5.2.1 Impact Assessment- TSC Act Listed Species 31
5.2.2 Impact Assessment- EPBC Act Listed Species 32

6 Conclusion 33

References 34

Appendix A: Threatened Species Likelihood of Occurrence Tables 38

Appendix B: Flora Species Recorded During Site Inspection 67

Appendix C: Fauna Species Recorded During Site Inspection 72

Appendix D: Assessments of Significance 73

Appendix E: Significance Assessments 159

List of Figures

Figure 1: Location of the subject site in the locality. 9

Figure 2: Direct impacts to ecological values in the subject site. 10

Figure 3: Patches of remnant vegetation adjacent to the subject site for which separate flora lists were made. Note that patches were surveyed from the subject site and thus only included species that could be seen from the subject site. Survey polygon numbers are indicated. 18

Figure 4: Vegetation mapping in the subject site and study area as per the 2008 western Sydney mapping. 20

Figure 5: Vegetation mapping in the subject site and study area as per the SMCMA mapping. 21

Figure 6: Location of some hollow-bearing trees observed within or directly adjacent to the subject site. 26

Figure 7: Location of some threatened flora and fauna species in the study area. Note that not all species with the potential to occur in the study area are shown. 28

List of Plates

Plate 1: Eucalyptus acmenoides (White Mahogany) to be removed in the subject site. 11

Plates 2 and 3: Rock face between Rene and High Streets which will be impacted by the proposed works 11

List of Tables

Table 1: Number of positive diagnostic species per potential SMCMA vegetation community within patches of remnant vegetation adjacent to the subject site (for location of patches, refer to Figure 3). 22

Abbreviations

ABBREVIATION	DESCRIPTION
CABF	Coastal Alluvial Bangalay Forest
CESMF	Coastal Enriched Sandstone Moist Forest
CESSF	Coastal Enriched Sandstone Sheltered Forest
CSFF	Coastal Sandstone Foreshores Forest
CSSPAF	Coastal Sandstone Sheltered Peppermint-Apple Forest
Council	City of Ryde
DCP	Development Control Plan
EEC	Endangered Ecological Community
ELA	Eco Logical Australia
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection & Biodiversity Conservation Act 1999*
EMF	Estuarine Mangrove Forest
ES	Estuarine Saltmarsh
ESOF	Estuarine Swamp Oak Forest
FM Act	NSW *Fisheries Management Act 1994*
LEP	Local Environmental Plan
NES	Matters of National Environmental Significance
REF	Review of Environmental Factors
SEWPAC	Commonwealth Department of Sustainability, Environment, Water, Population and Communities
SMCMA	Sydney Metropolitan Catchment Management Authority
SOFFCS Complex	Swamp Oak Floodplain Forest and Coastal Saltmarsh Complex
SSF	Swamp Sclerophyll Forest EEC
WM Act	NSW *Water Management Act 2000*

1 Introduction

1.1 BACKGROUND

Pittwater Road, a two lane road in the Ryde Local Government Area running between Epping Road, North Ryde and Victoria Road, Gladesville, is currently being investigated by the City of Ryde (Council) for road upgrade works. Council is responsible for the upkeep and safety of this road, and in recent years, has upgraded sections of the road with the assistance of a shared funding arrangement with the NSW Roads and Traffic Authority.

Community concern in 2010 about proposed upgrade works of Pittwater Road between Carramar Avenue and Coxs Road led Council to seek an integrated, rather than piecemeal, approach to a longer 3.1 km section of Pittwater Road, inclusive of this section, between Epping Road and High Street. Council commissioned Cardno to prepare a Review of Environmental Factors. In May 2011, Eco Logical Australia (ELA) was commissioned to conduct an assessment of the likely effects of the proposal on the ecological values in the study area.

This document represents the ecological impact assessment for the proposed development. It builds on previous assessments conducted for the section of Pittwater Road between Carramar Avenue and Bronhill Avenue (City of Ryde 2010; and ELA 2010) and between Rene and High Streets (Cardno 2009) and reports on the ecological values present within the subject site and study area. This report assesses the impacts of the proposal on the ecological values in the subject site and study area and considers these in relation to current environmental conservation legislation.

1.2 SUBJECT SITE AND LOCALITY

The subject site is a linear 3.1 km section of Pittwater Road between Epping Road and High Street, extending from the western edge of the road to approximately 5 m from the road edge (to the west). This section of road is located in the Ryde Local Government Area (latitude and longitude in the middle of the subject site between Epping Road and High Street approximately 151º8'E, 33º48'S) (Figure 1). For most of its length, the site is bound by residential development on its western side. However, the western side of the subject site is also bound by remnant vegetation contained in Council Reserves (Myall Reserve, North Ryde Park, Martin Reserve, Kitty's Creek Reserve, and Field of Mars). The eastern edge of the subject site is demarcated by Pittwater Road.

Besides remnant vegetation in the Council Reserves to the west of the site, remnant vegetation is present in the study area (area of direct and indirect impact from the proposal) and locality (within 10 km of the site). Yinnell and Boobajool Reserve are present to the east of Pittwater Road, near Epping Road and between Mars Street and Bronhill Avenue, respectively. The nearest National Park or Nature Reserve to the site are Lane Cove National Park and Wallumatta Nature Reserve. Lane Cove National Park is located directly adjacent to Pittwater Road to the east, south from Bronhill Avenue to the Field of Mars, while Wallumatta Nature Reserve lies to the west of the site, approximately 600 m away, near the headwater of Kittys Creek. Garigal National Park lies approximately 5.5 km away, to the north east.

Vegetation in the study area and locality are comprised of woodland and wetland communities, some of which are threatened in NSW, with some also threatened nationally, as a result of heavy clearing for urban and rural development in the area. Much of the vegetation remnants in the locality are Sandstone Ridgetop Woodland, and the endangered ecological communities (EECs) Sydney

Turpentine-Ironbark Forest and Blue Gum High Forest, although other vegetation communities are present (vegetation communities after NSW NPWS 2002a and b).

Hawkesbury Sandstone forms the underlying geology of the site, with Liverpool Shale also present in the locality. In some parts of the subject site, such as between Rene and High Streets, the underlying sandstone has been exposed as a result of previous road works which cut into the sandstone.

A number of major and minor watercourses are present in the study area and locality. The major waterway, Lane Cover River, is present to the east of the site. Minor watercourses near the site are Pages, Martins, Kittys, Strangers and Buffalo Creeks. Pages Creek is present to the south of Epping Road and east of Pittwater Road, but does not cross Pittwater Road; Martins Creek merges with Kittys Creek on the west of Pittwater Road prior to Kittys Creek crossing Pittwater Road at Kittys Creek Reserve; and Strangers Creek merges with Buffalo Creek on the west of Pittwater Road prior to Buffalo Creek crossing Pittwater Road on the eastern edge of the Field of Mars.

The climate of the area is typical of the Sydney region, which can generally be described as temperate.

1.3 PROPOSED WORKS

The proposed works will involve general road upgrade and stormwater works, and works to install a shared user path, in order to address safety concerns and allow for the use of the subject site by pedestrians and cyclists. The works to be undertaken for each type of work are outlined below:

General road upgrade works

- Upgrading of the kerb and guttering works throughout;
- Re-surfacing of the road in areas (where required);
- Replacement of guardrails in sections where the existing guardrail is unsatisfactory;
- Realignment of driveways (where required); and
- Construction of breakdown lane in some areas.

Stormwater works

- Installation of four sedimentation basins.

Shared user path works

- Construction of the shared user path
- Excavation of the rock face between Rene and High Streets;
- Construction of a cantilevered section on the existing bridge over Buffalo Creek;
- Realignment of driveways (where required); and
- Provision of protective barriers between the shared user path and the roadway.

Under the proposal, the majority of remnant vegetation within Council Reserves adjacent to the subject site will be retained. However, planted vegetation (*Allocasuarina* sp.) along Pittwater Road, above where Buffalo Creek crosses the road, will be removed. Further, 2 native trees within the road reserve will be removed. One of these trees is a mature *Eucalyptus acmenoides* (White Mahogany), located just north of Coxs Road, while the other tree is a small *Angophora bakeri* (Narrow-leaved Apple), located to the south of Cressy Road. A number of shrubs currently present on the rock escarpment between Rene and High Streets will also be trimmed or removed to allow a greater level of clearance above the shared user path. Some mangrove vegetation may require minor trimming where the shared user path crosses Buffalo Creek, should it obstruct the path.

Figure 2 shows the impacts as they relate to ecological issues. Plate 1 shows the White Mahogany to be removed, while Plates 2 and 3 show the rock face which will be impacted by the proposed works.

1.4 REPORT OBJECTIVES

The aims of this report are to:

- Report on the ecological values present in the subject site and study area, building on previous ecological assessments conducted for the section of Pittwater Road between Carramar Avenue and Bronhill Avenue (City of Ryde 2010; and ELA 2010) and between Rene and High Streets (Cardno 2009); and
- Conduct significance assessments in accordance with Section 5A of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) and the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999* (EPBC Act) for threatened species, populations or ecological communities likely to occur in the subject site and study area.

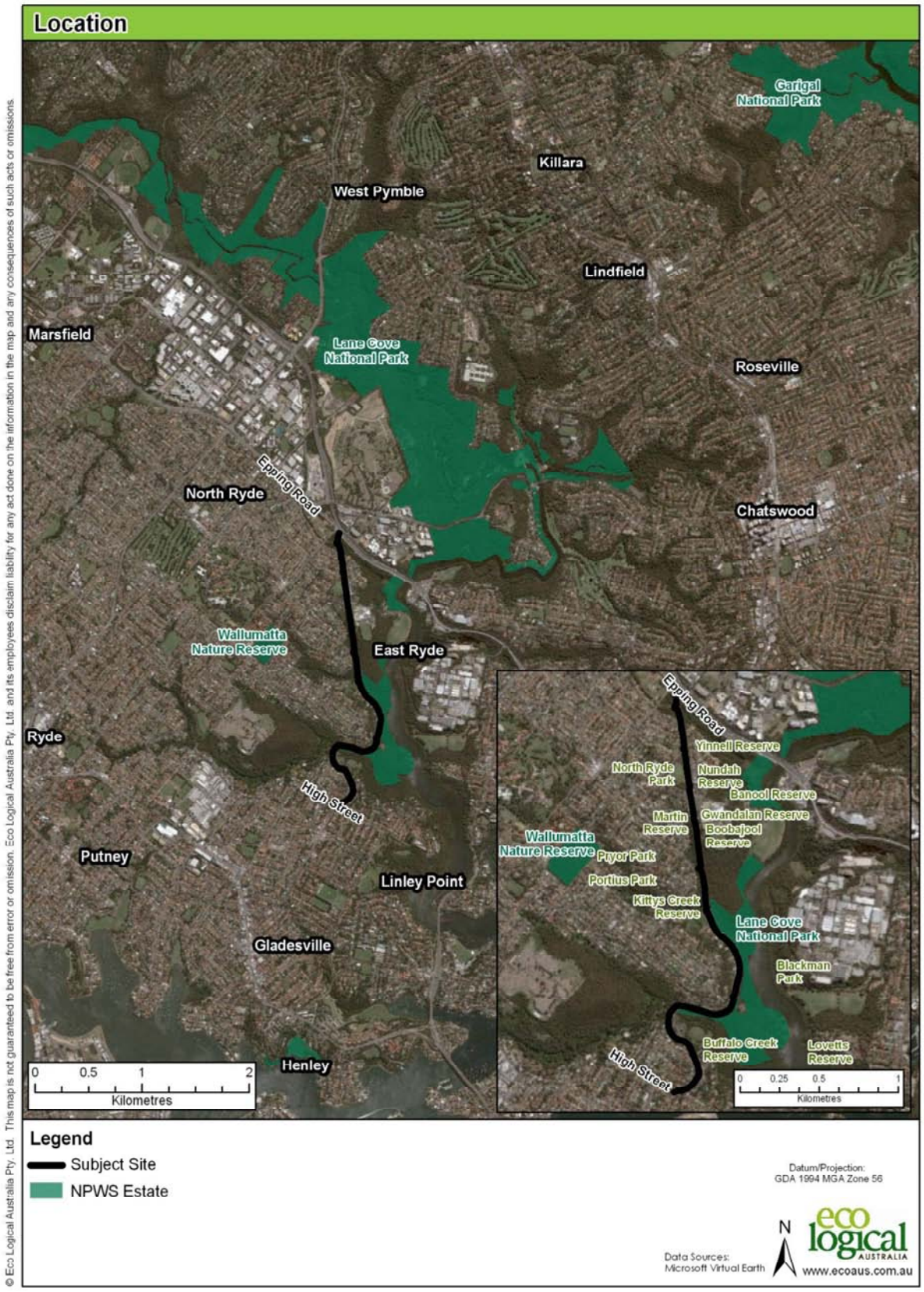

Figure 1: Location of the subject site in the locality.

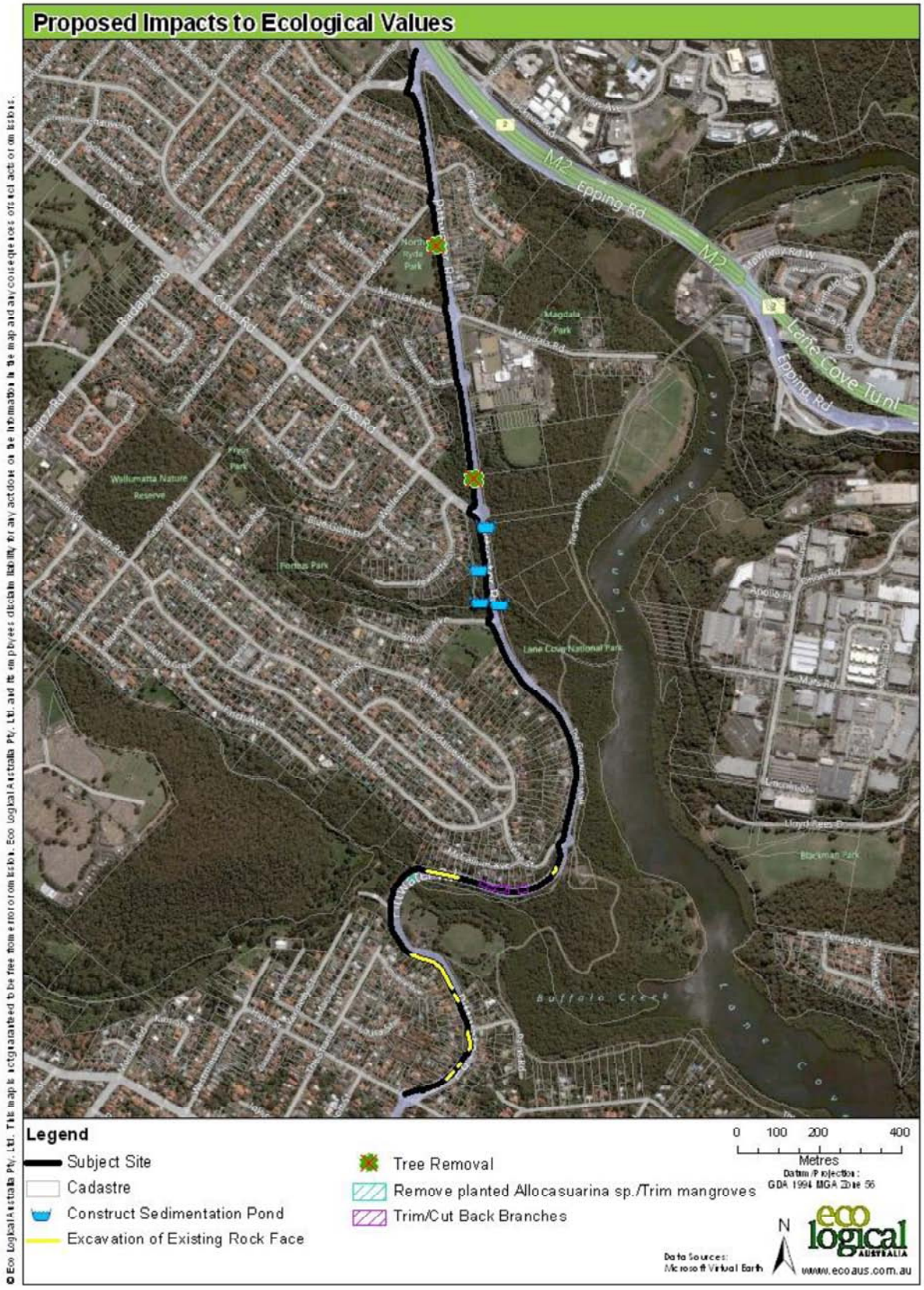

Figure 2: Direct impacts to ecological values in the subject site.

Plate 1: *Eucalyptus acmenoides* (White Mahogany) to be removed in the subject site.

Plates 2 and 3: Rock face between Rene and High Streets which will be impacted by the proposed works.

2 Legislative Requirements

Commonwealth and State legislation and policies, as well as local policies apply to the assessment, planning and management of ecological issues within the site. A brief outline of the relevant Commonwealth and State Acts and Policies, and local policies, is provided below.

2.1 COMMONWEALTH LEGISLATION

2.1.1 Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth *Environment Protection & Biodiversity Conservation Act 1999* (EPBC Act) establishes a process for assessing the environmental impact of activities and developments where 'matters of national environmental significance' (NES) may be affected. NES matters relevant to this study include threatened species, ecological communities and migratory species (JAMBA/CAMBA/ ROKAMBA) that are listed under the Act.

Under the Act, any action which "has, will have, or is likely to have a significant impact on a matter of national environmental significance" is defined as a "controlled action", and requires approval from the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (SEWPAC: formerly the Department of the Environment, Water, Heritage and the Arts; DEWHA), which is responsible for administering the EPBC Act.

Actions that may have a significant impact on one or more matters of NES need to be referred to the Department under the EPBC Act. The EPBC Act referrals process can produce one of three outcomes:

i. Non-controlled action (NCA): Assessment and approval under the EPBC Act is **not required**. The project may proceed without further approval under the EPBC Act.

ii. Non-controlled action – specified manner (NCA-SM): Assessment and approval under the EPBC Act is **not required** provided the action is undertaken in a specific way (similar to conditions).

iii. Controlled Action (CA): The project will, or is likely, to have a significant impact on one or more matters of national environmental significance. The project **will require** full assessment and approval before it can proceed.

This report highlights any EPBC NES matters and advises if a referral to SEWPAC is required.

2.2 STATE LEGISLATION AND POLICIES

2.2.1 Environmental Planning and Assessment Act 1979

The NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) is the principal planning legislation for the state, providing a framework for the overall environmental planning and assessment of development proposals. Various legislation and instruments, such as the NSW *Threatened Species Conservation Act 1995* (TSC Act) and *Fisheries Management Act 1994* (FM Act), are integrated with EP&A Act.

In determining a development application under Parts 4 or 5 of the Act, the consent authority is required to take into consideration matters listed under Section 79C of the EP&A Act that are relevant to the application. Key considerations include:

- Any environmental planning instrument, including drafts;
- The likely impacts of the development (including on biodiversity and threatened species, populations or ecological communities listed under the TSC Act);
- The suitability of the site for the development;
- Any submissions made in accordance with the EP&A Act or its regulations; and
- The public interest.

2.2.2 Threatened Species Conservation Act 1995

The NSW *Threatened Species Conservation Act* (TSC Act), as amended, aims to protect and encourage the recovery of threatened species, populations and communities listed under the Act. The interactions between the TSC Act and the EP&A Act requires consideration of whether a development (Part 4 of the EP&A Act), or an activity (Part 5 of the EP&A Act), is likely to significantly affect threatened species, populations, ecological communities or their habitats.

This report highlights threatened species, communities and populations and their habitats that are present or have the potential to be present on the subject site, and assesses potential impact on threatened species, communities and populations and their habitats.

2.2.3 Fisheries Management Act 1994

The *Fisheries Management Act 1994* (FM Act) provides for the protection, conservation and recovery of threatened species defined under the Act. It also makes provision for the management of threats to threatened species, populations and ecological communities defined under the Act, as well as the protection of fish and fish habitat in general. The interactions between the TSC Act and the EP&A Act requires consideration of whether a development (Part 4 of the EP&A Act), or an activity (Part 5 of the EP&A Act), is likely to significantly affect threatened species, populations, ecological communities or their habitats.

A number of activities require consultation and approval from the Department of Trade and Investment, Regional Infrastructure and Services (DTIRIS) (Fisheries). Permits must be obtained from DTIRIS to harm mangroves, where "harm" means gather, cut, pull up, destroy, poison, dig up, remove, injury, prevent light from reaching or otherwise harm the marine vegetation, or any part of it.

2.2.4 Water Management Act 2000

The *Water Management Act 2000* (WM Act) provides a number of mechanisms for protection of water sources via the water management planning process. If a 'controlled activity' is proposed on 'waterfront land', an approval is required under Section 91 (2) of the WM Act. 'Controlled activities' include; the construction of buildings or carrying out of works; the removal of material or vegetation from land by excavation or any other means; the deposition of material on land by landfill or otherwise. 'Waterfront land' is defined as 'the bed of any river or lake, and any land lying between the river or lake and a line drawn parallel to and 40 m inland from either the highest bank or shore'.

However, clause 39A(1) of the *Water Management (General) Regulation 2004* states that all public authorities and local Councils are exempt from obtaining controlled activity approval; thus, the City of Ryde, as the proponent of the works, is not required to obtain an approval under this Act.

2.3 LOCAL GOVERNMENT PLANS

The Ryde Local Environmental Plan (LEP) 2010 is the principal planning instrument for the Ryde Local Government Area. This LEP sets out planning decisions and establishes the requirements for the protection, use and development of land in Ryde. In the hierarchy of City of Ryde's environmental planning documents it stands at the top, providing broad direction. Further detail is provided in City of Ryde's Development Control Plan (DCP) 2010, which provides a range of development criteria for residential areas, urban centres and character areas as well as development criteria relating to environmental and engineering matters.

A number of chapters in the DCP, including Chapters 8 (Engineering) and 9 (Other Provisions), are relevant to the proposed works. The Development Control Plan "Environmental Standards – Development Criteria Section 4 – Public Civic Works" is also relevant to the proposed works. This DCP is currently in draft form and directs the design of public roads and stormwater drainage.

3 Methods

3.1 DATA AUDIT AND LITERATURE REVIEW

Database records and relevant literature pertaining to the ecology of the subject site and surrounding area, as well as previous ecological reports and Reviews of Environmental Factors (REFs) encompassing the study area were reviewed. The material reviewed included:

- DECC Vegetation of the Cumberland Plain, Final Edition – Vegetation & Core Habitat Mapping (DECC 2008);
- NPWS Vegetation of the Cumberland Plain – Vegetation & Core Habitat Mapping (NSW NPWS 2002a);
- Native Vegetation Interpretation Guidelines for Western Sydney Vegetation (NSW NPWS 2002b);
- The Native Vegetation of the Sydney Metropolitan Catchment Management Authority (SMCMA) Area - Native Vegetation Mapping (DECC 2009a);
- The Native Vegetation of the Sydney Metropolitan Catchment Management Authority (SMCMA) Area. Volume 2: Vegetation Community Profiles (DECC 2009b);
- Review of Environmental Factors: Proposed Upgrade and Cycleway, Pittwater Road from High Street, Gladesville to Rene Street, East Ryde (Cardno 2009);
- Review of Environmental Factors: Pittwater Road Reconstruction, Bronhill Ave to Carramar Ave, East Ryde (City of Ryde 2010);
- Pittwater Road Cycleway, East Ryde: Flora and Fauna Assessment and Assessment of Significance (ELA 2010);
- *Lane Cove Estuary Salt Marsh Site Assessments*. (Applied Ecology, 2010).
- Department of Environment, Climate Change and Water (DECCW) Atlas of NSW Wildlife. Search of data supplied May 2011, 10 km search radius); and
- Department of Sustainability, Environment, Water, Population and Communities (SEWPAC) Online search for Matters of National Environmental Significance (point search of coordinates -33.8069, 151.1382 with 10km buffer) (Accessed 3 June 2011).

High resolution aerial photographs (Virtual Earth) of the subject site and surrounding area were also used to investigate the extent of vegetation cover, landscape features and land use in the area prior to field survey. In addition, relevant GIS datasets (soil, drainage) were reviewed to guide the field survey component.

Species from both Atlas searches and searches for EPBC Act Matters of National Environmental Significance were combined to produce a list of threatened species that may occur within the study area ("subject species") (Appendix A). Likelihood of occurrences for threatened species, endangered populations and communities in the study area were then made based on location of database records, the likely presence or absence of suitable habitat on the subject site, and knowledge of the species' ecology, to limit the list of threatened species to potentially "affected species" (those that were defined as "yes", "likely" or having "potential" to occur in the study area – see below).

Five terms for the likelihood of occurrence of species are used in this report, as defined below:

- "yes" = the species was or has been observed in the study area;

- "likely" = a medium to high probability that a species uses the study area;
- "potential" = suitable habitat for a species occurs in the study area, but there is insufficient information to categorise the species as likely to occur, or unlikely to occur;
- "unlikely" = a very low to low probability that a species uses the study area; and
- "no" = habitat in the study area and in its vicinity is unsuitable for the species.

Note that assessments for the likelihood of occurrence were made both prior to field survey and following field survey. The pre-survey assessments were performed to determine which species were "affected species", and hence determine which sorts of habitat to look for during field survey. The post-survey assessments to determine final "affected species" were made after observing the available habitat in the study area first hand.

3.2 SITE INSPECTION

Site survey was performed by two Eco Logical Australia ecologists, Dr Enhua Lee and Dr Jennifer Fitzgerald, on 27th May 2011 over approximately 16 person hours, with a supplementary site visit made by Dr Enhua Lee on 15th July 2011 over approximately 1 hour. Temperatures were cool during both field surveys, with the minimum and maximum temperatures for the 27th March recorded as 5.1°C and 18.7°C, respectively, and the minimum and maximum temperatures for the 15th July recorded as 4.3°C and 13.4°C, respectively (recordings taken from the Bureau of Meteorology website for Lane Cove, the nearest weather station to the subject site). A small amount of rain fell during the survey on the 27th March, with 0.2 mm recorded for the day. No rain fell during survey on 15th July. Further weather details can be found at:
http://www.bom.gov.au/climate/dwo/201105/html/IDCJDW2120.201105.shtml.

During the main field survey, a traverse of the entire length of the subject site was undertaken from Epping Road to High Street, focussing on areas where remnant vegetation and potential fauna habitat were present, and the trees marked for removal, to collect site-specific data pertaining to the vegetation communities and habitat values for threatened flora and fauna potentially occurring in the study area (see Appendix A for list of potentially occurring species, populations and communities).

All visible vascular flora and fauna species, and traces / evidence of fauna species, observed from the western edge of the subject site were recorded, including within remnant vegetation that will not be removed under the proposal, other than in residential areas lacking remnant vegetation, where dominant species were recorded only. Separate flora lists were taken for separate patches of remnant vegetation adjacent to the subject site (see Figure 3). Notes on habitat were also taken, with observations made for areas directly adjacent to the subject site in order to determine the fauna and flora potentially occurring in the study area. Flora species were identified to the lowest taxonomic level possible.

No measurements of cover abundance for flora species were undertaken; however, dominant species within each patch of remnant vegetation were noted. No detailed fauna surveys targeting fauna groups were conducted given that most impacts would be confined to the subject site and habitat for fauna in the subject site was limited to edge and open, generally landscaped and maintained, habitat. Further, the timing of the survey limited the likelihood of detecting fauna: many fauna species are less active and thus detectable during late autumn. It was considered adequate for the purposes of the survey to use habitat assessment as the primary means of determining the likelihood of occurrence for fauna species. Habitat in the study area was also used during assessment of a speces' likelihood of occurrence.

3.3 SURVEY LIMITATIONS

It is likely that species were missed due to the life cycle and behaviour of species and environmental factors. It would be desirable if surveys were repeated over a number of seasons to fully appreciate the diversity of flora and fauna present. In the absence of these surveys, habitat assessments were undertaken.

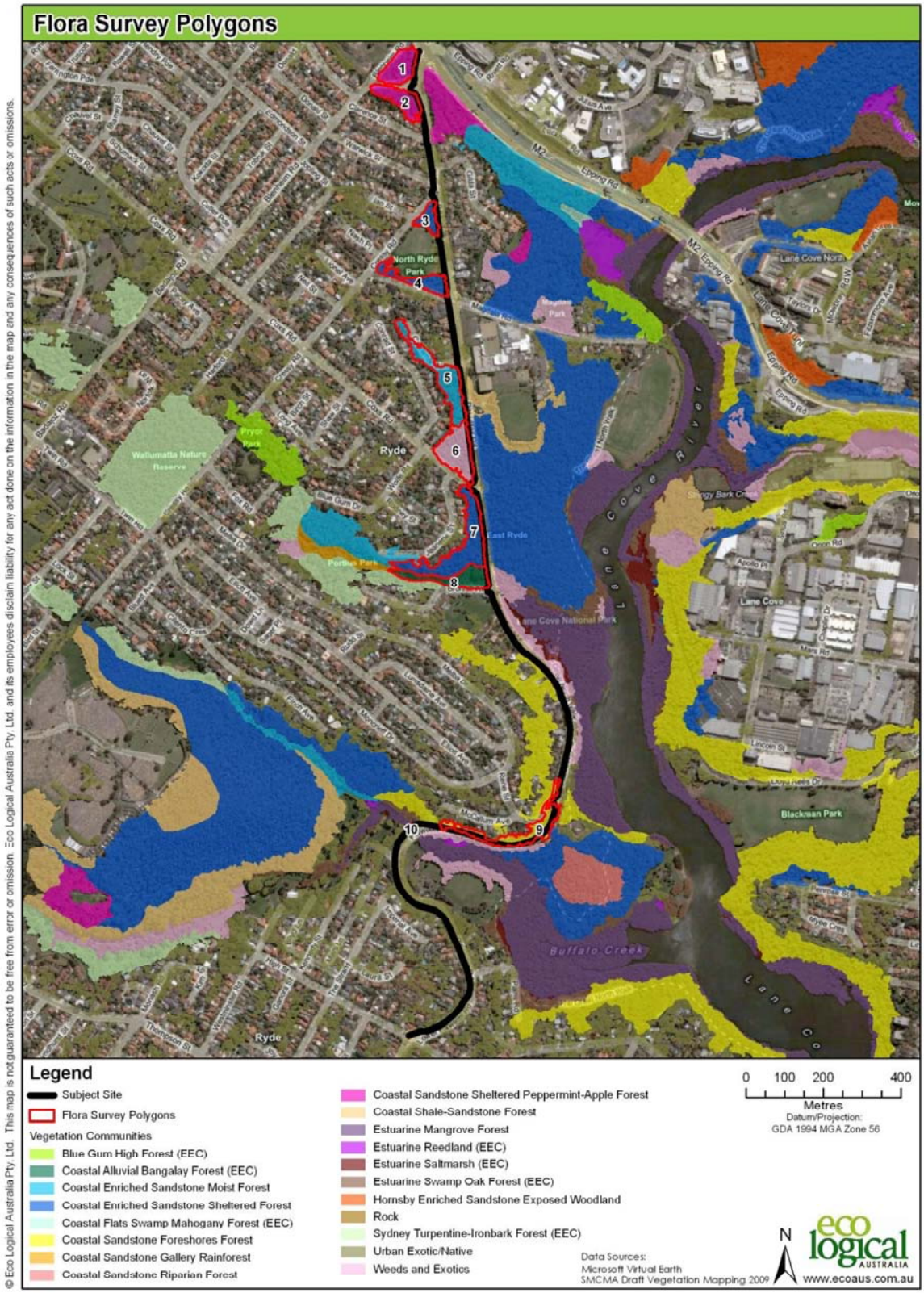

Figure 3: Patches of remnant vegetation adjacent to the subject site for which separate flora lists were made. Note that patches were surveyed from the subject site and thus only included species that could be seen from the subject site. Survey polygon numbers are indicated.

4 Results

4.1 VEGETATION COMMUNITIES

The vegetation community mapping available for the locality comprised of two different classifications, with the 2002 and 2008 vegetation mapping for western Sydney (NSW NPWS 2002a and DECC 2008, respectively) classified differently to the 2009 SMCMA vegetation mapping (DECC 2009a). As such, the vegetation mapping for western Sydney and the SMCMA area differed markedly in the locality, with equivalent vegetation communities in the different vegetation classifications also difficult to decipher.

In the western Sydney mapping (both the 2002 and 2008 mapping), two vegetation communities were mapped in and directly adjacent to the subject site:

- Sydney Sandstone Ridgetop Woodland; and
- Mangrove/Saltmarsh Complex.

Mangrove/Saltmarsh Complex is an amalgamation of mangrove and saltmarsh communities, and includes the endangered ecological community (EEC) listed under the TSC Act, *Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions*. Figure 4 shows vegetation mapping as per the 2008 western Sydney mapping (the 2008 mapping updated the 2002 mapping).

In the SMCMA mapping, 8 vegetation communities were mapped in and directly adjacent to the subject site:

- Coastal Sandstone Sheltered Peppermint-Apple Forest (CSSPAF);
- Coastal Enriched Sandstone Sheltered Forest (CESSF);
- Coastal Sandstone Foreshores Forest (CSFF);
- Coastal Enriched Sandstone Moist Forest (CESMF);
- Coastal Alluvial Bangalay Forest (CABF);
- Estuarine Saltmarsh (ES);
- Estuarine Swamp Oak Forest (ESOF); and
- Estuarine Mangrove Forest (EMF).

Coastal Alluvial Bangalay Forest is equivalent to *Swamp Sclerophyll Floodplain Forest on Coastal Floodplains of the NSW north Coast, Sydney Basin and South East Corner Bioregions*, Estuarine Swamp Oak Forest is equivalent to *Swamp Oak Floodplain Forest on Coastal Floodplains of the NSW north Coast, Sydney Basin and South East Corner Bioregions*, and Estuarine Saltmarsh is equivalent to *Coastal saltmarsh in the NSW North Coast, Sydney Basin and South East Corner bioregions*, listed as EECs under the TSC Act. Figure 5 shows vegetation mapping as per the SMCMA mapping.

Additional vegetation communities were mapped within 5km of the subject site in both the western Sydney and SMCMA mapping, and included the EEC, *Sydney Turpentine-Ironbark Forest*, as well as a other shale and sandstone vegetation communities.

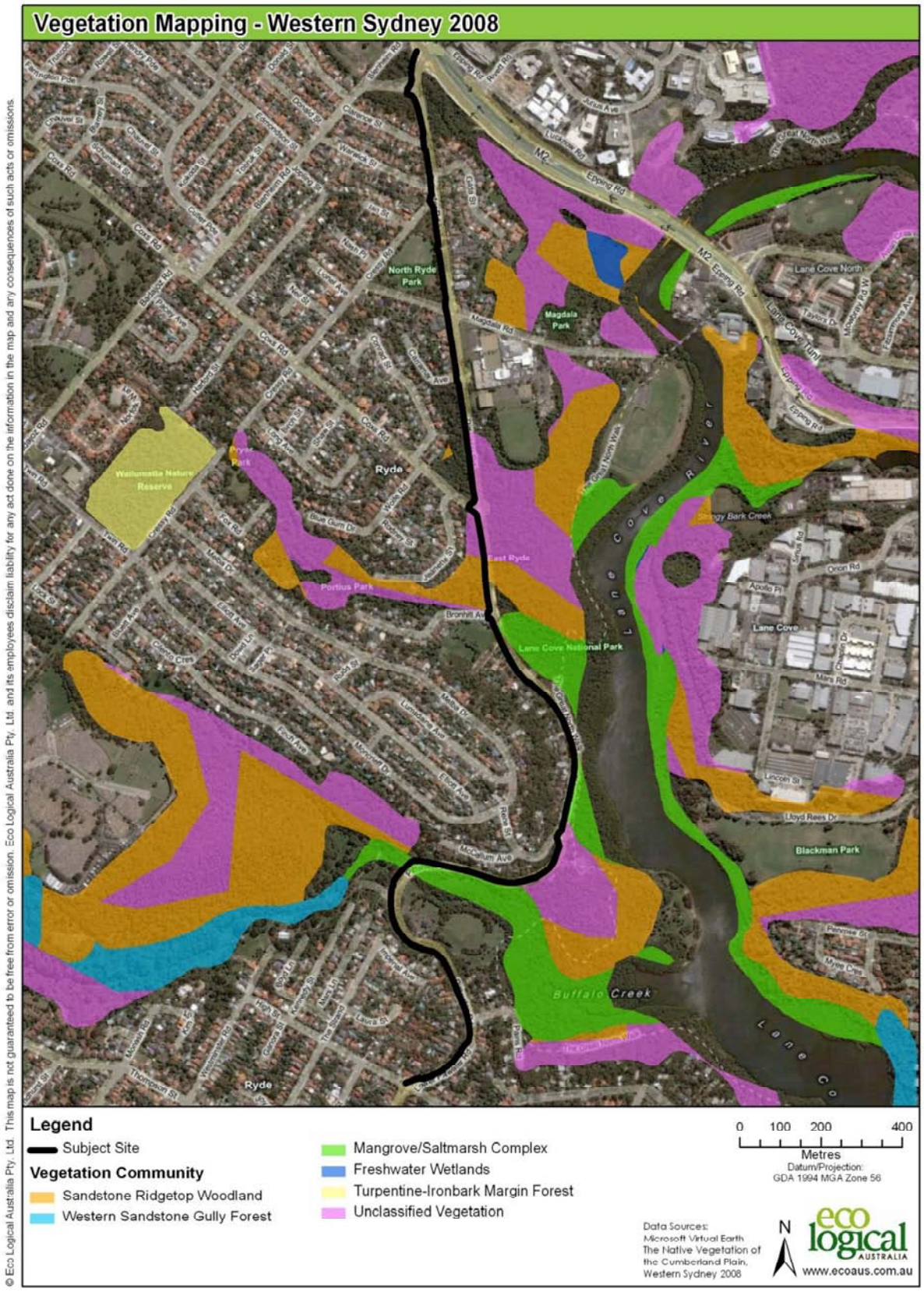

Figure 4: Vegetation mapping in the subject site and study area as per the 2008 western Sydney mapping.

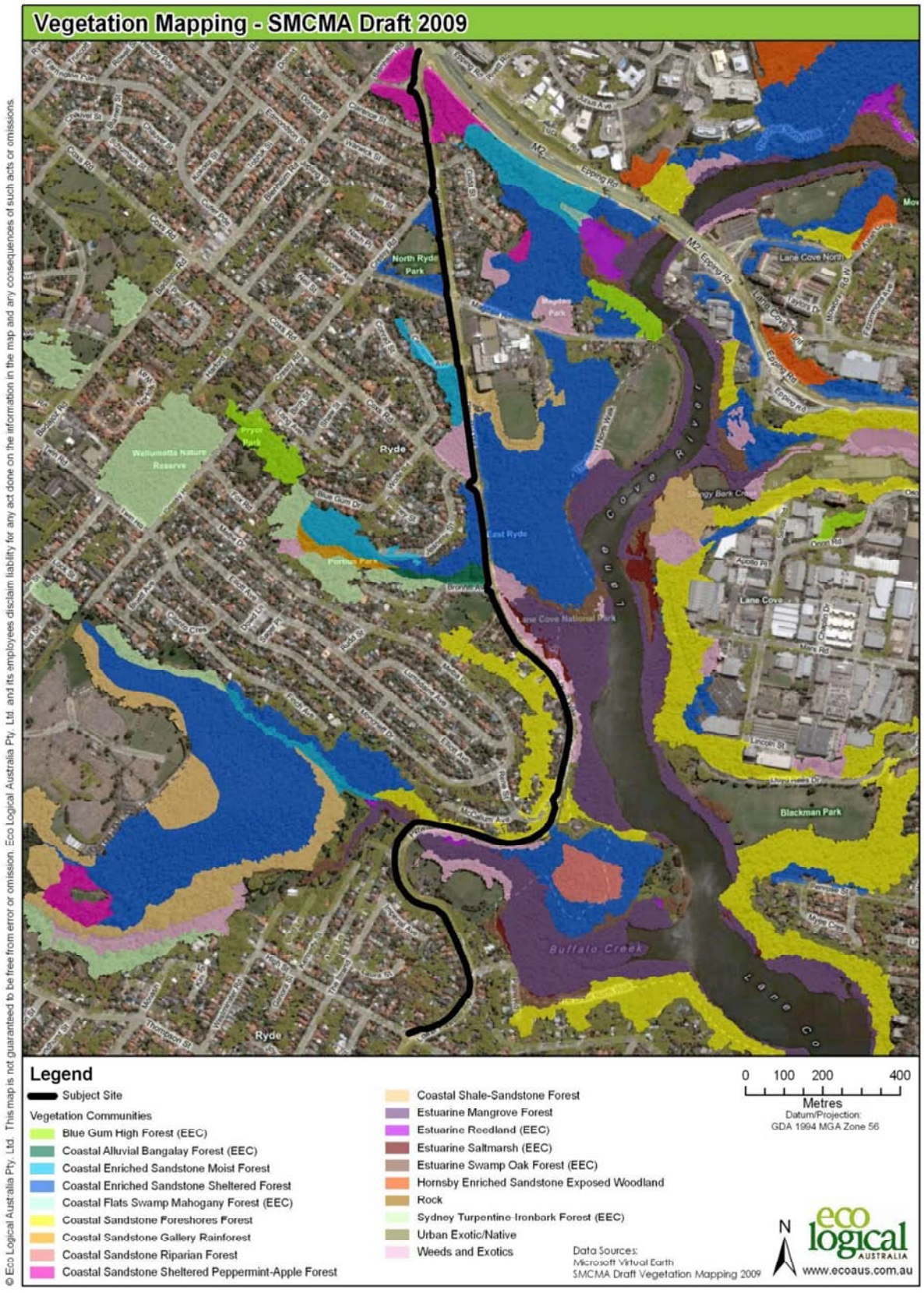

Figure 5: Vegetation mapping in the subject site and study area as per the SMCMA mapping.

Field surveys found that much of the remnant vegetation in and adjacent to the subject site comprised of dry sandstone vegetation, with mangroves and saltmarsh present where Buffalo Creek intersected with Pittwater Road on the eastern part of the Field of Mars. Vegetation communities further from the subject site, for example downstream of the creek lines crossing Pittwater Road, were not confirmed.

The dry sandstone vegetation communities in and adjacent to the subject site were consistent with Sydney Sandstone Ridgetop Woodland as mapped by NSW NPWS (2002 and 2008). However, vegetation communities were less consistent with the mapped vegetation communities in the SMCMA mapping. The patches of vegetation contained flora species that were diagnostic of a number of the vegetation communities in the SMCMA mapping (Table 1). Further, the cover of introduced species within remnant patches was high, complicating vegetation community determination.

Table 1: Number of positive diagnostic species per potential SMCMA vegetation community within patches of remnant vegetation adjacent to the subject site (for location of patches, refer to Figure 3).

REMNANT VEGETATION PATCH NUMBER *	CSSPAF	CESSF	CSFF	CESMF	CABF
1 and 2	3	6	5	5	3
3 and 4	3	4	5	4	1
5	2	3	5	4	2
7	4	5	2	3, possibly 4	1, possibly 2**
8	0	1	1	1, possibly 2**	1, possibly 2**
9	10	11	4	6	2

* Patch number 10 is not presented as this was not a sandstone community
** *Allocasuarina torulosa*, a diagnostic species, was not identified with certainty.

While it was difficult to validate vegetation communities as classified in the SMCMA mapping, the number of positive diagnostic species, in conjunction with the position of the patches in the landscape, the characteristics of vegetation communities, and features of some of the vegetation communities, such as their occurrence on steep sandstone or gullies, allowed vegetation communities in and adjacent to the subject site to be determined. Vegetation communities in the subject site were determined as Coastal Enriched Sandstone Sheltered Forest (remnant vegetation patches 1, 2, 3, 4, 7, and 9), Coastal Sandstone Foreshores Forest (remnant vegetation patch 5), and Estuarine Mangrove Forest (remnant vegetation patch 10) (see Figure 3 for locations of patches). Survey polygon 6 was validated as Weeds and Exotics as per the SMCMA mapping. Too few diagnostic species were identified to validate survey polygon 8 to any vegetation community with certainty. However, it could not be ruled out that the vegetation community comprised Coastal Alluvial Bangalay Forest (part of the EEC *Swamp Sclerophyll Floodplain Forest on Coastal Floodplains of the NSW north Coast, Sydney Basin and South East Corner Bioregions*).

The level of confidence in assigning to vegetation communities was not high; however, the SMCMA vegetation communities are closely related and grade into one another, with some communities showing extremely similar floristics. They also mostly belong to the same state-wide vegetation class (Sydney Coastal Dry Sclerophyll Forests), thus demonstrating their close affiliations to one another. It is possible that vegetation was not correctly validated. However, given the similarities of many of the

dry sandstone vegetation communities in the SMCMA vegetation mapping, the correct validation of the vegetation communities as classified for the SMCMA mapping is not considered of vital importance.

Vegetation communities found in the study area are described in the following sections. The sandstone vegetation communities are discussed under one heading, Sydney Sandstone Ridgetop Woodland, as per the Western Sydney classification, with the exception of the SMCMA vegetation community Coastal Alluvial Bangalay Forest given this community's classification as an EEC. While not directly validated during field survey, a description of an intergrade community between Swamp Oak Floodplain Forest and Coastal Saltmarsh (hereafter referred to as Swamp Oak Floodplain Forest and Coastal Saltmarsh Complex; SOFFCS Complex) is also provided. This community was described in a previous survey of the area (ELA 2010) and was found below the drainage outlet to Kitty's Creek.

Sydney Sandstone Ridgetop Woodland

This community varied in composition along different sections of the subject site. However, the canopy was generally dominated by *Angophora costata* (Smooth-barked Apple), *Corymbia gummifera* (Red Bloodwood), and *Eucalyptus sclerophylla* (Hard-leaved Scribbly Gum), with other trees, such as *E. resinifera* (Red Mahogany), *E. piperita* (Sydney Peppermint), *E. acmenoides* (White Mahogany), *E. robusta* (Swamp Mahogany) and *Syncarpia glomulifera* (Turpentine) present in some areas. The mid-storey comprised of a mixture of native and introduced species. Native species in the mid-storey included *Allocasuarina* sp., *Allocasuarina littoralis* (Black She-oak), *Glochidion ferdinandi* (Cheese Tree), *Pittosporum undulatum* (Sweet Pittosporum), *Omalanthus populifolius* (Bleeding Heart), *Ozothamnus diosmifolius* (White Dogwood), *Dodonaea triquetra*, *Kunzea ambigua* (Tick Bush), and a number of *Acacia* species. Introduced species included *Ligustrum lucidum* (Large-leaved Privet), *Ligustrum sinense* (Small-leaved Privet), and *Lantana camara* (Lantana). Common native groundcover species were *Microlaena stipoides* (Weeping Grass), *Imperata cylindrica* (Blady Grass), *Centella asiatica* (Pennywort), *Lomandra longifolia* (Spiny-headed Mat-rush), and *Pteridium esculentum* (Bracken). Common introduced groundcover species included *Plantago lanceolata* (Lamb's Tongue) and *Sida rhombifolia* (Paddy's Lucerne).

Like species composition, the community varied in condition along different sections of the subject site. Generally, the community was structurally intact, with canopy, mid-storey and ground-storey layers present, other than in the section adjacent to North Ryde Park between Cressy and Magdala Roads, where the mid-storey was generally absent. The community had varying levels of weed infestations. The patches of remnant bushland in the study area with the highest levels of weed infestation were survey polygons 1, and 5-7 (see Figure 3 for locations of polygons). Polygons with the lowest levels of weed infestations were survey polygons 2-5 and 9.

Coastal Alluvial Bangalay Forest (part of the EEC *Swamp Sclerophyll Floodplain Forest on Coastal Floodplains of the NSW north Coast, Sydney Basin and South East Corner Bioregions*)

As discussed above, too few diagnostic species were identified to validate survey polygon 8, mapped as CABF in the SMCMA, to any vegetation community with certainty. However, it could not be ruled out that the vegetation community comprised CABF. The community was highly degraded and supported a high density of weed species, but may have supported a diagnostic CABF species, *Allocasuarina torulosa* (Forest Oak).

Species in the canopy were few, with *E. acmenoides* the only species identified. The mid-storey was comprised of *Pittosporum undulatum*, *Kunzea ambigua*, *Ligustrum lucidum*, *Ligustrum sinense*, *Lantana camara*, *Casuarina glauca* (Swamp Oak), *Rubus fruiticosus* aggregate (Blackberry), and *Senna* sp. *Allocasuarina torulosa* may have been present, but no fruits were collected. Groundcover species

included *Sida rhombifolia*, *Plantago lanceolata,* and *Acetosa sagittata* (Turkey Rhubarb). Climbers included *Cardiospermum grandiflorum* (Balloon Vine) and *Araujia sericifera* (Moth Vine).

Estuarine Saltmarsh (equivalent to *Coastal saltmarsh in the NSW North Coast, Sydney Basin and South East Corner bioregions*)

This community was present only as a small patch on the northern edge of Estuarine Mangrove Forest where Buffalo Creek exited the Field of Mars. It was comprised of *Sporobolus virginicus* (Saltwater Couch), *Sarcocornia quinqueflora* (Samphire), and *Selliera radicans* (Swamp Weed), with scattered *Juncus* sp. and *Melaleuca ericifolia* (Swamp paperbark) also present.

The community was in good condition. Few weeds were observed within the community.

Swamp Oak Floodplain Forest and Coastal Saltmarsh Complex

This community was described in ELA (2010) and was considered to be an intergrade community between the two EECs, Swamp Oak Floodplain Forest and Coastal Saltmarsh. The community was present below the drainage outlet to Kitty's Creek and was dominated by an *Avicennia marina* var *australasica* (Grey Mangrove) canopy, although *Casuarina glauca* was also present. *Typha orientalis* (Cumbungi) was present in the mid-storey. Groundcover consisted of mostly *Sporobolus virginicus* (Saltwater Couch); however, *Lepidosperma filiforme*, *Hydrocotyle bonariensis* (Pennywort), *Tetragonia tetragonioides* (Warrigal Spinach), *Commelina cyanea*, *Alternanthera denticulata* (Lesser Joyweed), and *Atriplex prostrata* also occurred.

Estuarine Mangrove Forest

This community was present where Buffalo Creek exited the Field of Mars. It was dominated by an *Avicennia marina* canopy. There were no mid-storey species present. Some *Sporobolus virginicus* was present on the edges of the water, above the water line. *Melaleuca armillaris* (Bracelet Honey-myrtle), *Casuarina glauca*, *Casuarina cunninghamiana* (River Oak), and *Hakea salicifolia* (Willow-leaved Hakea) were present on the edges of the community, on the top of the bank.

The community was structurally intact, and in good condition. Few weeds were observed within the community.

Weeds and Exotics

This community was mapped by the SMCMA mapping in one area adjacent to the subject site (north of Coxs Road). It contained weeds such as *Ligustrum lucidum*, *Ligustrum sinense*, *Lantana camara*, *Solanum mauritianum* (Wild Tobacco Bush), *Ochna serrulata* (Mickey Mouse Plant), and *Cinnamomum camphora* (Camphor Laurel).

Structurally, the community was intact.

4.2 HABITAT ELEMENTS

There were a number of habitat elements present within the subject site for flora and fauna species, although the majority of habitat was present in the study area.

Habitat elements in the subject site included edge and open habitat, with foraging and sheltering resources for nectar and insect dependant species (birds, bats and arboreal mammals eg. gliders) provided in tree canopies within and overhanging the subject site, and foraging habitat for these species provided in the open areas adjacent to remnant vegetation and maintained lawns. Some sheltering and

foraging habitat was present in canopy, mid-storey and ground cover vegetation growing on the sandstone rock face north of the Field of Mars. Seeping sandstone covered with leaf litter was present north of the Field of Mars. Mangrove habitat with standing brackish water was present where Buffalo Creek drained the Field of Mars.

Habitat elements in the study area included:

- Intact canopy layers within vegetation patches;
- Intact and semi-intact shrub-layers within vegetation patches;
- Stags;
- Hollows;
- Trees with flaking bark;
- Leaf litter;
- Woody debris (fallen logs and braches);
- Exposed sandstone outcrops;
- Seeping sandstone;
- Standing fresh water (within creeks and also ditches at the base of the sandstone cuttings adjacent to Pittwater Road to the north of the Field of Mars); and
- Standing brackish water (mangroves).

The habitat elements available across the subject site and study area provided sheltering, foraging, and roosting habitat for a range of fauna groups. Intact canopy and mid-storey layers provided foraging habitat for birds, bats and arboreal mammals, with tree canopies providing sheltering habitat for birds. Hollow-bearing trees, stags and trees with flaking bark provided roosting and/or breeding habitat for birds, bats, and arboreal mammals (Figure 6 shows the locations of some hollow-bearing trees observed within or directly adjacent to the subject site. All hollow-bearing trees and stags in the study area are not indicated). Leaf litter, woody debris and exposed sandstone outcrops provided foraging and sheltering habitat for ground dwelling mammals, reptiles and some frog species. Seeping sandstone provided breeding habitat for frog species. Standing fresh water provided foraging and breeding habitat for frog species and foraging habitat for bat species. Standing brackish water, mangrove vegetation, and saltmarsh provided foraging and sheltering habitat for a number of fauna groups such as water birds, shorebirds, fish and bats.

With regards to threatened species, canopy trees and shrubs may provide foraging habitat for *Pteropus poliocephalus* (Grey-headed Flying-fox), owl species, and microbat and woodland bird species (see Appendix A). Standing water may also provide foraging habitat for threatened microbat species. Mangroves and saltmarsh may provide habitat for a number of shorebirds. Sandstone rocks seeping water and leaf litter may provide habitat for Red-crowned Toadlet (*Pseudophryne australis*).

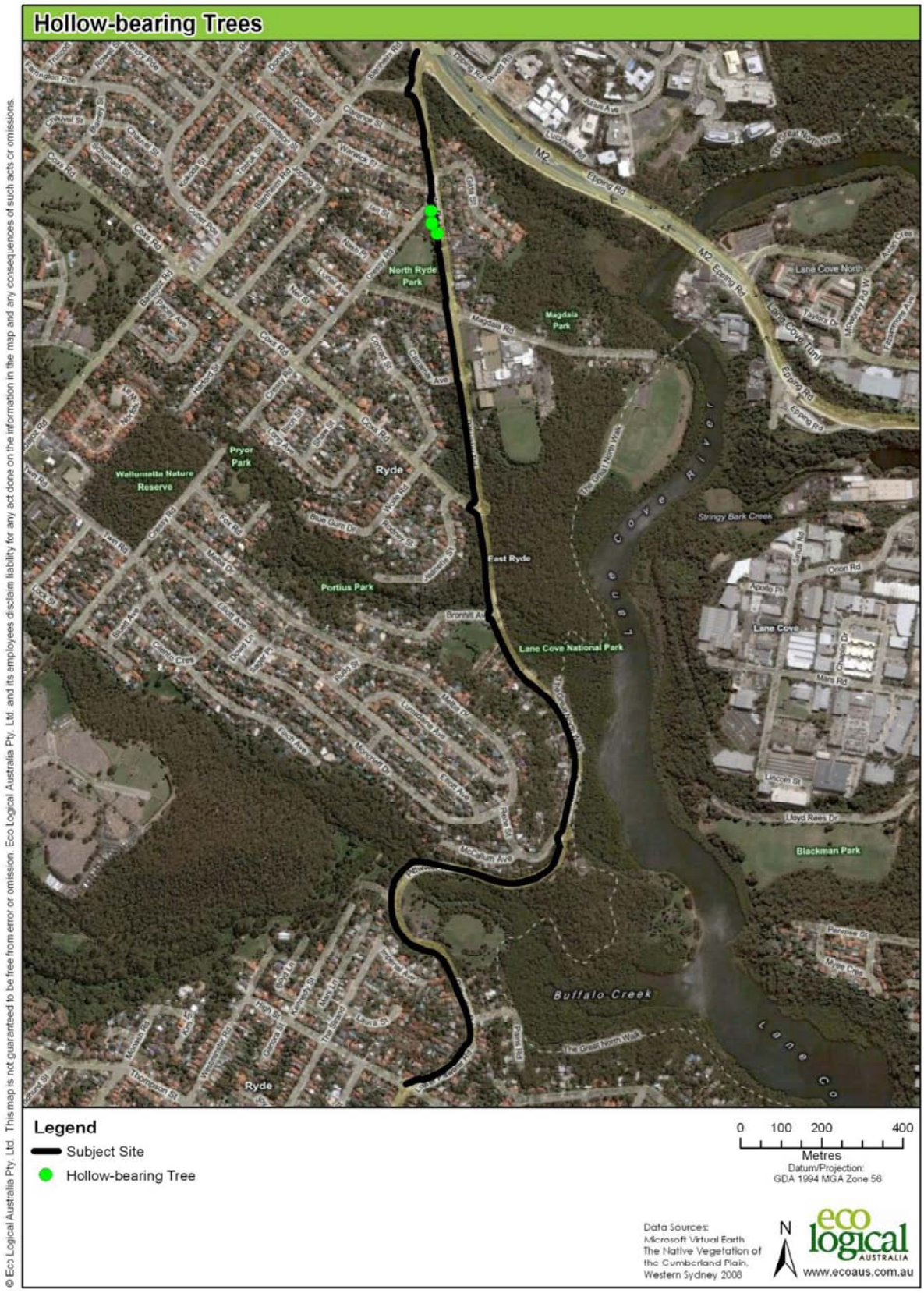

Figure 6: Location of some hollow-bearing trees observed within or directly adjacent to the subject site.

4.3 FLORA

An assessment of the potential for threatened flora species to occur in the study area and a list of species previously recorded within the locality has been included in Appendix A.

None of these flora species were recorded during the field survey (the *Syzygium* species recorded was not confidently identified to the species level). However, 10 threatened flora species were considered as having the potential to occur within the study area (Appendix A). Figure 7 shows the locations of some of the flora species previously recorded in the study area (not all species with the potential to occur are shown).

A list of flora observed during the site inspection is included in Appendix B. A total of 143 flora species, comprised of 97 native and 46 exotic species, were identified. Additional exotic weeds and landscape plantings in the study area were observed but not identified.

Thirteen listed noxious species for the Ryde area (including 3 noxious species for the whole of NSW) were observed within or directly adjacent to the subject site:

- *Salix* sp. (Willows): Class 5 noxious weed in the whole of NSW and in the Ryde LGA;
- *Cardiospermum grandiflorum* (Balloon Vine): Class 4 noxious weed in the whole of NSW and in the Ryde LGA;
- *Rubus fruticosus* (Blackberry): Class 4 noxious weed in the whole of NSW and in the Ryde Local Government Area (LGA);
- *Asparagus aethiopicus* (Asparagus Fern): Class 4 noxious weed in the Ryde LGA;
- *Asparagus plumosus* (Climbing Asparagus Fern): Class 4 noxious weed in the Ryde LGA
- *Cinnamomum camphora* (Camphor Laurel): Class 4 noxious weed in the Ryde LGA
- *Lantana camara* (Lantana): Class 4 noxious weed in the Ryde LGA;
- *Ligustrum lucidum* (Large-leaf Privet): Class 4 noxious weed in the Ryde LGA
- *Ligustrum sinense* (Small-leafed Privet): Class 4 noxious weed in the Ryde LGA
- *Ochna serrulata* (Ochna): Class 4 noxious weed in the Ryde LGA
- *Olea europaea* subsp. *cuspidata* (African Olive): Class 4 noxious weed in the Ryde LGA;
- *Phyllostachys aurea* (Fishpole Bamboo): Class 4 noxious weed in the Ryde LGA
- *Tradescantia fluminensis* (Trad): Class 4 noxious weed in the Ryde LGA

4.4 FAUNA

An assessment of the potential for threatened / migratory fauna species to occur in the study area and a list of species previously recorded within the locality has been included in Appendix A.

None of these fauna species were recorded during the field survey. However, 16 threatened fauna species and a number of migratory species were considered as having the potential to occur within the study area (Appendix A). Figure 7 shows the locations of some of the fauna species previously recorded in the study area (not all species with the potential to occur are shown).

A list of fauna observed during the field survey is included in Appendix C. A total of 15 fauna species (12 bird, 2 mammals and 1 frog) were recorded via direct observation, animal signs, and by their calls. Of the species recorded, 1 species was an introduced species.

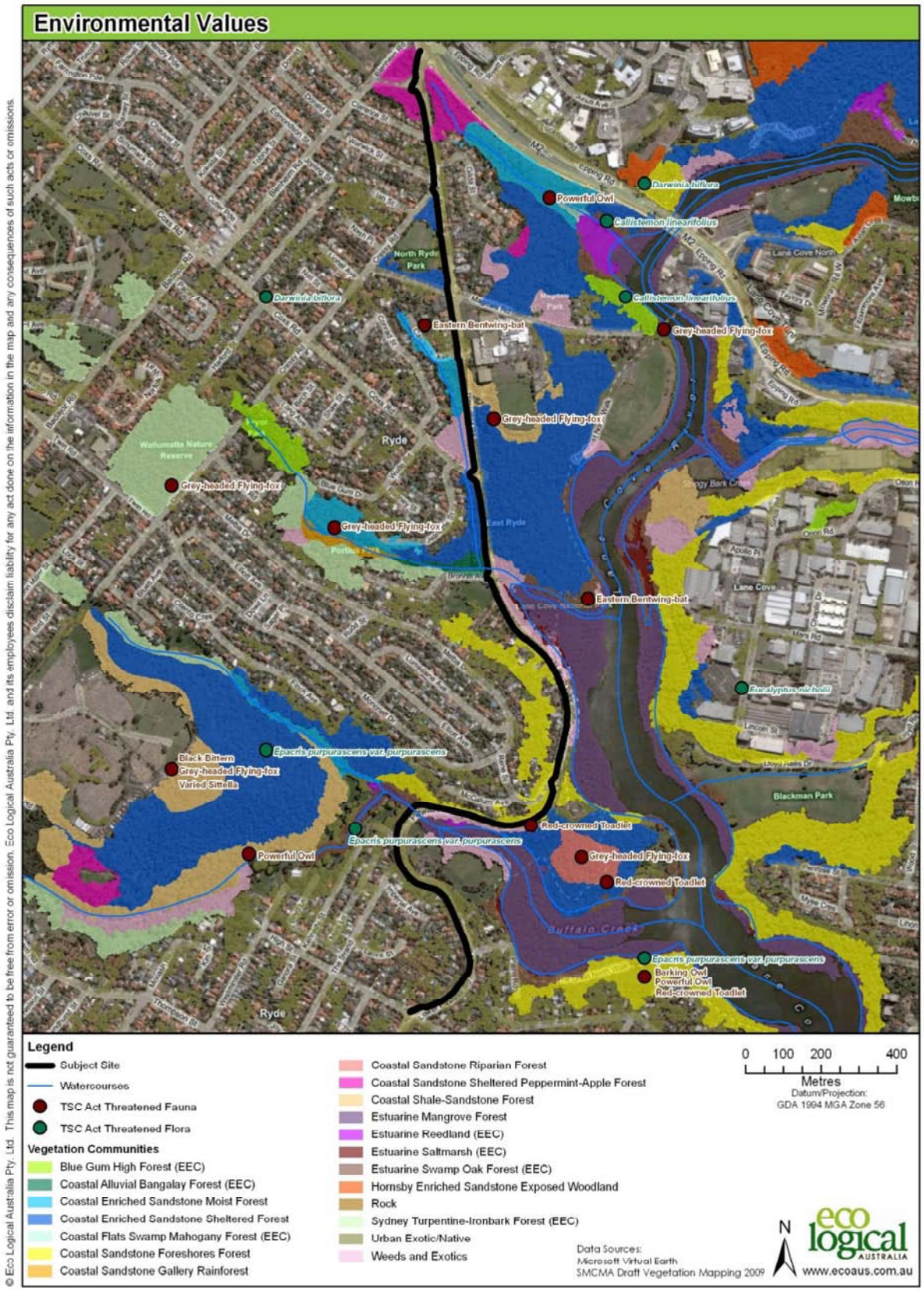

Figure 7: Location of some threatened flora and fauna species in the study area. Note that not all species with the potential to occur in the study area are shown.

5 Impact Assessment

5.1 METHODS

5.1.1 Impact Assessment- TSC Act Listed Species

The EP&A Act states that if a species, population or ecological community listed in Schedules 1, 1A and 2 of the TSC Act or Schedules 4, 4A and 5 of the FM Act is identified as occurring or having the potential to occur in the study area, a review of the factors set out to establish if there is likely to be a significant effect on that species, population, ecological community or habitat, must be undertaken. Section 5A of the EP&A Act sets out seven factors that must be addressed as part of an Assessment of Significance. This enables a decision to be made as to whether there is likely to be a significant effect on the species and, hence, if a Species Impact Statement (SIS) is required.

Species for which Assessments of Significance were applied

Assessments of Significance were applied to the below species. These communities and species were those TSC Act listed communities and species that occurred or had the potential to occur in the study area (which may therefore be impacted) (Appendix A). The list of potentially occurring species was generated following a search of the Atlas of NSW Wildlife. Determination of the likelihood of occurrence was made based on expert opinion of available habitat noted during field survey and species preferences and distribution.

Note that while *Eucalyptus nicholii* has been recorded in the locality, an Assessment of Significance was not applied to this species. The species is often planted, naturally occurring in the north of NSW, generally on granite. Also, while White-fronted Chat and Swift Parrot have been recorded in the locality and suitable habitat was present in the study area, White-fronted Chat does not occur in urban areas and would not be impacted. Swift Parrot habitat (winter flowering trees such as *Corymbia gummifera*, Red Bloodwood) would not be directly or indirectly impacted.

<u>Endangered Ecological Communities</u>

- Coastal Saltmarsh
- Swamp Oak Floodplain Forest and Coastal Saltmarsh Complex;
- Swamp Sclerophyll Forest on Coastal Floodplains.

<u>Flora Species</u>

- *Acacia bynoeana* (Bynoe's Wattle);
- *Acacia terminalis* subsp. *terminalis* (Sunshine Wattle);
- *Callistemon linearifolius* (Netted Bottlebrush);
- *Camarophyllopsis kearneyi*;
- *Darwinia biflora*;
- *Epacris purpurascens* var *purpurascens*;
- *Genoplesium baueri* (Bauer's Midge Orchid);
- *Melaleuca deanei* (Deane's Paperbark);
- *Persoonia hirsuta* (Hairy Geebung);
- *Wilsonia backhousei.*

Fauna Species

- Red-crowned Toadlet (*Pseudophryne australis*);
- Regent Honeyeater (*Anthochaera phrygia* also known as *Xanthomyza phrygia*);
- Gang-gang Cockatoo (*Callocephalon fimbriatum*);
- Glossy Black Cockatoo (*Calyptorhynchus lathami*);
- Black Bittern (*Ixobrychus flavicollis*);
- Little Lorikeet (*Glossopsitta pusilla*);
- Osprey (*Pandion haliaetus*);
- Superb Fruit Dove (*Ptilinopus superbus*);
- Barking Owl (*Ninox connivens*);
- Powerful Owl (*Ninox strenua*);
- Large-eared Pied Bat (*Chalinolobus dwyeri*);
- Eastern Bentwing-bat (*Miniopterus orianae oceanensis*);
- Little Bentwing-bat (*Miniopterus australis*);
- East Coast Freetail-bat (*Mormopterus norfolkensis*);
- Grey-headed Flying-fox (*Pteropus poliocephalus*);
- Yellow-bellied Sheathtail Bat (*Saccolaimus flaviventris*).

Impacts and impact areas considered in Assessments of Significance

Impacts considered in the Assessments of Significance related to the direct and indirect impacts from the clearing of remnant and planted vegetation for the upgrade works on threatened communities and species, although maintained lawns would also be cleared under the proposal.

Direct and indirect impacts considered in the Assessments of Significance included the loss of planted vegetation (*Allocasuarina* sp.) above Buffalo Creek where it exits the Field of Mars, 2 remnant trees (*E. acmenoides* and *A. bakeri*), shrubs on the rock escarpment between Rene and High Streets, and associated habitat. Further, impacts considered included the trimming of tree branches (including some mangrove vegetation) and the removal of rock in the rock escarpment area between Rene and High Streets, the installation of sedimentation, noise disturbance and vibration from the construction works, and the possible introduction of sediments and nutrients into remnant bushland. The following summarises some of the impacts considered:

- Loss of exotic ground cover within the area proposed for road upgrade works;
- Loss of remnant vegetation, including within a possible EEC (Swamp Sclerophyll Forest; SSF), and weeds/exotic vegetation in existing Council reserves (Kitty's Creek and Boobajool Reserves) for new sedimentation basins;
- Loss of planted vegetation (*Allocasuarina* sp.) above Buffalo Creek where it exits the Field of Mars;
- Loss of 2 remnant trees, one mature *E. acmenoides* and one young *A. bakeri*;
- Loss of vegetation on the rock escarpment between Rene and High Streets;
- Loss of sections of the rock escarpment between Rene and High Streets (470 m^3);
- Loss of tree branches (including potentially some mangrove vegetation) overhanging Pittwater Road between Rene Street and the Field of Mars;
- Loss and modification of habitat for flora and fauna species; and
- Noise disturbance and vibration from the construction works.

5.1.2 Impact Assessment- EPBC Act Listed Species

The EPBC Act Administrative Guidelines on Significance set out 'Significant Impact Criteria' that are to be used to assist in determining whether a proposed action is likely to have a significant impact on

matters of national environmental significance (NES). Matters listed under the EPBC Act as being of national environmental significance include:

- Listed threatened species and ecological communities;
- Listed migratory species;
- Wetlands of International Importance;
- The Commonwealth marine environment;
- World heritage properties;
- National heritage places; and
- Nuclear actions.

Specific 'Significant Impact Criteria' are provided for each matter of national environmental significance except for threatened species and ecological communities in which case separate criteria are provided for species listed as endangered and vulnerable under the EPBC Act.

Significance Assessments considering the impacts of the proposed road upgrade works in the subject site were applied to the species listed below.

Impacts were the same as those impacts considered in Assessments of Significance for TSC Act listed species (see Section 5.1.1 for impacts considered).

Threatened Species

Endangered

- Sunshine Wattle (*Acacia terminalis* subsp. *terminalis*);
- Hairy Geebung (*Persoonia hirsuta*); and
- Regent Honeyeater (*Anthochaera phrygia* also known as *Xanthomyza phrygia*).

Vulnerable

- *Acacia bynoeana* (Bynoe's Wattle);
- *Darwinia biflora*;
- *Melaleuca deanei* (Deane's Paperbark);
- Large-eared Pied Bat (*Chalinolobus dwyeri*); and
- Grey-headed Flying-fox (*Pteropus poliocephalus*).

Migratory Species

- White-bellied Sea-Eagle (*Haliaeetus leucogaster*);
- White-throated Needletail (*Hirundapus caudacutus*);
- Great Egret (*Ardea alba*);
- Sharp-tailed Sandpiper (*Calidris acuminata*);
- Curlew Sandpiper (*Calidris ferruginea*);
- Whimbrel (*Numenius phaeopus*);
- Regent Honeyeater (*Anthochaera phrygia* also known as *Xanthomyza phrygia*);

5.2 RESULTS

5.2.1 Impact Assessment- TSC Act Listed Species

Application of the Assessment of Significance determined that none of the threatened ecological communities or species occurring or with the potential to occur in the subject site and study area would

be significantly impacted by the proposed works (Appendix D). The areas impacted, which included habitat for some threatened flora and fauna species, were not considered to represent a significant portion of key habitat such that it would significantly impact these threatened ecological communities or species.

The majority of habitat elements present in the study area would not be impacted by the proposal. Further, the proposed works would minimise impacts to the study area through the establishment of sediment and erosion controls, and water flow and quality controls in upstream areas. Works would not isolate any currently interconnecting areas of habitat.

Given that no matters protected under the TSC Act would be significantly impacted by the proposed works, a Species Impact Statement is not required for the proposed development with respect to these matters.

5.2.2 Impact Assessment- EPBC Act Listed Species

The Significance Assessments conducted for threatened and migratory species determined that none of the species would be significantly impacted by the proposed works (Appendix E). The areas impacted, which included habitat for flora and fauna species, were not considered to represent a significant portion of key habitat such that it would significantly impact these threatened / migratory species through the disruption to their breeding cycles. The majority of habitat elements present in the study area would not be impacted by the proposal. Further, works would not isolate any currently interconnecting areas of habitat, impact on habitat critical to the survival of species, introduce diseases, or result in the introduction of invasive species that are harmful to any species potentially present.

Given that no matters protected under the EPBC Act would be significantly impacted by the proposed works, no referral to SEWPAC for assessment and approval by the Environment Minister is considered necessary.

6 Conclusion

Survey conducted for this study demonstrated that the study area contained flora and fauna species and vegetation communities common to the Sydney region. In addition, the study area supported or had the potential to support threatened flora and fauna species and EECs listed under the TSC Act and/or the EPBC Act.

Application of the Assessment of Significance to EECs and threatened flora and fauna species occurring or with the potential to occur in the study area determined that none of these would be significantly impacted by the proposed works. Similarly, Significance Assessments conducted for nationally threatened flora andnationally threatened or migratory fauna species determined that none of the species would be significantly impacted by the proposed works.

Given that the proposed works would not significantly impact on EECs or species protected under the TSC Act or EPBC Act, a Species Impact Statement is not required for the proposed development with respect to matters protected under the TSC Act, nor is a referral to the SEWPAC for assessment and approval by the Environment Minister considered necessary.

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Appendix A: Threatened Species Likelihood of Occurrence Tables

An assessment of likelihood of occurrence was made for threatened and migratory species identified from the database search. Five terms for the likelihood of occurrence of species are used in this report, as defined below:

- "yes" = the species was or has been observed in the subject site;
- "likely" = a medium to high probability that a species uses the subject site;
- "potential" = suitable habitat for a species occurs in the subject site, but there is insufficient information to categorise the species as likely to occur, or unlikely to occur;
- "unlikely" = a very low to low probability that a species uses the subject site; and
- "no" = habitat in the subject site and in its vicinity is unsuitable for the species.

This assessment was based on database or other records, presence or absence of suitable habitat, features of the proposal site, results of the field survey and professional judgement.

Flora

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Number of Records in the locality	Likelihood of Occurrence
Acacia bynoeana	Bynoe's Wattle	E	V	The species is found in central eastern NSW, from the Hunter District (Morisset) south to the Southern Highlands and west to the Blue Mountains. It has recently been found in the Colymea and Parma Creek areas west of Nowra. It is found in heath and dry sclerophyll forest, typically on a sand or sandy clay substrate, often with ironstone gravels (DECC 2011). The species seems to prefer open and sometimes slightly disturbed sites. Characteristic overstorey species include: *Corymbia gummifera*, *Eucalyptus haemastoma*, *E. gummifera*, *E. parramattensis*, *E. sclerophylla*, *Banksia serrata* and *Angophora bakeri*. Shrubs often associated with the species include *B. spinulosa*, *B. serrata*, *A. oxycedrus*, *A. myrtifolia* and *Kunzea* sp. (Winning 1992; James 1997). It flowers from September to March and fruits mature in November.	10	Potential
Acacia gordonii		V	V	Sydney sandstone ridge top communities, often on rocky outcrops (DECC 2011).	1	No
Acacia pubescens		V	V	Associated with on Cumberland Plains Woodlands, Shale / Gravel Forest and Shale / Sandstone Transition Forest. Clay soils, often with ironstone gravel (Benson and McDougall 1996).	63	Unlikely
Acacia terminalis subsp. terminalis	Sunshine Wattle	E1	E	Very limited distribution between Botany Bay to the northern foreshore of Port Jackson. Recent collections have only been made from the Quarantine Station, Clifton Gardens, Dover Heights, Parsely Bay, Nielson Park, Cooper Park, Chifley and Watsons Bays.	35	Potential
Bothriochloa biloba	Lobed Blue-grass	-	V	Grows in woodland on poorer soils. Flowers in summer.	-	No

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Number of Records in the locality	Likelihood of Occurrence
Caladenia tessellata	Thick Lip Spider Orchid	E	V	Occurs in grassy sclerophyll woodland, often growing in well-structured clay loams or sandy soils south from Swansea (DECC 2011). Usually in sheltered moist places, in areas of increased sunlight. It flowers from September to November (DECC 2011).	5	Unlikely
Callistemon linearifolius	Netted Bottlebrush	V	-	Grows in dry sclerophyll forest on the coast and adjacent ranges (DECC 2011). *C. linearifolius* has been recorded from the Georges River to Hawkesbury River in the Sydney area, and north to the Nelson Bay area of NSW. For the Sydney area, recent records are limited to the Hornsby Plateau area near the Hawkesbury River (DECC 2011).	6	Potential
Camarophyllopsis kearneyi		E	-	Known only from its type locality in Lane Cove Bushland Park in the Lane Cove local government area in the Sydney metropolitan region.	1	Potential
Cryptostylis hunteriana	Leafless Tongue Orchid	V	V	It is known from a range of vegetation communities including swamp-heath and woodland (DECC 2011). The larger populations typically occur in woodland dominated by Scribbly Gum (*Eucalyptus sclerophylla*), Silvertop Ash (*E. sieberi*), Red Bloodwood (*Corymbia gummifera*) and Black Sheoak (*Allocasuarina littoralis*); where it appears to prefer open areas in the understorey of this community and is often found in association with the Large Tongue Orchid (*C. subulata*) and the Tartan Tongue Orchid (*C. erecta*) (DECC 2011). Bell (2001) has identified Coastal Plains Scribbly Gum Woodland and Coastal Plains Smoothed-barked Apple Woodland as potential habitat on the Central Coast. Flowers between November and February, although may not flower regularly (DECC 2011; Bell 2001).	1	Unlikely
Darwinia biflora		V	V	Erect or spreading shrub to 80cm high. Associated with habitats where weathered shale capped ridges intergrade with Hawkesbury Sandstone, where soils have a higher clay content.	77	Potential

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Number of Records in the locality	Likelihood of Occurrence
Darwinia peduncularis		V	-	Dry sclerophyll forest on sandstone hillsides and ridges.	1	Unlikely
Deyeuxia appressa		E	E	Associated with wet ground. Known from a single historical record made in 1930.	3	Unlikely
Epacris purpurascens var purpurascens		V	-	Sydney Sandstone Gully Forest and wet heath with strong clay influences. Recorded between Gosford in the north to Avon Dam in the south. Found in a range of habitats, but most have a strong shale soil influence. Killed by fire and re-establishes from soil stored seed (DECC 2011).	46	Potential
Eucalyptus camfieldii	Heart-leaved Stringybark	V	V	Associated with shallow sandy soils bordering coastal heath with other stunted or mallee eucalypts, often in areas with restricted drainage and in areas with laterite influenced soils, thought to be associated with proximity to shale (DECC 2011). Flowering is irregular and has been recorded throughout the year (DECC 2011).	25	Unlikely
Eucalyptus pulverulenta	Silver-leafed Gum	V	-	Grows in shallow soils as an understorey plant in open forest, typically dominated by Brittle Gum (*Eucalyptus mannifera*), Red Stringybark (E. *macrorhynca*), Broad-leafed Peppermint (*E. dives*), Silvertop Ash (E. *sieberi*) and Apple Box (*E. bridgesiana*).	1	No

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Number of Records in the locality	Likelihood of Occurrence
Genoplesium baueri	Bauer's Midge Orchid	V	-	The species has been recorded from locations between Nowra and Pittwater and may occur as far north as Port Stephens. About half the records were made before 1960 with most of the older records being from Sydney suburbs including Asquith, Cowan, Gladesville, Longueville and Wahroonga. No collections have been made from those sites in recent years. The species has been recorded at locations now likely to be within the following conservation reserves: Berowra Valley Regional Park, Royal National Park and Lane Cove National Park. May occur in the Woronora, O'Hares, Metropolitan and Warragamba Catchments. Grows in sparse sclerophyll forest and moss gardens over sandstone. Flowers Dec to Mar.	14	Potential
Grevillea caleyi	Caley's Grevillea	E	E	The natural distribution of Grevillea caleyi is centred approximately on the northern Sydney suburb of Terrey Hills and also includes the areas of Duffys Forest, Belrose and Ingleside (DECC 2011). Occurs on the ridgetop between elevations of 170 to 240 m asl, in association with laterite soils and a vegetation community of open forest, generally dominated by *Eucalyptus sieberi* and *E. gummifera* (DECC 2011). Occasionally, *G. caleyi* occurs at the boundaries of the laterite soils in low open forests of *E. gummifera* and *E. haemastoma* (DECC 2011). A recent record from Middle Brother near Port Macquarie is thought to be a cultivated specimen and recent searches have failed to find any G. caleyi near this record (DECC 2011).	9	Unlikely
Haloragodendron lucasii		E	E	Associated with low woodland on sheltered slopes near creeks on moist loamy sand on bench below small sandstone cliff lines, with continuous seepage (Benson and McDougall 1997).	20	Unlikely

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Number of Records in the locality	Likelihood of Occurrence
Hygrocybe anomala var. ianthinomarginata		V	-	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*).	1	Unlikely
Hygrocybe aurantipes		V	-	See *Hygrocybe anomola* var. *ianthinomarginata*	1	Unlikely
Hygrocybe austropratensis		E1	-	See *Hygrocybe anomola* var. *ianthinomarginata*	1	Unlikely
Hygrocybe collucera		E1	-	See *Hygrocybe anomola* var. *ianthinomarginata*	1	Unlikely
Hygrocybe griseoramosa		E1	-	See *Hygrocybe anomola* var. *ianthinomarginata*	1	Unlikely
Hygrocybe lanecovensis		E1	-	See *Hygrocybe anomola* var. *ianthinomarginata*	1	Unlikely
Hygrocybe reesiae		V	-	See *Hygrocybe anomola* var. *ianthinomarginata*	1	Unlikely
Hygrocybe rubronivea		V	-	See *Hygrocybe anomola* var. *ianthinomarginata*	1	Unlikely
Lasiopetalum joyceae		V	-	Ridgetop woodland, in heath, woodland or open scrub, often with a clay influence.	4	Unlikely
Leptospermum deanei		V	-	Associated with lower hillsides & riparian vegetation communities and woodlands on Hawkesbury Sandstones and alluvial areas along the creeks (DECC 2011). Currently known to occur in areas such as Pennant Hills Park, Kuring-gai Chase, Garigal and Marramarra National Parks.	19	Unlikely

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Number of Records in the locality	Likelihood of Occurrence
Melaleuca biconvexa	Biconvex Paperbark	V	V	Associated with damp habitats, such as Coastal Narrabeen Moist Forest, Riparian Melaleuca Swamp Woodland. This species may occur in dense stands forming a narrow strip adjacent to watercourses, in association with other Melaleuca species or as an understorey species in wet forest. Flowering occurs over just 3-4 weeks in September and October (DECC 2011).	1	Unlikely
Melaleuca deanei	Deane's Paperbark	V	V	Found in heath on sandstone (DECC 2011), and also associated with woodland on broad ridge tops and slopes on sandy loam and lateritic soils (Benson and McDougall 1998).	21	Potential
Persoonia hirsuta	Hairy Geebung	E	E	This species occurs in dry sclerophyll eucalypt woodland/forest, and in shrub-woodland. It grows in sandy to stony soils derived from sandstone or very rarely on shale, from near sea level to 600 m altitude.	8	Potential
Persoonia nutans		E	E	Associated with dry woodland, Castlereagh Scribbly Gum Woodland, Agnes Banks Woodland and sandy soils associated with tertiary alluvium, occasionally poorly drained (Benson and McDougall 2000). Endemic to the Western Sydney (Benson and McDougall 2000).	1	No
Pimelea curviflora var curviflora		V	E	Associated with the Duffys Forest Community, shale lenses on ridges in Hawkesbury sandstone geology.	16	Unlikely
Pomaderris prunifolia	*Pomaderris prunifolia – Endangered Population*	E2	-	Known from only three sites within the listed local government areas, at Rydalmere, within Rookwood Cemetery and at The Crest of Bankstown	13	Unlikely

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Number of Records in the locality	Likelihood of Occurrence
Prostanthera junonis	Somersby Mintbush	E	E	Likely to be restricted to the Somersby plateau, found on the Somersby and Sydney Town soil landscapes. Occurs predominantly in the low woodland component of the Hawkesbury Sandstone Complex dominated by *Eucalyptus haemostoma* with *Banksia ericifolia* or *B. serrata* in the understorey (ibid.). Has been found in the ecotone between low woodland and open forest or the open scrub\heath components (ibid.). Not found in sedgelands or *Allocasuarina distyla* open heath (ibid.).	2	No
Prostanthera marifolia		E	extinct	Occurs on deeply weathered clay-loam soils associated with ironstone and scattered shale lenses, a soil type which only occurs on ridge tops and has been extensively urbanised (DECC 2011).	4	No
Pterostylis nigricans	Dark Greenhood	V	-	Coastal heathland with Heath Banksia (*Banksia ericifolia*), and lower-growing heath with lichen-encrusted and relatively undisturbed soil surfaces, on sandy soils. The Dark Greenhood occurs in north-east NSW north from Evans Head, and in Queensland. Not recorded in Sydney for 40years.	1	Unlikely
Pterostylis saxicola		E	E	Terrestrial orchid predominantly found in Hawkesbury Sandstone Gully Forest growing in small pockets of soil that have formed in depressions in sandstone rock shelves. Known from Georges River National Park, Ingleburn, Holsworthy, Peter Meadows Creek, St Marys Tower.	-	No
Sarcochilus hartmannii		V	V	Associated with cliff faces on steep narrow ridges supporting sclerophyll forest, growing in clefts on volcanic rock, occasionally epiphytic on grass trees at altitudes of 500 to 1000masl.	1	No

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Number of Records in the locality	Likelihood of Occurrence
Syzygium paniculatum	Magenta Lillypilly	V	V	This species occupies a narrow coastal area between Bulahdelah and Conjola State Forests in NSW. On the Central Coast, it occurs on Quaternary gravels, sands, silts and clays, in riparian gallery rainforests and remnant littoral rainforest communities. In the Ourimbah Creek valley, S. paniculatum occurs within gallery rainforest with *Alphitonia excelsa*, *Acmena smithii*, *Cryptocarya glaucescens*, *Toona ciliata*, *Syzygium oleosum* with emergent *Eucalyptus saligna*. At Wyrrabalong NP, *S. paniculatum* occurs in littoral rainforest as a co-dominant with *Ficus fraseri*, *Syzygium oleosum*, *Acmena smithii*, *Cassine australe*, and *Endiandra sieberi*. Payne (1991) reports that the species appears absent from Terrigal formation shales, on which the gully rainforests occur. S. paniculatum is summer flowering (November-February), with the fruits maturing in May (DECC 2011).	8	No
Tetratheca glandulosa		V	V	Associated with ridgetop woodland habits on yellow earths also in sandy or rocky heath and scrub. Often associated with sandstone / shale interface where soils have a stronger clay influence (DECC 2011). Flowers July to November.	67	Unlikely
Tetratheca juncea	Black-eyed Susan	V	V	Occurs on predominantly low nutrient soils with a dense grassy understorey of grasses although it has been recorded in heathland and moist forest (DECC 2011). It is associated with dry open forest or woodland habitats dominated by *Corymbia gummifera*, *E. capitellata*, *E. haemastoma* and *Angophora costata* (Payne 1993). *Themeda australis* is generally the dominant ground cover (Payne 1993). *T. juncea* also displays a preference for southern aspect slopes, although is slopes with different aspects (DECC 2011). Flowers July to December.	4	No

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Number of Records in the locality	Likelihood of Occurrence
Thesium australe	Austral Toadflax	V	V	Occurs in grassland or grassy woodland. Often found in damp sites in association with Kangaroo Grass (*Themeda australis*) (DECC 2011). Flowers in spring–summer. Widespread but rare. NSW subdivisions: NC, CC, SC, NT, ST, NWS, CWS. Other Australian states: Qld, Tas.	1	No
Wahlenbergia multicaulis		E2	-	Found in disturbed sites and grows in a variety of habitats including forest, woodland, scrub, grassland and the edges of watercourses and wetlands. Typically occurs in damp, disturbed sites (with natural or human disturbance of various forms), typically amongst other herbs rather than in the open. In Western Sydney most sites are closely aligned with the Villawood Soil Series, which is a poorly drained, yellow podsolic extensively permeated with fine, concretionary ironstone (laterite). However, the sites in Hornsby LGA are on the 'Hawkesbury' soil landscape.	44	No
Wilsonia backhousei		V	-	Grows in coastal saltmarshes in the Sydney Region and Jervis Bay	92	Potential

Disclaimer: Data extracted from the Atlas of NSW Wildlife and EPBC Protected Matters Report are only indicative and cannot be considered a comprehensive inventory.

E = Endangered; E2 = Endangered Population; V = Vulnerable.

Fauna

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Number of Records in the locality	Likelihood of Occurrence
FISH						
Macquarie australasica	Macquarie Perch	-	E	Habitat for the Macquarie perch is bottom or mid-water in slow-flowing rivers with deep holes, typically in the upper reaches of forested catchments with intact riparian vegetation. Macquarie perch also do well in some upper catchment lakes. In some parts of its range, the species is reduced to taking refuge in small pools which persist in midland–upland areas through the drier summer periods.	-	No
Prototroctes maraena	Australian Grayling	-	V	Historically, this species occurred in coastal streams from the Grose River southwards through NSW, VIC and TAS. On mainland Australia, this species has been recorded from rivers flowing east and south of the main dividing ranges. This species spends only part of its lifecycle in freshwater, mainly inhabiting clear, gravel-bottomed streams with alternating pools and riffles, and granite outcrops but has also been found in muddy-bottomed, heavily silted habitat. Grayling migrate between freshwater streams and the ocean and as such it is generally accepted to be a diadromous (migratory between fresh and salt waters) species.	-	No
FROGS						
Heleioporus australiacus	Giant Burrowing Frog	V	V	Forages in woodlands, wet heath, dry and wet sclerophyll forest (Ehmann 1997). Associated with semi-permanent to ephemeral sand or rock based streams (Ehmann 1997), where the soil is soft and sandy so that burrows can be constructed (Environment Australia 2000).	1	Unlikely

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Number of Records in the locality	Likelihood of Occurrence
Litoria aurea	Green and Golden Bell Frog	E	V	This species has been observed utilising a variety of natural and man-made waterbodies (Pyke & White 1996) such as coastal swamps, marshes, dune swales, lagoons, lakes, other estuary wetlands, riverine floodplain wetlands and billabongs, stormwater detention basins, farm dams, bunded areas, drains, ditches and any other structure capable of storing water (DECC 2011). Fast flowing streams are not utilised for breeding purposes by this species (Mahony 1999). Preferable habitat for this species includes attributes such as shallow, still or slow flowing, permanent and/or widely fluctuating water bodies that are unpolluted and without heavy shading (DECC 2011). Large permanent swamps and ponds exhibiting well-established fringing vegetation (especially bulrushes–Typha sp. and spikerushes–Eleocharis sp.) adjacent to open grassland areas for foraging are preferable (Ehmann 1997; Robinson 1993). Ponds that are typically inhabited tend to be free from predatory fish such as Mosquito Fish (*Gambusia holbrooki*) (DECC 2011).	11742	Unlikely
Mixophyes balbus	Stuttering Frog	E	V	A variety of forest habitats from rainforest through wet and moist sclerophyll forest to riparian habitat in dry sclerophyll forest (DECC 2007) that are generally characterised by deep leaf litter or thick cover from understorey vegetation (Ehmann 1997). Breeding habitats are streams and occasionally springs. Not known from streams disturbed by humans (Ehmann 1997) or still water environments (NSW Scientific Committee 2011).	-	No

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Number of Records in the locality	Likelihood of Occurrence
Mixophyes iteratus	Giant Barred Frog	E	E	Found on forested slopes of the escarpment and adjacent ranges in riparian vegetation, subtropical and dry rainforest, wet sclerophyll forests and swamp sclerophyll forest (DECC 2011; Ehmann 1997). This species is associated with flowing streams with high water quality, though habitats may contain weed species (Ehmann 1997). This species is not known from riparian vegetation disturbed by humans (NSW Scientific Committee 2011). During breeding eggs are kicked up onto an overhanging bank or the streams edge (DECC 2011).	-	No
Pseudophryne australis	Red-crowned Toadlet	V	-	Red-crowned Toadlets are found in steep escarpment areas and plateaus, as well as low undulating ranges with benched outcroppings on Triassic sandstones of the Sydney Basin (DECC 2011). Within these geological formations, this species mainly occupies the upper parts of ridges, usually being restricted to within about 100 metres of the ridgetop. However they may also occur on plateaus or more level rock platforms along the ridgetop (DECC 2011). Associated with open forest to coastal heath (Ehmann 1997). Utilises small ephemeral drainage lines which feed water from the top of the ridge to the perennial creeks below for breeding, and are not usually found in the vicinity of permanent water (Ehmann 1997). Breeding sites are often characterised by clay-derived soils and generally found below the first sandstone escarpment in the talus slope (NPWS 1997).	69	Likely
REPTILES						

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Number of Records in the locality	Likelihood of Occurrence
Hoplocephalus bungaroides	Broad-headed Snake	E	V	Typical sites consist of exposed sandstone outcrops and benching where the vegetation is predominantly woodland, open woodland and/or heath on Triassic sandstone of the Sydney Basin (DECC 2011). They utilise rock crevices and exfoliating sheets of weathered sandstone during the cooler months and tree hollows during summer (Webb & Shine 1998). Some of the canopy tree species found to regularly co-occur at known sites include *Corymbia eximia, C. gummifera, Eucalyptus sieberi, E. punctata* and *E. piperita* (DECC 2011).	-	Unlikely
Varanus rosenbergi	Heath Monitor	V	-	Associated with Sydney sandstone woodland and heath land. Rocks, hollow logs and burrows are utilised for shelter (Environment Australia 2000). Terrestrial termitaria are required for reproduction.	5	Unlikely
DIURNAL BIRDS						
Anthochaera phrygia	Regent Honeyeater	E	E & M	Associated with temperate eucalypt woodland and open forest including forest edges, wooded farmland and urban areas with mature eucalypts, and riparian forests of River Oak (*Casuarina cunninghamiana*) (Garnett 1993). Areas containing Swamp Mahogany (*Eucalyptus robusta*) in coastal areas have been observed to be utilised (NPWS 1997). The Regent Honeyeater primarily feeds on nectar from box and ironbark eucalypts and occasionally from banksias and mistletoes (NPWS 1995). As such it is reliant on locally abundant nectar sources with different flowering times to provide reliable supply of nectar (Environment Australia 2000).	19	Potential
Botaurus poiciloptilus	Australasian Bittern	V	-	Terrestrial wetlands with tall dense vegetation, occasionally estuarine habitats (Marchant & Higgins 1993). Reedbeds, swamps, streams, estuaries (Simpson & Day 2004).	3	Unlikely

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Number of Records in the locality	Likelihood of Occurrence
Burhinus grallarius	Bush Stone-curlew	E	-	Associated with dry open woodland with grassy areas, dune scrubs, in savanna areas, the fringes of mangroves, golf courses and open forest / farmland (Pittwater Council 2000; Marchant & Higgins 1993). Forages in areas with fallen timber, leaf litter, little undergrowth and where the grass is short and patchy (Environment Australia 2000; Marchant & Higgins 1993). Is thought to require large tracts of habitat to support breeding, in which there is a preference for relatively undisturbed in lightly disturbed.	4	Unlikely
Calidris ternuirostris	Great Knot	V	M	Sheltered coastal habitats containing large intertidal mudflats or sandflats, including inlets, bays, harbours, estuaries and lagoons (DECC 2011). Often recorded on sandy beaches with mudflats nearby, sandy spits and inlets, or exposed reefs or rock platforms (Higgins & Davies 1996).	1	Unlikely
Callocephalon fimbriatum	Gang-gang Cockatoo	V	-	During summer in dense, tall, wet forests of mountains and gullies, alpine woodlands (Morcombe 2004). In winter they occur at lower altitudes in drier more open forests and woodlands, particularly box-ironbark assemblages (Shields & Chrome 1992). They sometimes inhabit woodland, farms and suburbs in autumn/winter (Simpson & Day 2004).	40	Potential
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	-	Associated with a variety of forest types containing *Allocasuarina* species, usually reflecting the poor nutrient status of underlying soils (Environment Australia 2000; NPWS 1997; DECC 2011). Intact drier forest types with less rugged landscapes are preferred (DECC 2011). Nests in large trees with large hollows (Environment Australia 2000).	6	Potential
Charadrius leschenaultii	Greater Sand Plover	V	M	Entirely coastal in NSW, foraging on intertidal sand and mudflats in estuaries, roosting during high tide on sandy beaches or rocky shores (DECC 2011)	1	Unlikely

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Number of Records in the locality	Likelihood of Occurrence
Epthianura albifrons	White-fronted Chat	V	-	Found mostly in temperate to arid climates and very rarely sub-tropical areas, it occupies foothills and lowlands up to 1000 m above sea level. In NSW, it occurs mostly in the southern half of the state, in damp open habitats along the coast, and near waterways in the western part of the state. Along the coastline, it is found predominantly in saltmarsh vegetation but also in open grasslands and sometimes in low shrubs bordering wetland areas	208	Unlikely
Erythrotriorchis radiatus	Red Goshawk	E4A	V	Associated with forests and woodlands with a mosaic of vegetation types, an abundance of birds and permanent water. In NSW, this species is thought to favour mixed subtropical rainforest, *Melaleuca* Swamp Forest, and open eucalypt forest along rivers, often in rugged terrain (Marchant & Higgins 1993; DECC 2011). The species is very rare in NSW. Most records are from the Clarence River Catchment, with a few about the lower Richmond and Tweed Rivers (DECC 2011)	1	No
Falco hypoleucos	Grey Falcon	V	-	Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast.	1	No

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Number of Records in the locality	Likelihood of Occurrence
Glossopsitta pusilla	Little Lorikeet	V	-	In New South Wales Little Lorikeets are distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range, extending westwards to the vicinity of Albury, Parkes, Dubbo and Narrabri. Little Lorikeets mostly occur in dry, open eucalypt forests and woodlands. They have been recorded from both old-growth and logged forests in the eastern part of their range, and in remnant woodland patches and roadside vegetation on the western slopes. They feed primarily on nectar and pollen in the tree canopy, particularly on profusely-flowering eucalypts, but also on a variety of other species including melaleucas and mistletoes. On the western slopes and tablelands White Box *Eucalyptus albens* and Yellow Box *E. melliodora* are particularly important food sources for pollen and nectar respectively.	13	Potential
Haematopus fuliginosus	Sooty Oystercatcher	V	-	A coastal species that inhabits rock coastlines, coral cays, reefs and occasionally sandy beaches (Marchant & Higgins 1993; Simpson & Day 1999).	3	No
Haematopus longirostris	Pied Oystercatcher	V	-	Roosts and forages on sandy beaches, sand banks, mudflats and estuaries (Marchant & Higgins 1993, Simpson & Day 1999).	1	No
Ixobrychus flavicollis	Black Bittern	V	-	Occurs in both terrestrial and estuarine wetlands generally in areas of permanent water and dense vegetation (DECC 2011). In areas with permanent water it may occur in flooded grassland, forest, woodland, rainforest and mangroves (DECC 2011).	4	Potential

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Number of Records in the locality	Likelihood of Occurrence
Lathamus discolor	Swift Parrot	E	E	Breeds in Tasmania between September and January. Migrates to mainland in autumn, where it forages on profuse flowering Eucalypts (Blakers *et al.* 1984; Schodde and Tidemann 1986). Hence, in this region, autumn and winter flowering eucalypts are important for this species. Favoured feed trees include winter flowering species such as Swamp Mahogany (*Eucalyptus robusta*), Spotted Gum (*Corymbia maculata*), Red Bloodwood (*C. gummifera*), Mugga Ironbark (*E. sideroxylon*), and White Box (*E. albens*) (DECC 2011).	12	Unlikely
Limicola falcinellus	Broad-billed Sandpiper	V	M	The eastern form of the Broad-billed Sandpiper breeds in northern Siberia before migrating southwards in winter to Australia (DECC 2011). In Australia, Broad-billed Sandpipers over-winter on the northern coast, particularly in the north-west, with birds located occasionally on the southern coast (DECC 2011). In NSW, the main site for the species is the Hunter River estuary, with birds occasionally reaching the Shoalhaven estuary (DECC 2011). There are few records for inland NSW (DECC 2011). Broad-billed Sandpipers favour sheltered parts of the coast such as estuarine sandflats and mudflats, harbours, embayments, lagoons, saltmarshes and reefs as feeding and roosting habitat (DECC 2011). Occasionally, individuals may be recorded in sewage farms or within shallow freshwater lagoons (DECC 2011). Broad-billed Sandpipers roost on banks on sheltered sand, shell or shingle beaches.	2	Unlikely
Limosa limosa	Black-tailed Godwit	V	M	Primarily found along the coast on sandspits, lagoons and mudflats (DECC 2011). The species has also been found to occur inland on mudflats or shallow receding waters of portions of large muddy swamps or lakes (Pizzey and Knight 1997; Higgins & Davies 1996).	13	Unlikely

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Number of Records in the locality	Likelihood of Occurrence
Nettapus coromandelianus	Cotton Pygmy-Goose	E1	-	Freshwater lakes, lagoons, swamps and dams, particularly those vegetated with waterlilies and other floating and submerged aquatic vegetation. The Cotton Pygmy-goose uses standing dead trees with hollows close to water for roosting and breeding.	4	Unlikely
Pandion haliaetus	Osprey	V	-	Associated with waterbodies including coastal waters, inlets, lakes, estuaries, beaches, offshore islands and sometimes along inland rivers (Schodde and Tidemann 1986; Clancy 1991; Olsen 1995). Osprey may nest on the ground, on sea cliffs or in trees (Olsen 1995). Osprey generally prefer emergent trees, often dead or partly dead with a broken off crown (Olsen 1995).	3	Potential
Polytelis swainsonii	Superb Parrot	V	V	The Superb Parrot is found throughout eastern inland NSW. On the South-western Slopes their core breeding area is roughly bounded by Cowra and Yass in the east, and Grenfell, Cootamundra and Coolac in the west. Birds breeding in this region are mainly absent during winter, when they migrate north to the region of the upper Namoi and Gwydir Rivers. The other main breeding sites are in the Riverina along the corridors of the Murray, Edward and Murrumbidgee Rivers where birds are present all year round. Inhabit box-gum woodland and Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest foraging at or near the ground. Nest in hollows.	1	No
Ptilinopus superbus	Superb Fruit-Dove	V	-	Inhabits rainforest and similar closed forests where it forages high in the canopy, eating the fruits of many tree species such as figs and palms (DECC 2011). It may also forage in eucalypt or acacia woodland where there are fruit-bearing trees. Part of the population is migratory or nomadic. At least some of the population, particularly young birds, moves south through Sydney, especially in autumn. Breeding takes place from September to January. Will feed in adjacent mangroves or eucalypt forests (Blakers *et al*. 1984).	20	Potential

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Number of Records in the locality	Likelihood of Occurrence
Sterna albifrons	Little Tern	E	-	Almost exclusively coastal, preferring sheltered areas (DECC 2011), however may occur several kilometres inland in harbours, inlets and rivers (Smith 1990). Australian birds breed on sandy beaches and sand spits (Simpson & Day 2004).	3	Unlikely
Stictonetta naevosa	Freckled Duck	V	-	Associated with a variety of plankton-rich wetlands, such as heavily vegetated, large open lakes and their shores, creeks, farm dams, sewerage ponds and floodwaters (DECC 2011).	1	No
NOCTURNAL BIRDS						
Ninox connivens	Barking Owl	V	-	Associated with a variety of habitats such as savanna woodland, open eucalypt forests, wetland and riverine forest. The habitat is typically dominated by Eucalypts (often Redgum species), however often dominated by Melaleuca species in the tropics (DECC 2011). It usually roosts in dense foliage in large trees such as River She-oak (*Allocasuarina cunninghamiana*), other Casuarina and Allocasuarina, eucalypts, Angophora, Acacia and rainforest species from streamside gallery forests. It usually nests near watercourses or wetlands in large tree hollows with entrances averaging 2-29 metres above ground, depending on the forest or woodland structure and the canopy height (Debus 1997).	7	Potential
Ninox strenua	Powerful Owl	V	-	Powerful Owls are associated with a wide range of wet and dry forest types with a high density of prey, such as arboreal mammals, large birds and flying foxes (Environment Australia 2000, Debus & Chafer 1994). Large trees with hollows at least 0.5m deep are required for shelter and breeding (Environment Australia 2000).	141	Likely

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Number of Records in the locality	Likelihood of Occurrence
Tyto capensis	Grass Owl	V	-	Reported habitats include tall grass, swampy, sometimes tidal areas, mangrove fringes, grassy plains, coastal heaths, grassy woodland, cane grass, lignum, sedges, cumbungi, cane fields and grain stubble (Pizzey and Knight, 1997). The Grass Owl nests on the ground within dense tall grass, sedges, reeds and even sugarcane plantations (Pizzey and Knight, 1997). The Grass Owl primarily feeds on rodents, hunting on the wing over heathland, grassland and sedgeland, as well as along the edge of sugar cane, crops and pastureland (Pizzey and Knight, 1997).	1	Unlikely
MAMMALS (EXCLUDING BATS)						
Cercartetus nanus	Eastern Pygmy-possum	V	-	Found in wet and dry eucalypt forest, subalpine woodland, coastal banksia woodland and wet heath (Menkhorst & Knight 2004). Pygmy-Possums feed mostly on the pollen and nectar from banksias, eucalypts and understorey plants and will also eat insects, seeds and fruit (Turner & Ward 1995). The presence of *Banksia* sp. and *Leptospermum* sp. are an important habitat feature (DECC 2011). Small tree hollows are favoured as day nesting sites, but nests have also been found under bark, in old birds nests and in the branch forks of tea-trees (Turner & Ward 1995).	3	Unlikely
Dasyurus maculatus *Dasyurus maculatus maculatus*	Spotted-tailed Quoll Spotted-tailed Quoll (SE Mainland Population)	V -	- E	The Spotted-tailed Quoll inhabits a range of forest communities including wet and dry sclerophyll forests, coastal heathlands and rainforests (Mansergh 1984; DECC 2011), more frequently recorded near the ecotones of closed and open forest. This species requires habitat features such as maternal den sites, an abundance of food (birds and small mammals) and large areas of relatively intact vegetation to forage in (DECC 2011). Maternal den sites are logs with cryptic entrances; rock outcrops; windrows; burrows (Environment Australia 2000).	12	Unlikely

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Number of Records in the locality	Likelihood of Occurrence
Dasyurus viverrinus	Eastern Quoll	E	V	Associated with a variety of habitats, including dry sclerophyll forest, shrub, heath land, riparian forests and agricultural areas. Requires features such as hollow logs and rock piles for shelter (DECC 2011).	1	Unlikely
Isoodon obesulus	Southern Brown Bandicoot	E	E	This species is associated with heath, coastal scrub, heathy forests (Menkhorst & Knight 2004), shrubland and woodland on well drained soils. This species is thought to display a preference for newly regenerating heathland and other areas prone to fire (Menkhorst & Seebeck 1990).	90	Unlikely
Petaurus australis	Yellow-bellied Glider	V	-	This species is restricted to tall mature forests, preferring productive tall open sclerophyll forests with a mosaic of tree species including some that flower in winter (Environment Australia 2000, Braithwaite 1984, Davey 1984, Kavanagh 1984; DECC 2011). Large hollows within mature trees are required for shelter, nesting and breeding (Henry and Craig 1984; DECC 2011).	1	No
Petrogale penicillata	Brush-tailed Rock-wallaby	E	V	Rocky areas in a variety of habitats, typically north facing sites with numerous ledges, caves and crevices (DECC 2011).	-	No
Phascolarctos cinereus	Koala	V-E2	-	Associated with both wet and dry Eucalypt forest and woodland that contains a canopy cover of approximately 10 to 70% (Reed et al. 1990), with acceptable Eucalypt food trees. Some preferred Eucalyptus species are: Eucalyptus tereticornis, E. punctata, E. cypellocarpa, E. viminalis	2	Unlikely
Potorous tridactylus *Potorous tridactylus tridactylus*	Long-nosed Potoroo Long-nosed Potoroo (SE Mainland Population)	V -	- V	Associated with dry coastal heath and dry and wet sclerophyll forests with dense cover for shelter and adjacent more open areas for foraging (Menkhorst & Knight 2004).	-	Unlikely

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Number of Records in the locality	Likelihood of Occurrence
Pseudomys novaehollandiae	New Holland Mouse		V	A small burrowing native rodent with a fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. Inhabits open heathlands, open woodlands with a heathland understorey and vegetated sand dunes. A social animal, living predominantly in burrows shared with other individuals. The home range of the New Holland Mouse ranges from 0.44 ha to 1.4 ha and the species peaks in abundance during early to mid stages of vegetation succession typically induced by fire	-	Unlikely
MAMMALS (BATS)						
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	The Large-eared Pied Bat has been recorded in a variety of habitats, including dry sclerophyll forests, woodland, sub-alpine woodland, edges of rainforests and wet sclerophyll forests (Churchill 1998; DECC 2011). This species roosts in caves, rock overhangs and disused mine shafts and as such is usually associated with rock outcrops and cliff faces (Churchill 1998; DECC 2011).	1	Potential
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-	Prefers moist habitats with trees taller than 20m (DECC 2011). Roosts in tree hollows but has also been found roosting in buildings or under loose bark.	1	Unlikely
Miniopterus australis	Little Bent-wing Bat	V	-	Prefers well-timbered areas including rainforest, wet and dry sclerophyll forests, Melaleuca swamps and coastal forests (Churchill 1998). This species shelter in a range of structures including culverts, drains, mines and caves (Environment Australia 2000). Relatively large areas of dense vegetation of either wet sclerophyll forest, rainforest or dense coastal banksia scrub are usually found adjacent to caves in which this species is found (DECC 2011). Breeding occurs in caves, usually in association with M. schreibersii (Environment Australia 2000, DECC 2011).	1	Potential

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Number of Records in the locality	Likelihood of Occurrence
Miniopterus orianae oceanensis	Eastern Bent-wing Bat	V	-	Associated with a range of habitats such as rainforest, wet and dry sclerophyll forest, monsoon forest, open woodland, paperbark forests and open grassland (Churchill 1998). It forages above and below the tree canopy on small insects (AMBS 1995, Dwyer 1995, Dwyer 1981). Will utilise caves, old mines, and stormwater channels, under bridges and occasionally buildings for shelter (Environment Australia 2000, Dwyer 1995).	63	Likely
Mormopterus norfolkensis	East Coast Freetail Bat	V	-	Most records of this species are from dry eucalypt forest and woodland east of the Great Dividing Range (Churchill 1998). Individuals have, however, been recorded flying low over a rocky river in rainforest and wet sclerophyll forest and foraging in clearings at forest edges (Environment Australia 2000; Allison & Hoye 1998). Primarily roosts in hollows or behind loose bark in mature eucalypts, but have been observed roosting in the roof of a hut (Environment Australia 2000; Allison & Hoye 1998).	4	Likely
Pteropus poliocephalus	Grey-headed Flying-Fox	V	V	Inhabits a wide range of habitats including rainforest, mangroves, paperbark forests, wet and dry sclerophyll forests and cultivated areas (Churchill 1998, Eby 1998). Camps are often located in gullies, typically close to water, in vegetation with a dense canopy (Churchill 1998).	1330	Likely
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	-	Found in almost all habitats, from wet and dry sclerophyll forest, open woodland (Churchill 1998), open country, mallee, rainforests, heathland and waterbodies. Roosts in tree hollows; may also use caves; has also been recorded in a tree hollow in a paddock (Environment Australia 2000) and in abandoned sugar glider nests (Churchill 1998). The Yellow-bellied Sheathtail-bat is dependent on suitable hollow-bearing trees to provide roost sites, which may be a limiting factor on populations in cleared or fragmented habitats (Environment Australia 2000).	3	Potential

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Number of Records in the locality	Likelihood of Occurrence
MIGRATORY TERRESTRIAL SPECIES LISTED UNDER EPBC ACT						
Anthochaera phrygia	Regent Honeyeater	E	E, M	SEE DIURNAL BIRDS ABOVE	SEE DIURNAL BIRDS ABOVE	
Haliaeetus leucogaster	White-bellied Sea-Eagle	-	M	Forages over large open fresh or saline waterbodies, coastal seas and open terrestrial areas (Marchant & Higgins 1993, Simpson & Day 2004). Breeding habitat consists of tall trees, mangroves, cliffs, rocky outcrops, silts, caves and crevices and is located along the coast or major rivers. Breeding habitat is usually in or close to water, but may occur up to a kilometre away (Marchant & Higgins 1993).	-	Potential
Hirundapus caudacutus	White-throated Needletail	-	M	Forages aerially over a variety of habitats usually over coastal and mountain areas, most likely with a preference for wooded areas (Marchant & Higgins 1993; Simpson & Day 2004). Has been observed roosting in dense foliage of canopy trees, and may seek refuge in tree hollows in inclement weather (Marchant & Higgins 1993).	-	Potential
Merops ornatus	Rainbow Bee-eater	-	M	Resident in coastal and subcoastal northern Australia; regular breeding migrant in southern Australia, arriving September to October, departing February to March, some occasionally present April to May. Occurs in open country, chiefly at suitable breeding places in areas of sandy or loamy soil: sand-ridges, riverbanks, road-cuttings, sand-pits, occasionally coastal cliffs. Nest is a chamber a the end of a burrow, up to 1.6 m long, tunnelled in flat or sloping ground, sandy back or cutting.	-	Unlikely
Monarcha melanopsis	Black-faced Monarch	-	M	Rainforest and eucalypt forests, feeding in tangled understorey (Blakers et al. 1984).	-	Unlikely

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Number of Records in the locality	Likelihood of Occurrence
Myiagra cyanoleuca	Satin Flycatcher	-	M	Wetter, denser forest, often at high elevations (Simpson & Day 2004).	-	Unlikely
Rhipidura rufifrons	Rufous Fantail	-	M	The Rufous Fantail is a summer breeding migrant to southeastern Australia (Morcombe, 2004). The Rufous Fantail is found in rainforest, dense wet eucalypt and monsoon forests, paperbark and mangrove swamps and riverside vegetation (Morcombe, 2004). Open country may be used by the Rufous Fantail during migration (Morcombe, 2004).	-	Unlikely
MIGRATORY WETLAND SPECIES LISTED UNDER EPBC ACT						
Ardea alba	Great Egret	-	M	The Great Egret is common and widespread in Australia (McKilligan, 2005). It forages in a wide range of wet and dry habitats including permanent and ephemeral freshwaters, wet pasture and estuarine mangroves and mudflats (McKilligan, 2005).	-	Potential
Ardea ibis	Cattle Egret	-	M	Cattle Egrets forage on pasture, marsh, grassy road verges, rain puddles and croplands, but not usually in the open water of streams or lakes and they avoid marine environments (McKilligan, 2005). Some individuals stay close to the natal heronry from one nesting season to the next, but the majority leave the district in autumn and return the next spring. Cattle Egrets are likely to spend the winter dispersed along the coastal plain and only a small number have been recovered west of the Great Dividing Range (McKilligan, 2005).	-	Unlikely
Arenaria interpres	Ruddy Turnstone	-	M	Frequents beaches along the coast of NSW. Flies from Siberia or Alaska to Australia in August - September each year (*ibid*).	-	Unlikely
Calidris acuminata	Sharp-tailed Sandpiper	-	M	It prefers the grassy edges of shallow inland freshwater wetlands. It is also found around sewerage treatment ponds, flooded grasslands, mudflats, mangroves, rocky shores and beaches.	-	Potential

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Number of Records in the locality	Likelihood of Occurrence
Calidris canutus	Red Knot	-	M	Red Knots gather in large flocks on the coast in sandy estuaries with tidal mudflats	-	Unlikely
Calidris ferruginea	Curlew Sandpiper	-	M	Intertidal mudflats of estuaries, lagoons, mangrove channels; around lakes, dams, floodwaters, flooded saltbush surrounds of inland lakes (Morcombe, 2004).	-	Potential
Calidris ruficollis	Red-necked Stint	-	M	In Australia, Red-necked Stints are found on the coast, in sheltered inlets, bays, lagoons, estuaries, intertidal mudflats and protected sandy or coralline shores. They may also be seen in saltworks, sewage farms, saltmarsh, shallow wetlands including lakes, swamps, riverbanks, waterholes, bore drains, dams, soaks and pools in saltflats, flooded paddocks or damp grasslands. They are often in dense flocks, feeding or roosting	-	Unlikely
Calidris tenuirostris	Great Knot	V	M	SEE DIURNAL BIRDS ABOVE	SEE DIURNAL BIRDS ABOVE	
Charadrius mongolus	Lesser Sand Plover	V	M	SEE DIURNAL BIRDS ABOVE	SEE DIURNAL BIRDS ABOVE	
Charadrius bicinctus	Double-banded Plover	-	M	The Double-banded Plover is found on coastal beaches, mudflats, sewage farms, river banks, fields, dunes, upland tussock grasses and shingle	-	Unlikely
Charadrius leschenaultii	Greater Sand Plover	-	M	SEE DIURNAL BIRDS ABOVE	SEE DIURNAL BIRDS ABOVE	
Gallinago hardwickii	Latham's Snipe	-	M	A variety of permanent and ephemeral wetlands, preferring open fresh water wetlands with nearby cover (Marchant and Higgins 1999). Occupies a variety of vegetation around wetlands (Marchant and Higgins 1999) including wetland grasses and open wooded swamps (Simpson and Day 2004).	-	No

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Number of Records in the locality	Likelihood of Occurrence
Heteroscelus brevipes	Grey-tailed Tattler	-	M	Grey-tailed Tattlers are usually seen in small flocks on sheltered coasts with reefs and rock platforms or with intertidal mudflats. They are also found in intertidal rocky, coral or stony reefs, platforms and islets that are exposed at high tide, also shores of rock, shingle, gravel and shells and on intertidal mudflats in embayments, estuaries and coastal lagoons, especially those fringed with mangroves.	-	Unlikely
Limosa lapponica	Bar-tailed Godwit	-	M	Mainly coastal, usually sheltered bays, estuaries and lagoons with large intertidal mudflats or sandflats. Breeds in Northern Russia, Scandinavia, NW Alaska.	-	Unlikely
Limosa limosa	Black-tailed Godwit	V	M	Mainly coastal, usually sheltered bays, estuaries and lagoons with large intertidal mudflats or sandflats. Often found inland in small numbers (ibid). Breeds in Iceland, Nth Atlantic, Europe, Russian and China (*ibid*).	SEE DIURNAL BIRDS ABOVE	
Numenius madagascariensis	Eastern Curlew	-	M	Intertidal coastal mudflats, coastal lagoons, sandy spits (DEH 2005a). Breeds in Russia, NE China (*ibid*).	-	Unlikely
Numenius minutus	Little Curlew, Little Whimbrel	-	M	The Little Curlew is known to breed in Siberia, with migrants arriving after early April. Southern migration begins in September following the Chinese coast and, after a staging in Mongolia, continues to Northern Australia and New Guinea. Outside of the breeding season, the species inhabits grasslands, open plains, parklands and mud-flats of Northern Australia (Simpson and Day 2004).	-	Unlikely
Numenius phaeopus	Whimbrel	-	M	Intertidal coastal mudflats, river deltas and mangroves, occasionally sandy beaches. Breeds Siberia and Alaska (*ibid*.).	-	Potential
Pluvialis fulva	Pacific Golden Plover	-	M	Breeds North Siberia, Alaska. Mainly coastal, beaches, mudflats and sandflats and other open areas such as recreational playing fields in Australia (*ibid*.).	-	Unlikely

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Number of Records in the locality	Likelihood of Occurrence
Rostratula benghalensis (R. australis)	Painted Snipe	E	V, M	See: *Rostratula australis*	SEE DIURNAL BIRDS ABOVE	
Tringa stagnatilis	Marsh Sandpiper	-	M	Coastal - Permanent or ephemeral wetlands of varying degrees of salinity, commonly inland. Breeds Eastern Europe to Eastern Siberia (*ibid*).	-	Unlikely

Disclaimer: Data extracted from the Atlas of NSW Wildlife and EPBC Protected Matters Report are only indicative and cannot be considered a comprehensive inventory. 'Migratory marine species' and 'listed marine species' listed on the EPBC Act (and listed on the EPBC protected matters report) have not been included in this table, since they are considered unlikely to occur within the study area due to the absence of marine habitat.

E = Endangered; E2 = Endangered Population; V = Vulnerable; M = Migratory.

Appendix B: Flora Species Recorded During Site Inspection

Species Name	Common Name	1	2	3	4	5 and 6	7	8	9	10	Remainder [1]
Acacia baileyana ^	Cootamundra Wattle										x
Acacia binervia	Coast Myall							x			
Acacia elata	Mountain Cedar Wattle					x					
Acacia falcata				x	x						
Acacia fimbriata	Fringed Wattle									x	
Acacia linifolia	Flax-leaved Wattle								x		
Acacia longifolia subsp. *longifolia*	Sydney Golden Wattle		x				x				
Acacia mearnsii		x	x			x	x				
Acacia sp.										x	x
Acacia terminalis subsp. *aurea*									x		
Acacia ulicifolia	Prickly Moses				x						
Acetosa sagittata *	Rambling Dock							x			x
Adiantum aethiopicum	Common Maidenhair					x					
Agapanthus praecox subsp. *orientalis* *	Agapanthus		x								x
Ageratina adenophora *	Crofton Weed						x		x		x
Allocasuarina littoralis	Black Sheoak		x			x					
Allocasuarina sp.		x			x		x	x			
Anagallis arvensis *	Scarlet/Blue Pimpernel					x	x		x	x	
Angophora bakeri	Narrow-leaved Apple								x		x
Angophora costata	Sydney Red/Rusty Gum	x	x	x	x	x	x		x		x
Araujia sericifera *	Moth Vine	x						x			
Aristida ramosa	Purple Wiregrass			x							
Asparagus aethiopicus *	Asparagus Fern						x		x	x	x
Asparagus plumosus *	Climbing Asparagus Fern		x								
Austrodanthonia sp.									x		
Avicennia marina var *australasica*	Grey Mangrove									x	

Species Name	Common Name	1	2	3	4	5 and 6	7	8	9	10	Remainder [1]
Banksia ericifolia							x				
Banksia integrifolia		x								x	
Banksia paludosa		x									
Banksia serrata	Old Man Banksia								x		
Banksia spinulosa									x		
Bidens pilosa	Cobbler's Pegs			x			x				x
Blechnum sp.									x		
Bossiaea obcordata									x		
Bromeliad sp. *	Bromeliad sp.		x								
Bursaria spinosa	Native Blackthorn						x	x			
Callistemon rigidus	Stiff Bottlebrush					x					
Calochlaena dubia	Common Ground Fern					x					
Cardiospermum grandiflorum *	Balloon Vine							x	x		x
Casuarina cunninghamiana	River Oak	x								x	
Casuarina glauca	Swamp Oak							x		x	x
Centella asiatica	Pennywort			x	x		x				
Chlorophytum comosum *	Spider Plant										x
Cinnamomum camphora *	Camphor Laurel			x		x			x		
Cirsium vulgare *	Spear Thistle								x		
Clematis aristata		x				x			x		
Clematis glycinoides	Headache Vine		x								
Commelina cyanea	Native Wandering Jew					x	x	x			
Conyza bonariensis *	Flaxleaf Fleabane	x					x				
Corymbia gummifera	Red Bloodwood		x	x	x				x		
Corymbia maculata	Spotted Gum			x							
Cotoneaster sp. *							x	x	x		x
Cyathea sp.						x					
Cynodon dactylon	Common Couch										x
Dianella caerulea var *producta*			x			x	x		x		
Dodonaea triquetra			x	x	x						
Echinopogon sp.					x						
Ehrharta erecta *	Panic Veldtgrass	x					x		x		
Elaeocarpus reticulatus	Blueberry Ash								x		

Species Name	Common Name	1	2	3	4	5 and 6	7	8	9	10	Remainder [1]
Elephant ears *								x			
Entolasia sp.				x	x						
Entolasia stricta	Wiry Panic		x						x		
Eragrostis curvula *	African Lovegrass		x								
Erythrina x sykesii *	Coral tree										x
Eucalyptus acmenioides	White Mahogony			x		x	x	x			x
Eucalyptus pilularis	Blackbutt										x
Eucalyptus piperita	Sydney Peppermint						x		x		
Eucalyptus resinifera	Red Mahogany			x					x		
Eucalyptus robusta	Swamp Mahogany		x	x							x
Eucalyptus saligna	Sydney Blue Gum					x	x				
Eucalyptus sclerophylla	Hard-leaved Scribbly Gum		x	x							x
Eucalyptus spp.		x				x	x			x	
Ficus sp.									x		
Glochidion ferdinandi	Cheese Tree		x		x	x			x		
Glycine tabacina				x	x						
Goodenia sp.					x						
Grevillea sericea			x		x						
Grevillea sp.									x		
Hakea dactyloides						x					
Hakea salicifolia	Willow-leaved Hakea									x	
Hakea sericea									x		
Hardenbergia violacea	False Sarsaparilla			x	x						
Hypochaeris radicata *	Catsear	x	x			x	x				x
Imperata cylindrica			x			x			x		
Ipomoea purpurea *	Common Morning Glory	x									
Isopogon anemonifolius									x		
Juncus sp.										x	
Kunzea ambigua	Tick Bush	x			x	x	x	x			
Lantana camara *	Lantana	x	x			x	x	x	x		
Leptospermum trinervium							x		x		
Leucopogon ericoides			x								

Species Name	Common Name	1	2	3	4	5 and 6	7	8	9	10	Remainder [1]
Ligustrum lucidum *	Large-leaved Privet	x	x			x	x	x			
Ligustrum sinense *	Small-leaved Privet	x	x			x	x	x	x		
Lomandra longifolia	Spiny-headed Mat-rush	x	x			x	x		x	x	
Lomandra multiflora				x							
Lomandra sp.		x									
Lophostemon confertus ^	Brush Box			x							x
Melaleuca armillaris							x			x	
Melaleuca decora						x					
Melaleuca ericifolia	Swamp paperbark									x	
Microlaena stipoides	Weeping Grass			x	x	x	x		x		
Monstera deliciosa *	Fruit Salad Plant								x		
Nephrolepis cordifolia *	Fishbone Fern		x						x		x
Ochna serrulata *	Mickey Mouse Plant		x			x					
Olea europaea subsp. *cuspidata* *	African Olive						x		x		
Omalanthus populifolius	Bleeding Heart, Native Poplar	x		x		x			x		
Oplismenus aemulus			x								
Osteospermum fruiticosum *	South African Daisy										x
Oxalis sp.*						x	x				
Ozothamnus diosmifolius	White Dogwood			x	x		x		x		
Paspalum dilatatum *	Paspalum			x							x
Pennisetum clandestinum *	Kikuyu Grass			x							x
Persoonia lanceolata					x						
Persoonia levis	Broad-leaved Geebung		x								
Persoonia linearis	Narrow-leaved Geebung		x								
Phoenix sp. *								x			
Phyllostachys aurea *	Fishpole Bamboo								x		
Pimelea linifolia									x		
Pinus sp. *											x
Pittosporum undulatum	Sweet Pittosporum		x	x	x	x	x	x	x		x
Plantago lanceolata *	Lamb's Tongues			x		x	x	x	x		x
Pomaderris sp.				x	x	x					
Pteridium esculentum	Bracken		x				x		x		x

Species Name	Common Name	1	2	3	4	5 and 6	7	8	9	10	Remainder [!]
Pultenaea elliptica					x						
Rubus fruiticosus *	Blackberry complex		x					x	x		x
Salix sp. *							x				
Sarcocornia quinqueflora	Samphire									x	
Selliera radicans	Swamp Weed									x	
Senna sp. *							x	x			x
Sida rhombifolia *	Paddy's Lucerne	x		x	x	x	x	x	x		
Smilax glyciphylla	Sweet Sarsparilla								x		
Solanum mauritianum *	Wild Tobacco Bush	x				x					
Sonchus sp. *		x									
Sporobolus sp. *									x		
Sporobolus virginicus										x	
Stenotaphrum secundatum *	Buffalo Grass										x
Syncarpia glomulifera	Turpentine	x	x								
Syzygium sp.		x									
Themeda australis	Kangaroo Grass			x	x						
Tradescantia fluminensis *	Trad								x		x
Unidentified Brassicaceae sp. *											x
Unidentified Poaceae sp.				x	x						
Verbena bonariensis *	Purpletop										x

* Indicates exotic species. ^ Indicates native and planted species. [!] Landscaped areas (outside of remnant vegetation patches)

Appendix C: Fauna Species Recorded During Site Inspection

Species Name	Common Name
Birds	
Acanthiza sp.	Thornbill species
Acridotheres tristis *	Indian Minor
Corvus coronoides	Australian Raven
Cracticus torquatus	Grey Butcherbird
Dacelo novaeguineae	Laughing Kookaburra
Eolophus roseicapillus	Galah
Gymnorhina tibicen	Australian Magpie
Malurus cyaneus	Superb Fairy-wren
Manorina melanocephala	Noisy Miner
Pardalotus punctatus	Spotted Pardalote
Strepera graculina	Pied Currawong
Trichoglossus haematodus	Rainbow Lorikeet
Mammals	
Petaurus sp.	Glider species
Pseudocheirus peregrinus	Common Ringtail Possum
Frogs	
Crinia signifera	Common Eastern Froglet

* Indicates exotic species.

Appendix D: Assessments of Significance

The Assessment of Significance (7-part test) is applied to species, populations and ecological communities listed on Schedules 1, 1A and 2 of the TSC Act and Schedules 4, 4A and 5 of the FM Act. The assessment sets out 7 factors, which when considered, allow proponents to undertake a qualitative analysis of the likely impacts of an action and to determine whether further assessment is required via a Species Impact Statement (SIS). All factors must be considered and an overall conclusion made based on all factors in combination. An SIS is required if, through application of the 7-part test, an action is considered likely to have a significant impact on a threatened species, population or ecological community.

Assessments of Significance for threatened species, populations or ecological communities considered to occur or have the potential to occur in the study area are provided below.

Endangered Ecological Communities

- Coastal Saltmarsh;
- Swamp Oak Floodplain Forest and Coastal Saltmarsh Complex; and
- Swamp Sclerophyll Forest on Coastal Floodplains.

Flora Species

- *Acacia bynoeana* (Bynoe's Wattle);
- *Acacia terminalis* subsp. *terminalis* (Sunshine Wattle);
- *Callistemon linearifolius* (Netted Bottlebrush);
- *Camarophyllopsis kearneyi*;
- *Darwinia biflora*;
- *Epacris purpurascens* var *purpurascens*;
- *Genoplesium baueri* (Bauer's Midge Orchid);
- *Melaleuca deanei* (Deane's Paperbark);
- *Persoonia hirsuta* (Hairy Geebung); and
- *Wilsonia backhousei.*

Fauna Species

- Red-crowned Toadlet (*Pseudophryne australis*);
- Regent Honeyeater (*Anthochaera phrygia* also known as *Xanthomyza phrygia*);
- Gang-gang Cockatoo (*Callocephalon fimbriatum*);
- Glossy Black Cockatoo (*Calyptorhynchus lathami*);
- Black Bittern (*Ixobrychus flavicollis*);
- Little Lorikeet (*Glossopsitta pusilla*);
- Osprey (*Pandion haliaetus*);
- Superb Fruit Dove (*Ptilinopus superbus*);
- Barking Owl (*Ninox connivens*);
- Powerful Owl (*Ninox strenua*);

- Large-eared Pied Bat (*Chalinolobus dwyeri*);
- Eastern Bentwing-bat (*Miniopterus orianae oceanensis*);
- Little Bentwing-bat (*Miniopterus australis*);
- East Coast Freetail-bat (*Mormopterus norfolkensis*);
- Grey-headed Flying-fox (*Pteropus poliocephalus*); and
- Yellow-bellied Sheathtail Bat (*Saccolaimus flaviventris*).

Coastal Saltmarsh

Coastal Saltmarsh occurs in the intertidal zone on the shores of estuaries and lagoons that are permanently or intermittently open to the sea. It is frequently found as a zone on the landward side of mangrove stands. Characteristic plants include *Baumea juncea*, *Juncus krausii*, *Sarcocornia quinqueflora*, *Sporobolus virginicus*, *Triglochin striata*, *Isolepis nodosa*, *Samolus repens*, *Selliera radicans*, *Suaeda australis* and *Zoysia macrantha*. Occasionally, mangroves are scattered through the saltmarsh. Tall reeds may also occur, as well as salt pans. Species composition varies with elevation and latitude, with saltmarsh in southern NSW being generally more species-rich than further north. The sediment surface may support a diversity of seaweed species (DEC 2011).

The community is threatened by in-filling for development, modification of tidal flows as a consequence of artificial structures being erected, alteration of salinity and increasing nutrient levels resulting from the discharge of stormwater into saltmarshes, weed invasion, particularly by *Juncus acutus*, physical damage from human disturbance, domestic and feral animals, dumping of rubbish and pollution from oil or chemical spills from shipping or road accidents, invasion by mangroves, and inappropriate fire regimes.

The community is present in the study area along Buffalo Creek, near where the creek crosses Pittwater Road.

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

Coastal Saltmarsh is listed as an EEC, not as a threatened species.

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

Coastal Saltmarsh is listed as an EEC, not as an endangered population.

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

i. **is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**

ii. **is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.**

Field survey estimated that Coastal Saltmarsh occupied an area of approximately 15m^2. The community was comprised of *Sporobolus virginicus* (Saltwater Couch), *Sarcocornia quinqueflora* (Samphire), and *Selliera radicans* (Swamp Weed), with scattered *Juncus* sp. and *Melaleuca ericifolia* (Swamp paperbark) also present.

The proposed works would not directly impact on the extent of Coastal Saltmarsh given the proposed shared user path would be constructed 5-10m downstream, adjoining Pittwater Road. The shared user path would be unlikely to shade the community. Given that proper sedimentation controls would be in place to protect the community from increased sedimentation or changes in water flow, the proposed

road upgrade works would be unlikely to indirectly impact on the extent or composition of the community.

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

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

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

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

The proposed development would not remove any habitat for Coastal Saltmarsh, nor fragment or isolate the community from other areas of habitat.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat for Coastal Saltmarsh has been identified.

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

No Recovery Plan or Threat Abatement Plans have been prepared for Coastal Saltmarsh. Nine Priority Actions have been identified to help recover Coastal Saltmarsh. The proposal is not in conflict with these Priority Actions.

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

The proposed works would result in the operation of and increase the impact of a key threatening process, *Clearing of Native Vegetation*. However, only a minimal amount of vegetation would be removed under the proposal and would comprise mostly introduced species. No Coastal Saltmarsh vegetation would be removed.

Conclusion

The proposed development is unlikely to impose a significant effect on Coastal Saltmarsh given that the proposed works:

- would not remove any Coastal Saltmarsh and potential Coastal Saltmarsh habitat;
- would be unlikely to indirectly impact on vegetation comprising Coastal Saltmarsh or Coastal Saltmarsh habitat given sedimentation controls were in place; and
- would not isolate an area of known habitat from currently interconnecting areas of potential habitat for this community.

On the basis of the above considerations, it is unlikely that the proposed works would result in a significant impact on the extent or composition of Coastal Saltmarsh. Consequently, a Species Impact Statement is not required for the proposed development with respect to this community.

Swamp Oak Floodplain Forest and Coastal Saltmarsh Complex

Ecological communities are defined under the TSC Act as: *'An assemblage of species in a particular area'.*

The *particular area* of Swamp Oak Floodplain Forest and Coastal Saltmarsh is the coastal floodplain of NSW, which is defined as, 'level landform patterns on which there may be active erosion and aggradation by channelled and overbank stream flow with an average recurrence interval of 100 years or less'. The occurrence of this community is associated with 'grey-black clay-loams and sandy loams, where the groundwater is saline or sub-saline, on waterlogged or periodically inundated flats, drainage lines, lake margins and estuarine fringes associated with coastal floodplains' (DEC 2011).

The *assemblage of species* that characterise Swamp Oak Floodplain Forest is a dense to sparse canopy of Swamp Oak (*Casuarina glauca*) north from Bermagui, with Swamp Paperbark (*Melaleuca ericifolia*) taking over as the dominant canopy species as the community proceeds south from Sydney. Other subordinate trees including *Acmena smithii* (Lilly Pilly), *Glochidion* spp. (Cheese Tree) and *Melaleuca* spp. (paperbarks) may be present, but this community is often found in pure stands in the presence of salt tolerant understorey species such as *Baumea juncea, Juncus kraussii, Phragmites australis*, and *Selliera radicans*, with vines such as, *Parsonsia straminea, Geitonoplesium cymosum* and *Stephania japonica* var. *discolour* present (a full list of characteristic species of this community is found in the Final Determination of the Scientific Committee, see DEC 2011).

The *assemblage of species* that characterise Coastal Saltmarsh varies with elevation. *Sarcocornia quinqueflora* dominates at lower, and hence more frequently flooded, levels than *Sporobolus virginicus* which dominates the mid saltmarsh, while *Juncus kraussii* and *Baumea juncea* are upper saltmarsh species (DEC 2011).

Species common of both Coastal Saltmarsh and Swamp Oak Floodplain Forest were recorded at the area below the drainage outlet to Kitty's Creek and as such they are assessed here as an intergrade community (Swamp Oak Floodplain Forest and Coastal Saltmarsh Complex; SOFFCS Complex).

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

Swamp Oak Floodplain Forest and Coastal Saltmarsh are listed as endangered ecological communities, not as a threatened species.

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

Swamp Oak Floodplain Forest and Coastal Saltmarsh are listed as endangered ecological communities, not as endangered populations.

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

i. **is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

SOFFCS Complex in the area downstream of Kitty's Creek (to the east of the subject site) is estimated to occupy approximately 1.05 ha. The estimate was based on the extent of Estuarine Saltmarsh and Estuarine Swamp Oak Forest mapped in the SMCMA mapping. Previous survey (ELA 2010) found the SOFFCS Complex to be dominated by an *Avicennia marina* var *australasica* (Grey Mangrove) canopy, although *Casuarina glauca* was also present. *Typha orientalis* (Cumbungi) was present in the mid-storey. Groundcover consisted of mostly *Sporobolus virginicus* (Saltwater Couch); however, *Lepidosperma filiforme*, *Hydrocotyle bonariensis* (Pennywort), *Tetragonia tetragonioides* (Warrigal Spinach), *Commelina cyanea*, *Alternanthera denticulata* (Lesser Joyweed), and *Atriplex prostrata* also occurred. The community was found to be low in species richness overall.

Council advised that changes to flow volumes as a result of kerb and guttering parts of Pittwater Road will be negligible. A rock-lined sedimentation basin is proposed to be installed which will reduce existing sediment movement from the road reserve into Kitty's Creek. The proposed works would not directly or indirectly impact on the extent or composition of SOFFCS Complex.

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

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

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

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

The proposed development would not remove any habitat of SOFFCS Complex. A rock-lined sedimentation basin is proposed to be installed which will reduce existing sediment movement from the road reserve into Kitty's Creek.Thus, it is unlikely that the proposed development would modify the habitat of SOFFCS Complex.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat for SOFFCS Complex has been identified.

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

No Recovery Plan or Threat Abatement Plans have been prepared for SOFFCS Complex. Ten Priority Actions have been identified to help recover Swamp Oak Floodplain Forest, while 9 Priority Actions have been identified to help recover Coastal Saltmarsh. The proposal is not in conflict with these Priority Actions.

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

While the proposed works would result in the operation of or increase the impact of a key threatening process, *Clearing of Native Vegetation*, the proposed works do not constitute a key threatening process of relevance to SOFFCS Complex.

Conclusion

The proposed development is unlikely to impose a significant effect on SOFFCS Complex given that the proposed works:

- would not directly impact on the community or its habitat;
- would be unlikely to indirectly impact on the community or its habitat given water flow and sedimentation to the SOFFCS Complex following works would not increase significantly (any increases in water flow would be negligible and a sediment basin would prevent sedimentation to the area) and
- would not isolate an area of known habitat from currently interconnecting areas of potential habitat for this community.

On the basis of the above considerations, it is unlikely that the proposed works would result in a significant impact on the extent or composition of SOFFCS Complex. Consequently, a Species Impact Statement is not required for the proposed development with respect to this community.

Swamp Sclerophyll Forest on Coastal Floodplains

Swamp Sclerophyll Forest on Coastal Floodplains (SSF) has an open to dense tree layer of eucalypts and paperbarks although some remnants now only have scattered trees as a result of partial clearing. The trees may exceed 25 m in height, but can be considerably shorter in regrowth stands or under conditions of lower site quality where the tree stratum is low and dense. For example, stands dominated by *Melaleuca ericifolia* typically do not exceed 8 m in height. The community also includes some areas of fernland and tall reedland or sedgeland, where trees are very sparse or absent DEC 2011).

The most widespread and abundant dominant trees include *Eucalyptus robusta* (Swamp Mahogany), *Melaleuca quinquenervia* (Paperbark) and, south from Sydney, *Eucalyptus botryoides* (Bangalay) and *Eucalyptus longifolia* (Woollybut). Other trees may be scattered throughout at low abundance or may be locally common at few sites, including *Callistemon salignus* (Sweet Willow Bottlebrush), *Casuarina glauca* (Swamp Oak) and *Eucalyptus resinifera* subsp. *hemilampra* (Red Mahogany), *Livistona australis* (Cabbage Palm) and *Lophostemon suaveolens* (Swamp Turpentine). A layer of small trees may be present, including *Acacia irrorata* (Green Wattle), *Acmena smithii* (Lilly Oilly), *Elaeocarpus reticulatus* (Blueberry Ash), *Glochidion ferdinandi* (Cheese Tree), and *Melaleuca linariifolia* and *M. styphelioides* (paperbarks). Shrubs include *Acacia longifolia, Dodonaea triquetra, Ficus coronata, Leptospermum polygalifolium* subsp. *polygalifolium* and *Melaleuca* spp. Occasional vines include *Parsonsia straminea, Morinda jasminoides* and *Stephania japonica* var. *discolor*. The groundcover is composed of abundant sedges, ferns, forbs, and grasses including *Gahnia clarkei, Pteridium esculentum, Hypolepis muelleri, Calochlaena dubia, Dianella caerulea, Viola hederacea, Lomandra longifolia, Entolasia marginata* and *Imperata cylindrica* (DEC 2011).

SSF is associated with humic clay loams and sandy loams, on waterlogged or periodically inundated alluvial flats and drainage lines associated with coastal floodplains. It generally occurs below 20 m (though sometimes up to 50 m) elevation. The composition of the community is primarily determined by the frequency and duration of waterlogging and the texture, salinity nutrient and moisture content of the soil, and latitude.

The community is threatened by further clearing for urban and rural development, and the subsequent impacts from fragmentation, flood mitigation and drainage works, management of water and tidal flows, landfilling and earthworks associated with urban and industrial development, grazing and trampling by stock and feral animals (particulary pigs), changes in water quality, particularly increased nutrients and sedimentation, weed invasion, climate change, activation of acid sulfate soils, the removal of dead wood, rubbish dumping, and frequent burning which reduces the diversity of woody plant species.

The community may be present in the study area. The community is mapped in the SMCMA mapping as Coastal Alluvial Bangalay Forest (CABF), a component of SSF, just to the north of Bronhill Avenue. However, field survey could not determine the presence of the community with certainty due to the high density of weeds. Further, only one diagnostic species was present (Table 1), with one species, *Allocasuarina torulosa*, identified at a distance rather than with certainty through the validation of its fruits.

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

SSF is listed as an EEC, not as a threatened species.

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

SSF is listed as an EEC, not as an endangered population.

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

iii. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

iv. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

According to the SMCMA mapping, SSF occupies approximately 0.71 ha of the study area. Field survey found that vegetation where SSF was mapped was dominated by introduced species. Species in the canopy were few, with *E. acmenoides* the only species identified. The mid-storey was comprised of *Pittosporum undulatum*, *Kunzea ambigua*, *Ligustrum lucidum*, *Ligustrum sinense*, *Lantana camara*, *Casuarina glauca* (Swamp Oak), *Rubus fruiticosus* aggregate (Blackberry), and *Senna* sp. *Allocasuarina torulosa* may have been present, but no fruits were collected. Groundcover species included *Sida rhombifolia*, *Plantago lanceolata,* and *Acetosa sagittata* (Turkey Rhubarb). Climbers included *Cardiospermum grandiflorum* (Balloon Vine) and *Araujia sericifera* (Moth Vine).

The proposed works could directly impact on the extent of SSF if the proposed sedimentation basins were to be constructed within this community. Council has indicated that the basins would be approximately 2m x 5m, giving an impact area of $10m^{2.}$ The community is currently highly degraded by the presence of weeds. As such, it is not considered that removal of a small amount of vegetation, mostly introduced, would decrease the extent and composition of SSF which would modify the species composition and place the local occurrence of the community at risk of extinction.

The proposed road upgrade works would be unlikely to indirectly impact on the extent or composition of SSF given that proper sedimentation controls would be in place to protect the community from increased sedimentation or changes in water flow.

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

iv. the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

v. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

vi. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

The proposed development would remove only a small amount of habitat for SSF for the construction and installation of a new sedimentation basin. The amount that would be removed is minimal.

Construction of the sedimentation basin could not fragment or isolate the community from other areas of habitat.

It is unlikely that the habitat to be removed is important to SSF. The area where SSF is mapped in the SMCMA mapping was found to be dominated by introduced species.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat for SSF has been identified.

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

No Recovery Plan or Threat Abatement Plans have been prepared for SSF. Twelve Priority Actions have been identified to help recover SSF. The proposal is not in conflict with these Priority Actions.

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

The proposed works would result in the operation of and increase the impact of a key threatening process, *Clearing of Native Vegetation*. However, only a minimal amount of vegetation would be removed under the proposal and would comprise mostly introduced species.

Conclusion

The proposed development is unlikely to impose a significant effect on SSF given that the proposed works:

- would remove only a minimal amount of mostly introduced vegetation potentially comprising SSF and potential SSF habitat;
- would be unlikely to indirectly impact on vegetation potentially comprising SSF or potential SSF habitat given sedimentation controls were in place; and
- would not isolate an area of known habitat from currently interconnecting areas of potential habitat for this community.

On the basis of the above considerations, it is unlikely that the proposed works would result in a significant impact on the extent or composition of SSF. Consequently, a Species Impact Statement is not required for the proposed development with respect to this community.

Acacia bynoeana

Acacia bynoeana (Bynoe's Wattle) is listed as an endangered species under the TSC Act and a vulnerable species under the EPBC Act. Its distribution ranges from Dora Creek in the north, to Berrima and the Illawarra in the south and west to the Blue Mountains (DEC 2011).

A. bynoeana is a decumbent shrub to 0.5 m high which occurs in heath or dry sclerophyll forest on infertile, well drained sandy soils, appearing to prefer open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt patches (DEC 2011). Commonly associated over-storey species include *Corymbia gummifera* (Red Bloodwood), *Eucalyptus haemastoma* (Scribbly Gum), *E. parramattensis* (Parramatta Red Gum), *E. sclerophylla* (Hardleaved Scribbly Gum), *Banksia serrata* (Saw Banksia), and *Angophora bakeri* (Narrow-leafed Apple; DEC 2011). Shrubs often associated with the species include *Banksia spinulosa* (Hairpin Banksia), *Acacia oxycedrus* (Spike Wattle), *A. myrtifolia* (Red-stemmed Wattle) and *Kunzea* spp. (DEC 2011).

A. bynoeana produces few globular inflorescences, singularly in leaf axils, from September to March with mature seedpods present from September to January. Seed production is considered to be minimal and seedlings are rare with little local dispersal of seed (DEC 2011). It has a woody rootstock and it is considered likely that the species is able to re-sprout from this rootstock after fire. The species also maintains a long-term soil-stored seedbank with above ground individuals not always apparent and appearing periodically, possibly in response to local disturbance (DEC 2011).

Key threatening processes listed in the TSC Act that have been identified as threats to *A. bynoeana* include Clearing of Native Vegetation, Bush rock Removal and High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition. Additional threats identified for this species include habitat disturbance during road, trail and powerline maintenance, recreational use of habitat by vehicles, horse riders and pedestrians use, weed invasions, and inappropriate fire regimes (DEC 2011). It is likely the species can cope with fires of a frequency of every 10-12 years with more frequent fires threatening the species' survival (DEC 2011).

No individuals of this species were recorded within the subject site; however, there are 10 records for this species within 10 km, and potential habitat for this species was identified within the study area.

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

Factors likely to have an adverse impact on the life cycle of *A. bynoeana* include habitat loss, habitat degradation, weed invasion, and inappropriate fire regimes.

The proposed works could directly impact on *A. bynoeana* through the removal of vegetation on the rock escarpment, and sections of the rock escarpment between Rene and High Streets (to 470 m^3) representing habitat for the species.

However, no individuals of *A. bynoeana* were recorded on the rock escarpment area between Rene and High Streets. Remnant vegetation adjacent to the subject site within Council Reserves and Lane Cove National Park representing habitat for the species would be retained. The proposal would not impact on potential habitat in remnant vegetation in the study area given sedimentation controls. The amount of additional stormwater draining within potential *A. bynoeana* habitat during the operational phase would be negligible. Thus, potential habitat would not be degraded by the proposal which would lead to

adverse effects on the life cycle of a viable population of the species such that it would be placed at the risk of extinction.

The proposal would be unlikely to result in any changes to the fire regime and or increase the incidence of weeds. Potential habitat in the impact area is already degraded by the presence of weeds; weed invasion would not be a result of the proposed works.

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

Not applicable.

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

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

Not applicable.

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

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

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

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

(i) A small amount of vegetation on the rock escarpment, and 470 m^3 of rock between Rene and High Streets representing potential habitat for the species would be impacted by the proposed works. However, the amount of habitat is small in relation to that remaining in the study area. Impacts to potential habitat in the study area would also be prevented, with sedimentation controls adhered to during the construction phase of the works to limit transport of weed propagules and sediment to areas adjacent to the subject site. The amount of additional stormwater draining within potential *A. bynoeana* habitat during the operational phase would be negligible.

(ii) The vegetation and potential habitat of *A. bynoeana* on the rock escarpment between Rene and High Streets is located on the edge of Pittwater Road. Thus, the area of habitat is already somewhat fragmented. While the proposal would remove vegetation and substrate representing *A. bynoeana* habitat, potential habitat for the species in the study area would be retained. Thus, the proposed works would not greatly fragment or isolate, or increase the fragmentation or isolation of *A. bynoeana* habitat in the locality.

(iii) No *Acacia bynoeana* individuals have been recorded within the subject site previously, or as part of this project, and only potential habitat was present in the study area. As such, it is unlikely that the habitat to be removed or modified is important to the long-term survival of this species.

e. Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared for *A. bynoeana*.

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

No recovery plan or threat abatement plan has been prepared for *A. bynoeana*. The proposal is not in conflict with the 13 Priority Actions for this species. One of the Priority Actions involves ensuring that planning and maintenance staff undertaking road, trail, or easement maintenance activities in potential habitat are aware of the species and that processes are in place to avoid impacting upon it. Personnel undertaking clearing should be made aware of this species and the need to avoid impacting upon this species.

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

One key threatening process (KTP) is relevant to this proposal with respect to *A. bynoeana*: 'Clearing of Native Vegetation'. Whilst the action would involve this KTP, the scale of the impact is considered unlikely to increase the impact of the KTP due to the small size of the vegetation to be removed.

Conclusion

The proposed development is unlikely to impose a significant impact on *A. bynoeana* given that:

- Habitat removal is minimal compared to that remaining in the locality;
- Areas of potential habitat are present elsewhere in the locality;
- The amount of additional stormwater draining within potential *A. bynoeana* habitat during the operational phase would be negligible;
- This species has not been recorded within the subject site; and
- The proposal would not isolate or fragment any currently connecting areas of habitat.

On the basis of the above considerations, it is unlikely that the proposed works would result in a significant impact on the survival of *A. bynoeana*. Consequently, a Species Impact Statement is not required for the proposed works with respect to this species.

Acacia terminalis subsp. *terminalis*

Acacia terminalis subsp. *terminalis* (Sunshine Wattle) is listed as an endangered species under both the TSC and EPBC Acts. It has a very limited distribution, mainly in near-coastal areas from the northern shores of Sydney Harbour south to Botany Bay, with most records from the Port Jackson area and the eastern suburbs of Sydney. Recent collections have mainly been made from the Quarantine Station, Clifton Gardens, Dover Heights, Parsely Bay, Nielson Park, Cooper Park, Chifley and Watsons Bays (DEC 2011).

A. terminalis subsp. *terminalis* occurs on coastal scrub and dry sclerophyll woodland on sandy soils. Its habitat is generally sparse and scattered. Most areas of habitat or potential habitat are small and isolated, and most sites are highly modified or disturbed due to surrounding urban development (DEC 2011).

The species flowers in autumn. Small birds and bees are natural pollinators. Seeds mature in November and are dispersed by ants. Seed viability is high and recruitment occurs mainly after fire. A fire temperature of 60 degrees is required for optimum germination. Although plants are killed by fire, they have been recorded sprouting from the base (DEC 2011).

A. terminalis subsp. *terminalis* is threatened by clearing for land development and habitat degradation by rubbish dumping, weed invasion and access by people. Inappropriate fire regimes may also threaten the persistence of the species at some locations. As some plants occur on the edge of walking tracks and roads, there is potential for impacts from park management activities or recreational usage. *Acacia terminalis* is available from nurseries in the Sydney area and the source stock is questionable. Thus, there is also potential for the sub-species to hybridise with horticultural cultivars (DEC 2011).

No individuals of this species were recorded within the subject site; however, there are 35 records for this species within 10 km, and potential habitat for this species was identified within the study area.

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

Factors likely to have an adverse impact on the life cycle of *A. terminalis subsp. terminalis* include habitat loss, habitat degradation, weed invasion, inappropriate fire regimes, and hybridization with horticultural cultivars.

The proposed works could directly impact on *A. terminalis* subsp. *terminalis* through the removal of vegetation on the rock escarpment, and sections of the rock escarpment between Rene and High Streets (to 470 m^3) representing habitat for the species.

However, no individuals of *A. terminalis* subsp. *terminalis* were recorded on the rock escarpment area between Rene and High Streets (the field survey recorded *A. terminalis* subsp. *aurea)* Remnant vegetation adjacent to the subject site within Council Reserves and Lane Cove National Park representing habitat for the species would be retained. The proposal would not impact on potential habitat in remnant vegetation in the study area given sedimentation controls. The amount of additional stormwater draining within potential *A. terminalis* subsp. *terminalis* habitat during the operational phase would be negligible. Thus, potential habitat would not be degraded by the proposal which would lead to adverse effects on the life cycle of a viable population of the species such that it would be placed at the risk of extinction.

The proposal would be unlikely to result in any changes to the fire regime, or increase the incidence of weeds or hybridization between *A. terminalis* subsp. *terminalis* and horticultural cultivars. Potential habitat in the impact area is already degraded by the presence of weeds; weed invasion would not be a result of the proposed works.

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

Not applicable.

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

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

Not applicable.

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

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

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

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

(i) A small amount of vegetation on the rock escarpment, and 470 m^3 of rock between Rene and High Streets representing potential habitat for the species would be impacted by the proposed works. However, the amount of habitat is small in relation to that remaining in the study area. Impacts to potential habitat in the study area would also be prevented, with sedimentation controls adhered to during the construction phase of the works to limit transport of weed propagules and sediment to areas adjacent to the subject site. The amount of additional stormwater draining within potential *A. terminalis* subsp. *terminalis* habitat during the operational phase would be negligible.

(ii) The vegetation and potential habitat of *A. terminalis* subsp. *terminalis* on the rock escarpment between Rene and High Streets is located on the edge of Pittwater Road. Thus, the area of habitat is already somewhat fragmented. While the proposal would remove vegetation and substrate representing *A. terminalis* subsp. *terminalis* habitat, potential habitat for the species in the study area would be retained. Thus, the proposed works would not greatly fragment or isolate, or increase the fragmentation or isolation of *A. terminalis* subsp. *terminalis* habitat in the locality.

(iii) No *A. terminalis* subsp. *terminalis* individuals have been recorded within the subject site previously, or as part of this project, and only potential habitat was present in the study area. As such, it is unlikely that the habitat to be removed or modified is important to the long-term survival of this species.

e. Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared for *A. terminalis* subsp. *terminalis*.

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

A draft recovery plan has been prepared for *A. terminalis* subsp. *terminalis*. The proposal is not in conflict with the plan.

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

One key threatening process (KTP) is relevant to this proposal with respect to *A. terminalis* subsp. *terminalis*: 'Clearing of Native Vegetation'. Whilst the action would involve this KTP, the scale of the impact is considered unlikely to increase the impact of the KTP due to the small size of the vegetation to be removed.

Conclusion

The proposed development is unlikely to impose a significant impact on *A. terminalis* subsp. *terminalis* given that:

- Habitat removal is minimal compared to that remaining in the locality;
- Areas of potential habitat are present elsewhere in the locality;
- The amount of additional stormwater draining within potential *A. terminalis* subsp. *terminalis* habitat during the operational phase would be negligible;
- This species has not been recorded within the subject site; and
- The proposal would not isolate or fragment any currently connecting areas of habitat.

On the basis of the above considerations, it is unlikely that the proposed works would result in a significant impact on the survival of *A. terminalis* subsp. *terminalis*. Consequently, a Species Impact Statement is not required for the proposed works with respect to this species.

Callistemon linearifolius

Callistemon linearifolius (Netted Bottle Brush) is listed as a vulnerable species under the TSC Act. It has been recorded from the Georges River to Hawkesbury River in the Sydney area, and north to the Nelson Bay area of NSW. It was also recorded in 2000 at Coalcliff in the northern Illawarra. For the Sydney area, recent records are limited to the Hornsby Plateau area near the Hawkesbury River (DEC 2011).

C. linearifolius grows in dry sclerophyll forest on the coast and adjacent ranges. It flowers from spring to summer (DEC 2011).

The species is threatened by habitat loss and low population numbers which make it vulnerable to stochastic events (DEC 2011).

No individuals of this species were recorded within the subject site; however, there are 6 records for this species within 10 km, and potential habitat for this species was identified within the study area.

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

Factors likely to have an adverse impact on the life cycle of *C. linearifolius* include habitat loss, habitat degradation, and weed invasion.

The proposed works could directly impact on *C. linearifolius* through the removal of vegetation on the rock escarpment, and sections of the rock escarpment between Rene and High Streets (to 470 m^3) representing habitat for the species.

However, no individuals of *C. linearifolius* were recorded on the rock escarpment area between Rene and High Streets. Remnant vegetation adjacent to the subject site within Council Reserves and Lane Cove National Park representing habitat for the species would be retained. The proposal would not impact on potential habitat in remnant vegetation in the study area given sedimentation controls. The amount of additional stormwater draining within potential *C. linearifolius* habitat during the operational phase would be negligible. Thus, potential habitat would not be degraded by the proposal which would lead to adverse effects on the life cycle of a viable population of the species such that it would be placed at the risk of extinction.

The proposal would be unlikely to result in any increase the incidence of weeds. Potential habitat in the impact area is already degraded by the presence of weeds; weed invasion would not be a result of the proposed works.

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

Not applicable.

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

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

Not applicable.

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

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

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

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

(i) A small amount of vegetation on the rock escarpment, and 470 m^3 of rock between Rene and High Streets representing potential habitat for the species would be impacted by the proposed works. However, the amount of habitat is small in relation to that remaining in the study area. Impacts to potential habitat in the study area would also be prevented, with sedimentation controls adhered to during the construction phase of the works to limit transport of weed propagules and sediment to areas adjacent to the subject site. The amount of additional stormwater draining within potential *C. linearifolius* habitat during the operational phase would be negligible.

(ii) The vegetation and potential habitat of *C. linearifolius* on the rock escarpment between Rene and High Streets is located on the edge of Pittwater Road. Thus, the area of habitat is already somewhat fragmented. While the proposal would remove vegetation and substrate representing *C. linearifolius* habitat, potential habitat for the species in the study area would be retained. Thus, the proposed works would not greatly fragment or isolate, or increase the fragmentation or isolation of *C. linearifolius* habitat in the locality.

(iii) There are two records for the species in the study area, to the east of the subject site near Epping Road. Thus, it is possible that habitat to be removed or modified is important to *C. linearifolius*. However, no *C. linearifolius* individuals have been recorded within the subject site previously, or as part of this project. Thus, the small area to be removed or impacted is unlikely to be important to the long-term survival of *C. linearifolius* in the locality.

e. Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared for *C. linearifolius*.

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

No recovery plan or threat abatement plan has been prepared for *C. linearifolius*. The proposal is not in conflict with the 11 Priority Actions for this species.

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

One key threatening process (KTP) is relevant to this proposal with respect to *C. linearifolius*: 'Clearing of Native Vegetation'. Whilst the action would involve this KTP, the scale of the impact is considered unlikely to increase the impact of the KTP due to the small size of the vegetation to be removed.

Conclusion

The proposed development is unlikely to impose a significant impact on *C. linearifolius* given that:

- Habitat removal is minimal compared to that remaining in the locality;
- Areas of potential habitat are present elsewhere in the locality;
- The amount of additional stormwater draining within potential *C. linearifolius* habitat during the operational phase would be negligible;
- This species has not been recorded within the subject site; and
- The proposal would not isolate or fragment any currently connecting areas of habitat.

On the basis of the above considerations, it is unlikely that the proposed works would result in a significant impact on the survival of *C. linearifolius*. Consequently, a Species Impact Statement is not required for the proposed works with respect to this species.

Camarophyllopsis kearneyi

Camarophyllopsis kearneyi is listed as an endangered species under the TSC Act. It is a small, pale, gilled agaric fungus, which is known only from its type locality in Lane Cove Bushland Park in the Lane Cove LGA in the Sydney metropolitan region (DEC 2011).

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 *C. kearneyi*. The species does not produce basidiomes (above-ground fruiting structures) all year, but may be present only as non-reproductive hyphal structures below ground (DEC 2011).

C. kearneyi is likely to be threatened by water-borne pollutants. Industrial pollutants occur particularly in the upper reaches of Gore Creek in Lane Cove Bushland Park, and domestic contaminants arise from residential properties on the perimeter of the park. It is also likely to be at risk from encroachment by exotic weeds, dumping of rubbish and garden refuse, excess pedestrian traffic in areas where hyphae or basidiomes occur, and inappropriate bush regeneration measures that disturb the forest canopy and native understorey plants (DEC 2011).

No individuals of this species were recorded within the subject site; however, 1 record for this species occurs within 10 km, and potential habitat for this species was identified within the study area.

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

Factors likely to have an adverse impact on the life cycle of *C. kearneyi* include exposure to water-borne pollutants and domestic contaminants, encroachment by exotic weeds, dumping of rubbish and garden refuse, excess pedestrian traffic in areas where hyphae or basidiomes occur, and inappropriate bush regeneration measures that disturb the forest canopy and native understorey plants.

The proposed works could directly impact on *C. kearneyi* through the removal of vegetation on the rock escarpment, and sections of the rock escarpment between Rene and High Streets (to 470 m^3) representing habitat for the species.

However, the area of potential habitat to be removed is minimal. The species has only been recorded in Lane Cove National Park and remnant vegetation representing habitat for the species adjacent to the subject site (ie. within Lane Cove National Park) would be retained. The proposal would not impact on potential habitat in remnant vegetation in Lane Cove National Park given sedimentation and water quality controls. Thus, potential habitat in Lane Cove National Park would not be degraded by the proposal which would lead to adverse effects on the life cycle of a viable population of the species such that it would be placed at the risk of extinction.

The proposal would be unlikely to increase the incidence of weeds or result in increased pedestrian traffic in the study area (within the Council Reserves) or on top of the rock escarpment between Rene and High Streets. Potential habitat in the impact area is already degraded by the presence of weeds; weed invasion would not be a result of the proposed works.

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

Not applicable.

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

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

Not applicable.

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

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

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

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

(i) A small amount of vegetation on the rock escarpment, and 470 m^3 of rock between Rene and High Streets representing potential habitat for the species would be impacted by the proposed works. However, the amount of habitat is small in relation to that remaining in the study area. The species has only been recorded in Lane Cove National Park and remnant vegetation representing known habitat for the species adjacent to the subject site (ie. within Lane Cove National Park) would be retained. Impacts to potential habitat in the study area would also be prevented, with sedimentation and water quality controls adhered to during the construction and operation phases of the works to limit transport of weed propagules and sediment to areas adjacent to the subject site.

(ii) The vegetation and potential habitat of *C. kearneyi* on the rock escarpment between Rene and High Streets is located on the edge of Pittwater Road. Thus, the area of habitat is already somewhat fragmented. While the proposal would remove vegetation and substrate representing potential *C. kearneyi* habitat, known habitat for the species in the study area in Lane Cove National Park would be retained. Thus, the proposed works would not greatly fragment or isolate, or increase the fragmentation or isolation of *C. kearneyi* habitat in the locality.

(iii) *C. kearneyi* is currently only known in Lane Cove National Park. Only potential habitat is present in the subject site. As such, it is unlikely that the potential habitat to be removed or modified is important to the long-term survival of this species.

e. Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared for *C. kearneyi*.

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

No recovery plan or threat abatement plan has been prepared for *C. kearneyi*. There are no Priority Actions for the recovery of the species.

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

One key threatening process (KTP) is relevant to this proposal with respect to *C. kearneyi*: 'Clearing of Native Vegetation'. Whilst the action would involve this KTP, the scale of the impact is considered unlikely to increase the impact of the KTP due to the small size of the vegetation to be removed.

Conclusion

The proposed development is unlikely to impose a significant impact on *C. kearneyi* given that:

- The area of potential habitat to be removed is minimal compared to that remaining in the locality;
- Known habitat in Lane Cove National Park will not be impacted;
- This species has not been recorded within the subject site; and
- The proposal would not isolate or fragment any currently connecting areas of known habitat.

On the basis of the above considerations, it is unlikely that the proposed works would result in a significant impact on the survival of *C. kearneyi*. Consequently, a Species Impact Statement is not required for the proposed works with respect to this species.

Darwinia biflora

Darwinia biflora is listed as vulnerable species under both the TSC and EPBC Acts. It occurs in the Ku-ring-gai, Hornsby, Baulkham Hills and Ryde local government areas. The northern, southern, eastern and western limits of the range are at Maroota, North Ryde, Cowan and Kellyville, respectively (DEC 2011).

The species occurs on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone. Its associated over-storey species include *Eucalyptus haemastoma*, *Corymbia gummifera* and/or *E. squamosa*. The vegetation structure is usually woodland, open forest or scrub-heath (DEC 2011).

Longevity is thought to be 15-20 years. Flowering occurs throughout the year but is concentrated in autumn, with mature fruits being produced from May to August. Self-pollination is the usual form of pollination. Flowers and fruit are produced 18 months after germination, though at this stage few reach maturity. Maturation rates are higher for plants older than 5 years. Seed viability is high (up to 99%) (DEC 2011).

Fire is an important factor in the life cycle of *D. biflora*. Fire kills all plants, but also produces a flush of germination from seed stored in the soil. The number of individuals at a site then declines with time since fire as the surrounding vegetation develops (DEC 2011).

D. biflora is threatened by habitat loss and degradation from inappropriate fire regimes, slashing for easement maintenance, illegal track creation, and weed invasion (DEC 2011).

No individuals of this species were recorded within the subject site; however, there are 77 records for this species within 10 km, and potential habitat for this species was identified within the study area.

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

Factors likely to have an adverse impact on the life cycle of *D. biflora* include habitat loss and habitat degradation from inappropriate fire regimes, slashing for easement maintenance, illegal track creation, and weed invasion.

The proposed works could directly impact on *D. biflora* through the removal of vegetation on the rock escarpment, and sections of the rock escarpment between Rene and High Streets (to 470 m^3) representing habitat for the species.

However, no individuals of *D. biflora* were recorded on the rock escarpment area between Rene and High Streets. The six known populations of the species in the Ryde LGA would not be impacted by the proposal. Remnant vegetation adjacent to the subject site within Council Reserves and Lane Cove National Park representing habitat for the species would be retained. The proposal would not impact on potential habitat in remnant vegetation in the study area given sedimentation controls. The amount of additional stormwater draining within potential *D. biflora* habitat during the operational phase would be negligible. Thus, potential habitat would not be degraded by the proposal which would lead to adverse effects on the life cycle of a viable population of the species such that it would be placed at the risk of extinction.

The proposal would be unlikely to result in any changes to the fire regime, or increase the incidence of weeds. Potential habitat in the impact area is already degraded by the presence of weeds; weed invasion would not be a result of the proposed works.

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

Not applicable.

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

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

Not applicable.

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

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

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

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

(i) A small amount of vegetation on the rock escarpment, and 470 m^3 of rock between Rene and High Streets representing potential habitat for the species would be impacted by the proposed works. However, the amount of habitat is small in relation to that remaining in the study area. Impacts to potential habitat in the study area would also be prevented, with sedimentation controls adhered to during the construction phase of the works to limit transport of weed propagules and sediment to areas adjacent to the subject site. The amount of additional stormwater draining within potential *D. biflora* habitat during the operational phase would be negligible.

(ii) The vegetation and potential habitat of *D. biflora* on the rock escarpment between Rene and High Streets is located on the edge of Pittwater Road. Thus, the area of habitat is already somewhat fragmented. While the proposal would remove vegetation and substrate representing *D. biflora* habitat, potential habitat for the species in the study area would be retained. Thus, the proposed works would not greatly fragment or isolate, or increase the fragmentation or isolation of *D. biflora* habitat in the locality.

(iii) Given the number of records for the species in the locality, and also within the study area (near Coxs Road and Epping Road), it is possible that habitat to be removed or modified is important to *D. biflora*. However, no *D. biflora* individuals have been recorded within the subject site previously, or as part of this project. The six known populations of the species in the Ryde LGA would not be impacted by the proposal. Thus, the small area to be removed or impacted is unlikely to be important to the long-term survival of *D. biflora* in the locality.

e. Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared for *D. biflora*.

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

A recovery plan has been prepared for *D. biflora*. The proposal is not in conflict with this plan.

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

One key threatening process (KTP) is relevant to this proposal with respect to *D. biflora*: 'Clearing of Native Vegetation'. Whilst the action would involve this KTP, the scale of the impact is considered unlikely to increase the impact of the KTP due to the small size of the vegetation to be removed.

Conclusion

The proposed development is unlikely to impose a significant impact on *D. biflora* given that:

- Habitat removal is minimal compared to that remaining in the locality;
- The 6 known populations of *D. biflora* in the Ryde LGA would not be impacted by the proposal;
- Areas of potential habitat are present elsewhere in the locality;
- The amount of additional stormwater draining within potential *D. biflora* habitat during the operational phase would be negligible;
- This species has not been recorded within the subject site; and
- The proposal would not isolate or fragment any currently connecting areas of habitat.

On the basis of the above considerations, it is unlikely that the proposed works would result in a significant impact on the survival of *D. biflora*. Consequently, a Species Impact Statement is not required for the proposed works with respect to this species.

Epacris purpurascens var *purpurascens*

Epacris purpurascens var purpurascens is listed as vulnerable species under the TSC Act. It occurs from Gosford in the north, to Narrabeen in the east, Silverdale in the west and Avon Dam vicinity in the South (DEC 2011).

The species is found in a range of habitat types, most of which have a strong shale soil influence. The species' lifespan is recorded to be 5-20 years, requiring 2-4 years before seed is produced in the wild. It is killed by fire and re-establishes from soil-stored seed (DEC 2011).

The species is threatened by habitat clearance and habitat modification resulting from urban or rural development. In addition, existing populations are directly threatened by urban run-off leading to flooding, erosion, nitrification of soil substrate, altered pH, weed invasion, and introduction of plant pathogens. Other threats include altered fire regimes, uncontrolled vehicular access, soil compaction, slashing eg. powerline easements, fill and rubbish dumping, and trampling through inappropriate pedestrian access (DEC 2011).

No individuals of this species were recorded within the subject site; however, there are 46 records for this species within 10 km, and potential habitat for this species was identified within the study area.

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

Factors likely to have an adverse impact on the life cycle of *E. purpurascens var purpurascens* include habitat loss and habitat degradation from urban run-off leading to flooding, erosion, nitrification of soil substrate, altered pH, weed invasion, the introduction of plant pathogens, altered fire regimes, and fill and rubbish dumping.

The proposed works could directly impact on *E. purpurascens var purpurascens* through the removal of vegetation on the rock escarpment, and sections of the rock escarpment between Rene and High Streets (to 470 m^3) representing habitat for the species.

However, no individuals of *E. purpurascens var purpurascens* were recorded on the rock escarpment area between Rene and High Streets (although it has been recorded close by along Buffalo Creek (upstream of the subject site), within the Field of Mars, and to the east of the subject site in Buffalo Creek Reserve). Remnant vegetation adjacent to the subject site within Council Reserves and Lane Cove National Park representing habitat for the species would be retained. The proposal would not impact on potential habitat in remnant vegetation in the study area given sedimentation controls. The amount of additional stormwater draining within potential *E. purpurascens var purpurascens* habitat during the operational phase would be negligible. Thus, potential habitat would not be degraded by the proposal which would lead to adverse effects on the life cycle of a viable population of the species such that it would be placed at the risk of extinction.

The proposal would be unlikely to result in any changes to the fire regime, or increase the incidence of weeds. Potential habitat in the impact area is already degraded by the presence of weeds; weed invasion would not be a result of the proposed works.

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

Not applicable.

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

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

Not applicable.

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

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

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

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

(i) A small amount of vegetation on the rock escarpment, and 470 m^3 of rock between Rene and High Streets representing potential habitat for the species would be impacted by the proposed works. However, the amount of habitat is small in relation to that remaining in the study area. Impacts to potential habitat in the study area would also be prevented, with sedimentation controls adhered to during the construction phase of the works to limit transport of weed propagules and sediment to areas adjacent to the subject site. The amount of additional stormwater draining within potential *E. purpurascens var purpurascens* habitat during the operational phase would be negligible.

(ii) The vegetation and potential habitat of *E. purpurascens var purpurascens* on the rock escarpment between Rene and High Streets is located on the edge of Pittwater Road. Thus, the area of habitat is already somewhat fragmented. While the proposal would remove vegetation and substrate representing *E. purpurascens var purpurascens* habitat, potential habitat for the species in the study area would be retained. Thus, the proposed works would not greatly fragment or isolate, or increase the fragmentation or isolation of *E. purpurascens var purpurascens* habitat in the locality.

(iii) Given the number of records for the species in the locality, and also within the study area, it is possible that habitat to be removed or modified is important to *E. purpurascens var purpurascens*. The species has been previously recorded upstream of the subject site along Buffalo Creek, within the Field of Mars, and to the east of the subject site within Buffalo Creek Reserve. However, no *E. purpurascens var purpurascens* individuals have been recorded within the subject site previously, or as part of this project in the subject site. Thus, the small area to be removed or impacted is unlikely to be important to the long-term survival of *E. purpurascens var purpurascens* in the locality.

e. Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared for *E. purpurascens var purpurascens*.

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

No recovery plan or threat abatement plan has been prepared for *E. purpurascens var purpurascens*. The proposal is not in conflict with the 6 Priority Actions for this species.

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

One key threatening process (KTP) is relevant to this proposal with respect to *E. purpurascens var purpurascens*: 'Clearing of Native Vegetation'. Whilst the action would involve this KTP, the scale of the impact is considered unlikely to increase the impact of the KTP due to the small size of the vegetation to be removed.

Conclusion

The proposed development is unlikely to impose a significant impact on *E. purpurascens var purpurascens* given that:

- Habitat removal is minimal compared to that remaining in the locality;
- Areas of potential habitat are present elsewhere in the locality;
- The amount of additional stormwater draining within potential *E. purpurascens var purpurascens* habitat during the operational phase would be negligible;
- This species has not been recorded within the subject site; and
- The proposal would not isolate or fragment any currently connecting areas of habitat.

On the basis of the above considerations, it is unlikely that the proposed works would result in a significant impact on the survival of *E. purpurascens var purpurascens*. Consequently, a Species Impact Statement is not required for the proposed works with respect to this species.

Genoplesium baueri

Genoplesium baueri is listed as vulnerable species under the TSC Act. It has been recorded from locations between Ulladulla and Port Stephens. About half the records were made before 1960 with most of the older records being from Sydney suburbs including Asquith, Cowan, Gladesville, Longueville and Wahroonga. No collections have been made from those sites in recent years. Currently the species is known from just over 200 plants across 13 sites. The species has been recorded at locations now likely to be within the following conservation reserves: Berowra Valley Regional Park, Royal National Park and Lane Cove National Park (DEC 2011).

The species grows in sparse sclerophyll forest and moss gardens over sandstone and flowers from December to March (DEC 2011).

The species is threatened by habitat clearance for urban and infrastructure development, and inappropriate fire regimes (DEC 2011).

No individuals of this species were recorded within the subject site; however, there are 14 records for this species within 10 km, and potential habitat for this species was identified within the study area.

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

Factors likely to have an adverse impact on the life cycle of *G. baueri* include habitat loss and altered fire regimes.

The proposed works could directly impact on *G. baueri* through the removal of vegetation on the rock escarpment, and sections of the rock escarpment between Rene and High Streets (to 470 m^3) representing habitat for the species.

However, remnant vegetation adjacent to the subject site within Council Reserves and Lane Cove National Park representing habitat for the species would be retained. The proposal would not impact on potential habitat in remnant vegetation in the study area given sedimentation controls. The amount of additional stormwater draining within potential *G. baueri* habitat during the operational phase would be negligible. Thus, potential habitat would not be degraded by the proposal which would lead to adverse effects on the life cycle of a viable population of the species such that it would be placed at the risk of extinction.

The proposal would be unlikely to result in any changes to the fire regime, or increase the incidence of weeds. Potential habitat in the impact area is already degraded by the presence of weeds; weed invasion would not be a result of the proposed works.

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

Not applicable.

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

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

Not applicable.

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

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

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

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

(i) A small amount of vegetation on the rock escarpment, and 470 m^3 of rock between Rene and High Streets representing potential habitat for the species would be impacted by the proposed works. However, the amount of habitat is small in relation to that remaining in the study area. Impacts to potential habitat in the study area would also be prevented, with sedimentation controls adhered to during the construction phase of the works to limit transport of weed propagules and sediment to areas adjacent to the subject site. The amount of additional stormwater draining within potential *G. baueri* habitat during the operational phase would be negligible.

(ii) The vegetation and potential habitat of *G. baueri* on the rock escarpment between Rene and High Streets is located on the edge of Pittwater Road. Thus, the area of habitat is already somewhat fragmented. While the proposal would remove vegetation and substrate representing *G. baueri* habitat, potential habitat for the species in the study area would be retained. Thus, the proposed works would not greatly fragment or isolate, or increase the fragmentation or isolation of *G. baueri* habitat in the locality.

(iii) Given the number of records for the species in the locality, it is possible that habitat to be removed or modified is important to *G. baueri*. The species was not detected during survey - the species is cryptic and only has vegetative material which can be observed at periods during its life cycle. However, the area to be removed or impacted is small and unlikely to be important to the long-term survival of *G. baueri* in the locality.

e. Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared for *G. baueri*.

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

No recovery plan or threat abatement plan has been prepared for *G. baueri*. The proposal is not in conflict with the 12 Priority Actions for this species.

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

One key threatening process (KTP) is relevant to this proposal with respect to *G. baueri*: 'Clearing of Native Vegetation'. Whilst the action would involve this KTP, the scale of the impact is considered unlikely to increase the impact of the KTP due to the small size of the vegetation to be removed.

Conclusion

The proposed development is unlikely to impose a significant impact on *G. baueri* given that:

- Habitat removal is minimal compared to that remaining in the locality;
- Areas of potential habitat are present elsewhere in the locality;
- The amount of additional stormwater draining within potential *G. baueri* habitat during the operational phase would be negligible; and
- The proposal would not isolate or fragment any currently connecting areas of habitat.

On the basis of the above considerations, it is unlikely that the proposed works would result in a significant impact on the survival of *G. baueri*. Consequently, a Species Impact Statement is not required for the proposed works with respect to this species.

Melaleuca deanei

Melaleuca deanei is listed as vulnerable species under both the TSC and EPBC Acts. The species occurs in two distinct areas, in the Ku-ring-gai/Berowra and Holsworthy/Wedderburn areas, respectively. There are also more isolated occurrences at Springwood (in the Blue Mountains), Wollemi National Park, Yalwal (west of Nowra) and Central Coast (Hawkesbury River) areas (DEC 2011).

The species is grows on heath on sandstone. Flowers appear in summer but seed production appears to be small and consequently the species exhibits a limited capacity to regenerate (DEC 2011).

The species is threatened by small population sizes (given its limited capacity to regenerate), regimes of frequent fire and urban development. Trail maintenance and widening and associated changes in run-off and weed encroachment also threaten the species (DEC 2011).

No individuals of this species were recorded within the subject site; however, there are 21 records for this species within 10 km, and potential habitat for this species was identified within the study area.

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

Factors likely to have an adverse impact on the life cycle of *M. deanei* include habitat loss and habitat degradation from urban run-off leading to flooding, erosion, nitrification of soil substrate, altered pH, weed invasion, and altered fire regimes. The loss of individuals would also impact on the life cycle of the species given its limited capacity to regenerate.

The proposed works could directly impact on *M. deanei* through the removal of vegetation on the rock escarpment, and sections of the rock escarpment between Rene and High Streets (to 470 m^3) representing habitat for the species.

However, no individuals of *M. deanei* were recorded on the rock escarpment area between Rene and High Streets. Remnant vegetation adjacent to the subject site within Council Reserves and Lane Cove National Park representing habitat for the species would be retained. The proposal would not impact on potential habitat in remnant vegetation in the study area given sedimentation controls. The amount of additional stormwater draining within potential *M. deanei* habitat during the operational phase would be negligible. Thus, potential habitat would not be degraded by the proposal which would lead to adverse effects on the life cycle of a viable population of the species such that it would be placed at the risk of extinction.

The proposal would be unlikely to result in any changes to the fire regime, or increase the incidence of weeds. Potential habitat in the impact area is already degraded by the presence of weeds; weed invasion would not be a result of the proposed works.

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

Not applicable.

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

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

Not applicable.

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

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

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

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

(i) A small amount of vegetation on the rock escarpment, and 470 m^3 of rock between Rene and High Streets representing potential habitat for the species would be impacted by the proposed works. However, the amount of habitat is small in relation to that remaining in the study area. Impacts to potential habitat in the study area would also be prevented, with sedimentation controls adhered to during the construction phase of the works to limit transport of weed propagules and sediment to areas adjacent to the subject site. The amount of additional stormwater draining within potential *M. deanei* habitat during the operational phase would be negligible.

(ii) The vegetation and potential habitat of *M. deanei* on the rock escarpment between Rene and High Streets is located on the edge of Pittwater Road. Thus, the area of habitat is already somewhat fragmented. While the proposal would remove vegetation and substrate representing *M. deanei* habitat, potential habitat for the species in the study area would be retained. Thus, the proposed works would not greatly fragment or isolate, or increase the fragmentation or isolation of *M. deanei* habitat in the locality.

(iii) No *M. deanei* individuals have been recorded within the subject site previously, or as part of this project, and only potential habitat was present in the study area. As such, it is unlikely that the habitat to be removed or modified is important to the long-term survival of this species.

e. Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared for *M. deanei*.

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

A draft NSW and National recovery plan has been prepared for *M. deanei*. The proposal is not in conflict with the recovery actions of the plan.

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

One key threatening process (KTP) is relevant to this proposal with respect to *M. deanei*: 'Clearing of Native Vegetation'. Whilst the action would involve this KTP, the scale of the impact is considered unlikely to increase the impact of the KTP due to the small size of the vegetation to be removed.

Conclusion

The proposed development is unlikely to impose a significant impact on *M. deanei* given that:

- Habitat removal is minimal compared to that remaining in the locality;
- Areas of potential habitat are present elsewhere in the locality;
- The amount of additional stormwater draining within potential *M. deanei* habitat during the operational phase would be negligible;
- This species has not been recorded within the subject site; and
- The proposal would not isolate or fragment any currently connecting areas of habitat.

On the basis of the above considerations, it is unlikely that the proposed works would result in a significant impact on the survival of *M. deanei*. Consequently, a Species Impact Statement is not required for the proposed works with respect to this species.

Persoonia hirsuta

Persoonia hirsuta (Hairy Geebung) is listed as an endangered species under both the TSC and EPBC Acts. The species has a scattered distribution around Sydney. The species is distributed from Singleton in the north, along the east coast to Bargo in the south and the Blue Mountains to the west. *P. hirsuta* has a large area of occurrence, but occurs in small populations, increasing the species fragmentation in the landscape (DEC 2011).

The species is grows in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone. It is usually present as isolated individuals or very small populations. It is probably killed by fire (as other *Persoonia* species are) but will regenerate from seed (DEC 2011).

The species is threatened by burning for hazard reduction and other unnatural ignitions, loss of habitat through clearing for urban and small-rural-lot development, the European Honey Bee (*Apis mellifera*) which is a poor pollinator of Geebungs, and habitat degradation related to unrestricted access and grazing (DEC 2011).

No individuals of this species were recorded within the subject site; however, there are 8 records for this species within 10 km, and potential habitat for this species was identified within the study area.

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

Factors likely to have an adverse impact on the life cycle of *P. hirsuta* include habitat loss and habitat degradation, altered fire regimes, and increases in the occurrence of the European Honey Bee displacing other pollinators of *P. hirsuta*.

The proposed works could directly impact on *P. hirsuta* through the removal of vegetation on the rock escarpment, and sections of the rock escarpment between Rene and High Streets (to 470 m^3) representing habitat for the species.

However, no individuals of *P. hirsuta* were recorded on the rock escarpment area between Rene and High Streets. Remnant vegetation adjacent to the subject site within Council Reserves and Lane Cove National Park representing habitat for the species would be retained. The proposal would not impact on potential habitat in remnant vegetation in the study area given sedimentation controls. The amount of additional stormwater draining within potential *P. hirsuta* habitat during the operational phase would be negligible. Thus, potential habitat would not be degraded by the proposal which would lead to adverse effects on the life cycle of a viable population of the species such that it would be placed at the risk of extinction.

The proposal would be unlikely to result in any changes to the fire regime, or increase the incidence of European Honey Bee or weeds degrading its habitat. Potential habitat in the impact area is already degraded by the presence of weeds; weed invasion would not be a result of the proposed works.

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

Not applicable.

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

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

Not applicable.

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

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

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

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

(i) A small amount of vegetation on the rock escarpment, and 470 m^3 of rock between Rene and High Streets representing potential habitat for the species would be impacted by the proposed works. However, the amount of habitat is small in relation to that remaining in the study area. Impacts to potential habitat in the study area would also be prevented, with sedimentation controls adhered to during the construction phase of the works to limit transport of weed propagules and sediment to areas adjacent to the subject site. The amount of additional stormwater draining within potential *P. hirsuta* habitat during the operational phase would be negligible.

(ii) The vegetation and potential habitat of *P. hirsuta* on the rock escarpment between Rene and High Streets is located on the edge of Pittwater Road. Thus, the area of habitat is already somewhat fragmented. While the proposal would remove vegetation and substrate representing *P. hirsuta* habitat, potential habitat for the species in the study area would be retained. Thus, the proposed works would not greatly fragment or isolate, or increase the fragmentation or isolation of *P. hirsuta* habitat in the locality.

(iii) No *P. hirsuta* individuals have been recorded within the subject site previously, or as part of this project, and only potential habitat was present in the study area. As such, it is unlikely that the habitat to be removed or modified is important to the long-term survival of this species.

e. Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared for *P. hirsuta*.

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

No recovery or threat abatement plan has been prepared for *P. hirsuta*. The proposal is not in conflict with the 21 Priority Actions for the recovery of the species.

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

One key threatening process (KTP) is relevant to this proposal with respect to *P. hirsuta*: 'Clearing of Native Vegetation'. Whilst the action would involve this KTP, the scale of the impact is considered unlikely to increase the impact of the KTP due to the small size of the vegetation to be removed.

Conclusion

The proposed development is unlikely to impose a significant impact on *P. hirsuta* given that:

- Habitat removal is minimal compared to that remaining in the locality;
- Areas of potential habitat are present elsewhere in the locality;
- The amount of additional stormwater draining within potential *P. hirsuta* habitat during the operational phase would be negligible;
- This species has not been recorded within the subject site; and
- The proposal would not isolate or fragment any currently connecting areas of habitat.

On the basis of the above considerations, it is unlikely that the proposed works would result in a significant impact on the survival of *P. hirsuta*. Consequently, a Species Impact Statement is not required for the proposed works with respect to this species.

Wilsonia backhousei

Wilsonia backhousei is a matforming prostrate member of the Convolvulaceae listed as a vulnerable species under the TSC Act (DEC 2011).

In New South Wales *W. backhousei* is scattered along the coast, reaching a northern limit at Wamberal Lagoon. In the Sydney region, there has been a considerable decline in the abundance of the species this century, largely as a result of loss of habitat (DEC 2011).

The species is salt tolerant and is found in intertidal saltmarshes and, more rarely, on seacliffs. It often occurs as pure, or nearly pure, stands. At most sites, stands are limited in extent (in the order of a few 10s m.2). The most extensive stands occur around Jervis Bay (DEC 2011).

Mats of *W. backhousei* are damaged by trampling and vehicle use, and recovery from damage is slow. The species is also threatened by changed salinity regimes resulting from modified drainage or discharge of stormwater and invasion of weeds such as *Juncus acutus* (DEC 2011).

No individuals of this species were recorded within the subject site; however, there are 92 records for this species within 10 km, and potential habitat for this species was identified within the study area.

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

Factors likely to have an adverse impact on the life cycle of *W. backhousei* include trampling, changes in salinity regimes resulting from modified drainage or discharge of stormwater, and invasion of weeds such as *Juncus acutus*.

The proposed works would be unlikely to directly impact on *W. backhousei* given habitat for the species (saltmarsh) would not be directly impacted. Further, the proposed works would be unlikely to indirectly impact on *W. backhousei* from stormwater. Council has estimated that any increases in water flow discharging into Kitty's Creek would be negligible. Further, a rock-lined sedimentation basin is proposed to be installed downstream of Kitty's Creek just where it crosses Pittwater Road. The sedimentation basin would trap sediments, and reduce water pollutants entering Kitty's Creek.

The proposal would not lead to increased access to *W. backhousei* which could result in the trampling of the species or the increase in weeds including *Juncus acutus*.

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

Not applicable.

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

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

Not applicable.

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

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

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

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

(i) No *W. backhousei* habitat would be directly impacted. Indirect impacts to potential *W. backhousei* habitat in the study area would be prevented, with sedimentation controls adhered to during the construction phase of the works to limit transport of weed propagules and sediment to areas adjacent to the subject site. The amount of additional stormwater draining within potential *W. backhousei* habitat during the operational phase would be negligible.

(ii) No *W. backhousei* habitat would be fragmented or isolated as a result of the proposed upgrade works.

(iii) *W. backhousei* occurs mostly in intertidal saltmarshes. Thus, the saltmarsh present in the study area is likely to be important to the long-term survival of the species in the locality. However, it is unlikely that *W. backhousei* habitat in the study area would be impacted given impacts to saltmarsh on Buffalo Creek would be avoided and there is negligible change to water flows and an improvement of water quality due to the sedimentation basins.

e. Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared for *W. backhousei*.

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

No recovery or threat abatement plan has been prepared for *W. backhousei*.

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

One key threatening process (KTP) is relevant to this proposal with respect to *W. backhousei*: 'Clearing of Native Vegetation' potentially affecting water infiltration. Whilst the action would involve this KTP, the scale of the impact is considered unlikely to increase the impact of the KTP due to the small size of the vegetation to be removed.

Conclusion

The proposed development is unlikely to impose a significant impact on *W. backhousei* given that:

- This species was not recorded within the subject site;
- No *W. backhousei* habitat would be directly impacted;
- The amount of additional stormwater draining within potential *W. backhousei* habitat during the operational phase would be negligible; and
- The proposal would not isolate or fragment any currently connecting areas of habitat.

On the basis of the above considerations, it is unlikely that the proposed works would result in a significant impact on the survival of *W. backhousei*. Consequently, a Species Impact Statement is not required for the proposed works with respect to this species.

Red-crowned Toadlet

The Red-crowned Toadlet is listed as a Vulnerable Species under the TSC Act. The Red-crowned Toadlet has a restricted distribution, known only from a relatively small area of mid-eastern New South Wales.

Known only from Triassic sandstones of the Sydney Basin, Red-crowned Toadlets are found in steep escarpment areas and plateaus, as well as low undulating ranges with benched outcroppings. Within these geological formations, this species mainly occupies the upper parts of ridges, usually being restricted to within about 100 metres of the ridgetop. Red-crowned Toadlets may also occur on plateaus or more level rock platforms along the ridgetop. This area is usually less preferred than the first talus slope areas below the upper escarpment or just below benched rock platforms (DEC 2011).

The species has been recorded from near sea level to about 1000 metres elevation, but most sites are on fairly low coastal ranges under 200 m in elevation. Favoured microhabitats for shelter sites are under flat sandstone rocks ('bush-rock') either resting on bare rock or damp loamy soils. They have also been found under logs on soil, beneath thick ground litter, particularly near large trees and in horizontal rock crevices near the ground. Breeding congregations occur in dense vegetation and debris beside ephemeral creeks and gutters. Eggs are laid in moist leaf litter, from where they are washed by heavy rain; a large proportion of the development of the tadpoles takes place in the egg (DEC 2011).

Known prey for Red-crowned Toadlets are ants, termites, mites, pseudo-scorpions, collembolans and small cockroaches, although they are likely to eat most small invertebrates encountered.

Threats to Red-crowned Toadlet include loss of / degradation of habitat, high frequency fire, bush rock removal, disease, water pollution, and changed hydrological regimes (DEC 2011).

No individuals of this species were recorded within the subject site; however, there are 69 records for this species within 10 km, and potential habitat for this species was identified within the study area.

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

Factors likely to have an adverse effect on the life cycle of Red-crowned Toadlet would include a substantial loss and/or fragmentation of foraging and breeding habitat, water pollution, and changed hydrological regimes.

The proposed works could directly impact on Red-crowned Toadlet through the removal of vegetation and leaf litter for sedimentation basins and on the rock escarpment, and sections of the rock escarpment between Rene and High Streets (to 470 m^3) representing habitat for the species.

However, only a small area of Red-crowned Toadlet habitat would be removed under the proposal for sedimentation basins and road widening. The amount to be removed is minimal in comparison to the larger undisturbed areas of habitat present in the study area, most notably in Lane Cove National Park and Buffalo Creek Reserve. Habitat for the species would be retained in Lane Cove National Park and Buffalo Creek Reserve. The proposal would not indirectly impact on potential habitat in Lane Cove National Park and Buffalo Creek Reserve through the introduction of contaminated water or sediments from construction works given sedimentation and water quality controls. In addition, the removal of 470 m^3 of rock, the majority of which would be south of the Field of Mars, would be unlikely to significantly alter the hydrological regime of the area. The majority of the sandstone rock escarpment would be retained and would continue to seep water despite the removal of sections of rock from its surface. The

amount of additional stormwater draining within potential Red-crowned Toadlet habitat during the operational phase would be negligible. Thus, it is unlikely that the loss of habitat and rock between Rene and High Streets would significantly disrupt the habitat of the species that would affect the life cycle of a viable local population of the species.

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

Not applicable.

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

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

Not applicable.

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

- **i. the extent to which habitat is likely to be removed or modified as a result of the action proposed, and**
- **ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**
- **iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long term survival of the species, population or ecological community in the locality,**

(i) A small amount of vegetation in the Council Reserves and on the rock escarpment, and 470 m^3 of rock between Rene and High Streets representing potential habitat for the species would be impacted by the proposed works. However, the amount of habitat is small in relation to that remaining in the study area. Removal of the surface of the rock face would be unlikely to significantly alter the hydrological regime of the area, with the rock face continuing to seep water following removal of sections of rock. Impacts to potential habitat in the study area would also be prevented, with sedimentation controls adhered to during the construction phase of the works to limit transport of water contaminants and sediment to areas adjacent to the subject site. The amount of additional stormwater draining within potential Red-crowned Toadlet habitat during the operational phase would be negligible.

(ii) The vegetation and potential Red-crowned Toadlet habitat on the rock escarpment between Rene and High Streets is located on the edge of Pittwater Road. Thus, the area of habitat is already somewhat fragmented. While the proposal would remove vegetation and substrate representing Red-crowned Toadlet habitat, potential habitat in the study area and known habitat in Lane Cove National Park and Buffalo Creek Reserve would be retained. Thus, the proposed works would not greatly fragment or isolate, or increase the fragmentation or isolation of Red-crowned Toadlet habitat in the locality.

(iii) Given the number of records for the species in the locality, and also within the study area, it is possible that habitat to be removed or modified on the rock escarpment between Rene and High Streets is important to Red-crowned Toadlet. The species has been previously recorded downstream of the subject site (ie to the east) within Lane Cove National Park and Buffalo Creek Reserve. The rock face currently seeps water and water pools at its base. However, the area to be removed is small and water

will continue to seep from the rock face into downstream areas. Thus, the small area to be removed or modified is unlikely to be important to the long-term survival of Red-crowned Toadlet in the locality.

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

No critical habitat has been declared for Red-crowned Toadlet.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

No Recovery Plan or Threat Abatement Plan has been prepared for the Red-crowned Toadlet.

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

One key threatening process (KTP) is relevant to this proposal with respect to Red-crowned Toadlet: 'Clearing of Native Vegetation'. Whilst the action would involve this KTP, the scale of the impact is considered unlikely to increase the impact of the KTP due to the small size of the vegetation to be removed.

Conclusions

The proposed development is unlikely to significantly impact upon Red-crowned Toadlet given that:

- Habitat removal is minimal compared to that remaining in the locality;
- Areas of potential habitat are present elsewhere in the locality;
- Removal of vegetation and sections of rock between Rene and High Streets would be unlikely to alter the hydrological regime in the area;
- The amount of additional stormwater draining within potential Red-crowned Toadlet habitat during the operational phase would be negligible; and
- The proposal would not isolate or fragment any currently connecting areas of habitat.

On the basis of the above considerations, it is unlikely that the proposed works would result in a significant impact on the survival of Red-crowned Toadlet. Consequently, a Species Impact Statement is not required for the proposed works with respect to this species.

Regent Honeyeater

Regent Honeyeater is listed as an endangered species under both the TSC and EPBC Acts. It mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. Birds are also found in drier coastal woodlands and forests in some years. Once recorded between Adelaide and the central coast of Queensland, its range has contracted dramatically in the last 30 years to between north-eastern Victoria and south-eastern Queensland. There are only three known key breeding regions remaining: north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region. In NSW the distribution is very patchy and mainly confined to the two main breeding areas and surrounding fragmented woodlands (DEC 2011).

The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak (DEC 2011). These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. The Regent Honeyeater is a generalist forager, which mainly feeds on the nectar from a wide range of eucalypts and mistletoes (DEC 2011). When nectar is scarce, lerp and honeydew comprise a large proportion of the diet. Insects make up about 15% of the total diet and are important components of the diet of nestlings. A shrubby understorey is an important source of insects and nesting material.

Threats to Regent Honeyeater include habitat loss, fragmentation and degradation, loss of key habitat tree species, suppression of natural regeneration of over-storey tree species and shrub species from overgrazing, inappropriate forestry management practices and firewood harvesting that remove large mature resource-abundant trees, and competition from larger aggressive honeyeaters.

No individuals of this species were recorded within the subject site; however, there are 19 records for this species within 10 km, and potential habitat for this species was identified within the study area.

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

Factors likely to have an adverse effect on the life cycle of Regent Honeyeater would include a substantial loss and/or fragmentation of foraging habitat, including the removal of large mature resource-abundant trees. No breeding habitat would be impacted.

The proposed works could directly impact on Regent Honeyeater through the removal of 2 trees (one mature *E. acmenoides* and one young *A. bakeri*) and the removal of some tree branches overhanging Pittwater Road between Rene Street and the Field of Mars, representing foraging habitat for the species.

However, only a small area of Regent Honeyeater foraging habitat would be removed under the proposal for the road widening works. The amount to be removed is minimal in comparison to the larger undisturbed areas of foraging habitat present in the study area, most notably in Lane Cove National Park and Buffalo Creek Reserve. While the *E. acmenoides* to be removed is mature and would provide abundant foraging resources, other nectar trees in the study area would be retained.

The proposal would not impact on potential foraging habitat in the study area through the introduction of contaminated water or sediments from construction works given sedimentation and water quality controls. In addition, the removal of 470 m^3 of rock, the majority of which would be south of the Field of Mars, would be unlikely to significantly alter the hydrological regime of the area. The majority of the sandstone rock escarpment would be retained and would continue to seep water despite the removal of sections of rock from its surface. The amount of additional stormwater draining within potential Regent

Honeyeater foraging habitat during the operational phase would be negligible. Thus, it is unlikely that the proposed works would significantly disrupt the foraging habitat of the species that would affect the life cycle of a viable local population of the species.

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

Not applicable.

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

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable.

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

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

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

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

(i) Two trees (one mature *E. acmenoides* and one young *A. bakeri*) and tree branches representing potential foraging habitat for the species would be removed by the proposed works. However, the amount of foraging habitat is small in relation to that remaining in the study area. Regent Honeyeater is a highly mobile species which would be able to access foraging resources in the study area. Impacts to potential foraging habitat in the study area would also be prevented, with sedimentation controls adhered to during the construction phase of the works to limit transport of weed propagules and sediment to areas adjacent to the subject site. The amount of additional stormwater draining within potential Regent Honeyeater foraging habitat during the operational phase would be negligible.

(ii) The trees and tree branches that would be removed are located on the edge of Pittwater Road, with *E. acmenoides* and the tree branches between Rene Street and the Field of Mars providing some connectivity across Pittwater Road. Thus, the proposed works would decrease habitat connectivity. However, the loss of the trees and branches would not result in the fragmentation or isolation of foraging habitat for Regent Honeyeater. The species is highly mobile and would be able to access remaining foraging resources in the study area.

(iii) Foraging habitat that would be removed is not likely to be crucial habitat for the species. This is due primarily due to the small loss of potential foraging habitat. While a mature *E. acmenoides* would be removed, nectar resources for Regent Honeyeater would be retained in the study area.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared for Regent Honeyeater.

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

No Recovery Plan or Threat Abatement Plan has been prepared for Regent Honeyeater. Thirty-six Priority Actions have been identified to help recover this species. The proposal is not in conflict with these Priority Actions.

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

One key threatening process (KTP) is relevant to this proposal with respect to Regent Honeyeater: 'Clearing of Native Vegetation'. Whilst the action would involve this KTP, the scale of the impact is considered unlikely to increase the impact of the KTP due to the small size of the vegetation to be removed.

Conclusion

The proposed development is unlikely to impose a significant effect on Regent Honeyeater given that:

- Habitat removal is minimal compared to that remaining in the locality;
- Areas of potential foraging habitat are present elsewhere in the locality;
- No breeding habitat would be impacted;
- Works would be unlikely to alter the hydrological regime (and hence impact on foraging resources) in the area; and
- The proposal would not isolate or fragment any currently connecting areas of foraging habitat.

On the basis of the above considerations, it is unlikely that the proposed works would result in a significant impact on the survival of Regent Honeyeater. Consequently, a Species Impact Statement is not required for the proposed works with respect to this species.

Gang-gang Cockatoo

Gang Gang Cockatoo is listed as a vulnerable species under the TSC Act. Gang-gang Cockatoos are endemic to south-eastern Australia. They are widespread in eastern New South Wales from the central slopes and tablelands to the south coast, down through Victoria's north-eastern regions to Seymour, with some records in east Melbourne, Mornington Peninsula and south-western Gippsland (DEC 2011).

During summer the species occurs in dense, tall, wet forests of mountains and gullies, alpine woodlands. In winter they occur at lower altitudes in drier more open forests and woodlands, particularly box-ironbark assemblages. They sometimes inhabit woodland, farms and suburbs in autumn/winter (DEC 2011).

Gang-gang Cockatoos feed mainly on seeds of native and introduced trees and shrubs, with a preference for eucalypts, wattles and introduced hawthorns. They will also eat berries, fruits, nuts and insects and their larvae. They are mainly arboreal (found in trees), coming to the ground only to drink and to forage among fallen fruits or pine cones (DEC 2011).

Gang Gang Cockatoos are threatened by habitat loss and degradation, and altered fire regimes. The species is susceptible to Psittacine cirovirus disease (DEC 2011).

No individuals of this species were recorded within the subject site; however, there are 40 records for this species within 10 km, and potential habitat for this species was identified within the study area.

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

Factors likely to have an adverse effect on the life cycle of the Gang Gang Cockatoo would include a substantial loss and/or fragmentation of foraging habitat and loss of suitable nesting and roosting habitat, altered fire regimes, and weed invasion.

The proposed works could directly impact on Gang Gang Cockatoo through the removal of remnant vegetation for new sedimentation basins and vegetation on the rock escarpment between Rene and High Streets, representing foraging habitat for the species.

However, only a small area of Gang Gang Cockatoo foraging habitat would be removed under the proposal for the sedimentation basins and road widening works. The amount to be removed is minimal in comparison to the larger undisturbed areas of foraging habitat present in the study area, most notably in Lane Cove National Park and Buffalo Creek Reserve, which support feed tree species. No breeding habitat would be directly impacted.

The proposal would not indirectly impact on potential foraging and breeding habitat in the study area through the introduction of contaminated water or sediments from construction works given sedimentation and water quality controls. In addition, the removal of 470 m^3 of rock, the majority of which would be south of the Field of Mars, would be unlikely to significantly alter the hydrological regime of the area which would impact on foraging and breeding habitat. The majority of the sandstone rock escarpment would be retained and would continue to seep water despite the removal of sections of rock from its surface. The amount of additional stormwater draining within potential Gang Gang Cockatoo habitat during the operational phase would be negligible. Thus, it is unlikely that the proposed works would significantly disrupt the foraging and breeding habitat of the species that would affect the life cycle of a viable local population of the species.

The proposed works would not alter the fire regime of the area or lead to the increased incidence of weeds. Weeds are present in the subject site and study area but would not increase as a result of the proposal.

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

Not applicable.

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

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

Not applicable.

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

- **i. the extent to which habitat is likely to be removed or modified as a result of the action proposed, and**
- **ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**
- **iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long term survival of the species, population or ecological community in the locality,**

(i) Remnant vegetation in Council Reserves and on the rock escarpment between Rene and High Streets representing potential foraging habitat for the species would be removed by the proposed works. However, the amount of foraging habitat is small in relation to that remaining in the study area. Gang Gang Cockatoo is a highly mobile species which would be able to access foraging resources in the study area. No breeding habitat would be directly impacted. Indirect impacts to potential foraging and breeding habitat in the study area would also be prevented, with sedimentation controls adhered to during the construction phase of the works to limit transport of weed propagules and sediment to areas adjacent to the subject site. The amount of additional stormwater draining within potential Gang Gang Cockatoo habitat during the operational phase would be negligible.

(ii) The vegetation that would be removed is located on the edge of Pittwater Road. The road widening works would not significantly increase habitat fragmentation. Gang Gang Cockatoo is highly mobile and would be able to access remaining foraging and breeding resources in the study area.

(iii) Habitat that would be removed is not likely to be crucial habitat for the species. This is due primarily due to the small loss of potential foraging habitat. No breeding habitat would be directly impacted. Foraging resources for Gang Gang Cockatoo would be retained in the study area.

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

No critical habitat has been declared for the Gang Gang Cockatoo.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

No Recovery Plan or Threat Abatement Plan has been prepared for the Gang Gang Cockatoo.

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

One key threatening process (KTP) is relevant to this proposal with respect to Gang Gang Cockatoo: 'Clearing of Native Vegetation'. Whilst the action would involve this KTP, the scale of the impact is considered unlikely to increase the impact of the KTP due to the small size of the vegetation to be removed.

Conclusions

The proposed development is unlikely to impose a significant effect on Gang Gang Cockatoo given that:

- Habitat removal is minimal compared to that remaining in the locality;
- Areas of potential foraging habitat are present elsewhere in the locality;
- No breeding habitat would be impacted;
- Works would be unlikely to alter the hydrological regime (and hence impact on foraging and breeding resources) in the area; and
- The proposal would not isolate or fragment any currently connecting areas of habitat.

On the basis of the above considerations, it is unlikely that the proposed works would result in a significant impact on the survival of Gang Gang Cockatoo. Consequently, a Species Impact Statement is not required for the proposed works with respect to this species.

Glossy Black Cockatoo

Glossy Black-cockatoo is listed as a vulnerable species under the TSC Act. It inhabits open forest and woodlands of the coast and the Great Dividing Range up to 1000 m in which stands of she-oak species, particularly Black She-oak (*Allocasuarina littoralis*), Forest She-oak (*A. torulosa*) or Drooping She-oak (*A. verticillata*), occur.

It feeds almost exclusively on the seeds of several species of she-oak (*Casuarina* and *Allocasuarina* species), shredding the cones with its bill. The species is dependent on large hollow-bearing eucalypts for nest sites. One or two eggs are laid between March and August.

The Glossy Black-cockatoo is threatened by a number of processes including habitat clearing and fragmentation, loss of mature hollow bearing trees, and inappropriate fire regimes which reduce its range and remove nesting and feeding resources.

No individuals of this species were recorded within the subject site; however, there are 6 records for this species within 10 km, and potential habitat for this species was identified within the study area.

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

Factors likely to have an adverse effect on the life cycle of the Glossy Black-cockatoo would include a substantial loss and/or fragmentation of foraging habitat and loss of suitable nesting and roosting habitat.

The proposed works could directly impact on Glossy Black-cockatoo through the removal of remnant vegetation for new sedimentation basins and remnant and planted vegetation along Pittwater Road (above Buffalo Creek) and on the rock escarpment between Rene and High Streets, representing foraging habitat for the species.

However, only a small area of Glossy Black-cockatoo foraging habitat would be removed under the proposal for the sedimentation basins and road widening works. The amount to be removed is minimal in comparison to the larger undisturbed areas of foraging habitat present in the study area, most notably in Lane Cove National Park and Buffalo Creek Reserve, which support *Casuarina* / *Allocasuarina* species. No breeding habitat would be directly impacted.

The proposal would not indirectly impact on potential foraging and breeding habitat in the study area through the introduction of contaminated water or sediments from construction works given sedimentation and water quality controls. In addition, the removal of 470 m^3 of rock, the majority of which would be south of the Field of Mars, would be unlikely to significantly alter the hydrological regime of the area which would impact on foraging and breeding habitat. The majority of the sandstone rock escarpment would be retained and would continue to seep water despite the removal of sections of rock from its surface. The amount of additional stormwater draining within potential Glossy Black-cockatoo habitat during the operational phase would be negligible. Thus, it is unlikely that the proposed works would significantly disrupt the foraging and breeding habitat of the species that would affect the life cycle of a viable local population of the species.

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

Not applicable.

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

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable.

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

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

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

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

(i) Remnant vegetation in Council Reserves and on the rock escarpment between Rene and High Streets and planted vegetation above Buffalo Creek representing potential foraging habitat for the species would be removed by the proposed works. However, the amount of foraging habitat is small in relation to that remaining in the study area. Glossy Black-cockatoo is a highly mobile species which would be able to access foraging resources in the study area. No breeding habitat would be directly impacted. Indirect impacts to potential foraging and breeding habitat in the study area would also be prevented, with sedimentation controls adhered to during the construction phase of the works to limit transport of weed propagules and sediment to areas adjacent to the subject site. The amount of additional stormwater draining within potential Glossy Black-cockatoo habitat during the operational phase would be negligible.

(ii) The vegetation that would be removed is located on the edge of Pittwater Road. The road widening works would not significantly increase habitat fragmentation. Glossy Black Cockatoo is highly mobile and would be able to access remaining foraging and breeding resources in the study area.

(iii) Habitat that would be removed is not likely to be crucial habitat for the species. This is due primarily due to the small loss of potential foraging habitat. No breeding habitat would be directly impacted. Foraging resources for Glossy Black Cockatoo would be retained in the study area.

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

No critical habitat has been declared for the Glossy Black-cockatoo.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

No Recovery Plan or Threat Abatement Plan has been prepared for the Glossy Black-cockatoo.

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

One key threatening process (KTP) is relevant to this proposal with respect to Glossy Black-cockatoo: 'Clearing of Native Vegetation'. Whilst the action would involve this KTP, the scale of the impact is considered unlikely to increase the impact of the KTP due to the small size of the vegetation to be removed.

Conclusions

The proposed development is unlikely to impose a significant effect on Glossy Black-cockatoo given that:

- Habitat removal is minimal compared to that remaining in the locality;
- Areas of potential foraging habitat are present elsewhere in the locality;
- No breeding habitat would be impacted;
- Works would be unlikely to alter the hydrological regime (and hence impact on foraging and breeding resources) in the area; and
- The proposal would not isolate or fragment any currently connecting areas of habitat.

On the basis of the above considerations, it is unlikely that the proposed works would result in a significant impact on the survival of Glossy Black-cockatoo. Consequently, a Species Impact Statement is not required for the proposed works with respect to this species.

Black Bittern

Black Bittern is listed as a vulnerable species under the TSC Act. It is an endemic Australasian species whose range includes New Zealand. In Australia, and it occurs in three regions: south-eastern Australia from the Queensland border to south-east South Australia, south-west Western Australia and Tasmania. These regions are inferred to support three subpopulations. Australasian Bitterns in NSW form a part of the south-eastern subpopulation and are found in the riparian and wetland areas in the east and south of the state (DEC 2011).

The Australasian Bittern inhabits temperate freshwater wetlands and occasionally estuarine reedbeds and mangroves. The species favours permanent shallow waters, or edges of pools and waterways, with tall, dense vegetation such as sedges, rushes and reeds on muddy or peaty substrate. Australasian Bitterns also occur in Lignum *Muehlenbeckia florulenta* and Canegrass *Eragrostis australasica* on inland wetlands (DEC 2011).

The Australasian Bittern builds a platform nest of reeds and rushes just above water, in the deep cover of tall dense stands of reeds or rushes. A clutch of up to four to five eggs may be laid in spring to summer, although limited information is available. Breeding pairs of Australasian Bitterns are solitary and territorial, occupying relatively large home ranges of 40-50 ha and occurring at low densities. Generation length is estimated as five years, with low reliability (DEC 2011).

The Australasian Bittern feeds on animals in and around the margins of wetlands including: fish, crayfish, frogs, insects, snakes, lizards and occasionally small birds and mammals. Plant matter can also form part of the diet (DEC 2011).

The species is threatened by habitat loss and degradation from grazing and burning, alterations to the natural flow of waterways, climate change, and predation by foxes.

No individuals of this species were recorded within the subject site; however, there are 4 records for this species within 10 km, one of which was in the Field of Mars, and potential habitat for this species was identified within the study area.

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

Factors likely to have an adverse impact on the life cycle of Australasian Bittern include habitat loss and degradation from grazing and burning, alterations to the natural flow of waterways, climate change, and predation by foxes.

The proposed works could impact on Australasian Bittern through the trimming of mangrove vegetation for the construction of the shared user path along Buffalo Creek where it crosses Pittwater Road.

However, only some branches of mangrove vegetation representing foraging habitat would be removed under the proposal. The amount to be removed is minimal in comparison to the larger undisturbed areas of foraging habitat present in the study area, most notably along the Lane Cove River and in Buffalo Creek Reserve, which support mangrove. There would be limited disturbance to Buffalo Creek in trimming mangrove vegetation, with trampling within the mangrove vegetation avoided. The footbridge would be placed across Buffalo Creek by cantilever and no in stream structures would be used. No breeding habitat would be directly impacted.

The proposal would not indirectly impact on potential foraging habitat in the study area through the introduction of sediments from construction works given sedimentation controls. In addition, the removal of 470 m^3 of rock, the majority of which would be south of the Field of Mars, would be unlikely to significantly alter the hydrological regime of the area which would impact on potential foraging habitat in mangrove vegetation downstream. The majority of the sandstone rock escarpment would be retained and would continue to seep water despite the removal of sections of rock from its surface. The amount of additional stormwater draining within potential Australasian Bittern habitat during the operational phase would be negligible, with sedimentation basins allowing for the imitation of the current hydrological regime. Thus, it is unlikely that the proposed works would significantly disrupt the foraging habitat of the species that would affect the life cycle of a viable local population of the species.

The proposal would not lead to increased incidence of predation of Australasian Bittern by foxes.

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

Not applicable.

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

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

Not applicable.

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

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

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

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

(i) Some mangrove vegetation representing potential foraging habitat for the species would be removed by the proposed works (at Buffalo Creek where it crosses Pittwater Road). However, mangrove vegetation would only be trimmed and the amount of foraging habitat modified is small in relation to that remaining in the study area. Also, athough relatively sedentary, Australasian Bittern would be able to access foraging resources in the study area. There would be limited disturbance to Buffalo Creek in timming mangrove vegetation, with trampling within the mangrove vegetation avoided. The footbridge would be placed across Buffalo Creek by cantilever and no in stream structures would be used. No breeding habitat would be directly impacted.

Indirect impacts to potential foraging habitat in the study area would also be prevented, with sedimentation controls adhered to during the construction phase of the works to limit transport of weed

propagules and sediment to areas adjacent to the subject site. The amount of additional stormwater draining within potential Australasian Bittern habitat during the operational phase would be negligible.

(ii) The proposed works could require trimming mangrove trees along Buffalo Creek. This would not significantly fragment or isolate Australasian Bittern habitat given that trimmed vegetation would occur on the edge of existing mangrove. Also, the natural hydrological regime of Buffalo Creek would not be altered.

(iii) Habitat that would be removed is not likely to be crucial habitat for the species. This is due primarily due to the small loss of potential foraging habitat. No breeding habitat would be directly impacted. Foraging resources for Australasian Bittern would be retained in the study area.

e. Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared for Australasian Bittern.

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

No recovery or threat abatement plan has been prepared for Australasian Bittern.

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

One key threatening process (KTP) is relevant to this proposal with respect to Australasian Bittern: 'Clearing of Native Vegetation'. Whilst the action would involve this KTP, the scale of the impact is considered unlikely to increase the impact of the KTP due to the small size of the vegetation to be removed.

Conclusion

The proposed development is unlikely to impose a significant impact on Australasian Bittern given that:

- Habitat removal is minimal compared to that remaining in the locality;
- Areas of potential foraging habitat are present elsewhere in the locality;
- No breeding habitat would be impacted;
- Works would be unlikely to alter the hydrological regime (and hence impact on foraging resources) in the area; and
- The proposal would not isolate or fragment any currently connecting areas of habitat.

On the basis of the above considerations, it is unlikely that the proposed works would result in a significant impact on the survival of Australasian Bittern. Consequently, a Species Impact Statement is not required for the proposed works with respect to this species.

Little Lorikeet

Little Lorikeet is listed as a Vulnerable Species under the TSC Act. It extends from just north of Cairns, around the east coast of Australia, to Adelaide. In NSW, Little Lorikeets are distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range, extending westwards to the vicinity of Albury, Parkes, Dubbo and Narrabri (DEC 2011).

Little Lorikeets mostly occur in dry, open eucalypt forests and woodlands. They have been recorded from both old-growth and logged forests in the eastern part of their range, and in remnant woodland patches and roadside vegetation on the western slopes. In south-east Queensland, Little Lorikeets were more likely to occupy forest sites with relatively short to intermediate logging rotations (15–23 years) and sites that have had short intervals (2.5– 4 years) between fires (DEC 2011).

There is no evidence of regular migration, but Little Lorikeets are generally considered to be nomadic, with irregular large or small influxes of individuals occurring at any time of year, apparently related to food availability. However, long term investigation of the breeding population on the north-western slopes indicates that breeding birds are resident from April to December, and even during their non-resident period, they may return to the nest area for short periods if there is some tree-flowering in the vicinity (DEC 2011).

Little Lorikeets are gregarious, usually foraging in small flocks, often with other species of lorikeet. They feed primarily on nectar and pollen in the tree canopy, particularly on profusely-flowering eucalypts, but also on a variety of other species including melaleucas and mistletoes. On the western slopes and tablelands White Box *Eucalyptus albens* and Yellow Box *E. melliodora* are particularly important food sources for pollen and nectar respectively. They are also reported as feeding on fruits, particularly those of mistletoes (DEC 2011).

This species is threatened by a number of processes including the loss of breeding sites and foraging habitat from ongoing land clearance (DEC 2011).

No individuals of this species were recorded within the subject site; however, there are 13 records for this species within 10 km, and potential habitat for this species was identified within the study area.

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

Factors likely to have an adverse effect on the life cycle of Little Lorikeet would include a significant loss of breeding and foraging habitat.

The proposed works could directly impact on Little Lorikeet through the removal of 2 trees (one mature *E. acmenoides* and one young *A. bakeri*), the removal of some tree branches overhanging Pittwater Road between Rene Street and the Field of Mars, the removal of vegetation on the rock escarpment between Rene and High Streets and for sedimentation basins, and potentially the removal of some mangrove branches representing foraging habitat for the species.

However, only a small area of Little Lorikeet foraging habitat would be removed under the proposal for the road widening works. The amount to be removed is minimal in comparison to the larger undisturbed areas of foraging habitat present in the study area, most notably in Lane Cove National Park and Buffalo Creek Reserve. While the *E. acmenoides* to be removed is mature and would provide abundant foraging resources, other nectar trees in the study area would be retained.

The proposal would not indirectly impact on potential foraging habitat in the study area through the introduction of contaminated water or sediments from construction works given sedimentation and water quality controls. In addition, the removal of 470 m^3 of rock, the majority of which would be south of the Field of Mars, would be unlikely to significantly alter the hydrological regime of the area. The majority of the sandstone rock escarpment would be retained and would continue to seep water despite the removal of sections of rock from its surface. The amount of additional stormwater draining within potential Little Lorikeet foraging habitat during the operational phase would be negligible. Thus, it is unlikely that the proposed works would significantly disrupt the foraging habitat of the species that would affect the life cycle of a viable local population of the species.

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

Not applicable.

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

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable.

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

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

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

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

(i) Two trees (one mature *E. acmenoides* and one young *A. bakeri*), tree branches overhanging Pittwater Road between Rene Street and the Field of Mars, vegetation on the rock escarpment between Rene and High Streets, vegetation in Council Reserves (for sedimentation basins), and mangrove branches along Buffalo Creek, all representing potential foraging habitat for the species, would be removed for the proposed works. However, the amount of foraging habitat is small in relation to that remaining in the study area. Little Lorikeet is a highly mobile species which would be able to access foraging resources in the study area. Indirect impacts to potential foraging habitat in the study area would also be prevented, with sedimentation controls adhered to during the construction phase of the works to limit transport of weed propagules and sediment to areas adjacent to the subject site. The amount of additional stormwater draining within potential Little Lorikeet foraging habitat during the operational phase would be negligible. No breeding habitat (hollow-bearing trees) would be impacted.

(ii) The vegetation that would be removed are located on the edge of Pittwater Road, with *E. acmenoides* and the tree branches between Rene Street and the Field of Mars providing some

connectivity across Pittwater Road. Thus, the proposed works would decrease habitat connectivity. However, the loss of the trees and branches would not result in the fragmentation or isolation of foraging habitat for Little Lorikeet. The species is highly mobile and would be able to access remaining foraging resources in the study area.

(iii) Foraging habitat that would be removed is not likely to be crucial habitat for the species. This is due primarily due to the small loss of potential foraging habitat. While a mature *E. acmenoides* would be removed, nectar resources for Little Lorikeet would be retained in the study area. No breeding habitat (hollow-bearing trees) would be impacted.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared for Little Lorikeet.

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

No recovery plan or threat abatement plan has yet been developed for Little Lorikeet.

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

One key threatening process (KTP) is relevant to this proposal with respect to Little Lorikeet: 'Clearing of Native Vegetation'. Whilst the action would involve this KTP, the scale of the impact is considered unlikely to increase the impact of the KTP due to the small size of the vegetation to be removed.

Conclusion

The proposed development is unlikely to impose a significant effect on Little Lorikeet given that:

- Habitat removal is minimal compared to that remaining in the locality;
- Areas of potential foraging habitat are present elsewhere in the locality;
- No breeding habitat (hollow-bearing trees) would be impacted;
- Works would be unlikely to alter the hydrological regime (and hence impact on foraging resources) in the area; and
- The proposal would not isolate or fragment any currently connecting areas of foraging habitat.

On the basis of the above considerations, it is unlikely that the proposed works would result in a significant impact on the survival of Little Lorikeet. Consequently, a Species Impact Statement is not required for the proposed works with respect to this species.

Osprey

The Osprey is listed as a Vulnerable Species under the TSC Act. It is cosmopolitan, being found in many coastal and lake areas of the world. In Australia, it is found on the north and east coast from Broome to the south coast of New South Wales (DEC 2011).

Ospreys are found on the coast and in terrestrial wetlands of tropical and temperate Australia and off-shore islands, occasionally ranging inland along rivers, though mainly in the north of the country (DEC 2011).

The Osprey feeds mainly on medium-sized live fish, which it does not swallow whole, but rips apart to eat. The Osprey patrols the coast, searching for prey. It folds its wings, then drops headlong, with its feet forward to snatch a fish with its talons. It may go right under the water or snatch a fish from the surface, before lifting off again, with strong wing strokes (DEC 2011).

The Osprey may use the same nest year after year. The nest is made from sticks and driftwood and may be huge after many years. It is usually placed on a cliff, a dead tree or even a radio mast. Both birds bring sticks, but the female usually places the sticks in the nest. The nest is lined with grass, seaweed or bark. The female does most of the incubation, while the male brings food to the nest (DEC2011).

This species is threatened by a number of processes including the loss of breeding habitat and nest trees, pollution of foraging habitat and prey with agricultural and industrial chemicals, and entanglement in fishing gear (DEC 2011).

No individuals of this species were recorded within the subject site; however, there are 3 records for this species within 10 km, and potential habitat for this species was identified within the study area.

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

Factors likely to have an adverse impact on the life cycle of Osprey include the loss of habitat and nest trees, pollution of foraging habitat and prey, and entanglement with fishing gear.

The proposed works could directly impact on Osprey through the removal of mangrove vegetation (trimming of branches only) along Buffalo Creek where it crosses Pittwater Road.

However, only a small area of mangrove vegetation representing foraging habitat would be removed under the proposal. The amount to be removed is minimal in comparison to the larger undisturbed areas of foraging habitat present in the study area, most notably along the Lane Cove River and in Buffalo Creek Reserve, which support mangrove. There would be limited disturbance to Buffalo Creek in removing mangrove vegetation, with trampling within the mangrove vegetation avoided. The footbridge would be placed across Buffalo Creek by cantilever and no in stream structures would be used. No breeding habitat would be directly impacted.

The proposal would not indirectly impact on potential foraging habitat in the study area through the introduction of sediments from construction works given sedimentation controls. In addition, the removal of 470 m^3 of rock, the majority of which would be south of the Field of Mars, would be unlikely to significantly alter the hydrological regime of the area which would impact on potential foraging habitat in mangrove vegetation downstream. The majority of the sandstone rock escarpment would be retained and would continue to seep water despite the removal of sections of rock from its surface. The amount

of additional stormwater draining within potential Osprey habitat during the operational phase would be negligible, with sedimentation basins allowing for the imitation of the current hydrological regime. Thus, it is unlikely that the proposed works would significantly disrupt the foraging habitat of the species that would affect the life cycle of a viable local population of the species.

The proposal would not lead to increased incidence of entanglement with fishing gear.

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

Not applicable.

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

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

Not applicable.

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

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

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

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

(i) Mangrove vegetation along Buffalo Creek representing potential foraging habitat for the species would be removed by the proposed works (trimming of branches only). However, the amount of foraging habitat is small in relation to that remaining in the study area. Also, Osprey is highly mobile and would be able to access foraging resources in the study area. There would be limited disturbance to Buffalo Creek in removing mangrove vegetation, with trampling within the mangrove vegetation avoided. The footbridge would be placed across Buffalo Creek by cantilever and no in stream structures would be used. No breeding habitat would be directly impacted.

Indirect impacts to potential foraging habitat in the study area would also be prevented, with sedimentation controls adhered to during the construction phase of the works to limit transport of weed propagules and sediment to areas adjacent to the subject site. The amount of additional stormwater draining within potential Osprey habitat during the operational phase would be negligible.

(ii) The proposed works would remove some mangrove branches along Buffalo Creek. This would not significantly fragment or isolate Osprey habitat given that vegetation to be removed is located at the edge of Pittwater Road and Osprey is highly mobile. Also, the natural hydrological regime of Buffalo Creek would not be altered.

(iii) Habitat that would be removed is not likely to be crucial habitat for the species. This is due primarily due to the small loss of potential foraging habitat. No breeding habitat would be directly impacted. Foraging resources for Osprey would be retained in the study area.

e. Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared for Osprey.

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

No recovery or threat abatement plan has been prepared for Osprey.

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

One key threatening process (KTP) is relevant to this proposal with respect to Osprey: 'Clearing of Native Vegetation'. Whilst the action would involve this KTP, the scale of the impact is considered unlikely to increase the impact of the KTP due to the small size of the vegetation to be removed.

Conclusion

The proposed development is unlikely to impose a significant impact on Osprey given that:

- Habitat removal is minimal compared to that remaining in the locality;
- Areas of potential foraging habitat are present elsewhere in the locality;
- No breeding habitat would be impacted;
- Works would be unlikely to alter the hydrological regime (and hence impact on foraging resources) in the area; and
- The proposal would not isolate or fragment any currently connecting areas of habitat.

On the basis of the above considerations, it is unlikely that the proposed works would result in a significant impact on the survival of Osprey. Consequently, a Species Impact Statement is not required for the proposed works with respect to this species.

Superb Fruit Dove

Superb Fruit Dove is listed as a Vulnerable Species under the TSC Act. The species is found along the coast and nearby ranges of Queensland and New South Wales south to Moruya (DEC 2011).

The Superb Fruit-Dove is found in rainforests, rainforest margins, mangroves, wooded stream-margins, and even isolated figs, lilly pillies and pittosporums. Superb Fruit-Doves are arboreal and feed almost exclusively on fruit, mainly in large trees. They have a large gape, which allows them to swallow bulky items (DEC 2011).

Superb Fruit-Doves build a flimsy platform nest of twigs in bushy trees from 5 m - 30 m above the ground. The female incubates the eggs at night while the male incubates by day (DEC 2011).

This species is threatened primarily by habitat loss (DEC 2011).

No individuals of this species were recorded within the subject site; however, there are 20 records for this species within 10 km, and potential habitat for this species was identified within the study area.

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

Factors likely to have an adverse effect on the life cycle of Superb Fruit-Dove would include a significant loss of foraging and habitat.

The proposed works could directly impact on Superb Fruit-Dove through the removal of mangrove vegetation along Buffalo Creek (trimming of branches only) where it crosses Pittwater Road and the construction of the shared user path.

However, only a small area of mangrove vegetation representing foraging habitat would be removed under the proposal. The amount to be removed is minimal in comparison to the larger undisturbed areas of foraging habitat present in the study area, most notably along the Lane Cove River and in Buffalo Creek Reserve, which support mangrove. There would be limited disturbance to Buffalo Creek in removing mangrove vegetation, with trampling within the mangrove vegetation avoided. The footbridge would be placed across Buffalo Creek by cantilever and no in stream structures would be used. No breeding habitat would be directly impacted.

The proposal would not indirectly impact on potential foraging habitat in the study area through the introduction of sediments from construction works given sedimentation controls. In addition, the removal of 470 m^3 of rock, the majority of which would be south of the Field of Mars, would be unlikely to significantly alter the hydrological regime of the area which would impact on potential foraging habitat in mangrove vegetation downstream. The majority of the sandstone rock escarpment would be retained and would continue to seep water despite the removal of sections of rock from its surface. The amount of additional stormwater draining within potential Superb Fruit-Dove habitat during the operational phase would be negligible, with sedimentation basins allowing for the imitation of the current hydrological regime. Thus, it is unlikely that the proposed works would significantly disrupt the foraging habitat of the species that would affect the life cycle of a viable local population of the species.

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

Not applicable.

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

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable.

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

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

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

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

(i) Mangrove vegetation along Buffalo Creek where it crosses Pittwater Road representing potential foraging habitat for the species would be removed by the proposed works (trimming of branches only). However, the amount of foraging habitat is small in relation to that remaining in the study area. Also, Superb Fruit-Dove is highly mobile and would be able to access foraging resources in the study area. There would be limited disturbance to Buffalo Creek in removing mangrove vegetation, with trampling within the mangrove vegetation avoided. The footbridge would be placed across Buffalo Creek by cantilever and no in stream structures would be used. No breeding habitat would be directly impacted.

Indirect impacts to potential foraging habitat in the study area would also be prevented, with sedimentation controls adhered to during the construction phase of the works to limit transport of weed propagules and sediment to areas adjacent to the subject site. The amount of additional stormwater draining within potential Superb Fruit-Dove habitat during the operational phase would be negligible.

(ii) The proposed works would remove some mangrove branches along Buffalo Creek. This would not significantly fragment or isolate Superb Fruit-Dove habitat given that vegetation to be removed is located on the edgeof Pittwater Road and Superb Fruit-Dove is highly mobile. Also, the natural hydrological regime of Buffalo Creek would not be altered.

(iii) Foraging habitat that would be removed is not likely to be crucial habitat for the species. This is due primarily due to the small loss of potential foraging habitat. No breeding habitat would be impacted.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared for Superb Fruit-Dove.

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

No recovery plan or threat abatement plan has yet been developed for this species.

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

One key threatening process (KTP) is relevant to this proposal with respect to Superb Fruit-Dove: 'Clearing of Native Vegetation'. Whilst the action would involve this KTP, the scale of the impact is considered unlikely to increase the impact of the KTP due to the small size of the vegetation to be removed.

Conclusion

The proposed development is unlikely to impose a significant effect on Superb Fruit-Dove given that:

- Habitat removal is minimal compared to that remaining in the locality;
- Areas of potential foraging habitat are present elsewhere in the locality;
- No breeding habitat would be impacted;
- Works would be unlikely to alter the hydrological regime (and hence impact on foraging resources) in the area; and
- The proposal would not isolate or fragment any currently connecting areas of foraging habitat.

On the basis of the above considerations, it is unlikely that the proposed works would result in a significant impact on the survival of Superb Fruit-Dove. Consequently, a Species Impact Statement is not required for the proposed works with respect to this species.

Barking Owl

Barking Owl is listed as a vulnerable species under the TSC Act. It is found throughout Australia except for the central arid regions and Tasmania. It is quite common in parts of northern Australia, but is generally considered uncommon in southern Australia. It has declined across much of its distribution in NSW and now occurs only sparsely. It is most frequently recorded on the western slopes and plains. It is rarely recorded in the far west or in coastal and escarpment forests (DEC 2011).

Barking Owl inhabits eucalypt woodland, open forest, swamp woodlands and, especially in inland areas, timber along watercourses. Denser vegetation is used occasionally for roosting. The species feeds on a variety of prey, with invertebrates predominant for most of the year, and birds and mammals such as smaller gliders, possums, rodents and rabbits becoming important during breeding (DEC 2011).

Barking Owl live alone or in pairs. Territories range from 30 to 200 hectares and birds are present all year. Three eggs are laid in nests in hollows of large, old eucalypts including River Red Gum (*Eucalyptus camaldulensis*), White Box (*Eucalyptus albens*), (Red Box) *Eucalyptus polyanthemos* and Blakely's Red Gum (*Eucalyptus blakelyi*). Breeding occurs during late winter and early spring (DEC 2011).

Barking Owl is threatened by clearing and degradation of habitat, inappropriate forest harvesting practices that have changed forest structure and removed old growth hollow-bearing trees, firewood harvesting resulting in the removal of old trees, and too-frequent fire which causes degradation of understorey vegetation which provides habitat and foraging substrate for prey species (DEC 2011).

No individuals of this species were recorded within the subject site; however, however, the species has been recorded in the study area, with 7 records for this species within 10 km, and potential habitat and prey species for this species (eg. Gliders and Common Ringtail Possum) for this species was identified within the study area.

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

Factors likely to have an adverse effect on the life cycle of the Barking Owl would include a substantial loss and/or fragmentation of foraging habitat and loss of suitable nesting and roosting habitat.

The proposed works could directly impact on Barking Owl through the removal of 2 trees (one mature *E. acmenoides* and one young *A. bakeri*) and vegetation for sedimentation basins and road widening (vegetation on the rock escarpment between Rene and High Streets), representing foraging habitat for the species.

However, only a small area of Barking Owl foraging habitat would be removed under the proposal for the road widening works. The amount to be removed is minimal in comparison to the larger undisturbed areas of foraging habitat present in the study area, most notably in Lane Cove National Park and Buffalo Creek Reserve. While the *E. acmenoides* to be removed is mature and would provide abundant foraging resources for the prey species of Barking Owl, other trees in the study area would be retained.

The proposal would not indirectly impact on potential habitat supporting prey species or roosting/breeding resources in the study area through the introduction of contaminated water or sediments from construction works given sedimentation and water quality controls. In addition, the removal of 470 m^3 of rock, the majority of which would be south of the Field of Mars, would be unlikely to significantly alter the hydrological regime of the area which could impact on vegetation supporting

prey species and/or roosting or breeding trees. The majority of the sandstone rock escarpment would be retained and would continue to seep water despite the removal of sections of rock from its surface. The amount of additional stormwater draining within potential Barking Owl foraging, roosting or breeding habitat during the operational phase would be negligible. Thus, it is unlikely that the proposed works would significantly disrupt the habitat of the species that would affect the life cycle of a viable local population of the species.

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

Not applicable.

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

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable.

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

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

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

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

(i) Two trees (one mature *E. acmenoides* and one young *A. bakeri*) and vegetation for sedimentation basins and road widening (vegetation on the rock escarpment between Rene and High Streets), representing foraging habitat for the species would be removed by the proposed works. However, the amount of habitat is small in relation to that remaining in the study area. Barking Owl is a highly mobile species which would be able to access foraging resources in the study area. Impacts to potential foraging/roosting/breeding habitat in the study area would also be prevented, with sedimentation controls adhered to during the construction phase of the works to limit transport of weed propagules and sediment to areas adjacent to the subject site. The amount of additional stormwater draining within potential Barking Owl habitat during the operational phase would be negligible.

(ii) The trees and vegetation that would be removed are located on the edge of Pittwater Road, with *E. acmenoides* and the tree branches between Rene Street and the Field of Mars providing some connectivity across Pittwater Road. Thus, the proposed works would decrease habitat connectivity slightly. However, the loss of the trees and branches would not result in the fragmentation or isolation of habitat for Barking Owl. The species is highly mobile and would be able to access remaining foraging and breeding/roosting resources in the study area.

(iii) Foraging habitat that would be removed is not likely to be crucial habitat for the species. This is due primarily due to the small loss of potential foraging habitat. While a mature *E. acmenoides* would be removed, nectar resources for Barking Owl prey species would be retained in the study area. No roosting/breeding habitat would be impacted by the proposal.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared for Barking Owl.

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

A draft recovery plan for Barking Owls includes the following objectives or actions:

1. Increase understanding of the biology, ecology and management of the Barking Owl
2. Increase education and awareness of and involvement in the conservation of the Barking Owl and its habitat in NSW
3. Undertake threat abatement and mitigation
4. Gain efficiencies through links with other conservation plans and conservation groups
5. Provide organizational support

The proposed works would reduce a small area of potential foraging habitat which is inconsistent with objective 3. This objective expands to state that impacts on Barking Owl and its habitats should be adequately assessed during the environmental assessment process, and that loss and fragmentation of significant owl habitat should be minimised and this habitat should be better protected and managed.

The area of habitat being removed is relatively small and as such it is expected that this species would not be reliant on this habitat for survival, especially in the context of the significant area of undisturbed vegetation within the locality. As such, the study area is not considered significant Barking Owl habitat.

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

One key threatening process (KTP) is relevant to this proposal with respect to Barking Owl: 'Clearing of Native Vegetation'. Whilst the action would involve this KTP, the scale of the impact is considered unlikely to increase the impact of the KTP due to the small size of the vegetation to be removed.

Conclusions

The proposed development is unlikely to impose a significant effect on Barking Owl given that:

- Habitat removal is minimal compared to that remaining in the locality;
- Areas of potential foraging habitat are present elsewhere in the locality;
- No breeding habitat would be impacted;
- Works would be unlikely to alter the hydrological regime (and hence impact on the habitat of prey species or breeding resources) in the area; and
- The proposal would not isolate or fragment any currently connecting areas of habitat.

On the basis of the above considerations, it is unlikely that the proposed works would result in a significant impact on the survival of Barking Owl. Consequently, a Species Impact Statement is not required for the proposed works with respect to this species.

Powerful Owl

The Powerful Owl is listed as a vulnerable species under the TSC Act. It is endemic to eastern and south-eastern Australia, mainly on the coastal side of the Great Dividing Range from Mackay to south-western Victoria and occurs at low densities. In NSW it is widely distributed throughout the eastern forests from the coast inland to tablelands, with scattered, mostly historical records on the western slopes and plains (DEC 2011).

Powerful Owls occur primarily in densely vegetated gullies of open and tall open forest, but they are also found in a wider range of habitats, including forests and woodlands within the metropolitan regions of cities. However, optimal habitat requires large tracts of forest or woodland habitat, including a tall shrub layer and abundant hollows supporting high densities of arboreal marsupial prey species (DEC 2011).

This species roosts in dense mid-canopy trees (such as Turpentines, She-oaks and rainforest trees), or tall shrubs in sheltered gullies, typically on wide creek flats and at the heads of minor drainage lines. Nesting occurs in large hollows (greater than 45 cm wide and greater than 100 cm deep) in eucalypts in unlogged, unburnt gullies and lower slopes within 100 m of streams or minor drainage lines. Nest trees are typically emergent, and are often the largest and oldest in a stand. Powerful Owls are faithful to traditional nesting hollows but can also use other hollows within the nesting gully (DEC 2011).

Pairs of birds occupy large home ranges (300-1500 ha), utilising various portions of this area at different times, depending on the local abundance of arboreal mammals as a food source. Powerful Owls prey particularly on the Greater Glider and Ringtail Possum although the relative importance of prey items appears to vary regionally, with other prey such as Sugar Gliders, Brushtail Possums, Greyheaded Flying-foxes, insects and birds also used (DEC 2011).

This species is threatened by a number of processes including loss and fragmentation of suitable forest and woodland habitat from land clearing for residential and agricultural development, which also affects the populations of arboreal prey species. Other threats include loss of hollow-bearing trees suitable for nesting, disturbance around nest sites (particularly during pre-laying, laying and downy chick stages), high frequency hazard reduction burning (affecting prey availability), secondary poisoning, road kills, and predation of fledglings by foxes, dogs and cats (DEC 2011).

No individuals of this species were recorded within the subject site; however, however, the species has been recorded in the study area, with 141 records for this species within 10 km, and potential habitat and prey species for this species (eg. Gliders and Common Ringtail Possum) was identified within the study area.

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

Factors likely to have an adverse effect on the life cycle of the Powerful Owl would include a substantial loss and/or fragmentation of foraging habitat and loss of suitable nesting and roosting habitat.

The proposed works could directly impact on Powerful Owl through the removal of 2 trees (one mature *E. acmenoides* and one young *A. bakeri*) and vegetation for sedimentation basins and road widening (vegetation on the rock escarpment between Rene and High Streets), representing foraging habitat for the species.

However, only a small area of Powerful Owl foraging habitat would be removed under the proposal for the road widening works. The amount to be removed is minimal in comparison to the larger undisturbed areas of foraging habitat present in the study area, most notably in Lane Cove National Park and Buffalo Creek Reserve. While the *E. acmenoides* to be removed is mature and would provide abundant foraging resources for the prey species of Powerful Owl, other trees in the study area would be retained.

The proposal would not indirectly impact on potential habitat supporting prey species or roosting/breeding resources in the study area through the introduction of contaminated water or sediments from construction works given sedimentation and water quality controls. In addition, the removal of 470 m^3 of rock, the majority of which would be south of the Field of Mars, would be unlikely to significantly alter the hydrological regime of the area which could impact on vegetation supporting prey species and/or roosting or breeding trees. The majority of the sandstone rock escarpment would be retained and would continue to seep water despite the removal of sections of rock from its surface. The amount of additional stormwater draining within potential Powerful Owl foraging, roosting or breeding habitat during the operational phase would be negligible. Thus, it is unlikely that the proposed works would significantly disrupt the habitat of the species that would affect the life cycle of a viable local population of the species.

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

Not applicable.

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

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

Not applicable.

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

> **(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and**
>
> **(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**
>
> **(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,**

(i) Two trees (one mature *E. acmenoides* and one young *A. bakeri*) and vegetation for sedimentation basins and road widening (vegetation on the rock escarpment between Rene and High Streets), representing foraging habitat for the species would be removed by the proposed works. However, the amount of habitat is small in relation to that remaining in the study area. Powerful Owl is a highly mobile species which would be able to access foraging resources in the study area. Impacts to

potential foraging/roosting/breeding habitat in the study area would also be prevented, with sedimentation controls adhered to during the construction phase of the works to limit transport of weed propagules and sediment to areas adjacent to the subject site. The amount of additional stormwater draining within potential Powerful Owl habitat during the operational phase would be negligible.

(ii) The trees and vegetation that would be removed are located on the edge of Pittwater Road, with *E. acmenoides* and the tree branches between Rene Street and the Field of Mars providing some connectivity across Pittwater Road. Thus, the proposed works would decrease habitat connectivity slightly. However, the loss of the trees and branches would not result in the fragmentation or isolation of habitat for POwerful Owl. The species is highly mobile and would be able to access remaining foraging and breeding/roosting resources in the study area.

(iii) Foraging habitat that would be removed is not likely to be crucial habitat for the species. This is due primarily due to the small loss of potential foraging habitat. While a mature *E. acmenoides* would be removed, nectar resources for Powerful Owl prey species would be retained in the study area. No roosting/breeding habitat would be impacted by the proposal.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared for Powerful Owl.

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

A recovery plan for the Large Forest Owls including the Powerful Owl was produced by the former Department of Environment and Conservation with the following objectives or actions:

1. Model and map owl habitat and validate with surveys;
2. Monitor owl population parameters;
3. Audit forestry prescriptions;
4. Manage and protect habitat off reserves and state forests;
5. Undertake research;
6. Increase community awareness and involvement in owl conservation; and
7. Provide organisational support and integration.

The proposed works would reduce a small area of potential foraging habitat which is inconsistent with objective 4. This objective expands to state that impacts on large forest owls and their habitats should be adequately assessed during the environmental assessment process, and that loss and fragmentation of significant owl habitat should be minimised and this habitat should be better protected and managed.

The area of habitat being removed is relatively small and as such it is expected that this species would not be reliant on this habitat for survival, especially in the context of the significant area of undisturbed vegetation within the locality. As such, the study area is not considered significant Powerful Owl habitat.

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

One key threatening process (KTP) is relevant to this proposal with respect to Powerful Owl: 'Clearing of Native Vegetation'. Whilst the action would involve this KTP, the scale of the impact is considered unlikely to increase the impact of the KTP due to the small size of the vegetation to be removed.

Conclusion

The proposed development is unlikely to impose a significant effect on Powerful Owl given that:

- Habitat removal is minimal compared to that remaining in the locality;
- Areas of potential foraging habitat are present elsewhere in the locality;
- No breeding or roosting habitat would be impacted;
- Works would be unlikely to alter the hydrological regime (and hence impact on the habitat of prey species or breeding resources) in the area; and
- The proposal would not isolate or fragment any currently connecting areas of habitat.

On the basis of the above considerations, it is unlikely that the proposed works would result in a significant impact on the survival of Powerful Owl. Consequently, a Species Impact Statement is not required for the proposed works with respect to this species.

Large-eared Pied Bat

Large-eared Pied Bat is listed as vulnerable under Schedule 2 of the TSC Act. It is a small to medium-sized bat with long, prominent ears and glossy black fur. The lower body has broad white fringes running under the wings and tail-membrane, meeting in a V-shape in the pubic area. The species is found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland south to Bungonia in the NSW Southern Highlands. It is generally rare with a very patchy distribution in NSW. There are scattered records from the New England Tablelands and North West Slopes (DEC 2011).

Large-eared Pied Bat roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (*Hirundo ariel*). Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in sandstone caves. They remain loyal to the same cave over many years (DEC 2011).

Large-eared Pied Bat is found in well-timbered areas containing gullies. It frequents low to mid-elevation dry open forest and woodland close to caves, crevices in cliffs, old mine workings and disused mud nests of Fairy Martin. The relatively short, broad wing combined with the low weight per unit area of wing indicates manoeuvrable flight. This species probably forages for small, flying insects below the forest canopy (DEC 2011).

The threats to this species include clearing and isolation of forest and woodland habitats near cliffs, caves and old mine workings for agriculture or development; loss of foraging habitat close to cliffs, caves and old mine workings from forestry activities; too-frequent burning, usually associated with grazing; damage to roosting and maternity sites from mining operations, and recreational caving activities; and use of pesticides (DEC 2011).

No individuals of this species were recorded within the subject site; however, there is 1 record for this species within 10 km, and potential habitat for this species was identified within the study area.

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

Factors likely to have an adverse effect on the life cycle of Large-eared Pied Bat would include a substantial loss and/or fragmentation of foraging habitat near cliffs, damage of suitable roosting or breeding habitat, and recreational caving activities.

The proposed works could directly impact on Large-eared Pied Bat through the removal of 2 trees (one mature *E. acmenoides* and one young *A. bakeri*) and vegetation for sedimentation basins and road widening (vegetation on the rock escarpment between Rene and High Streets), representing foraging habitat for the species.

However, only a small area of Large-eared Pied Bat foraging habitat would be removed under the proposal for the road widening works. The amount to be removed is minimal in comparison to the larger undisturbed areas of foraging habitat present in the study area, most notably in Lane Cove National Park and Buffalo Creek Reserve. While the *E. acmenoides* to be removed is mature and would provide abundant foraging resources for the prey species of Large-eared Pied Bat, other trees in the study area would be retained. No roosting or breeding habitat would be impacted.

The proposal would not indirectly impact on potential habitat supporting prey species in the study area through the introduction of contaminated water or sediments from construction works given sedimentation and water quality controls. In addition, the removal of 470 m^3 of rock, the majority of

which would be south of the Field of Mars, would be unlikely to significantly alter the hydrological regime of the area which could impact on vegetation supporting prey species in the study area. The majority of the sandstone rock escarpment would be retained and would continue to seep water despite the removal of sections of rock from its surface. The amount of additional stormwater draining within potential Large-eared Pied Bat foraging habitat during the operational phase would be negligible. Thus, it is unlikely that the proposed works would significantly disrupt the foraging habitat of the species that would affect the life cycle of a viable local population of the species.

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

Not applicable.

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

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable.

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

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

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

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

(i) Two trees (one mature *E. acmenoides* and one young *A. bakeri*) and vegetation for sedimentation basins and road widening (vegetation on the rock escarpment between Rene and High Streets), representing foraging habitat for the species would be removed by the proposed works. However, the amount of habitat is small in relation to that remaining in the study area. Large-eared Pied Bat is a highly mobile species which would be able to access foraging resources in the study area. No breeding habitat would be impacted. Indirect impacts to potential foraging habitat in the study area would also be prevented, with sedimentation controls adhered to during the construction phase of the works to limit transport of weed propagules and sediment to areas adjacent to the subject site. The amount of additional stormwater draining within potential Large-eared Pied Bat habitat during the operational phase would be negligible.

(ii) The trees and vegetation that would be removed are located on the edge of Pittwater Road, with *E. acmenoides* and the tree branches between Rene Street and the Field of Mars providing some connectivity across Pittwater Road. Thus, the proposed works would decrease habitat connectivity slightly. However, the loss of the trees and branches would not result in the fragmentation or isolation

of habitat for Large-eared Pied Bat. The species is highly mobile and would be able to access remaining foraging resources in the study area.

(iii) Foraging habitat that would be removed is not likely to be crucial habitat for the species. This is due primarily due to the small loss of potential foraging habitat. While a mature *E. acmenoides* would be removed, nectar resources for Large-eared Pied Bat prey species would be retained in the study area. No roosting/breeding habitat would be impacted by the proposal.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared for Large-eared Pied Bat.

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

No Recovery Plan or Threat Abatement Plans are relevant to this species. However, 17 priority actions are in place to help recover Large-eared Pied Bat. The proposed works are not in conflict with any of these priority actions.

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

One key threatening process (KTP) is relevant to this proposal with respect to Large-eared Pied Bat: 'Clearing of Native Vegetation'. Whilst the action would involve this KTP, the scale of the impact is considered unlikely to increase the impact of the KTP due to the small size of the vegetation to be removed.

Conclusions

The proposed development is unlikely to impose a significant effect on Large-eared Pied Bat given that:

- Habitat removal is minimal compared to that remaining in the locality;
- Areas of potential foraging habitat are present elsewhere in the locality;
- No roosting or breeding habitat would be impacted;
- Works would be unlikely to alter the hydrological regime (and hence impact on the habitat of prey species) in the area; and
- The proposal would not isolate or fragment any currently connecting areas of habitat.

On the basis of the above considerations, it is unlikely that the proposed works would result in a significant impact on the survival of Large-eared Pied Bat. Consequently, a Species Impact Statement is not required for the proposed works with respect to this species.

Eastern Bentwing-bat and Little Bentwing Bat

Eastern Bentwing-bat and Little Bentwing-bat are listed as vulnerable species under the TSC Act. Eastern Bentwing-bat occupies a range of forested environments (including wet and dry sclerophyll forests), along the coastal portion of eastern Australia, and through the Northern Territory and Kimberley area (subject to subdivision of this species). Little Bentwing-bat occupies moist eucalypt forest, rainforest or dense coastal banksia scrub along coastal north-eastern NSW and eastern Queensland (DEC 2011).

Given that the species have similar foraging, roosting and breeding requirements, the species are considered together. Both species are highly mobile capable of large regional movements in relation to seasonal differences in reproductive behaviour and winter hibernation. Both roost primarily in caves, though they also roost in culverts, tunnels and occasionally tree-hollows, and species have been recorded roosting together (DEC 2011).

Eastern Bentwing-bat and Little Bentwing-bat are threatened by a number of processes including loss of foraging habitat, damage to or disturbance of roosting caves (particularly during winter or breeding), application of pesticides in or adjacent to foraging areas, and predation by feral cats and foxes (DEC 2011).

No individuals of Eastern Bentwing-bat or Little Bentwing-bat were recorded within the subject site; however, however, Eastern Bentwing-bat has been recorded in the study area, with 63 and 1 records for Eastern Bentwing-bat and Little Bentwing-bat, respectively, within 10 km, and potential habitat for these species was identified within the study area.

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

Factors likely to have an adverse effect on the life cycle of the Eastern Bentwing-bat and Little Bentwing-bat would include a substantial loss and/or fragmentation of foraging habitat, loss of suitable roosting or breeding habitat, and predation by feral cats and foxes.

The proposed works could directly impact on Eastern Bentwing-bat and Little Bentwing-bat through the removal of 2 trees (one mature *E. acmenoides* and one young *A. bakeri*) and vegetation for sedimentation basins and road widening (vegetation on the rock escarpment between Rene and High Streets), representing foraging habitat for the species.

However, only a small area of Eastern Bentwing-bat and Little Bentwing-bat foraging habitat would be removed under the proposal for the road widening works. The amount to be removed is minimal in comparison to the larger undisturbed areas of foraging habitat present in the study area, most notably in Lane Cove National Park and Buffalo Creek Reserve. While the *E. acmenoides* to be removed is mature and would provide abundant foraging resources for the prey species of Eastern Bentwing-bat and Little Bentwing-bat, other trees in the study area would be retained. No roosting or breeding habitat would be impacted.

The proposal would not indirectly impact on potential habitat supporting prey species in the study area through the introduction of contaminated water or sediments from construction works given sedimentation and water quality controls. In addition, the removal of 470 m^3 of rock, the majority of which would be south of the Field of Mars, would be unlikely to significantly alter the hydrological regime of the area which could impact on vegetation supporting prey species in the study area. The majority of the sandstone rock escarpment would be retained and would continue to seep water despite the

removal of sections of rock from its surface. The amount of additional stormwater draining within potential Eastern Bentwing-bat and Little Bentwing-bat foraging habitat during the operational phase would be negligible. Thus, it is unlikely that the proposed works would significantly disrupt the foraging habitat of the species that would affect the life cycle of a viable local population of the species.

The proposal would be unlikely to increase predation of Eastern Bentwing-bat and Little Bentwing-bat by feral cats and foxes.

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

Not applicable.

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

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable.

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

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

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

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

(i) Two trees (one mature *E. acmenoides* and one young *A. bakeri*) and vegetation for sedimentation basins and road widening (vegetation on the rock escarpment between Rene and High Streets), representing foraging habitat for the species would be removed by the proposed works. However, the amount of habitat is small in relation to that remaining in the study area. Eastern Bentwing-bat and Little Bentwing-bat are highly mobile species which would be able to access foraging resources in the study area. No breeding habitat would be impacted. Indirect impacts to potential foraging habitat in the study area would also be prevented, with sedimentation controls adhered to during the construction phase of the works to limit transport of weed propagules and sediment to areas adjacent to the subject site. The amount of additional stormwater draining within potential Eastern Bentwing-bat and Little Bentwing-bat habitat during the operational phase would be negligible.

(ii) The trees and vegetation that would be removed are located on the edge of Pittwater Road, with *E. acmenoides* and the tree branches between Rene Street and the Field of Mars providing some connectivity across Pittwater Road. Thus, the proposed works would decrease habitat connectivity slightly. However, the loss of the trees and branches would not result in the fragmentation or isolation of habitat for Eastern Bentwing-bat and Little Bentwing-bat. The species is highly mobile and would be able to access remaining foraging resources in the study area.

(iii) Foraging habitat that would be removed is not likely to be crucial habitat for the species. This is due primarily due to the small loss of potential foraging habitat. While a mature *E. acmenoides* would be removed, nectar resources for Eastern Bentwing-bat and Little Bentwing-bat prey species would be retained in the study area. No roosting/breeding habitat would be impacted by the proposal.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared for Eastern Bentwing-bat or Little Bentwing-bat.

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

No Recovery Plan or Threat Abatement Plan have been prepared for these species. However, 25 priority actions and 24 priority actions are in place to help recover Eastern Bentwing-bat and Little Bentwing-bat. The proposed works are not in conflict with any of these priority actions.

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

One key threatening process (KTP) is relevant to this proposal with respect to Eastern Bentwing-bat and Little Bentwing-bat: 'Clearing of Native Vegetation'. Whilst the action would involve this KTP, the scale of the impact is considered unlikely to increase the impact of the KTP due to the small size of the vegetation to be removed.

Conclusions

The proposed development is unlikely to impose a significant effect on Eastern Bentwing-bat and Little Bentwing-bat given that:

- Habitat removal is minimal compared to that remaining in the locality;
- Areas of potential foraging habitat are present elsewhere in the locality;
- No roosting or breeding habitat would be impacted;
- Works would be unlikely to alter the hydrological regime (and hence impact on the habitat of prey species) in the area; and
- The proposal would not isolate or fragment any currently connecting areas of habitat.

On the basis of the above considerations, it is unlikely that the proposed works would result in a significant impact on the survival of Eastern Bentwing-bat and Little Bentwing-bat. Consequently, a Species Impact Statement is not required for the proposed works with respect to these species.

East Coast Freetail Bat

East Coast Freetail-bat is listed as a vulnerable species under the TSC Act. It is found along the east coast from south Queensland to southern NSW. The species occurs in dry sclerophyll forest and woodland east of the Great Dividing Range (DEC 2011).

East Coast Freetail-bat roost mainly in tree hollows but will also roost under bark or in man-made structures. The species is solitary and probably insectivorous. Little is known of the species' reproduction (DEC 2011).

Threats to the species include the loss of hollow-bearing trees, loss of foraging habitat and the application of pesticides in or adjacent to foraging areas (DEC 2011).

No individuals of this species were recorded within the subject site; however, there are 4 records for this species within 10 km, and potential habitat for this species was identified within the study area.

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

Factors likely to have an adverse effect on the life cycle of East Coast Freetail-bat would include the loss of hollow-bearing trees, loss of foraging habitat, and the application of pesticides in or adjacent to foraging areas.

The proposed works could directly impact on East Coast Freetail-bat through the removal of 2 trees (one mature *E. acmenoides* and one young *A. bakeri*) and vegetation for sedimentation basins and road widening (vegetation on the rock escarpment between Rene and High Streets), representing foraging habitat for the species.

However, only a small area of East Coast Freetail-bat foraging habitat would be removed under the proposal for the road widening works. The amount to be removed is minimal in comparison to the larger undisturbed areas of foraging habitat present in the study area, most notably in Lane Cove National Park and Buffalo Creek Reserve. While the *E. acmenoides* to be removed is mature and would provide abundant foraging resources for the prey species of East Coast Freetail-bat, other trees in the study area would be retained. No roosting or breeding habitat (hollow-bearing trees) would be impacted.

The proposal would not indirectly impact on potential habitat supporting prey species in the study area through the introduction of contaminated water or sediments from construction works given sedimentation and water quality controls. In addition, the removal of 470 m^3 of rock, the majority of which would be south of the Field of Mars, would be unlikely to significantly alter the hydrological regime of the area which could impact on vegetation supporting prey species or hollow-bearing trees in the study area. The majority of the sandstone rock escarpment would be retained and would continue to seep water despite the removal of sections of rock from its surface. The amount of additional stormwater draining within potential East Coast Freetail-bat foraging habitat during the operational phase would be negligible. Thus, it is unlikely that the proposed works would significantly disrupt the foraging or roosting/breeding habitat of the species that would affect the life cycle of a viable local population of the species.

The proposed works would not result in the increased use of pesticides in the study area.

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

Not applicable.

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

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable.

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

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

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

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

(i) Two trees (one mature *E. acmenoides* and one young *A. bakeri*) and vegetation for sedimentation basins and road widening (vegetation on the rock escarpment between Rene and High Streets), representing foraging habitat for the species would be removed by the proposed works. However, the amount of habitat is small in relation to that remaining in the study area. East Coast Freetail-bat is a highly mobile species which would be able to access foraging resources in the study area. No roosting or breeding habitat (hollow-bearing trees) would be impacted. Indirect impacts to potential foraging and roosting/breeding habitat in the study area would also be prevented, with sedimentation controls adhered to during the construction phase of the works to limit transport of weed propagules and sediment to areas adjacent to the subject site which could impact on habitat. The amount of additional stormwater draining within potential East Coast Freetail-bat habitat during the operational phase would be negligible.

(ii) The trees and vegetation that would be removed are located on the edge of Pittwater Road, with *E. acmenoides* and the tree branches between Rene Street and the Field of Mars providing some connectivity across Pittwater Road. Thus, the proposed works would decrease habitat connectivity slightly. However, the loss of the trees and branches would not result in the fragmentation or isolation of habitat for East Coast Freetail-bat. The species is highly mobile and would be able to access remaining foraging resources in the study area.

(iii) Foraging habitat that would be removed is not likely to be crucial habitat for the species. This is due primarily due to the small loss of potential foraging habitat. While a mature *E. acmenoides* would be removed, nectar resources for East Coast Freetail-bat prey species would be retained in the study area. No roosting/breeding habitat (hollow-bearing trees) would be impacted by the proposal.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared for East Coast Freetail-bat.

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

No Recovery Plan or Threat Abatement Plans are relevant to this species. However, 18 priority actions are in place to help recover East Coast Freetail-bat. The proposed works are not in conflict with any of these priority actions.

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

One key threatening process (KTP) is relevant to this proposal with respect to East Coast Freetail-bat: 'Clearing of Native Vegetation'. Whilst the action would involve this KTP, the scale of the impact is considered unlikely to increase the impact of the KTP due to the small size of the vegetation to be removed.

Conclusions

The proposed development is unlikely to impose a significant effect on East Coast Freetail-bat given that:

- Habitat removal is minimal compared to that remaining in the locality;
- Areas of potential foraging habitat are present elsewhere in the locality;
- No roosting or breeding habitat (hollow-bearing trees) would be impacted;
- Works would be unlikely to alter the hydrological regime (and hence impact on the habitat of prey species or on roosting/breeding habitat) in the area; and
- The proposal would not isolate or fragment any currently connecting areas of habitat.

On the basis of the above considerations, it is unlikely that the proposed works would result in a significant impact on the survival of East Coast Freetail-bat. Consequently, a Species Impact Statement is not required for the proposed works with respect to this species.

Grey-headed Flying Fox

Grey-headed Flying Fox is listed as vulnerable under both the TSC and EPBC Acts. The species is endemic to the east coast of Australia with a distribution from Bundaberg in the north to Melbourne in the south, from the western slopes of the Great Dividing Range to the coast. The distribution of this species has recently suffered a southward contraction and a 30% population decline over the last ten years (DEC 2011).

Grey-headed Flying-fox is a highly mobile species whose migration patterns are determined by the availability of flowering food resources. The species is a canopy-feeding frugivore, blossom-eater and nectarivore, and occurs in rainforest, woodlands, paperbark swamps and Banksia woodlands. This species feeds in particular on the nectar and pollen of native trees, especially *Eucalyptus* spp., *Melaleuca* spp. and *Banksias* spp., and fruits of rainforest trees and vines. During times when native food resources are limited, Grey-Headed Flying-foxes forage on fruit crops and cultivated gardens. Grey-headed Flying-fox congregates in large colonies of up to 200,000 individuals in the summer season. Camp sites are generally located next to rivers or creeks, and occur in a range of vegetation communities including rainforest, wet sclerophyll forest, Melaleuca woodland, Casuarina forest or mangroves. These sites have a dense canopy, providing them with the moist, humid microclimate they require. Campsites are critical for mating, birthing, rearing of young and as diurnal refuge from predators. Urban gardens, cultivated fruit crops and roadside verges may also provide temporary roosting habitat for this species (DEC 2011).

This species is threatened by a number of processes including loss of foraging habitat, disturbance of roosting sites, unregulated shooting, and electrocution on powerlines (DEC 2011).

No individuals of this species were recorded within the subject site; however, the species has been recorded in the study area, with 1330 records for this species within 10 km, and potential habitat for this species was identified within the study area.

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

Factors likely to have an adverse effect on the life cycle of Grey-headed Flying-fox would include a significant loss of foraging habitat, disturbance to roosting sites, unregulated shooting and electrocution on powerlines.

The proposed works could directly impact on Grey-headed Flying-fox through the removal of 2 trees (one mature *E. acmenoides* and one young *A. bakeri*), the removal of some tree branches overhanging Pittwater Road between Rene Street and the Field of Mars, the removal of vegetation on the rock escarpment between Rene and High Streets and for sedimentation basins, and the removal of some mangrove vegetation (branches only) representing foraging habitat for the species.

However, only a small area of Grey-headed Flying-fox foraging habitat would be removed under the proposal for the road widening works. The amount to be removed is minimal in comparison to the larger undisturbed areas of foraging habitat present in the study area, most notably in Lane Cove National Park and Buffalo Creek Reserve. While the *E. acmenoides* to be removed is mature and would provide abundant foraging resources, other nectar trees in the study area would be retained.

The proposal would not indirectly impact on potential foraging habitat in the study area through the introduction of contaminated water or sediments from construction works given sedimentation and water quality controls. In addition, the removal of 470 m^3 of rock, the majority of which would be south of the

Field of Mars, would be unlikely to significantly alter the hydrological regime of the area. The majority of the sandstone rock escarpment would be retained and would continue to seep water despite the removal of sections of rock from its surface. The amount of additional stormwater draining within potential Grey-headed Flying-fox foraging habitat during the operational phase would be negligible. Thus, it is unlikely that the proposed works would significantly disrupt the foraging habitat of the species that would affect the life cycle of a viable local population of the species.

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

Not applicable.

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

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable.

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

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

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

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

(i) Two trees (one mature *E. acmenoides* and one young *A. bakeri*), tree branches overhanging Pittwater Road between Rene Street and the Field of Mars, vegetation on the rock escarpment between Rene and High Streets, vegetation in Council Reserves (for sedimentation basins), and mangrove vegetation along Buffalo Creek, all representing potential foraging habitat for the species, would be removed for the proposed works. However, the amount of foraging habitat is small in relation to that remaining in the study area. Grey-headed Flying-fox is a highly mobile species which would be able to access foraging resources in the study area. Indirect impacts to potential foraging habitat in the study area would also be prevented, with sedimentation controls adhered to during the construction phase of the works to limit transport of weed propagules and sediment to areas adjacent to the subject site. The amount of additional stormwater draining within potential Grey-headed Flying-fox foraging habitat during the operational phase would be negligible. No roosting or breeding habitat (camps) would be impacted.

(ii) The vegetation that would be removed are located on the edge of Pittwater Road, with *E. acmenoides* and the tree branches between Rene Street and the Field of Mars providing some connectivity across Pittwater Road. Thus, the proposed works would decrease habitat connectivity. However, the loss of the trees and branches would not result in the fragmentation or isolation of

foraging habitat for Grey-headed Flying-fox. The species is highly mobile and would be able to access remaining foraging resources in the study area.

(iii) Foraging habitat that would be removed is not likely to be crucial habitat for the species. This is due primarily due to the small loss of potential foraging habitat. While a mature *E. acmenoides* would be removed, nectar resources for Grey-headed Flying-fox would be retained in the study area. No roosting or breeding habitat (camps) would be impacted.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared for Grey-headed Flying-fox.

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

No recovery plan or threat abatement plan has yet been developed for this species. However, 31 priority actions are in place to help recover Grey-headed Flying-fox.

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

One key threatening process (KTP) is relevant to this proposal with respect to Grey-headed Flying-fox: 'Clearing of Native Vegetation'. Whilst the action would involve this KTP, the scale of the impact is considered unlikely to increase the impact of the KTP due to the small size of the vegetation to be removed.

Conclusion

The proposed development is unlikely to impose a significant effect on Grey-headed Flying-fox given that:

- Habitat removal is minimal compared to that remaining in the locality;
- Areas of potential foraging habitat are present elsewhere in the locality;
- No roosting or breeding habitat (camps) would be impacted;
- Works would be unlikely to alter the hydrological regime (and hence impact on foraging resources) in the area; and
- The proposal would not isolate or fragment any currently connecting areas of foraging habitat.

On the basis of the above considerations, it is unlikely that the proposed works would result in a significant impact on the survival of Grey-headed Flying-fox. Consequently, a Species Impact Statement is not required for the proposed works with respect to this species.

Yellow-bellied Sheathtail-bat

Yellow-bellied Sheathtail-bat is listed as a vulnerable species under the TSC Act. Yellow-bellied Sheathtail-bat is a wide-ranging species found across northern and eastern Australia. In the most southerly part of its range - most of Victoria, south-western NSW and adjacent South Australia - it is a rare visitor in late summer and autumn. There are scattered records of this species across the New England Tablelands and North West Slopes (DEC 2011).

Yellow-bellied Sheathtail-bat roosts singly or in groups of up to six, in tree hollows and buildings, and in treeless areas they are known to use mammal burrows. When foraging for insects, the species flies high and fast over the forest canopy, but lower in more open country. It forages in most habitats across its very wide range, with and without trees, and appears to defend an aerial territory. Breeding has been recorded from December to mid-March, when a single young is born. The species' seasonal movements are unknown; there is speculation about a migration to southern Australia in late summer and autumn (DEC 2011).

Threats to Yellow-bellied Sheathtail-bat include disturbance to roosting and summer breeding sites, clearing of foraging habitat, and loss of hollow-bearing trees (DEC 2011).

No individuals of this species were recorded within the subject site; however, there are 3 records for this species within 10 km, and potential habitat for this species was identified within the study area.

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

Factors likely to have an adverse effect on the life cycle of Yellow-bellied Sheathtail-bat would include disturbance to roosting and summer breeding sites, clearing of foraging habitat, and loss of hollow-bearing trees.

The proposed works could directly impact on Yellow-bellied Sheathtail-bat through the removal of 2 trees (one mature *E. acmenoides* and one young *A. bakeri*) and vegetation for sedimentation basins and road widening (vegetation on the rock escarpment between Rene and High Streets), representing foraging habitat for the species.

However, only a small area of Yellow-bellied Sheathtail-bat foraging habitat would be removed under the proposal for the road widening works. The amount to be removed is minimal in comparison to the larger undisturbed areas of foraging habitat present in the study area, most notably in Lane Cove National Park and Buffalo Creek Reserve. While the *E. acmenoides* to be removed is mature and would provide abundant foraging resources for the prey species of Yellow-bellied Sheathtail-bat, other trees in the study area would be retained. No roosting or breeding habitat (hollow-bearing trees) would be impacted.

The proposal would not indirectly impact on potential habitat supporting prey species in the study area through the introduction of contaminated water or sediments from construction works given sedimentation and water quality controls. In addition, the removal of 470 m^3 of rock, the majority of which would be south of the Field of Mars, would be unlikely to significantly alter the hydrological regime of the area which could impact on vegetation supporting prey species or hollow-bearing trees in the study area. The majority of the sandstone rock escarpment would be retained and would continue to seep water despite the removal of sections of rock from its surface. The amount of additional stormwater draining within potential Yellow-bellied Sheathtail-bat foraging habitat during the operational phase would be negligible. Thus, it is unlikely that the proposed works would significantly disrupt the

foraging or roosting/breeding habitat of the species that would affect the life cycle of a viable local population of the species.

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

Not applicable.

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

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

Not applicable.

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

> **(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and**
>
> **(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**
>
> **(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,**

(i) Two trees (one mature *E. acmenoides* and one young *A. bakeri*) and vegetation for sedimentation basins and road widening (vegetation on the rock escarpment between Rene and High Streets), representing foraging habitat for the species would be removed by the proposed works. However, the amount of habitat is small in relation to that remaining in the study area. Yellow-bellied Sheathtail-bat is a highly mobile species which would be able to access foraging resources in the study area. No roosting or breeding habitat (hollow-bearing trees) would be impacted. Indirect impacts to potential foraging and roosting/breeding habitat in the study area would also be prevented, with sedimentation controls adhered to during the construction phase of the works to limit transport of weed propagules and sediment to areas adjacent to the subject site which could impact on habitat. The amount of additional stormwater draining within potential Yellow-bellied Sheathtail-bat habitat during the operational phase would be negligible.

(ii) The trees and vegetation that would be removed are located on the edge of Pittwater Road, with *E. acmenoides* and the tree branches between Rene Street and the Field of Mars providing some connectivity across Pittwater Road. Thus, the proposed works would decrease habitat connectivity slightly. However, the loss of the trees and branches would not result in the fragmentation or isolation of habitat for Yellow-bellied Sheathtail-bat. The species is highly mobile and would be able to access remaining foraging resources in the study area.

(iii) Foraging habitat that would be removed is not likely to be crucial habitat for the species. This is due primarily due to the small loss of potential foraging habitat. While a mature *E. acmenoides* would be

removed, nectar resources for Yellow-bellied Sheathtail-bat prey species would be retained in the study area. No roosting/breeding habitat (hollow-bearing trees) would be impacted by the proposal.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat.

No critical habitat has been declared for Yellow-bellied Sheathtail-bat.

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

No Recovery Plan or Threat Abatement Plans are relevant to this species. However, 20 priority actions are in place to help recover Yellow-bellied Sheathtail-bat. The proposed works are not in conflict with any of these priority actions.

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

One key threatening process (KTP) is relevant to this proposal with respect to Yellow-bellied Sheathtail-bat: 'Clearing of Native Vegetation'. Whilst the action would involve this KTP, the scale of the impact is considered unlikely to increase the impact of the KTP due to the small size of the vegetation to be removed.

Conclusions

The proposed development is unlikely to impose a significant effect on Yellow-bellied Sheathtail-bat given that:

- Habitat removal is minimal compared to that remaining in the locality;
- Areas of potential foraging habitat are present elsewhere in the locality;
- No roosting or breeding habitat (hollow-bearing trees) would be impacted;
- Works would be unlikely to alter the hydrological regime (and hence impact on the habitat of prey species or on roosting/breeding habitat) in the area; and
- The proposal would not isolate or fragment any currently connecting areas of habitat.

On the basis of the above considerations, it is unlikely that the proposed works would result in a significant impact on the survival of Yellow-bellied Sheathtail-bat. Consequently, a Species Impact Statement is not required for the proposed works with respect to this species.

Appendix E: Significance Assessments

The EPBC Act Administrative Guidelines on Significance set out 'Significant Impact Criteria' that are to be used to assist in determining whether a proposed action is likely to have a significant impact on NES.

Specific 'Significant Impact Criteria' are provided for each matter of national environmental significance except for threatened species and ecological communities in which case separate criteria are provided for species listed as endangered and vulnerable under the EPBC Act.

Significance Assessments considering the impacts of the proposed road upgrade works in the subject site are provided below.

Threatened Species

Endangered

- *Acacia terminalis* subsp. *terminalis* (Sunshine Wattle);
- *Persoonia hirsuta* (Hairy Geebung); and
- Regent Honeyeater (*Anthochaera phrygia* also known as *Xanthomyza phrygia*).

Vulnerable

- *Acacia bynoeana* (Bynoe's Wattle);
- *Darwinia biflora*;
- *Melaleuca deanei* (Deane's Paperbark);
- Large-eared Pied Bat (*Chalinolobus dwyeri*); and
- Grey-headed Flying-fox (*Pteropus poliocephalus*).

Migratory Species

- White-bellied Sea-Eagle (*Haliaeetus leucogaster*);
- White-throated Needletail (*Hirundapus caudacutus*);
- Great Egret (*Ardea alba*);
- Sharp-tailed Sandpiper (*Calidris acuminata*);
- Curlew Sandpiper (*Calidris ferruginea*);
- Whimbrel (*Numenius phaeopus*); and
- Regent Honeyeater (*Anthochaera phrygia* also known as *Xanthomyza phrygia*).

Endangered Species

Acacia terminalis subsp. *terminalis*

Acacia terminalis subsp. *terminalis* is listed as an endangered species under both the TSC Act and EPBC Act. A description of the species and distribution in NSW is provided in the *A. terminalis* subsp. *terminalis* Assessment of Significance in Appendix D of this report.

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will meet any of the following criteria:

Criterion 1: lead to a long-term decrease in size of a population;

The proposed works would result in the removal of a minimal amount of potential habitat for *A. terminalis* subsp. *terminalis,* particularly on the rock escarpment between Rene Street and the Field of Mars. However, potential habitat would remain in the study area, and measures would be taken to prevent indirect impacts on the species in downstream areas of potential habitat. As the proposal would not remove significant amount of potential habitat for the species, the proposed works are unlikely to lead to a long-term decrease in the size of an *A. terminalis* subsp. *terminalis* population.

Criterion 2: reduce the area of occupancy of the species;

The proposal would not remove habitat in an area representing the limit of the species' range. Thus, the proposed action will not further reduce the area of potential occurrence for *A. terminalis* subsp. *terminalis*. The area of occupancy is unlikely to be affected for any populations given that extensive habitat exists in the surrounding landscape.

Criterion 3: fragment an existing population into two or more populations;

The proposal would not fragment any populations into two or more populations given the area is already disturbed, and the proposal would only remove only a minimal amount of potential habitat on the edge of Pittwater Road.

Criterion 4: adversely affect habitat critical to the survival of a species;

The proposed development would result in the removal of a minimal amount of vegetation representing potential habitat. Habitat that would be removed is not likely to be habitat critical to the survival of the species. This is due primarily due to the small loss of potential habitat. No individuals of *A. terminalis* subsp. *terminalis* have been recorded in the subject site.

Criterion 5: disrupt the breeding cycle of a population;

The works would be unlikely to impact on or disrupt the breeding cycle of *A. terminalis* subsp. *terminalis*. There are no records of the species in the subject site or study area, with records present only in the wisder locality.

Criterion 6: modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;

As only a small amount of potential habitat would be removed or disturbed, and larger areas of potential habitat exists in the study area, the proposed work would be unlikely to modify, destroy, remove, or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Criterion 7: result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat;

It is unlikely that the proposed works would result in the introduction of invasive species that are considered likely to impact on *A. terminalis* subsp. *terminalis* in the locality. Weeds are present in the study area but would not be increased as a result of the proposal.

Criterion 8: introduce disease that may cause species to decline; or

Disease is not listed as a threat to this species. The proposed work would be unlikely to introduce a disease that may cause this species to decline.

Criterion 9: interfere with the recovery of the species

As the proposal is unlikely to significantly reduce the amount of habitat for *A. terminalis* subsp. *terminalis*, and no individuals were or have been recorded in the subject site or study area, it is unlikely that the proposal will interfere with the recovery of the species.

Conclusion

Based on the above assessment it is concluded that the proposed works are unlikely to have a significant impact on *A. terminalis* subsp. *terminalis*. No referral to the SEWPAC for assessment and approval by the Environment Minister is considered necessary.

Persoonia hirsuta

Persoonia hirsuta is listed as an endangered species under both the TSC Act and EPBC Act. A description of the species and distribution in NSW is provided in the *P. hirsuta* Assessment of Significance in Appendix D of this report.

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will meet any of the following criteria:

Criterion 1: lead to a long-term decrease in size of a population;

The proposed works would result in the removal of a minimal amount of potential habitat for *P. hirsuta,* particularly on the rock escarpment between Rene Street and the Field of Mars. However, potential habitat would remain in the study area, and measures would be taken to prevent indirect impacts on the species in downstream areas of potential habitat. As the proposal would not remove significant amount of potential habitat for the species, the proposed works are unlikely to lead to a long-term decrease in the size of a *P. hirsuta* population.

Criterion 2: reduce the area of occupancy of the species;

The proposal would not remove habitat in an area representing the limit of the species' range. Thus, the proposed action will not further reduce the area of potential occurrence for *P. hirsuta*. The area of occupancy is unlikely to be affected for any populations given that extensive habitat exists in the surrounding landscape.

Criterion 3: fragment an existing population into two or more populations;

The proposal would not fragment any populations into two or more populations given the area is already disturbed, and the proposal would only remove only a minimal amount of potential habitat on the edge of Pittwater Road.

Criterion 4: adversely affect habitat critical to the survival of a species;

The proposed development would result in the removal of a minimal amount of vegetation representing potential habitat. Habitat that would be removed is not likely to be habitat critical to the survival of the species. This is due primarily due to the small loss of potential habitat. No individuals of *P. hirsuta* have been recorded in the subject site.

Criterion 5: disrupt the breeding cycle of a population;

The works would be unlikely to impact on or disrupt the breeding cycle of *P. hirsuta*. There are no records of the species in the subject site or study area, with records present only in the wisder locality.

Criterion 6: modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;

As only a small amount of potential habitat would be removed or disturbed, and larger areas of potential habitat exists in the study area, the proposed work would be unlikely to modify, destroy, remove, or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Criterion 7: result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat;

It is unlikely that the proposed works would result in the introduction of invasive species that are considered likely to impact on *P. hirsuta* in the locality. Weeds are present in the study area but would not be increased as a result of the proposal.

Criterion 8: introduce disease that may cause species to decline; or

Disease is not listed as a threat to this species. The proposed work would be unlikely to introduce a disease that may cause this species to decline.

Criterion 9: interfere with the recovery of the species

As the proposal is unlikely to significantly reduce the amount of habitat for *P. hirsuta*, and no individuals were or have been recorded in the subject site or study area, it is unlikely that the proposal will interfere with the recovery of the species.

Conclusion

Based on the above assessment it is concluded that the proposed works are unlikely to have a significant impact on *P. hirsuta*. No referral to the SEWPAC for assessment and approval by the Environment Minister is considered necessary.

Regent Honeyeater

Regent Honeyeater is listed as an endangered species under both the TSC Act and EPBC Act, and a migratory species under the EPBC Act. A description of the species and distribution in NSW is provided in the Regent Honeyeater Assessment of Significance in Appendix D of this report.

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will meet any of the following criteria:

Criterion 1: lead to a long-term decrease in size of a population;

The proposed works would result in the removal of a minimal amount of foraging habitat for Regent Honeyeater, including one mature *Eucalyptus acmenoides*. However, foraging resources would remain in the study area which the species could access, and the species would not be reliant on this foraging resource. As the proposal would not remove significant resources for the species, the proposed works are unlikely to lead to a long-term decrease in the size of a Regent Honeyeater population.

Criterion 2: reduce the area of occupancy of the species;

The proposal would not remove habitat in an area representing the limit of the species' range. Thus, the proposed action will not further reduce the area of potential occurrence for Regent Honeyeater. The area of occupancy is unlikely to be affected for any populations given that extensive foraging habitat exists in the surrounding landscape.

Criterion 3: fragment an existing population into two or more populations;

The proposal would not fragment any populations into two or more populations given the area is already disturbed, and the proposal would only remove only a minimal amount of foraging habitat. The highly mobile nature of this species means that the proposed work would not be a barrier to movement.

Criterion 4: adversely affect habitat critical to the survival of a species;

The proposed development would result in the removal of a minimal amount of vegetation representing potential foraging habitat. Habitat that would be removed is not likely to be habitat critical to the survival of the species. This is due primarily due to the small loss of potential foraging habitat, and the representation of other foraging habitat in the study area that would be retained. No breeding habitat would be impacted. Thus, the proposal will not adversely affect habitat critical to the survival of the species.

Criterion 5: disrupt the breeding cycle of a population;

The works would be unlikely to impact on or disrupt the breeding cycle of Regent Honeyeater. The study area is not located near the three known key breeding areas for the species, and the species is unlikely to use the locality during breeding periods. The study area may be used as a foraging resource during the species' non-breeding period as the species moves to coastal areas during this period. However, the foraging resources that will be removed are minimal, and remaining foraging habitat in the study area will be retained.

Criterion 6: modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;

As no breeding habitat would be removed or disturbed, and foraging habitat exists in the study area, the proposed work would be unlikely to modify, destroy, remove, or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Criterion 7: result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat;

It is unlikely that the proposed works would result in the introduction of invasive species that are considered likely to impact on Regent Honeyeater in the locality. The species suffers from competition from larger aggressive honeyeaters, particularly Noisy Miners, Noisy Friarbirds and Red Wattlebirds. However, the proposal would not lead to an increase in the incidence of these species in the study area.

Criterion 8: introduce disease that may cause species to decline; or

Disease is not listed as a threat to this species. The proposed work would be unlikely to introduce a disease that may cause this species to decline.

Criterion 9: interfere with the recovery of the species

As the proposal is unlikely to significantly reduce the amount of foraging habitat for the Regent Honeyeater, and no breeding habitat will be impacted, it is unlikely that the proposal will interfere with the recovery of the species.

Conclusion

Based on the above assessment it is concluded that the proposed works are unlikely to have a significant impact on Regent Honeyeater. No referral to the SEWPAC for assessment and approval by the Environment Minister is considered necessary.

Vulnerable Species

Acacia bynoeana

Acacia bynoeana is listed as an endangered species under the TSC Act and a vulnerable species under the EPBC Act. A description of the species and distribution in NSW is provided in the *A. bynoeana* Assessment of Significance in Appendix D of this report.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it would meet any of the following criteria:

Criterion 1: lead to a long-term decrease in size of an important population of a species;

It is unlikely that an important population of the species occurs in the study area. The species is not near the limit of its range and the population is unlikely to represent a key source population for breeding or dispersal. There are only 10 records of the species in the locality. Thus, the proposal is unlikely to lead to a long-term decrease in the size of an important population.

Criterion 2: reduce the area of occupancy of an important population;

This is unlikely to be an important population. The proposed action will not further reduce the area of potential occurrence for *A. bynoeana*. The area of occupancy is unlikely to be affected for any populations given that extensive habitat exists in the surrounding landscape.

Criterion 3: fragment an existing important population into two or more populations;

This is unlikely to be an important population. The proposal would not fragment any populations into two or more populations given the area is already disturbed, and the proposal would only remove only a minimal amount of potential habitat.

Criterion 4: adversely affect habitat critical to the survival of a species;

The proposed development would result in the removal of a minimal amount of vegetation representing potential habitat. Habitat that would be removed is not likely to be habitat critical to the survival of the species. This is due primarily due to the small loss of potential habitat. No individuals of *A. bynoeana* have been recorded in the subject site.

Criterion 5: disrupt the breeding cycle of an important population;

The works would be unlikely to impact on or disrupt the breeding cycle of *A. bynoeana*. There are no records of the species in the subject site or study area, with records present only in the wisder locality.

Criterion 6: modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;

As only a small amount of potential habitat would be removed or disturbed, and larger areas of potential habitat exists in the study area, the proposed work would be unlikely to modify, destroy, remove, or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Criterion 7: result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;

It is unlikely that the proposed works would result in the introduction of invasive species that are considered likely to impact on *A. bynoeana* in the locality. Weeds are present in the study area but would not be increased as a result of the proposal.

Criterion 8: introduce disease that may cause the species to decline; or

Disease is not listed as a threat to this species. The proposed work would be unlikely to introduce a disease that may cause this species to decline.

Criterion 9: interfere substantially with the recovery of the species

No detailed recovery plan has been prepared for this species. As the proposal is unlikely to significantly reduce the amount of habitat for *A. bynoeana*, and no individuals were or have been recorded in the subject site or study area, it is unlikely that the proposal will interfere with the recovery of the species

Conclusion

Based on the above assessment it is concluded that the proposed development is unlikely to have a significant impact on a population of *A. bynoeana*. As such, no referral to the SEWPAC for assessment and approval by the Environment Minister is necessary.

Darwinia biflora

Darwinia biflora is listed as a vulnerable species under both the TSC and EPBC Acts. A description of the species and distribution in NSW is provided in the *D. biflora* Assessment of Significance in Appendix D of this report.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it would meet any of the following criteria:

Criterion 1: lead to a long-term decrease in size of an important population of a species;

There are 6 known populations of *D. biflora* in the Ryde LGA. These populations are likely to be important populations of *D. biflora* given that North Ryde represents the southern limit of the species. However, the proposal would be unlikely to lead to a decrease in the size of any of these important populations as no *D. biflora* were recorded in the subject site and only a small amount of potential habitat would be removed. Impacts to potential habitat in the study area would also be prevented, with sedimentation controls adhered to during the construction phase of the works to limit transport of weed propagules and sediment to areas adjacent to the subject site.

Criterion 2: reduce the area of occupancy of an important population;

While there are 6 known populations of *D. biflora* in the Ryde LGA (likely to be important populations), with the closest population located along Epping Road, the proposal is unlikely to reduce the area of occupancy for any of the known populations. No *D. biflora* were recorded in the subject site and only a small amount of potential habitat would be removed. Impacts to potential habitat in the study area would also be prevented, with sedimentation controls adhered to during the construction phase of the works to limit transport of weed propagules and sediment to areas adjacent to the subject site.

Criterion 3: fragment an existing important population into two or more populations;

While there are 6 known populations of *D. biflora* in the Ryde LGA (likely to be important populations), with the closest population located along Epping Road, the proposal is unlikely to fragment any of these populations into two or more populations. The area is already disturbed, and the proposal would only remove only a minimal amount of potential habitat, increasing the road width marginally.

Criterion 4: adversely affect habitat critical to the survival of a species;

The proposed development would result in the removal of a minimal amount of vegetation representing potential habitat. Habitat that would be removed is not likely to be habitat critical to the survival of the species. No individuals belonging to any of the 6 known populations of the species in the Ryde LGA were recorded in the subject site and study area.

Criterion 5: disrupt the breeding cycle of an important population;

The works would be unlikely to impact on or disrupt the breeding cycle of an important population of *D. biflora*. The closest population occurs along Epping Road, and this would not be impacted.

Criterion 6: modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;

As only a small amount of potential habitat would be removed or disturbed, and larger areas of potential habitat exists in the study area, the proposed work would be unlikely to modify, destroy, remove, or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Criterion 7: result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;

It is unlikely that the proposed works would result in the introduction of invasive species that are considered likely to impact on *D. biflora* in the locality. Weeds are present in the study area but would not be increased as a result of the proposal.

Criterion 8: introduce disease that may cause the species to decline; or

Disease is not listed as a threat to this species. The proposed work would be unlikely to introduce a disease that may cause this species to decline.

Criterion 9: interfere substantially with the recovery of the species

A NSW and National recovery plan has been prepared for this species. However, the proposal does not conflict with this recovery plan. As the proposal is unlikely to significantly reduce the amount of habitat for *D. biflora*, and no individuals were or have been recorded in the subject site or study area, it is unlikely that the proposal will interfere with the recovery of the species.

Conclusion

Based on the above assessment it is concluded that the proposed development is unlikely to have a significant impact on a population of *D. biflora*. As such, no referral to the SEWPAC for assessment and approval by the Environment Minister is necessary.

Melaleuca deanei

Melaleuca deanei is listed as an endangered species under the TSC Act and a vulnerable species under the EPBC Act. A description of the species and distribution in NSW is provided in the *M. deanei* Assessment of Significance in Appendix D of this report.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it would meet any of the following criteria:

Criterion 1: lead to a long-term decrease in size of an important population of a species;

It is unlikely that an important population of the species occurs in the study area. The species is not near the limit of its range and the population is unlikely to represent a key source population for breeding or dispersal. There are only 21 records of the species in the locality. Thus, the proposal is unlikely to lead to a long-term decrease in the size of an important population.

Criterion 2: reduce the area of occupancy of an important population;

This is unlikely to be an important population. The proposed action will not further reduce the area of potential occurrence for *M. deanei*. The area of occupancy is unlikely to be affected for any populations given that extensive habitat exists in the surrounding landscape.

Criterion 3: fragment an existing important population into two or more populations;

This is unlikely to be an important population. The proposal would not fragment any populations into two or more populations given the area is already disturbed, and the proposal would only remove only a minimal amount of potential habitat.

Criterion 4: adversely affect habitat critical to the survival of a species;

The proposed development would result in the removal of a minimal amount of vegetation representing potential habitat. Habitat that would be removed is not likely to be habitat critical to the survival of the species. This is due primarily due to the small loss of potential habitat. No individuals of *M. deanei* have been recorded in the subject site.

Criterion 5: disrupt the breeding cycle of an important population;

The works would be unlikely to impact on or disrupt the breeding cycle of *M. deanei*. There are no records of the species in the subject site or study area, with records present only in the wisder locality.

Criterion 6: modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;

As only a small amount of potential habitat would be removed or disturbed, and larger areas of potential habitat exists in the study area, the proposed work would be unlikely to modify, destroy, remove, or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Criterion 7: result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;

It is unlikely that the proposed works would result in the introduction of invasive species that are considered likely to impact on *M. deanei* in the locality. Weeds are present in the study area but would not be increased as a result of the proposal.

Criterion 8: introduce disease that may cause the species to decline; or

Disease is not listed as a threat to this species. The proposed work would be unlikely to introduce a disease that may cause this species to decline.

Criterion 9: interfere substantially with the recovery of the species

A NSW and National recovery plan has been prepared for this species. However, the proposal does not conflict with this recovery plan. As the proposal is unlikely to significantly reduce the amount of habitat for *M. deanei*, and no individuals were or have been recorded in the subject site or study area, it is unlikely that the proposal will interfere with the recovery of the species

Conclusion

Based on the above assessment it is concluded that the proposed development is unlikely to have a significant impact on a population of *M. deanei*. As such, no referral to the SEWPAC for assessment and approval by the Environment Minister is necessary.

Large-eared Pied Bat

Large-eared Pied Bat is listed as a vulnerable species under the TSC Act and EPBC Act. A description of the species and distribution in NSW is provided in the Large-eared Pied Bat Assessment of Significance in Appendix D.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it would meet any of the following criteria:

Criterion 1: lead to a long-term decrease in size of an important population of a species;

It is unlikely that an important population of the species occurs in the study area. The species is not near the limit of its range and the population is unlikely to represent a key source population for breeding or dispersal. There is only 1 record of the species in the locality. Thus, the proposal is unlikely to lead to a long-term decrease in the size of an important population.

Criterion 2: reduce the area of occupancy of an important population;

This is unlikely to be an important population. The proposed action will not further reduce the area of potential occurrence for the Large-eared Pied Bat. The area of occupancy is unlikely to be affected for any populations given that extensive foraging habitat exists in the surrounding landscape.

Criterion 3: fragment an existing important population into two or more populations;

This is unlikely to be an important population. The proposal would not fragment any populations into two or more populations given the area is already disturbed, and the proposal would only remove only a minimal amount of foraging habitat. The highly mobile nature of this species means that the proposed work would not be a barrier to movement.

Criterion 4: adversely affect habitat critical to the survival of a species;

As the proposed work would not involve the removal of any roosting or breeding habitat (caves), would be unlikely to create a barrier to movement, and would result only in the removal of a small amount of foraging habitat relative to the availability of foraging habitat in surrounding lands, it is unlikely that habitat critical to the survival of this species would be adversely affected.

Criterion 5: disrupt the breeding cycle of an important population;

This is unlikely to be an important population. As no roosting habitat would be removed or disturbed, it is unlikely the proposed work would disrupt the breeding cycle of a local population.

Criterion 6: modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;

As no roosting habitat would be removed or disturbed, and foraging habitat exists in the study area, the proposed work would be unlikely to modify, destroy, remove, or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Criterion 7: result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;

The proposal would not result in invasive species, such as weeds, that could impact prey resources which would in turn be harmful to Large-eared Pied Bat. Vegetation in the study area is already degraded with weeds, but this would not be increased as a result of the proposed works.

Criterion 8: introduce disease that may cause the species to decline; or

Disease is not listed as a threat to this species. The proposed work would be unlikely to introduce a disease that may cause this species to decline.

Criterion 9: interfere substantially with the recovery of the species

No detailed recovery plan has been prepared for this species. As no roosting habitat would be removed and foraging habitat exists in the surrounding landscape, the proposed works would be unlikely to interfere with the recovery of this species.

Conclusion

Based on the above assessment it is concluded that the proposed development is unlikely to have a significant impact on a population of Large-eared Pied Bat. As such, no referral to the SEWPAC for assessment and approval by the Environment Minister is necessary.

Grey-headed Flying-fox

Grey-headed Flying Fox is listed as a vulnerable species under the TSC Act and EPBC Act. A description of the species and distribution in NSW is provided in the Grey-headed Flying Fox Assessment of Significance in Appendix D.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it would meet any of the following criteria:

Criterion 1: lead to a long-term decrease in size of an important population of a species;

The study area does not contain any current or historic campsites for this species and it is likely that the study area would only be used on occasion as foraging habitat. Grey-headed Flying Fox in the study area are not part of an important population as they are not near the limit of the species' range or represent key source populations for breeding or dispersal. Thus, the proposal is unlikely to lead to a long-term decrease in the size of an important population.

Criterion 2: reduce the area of occupancy of an important population;

This is not an important population. The proposed action will not further reduce the area of potential occurrence for the Grey-headed Flying Fox. The area of occupancy is unlikely to be affected for any populations given that no campsites have been recorded within the study area and that extensive foraging habitat exists in the surrounding landscape.

Criterion 3: fragment an existing important population into two or more populations;

This is not an important population. The proposal would not fragment any populations into two or more populations given the area is already disturbed, and the proposal would only remove a small amount of foraging habitat. The highly mobile nature of this species means that the proposed work would not be a barrier to movement.

Criterion 4: adversely affect habitat critical to the survival of a species;

As the proposed work would not involve the removal of any campsites, would be unlikely to create a barrier to movement, and would result only in the removal of a small amount of foraging habitat relative to the availability of foraging habitat in surrounding lands, it is unlikely that habitat critical to the survival of this species would be adversely affected.

Criterion 5: disrupt the breeding cycle of an important population;

This is not an important population. As no roosting habitat would be removed or disturbed, and foraging habitat will be retained in the study area, it is unlikely the proposed work would disrupt the breeding cycle of the local population.

Criterion 6: modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;

As no campsites would be removed or disturbed, and foraging habitat exists in the study area, the proposed work would be unlikely to modify, destroy, remove, or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Criterion 7: result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;

The proposal would not result in invasive species, such as weeds, that would be harmful to Grey-headed Flying Fox. Vegetation in the study area is already degraded with weeds, but this would not be increased as a result of the proposed works.

Criterion 8: introduce disease that may cause the species to decline; or

Disease is not listed as a threat to this species. The proposed work would be unlikely to introduce a disease that may cause this species to decline.

Criterion 9: interfere substantially with the recovery of the species

No detailed recovery plan has been prepared for this species. As no roosting habitat would be removed and foraging habitat exists in the surrounding landscape, the proposed works would be unlikely to interfere with the recovery of this species.

Conclusion

Based on the above assessment it is concluded that the proposed development is unlikely to have a significant impact on a population of Grey-headed Flying Fox. As such, no referral to the SEWPAC for assessment and approval by the Environment Minister is necessary.

Migratory Species

White-bellied Sea-Eagle

White-bellied Sea-Eagle is distributed along the coastline (including offshore islands) of mainland Australia and Tasmania. It also extends inland along some of the larger waterways, especially in eastern Australia. The inland limits of the species are most restricted in south-central and south-western Australia, where it is confined to a narrow band along the coast. Breeding has been recorded from only a relatively small area of the total distribution. Breeding records are patchily distributed, mainly along the coastline, and especially the eastern coast, extending from Queensland to Victoria, and to Tasmania. The White-bellied Sea-Eagle is found in coastal habitats (especially those close to the sea-shore) and around terrestrial wetlands in tropical and temperate regions of mainland Australia and its offshore islands. The habitats occupied by the sea-eagle are characterised by the presence of large areas of open water (larger rivers, swamps, lakes, the sea) (SEWPAC 2011).

An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will meet any of the following criteria:

Criterion 1: substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species;

The study area does not represent important habitat for White-bellied Sea-Eagle as it does not occur on the limit of the species' range, and does not support an ecologically significant proportion of the population of the species, is not of critical importance to the species at particular life cycle stages and is not within an area where the species is declining.

The proposed development would result in the removal of foraging habitat for the species. However, removal of vegetation would not represent a substantial loss and/or fragmentation of foraging habitat for the species, with the species unlikely to be reliant on the resources present in the impact area and able to use other areas due to its highly mobile nature. Therefore, the proposed loss of potential habitat is not likely to substantially modify, destroy, or isolate an area of important habitat for the species.

Criterion 2: result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species;

The proposal would not result in the establishment of an invasive species that is harmful to White-bellied Sea-Eagle.

Criterion 3: seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

The proposal is unlikely to seriously disrupt the lifecycle of an ecologically significant proportion of the population of White-bellied Sea-Eagle. The removal and fragmentation of vegetation in the study area would be unlikely to affect the species, which forages aerially over a range of habitats including cleared areas.

Conclusion

Based on the above assessment it is concluded that the proposed development is unlikely to have a significant impact on White-bellied Sea-Eagle. As such, no referral to the SEWPAC for assessment and approval by the Environment Minister is necessary.

White-throated Needletail

In Australia, the White-throated Needletail is almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Because they are aerial, it has been stated that conventional habitat descriptions are inapplicable, but there are, nevertheless, certain preferences exhibited by the species. Although they occur over most types of habitat, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland. They also commonly occur over heathland, but less often over treeless areas, such as grassland or swamps. When flying above farmland, they are more often recorded above partly cleared pasture, plantations or remnant vegetation at the edge of paddocks. In coastal areas, they are sometimes seen flying over sandy beaches or mudflats, and often around coastal cliffs and other areas with prominent updraughts, such as ridges and sand-dunes (SEWPAC 2011).

An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will meet any of the following criteria:

Criterion 1: substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species;

The study area does not represent important habitat for White-throated Needletail as it does not occur on the limit of the species' range, and does not support an ecologically significant proportion of the population of the species, is not of critical importance to the species at particular life cycle stages and is not within an area where the species is declining.

The proposed development would result in the removal of foraging habitat for the species. However, removal of vegetation would not represent a substantial loss and/or fragmentation of foraging habitat for the species, with the species unlikely to be reliant on the resources present in the impact area and able to use other areas due to its highly mobile nature. Therefore, the proposed loss of potential habitat is not likely to substantially modify, destroy, or isolate an area of important habitat for the species.

Criterion 2: result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species;

The proposal would not result in the establishment of an invasive species that is harmful to White-throated Needletails.

Criterion 3: seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

The proposal is unlikely to seriously disrupt the lifecycle of an ecologically significant proportion of the population of White-throated Needletail. White-throated Needletails do not breed in Australia. The removal and fragmentation of vegetation in the project site would be unlikely to affect the species, which forages aerially over a range of habitats including cleared areas.

Conclusion

Based on the above assessment it is concluded that the proposed development is unlikely to have a significant impact on White-throated Needletail. As such, no referral to the SEWPAC for assessment and approval by the Environment Minister is necessary.

Great Egret

The Great Egret has been reported in a wide range of wetland habitats, for example inland and coastal, freshwater and saline, permanent and ephemeral, open and vegetated, large and small, natural and artificial habitats. The species may retreat to permanent wetlands or coastal areas when other wetlands are dry (SEWPAC 2011).

An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will meet any of the following criteria:

Criterion 1: substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species;

The study area does not represent important habitat for Great Egret as it does not occur on the limit of the species' range, and does not support an ecologically significant proportion of the population of the species, is not of critical importance to the species at particular life cycle stages and is not within an area where the species is declining.

The study area could provide occasional foraging habitat for the species. The proposal could remove some of this potential, occasional foraging habitat. However, impacts would be minimal and the impacts in terms of disturbance to potential habitat for Great Egret within the study area are likely to be negligible given they forage widely, with the species capable of making large regional movements. The species is likely be present infrequently while migrating or foraging. Further, only a minimal amount of clearing will be required, which represents a small amount comparative to the amount of habitat present within the study area. Therefore, the proposed loss of potential habitat is not likely to substantially modify, destroy, or isolate an area of important habitat for the species.

Criterion 2: result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species;

The study area does not represent important habitat for Great Egret as it does not occur on the limit of the species' range, and does not support an ecologically significant proportion of the population of the species, is not of critical importance to the species at particular life cycle stages and is not within an area where the species is declining.

The proposal would not result in the establishment of an invasive species that is harmful to Great Egret.

Criterion 3: seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

The proposal is unlikely to seriously disrupt the lifecycle of an ecologically significant proportion of the population of Great Egret. The proposal will remove foraging habitat for the species, with larger areas of potential habitat remaining in the study area. Given the minimal habitat that would be impacted in the study area, the proposed works are unlikely to seriously disrupt the lifecycle of a Great Egret population.

Conclusion

Based on the above assessment it is concluded that the proposed development is unlikely to have a significant impact on Great Egret. As such, no referral to the SEWPAC for assessment and approval by the Environment Minister is necessary.

Sharp-tailed Sandpiper, Curlew Sandpiper and Whimbrel

Given that these species have similar foraging requirements, the species are considered together.

The Sharp-tailed Sandpiper prefers the grassy edges of shallow inland freshwater wetlands. It is also found around swage farms, flooded fields, mudflats, mangroves, rocky shores and beaches.

Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often. They occur in both fresh and brackish waters.

Whimbrels are found mainly on the coast, on tidal and estaurine mudflats, especially near mangroves.

An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will meet any of the following criteria:

Criterion 1: substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species;

The study area does not represent important habitat for these species as it does not occur on the limit of the species' ranges, does not support an ecologically significant proportion of the population of the species, is not of critical importance to the species at particular life cycle stages and is not within an area where the species are declining.

The proposed development would result in the removal of foraging habitat (mangrove vegetation – branches only) for the species. However, removal of vegetation would not represent a substantial loss and/or fragmentation of foraging habitat for the species, with the species unlikely to be reliant on the resources present in the impact area and able to use other areas due to their highly mobile natures. Therefore, the proposed loss of potential habitat is not likely to substantially modify, destroy, or isolate an area of important habitat for the species.

Criterion 2: result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species;

The proposal would not result in the establishment of an invasive species that is harmful to these species.

Criterion 3: seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

The proposal is unlikely to seriously disrupt the lifecycle of an ecologically significant proportion of the population of these species. The removal and fragmentation of vegetation in the study area would be unlikely to affect the species, which could forage in mangrove areas retained in the study area.

Conclusion

Based on the above assessment it is concluded that the proposed development is unlikely to have a significant impact on these species. As such, no referral to the SEWPAC for assessment and approval by the Environment Minister is necessary.

Regent Honeyeater

Regent Honeyeater is listed as a critically endangered species under the TSC Act and an endangered and migratory species under the EPBC Act. A description of the species and distribution in NSW is provided in the Regent Honeyeater Impact Assessment in Appendix D of this report

An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will meet any of the following criteria:

Criterion 1: substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species;

The study area does not represent important habitat for Regent Honeyeater as it does not occur on the limit of the species' range, and does not support an ecologically significant proportion of the population of the species, and is not of critical importance to the species at particular life cycle stages.

The study area could provide occasional foraging habitat for the species. The proposal could remove some of this potential, occasional foraging habitat. However, impacts would be minimal and the impacts in terms of disturbance to potential habitat for Regent Honeyeater within the study area are likely to be negligible given they forage widely, with the species capable of making large regional movements. The species is likely be present infrequently while foraging. Further, only a minimal amount of clearing will be required, which represents a small amount comparative to the amount of habitat present within the study area. Therefore, the proposed loss of potential habitat is not likely to substantially modify, destroy, or isolate an area of important habitat for the species.

Criterion 2: result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species;

It is unlikely that the proposed works would result in the introduction of invasive species that are considered likely to impact on Regent Honeyeater in the locality. The species suffers from competition from larger aggressive honeyeaters, particularly Noisy Miners, Noisy Friarbirds and Red Wattlebirds. However, the proposal would not lead to an increase in the incidence of these species in the study area.

Criterion 3: seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

The species breeds in 3 key locations in NSW, which do not include the study area. The project site could be used as a foraging resource during the species' non-breeding period. However, the amount of foraging habitat that would be removed represents a small proportion of the foraging habitat in the study area and the locality, with impacted habitat unlikely to supply large quantities of nectar resources for the species. Regent Honeyeaters would be able to continue using resources remaining within and outside of the study area.

Conclusion

Based on the above assessment it is concluded that the proposed development is unlikely to have a significant impact on Regent Honeyeater. As such, no referral to the SEWPAC for assessment and approval by the Environment Minister is necessary.

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Appendix E

GHD Community Consultation

CLIENTS | PEOPLE | PERFORMANCE

City of Ryde

Report for Pittwater Road Upgrade

Community & Stakeholder Engagement

June 2011

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

This Community and Stakeholder Engagement Report ("Report"):

1. *has been prepared by GHD Pty Ltd ("GHD") for the City of Ryde;*
2. *may only be used and relied on by the City of Ryde;*
3. *must not be copied to, used by, or relied on by any person other than City of Ryde without the prior written consent of GHD;*
4. *may only be used for the purpose of understanding the interests and concerns of the community in relation to the Pittwater Road Upgrade Project (and must not be used for any other purpose).*

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To the maximum extent permitted by law, all implied warranties and conditions in relation to the services provided by GHD and the Report are excluded unless they are expressly stated to apply in this Report.

Contents

1. Introduction 1

2. Engagement activities 2

   2.1 Phase one – project inception: from 28 April 2011 2

   2.2 Phase two – obtaining feedback: from 23 May 2011 2

   2.3 Phase three – presenting the REF: future 3

3. Community and stakeholder feedback 4

   3.1 Issues summary 4

   3.2 Feedback matrix 12

4. Summary of findings 13

5. Initial recommendations 14

1. Introduction

The City of Ryde has been gradually upgrading Pittwater Road over the past several years. This has been undertaken through a shared funding arrangement between Council and the NSW Roads and Traffic Authority (RTA). In 2010 there was community concern about proposed upgrade works between Carramar Avenue and Coxs Road, which led Council to seek an integrated approach to the proposed work between Epping Road and High Street.

The City of Ryde (Council) is now proposing to upgrade a 3.1 km stretch of Pittwater Road at East Ryde over the next five years. The work will include:

- Road reconstruction/rehabilitation including drainage, kerb and gutter, pavement patching and resheet, and the provision of a break down lane in each direction
- A Shared User Path (SUP) for cyclists and pedestrians extending from Epping Road to High Street
- New guardrails in some sections and protective barricading
- Gross pollutant traps to help improve stormwater management
- Where necessary, intersections will be upgraded to improve pedestrian and cyclist safety
- Landscaping using locally propagated species

One of the outcomes of the Ryde 2021 Community Strategic Plan is a 'City of Connections' with access to, from and within the City of Ryde. To achieve this, the City of Ryde has established a goal of ensuring that everyone in the community has the option to safely and conveniently drive, park, cycle or walk around the City of Ryde. The upgrade of Pittwater Road is a project that will assist in achieving this outcome. The upgrade also fulfils commitments in the Ryde Regional Bike Plan, which involves the provision of a cycleway along Pittwater Road. The proposed project will also improve safety and ensure better traffic flow for all road users.

GHD Pty Ltd (GHD) has been engaged to design and implement a suitable community engagement program for the project and coordinate other consultants' development of a Review of Environmental Factors and Flora and Fauna Assessment on behalf of Council.

This report describes the community and stakeholder engagement activities undertaken as at 9 June 2011 and provides a summary of the issues raised.

2. Engagement activities

The Community and Stakeholder Consultation Strategy developed by GHD was used by the Communications Team to manage community relations and consultation processes. The key objectives of the strategy were to:

- Ensure that a diverse range of the local community and stakeholders are informed about the project and given the opportunity to provide feedback
- Provide stakeholders with an opportunity to ask questions and to identify areas of concern with respect to the project
- Ensure that all concerns and issues raised by the community and stakeholders are considered in the development of the REF
- Implement a planned approach to community and stakeholder communications
- Effectively and proactively identify and manage local issues

An outline of the engagement activities already completed, as well as those that are proposed for the future, is provided below.

2.1 Phase one – project inception: from 28 April 2011

- Establishment of a project 1800 number and email facility
- Preparation of a Community and Stakeholder Consultation Strategy
- Development of contact and issues database

2.2 Phase two – obtaining feedback: from 23 May 2011

- Delivery of community newsletter outlining the proposal and an upcoming workshop to local residents
- Provision of information about the project on the City of Ryde's website
- Promotion of an online community survey
- Preparing and distributing a letter to various stakeholders and government agencies
- Meetings with Ryde Environment Group, Friends of Kittys Creek and the Ryde-Hunter's Hill Flora and Fauna Preservation Society
- Telephone discussion with representatives from Bike North
- Information about the project included in the City of Ryde's *City View* publication (which is included in an edition of The Northern District Times)
- Signage installed along Pittwater Road to advertise the project and consultation process

- An interactive community workshop on 2 June 2011: about 25 people attended

2.3 Phase three – presenting the REF: future

GHD has been engaged to prepare this report for Council officers, prepare a Preferred Outcomes Report for Council and then prepare and distribute a final community newsletter to residents. Additional activities may be undertaken at the request of the City of Ryde including a further direct mail letter, additional meetings with some stakeholder groups and a facilitated session with City of Ryde councillors.

3. Community and stakeholder feedback

The feedback below has been drawn from all of the feedback mechanisms outlined above. It has been summarised by topic for ease of reading.

3.1 Issues summary

3.1.1 Traffic and Road Safety

Traffic and road condition concerns

- Increased traffic since Lane Cove tunnel (traffic light signal for left hand turn)
- Road resurfacing is currently required
- Corner of Pittwater Road and Epping Road traffic light signal
- Traffic volume along Pittwater Road has gone down but congestion has gone up
- Concern that Pittwater Road will eventually be widened for future traffic
- Why aren't extra lanes being added in if it's a road 'upgrade' to reduce congestion?

Road Safety concerns

- RTA won't allow traffic calming devices on sub arterial road
- Traffic calming on bends of Pittwater Road needed
- Rene Street is a blind corner to traffic on the right
- 50 km/h limit from High Street to Epping Road needed (especially High Street to Rene Street)
- Concern for pedestrians from oncoming traffic, especially where roundabouts seem to direct traffic close to homes and the footpath
- Buffalo Creek Park, especially where cars veer off the road
- Who has the right of way when a cyclist at speed crosses a driveway when a car is backing out? Safety issue/liability
- Rene Street/Pittwater Road roundabout is dangerous

Cycle Safety

- Remove raised traffic calming humps to ensure a safe path of travel for cyclists transitioning from the roadway to the Shared User Path
- All concrete driveway laybacks along the route should have their lips ground down to provide a safe transition for bicycles entering or leaving the path at an acute angle.

- The path is shown 'indented' at some intersections (e.g. Bronhill Rd, Clarence St, Blenheim Rd, Carramar Rd and Magdala Rd). This moves cyclists out of the sight-line of motorists turning into these roads and increases the possibility of a collision.
- Can the Council provide full size bicycle logos in the centre of all traffic lanes approaching the roundabout to indicate the likely presence of bicycles?
- On the service road (near No. 200) the Council needs to provide protection at the deep drain.
- Suggested that all proposed bollards on the SUP be removed as they are a major contributor to cyclist injuries
- Use non-slip coloured pavement paint on the section of the SUP that goes through the existing car park
- Safety issue at the Bronhill Avenue intersection – need to provide protection at the edge of the SUP at the top of the retaining wall and side of the bridge.
- Remove vegetation and install concave mirrors on the intersection with Epping Road to improve visibility of the bus lane.
- Need to modify existing concrete refuge island to ensure a minimum 2 metre bicycle storage length.

Safety barrier concerns

- Safety barrier at 196 Pittwater Road
- How high is the barricade?
- What is the visibility like behind the barricade?
- What colour will the barricade be painted?
- No consistency of bike path barrier
- The Shared User Path needs separation from the road
- Barricade at Rene Street intersection required

Speed concerns

- Concern with speed of cars along narrow area at Pittwater Road from Buffalo Creek to High Street.
- The "S bend" 25 km/h speed guideline is ignored

3.1.2 Stormwater

Water

- Is the Gross Pollutant Trap (GPT) an appropriate water quality control device?
- What impact will an increased volume of freshwater have on:
  - Mangroves
  - Saltmarshes

- How do we minimise surface water that runs off and maximise infiltration?
- Details of biodiversity requested between Coxs and Bronhill Avenue
- Need to protect the Saltmarsh
- Concern that the approach is going to direct fresh water into the salt marshes.
- Need to improve the environmental quality of Buffalo Creek and Kittys Creek catchments

Drainage

- Prevention is better than cure. Make sure we get it right in the design phase
- Pros and cons of open versus closed pipe drainage? Preference to keep existing infrastructure where it functions well
- Effort should go to addressing situation in existing creeks and channels (long term commitment)
- Drainage to Kittys Creek and salt marshes - want more guarantee that more finer filtration than pollutant traps will be provided

3.1.3 Shared User Path (SUP) - need for it and location

Shared User Path concerns

- Why a SUP?
- If SUP is built, Council will need to make sure it is used
- Problem with the SUP (not safe for kids and aged people)
- Council to encourage people to use it
- How is the 'shared' path going to work? e.g. Conflict between users such as dog walkers, cyclists and pedestrians.
- Needs to be off road and away from the busy road
- Hard to reverse out of driveway as it is at Rene Road and Bronhill Avenue without introducing SUP
- Need the potential to safely cross from Pittwater Road near Rene Street into Buffalo Creek Park (where bollards are)
    - Move SUP into this section of the park and away from Pittwater Road
- Have SUP from Epping Road to Buffalo Creek Reserve Park on the eastern side of road
- Re-position SUP. Do not need to build all of SUP along Pittwater Road
- Recommend moving cycle path to the other side of the road
- Concerned that motorcycles will use the SUP
- Consider alternative bike path away from Pittwater Road
- Will SUP potentially be turned into a third lane of traffic?

- Bike Plan is out dated which questions the validity of the SUP
- Will cycle along Pittwater Road more often if a SUP provided (will feel safer)
- SUP will provide safer option for cyclists
- SUP may not be used by faster riders (e.g. commuter riders) because it will be considered much slower than riding on the road and the paths will be too narrow.
- The Shared User Path will be a good addition to the community
- At 2.5m the SUP is too narrow for a two-way shared user path, especially for a regional route – required to be at least 3-4 metres.

Residents

- Would not mind a footpath, but no cyclists
- Issue with cars entering/exiting driveways especially if you are reversing onto the street; there is a concern that cars won't see the cyclists
- Concept is terrific because it allows long term residents to have a path to use and not have to cross Pittwater Road, which is dangerous
- Driveways near Rene Street and High Street concerned about people reversing down driveways. Can cycleway be moved to the other side of the road?

Pedestrians

- Danger for pedestrians
- High Street to Buffalo Creek Reserve is in need of a footpath
- Footpath from Rene Street up to Epping Hwy is adequate
- Separate footpath for residents and cyclists needed
- Will there be an increase in noise? If so will there be a sound barrier?
- Support for footpath

Cyclists

- Safe facility for cyclists needed
- Potential for increased cyclists if provided
- Need safe access from Coxs Road to bike path, even if SUP is on the other side
- How many cyclists will use SUP?
- Worried that motorcyclists may use SUP if road becomes congested
- Worried about the speed cyclists will be travelling at
- Utilise existing crossing at Ryrie Street and Magdala Street to access the regional bike path on Epping Road (south and north bound)
- Estimates on the Cyclist users?
- Level of use of cycle way?

- Few cyclists use Pittwater Road

3.1.4 Vegetation trimming, tree removal, rock face excavation

Vegetation trimming

- Cumulative loss is a concern
- East/West and North/South biodiversity corridor
- Consultation with the right people in National Park and Wildlife Service is important
- Section at North Ryde Park – result in disturbance to the existing canopy and eventual planting of section as biodiversity corridor
- Removing vegetation along Buffalo creek reserve won't increase visibility
- Animals coming out of National Park & entering Kittys Creek & other areas need habitat preserved

Tree removal

- Don't want to remove any trees. Not justified. Like it just how it is
- Trees are corridor into Land Cove and National Park
- Sugar gliders need trees in this area
- Heard sugar gliders there last spring
- Noise to neighbours when trees are removed along the rock-face

Rock face excavation

- Aboriginal heritage issue with rock face
- Imperial Avenue – rock sticking out, concerned removing rock will destabilise back garden. Agrees that rock needs to be removed for safety
- Lane Cove National Park and Field of Mars are heritage items in the LEP
- Worried about rocks slippage once work commences close to Imperial Avenue

Kittys Creek

- River to River Project (Parramatta to Lane Cove)
- Concern for run-off impacts on saltmarsh in Kittys Creek
- Arthur White studies for Council – studies made for Kitty's Creek need to be reviewed by the consultants

3.1.5 Restoration and Landscaping ideas

Restoration

- Use trees that are native to the area
- Use endemic plants
    - Grasses and shrubs from the local sources eg. the National Park

- Effort during construction to minimise siltation to the surrounding creeks
- The two creek lines are important areas for birds and possums; trees should replace those removed. Consideration to fauna crossing the road
- Concern about stability of the ground
- Loss of visual and acoustic privacy (especially loss of tree aspect)
- Replace with trees or shrubbery on the borderlines
- Will a widened and guttered road degrade the saltmarsh along Lane Cover River?
- Over-road crossing for animals needed
- Two points for underground crossing: Kittys & Buffalo creeks

Landscaping ideas

- Landscaping sympathetic with surrounding foliage
- Sufficient replacement or more flora than there, creating a 'corridor effect'
- Use M.A.R.S at Gladesville Hospital to do the propagation for landscaping
- Amelioration for eco-system damage
- Maintenance of any landscaping adjacent to SUP, (lack of) and encroachment into SUP
- Overhead cycleway from eastern side crossover at Buffalo Reserve back to current SUP side
- Maybe put SUP on other-side
- Wants consistency with the footpaths along Pittwater Road
- Will a retaining wall/fencing be setup for properties opened up to the public when the path is widened?

3.1.6 Design Questions

Plans

- Road surface bad at Plan 4 area
- Rationale for plan 15?
- Why do you need the extra pavement on Plan 16?
- Is the breakdown lane needed?
- Rene St Barricade
  - Cars go down to 270 – 280 house (Plan 19)
  - Require a metal barricade on the corner
  - Cars go on the footpath as far as 280 house
- Need to do a technical review of the bike plan

- Bicycle path should be relocated with former study and community consultation regarding location
- Upgrade is “trojan horse” to make this a four lane road (this has been done with other roads)
- Plans difficult to interpret

Cost

- Concerned about cost of project
- Why is the council doing this?
- Cost of the pre-cost structure
- It is in close proximity to the mangroves
- Council required for crossovers?
- Is RTA going to share the costs?
- Concern that dollars will be higher
- No cost benefit analysis is being done

Ideas

- 2nd crossing at Buffalo Creek
- Would like to see a bus stop
- Pittwater Road should be factored into the provision of feeder bus services
- Leave footpath as is between Rene Road and Bronhill Avenue
- Path should be on eastern side of the road to avoid driveways and T intersections and should go all the way to Boronia Public School
- Move SUP to east side of road and widen the whole road to the maximum possible area where required
- Between Rene Road and Pittwater Road
    - Why widen the road?
- A separate enclosed area for dogs at the Field of Mars.
- National Park Access - remove part of the central median strip and proposed barrier between the SUP and roadway, and provide a lipless layback to the SUP for cyclists entering and leaving the National Park
- Modify ‘Left Only’ signs along the road to say “Bicycles Excepted”
- Remove part of the central concrete median strip on Pittwater Road to allow bicycle access to Eastern carriageway.
- Construct a new concrete refuge island on the Blenheim Road median. This may necessitate the relocation of the existing left lane by reducing the size of the existing grassed island.
- Relocate ‘Give Way’ sign for buses behind path of the SUP

- Install standard SUP signage at Epping Road SUP to indicate distance to Gladesville shops and Gladesville Bridge.

3.1.7 Other issues

- Need to write directly to impacted residents about the project. Ask Council for residents' addresses
- Residents need to know beforehand about any change of plans
- Consultation has been limited
- Changes are a big improvement and long overdue
- Overall improvement in community amenities

3.2 Feedback matrix

The following table displays the categories and methods in which stakeholder issues have been raised.

Table 1 Stakeholder issues and consultation methods where raised

	Survey	Workshop	Feedback Forms	Email	Phone	Meetings
Traffic and Road Safety	X	X	X	X	X	X
Stormwater		X			X	X
Shared User Path (need for it & location)	X	X	X			X
Residents	X	X	X		X	
Pedestrians	X	X	X			
Cyclists	X	X	X			
Vegetation trimming, tree removal, rock face excavation	X	X			X	X
Restoration and Landscaping Ideas	X	X				
Design Questions	X	X	X	X	X	X
Other Issues		X			X	X

4. Summary of findings

Concerns have been raised as to whether the Pittwater Road Upgrade will effectively address traffic congestion. Some residents and road users did not understand whether the upgrade will involve road widening to make way for additional carriageways. The majority of respondents to the community survey felt that traffic congestion would remain the same after the upgrade works, this is of particularly concern given that Council have stated that this is the overall objective for the project. A small number of community members are very concerned that the proposed works are simply a prelude to the RTA turning Pittwater Road into a four lane road.

A key issue for many of the stakeholders and residents who have provided feedback is that they are uncertain of the need for a Shared User Path. General comments suggest that local residents believe there is limited or no evidence that many cyclists would use an off-road Shared User Path along Pittwater Road. This point is generally made in conjunction with the concern that a Shared User Path will be expensive and a waste of the City of Ryde's money.

There is also overall concern relating to safety, particularly in regards to a Shared User Path. These comments related to concerns that pedestrians might be knocked over by cyclists. Local residents along Pittwater Road have also expressed concern that they may be at fault if cyclists are injured whilst residents reverse out of driveways.

Other safety concerns related to the upgrade of the road. These included the need to have better traffic calming devices and barriers installed to ensure a safer and slower flow of traffic. When asked in the community survey how safe Pittwater Road would be after the upgrade 65% responded it would be safe or very safe for pedestrians, 65% responded safe or very safe for cyclists and 60% responded it will be safe or very safe for drivers.

Those that supported the Pittwater Road Upgrade stated that it would be a welcome addition to the community as an overall amenity improvement, and that it would lead to a safer way to travel for those along Pittwater Road for pedestrians, cyclists and road users. Others commented that the road resurfacing will be beneficial.

Similar to issues raised with the previous round of consultation, loss of trees/vegetation has been a concern for members of the community. The loss of trees will detract from the look of the area and adversely impact upon local flora and fauna, particularly relating to habitat corridors. These members of the community are not completely opposed to the project, but just want to make sure their environmental concerns are addressed. Stormwater drainage to the saltwater marshes on the Lane Cove River was also of particular concern.

5. Initial recommendations

GHD recommends that the City of Ryde:

1. Consider the feedback raised by the community and stakeholder groups outlined above and make note of which requests/comments they cannot satisfy and why, and which requests/comments warrant further investigation.
2. Identify the justifications for the road upgrade and provision of a Shared User Path (by reviewing the Regional Bike Plan and discussing the project with Councils' Traffic and Cycling Committees) and pass this information on to Cardno and Eco Logical for their Review of Environmental Factors and Flora and Fauna Assessment.
3. Review the current preferred concept design and, where appropriate, make changes to meet the needs of the community and stakeholders.
4. Advise Cardno and Eco Logical of the final preferred option scope of works and any sub-options, all of which should be considered in their Review of Environmental Factors and Flora and Fauna Assessment.
5. Undertake further consultation with key stakeholder groups to help finalise the preferred option concept design. This will assist Council in finalising the most appropriate design and ensure that as many concerns/needs of these influential groups are satisfied as possible/appropriate.
6. Prepare and distribute a direct mail letter to residents affected by the proposal to update them on the consultation and planning process and to explain how identified impacts are being assessed and addressed.

The community engagement program is ongoing; this report provides a summary of the current concerns and interests of the community to date. GHD will prepare a Preferred Outcomes Report based on this report and the final draft of the REF, prior to the first Council meeting for the project later this year.

GHD

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Document Status

Rev No.	Author	Reviewer		Approved for Issue		
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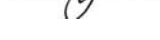
1	Michael Robertson	Michala Lander		Lynne Clayton		19/07/2011

Appendix F

Arborist Report

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Tree Survey/ Arborist Report

An Audit of Existing trees

PITTWATER ROAD – UPGRADE

High Street Gladesville
to
Epping Road North Ryde

25th July 2011

Prepared for
The City of Ryde

Prepared by
Cheryl MacKay
Arboriculturist

1 Introduction/Background

The City of Ryde (Council) is proposing upgrades to Pittwater Road Ryde.
Road works will include widening of the carriageway, provision of an emergency breakdown lane and provision of a shared pedestrian/cyclist pathway.
Road works will impact on trees and vegetation lining the proposed section of Pittwater Road.

Mr. Charles Mahfoud Project Manager for Council has commissioned this Arborist Report to assess the condition and significance of trees lining Pittwater Road that may be impacted by the road works proposal.

The subject site is a linear 3.1 km section of Pittwater Road running from High Street, Gladesville to Epping Road, North Ryde, located within Ryde Local Government Area. The site extends the roadway and pathway area by 4.5 – 5 metres (m.) to the west. Residential properties and Council Reserves – Myall Reserve, North Ryde Park, Martin Reserve, Kitty's Creek Reserve and Field of Mars bound the subject western side of Pittwater Road. The eastern (non subject side) is bordered by Land Cove National Park.

This report aims to assess trees impacted by the road works in the subject area for their environmental and landscape significance and give comment on their overall condition.

2 Methodology

In preparing this report a walked tree assessment was undertaken on the western side of Pittwater Road. The survey commenced at High Street, Gladesville and concluded at Blenheim Road, North Ryde. The subject site covered a five to five and a half metre wide strip from the existing edge of the carriageway.
The visual tree assessment (*VTA*) [1.] was carried out from the ground by a Level 5 (AQF) Consulting Arborist on 17th, 18th, 20th July 2011.
The comments and recommendations made in this report are based on findings from the site inspections with a general understanding of the extent of the proposed road alterations.

Tree height and age was estimated and Diameter at Breast Height (D.B.H.) was measured 1.4 m. above ground level. No tree root investigation, trunk drilling, tissue sampling, aerial inspections or soil exploration was undertaken.

The report considers the City of Ryde Development Control Plan 2010, Section 9.6 Tree Preservation where Council consent is required for the pruning or removal of:
1. any tree with a with a height greater than 5 metres and a trunk circumference of 450 mm at 1.4 metres above ground level .
ii. Native vegetation within defined 'Urban Bushland'
iii. Trees which are prominent or have landmark qualities due to their height, size, position & age.
iv. Trees which are part of an important wildlife habitat, refuge or corridor.
v. Native bushland subject to controls under State Environmental Planning Policy 19.
vi. Trees on the City of Ryde Significant Tree Register.

Shrubs/trees with a height less than 5 m., a trunk circumference less than 450 mm, noxious weeds or species exempt under Council's DCP are not included in the Tree Survey.

1. A Visual Tree Assessment (VTA) is a systematic method of identifying tree characteristics and hazard potential recognised by The International Society of Arboriculture. Journal of Arboriculture, Vol. 22, No. 6, November 1996.
The VTA was formulated by Mattheck and Breloer and described in, - Mattheck, C. and Breloer, H (2001) *The Body Language of Trees A Handbook for Failure Analysis*, Department of Transport, Local Government and the Regions. London, Research for Amenity Trees No. 4.

Trees were identified (from fruit where possible) with reference to Boland, Brooker, *et all* [2.] and Leonard [3.]

Trees in groups of the same species that are co dependant are assessed as a group. Individuals are assessed singularly.

Tree Protection Methods are referenced from Standard® AS 4970 - 2009 *Protection of trees on development sites*. [3.]

A Glossary of terms used throughout this report is attached Appendix 7 Page 18.

3 Scope of Works

This Tree Survey/Arborist Report has been prepared to identify all trees that may be directly impacted by the proposed road upgrade.
It is an audio of the tree population within the subject area only.
The report provides base arboricultural data including construction offsets (Tree Protection Zones) to guide future construction.

3.1 Limitations

This Tree Survey/Arborist Report is not an Arboricultural Impact Assessment and does not address specific construction impacts.
The Report offers no guidance on Tree Protection during Construction or Tree Preservation Methods to ensure the ongoing safety of trees to be retained as part of the road upgrade. When road works are to commence further Arborist input for the Preservation of the Trees is required.

4 Impacts of Road Works to the Subject Trees

Trees may be impacted by being in the footprint of the proposed road works or by having root zones that extend into the construction zones.
Most tree roots are in the top 30 cm of soil and need to be preserved. Loss of fine absorbing roots by compaction can cause water stress and excavation can sever or damage the roots, which may impair the stability of the trees.

Tree Protection Zones (TPZ) are the principal means of protecting trees on construction sites.
The TPZ is a combination of the root area and crown area requiring protection. It is an area isolated from construction disturbance, so that the tree remains viable.
Structural Root Zones (SRZ) are the areas required for street stability. A larger area is required to maintain a viable tree. No root severance should be undertaken in the SRZ.
TPZ and SRZ included in the Tree Survey indicate areas to remain undisturbed. If trees impacted by the road works are to be retained for long term preservation the Protection Zones (TPZ and SRZ) are to be implemented.

All subject trees are directly impacted by the proposal.

Surveyed trees have High to Medium Significance and High to Medium Retention Value.

2. Brooker, M.A.I.H. Kleinig, D.A. (1999) Field Guide to Eucalypts, Volume 1 – South – Eastern Australia. Bloomings Books, Hawthorn.
3. Leonard, Gary (1998) Eucalypts: A Bushwalker's Guide. New South Wales University Press, Sydney 2052
4. Standards Australia 2009, *Australian Standard 4970 Protection of trees on development sites*, Standards Australia, Sydney, Australia.
5. Standards Australia (Originated 1996 – second edition 2007) *Australian Standard, Pruning of amenity trees*. AS 4373 (2007) Standards Australia, Homebush, NSW.

Table 1 Tree Survey PITTWATER ROAD Upgrade from High Street, Gladesville to Epping Road, Ryde

Tree No.	Genus/species Common Name	Height Spread	D.B.H. mm	Age	Crown Form Condition	Vigour	STARS	Retention Value	TPZ Radius	SRZ Radius	Comments
	Grass verge 186 Pittwater Road										Canopy one sided & biased to the east over the roadway. Basal decay and basal suckers. Limbs lopped for power line clearance with resultant dead leaders. Twig and 1st order branch dieback, 60% high volume epicormic cover. Remnant species in poor condition.
1.	*Eucalyptus robusta* Swamp Mahogany	7 7	Multi to 380	M	Co Dominant Asymm. Poor	Normal	Medium	Consider Med	4.2 m.	2.7 m.	
	Rock shelf Road edge 186 Pittwater Road										Planted or self sown individual in poor location. Lopped/torn limbs for vehicle/parking clearance. Canopy cover reduced to 20%. Poor condition, declining vigour.
2.	*Eucalyptus gunnii* Cider Gum	5 5	250	O	Poor Asymmetrical	Low	Low	Low Remove	3 m.	2 m.	
	Within Property Boundary 186 Pittwater Road										Resident's street screen planting in good condition. Native species x 3 trees. Poorly pruned/lopped for pedestrian/pathway clearance. Trees will overhang proposed works and will require "reduction pruning" to prevent damage by construction equipment.
3	*Banksia integrifolia* Coast Banksia **x 3 trees**	6 5	200 – 400	M	Co Dominant Asymmetrical	Normal	Medium	Priority	4.5 average	2.4 average	
`	Within Property Boundary 194 Pittwater Road										Resident's street screen planting in good condition.
4	*Schefflera actinophylla* Umbrella tree	5.5 3	Multi to 600	M	Poor Symmetrical	Normal	Medium	Medium	7.2 m.	2.8 m.	Heavily lopped at 1.4 m., producing a shrub like form.
	Within Property Boundary 198 Pittwater Road										Resident's planting in good condition. Native species, lopped for powerline clearance. Raised bed beside new driveway and footpath. Shows good vigour and condition.
5	*Corymbia citriodora* Lemon Scented Gum	11 5	300 300	M	Dominant Asymmetrical	Normal	High	High	5.2 m.	2.5 m.	
	Grass verge 204 Pittwater Road										One sided canopy overhangs roadway. Lopped for powerline clearance. 60 – 80% canopy density, twig and small branch dieback. Prominent size and position on roadway.
6	*Eucalyptus robusta* Swamp Mahogany	15 8	300 650	M	Dominant Asymmetrical	Normal	High	High	8.6 m.	3.1 m.	
	Grass verge 206 Pittwater Road – over neighbouring driveway										Lopped for powerline clearance. 30 – 50 % canopy density, twig and small branch dieback. Exposed 1st order roots, girdled & intertwined with *Pittosporum undulatum* root plate. Reduced long term stability and viability.
7	*Eucalyptus robusta* Swamp Mahogany	15 9	620	M	Dominant Asymmetrical	Normal	Medium	Med	7.4 m.	3.1 m.	
	Rock Escarpment – curve Pittwater Road – rear 16 A Imperial Avenue										One sided canopy overhangs roadway. Lopped for powerline clearance. Multi trunked from 1.1 m. Exposed root crown with slight buttressed base for added stability. 60 – 80% canopy density, twig and small branch dieback. Prominent size and position on roadway.
8	*Eucalyptus piperita* Sydney Peppermint	16 12	Multi 250 450 580	M	Codominant Asymmetrical	Normal	High	High	9.4 m.	3.1 m.	
	Rock Escarpment – curve Pittwater Road – rear 16 A Imperial Avenue										One sided canopy overhangs roadway. Lopped for powerline and power pole clearance. Multi trunked and heavily suckered from over pruning. Over pruned laterals dead. Damaged trunk south side. 40 -50 % canopy density. Poor condition and declining vigour.
9	*Eucalyptus piperita* Sydney Peppermint	15 8	Multi 150 200 320	M	Intermediate Asymmetrical	Normal	High	Low Remove	4.9 m.	2.6 m.	

Tree No.	Genus/species Common Name	Height Spread	D.B.H. mm	Age	Crown Form Condition	Vigour	STARS	Retention Value	TPZ Radius	SRZ Radius	Comments
	Rock Escarpment – curve Pittwater Road – rear 14 Imperial Avenue										Canopy one sided & biased to the east over the roadway. Lopped for power line clearance. Reduced form and condition. Suckered limbs and 1st order lateral dead from over pruning 20 – 30 cm Diameter. Remnant species with reduced condition & low vigour.
10	*Eucalyptus piperita* Sydney Peppermint	11 9	Multi 380 440	M	Intermediate Asymmetrical	Normal/ Low	Medium	Medium	7.1 m.	3 m.	
	Rock Escarpment – curve Pittwater Road – rear 12 Imperial Avenue										Remnant tree overhanging street light. One sided crown, lean over roadway. Co dominant leaders at 3.5 m. Spindly tree with tall, thin vine smothered trunk and 30 - 40% canopy cover. Reduced condition, form & vigour.
11	*Eucalyptus piperita* Sydney Peppermint	13 10	Multi 350	M	Suppressed Asymmetrical	Normal	Medium	Medium /Low	4.2 m.	2.4 m.	
	Rock Escarpment 4 – 4.5 m. from Pittwater Road edge – open weed smothered area - rear Imperial Avenue										Located in a vine smothered cleared area, set back from the road edge. Co dependant trees with forest form. Tall thin canopies with 50 – 60% foliage cover. Good overall form and vigour.
12	*Eucalyptus piperita* **x 2** Sydney Peppermint	18 10	450 average	M	Codominant Asymmetrical	Normal	High	Medium	5.4 m.	2.5 m.	
	Pittwater Road – opposite Buffalo Creek Playground										Semi mature tree with co dependant small neighbour *Eucalyptus saligna* (5 m. x 4 m. x 180 mm). Average form, vigour and overall condition. Relatively recent planting could be replaced with same species.
13	*Eucalyptus saligna* Sydney Blue Gum	14 5	280	S	Codominant Symmetrical	Normal	Medium	Medium /Low	3.4 m.	2.2 m.	
	Pittwater Road – opposite Buffalo Creek Playground										Stand of *Casuarina* and *Acacia* sp. Planted and possibly self sown riparian species with normal to low vigour and average overall condition.
14	*Casuarina glauca* Swamp Oak **X stand**	2 - 8 2 - 4	150	M	Codominant Symmetrical	Normal/ Low	Medium	Medium	1.8 m.	1.7 m.	
	Field of Mars Car Park Island Nature Strip Planting										Individual specimen in prominent location at car park entrance. Form slightly reduced by powerline clearing, 20% epicormic growth. Good health & vigour. Established in an island planting with *Banksia integrifolia* and *Casuarina glauca* which have been lopped to less than 5 m. for powerline clearance.
15	*Eucalyptus botryoides* Swamp Mahogany	16 11	490	M	Dominant Symmetrical	Normal	High	High	5.9 m.	2.6 m.	
	Rock Escarpment North from Field of Mars to Rene Street - Rear of McCallum Avenue										**Up to 45 trees** lining the escarpment rock face, 2 – 5 m. from the existing road edge. Remnant trees with forest form. One sided canopies leaning to the east and open areas over the roadway. Buttress roots for stability on rock shelves where required, 30 – 60 % foliage cover, moderate twig and small branch dieback. Individuals close to the carriageway have been pruned for power pole and street light clearance.
16	*Eucalyptus piperita* Sydney Peppermint **x 45 trees**	10 - 14 6 – 8 average	200 - 500 average	M	Intermediate to Suppressed Asymmetrical	Normal/ Low	Medium	Medium	4.2 m. average	2.4 m. average	
	Rock Escarpment Opposite Sugar Loaf Track Parking Area										**8 trees** on the northern section of the escarpment rock face, 2 – 4 m. from the existing road edge. Remnant trees with forest form, good condition and good vigour. One sided canopies leaning to the east and open areas over the roadway. 60% foliage cover, moderate twig and small branch die back.
17	*Eucalyptus resinifera* **x 8** Red Mahogany	12 - 16 8 – 12 average	400 – 500 average	M	Codominant Asymmetrical	Normal	High	High	4.8 m. average	2.5 m. average	

Tree No.	Genus/species Common Name	Height Spread	D.B.H. mm	Age	Crown Form Condition	Vigour	STARS	Retention Value	TPZ Radius	SRZ Radius	Comments
	South of Rene Street										
18	*Angophora costata* Sydney Red Gum **x 3**	13 - 14 8 – 10 average	Multi 350 - 400	M	Co Dominant Asymmetrical	Normal	High	High	4.4 m.	2.4 m.	Good remnant specimens x 3 with good condition, health & vigour.
	Near Corner of Pittwater Road and Rene Street at "60" Road Sign										
19	*Eucalyptus robusta* Swamp Mahogany	16 12	Multi 300 350 500	M	Co Dominant Asymmetrical	Normal	Medium	Medium /Low	8.3 m.	3.1 m.	Large tree, remnant species. Basal cavity with progressive decay on eastern side of trunk. Reduced overall condition. Good vigour.
	Near Corner of Pittwater Road and Rene Street										
20	*Eucalyptus robusta* Swamp Mahogany	14 9	450	M	Codominant Asymmetrical	Normal	High	High	5.4 m.	2.6 m.	Smaller remnant species in good overall condition.
	Corner of Pittwater Road and Rene Street										
21	*Eucalyptus piperita resinifera* X cross species	12 12	480	M	Dominant Symmetrical	Normal	High	High	5.8 m.	2.6 m.	Dominant tree in prominent location on the street corner. Excellent form, vigour and overall condition. Symmetrical crown, no obvious defects.
	Corner of Pittwater Road and northern side of Rene Street										
22	*Angophora costata* Sydney Red Gum	13 7	320	M	Dominant Asymmetrical	Normal	High	High	3.8 m.	2.3 m.	Tall one sided crown, pruned on eastern side for powerlines, 60% foliage cover. No obvious structural defects. Prominent in the streetscape and locality.
	Grass Verge 270 Pittwater Road										
23	*Eucalyptus rossii* Scribbly Gum	14 7	650	M	Dominant Symmetrical	Normal	High	Medium	7.8 m.	2.9 m.	Prominent in streetscape and locality. Lopped for service wires, showing twig and small branch dieback, basal cavity (mechanical damage). Loss of overall condition, normal vigour.
24	*Eucalyptus robusta* Swamp Mahogany	13 5	320	M	Codominant Asymmetrical	High	High	Medium	3.8 m.	2.3 m.	Slightly stunted co dependant tree. Reduced form – crown raised to 7 m. Good vigour and overall condition.
	Grass Verge 282 Pittwater Road										
25	*Jacaranda mimosifolia* Jacaranda	7 7	Multi 280 300	M	Codominant Asymmetrical	Normal	Medium	Medium	5.0 m.	2.9 m.	Heavily lopped and suckered on the western side of the canopy for power clearance. Reduced form and overall condition. 2nd order limbs dead or dying.
	Naturestrip planting 284 Pittwater Road										
26	*Ficus microcarpa* "Hillii" Small Leaf Fig	12 8	200 300 350 450	M	Dominant Asymmetrical	Normal	Medium	Medium	7.8 m.	3.2 m.	Heavily lopped and suckered on the western side of the canopy for powerline clearance. Good foliage cover and overall condition – typical of *Ficus,* a resilient species. Leans towards the street.

Tree No.	Genus/species Common Name	Height Spread	D.B.H. mm	Age	Crown Form Condition	Vigour	STARS	Retention Value	TPZ Radius	SRZ Radius	Comments
	Within property 286 Pittwater Road										Multi trunked, heavily lopped at 750 mm reducing the tree's form and condition. 60% canopy cover, minor small branch dieback. Good to average vigour.
27	*Harpephyllum caffrum* Kaffir Plum	8 6	150 200 320	M	Dominant Asymmetrical	Normal	Medium	Medium	4.9 m.	2.8 m.	
	Within property 290 Pittwater Road										Heavily lopped on the western side, dead lateral limbs from over pruning. Leans to east, average form, and good condition.
28	*Angophora costata* Sydney Red Gum	14 10	700	M	Dominant Asymmetrical	Normal	High	High	8.4 m.	3 m.	
	Within property 292 Pittwater Road										Crown raised (removal of lower branches) to 6 m. Reduced form, 60% canopy cover, 10% epicormic growth, reduced vigour.
29	*Angophora costata* Sydney Red Gum	12 7	430	M	Dominant Asymmetrical	Normal	High	Medium	5.2 m.	2.5 m.	
	Corner of Pittwater Road and Bronhill Avenue, **Kittys Creek**										Part of Swamp Sclerophyll Forest Plant Community. On edge of proposed pathway. Weed infestation covering lower part of canopies. 40% canopy cover, reduced overall condition.
30	*Casuarina glauca* Swamp Oak **X 3**	12 5	400 average	M	Codominant Symmetrical	Normal/ Low	Medium	Medium	4.8 m.	2.4 m.	
	Pittwater Road south of Cox's Road , **Kittys Creek Reserve**										Significant tree (age, size & species) located on the edge of the existing carriageway. Specimen reaching full maturity to over maturity. 50 – 60% canopy cover, 15% epicormic growth, good structure, medium defects, form reduced by removal of lopped and damaged limbs. Vehicle damage to the base of the trunk, non frangible species.
31	*Eucalyptus radiata* Narrow leaved Peppermint	16 10	380 730	M - OM	Dominant Symmetrical	Normal	High	Medium	10 m.	3.4 m	
	Corner of Pittwater Road south of Cox's Road, **Kittys Creek Reserve**										Significant tree (age, size & species) located on the edge of the carriageway. Vehicle damage to the base of the trunk. Showing signs of over maturity, reduced crown cover to 20 – 50%, small limb and branch dieback, holding dry, brittle wood to 30%. "Witches Broom" viral infection through canopy. Co dominant leaders at 2.2 m., good structure.
32	*Eucalyptus resinifera* Red Mahogany	18 15	750	M-OM	Dominant Asymmetrical	Normal	High	Medium	9 m.	3.2 m.	
	Corner of Pittwater Road and Cox's Road **Martin Reserve**										Significant tree (age, size & species) located between path & carriageway. 80% canopy cover, small twig & small branch dieback, "Witches Broom" viral infection through canopy. Vehicular damage - torn limbs x 2, 35 cm diameter at 5 m. over carriageway.
33	*Eucalyptus notabilis* Blue Mountains Mahogany	18 12	650	M - OM	Dominant Asymmetrical	Normal	High	Medium	7.8 m.	3 m.	
	Pittwater Road and Martin Reserve										Significant tree (age, size & species) located on the edge of the carriageway. Multi trunked from 600 mm, co dominant leaders at 1 m. Good structure, 80% canopy cover. Obvious defects – arboreal termite mounds and trails, split lateral limb on west side of canopy with termite trails. Vehicular damage - dead leader southern side of trunk & basal cavity with extensive decay & termite trails.
34	*Eucalyptus acmenoides* White Mahogany	19 10	Multi 400 650 700	M	Dominant Asymmetrical	Normal	Medium	Medium / Low	12.5 m.	3.6 m.	

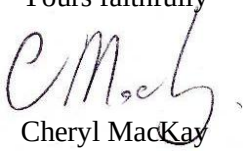
Tree No.	Genus/species Common Name	Height Spread	D.B.H. mm	Age	Crown Form Condition	Vigour	STARS	Retention Value	TPZ Radius	SRZ Radius	Comments
	Pittwater Road and Martin Reserve										Good overall condition and vigour. Form reduced by powerline pruning, small twig and branch dieback. One limb damaged on roadside, 20 cm. cavity.
35	*Angophora costata* Sydney Red Gum	16 9	700	M	Dominant Asymmetrical	Normal	High	High	8.4 m.	3.1 m.	
	Grass Verge 346 Pittwater Road										Good specimen, good form, health & vigour.
36	*Allocasuarina torulosa* Forest She Oak	13 7	320	M	Dominant Symmetrical	Normal	High	High	3.8 m.	2.3 m.	
	Grass Verge 348 Pittwater Road										Mallee form – multi stemmed from the base, pruned for wires on the western side. 80% canopy cover, 20% epicormic, and basal cavity 1 leader.
37	*Eucalyptus sclerophylla* Hard leaved Scribbly G.	7 7	180 250 440	M	Codominant Asymmetrical	Normal	High	Medium	6.5 m.	2.9 m.	
	Grass Verge 350 Pittwater Road										Small tree one sided canopy with restricted growth space. Trunk cavity at 1 m. multi stemmed from 1.6 m. Average form and overall condition.
38	*Eucalyptus haemastoma* Scribbly Gum	7 7	310	M	Intermediate Symmetrical	Normal	High	Medium	3.7 m.	2.3 m.	
	Grass Verge 350 Pittwater Road										Good specimen, good seed bearing tree. Twig & small branch dieback. Structurally stable.
39	*Corymbia gummifera* Red Bloodwood	14 9	620	M	Dominant Symmetrical	Normal	High	High	7.4 m.	2.8 m.	
	Grass Verge 354 Pittwater Road										Form reduced by heavy pruning to clear powerlines and driveway cross over. Good health & overall condition. Crown raised to 7 m.
40	*Corymbia gummifera* Red Bloodwood	13 6	350	M	Dominant Asymmetrical	Normal	High	Medium	4.2 m.	2.3 m.	
	Grass Verge 354 Pittwater Road										Good specimen, good vigour and overall condition.
41	*Eucalyptus sclerophylla* Hard leaved Scribbly G.	7 6	310	M	Codominant Asymmetrical	Normal	High	Medium	3.7 m.	2.2 m.	
	Grass Verge 354 Pittwater Road										Good specimen, good vigour and overall condition.
42	*Eucalyptus sclerophylla* Hard leaved Scribbly G.	8 6	310	M	Codominant Asymmetrical	Normal	High	Medium	3.7 m.	2.2 m.	

Tree No.	Genus/species Common Name	Height Spread	D.B.H. mm	Age	Crown Form Condition	Vigour	STARS	Retention Value	TPZ Radius	SRZ Radius	Comments
	Pathway only Corner Pittwater Road and Magdala Road, **North Ryde Park**										Tree leaning over street for light and space. Low canopy. Good vigour and condition. Low hanging branches need crown raising to 4 m. to prevent them being damaged be machinery or vehicles.
43	*Eucalyptus sideroxylon* Red Ironbark	11 11	400	M	Co Dominant Asymmetrical	Normal	High	High	4.8 m.	2.5 m.	
	North Ryde Park										Good form and vigour. Good specimen. No obvious defects
44	*Angophora costata* Sydney Red Gum	10 11	300 300	M	Co Dominant Asymmetrical	Normal	High	High	5.2 m.	2.5 m.	
	North Ryde Park										Good form and Vigour. Good specimen. No obvious defects. Low hanging branches.
45	*Eucalyptus sclerophylla* Hard leaved Scribbly G.	6 6	350	M	Codominant Asymmetrical	Normal	High	High	4.2 m.	2.3 m.	
	North Ryde Park – on the edge of the roadway.										Small spreading tree showing a decline in vigour. Crown dieback, small twig and branch dieback, 1 dead limb on western side of canopy. Basal suckers (from mechanical damage). Good fruiting tree.
46	*Eucalyptus globoidea* White Stringybark	9 11	175 340	M	Codominant Asymmetrical	Normal	High	Medium	4.7 m.	2.4 m.	
	North Ryde Park – on the edge of the roadway.										Significant and rare species. Tree showing general decline in condition, reduced health & vigour. 20% canopy cover, 10% epicormic growth. Crown die back. Poor growing conditions from ongoing soil compaction.
47	*Angophora bakeri* Narrow leaved Apple	8 7	320	M/ OM	Dominant Symmetrical	Normal	High	Medium /Low	3.8 m.	2.3 m.	
	North Ryde Park – Opposite 307B Pittwater Road.										Tree in decline. 20% canopy cover, 10% epicormic growth. Holding 10% medium volume deadwood.
48	*Corymbia gummifera* Red Bloodwood	11 9	320	M	Dominant Asymmetrical	Normal	Medium	Med	3.8 m.	2.3 m.	
	North Ryde Park – Opposite 311 Pittwater Road.										Small tree leaning towards road carriageway. Reduced crown cover to 30%. Good foliage condition but sparse. Twig and small branch dieback. Planted native species will not achieve full size potential in this location.
49	*Eucalyptus globulus* Tasmanian Blue Gum	13 9	310	M	Codominant Asymmetrical	Normal	Medium	Medium	3.7 m.	2.3 m.	
	North Ryde Park – Group planting Corner of Cressy Road										Small tree in group planting below powerlines. Basal cavity and dead basal sucker. Crown dieback and reduced vigour and overall condition.
50	*Eucalyptus haemastoma* Scribbly Gum	6 6	310	M	Codominant Asymmetrical	Normal	Medium	Medium	3.7 m.	2.3 m.	
	North Ryde Park – Corner of Cressy Road										Spreading tree on the street corner. Form reduced by powerline pruning. Average health and condition. Poorly located to accommodate future growth.
51	*Eucalyptus haemastoma* Scribbly Gum	8 7	290 310	M	Codominant Asymmetrical	Normal	Medium	Medium	15 m.	5.4 m.	

Tree No.	Genus/species Common Name	Height Spread	D.B.H. mm	Age	Crown Form Condition	Vigour	STARS	Retention Value	TPZ Radius	SRZ Radius	Comments
	Corner of Warwick Street – 358 Pittwater Road.										Excellent specimen, open spreading crown with center removed for powerline clearance. Good health and vigour. Minor defects.
52	*Angophora costata* Sydney Red Gum	12 12	620	M	Dominant Symmetrical	Normal	High	High	7.4 m.	2.8 m.	
	358 Pittwater Road										Good specimen with center removed for powerline clearance. Multiple trunks from the base. Good overall condition.
53	*Angophora costata* Sydney Red Gum	12 8	320 400	M	Co Dominant Asymmetrical	Normal	High	Medium	6.2 m.	2.7 m.	
	360 Pittwater Road										Completely one sided tree leaning towards roadway and away from powerlines. Cavity at base of the trunk, northern side.
54	*Angophora costata* Sydney Red Gum	12 7	450	M	Codominant Asymmetrical	Normal	High	Medium	5.4 m.	2.6 m.	
	364 Pittwater Road										Completely one sided tree leaning towards roadway and away from powerlines. Average health and vigour.
55	*Angophora costata* Sydney Red Gum	13 6	320	M	Codominant Asymmetrical	Normal	High	Medium	3.8 m.	2.3 m.	
	364 Pittwater Road										Tree restricted for open growing space, center removed for line clearance. Reduced form, vigour and overall condition. Reduced canopy cover, 20% epicormic growth.
56	*Angophora costata* Sydney Red Gum	12 8	400	M	Intermediate Symmetrical	Normal	High	Medium	4.8 m.	2.5 m.	
	364 Pittwater Road										80% of canopy over roadway. Small limb and tip die back. Poor form, average condition.
57	*Eucalyptus* sp. Stringybark	10 7	320	M	Codominant Asymmetrical	Normal	Medium	Medium	3.8 m.	2.3 m.	
	Myall Reserve southern corner										Significant tree (age, size & species) located in reserve. Good canopy cover, good from and condition. Small branch die back, normal for a tree of this size and age.
58	*Eucalyptus deanei* Mountain Blue Gum	16 15	650	M	Dominant Symmetrical	Normal	High	High	7.8 m.	3 m.	
	Myall Reserve										Small rock escarpment. Forest form, tall thin canopy. Average health and vigour.
59	*Corymbia gummifera* Red Bloodwood	16 6	300	M	Codominant Asymmetrical	Normal	Medium	Medium	3.6 m.	2.3 m.	
	Myall Reserve										Forest form, tall thin canopy. Average health and vigour.
60	*Angophora costata* Sydney Red Gum	16 7	300	M	Codominant Asymmetrical	Normal	Medium	Medium	3.6 m.	2.3 m.	

Tree No.	Genus/species Common Name	Height Spread	D.B.H. mm	Age	Crown Form Condition	Vigour	STARS	Retention Value	TPZ Radius	SRZ Radius	Comments
	Myall Reserve										Forest form, tall thin canopy. Average health and vigour.
61	*Corymbia gummifera* Red Bloodwood	15 8	280	M	Co Dominant Asymmetrical	Normal	Medium	Medium	3.4 m.	2.2 m.	
	Myall Reserve										Forest form, tall thin canopy. Average health and vigour.
62	*Angophora costata* Sydney Red Gum	16 7	180	M	Co Dominant Asymmetrical	Normal	Medium	Medium	2.2 m.	2 m.	
	Myall Reserve										Forest form, tall thin canopy. Average health and vigour.
63	*Corymbia gummifera* Red Bloodwood	16 6	125 300	M	Codominant Asymmetrical	Normal	Medium	Medium	4.0 m.	2.3 m.	
	Myall Reserve										Forest form, tall thin canopy. Average health and vigour.
64	*Corymbia gummifera* Red Bloodwood	15 6	300	M	Dominant Symmetrical	Normal	Medium	Medium	3.6 m.	2.3 m.	
	Myall Reserve – Southern Corner of Blenheim Road										Good specimen, good health and vigour. Excellent overall condition.
65	*Eucalyptus resinifera* Red Mahogany	14 12	310	M	Codominant Symmetrical	Normal	High	High	3.7 m.	2.3 m.	

Yours faithfully



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Please Note: I have no vested interest in any forthcoming tree works or actions carried out from recommendations made in this report.
Information contained in this report covers only those trees assessed. It reflects their condition at the time of assessment. The inspection was limited to a Visual Assessment without dissection, excavation, probing or core drilling. There is no guarantee, expressed or implied, that problems or deficiencies of the subject trees may not arise in the future.

Appendices

Appendix 1:	Tree Protection Zone Calculations	12, 13
Appendix 2:	Determining the protection zones of the selected trees TPZ	14
Appendix 3:	Determining the protection zones of the selected trees SRZ	14
Appendix 4:	Tree Significance Assessment Criteria (STARS)	15
Appendix 5:	Retention Value Priority Matrix Table 2	16
Appendix 6:	Matrix - Sustainable Retention Index Value Vigour Class and Condition Class Table 3	17
Appendix 7:	Glossary of terms	18, 19, 20, 21

Appendix 1

Tree Protection Zone Calculations

TREE NO.	diam 1	diam 2	diam 3	diam 4	DBH (cm)	DRB (cm)	TPZ radius (m)	TPZ area (m^2)	SRZ radius (m)
1	12	15	29		35	60	4.2	55	2.7
2	25				25	30	3.0	28	2.0
3	38				38	45	4.6	65	2.4
4	60				60	65	7.2	163	2.8
5	30	30			43	50	5.2	84	2.5
6	30	65			72	80	8.6	235	3.1
7	62				62	80	7.4	174	3.1
8	25	45	58		78	85	9.4	275	3.1
9	15	20	32		41	55	4.9	76	2.6
10	38	44			59	75	7.1	157	3.0
11	35				35	45	4.2	55	2.4
12	45				45	50	5.4	92	2.5
13	28				28	35	3.4	35	2.2
14	15				15	20	1.8	10	1.7
15	49				49	55	5.9	109	2.6
16	35				35	45	4.2	55	2.4
17	40				40	50	4.8	72	2.5
18	37				37	45	4.4	62	2.4
19	30	35	50		69	80	8.3	215	3.1
20	45				45	55	5.4	92	2.6
21	48				48	55	5.8	104	2.6
22	32				32	40	3.8	46	2.3
23	65				65	70	7.8	191	2.9
24	32				32	40	3.8	46	2.3
25	28	30			42	70	5.0	80	2.9
26	20	30	35	40	65	90	7.8	191	3.2
27	15	20	32		41	65	4.9	76	2.8
28	70				70	75	8.4	222	3.0
29	43				43	50	5.2	84	2.5
30	40				40	45	4.8	72	2.4
31	38	73			83	100	10.0	312	3.4
32	75				75	90	9.0	254	3.2
33	65				65	75	7.8	191	3.0
34	40	65	70		104	120	12.5	489	3.6
35	70				70	80	8.4	222	3.1
36	32				32	40	3.8	46	2.3
37	18	25	44		54	70	6.5	132	2.9
38	31				31	40	3.7	43	2.3
39	62				62	65	7.4	174	2.8
40	35				35	40	4.2	55	2.3
41	31				31	36	3.7	43	2.2
42	31				31	36	3.7	43	2.2
43	40				40	48	4.8	72	2.5
44	30	30			43	50	5.2	84	2.5
45	35				35	40	4.2	55	2.3
46	17	34			39	45	4.7	69	2.4
47	32				32	38	3.8	46	2.3
48	32				32		3.8	46	
49	31				31	38	3.7	43	2.3
50	31				31	38	3.7	43	2.3

TREE NO.	diam 1	diam 2	diam 3	diam 4	DBH (cm)	DRB (cm)	TPZ radius (m)	TPZ area (m^2)	SRZ radius (m)
51	29	310			312	320	15.0	707	5.4
52	62				62	65	7.4	174	2.8
53	32	40			52	60	6.2	122	2.7
54	45				45	55	5.4	92	2.6
55	32				32	40	3.8	46	2.3
56	40				40	48	4.8	72	2.5
57	32				32	40	3.8	46	2.3
58	65				65	75	7.8	191	3.0
59	30				30	38	3.6	41	2.3
60	30				30	38	3.6	41	2.3
61	28				28	35	3.4	35	2.2
62	18				18	28	2.2	15	2.0
63	12	30			33	40	4.0	49	2.3
64	30				30		3.6	41	
65	31				31	40	3.7	43	2.3

Appendix 2

Determining the tree protection zones of the selected trees

Extract from Australian Standard AS4970 2009 Protection of trees on development sites

3.1 Tree protection zone (TPZ)

"The tree protection zone (TPZ) is the principal means of protecting trees on development sites. The TPZ is a combination of the root area and crown area requiring protection. It is an area isolated from construction disturbance, so that the tree remains viable.

The TPZ incorporates the structural root zone (SRZ) (refer to Clause 3.3.5)."

3.2 Determining the TPZ

The radius of the TPZ is calculated for each tree by multiplying its D.B.H. x 12.

TPZ = D.B.H. x 12 where D.B.H. = trunk diameter measured at 1.4 m above ground from the center of the trunk.

Radius is measured from the centre of the stem at ground level.

Appendix 3

Determining the protection zones of the selected trees

Extract from Australian Standard AS4970 2009 Protection of trees on development sites

3.3.5 Structural root zone (SRZ)

"The SRZ is the area required for street stability. A larger area is required to maintain a viable tree. The SRZ only needs to be calculated when a major encroachment into a TPZ is proposed. Root investigation may provide more information on the extent of these roots."

Determining the SRZ

SRZ radius = $(D \times 50)^{0.42} \times 0.64$ where *D* = trunk diameter, in metres, measured above the root buttress.

Note: The SRZ for trees with trunk diameters less than 0.15 m will be 1.5 m.

Appendix 4

Significance of a **Tree**, **Assessment Rating System (STARS)** ©

From Institute of Australian Consulting Arborists 2010© from an original concept by Footprint Green Tree Significance & Retention Value Matrix, June 2001.

Tree Significance - Assessment Criteria

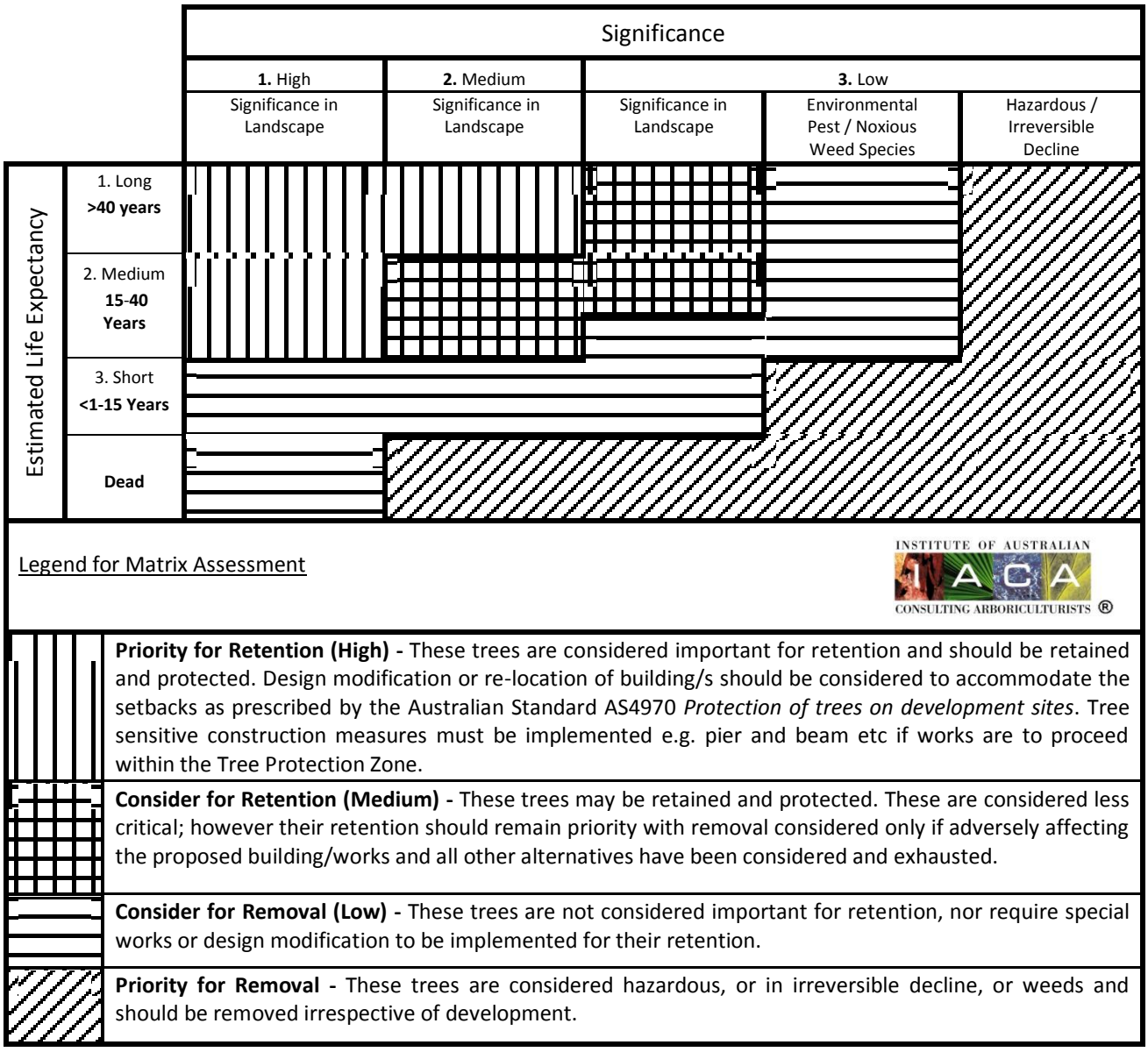
1. High Significance in landscape
- The tree is in good condition and good vigour;
- The tree has a form typical for the species;
- The tree is a remnant or is a planted locally indigenous specimen and/or is rare or uncommon in the local area or of botanical interest or of substantial age;
- The tree is listed as a Heritage Item, Threatened Species or part of an Endangered ecological community or listed on Councils significant Tree Register;
- The tree is visually prominent and visible from a considerable distance when viewed from most directions within the landscape due to its size and scale and makes a positive contribution to the local amenity;
- The tree supports social and cultural sentiments or spiritual associations, reflected by the broader population or community group or has commemorative values;
- The tree's growth is unrestricted by above and below ground influences, supporting its ability to reach dimensions typical for the taxa *in situ* - tree is appropriate to the site conditions.

2. Medium Significance in landscape
- The tree is in fair-good condition and good or low vigour;
- The tree has form typical or atypical of the species;
- The tree is a planted locally indigenous or a common species with its taxa commonly planted in the local area
- The tree is visible from surrounding properties, although not visually prominent as partially obstructed by other vegetation or buildings when viewed from the street,
- The tree provides a fair contribution to the visual character and amenity of the local area,
- The tree's growth is moderately restricted by above or below ground influences, reducing its ability to reach dimensions typical for the taxa *in situ*.

3. Low Significance in landscape
- The tree is in fair-poor condition and good or low vigour;
- The tree has form atypical of the species;
- The tree is not visible or is partly visible from surrounding properties as obstructed by other vegetation or buildings,
- The tree provides a minor contribution or has a negative impact on the visual character and amenity of the local area,
- The tree is a young specimen which may or may not have reached dimension to be protected by local Tree Preservation orders or similar protection mechanisms and can easily be replaced with a suitable specimen,
- The tree's growth is severely restricted by above or below ground influences, unlikely to reach dimensions typical for the taxa *in situ* - tree is inappropriate to the site conditions,
- The tree is listed as exempt under the provisions of the local Council Tree Preservation Order or similar protection mechanisms,
- The tree has a wound or defect that has potential to become structurally unsound.
  Environmental Pest / Noxious Weed Species
- The tree is an Environmental Pest Species due to its invasiveness or poisonous/ allergenic properties,
- The tree is a declared noxious weed by legislation.
  Hazardous/Irreversible Decline
- The tree is structurally unsound and/or unstable and is considered potentially dangerous,
- The tree is dead, or is in irreversible decline, or has the potential to fail or collapse in full or part in the immediate to short term.

Appendix 5

Table 2 Tree Retention Value - Priority Matrix.



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The IACA Significance of a Tree, Assessment Rating System (STARS) is free to use, but only in its entirety and must be cited as follows:

IACA, 2010, *IACA Significance of a Tree, Assessment Rating System (STARS)*, Institute of Australian Consulting Arboriculturists, Australia, www.iaca.org.au

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Australia ICOMOS Inc. 1999, *The Burra Charter – The Australian ICOMOS Charter for Places of Cultural Significance*, International Council of Monuments and Sites, www.icomos.org/australia

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Appendix 6

Table 3 Matrix - Sustainable Retention Index Value (SRIV) ©

Institute of Australian Consulting Arboriculturists, Australia, 2010, Sustainable Retention Index Value (SRIV), Version 4.

A visual method of objectively rating the viability of urban trees for development sites and management, based on general tree and landscape assessment criteria.

The matrix is to be used with the value classes defined in the Glossary for Age / Vigour / Condition. An index value is given to each category where ten (10) is the highest value.

Age Class	Vigour Class and Condition Class					
	Good Vigour & Good Condition (GVG)	Good Vigour & Fair Condition (GVF)	Good Vigour & Poor Condition (GVP)	Low Vigour & Good Condition (LVG)	Low Vigour & Fair Condition (LVF)	Low Vigour & Poor Condition (LVP)
	Able to be retained if sufficient space available above and below ground for future growth. No remedial work or improvement to growing environment required. May be subject to high vigour. Retention potential - Medium – Long Term.	Able to be retained if sufficient space available above and below ground for future growth. Remedial work may be required or improvement to growing environment may assist. Retention potential - Medium Term. Potential for longer with remediation or favourable environmental conditions.	Able to be retained if sufficient space available above and below ground for future growth. Remedial work unlikely to assist condition, improvement to growing environment may assist. Retention potential - Short Term. Potential for longer with remediation or favourable environmental conditions.	May be able to be retained if sufficient space available above and below ground for future growth. No remedial work required, but improvement to growing environment may assist vigour. Retention potential - Short Term. Potential for longer with remediation or favourable environmental conditions.	May be able to be retained if sufficient space available above and below ground for future growth. Remedial work or improvement to growing environment may assist condition and vigour. Retention potential - Short Term. Potential for longer with remediation or favourable environmental conditions.	Unlikely to be able to be retained if sufficient space available above and below ground for future growth. Remedial work or improvement to growing environment unlikely to assist condition or vigour. Retention potential - Likely to be removed immediately or retained for Short Term. Potential for longer with remediation or favourable environmental conditions.
(Y) Young	**YGVG - 9** **Index Value 9** Retention potential - Long Term. Likely to provide minimal contribution to local amenity if height <5 m. High potential for future growth and adaptability. Retain, move or replace.	**YGVF - 8** **Index Value 8** Retention potential - Short – Medium Term. Potential for longer with improved growing conditions. Likely to provide minimal contribution to local amenity if height <5 m. Medium-high potential for future growth and adaptability. Retain, move or replace.	**YGVP - 5** **Index Value 5** Retention potential - Short Term. Potential for longer with improved growing conditions. Likely to provide minimal contribution to local amenity if height <5 m. Low-medium potential for future growth and adaptability. Retain, move or replace.	**YLVG - 4** **Index Value 4** Retention potential - Short Term. Potential for longer with improved growing conditions. Likely to provide minimal contribution to local amenity if height <5 m. Medium potential for future growth and adaptability. Retain, move or replace.	**YLVF - 3** **Index Value 3** Retention potential - Short Term. Potential for longer with improved growing conditions. Likely to provide minimal contribution to local amenity if height <5m. Low-medium potential for future growth and adaptability. Retain, move or replace.	**YLVP - 1** **Index Value 1** Retention potential - Likely to be removed immediately or retained for Short Term. Likely to provide minimal contribution to local amenity if height <5 m. Low potential for future growth and adaptability.
(M) Mature	**MGVG - 10** **Index Value 10** Retention potential - Medium - Long Term.	**MGVF - 9** **Index Value 9** Retention potential - Medium Term. Potential for longer with improved growing conditions.	**MGVP - 6** **Index Value 6** Retention potential - Short Term. Potential for longer with improved growing conditions.	**MLVG - 5** **Index Value 5** Retention potential - Short Term. Potential for longer with improved growing conditions.	**MLVF - 4** **Index Value 4** Retention potential - Short Term. Potential for longer with improved growing conditions.	**MLVP - 2** **Index Value 2** Retention potential - Likely to be removed immediately or retained for Short Term.
(O) Over-mature	**OGVG - 6** **Index Value 6** Retention potential - Medium - Long Term.	**OGVF - 5** **Index Value 5** Retention potential - Medium Term.	**OGVP - 4** **Index Value 4** Retention potential - Short Term.	**OLVG - 3** **Index Value 3** Retention potential - Short Term. Potential for longer with improved growing conditions.	**OLVF - 2** **Index Value 2** Retention potential - Short Term.	**OLVP - 0** **Index Value 0** Retention potential - Likely to be removed immediately or retained for Short Term.

Appendix 7

Glossary of Terms

From Dictionary for Managing Trees in Urban Environments
Institute of Australian Consulting Arboriculturists (IACA) 2009.

Age of Trees **Age** Most trees have a stable biomass for the major proportion of their life. The estimation of the age of a tree is based on the knowledge of the expected lifespan of the taxa in situ divided into three distinct stages of measurable biomass, when the exact age of the tree from its date of cultivation or planting is unknown and can be categorized as *Young*, *Mature* and *Over-mature* (British Standards 1991, p. 13, Harris *et al*, 2004, p. 262).

Young Tree aged less than <20% of life expectancy, *in situ*.

Mature Tree aged 20-80% of life expectancy, *in situ*.

Over-mature Tree aged greater than >80% of life expectancy, *in situ,* or *senescent* with or without reduced *vigour*, and declining gradually or rapidly but irreversibly to death.

Basal Flare Swelling at the root crown usually uniform around the base of the trunk involving tissue from the trunk and root crown. Here first first order roots may not be evident at the root crown.

Buttress
A flange of adaptive wood as an upright extension of the first order roots and the trunk adding to the stability of many rainforest taxa and often on tall trees. The flange tapers up the trunk and out along the first order root where it may extend several metres from the trunk. It may extend the branches and branch collars on trees with short trunks.

Condition of Trees
Condition A tree's *crown form* and growth habit, as modified by its *environment* (aspect, suppression by other trees, soils), the *stability* and *viability* of the *root plate*, trunk and structural branches (first (1^{st}) and possibly second (2^{nd}) order branches), including structural defects such as wounds, cavities or hollows, *crooked* trunk or weak trunk/branch junctions and the effects of predation by pests and diseases. These may not be directly connected with *vigour* and it is possible for a tree to be of *normal vigour* but in *poor condition*. Can be categorized as *Good Condition*, *Fair Condition*, *Poor Condition* or *Dead*.

Good Condition Tree is of good habit, with *crown form* not severely restricted for space and light, physically free from the adverse effects of *predation* by pests and diseases, obvious instability or structural weaknesses, fungal, bacterial or insect infestation and is expected to continue to live in much the same condition as at the time of inspection provided conditions around it for its basic survival do not alter greatly. This may be independent from, or contributed to by vigour.

Fair Condition Tree is of good habit or *misshapen*, a form not severely restricted for space and light, has some physical indication of *decline* due to the early effects of *predation* by pests and diseases, fungal, bacterial, or insect infestation, or has suffered physical injury to itself that may be contributing to instability or structural weaknesses, or is faltering due to the modification of the *environment* essential for its basic survival. Such a tree may recover with remedial works where appropriate, or without intervention may stabilise or improve over time, or in response to the implementation of beneficial changes to its local environment. This may be independent from, or contributed to by vigour.

Poor Condition Tree is of good habit or *misshapen*, a form not severely restricted for space and light, exhibits symptoms of advanced and irreversible decline such as fungal or bacterial infestation, major dieback in the branch and foliage crown, structural deterioration from insect damage, or storm damage from lightning strike, ring barking from borer activity.

Crown Cover The estimated percentage of foliage covering the entire tree compared to that considered typical for the taxon when in good condition and in normal vigour and expressed as a percentage, considering crown form and vigour in situ.

Crown Projection Area within the dripline or beneath the lateral extent of the crown (Geiger 2004, p. 2).

Crown Spread **Crown Spread Orientation Non-radial** Where the crown extent is longer than it is wide, e.g. east/west or E/W. Further examples, north/south or N/S, and may be *Crown Form Codominant*, e.g. **A** or **B**, *Crown Form Intermediate* e.g. **A**, or *Crown Form Suppressed* e.g. **B***, and* crown symmetry is *symmetrical* e.g. **A**, or *asymmetrical* e.g. **B**.

Crown Spread Orientation Radial Where the *crown spread* is generally an even distance in all directions from the trunk and often where a tree has *Crown Form Dominant* and is *symmetrical.*

Diameter at Breast Height (D.B.H.) Measurement of trunk width calculated at a given distance above ground from the base of the tree often measured at 1.4 m. The trunk of a tree is usually not a circle when viewed in cross section, due to the presence of *reaction wood* or *adaptive wood*, therefore an average diameter is determined with a *diameter tape* or by recording the trunk along its narrowest and widest axes, adding the two dimensions together and dividing them by 2 to record an average and allowing the orientation of the longest axis of the trunk to also be recorded. Where a tree is growing on a lean the distance along the top of the trunk is measured to 1.4 m and the diameter then recorded from that point perpendicular to the edge of the trunk.
Where a *leaning* trunk is *crooked* a vertical distance of 1.4 m is measured from the ground. Where a tree branches from a trunk that is less than 1.4 m above ground, the trunk diameter is recorded perpendicular to the length of the *trunk* from the point immediately below the base of the flange of the *branch collar* extending the furthest down the trunk, and the distance of this point above ground recorded as *trunk* length.
Where a tree is located on sloping ground the D.B.H. should be measured at half way along the side of the tree to average out the angle of slope. Where a tree is *acaulescent* or *trunkless* branching at or near ground an average diameter is determined by recording the radial extent of the trunk at or near ground and noting where the measurement was recorded e.g. at ground.

Deadwood **Deadwood** Dead branches within a tree's crown and considered quantitatively as separate to *crown cover* and can be categorised as *Small Deadwood* and *Large Deadwood* according to diameter, length and subsequent *risk* potential. The amount of dead branches on a tree can be categorized as *Low Volume Deadwood*, *Medium Volume Deadwood* and *High Volume Deadwood*. See also *Dieback.*

Deadwooding *Removing of dead branches by pruning. Such pruning may assist in the prevention of the spread of decay from dieback or for reasons of safety near an identifiable target.*

Small Deadwood A dead branch up to 10 mm diameter and usually <2 metres long, generally considered of low *risk* potential.

Large Deadwood A dead branch >10 mm diameter and usually >2 metres long, generally considered of high *risk* potential.

Low Volume Deadwood Where <5 dead branches occur that may require *removal*.

Medium Volume Deadwood Where 5-10 dead branches occur that may require *removal*.

High Volume Deadwood Where >10 dead branches occur that may require *removal*.
constraints within the growing *environment* from topography e.g. slope, soil depth, rocky outcrops, exposure to predominant wind, soil moisture, depth of *water table* etc.

Dripline A line formed around the edge of a tree by the lateral extent of the *crown*. Such a line may be evident on the ground with some trees when exposed soil is displaced by rain shed from the crown

Epicormic Shoots Juvenile shoots produced at branches or trunk from *epicormic strands* in some Eucalypts (Burrows 2002, pp. 111-131) or sprouts produced from dormant or latent buds concealed beneath the bark in some trees. Production can be triggered by fire, pruning, wounding, or root damage **but may also be as a result of *stress* or *decline*.** Epicormic shoots can be categorized as *Low Volume Epicormic Shoots*, *Medium Volume Epicormic Shoots* and *High Volume Epicormic Shoots*.

Form of Trees **Crown Form** The shape of the crown of a tree as influenced by the availability or restriction of space and light, or other contributing factors within its growing environment. Crown Form may be determined for tree shape and habit generally as *Dominant*, *Codominant*, *Intermediate*, *Emergent*, *Forest* and *Suppressed*. The habit and shape of a *crown* may also be considered qualitatively and can be categorized as *Good Form* or *Poor Form*.

Good Form Tree of *typical* crown shape and habit with proportions representative of the taxa considering constraints such as origin e.g. indigenous or exotic, but does not appear to have been adversely influenced in its development by environmental factors in situ such as *soil water* availability, prevailing wind, or cultural practices such as lopping and competition for space and light.

Poor Form Tree of *atypical* crown shape and habit with proportions not representative of the species considering constraints and appears to have been adversely influenced in its development by environmental factors in situ such as *soil water* availability, prevailing wind, cultural practices such as lopping and competition for space and light; causing it to be *misshapen* or disfigured by disease or vandalism.

Crown Form Codominant Crowns of trees restricted for space and light on one or more sides and receiving light primarily from above e.g. constrained by another tree/s or a building.

Crown Form Dominant Crowns of trees generally not restricted for space and light receiving light from above and all sides.

Crown Form Emergent Crowns of trees restricted for space on most sides receiving most light from above until the *upper crown* grows to protrude above the canopy in a stand or forest environment. Such trees may be *crown form dominant* or transitional from *crown form intermediate* to *crown form forest* asserting both *apical dominance* and *axillary dominance* once free of constraints for space and light.

Crown Form Forest Crowns of trees restricted for space and light except from above forming tall trees with narrow spreading crowns with foliage restricted generally to the top of the tree. The trunk is usually erect, straight and continuous, tapering gradually, crown often excurrent, with first order branches becoming structural, supporting the live crown concentrated towards the top of the tree, and below this point other first order branches arising radially with each *inferior* and usually temporary, divergent and ranging from horizontal to ascending, often with internodes exaggerated due to competition for space and light in the *lower crown*.

Crown Form Intermediate Crowns of trees restricted for space on most sides with light primarily from above and on some sides only.

Crown Form Suppressed Crowns of trees generally not restricted for space but restricted for light by being *overtopped* by other trees and occupying an understorey position in the canopy and growing slowly.

Frangible Tree and shrub taxa utilised as roadside plantings and favoured as a result of their predisposition to breaking upon impact, especially from motor vehicle accidents. Such trees are usually of small dimensions or often shrub like.

Mallee A shrub or small tree of eucalypts with a crown formed from multiple stems, often subject to fire where the crown is destroyed and regenerates as a coppice or lignotuber (Beard 1990, p.128).

Roots **Primary Root Zone** Minimum root mass and soil volume essential for the basic survival of a tree, enabling it to be sustained or retained in good condition, without alteration to its physical characteristics or stability. A method that considers a minimum radial distance from the trunk that excavation as cut and fill and construction are permissible to enable a tree to be satisfactorily retained.

Root Crown Roots arising at the base of the trunk

Root Plate The entire root system of a tree generally occupying the top 300 – 600 mm of soil including roots at or above ground and may extend laterally for distances exceeding twice the height of the tree (Perry 1982, pp. 197 – 221). Development and extent is dependent on water availability, soil type, soil depth and the physical characteristics of the surrounding landscape.

First Order Roots Initial woody roots arising from the root crown at the base of the trunk. For structural support and stability. Woody roots may be buttressed and divided as a marked graduation, gradually tapering and continuous or tapering rapidly at a short distance from the root crown. Tree may develop 4 – 11 (Perry 1982, pp. 197-221) or more first order roots which may radiate from the trunk with even distribution or be prominent on a particular aspect.

Significant Important, weighty or more than ordinary. **Significant Tree** A tree considered important, weighty or more than ordinary. Example: due to prominence of location, or *in situ*, or contribution as a component of the overall landscape for *amenity* or aesthetic qualities, or *curtilage* to structures, or importance due to uniqueness of taxa for species, subspecies, variety, *crown form*, or as an historical or cultural planting, or for age, or substantial dimensions, or habit, or as *remnant vegetation*, or habitat potential, or a rare or threatened species, or uncommon in cultivation, or of aboriginal cultural importance, or is a commemorative planting.

Stability resistance to change especially from loading forces or physical modifications to a tree's growing environment.

Structural integrity The ability of a load bearing part of a tree, e.g. Trunk, branch or root under normal conditions to sustain resistance to loading forces such as bending.

Substantial A tree with large dimensions or proportions in relation to its place in the landscape.

Trunk

Trunk A single stem extending from the *root crown* to support or elevate the *crown*, terminating where it divides into separate *stems* forming *first order branches*. A trunk may be evident at or near ground or be absent in *acaulescent* trees of *deliquescent* habit, or may be continuous in trees of *excurrent* habit. The trunk of any *caulescent* tree can be divided vertically into three (3) sections and can be categorized as *Lower Trunk*, *Mid Trunk* and *Upper Trunk*. For a *leaning* tree these may be divided evenly into sections of one third along the trunk.

Acaulescent A *trunkless* tree or tree growth forming a very short *trunk*. See also *Caulescent.*
Caulescent Tree grows to form a *trunk*. See also *Acaulescent*.

Vigour **Vigour** Ability of a tree to sustain its life processes. This is independent of the *condition* of a tree but may impact upon it. Vigour can appear to alter rapidly with change of seasons (seasonality) e.g. *dormant*, deciduous or semi-deciduous trees.

Normal Vigour Ability of a tree to maintain and sustain its life processes. This may be evident by the *typical* growth of leaves, *crown cover* and *crown density*, branches, roots and trunk and *resistance* to *predation*. This is independent of the *condition* of a tree but may impact upon it, and especially the ability of a tree to sustain itself against predation.

High Vigour *Accelerated growth* of a tree due to incidental or deliberate artificial changes to its growing *environment* that are seemingly beneficial, but may result in *premature aging* or failure if the favourable conditions cease, or promote *prolonged senescence* if the favourable conditions remain, e.g. water from a leaking pipe; water and nutrients from a leaking or disrupted sewer pipe; nutrients from animal waste; or some trees may achieve an extended lifespan from continuous *pollarding* practices over the life of the tree.

Low Vigour Reduced ability of a tree to sustain its life processes. This may be evident by the *atypical* growth of leaves, reduced *crown cover* and reduced *crown density*, branches, roots and trunk, and a deterioration of their functions with reduced *resistance* to *predation*. This is independent of the *condition* of a tree but may impact upon it, and especially the ability of a tree to sustain itself against predation.

Dormant Tree Vigour Determined by existing turgidity in lowest order branches in the outer extremity of the crown, with good bud set and formation, and where the last *extension growth* is distinct from those most recently preceding it, evident by bud scale scars. Normal vigour during dormancy is achieved when such growth is evident on a majority of branches throughout the canopy.

Witches Broom A virus or other pathogen- initiated reaction culminating in excessive branching from a given point.