Northern Beaches Hospital Connectivity and Network Enhancements: Stage 2

Urban Design Report and Landscape Character and Visual Impact Assessment

Final report - July 2015
Looking south from existing footbridge over Warringah Road
Northern Beaches Hospital Connectivity and Network Enhancements: Stage 2

Urban Design Report and Landscape Character and Visual Impact Assessment

Final report - July 2015

Prepared for:

NSW Transport Roads & Maritime Services

Prepared by:

SPACKMAN MOSSOP MICHAELS

PO Box 880 Darlinghurst, NSW 1300
P (02) 9361 4549 • F (02) 9361 4569
www.sm2group.com.au
ABN 65 065 578 985

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1. Project description and requirements

1.1 Introduction

Roads and Maritime Services (Road and Maritime) is now seeking approval for the Stage 2 Project Network Enhancement Works (Stage 2 Project) which forms part of the Northern Beaches Hospital – Road Connectivity and Network Enhancements Project Concept Proposal. Approval is sought under Part 5.1 (State significant infrastructure) of the Environmental Planning and Assessment Act 1979 (NSW) (EP&A Act).

The Stage 2 Project comprises road upgrades directed towards broader network capacity enhancement of the existing road network surrounding the Northern Beaches Hospital (NBH) at Frenchs Forest, within the Warringah local government area (LGA) on Sydney’s Northern Beaches (refer to Figure 1-1). These upgrades focus on Warringah Road which caters for the dominant traffic movement.

The Stage 2 Project is generally proposed to be carried out in the following locations:

- Warringah Road between west of Fitzpatrick Ave East to west of Allambie Road
- Forest Way between Warringah Road and the Stage 1 Project tie in (about 100 metres north of the Warringah Road intersection)
- Wakehurst Parkway from the intersection with Warringah Road to about 120 metres south of Aquatic Drive
- Aquatic Drive for about 100 metres east from the intersection with Wakehurst Parkway
- Allambie Road between Warringah Road and Rodborough Road.

On Warringah Road, the Stage 2 Project is incorporated largely within the existing road-reserve to the north, and extends beyond the existing road-reserve to the south by up to 30 metres.

The indicative location of the Stage 2 Project is shown in Figure 1-2.

Design and assessment of the Northern Beaches Hospital building and surrounds, is a separate project undertaken by others and subject to a separate approval application.
1.2 Background

Roads and Maritime placed the EIS for the Concept Proposal and Stage 1 Project Hospital Connectivity Works on public exhibition between 22 October 2014 to 21 November 2014. A Submissions Report, which responds to issues raised during exhibition has been prepared and is currently being considered by the Department of Planning and Environment (DP&E) as part of its assessment. Based on this assessment the Department will decide whether to recommend concept approval of the Northern Beaches Hospital – Road Connectivity and Network Enhancements Project, and Project approval for the Stage 1 Project.

Northern Beaches Hospital is proposed by NSW Health Infrastructure (HI) and would be located at the intersection of Warringah Road / Wakehurst Parkway and Frenchs Forest Road / Wakehurst Parkway. The hospital concept proposal and the first stage (clearing and utility works) of the hospital project were approved on 22 June 2014, and the second stage of the Northern Beaches Hospital project (hospital construction and operation) is currently being considered by the Department of Planning and Environment.

The Long Term Transport Master Plan (Transport for NSW, 2012) identifies Warringah Road as a key strategic transport corridor linking Dee Why and Chatswood. Heavy traffic flows and congestion along Warringah Road during commuter peak periods and, to a lesser degree, during business hours result in low average peak travel speeds, unreliable travel times and disruptions to traffic movements. This impacts both road users and the adjoining community. Warringah Road is already operating at or beyond capacity during peak periods and is expected to experience continued traffic growth in the future.

Based on the anticipated future land use changes, both within and surrounding the Northern Beaches Hospital Precinct, under Warringah Council’s structure plan (currently being prepared by Warringah Council), and the current level of congestion on Warringah Road (a key strategic transport corridor linking Dee Why and Chatswood), the Stage 2 Project is needed at a strategic level to:

- Assist in the management of journeys in connection with anticipated future intensification of medical, commercial and residential land uses surrounding the new hospital
- Mitigate the worsening of traffic congestion on the Warringah Road and Wakehurst Parkway arterial road corridors and their principal feeder roads
- Enhance access arrangements by car, bus and active transport for the Northern Beaches Hospital employees, patients, outpatients and visitors
- Facilitate improved access to the Northern Beaches Hospital and the surrounding employment precincts
- Have key infrastructure components in place for the proposed hospital opening in 2018.
1.3 Location

The Stage 2 project is located on the Northern Beaches district of Sydney, in the suburb of Frenchs Forest about 17 kilometres (km) north of the Sydney CBD and five kilometres west of Dee Why. The surrounding road network comprises Warringah Road (between Maxwell Avenue and Courtley Road), Frenchs Forest Road, which runs parallel with Warringah Road and connects Allambie Road to the east with Forest Way in the west and Wakehurst Parkway, which intersects with both Frenchs Forest Road and Warringah Road. The NBH site is situated between the block formed by Frenchs Forest Road and Warringah Road with Wakehurst Parkway.

The location of the Stage 2 project is shown in Figure 1-1.
1.4 The study area

The suburbs of Frenchs Forest and Forestville further to the west of the Stage 2 project site, are enveloped by Garrigal National Park, Garigal National Park and Middle Harbour and are dotted with playing fields, parks and remnant bushland, which afford its residents plentiful recreational resources, open space and visual amenity. Colloquially known as the Forest, the suburbs are centrally located between the beaches of Dee Why and Curl Curl and metropolitan Chatswood.

The study area for the concept proposal comprises both the Stages 1 and 2 projects and the immediate surrounding area.

The Stage 1 project, assessed in a separate report, comprises Frenchs Forest Road and Naree Road between Warringah Road in the east and Forest Way in the west. It also comprises a sections of Warringah Road, Allambie Road, Wakehurst Parkway and Forest Way.

The Stage 2 project, which is the focus of this report, is centred on Warringah Road, between Maxwell Parade in the west and Allambie Road in the east. It also comprises the Wakehurst Parkway corridor and Allambie Road, both primarily south of Warringah Road.

The location of the concept proposal and the Stage 1 and 2 projects and their key features are shown in Figure 1-2.
Figure 1-2: Project overview and staging

- **Stage one road upgrades**
  - Hospital connectivity works
  - Widening and upgrade along Warringah Road at surface
  - Through traffic on Warringah Road separated from Forest Way by way of an underpass
  - Through traffic on Warringah Road separated from turning traffic at Hilmer Street by way of an underpass

- **Stage two road upgrades**
  - Network enhancement works
  - Construction compound sites
  - Underpass for through traffic
  - Pedestrian overbridge

- **Proposed shared pedestrian / cyclist bridges**
  - New on-ramp from Wakehurst Parkway southbound into the slot westbound
  - Through traffic on Warringah Road separated from turning traffic at Wakehurst Parkway by way of an underpass
  - New shared path and footpath east side of Forest Way
  - New shared path and footpath east side of Warringah Road
  - New shared path and footpath west side of Allambie Road
  - New shared path and footpath west side of Forest Way
  - Proposed shared pedestrian / cyclist bridges

- **Other improvements**
  - Remove existing pedestrian overbridge and replace with shared pedestrian / cyclist bridges
  - New on-ramp from Wakehurst Parkway southbound into the slot westbound
  - Through traffic on Warringah Road separated from turning traffic at Wakehurst Parkway by way of an underpass
  - Through traffic on Warringah Road separated from turning traffic at Hilmer Street by way of an underpass

- **Connecting Aquatic Drive with Wakehurst Parkway**
  - Widening of Allambie Road south of Warringah Road
  - Widening of Allambie Road south of Warringah Road
1.5 Project description

The Stage 2 Project would broadly include the following key project elements (subject to detailed design):

- Provision of four through lanes on Warringah Road (two lanes in each direction for east-west through traffic) within a grade separated open slot for about 1.3 kilometres

- Ingress and egress points from and to the slot include:
  - Western extent - Warringah Road near Fitzpatrick Avenue East
  - Eastern extent - Warringah Road from about 350 metres east of the Wakehurst Parkway grade separated intersection
  - Provision of a two-lane on-ramp (merging into one lane) from Wakehurst Parkway (southbound) into the slot (westbound)

- Widening of Warringah Road from west of Fitzpatrick Avenue East to west of Allambie Road to include:
  - Westbound travel lanes, at surface level on the southern side of the Warringah Road corridor for the length of the project
  - Eastbound travel lanes, at surface level on the northern side of the Warringah Road corridor (using existing road pavement), for the length of the project

- The intersections of Warringah Road with Forest Way, Hilmer Street and Wakehurst Parkway to form a surface level bridge over the slot to provide all traffic movements at surface level and allow east-west through traffic in the slot to pass beneath uninterrupted.

- Upgrades or adjustments to existing intersections of Warringah Road with the following local roads and approaches:
  - Fitzpatrick Avenue East (including the closing of the left turn into Fitzpatrick Avenue East from Warringah Road westbound)
  - Rodborough Road
  - Allambie Road

- Widening of Wakehurst Parkway from the intersection of Warringah Road to south of Aquatic Drive

- Provision of a new connection at Aquatic Drive including right in from Wakehurst Parkway (northbound), left in from Wakehurst Parkway and left out movements from Aquatic Drive and Wakehurst Parkway.

- Provision of shared (pedestrian and cyclist) bridges at the following locations:
  - Across Warringah Road west of the intersection of Forest Way (removal and replacement of the existing pedestrian bridge).
  - Across Warringah Road on the western side of the intersection with Hilmer Street (new pedestrian bridge).

- Removal of the existing pedestrian crossing across Warringah Road at Hilmer Street.

The Stage 2 Project would also include drainage works, landscaping, property acquisition and adjustments. The ancillary works would include but not be limited to, construction compounds, and stockpile sites. For the purposes of this EIS, the scope of the Stage 2 Project would not include ongoing maintenance works.
1.6 Secretary Environmental Assessment Requirements

The Secretary has set out the assessment requirements (refer Tables 1-1 and 1-2) that must be addressed in relation to urban design. The requirements have been determined by the NSW Department of Planning and Environment. An assessment of the Stage 2 project is required under the Environmental Planning and Assessment Act 1979 Part 5.1.

Refer to Secretary Environmental Assessment Requirements for Northern Beaches Hospital Connectivity and Network Enhancement Works (SSI 6622) (NSW Department of Planning and Infrastructure, 08.09.2014).

**Table 1-1:** Secretary Environmental Assessment’s Requirements – Urban Design

<table>
<thead>
<tr>
<th>No.</th>
<th>Stage 2 visual amenity, built form and urban design requirement</th>
<th>Urban design strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.0</td>
<td>Stage 2 connectivity and network enhancements</td>
<td></td>
</tr>
</tbody>
</table>
| 2.1 | Rationale for the overall design of enhancement works and key elements within the framework of the concept proposal in terms of:  
  ✔ Scale, length, height, width, materials, lighting and relationship of elements that affects the form and appearance of the proposal in its context for users and the community  
  ✔ Views to and from the proposal  
  ✔ Design relationship to the existing State road network and adjoining built forms and streetscapes. | Urban design guidance has been developed in order to inform the scale, dimensions, materiality and aesthetic quality of infrastructure elements.  
Views to and from the Stage 2 project have been reviewed as part of a visual impact assessment prepared in accordance with Roads and Maritime guidelines.  
A contextual analysis has been undertaken to ascertain background knowledge of the Stage 2 project area in order to establish a contextual framework within which to develop appropriate mitigation measures.  
Refer Sections 3 - 4 of this report |
| 2.2 | An assessment of the visual and amenity impacts of the proposal (including a visual impact assessment) on the local and regional area, particularly on:  
  ✔ Existing and future residential properties adjacent to the proposal alignment  
  ✔ The proposed Northern Beaches Hospital and The Forest High School  
  ✔ Character precincts  
  ✔ Landscape, particularly trees and vegetation along the Wakehurst Parkway corridor  
  ✔ Adjoining commercial, industrial, educational, cultural and recreational land uses  
  ✔ Significant vantage points in the public domain. | A visual impact assessment has been prepared in accordance with Roads and Maritime guidelines. A strategy has been developed that mitigates physical and visual impacts for local residents and workers and adjoining land uses, road users and other selected viewpoints in terms of context.  
Future developments whilst not currently proposed next to the upgrade, are likely and would be subject to similar visual impact mitigation strategies Future residential development next to the upgrade, whilst unlikely, would benefit from the mitigation measures currently proposed, however this would need to be assessed in the future.  
Refer Section 4 of this report |
<table>
<thead>
<tr>
<th>No.</th>
<th>Stage 2 visual amenity, built form and urban design requirement</th>
<th>Urban design strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.3</td>
<td>Consideration of design, including safety aspects, for pedestrian, cycle and bus connectivity and access and related facilities as part of and within the vicinity of the proposal.</td>
<td>The concept design prepared by Roads and Maritime has been developed to improve access and connectivity for motorists, bus services, cyclists and pedestrians, as well as safety for all road users and pedestrians. Urban design has participated in this design process to ensure that cyclists and pedestrians are well connected to study area destinations, residential areas and local landmarks. Refer Section 3 of this report.</td>
</tr>
<tr>
<td>2.4</td>
<td>Landscape needed to protect or repair affected trees and vegetation, mitigate proposal impacts and blend the proposal into the adjacent environment, and consistency with the landscape and urban design concepts of the proposed Northern Beaches Hospital.</td>
<td>Landscape design objectives and principles have been developed based on an assessment of existing vegetation communities and corridors, in order to mitigate vegetation loss necessary for constructing the upgrade. The landscape design is to ensure a consistent streetscape and ensure screening of impacted properties. The design must also ensure a consistency with the NBH landscape design and to provide appropriately considered gateway statements. Refer Section 3 of this report.</td>
</tr>
<tr>
<td>2.5</td>
<td>Visual impact assessment of the construction and operation impacts of the proposal and how visual and amenity impacts are to be mitigated, including noise mitigation measures.</td>
<td>A high level assessment has been made of impacts during construction and how these impacts can be mitigated during Stage 2. As precise staging of works is not currently known, this would be subject to further development during later design stages and during construction. Refer Section 4.6 of this report.</td>
</tr>
<tr>
<td>2.6</td>
<td>Incorporation of water sensitive urban design (WSUD) where possible</td>
<td>WSUD is to be considered as a means of managing surface water wherever possible</td>
</tr>
<tr>
<td>Supplementary Requirements</td>
<td>Urban design strategy</td>
<td></td>
</tr>
<tr>
<td>----------------------------</td>
<td>--------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>B7</td>
<td>Visual amenity, built form and urban design is to be considered as a key issue</td>
<td>Urban design has been integrated into the concept design of the proposal. Mitigation measures outlined in Section 4.6 of this report require urban design integration during detailed design stages.</td>
</tr>
<tr>
<td>B8</td>
<td>Consideration of the design objectives and principles identified in <em>Northern Beaches Hospital Connectivity and Network Enhancements: Concept Proposal and Stage 1 Urban Design and Landscape Character and Visual Impact Assessment</em>, SMM October 2014</td>
<td>Where interfacing with the Stage 1 proposal, objectives and principles for the Stage 2 project have considered the Stage 1 objectives and principles. Site wide objectives and principles outlined for the Concept Proposal have been further developed in the Stage 2 project. Refer Section 1 of this report</td>
</tr>
<tr>
<td>B9</td>
<td>As part of the rationale of design, a demonstration that in areas that have a moderate to high landscape character impact rating, that impacts have been minimised, including in relation to loss of verge and vegetation</td>
<td>Section 4.2 - 4.5 of this report has assessed landscape character and visual impacts that would potentially result from the Stage 2 project. Mitigation measures outlined in Section 4.7 of this report have been developed in response to these impacts, both in the concept design and for inclusion in the subsequent detailed design. These measures have been outlined both as an overall strategy as well as specifically measures applied to visual assessment precincts and landscape character zones with impact ratings assessed between Moderate and High.</td>
</tr>
<tr>
<td>B10</td>
<td>A demonstration that significant infrastructure will be designed to minimise impacts, including but not limited to retaining structures and walls associated with the slot road, pedestrian overbridges and noise walls. This will include the presentation of visual concepts for these structures</td>
<td>The concept design has been developed in parallel with the impact assessment and mitigation measures to ensure an integrated outcome. During detailed design additional measures are to be incorporated once more detailed information has been ascertained regarding, for example, the site, traffic modelling and structural requirements. Representative designs have been prepared of the major elements in plan, section and perspective view in Section 3 of this report. These concept designs are to guide the development of these elements during the detailed design stage.</td>
</tr>
</tbody>
</table>
1.7 Urban design guidance

The following documents, guidelines and policy framework are important references for the continuing design development for the project and have been considered in the preparation of this urban design report and associated concept design and mitigation measures (refer Plates 1-1 and 1-2):

- **Beyond the Pavement** (Roads and Maritime, 2014)
- **EIA N04 Practice Note: Guidelines for Landscape Character and Visual Impact Assessment V2.0** (Roads and Maritime, 2013)
- **Bridge Aesthetics** (Roads and Maritime, 2012)
- **Noise Wall Guidelines** (Roads and Maritime, 2006)
- **Shotcrete Design Guidelines** (Roads and Maritime, 2005)
- **Landscape Guidelines** (Roads and Maritime, 2008)
- **Northern Beaches Hospital Precinct Supporting Road Network - Urban Design Framework** (KI Studio, September 2013)
- **Northern Beaches Hospital Connectivity and Network Enhancements Preliminary Environmental Investigation** (SMEC, 2014)
- Warringah Local Environmental Plan (Warringah Council, 2011)
- Frenchs Forest Significant Site Study (now discontinued) (Department of Planning & Environment, 2010)
- Frenchs Forest Structure Plan (Warringah Council, 2014)
- Shaping our future, transport and health investment (SHOROC, 2010)

Plate 1-1: Cover page of Urban Design Framework report (KI Studio, September 2013)
1.8 Urban design and landscape objectives and principles

Objectives

The over-arching aim of the urban design proposal is to ensure that the project is physically and visually integrated with its surrounding environment and where possible, maximises engagement of the road user with local context in order to provide a more enjoyable and interesting driving experience. Urban and landscape design work in combination in order to provide a dialogue with the existing landscape, a consistency of visual outcomes along the upgrade and to satisfy the Secretary Environmental Assessment Requirements.

In order to meet these aims, a set of key urban design objectives and related design principles have been developed. These objectives and principles reference Roads and Maritime’s Beyond the Pavement and other key guidelines. These objectives and principles are also based on an understanding of the key existing landscape and urban values of the study area and the landscape and urban design issues that affect, or are affected by, the Stage 2 project.

These urban design objectives have been developed in order to:

• Retain and reinforce the parkway character of Warringah Road and Wakehurst Parkway and distinguish the ecological character of Wakehurst Parkway from the more formal and urbanised parkland character of Warringah Road
• Reinforce the lush and green character of the area and express the bushland character
• Deliver an integrated approach to traffic (including pedestrian and cycle), public transport and land use
• Retain the privacy and amenity of residents in the local streets in the immediate area, and provide opportunities for urban restructuring and redevelopment
• Define the address of the hospital locality as well as expressing the area as a gateway to the Northern Beaches
• Create a clear structural framework for streetscapes that enhances the legibility, way-finding and functioning of the precinct
• Design integrated urban infrastructure/landscape design elements that allow the landscape to dominate and built forms to recede.
Principles

A series of urban design principles have been developed to ensure that the urban and landscape design objectives are achieved by the road enhancement. The purpose of these principles is to integrate sound urban design practice into all aspects of the concept design development, and also inform the detailed design and construction phases of the Stage 2 project.

The urban design principles relate to three broad areas of design influence:

- **Road alignment design** - The design of the location and geometry of the Stage 2 project
- **Road elements design** - Input into the design of structures (e.g., walls and bridges), fences and furniture that are necessary to achieve the desired road alignment or are required for the effective operation of the road
- **Landscape design** - The design of new planting or revegetation areas in order to integrate the stage 2 project with the existing local landscape character and natural patterns, and to provide interest to the road users and pedestrians.

Table 1-3 below describes the interrelationship between the urban design objectives, their associated urban design principles and the areas of the Stage 2 project that they influence. The mitigation measures that respond to the principles and impacts identified are located in Section 4 of this report.

<table>
<thead>
<tr>
<th>Urban design objectives &amp; related principles</th>
<th>Areas of design influence</th>
</tr>
</thead>
<tbody>
<tr>
<td>I Retain and reinforce the parkway character of Warringah Road and Wakehurst Parkway and distinguish the ecological character of Wakehurst Parkway from the more formal and urbanised parkland character of Warringah Road</td>
<td>![Icon] ![Icon] ![Icon]</td>
</tr>
<tr>
<td>1A Ensure that parkway character of both Warringah Road and Wakehurst Parkway are retained through ensuring adequate retention and protection of existing trees and vegetation wherever possible. In particular, ensure vegetation is retained on both sides of the roadway along Warringah Road, where higher impacts are planned.</td>
<td>![Icon] ![Icon] ![Icon]</td>
</tr>
<tr>
<td>1B Minimise earthworks in order to maximise vegetation retention.</td>
<td>![Icon]</td>
</tr>
<tr>
<td>1C Carefully locate shared paths and utility corridors so not to require removal of critical trees e.g., locate shared path if practical along the southern verge of Warringah Road.</td>
<td>![Icon] ![Icon]</td>
</tr>
<tr>
<td>1D Encroach any required new road work into the southern verge of Warringah Road.</td>
<td>![Icon]</td>
</tr>
<tr>
<td>1E Apply an informal bush landscape character with large scale boulders and informal native planting along Wakehurst Parkway, and a more urbanised parkway landscape concept along Warringah Road.</td>
<td>![Icon]</td>
</tr>
<tr>
<td>Urban design objectives &amp; related principles</td>
<td>Areas of design influence</td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td></td>
<td>Road alignment design</td>
</tr>
<tr>
<td>1F Improve facilities for all road users – including motorists, pedestrians and cyclists.</td>
<td>●</td>
</tr>
<tr>
<td>2 Reinforce the lush and green character of the area and express the bushland character</td>
<td></td>
</tr>
<tr>
<td>2A Use native vegetation in the application of landscape design strategies to reinforce the character of the area.</td>
<td></td>
</tr>
<tr>
<td>2B Evaluate opportunities of introducing street trees along Forest Way.</td>
<td>●</td>
</tr>
</tbody>
</table>
### Urban design objectives & related principles

<table>
<thead>
<tr>
<th>Objective</th>
<th>Areas of design influence</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Road alignment design</td>
</tr>
<tr>
<td>6B  If possible, avoid the introduction of noise barriers that visually bisect the community/precinct. If these elements are required integrate these with fencing elements and soften their appearance with vegetation.</td>
<td></td>
</tr>
<tr>
<td>6C  Minimise impacts to existing vegetation and utilise it as green buffers/visual foils to new built form, and urban infrastructure.</td>
<td></td>
</tr>
<tr>
<td>6D  Reinforce/formalise the existing pedestrian link between the hospital site and The Forest High School.</td>
<td></td>
</tr>
<tr>
<td>6E  Ensure existing pedestrian links are retained and proper connectivity is achieved to road crossings, particularly for Warringah Road.</td>
<td></td>
</tr>
<tr>
<td>6F  Create a buffer zone between road and path to increase pedestrian safety and articulate the paved surfaces.</td>
<td></td>
</tr>
<tr>
<td>6G  Avoid as much as practical the introduction of concrete barriers.</td>
<td></td>
</tr>
<tr>
<td>6H  Evaluate opportunities to introduce pedestrian crossings as overpasses, acting as legible markers to both drivers and pedestrians.</td>
<td></td>
</tr>
<tr>
<td>6I  Ensure hospital access/entry points allow proper connectivity to major arterial roads.</td>
<td></td>
</tr>
<tr>
<td>6J  Apply CPTED (Crime Prevention Through Environmental Design) principles in the design resolution of the Stage 2 project</td>
<td></td>
</tr>
<tr>
<td>7   Design integrated urban infrastructure/landscape design elements that allow the landscape to dominate and built forms to recede</td>
<td></td>
</tr>
<tr>
<td>7A  Consider the use of natural materials in built form elements to reinforce the setting’s character.</td>
<td></td>
</tr>
<tr>
<td>7B  Consider, if practical, under grounding power lines particularly on the high ridge area, and in constrained areas, to enhance opportunities for planting.</td>
<td></td>
</tr>
<tr>
<td>7C  Use colour schemes that complement the area’s character or that help recede built form elements.</td>
<td></td>
</tr>
<tr>
<td>7D  Apply landscape strategies that complement the future character and scale of built form elements of the precinct.</td>
<td></td>
</tr>
<tr>
<td>7E  Apply darker colours in areas where structures should visually recede.</td>
<td></td>
</tr>
<tr>
<td>7F  Introduce stepped retaining walls (where possible) with planted benches to reinforce the green character of the setting.</td>
<td></td>
</tr>
<tr>
<td>7G  Consider widening the road corridor in strategic areas to allow better greening opportunities.</td>
<td></td>
</tr>
<tr>
<td>7H  Introduce vegetated batters where practical to conceal the apparent height of structures.</td>
<td></td>
</tr>
<tr>
<td>7I  Introduce water sensitive design and minimise hard surface engineered drainage concepts.</td>
<td></td>
</tr>
</tbody>
</table>
2. Existing environment

The following section of the report provides a summary of existing landscape context and cultural influences on the concept proposal study area. The purpose of this background information is to inform the development of mitigation measures that respond to impacts that have been identified in the Secretary Environmental Assessment’s requirements.

Further detail can be obtained by reviewing the relevant specialist consultant’s reports.

2.1 Geology

The study area is underlain by Hawkesbury Sandstone and Triassic Wianamatta Group Shales, which comprise the Liverpool Sub-Group of Minchinbury Sandstone and Bringelly and Ashfield Shales (1:250,000 Geological Series Sheet S1 56-5 Sydney). The sandstone geology has weathered to leave exposed stone outcroppings, while the shale geology consists of shale with sandstone lenses. Many locations have been disturbed by development.

An existing cutting located on Wakehurst Parkway south (refer Plate 2.1) of the intersection with Warringah Road, provides a good example of the underlying sandstone formation. Further south along Wakehurst Parkway, good examples of sandstone outcropping are present.

The study area is within the Lucas Heights soil landscape, overlying shale at 3-5 m thick and Hawkesbury Sandstone at about 10-11 metres deep. Pockets of clay are common, while bands of iron-rich sands and ironstone gravels can also be found.

The main soil types to be expected are sandstone derived soils associated with ridgelines, as well as pockets or ironstone gravels and shaly clays.

Urban design considerations:
• Geology and soil types closely relate to vegetation communities present, therefore dictating the landscape approach
• Opportunity to reveal exposed rock in proposed cuttings or re-use rock material
• Understanding the drainage properties of soils is crucial to ensure appropriate species are selected and sensitive catchments are protected.

Plate 2-1: Existing sandstone cutting adjacent Wakehurst Parkway showing underlying sandstone formation
2.3 Climates factors

The Frenchs Forest to Terry Hills area is relatively high in elevation in a local context and known locally to be more exposed to heavy rainstorms and colder temperatures than the nearby coastal suburbs. According to Bureau of Meteorology data, Frenchs Forest has a total mean annual rainfall of 1,348.8 millimetres (mm), with the highest mean monthly rainfall falling in the months of January to April (129.5 to 155.5 mm per month). At Collaroy Beach 2.8 km to the north of Dee Why, reduced mean rainfall of 119.7 to 109.4 mm is recorded for the same period.

Frenchs Forest has a mean average annual temperature of 21.6 degrees Celsius (C), with the warmest months being December to February (about 28°C) and the coldest months of June to August (about 15 to 16°C).

Urban design considerations:
- Seasonal impacts on construction activities, specifically landscape implementation
- Planting and revegetation species would need to be adaptable to expected climate.

2.2 Landform and topography

The study area comprises a series of ridges, plateaus and gullies, with the major roads ie Warringah Road, Forest Way and Wakehurst Parkway generally following ridgelines. Elevations range from 115 to 164 metres (m) above sea level (asl). The Stage 2 area centred on Warringah Road is immediately to the north of the major east-west ridgeline (Refer Figure 2-1).

The proposed NBH site, which is bounded by Warringah Road on one side, is situated at the intersection of two ridgelines that Warringah Road and Wakehurst Parkway follow. At the intersection of Warringah Road and Wakehurst Parkway, the topographic height is about 110 m asl with deep gullies either side.

The ridgeline associated with Warringah Road continues in an easterly direction towards Dee Why via the Governor Phillip Lookout at Beacon Hill, which at about 150 asl, is a local highpoint and landmark. From Beacon Hill the ridgeline continues on to form the headland at North Curl Curl between Dee Why and Curl Curl beaches.

The Warringah Road ridge intersects with the ridge associated with the southern section of Wakehurst Parkway. The northern section of Wakehurst Parkway descends into a valley associated with Deep Creek and Narrabeen Lakes, a tidal lagoon.

Urban design considerations:
- Prominent ridgeline position from all approaches
- Strong topographic form typical of region
- Vertical and horizontal alignment design challenges.
Figure 2-1: Landform and topography of the study area
2.4 Hydrology and drainage

The catchments formed by the Warringah Road and Wakehurst Parkway ridges define deep gullies either side, which contain 2 and 3 order creek systems that ultimately drain into either estuarine lagoons or Middle Harbour (Refer Figure 2-2).

Trefoil Creek 100 metres to the north east of the study area is the closest water body and is a tributary of Middle Creek, which drains into Narrabeen Lagoon a further five kilometres to the north east. To the south of Warringah Road lies Curl Curl Creek, a tributary of Manly Dam, a former water supply. Further downstream of this catchment is Manly Lagoon. To the south west is the Middle Harbour catchment at Bantry Bay, an important geographical feature of European settlement of the area.

The Stage 2 area, which generally follows a local ridge line, primarily drains into two major catchments being Bantry Bay catchment in the south west and Manly Dam in the south east. Generally catchment runoff traverses bushland once beyond the immediate suburban areas, which are generally well-vegetated. Run off will primarily be intercepted by pits and pipe drainage associated with the road corridor. A small amount of run off may enter Narrabeen Lakes to the north via Middle Creek and Trefoil Creek, particularly along the Stage 1 boundary.

Urban design considerations:
• Sensitive broader catchments, comprising bushland creeks, recreational water bodies and coastal lagoons
• The study area is generally well drained due to the ridge top location and presence of nearby gullies.
Figure 2-2: Hydrology and drainage of the study
2.5  Biodiversity

Habitat
The concept proposal study area includes remnant stands of vegetation on ridgelines and in gullies, riparian corridors and grasslands, as well as substantial tree and shrub planting associated with commercial sites. The Forest High School, Karingal Reserve, street trees and residential ‘back yards’, which contribute to the overall density of vegetation found in the Stage 2 area. Hollow-bearing trees, rock platforms, boulders and coarse woody debris and sandstone caves, which all provide certain types of habitat for native fauna, can be found in and around the study area. Wakehurst Parkway follows an important vegetation corridor connecting bushland between the Manly/Seaforth area with Oxford Falls and Narrabeen Lakes. The corridor contributes to fauna connectivity, particularly along the various creek lines and in the vicinity of Aquatic Drive.

Vegetation
Dense stands of indigenous vegetation remain, however residential and commercial land uses and roads have substantially impacted, and continue to impact these areas, creating a patchwork of vegetation in various states of intactness. Key vegetation communities that are consistent with Duffy’s Forest Ecological Community have been identified as Sydney Ironstone Bloodwood–Silvertop Ash Forest and Coastal Enriched Sandstone Dry Forest. Dominant canopy tree species include Smooth-barked Apple (*Angophora costata*), Silver-topped Ash (*Eucalyptus sieberi*) and Red Bloodwood (*Corymbia gummifera*). Also common are Broad-leaved White Mahogany (*Eucalyptus umbra*) and Red Mahogany (*Eucalyptus resinifera*), while Brown Stringybark (*Eucalyptus capitellata*) and White Stringybark (*Eucalyptus globoidea*) occur less frequently. The vegetation communities are shown in Figure 2-3.

Threatened species
There are about 17 flora species that have been identified as having a moderate to high potential of occurring in the study area, these include *Callistemon linearifolius*, *Epacris purpureascens var. purpureascens*, *Eucalyptus camfieldii* and *Grevillea caley*. There are about 32 threatened fauna species that have been identified as having a moderate to high potential of occurring in the study area, these include frogs and reptiles, various birds including cockatoos, the Little Lorikeet and the Little Eagle, owls, small mammals including Koala, gliders, flying-foxes and bats.

Urban design considerations:
• Clearing of Duffy’s Forest Ecological Community should be avoided wherever possible, all disturbed areas are to be revegetated
• Vegetation retention strategies should be employed wherever possible, including endemic seed harvesting and Bushland Reconstruction techniques
• Indigenous vegetation should not be cleared for ancillary work such as site compounds or temporary water quality basins wherever possible
• Connectivity of these habitats is to be maintained through the incorporation of fauna culverts and rope bridges in locations to be confirmed during detailed design
• Construction work and associated clearing are to be strictly managed in order to minimise impacts on threatened vegetation communities and fauna species
• Loss of specific habitat such as hollow-bearing trees should be replaced or relocated, as outlined in the Environmental Management Plan.
Figure 2-3: Existing vegetation communities of the study area
2.6 Transport and pedestrian network

Warringah Road is the main arterial road in the region and in combination with Boundary Road in Willoughby to the south of the study area, links Chatswood and the Pacific Highway with the Northern Beaches. Wakehurst Parkway, in this immediate area, consists of a bushland corridor that provides an alternative route from Seaforth, Manly and the Spit Bridge to Narrabeen and the Northern Beaches. Forest Way connects Warringah Road with Mona Vale Road, an important regional arterial road that connects Mona Vale and Terry Hills in the north to St Ives and the Pacific Highway. All of these routes provide important connections for people of the Northern Beaches with either the City or the Pacific Highway and are heavily congested in the peak travel hours.

Government and private (Forest Coach Lines) bus services operate in the study area, connecting Manly, Warringah Mall, Dee Why, Forestway Shopping Centre, Roseville, Terry Hills and Chatswood Rail Interchange. Buses also provide access to the The Forest High School adjacent to the NBH site. Several bus stops are located within the Stage 2 area, which are identified in the Stage 2 traffic and transport impact assessment.

There are no rail or light rail services in the area, which places reliance on private vehicle and bus usage. Several studies have been undertaken with regards to bus rapid transport and there is potential for this to be realised post-completion of the NBH and associated road network upgrades. Warringah Road and Wakehurst Parkway are the designated Warringah Council regional bicycle routes, although minimal work has been undertaken to facilitate this. These connections would be improved as part of the Stage 2 project.

Within the Stage 2 area, Warringah Road, Forest Way and Wakehurst Parkway form critical routes and intersections for the functioning of the future NBH, as well as ongoing connectivity for local residents. Buses, bicycle and pedestrian routes are also present in the Stage 2 project area (refer Figure 2-4).

Urban design considerations:
- Heavy vehicle congestion in peak hours and weekends, likely to worsen upon completion of the NBH
- Bus services and pedestrian connectivity to the NBH is important
- High levels of pedestrian activity during school opening and closing times
- Improved bicycle and pedestrian connectivity and safety is needed
- Consideration of local vehicle, bicycle and pedestrian routes between residential areas, institutional and commercial facilities
- Relationship to regional road network in terms of connectivity and visual consistency.
Figure 2-4: Existing transport network
2.7 Historical context

Aboriginal heritage

Historical context of the study area represents Aboriginal heritage, Non-Aboriginal heritage and other notable site features that contribute to the history of the site. Non-Aboriginal historical context is described in Figure 2-5.

For at least 20,000 years prior to European settlement in 1788, local Aboriginal people, largely of the Guringai and Gai-Mariagal, lived out a subsistence existence utilising the abundant source of food from densely forested areas, grasslands, as well as nearby water bodies. The ridge tops and creek lines provided travel routes within the study area and, to surrounding areas including the coast.

Exposed rock platforms found in and around the study area were considered suitable as surfaces for engraving and sharpening of stone axes/tools, or for shelter. No examples have been found within the Stage 2 area or the broader study area, however examples of rock engravings have been recorded outside of the study area. Many examples of Aboriginal culture that would have previously existed have since been destroyed by previous land uses and in some cases vandalism. No Aboriginal sites or deposits have been identified, nor are they likely to be uncovered during construction due to previous disturbance.

Non-aboriginal heritage

Europeans first discovered the Frenchs Forest area shortly after settlement in 1788. Governor Arthur Phillip explored the area for the purpose of finding arable land and water sources for the colony. He noted that the area was not particularly suitable for agricultural uses due to the dense bushland and areas of native grassland.

Settlement of the coastal villages such as Manly and Narrabeen began prior to the 1830s. Formalised land grants of 100-200 acres commenced in the Frenchs Forest around the 1840s-50s and consisted of small farms divided from the larger grants. One such grant was known as ‘Pearce’s 200 Acres’ and later Rodborough, which comprises much of the study area and virtually all of Stage 2. Further subdivisions occurred, with smaller 8-10 acre residential lots available from the 1870s. Often these were divided from the earlier, larger grants.

During these early years, there were limited roads, and access from the city was via boat to Manly, a pier in Bantry Bay, or via the Spit punt (now Spit Bridge). An unsealed road (probably the Allambie Road route) from Manly pier, about six kilometres away, or the closer wharf at Bantry Bay, accessed by what we now know as Bantry Bay Road (cleared in 1859), would have been the main routes to Frenchs Forest. By 1943, as evidenced by Roads and Traffic Authority mapping, Warringah Road was not as formalised as Wakehurst Parkway, which was sealed in 1946. Later, Warringah Road would become the primary route.

This intersection of these two roads forms a gateway to ‘the Forest’ district and is considered a local landmark by many due its location. The intersection was formally known colloquially as the ‘blinking light’, a reference to the suspended signal light that marked the intersection and which was one of very few traffic signals in the northern beaches. The ‘blinking light’ remained until the early 1970s.
Heritage listed items

There are no items of significance within the study area on the world, national, state or Roads and Maritime registers, however there are some items registered as having local significance on the Warringah Council Local Environmental Plan or considered to have potential significance and which are currently nominated for listing, including:

- Stage 1 - Former Methodist Church on the corner of Forestway and Naree Road
- Stage 1 - Betty Maloney Gardens at 18 Hurdis Avenue, Frenchs Forest, which whilst overgrown contains a number of important indigenous species and plant groupings
- Stage 2 - Remnant orchard trees (Holland’s Orchard) along Warringah Road in front of the Forest High School (one remains in the verge, several have been propagated on the school grounds)
- Stage 1 and 2 - Several local residences in Frenchs Forest relating to early settlement.

Other locations considered important in an urban design sense to the history and development of the area are:

- Stage 2 - Brick Pit Reserve on Bantry Bay Road (former brick quarry run by Hews)
- Stage 2 - The intersection of Warringah Road and Wakehurst Parkway (location of the “Blinking Light”) (refer Plate 2-2)
- Stage 2 - The pedestrian overbridge at the intersection of Warringah Road and Forest Way, which is an early example of a concrete pedestrian bridge with an elegant form and integrated haunching and substructure.

Urban design considerations:

- Careful management during construction to assess potential for Aboriginal deposits or evidence of rock engravings, middens, burial sites or cave shelters
- Construction activities in the study area should avoid items of heritage significance and be managed in accordance with best practice
- Items such as the orchard trees and the ‘blinking light’ may be considered as sources of design inspiration for future urban and landscape design treatments associated with the roadwork.
Figure 2-5: Non-Aboriginal heritage features
2.8 Land use and settlement patterns

A review of existing and former land uses in the study area has provided an understanding of how settlement patterns have influenced cultural patterns on the landscape (refer Figure 2-6). Early settlement of the area began in the 1820s with 100-200 acre land grants for timber harvesting and farming. Timber getting was carried out from the 1840-50s, the brick quarry was established on Bantry Bay Road in 1885 and the orchard on the Forest High School site commenced about 1906. More substantial settlement of the area (primarily in Forestville to the west) began about 1916 in the form of five-acre-lot returned soldier settlements. Progress was relatively slow due to the isolation of the area and scattered nature of the community.

Access improved with the construction of the first Roseville Bridge in 1924 (providing a connection to Willoughby and Chatswood) as well as a bridge over Middle Harbour at ‘the Spit’ in the same year. Despite these improvements in connectivity, the area remained largely rural until the mid nineteenth century. The population remained steady at about 500 residents and occupations included brick-makers, labourers and rural activities including dairy, poultry and pig farming as well as market gardening and orchards.

The 1950-60s saw substantial low-density suburban development and road and infrastructure construction, as well as the development of Forestville, Killarney Heights and Belrose to the west of the study area and isolated pockets of commercial development along Warringah Road. The Forest High School was opened in 1961 and ‘Arndale’ shops (now Forestway Shopping Centre) was opened at a similar time. The Spit Bridge was widened in 1958 and Roseville Bridge replaced in 1966, both bridges remain to this day. Bus services became more frequent, with the ‘Royale’ line linking Terry Hills with the city via Frenchs Forest.

Remnants of the major original land grants are still discernible, with many of the major roads and subdivisions typically following cadastral boundaries. Frenchs Forest Road, Warringah Road and Fitzpatrick Avenue, all running parallel, are the major east-west cadastral boundary lines in the study area. Today, Warringah Road deviates between the three parallel alignments and early tracks correlating with this are visible in aerial photography taken in 1943. The study area has been extensively cleared during the previous history of land uses.

By the 1960s, the intersection of Wakehurst Parkway and Warringah Road had became a local landmark due to its historical uses, topographical location and the fact that it was an important junction of a relative few arterial roads in the region. During the next 20 years, land uses that occurred around the intersection were the former ‘skyline’ outdoor movie cinema (demolished in the early 1980s) to the east (now the Parkway Hotel and Skyline Business Park) as well as the ‘Arndale’ shops (now Forestway Shopping Centre), The Forest High School, and the ‘Bantry Bay’ shops.

Other key land uses present in the Stage 2 project area include, commercial ‘business park’ developments, The Forest High School and Frenchs Forest Public School, residential development (primarily south of Warringah Road), the ‘Forest Kirk’ Church and the Warringah Aquatic Centre.

Urban design considerations:

• Visual, noise and character impacts on nearby land uses, particularly residences in the Stage 2 area
• Consideration of land uses in determination of landscape character:

Figure 2-6: Land use of the study area
2.9 Key stakeholder sites

The study area consists of several stakeholder sites where strategic urban design measures would be required in order to mitigate the impacts of the project. These impacts include functional issues such as access and parking, as well as visual amenity issues such as screening.

Understanding the location and nature of these key stakeholders is a key urban design consideration in order to ensure mitigation measures adequately address the needs of these stakeholders.

These Stage 2 stakeholders are:
- Bantry Bay shops
- Business parks along both sides of Warringah Road
- The Forest High School
- Frenchs Forest Public School
- Residences in the vicinity of Karingal Crescent
- Residences in the vicinity of Bantry Bay Road and Fitzpatrick Avenue
- Warringah Aquatic Centre.

Bantry Bay shops

Bantry Bay Shops are located on the corner of Warringah Road and Bantry Bay Road East (refer Plate 2-3) and have been present on the site since the 1950s. Prior to this, the site was associated with French’s Cottage and the Bantry Bay Brick Pit (now Brick Pit Reserve). Bantry Bay Road is a historically important supply route linking Middle Harbour at Bantry Bay with the Brick Pit and Warringah Road.

As a result of the widening of Warringah Road and the intersection with Wakehurst Parkway, the upgrade would see complete demolition of the shops, with a remnant parcel of land converted to open space. An opportunity exists to connect this potential future open space with the existing Brick Pit Reserve as part of the upgrade.
Business parks

Several business parks and the Parkway Hotel exist along Frenchs Forest Road in the block formally known as ‘Pearce’s 200 acres’ or Rodborough, part of which was formerly the site of the Skyline outdoor cinema. These sites are accessed via Frenchs Forest Road, although many also front Warringah Road. Corporate buildings on the southern side of Warringah Road (also on ground formally within ‘Pearce’s 200 acres’) have equally large setbacks. These are primarily accessed via Aquatic Drive and Rodborough Road via Allambie Road.

The largest setbacks comprise a combination of landscape lawn areas with clustered tree planting and car parks (refer Plate 2-4). Some setbacks on the southern side of Warringah Road have dense tree planting. The vegetation contributes to the overall sense of place inherent to the local area and helps to screen the buildings from the road.

Widening of Warringah Road would largely be limited to the southern verge, therefore limiting impacts primarily to corporate buildings on the southern side. It is proposed that Aquatic Drive will be extended to form an intersection with Wakehurst Parkway, which will provide alternative access for workers on Warringah Road and Aquatic Drive.

The Forest High School

The Forest High School (refer Plate 2-5) is located west of the Wakehurst Parkway intersection with Warringah Road and is accessed via Frenchs Forest Road. It occupies land between Frenchs Forest Road and Warringah Road in a similar fashion to the business parks along Frenchs Forest Road East. School buildings are set well back from Warringah Road with a landscaped lawn area, clustered tree planting and a sports field. The future NBH site is located immediately to the east of the school on land formally dotted with residential houses amongst bushland (now cleared).

Access to the school on the southern side is currently limited to a single pedestrian gate located close to the NBH boundary opposite Hilmer Street. Security fencing similar to the Frenchs Forest Road West frontage defines the boundary. A single remnant orchard tree
remains in the Warringah Road verge near the pedestrian access point. It is the last surviving original tree from Holland’s Orchard which previously occupied the site and is registered on the Warringah Council LEP. The tree has previously been propagated, with a cluster of the resultant offspring located within school grounds near the sports field.

The Stage 2 project would have minimal impact on the school as widening is concentrated on the southern side of Warringah Road. The primary objective to ensure safe and convenient access is provided to the school for pedestrians, and to improve legibility of access points.

Frenchs Forest Public School

The Frenchs Forest Public School is located between Warringah Road and Grace Avenue, near the intersection with Forest Way. The grounds include several buildings and small carparks, as well as a sports field. The school was established in 1916, making it one of the oldest schools in the district.

Vehicular access to the school is via Grace Avenue, which can be accessed from Warringah Road, Forest Way or the local road network. School buses use the bus only access road between Warringah Road and Forest Way for pick up/ drop off. Pedestrian access is via Sorlie Place or Ann Street (via Grace Avenue) or via the existing pedestrian footbridge over Warringah Road, which connects with the eastern frontage (refer Plate 2-6). The footbridge is an important connection for pedestrians and cyclists from the Karingal Crescent area south of Warringah Road to the school and the Forestway Shopping Centre. A number of community facilities including the Warringah Council run Forest Youth Centre and a child care centre are located next to the school.

The Stage 2 project includes the widening of the Warringah Road/ Forest Way intersection and the replacement of the existing footbridge over Warringah Road and widening of the road to south in order to accommodate the central slot. The combination of the wider intersection and current access standards would see a substantial increase in the length of the
shared path bridge and associated ramps, which would result in the removal of several mature trees and the relocation of bridge access further away from the school entrance. Existing 40 km/h signage and other associated signage is to be assessed as part of a signage strategy that would aim to maintain safety for school children and reduce visual clutter.

Forestway Shopping Centre
Forestway Shopping Centre (refer Plate 2-8) comprises a multi-level shopping mall and carpark structure, located at the corner of Forest Way and Russell Avenue. Access to the carparking structure is via Forest Way or from Russell Avenue. Pedestrian access to the shops is also via these locations as well as other entries not associated with the project. A bus stop servicing a number of routes is located half way along the carpark structure on Forest Way.

The design is to ensure that legible, safe and convenient access is provided for pedestrians, which in terms of Stage 2, would see appropriate measures undertaken to ensure access from the shared path bridge over Warringah Road and associated footpaths are retained and upgraded where impacted by the project.
Private residences on Karingal Crescent

Vehicular access to Karingal Crescent from Warringah Road is via Fitzpatrick Avenue and Bantry Bay Road. Pedestrian and cyclist access is possible along a shared path that meanders through the reserve, which connects with existing footpaths on Warringah Road and Karingal Crescent and with Forest Way via an existing footbridge over Warringah Road. Residences along Karingal Crescent, currently back on to Karingal Reserve, (refer Plate 2-9) part of a road reserve through which this section of Warringah Road passes.

The reserve affords a generous setback for these properties, which is also well vegetated with mature native trees within a landscaped lawn area. Most properties have established rear gates in order to provide direct access to the shared pathway and the footbridge. Properties further south on Warringah Road are located at the end of the reserve.

The widening of Warringah Road proposed for Stage 2, would see virtually all of the reserve excavated and trees removed. The shared connection would remain, however a more direct lineal route would result from the reduced available land. Opportunities for new tree plantings are to be investigated wherever possible. This is to be addressed in the design through the provision of a noise abatement wall (refer Section 3.3 of this report). A ramped footway would also be required in order to connect to footpaths on Warringah Road to the shared path and shared path bridge.

Private residences on Fitzpatrick Avenue and Bantry Bay Road

Vehicular and access to Fitzpatrick Avenue is directly from Warringah Road, Bantry Bay Road and Hilmer Street. Pedestrian and cyclist access is possible via Karingal Crescent and the existing footbridges over Warringah Road and Wakehurst Parkway. The footbridge over Wakehurst Parkway provides pedestrian and cyclist access to southbound buses on Wakehurst Parkway, the Warringah Aquatic Centre and the commercial precinct along Aquatic Drive.

Residences on Fitzpatrick Avenue East and Bantry Bay Road (along with those on Karingal (refer Plate 2-9) Crescent) form a suburban area, with virtually no through traffic and are in close proximity to Bantry Bay shops and have a strong pedestrian link to Forestway Shopping Centre and The Forest High School.

The widening of Warringah Road proposed for Stage 2, would see the loss of Karingal Reserve, part of the Brickpit Reserve and all of the Bantry Bay shops. The project would also
require the replacement of the shared path bridges over Warringah Road and Wakehurst Parkway. A new shared path bridge is proposed for the intersection of Warringah Road and Hilmer Street in order to facilitate pedestrian access to the NBH and The Forest High School.

Plate 2-9: Residences along Bantry Bay Road south of the shops

Warringah Aquatic Centre

The Warringah Aquatic Centre was established in 1979 and is the only regional scale and 50 metre swimming facility on the Northern Beaches. The Centre hosted the Olympic swimming trials in 1982 and serves the local community as the venue for high school swimming carnivals, public swimming and children’s learn to swim classes. It is located at the end of Aquatic Drive (off Allambie Road). The main building (refer Plate 2-10) is surrounded by vegetated areas and carparking associated with both the pool and the Aquatic Reserve playing fields. Pedestrian and cyclist access is from Aquatic Drive and from Bantry Bay Road via the existing footbridge over Wakehurst Parkway. Warringah Council has recently prepared a development strategy for the site including pool and facility upgrades and mountain bike trails through bushland.

The Stage 2 project would see the extension of Aquatic Drive by about 100 metres to form an intersection with Wakehurst Parkway. This will alter traffic patterns in the area and allow workers at the Aquatic Centre and commercial buildings to enter and exist via Wakehurst Parkway, which is currently only possible via Allambie Road to the east.

Plate 2-10: Warringah Aquatic Centre main building
3. Urban design and landscape concept

3.1 Urban design and landscape strategy

Overview

In Section 1 of this report, urban design objectives and principles were developed for the Stage 2 project and an outline of landscape context provided in order to satisfy the Secretary Environmental Assessment requirements. The following section describes the urban design strategy that has led to the development of an urban and landscape concept design for the Stage 2 project, which in turn would inform the Stage 2 project detailed design. A summary of the strategy, which aims to identify specific direction for the project, is outlined below in Table 3-1 and represented graphically in Figure 3-1.

Prepared in parallel with the concept design is the impacts analysis and subsequent mitigation measures outlined in Section 4.

The urban design and landscape strategy expands on the following topics:

• Road design elements
• Structures
• Landscape formations
• Drainage and water quality
• Road furniture
• Landscape treatments.

<table>
<thead>
<tr>
<th>Framework objective and principle</th>
<th>Concept design strategy</th>
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<tbody>
<tr>
<td>1 Retain and reinforce the parkway character of Warringah Road and Wakehurst Parkway and distinguish the ecological character of Wakehurst Parkway from the more formal and urbanised parkland character of Warringah Road</td>
<td>Due to widening of Warringah Road along the southern verge, street trees located in the existing verge, as well trees located within business park setbacks and the Wakehurst Parkway corridor would be removed. In combination with replacement and new street tree planting, existing trees located in the front of commercial and residential properties would assist in maintaining the vegetation corridor parkway character.</td>
</tr>
<tr>
<td>1A Ensure that parkway character of both Warringah Road and Wakehurst Parkway are retained through ensuring adequate retention and protection of existing trees and vegetation. In particular, ensure vegetation is retained on both sides of the roadway along Warringah Road, where higher impacts are planned</td>
<td>Due to widening of Warringah Road along the southern verge, street trees located in the existing verge, as well trees located within business park setbacks and the Wakehurst Parkway corridor would be removed. In combination with replacement and new street tree planting, existing trees located in the front of commercial and residential properties would assist in maintaining the vegetation corridor parkway character.</td>
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<tr>
<td><strong>1B</strong> Minimise earthworks in order to maximise vegetation retention</td>
<td>Due to widening of Warringah Road and Wakehurst Parkway, substantial cutting, acquisition and vegetation loss would be required. Retaining wall design and finishes are to be designed in accordance with the mitigation strategy, which would include the use of terracing, recessive colours and textured finishes in order to reduce visual bulk and respond to the existing landscape.</td>
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<tr>
<td><strong>1C</strong> Carefully locate shared paths so not to require removal of critical trees e.g. locate shared path if practical along the southern verge of Warringah Road</td>
<td>In line with Warringah Council’s desire to provide access along both sides of Warringah Road for both pedestrians and cyclists, shared paths would be required. Where road corridor width permits, the shared paths would be designed to avoid trees through minimising path widths and by a curvilinear route that avoids trees.</td>
</tr>
<tr>
<td><strong>1D</strong> Encroach any required new road work into the southern verge of Warringah Road</td>
<td>The concept design demonstrates that widening would primarily occur along the southern verge, in order to limit vegetation loss and impacts on private and commercial properties to one side and in order to reduce impacts on The Forest High School and the NBH (which would have occurred should the alignment have been on the northern side).</td>
</tr>
<tr>
<td><strong>1E</strong> Apply an informal bush landscape character with large scale boulders and informal native planting along Wakehurst Parkway and a more urbanised parkway landscape concept along Warringah Road</td>
<td>Widening of Wakehurst Parkway as part of the Stage 2 project would occur south of Warringah Road including the new intersection with Aquatic Drive. With only limited road corridor width available, opportunities to reinstate bushland character may be limited in these circumstances, however indigenous vegetation communities would inform revegetation species selection. Street tree selection for all Stage 2 roads would comprise indigenous species.</td>
</tr>
<tr>
<td><strong>1F</strong> Improve facilities for all road users – including motorists, pedestrians and cyclists</td>
<td>The road and intersection upgrades, footpath connectivity and widening and provision for cycling would see improvements to all road users.</td>
</tr>
<tr>
<td><strong>2</strong> Reinforce the lush and green character of the area and express the bushland character</td>
<td>Indigenous vegetation communities, particularly those comprising the Duffys Forest EEC, would inform revegetation species selection. Ideally, planting and revegetation species would be propagated from endemic locally sourced seed.</td>
</tr>
<tr>
<td><strong>2A</strong> Use native vegetation in the application of landscape design strategies to reinforce the character of the area</td>
<td>Where opportunities exist, tree planting would be undertaken on both road reserve and private properties with landowner consent. Landowners would be encouraged to plant trees in the front of their properties.</td>
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<tr>
<td><strong>2B</strong> Evaluate opportunities of introducing street trees along Forest Way</td>
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<td>Framework objective and principle</td>
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<tr>
<td>2C Reinforce the definition of the intersection of Warringah Road and Wakehurst Parkway through strategic landscape measures such as revegetating impacted areas where applicable</td>
<td>Due to widening of Warringah Road, some vegetation loss would be unavoidable at the intersection with Wakehurst Parkway. Clearing associated with construction activities would be revegetated in accordance with the associated vegetation community. Street tree selection for all Stage 2 roads would comprise indigenous species.</td>
</tr>
<tr>
<td>2D Minimise impacts to existing vegetation and utilise it as green buffers/visual foils to new built form, and urban infrastructure</td>
<td>In Stage 2, there would be impacts on existing vegetation due to road widening, shared path and footpath provisions. New planting would be undertaken to assist with mitigating visual impacts.</td>
</tr>
<tr>
<td>3 Deliver an integrated approach to traffic (including pedestrian and cycle), public transport and land use</td>
<td>In the Stage 2 project, new pedestrian crossings of Warringah Road would be associated with signalised intersections and shared path bridges. New pedestrian crossing facilities would be provided at the following locations:  - Shared path bridge over Warringah Road near Hilmer Street, the NBH and The Forest High School. Existing pedestrian crossing facilities would be upgraded or reconfigured at the following locations:  - Shared path bridge over Warringah Road at the intersection with Forest Way.  - Existing footbridge retained over Wakehurst Parkway near Aquatic Drive/ Fitzpatrick Avenue.  - Across Forest Way opposite Forestway Shopping Centre and at the intersection with Warringah Road.  - Across Wakehurst Parkway on both sides of the intersection with Warringah Road.  - Across Warringah Road at the intersection with Wakehurst Parkway (excluding western side) and the intersection with Allambie Road (excluding eastern side). Pedestrian crossing locations, even where signalised, are to be located close to existing crossing locations. There is to be a net gain in pedestrian crossings throughout the project.</td>
</tr>
<tr>
<td>3A Provide user friendly pedestrian crossings at Warringah Road, Forest Way and other intersections within the Stage 2 project area</td>
<td>Widening associated with bus requirements is to be minimised (in line bus stops preferred), through careful alignment design. Impacts on bicycle and pedestrian connectivity, as well as physical impacts on the public domain and residential screening requirements are to be minimised. Shared paths and footpaths are to connect to bus stops in order to ensure access and connectivity for bus users and local residents. Bus stops should be kept as close as possible to existing locations.</td>
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<tr>
<td>3B Ensure good connectivity to public transport modes, particularly along Warringah Road</td>
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**URBAN DESIGN REPORT AND LANDSCAPE CHARACTER AND VISUAL IMPACT ASSESSMENT - FINAL REPORT**
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<tr>
<td>4 Retain the privacy and amenity of residents in the local streets in the immediate area, and provide opportunities for urban restructuring and redevelopment</td>
<td>New developments along Warringah Road may be possible in the future in line with the planned Warringah Council Hospital Precinct Structure Plan and following the construction of the NBH. New developments should retain existing vegetation to the greatest extent possible and incorporate similar strategies in order to assist with visual impact mitigation.</td>
</tr>
<tr>
<td>4A Utilise existing vegetation as visual screening within new developments to retain green character and minimise visual impacts</td>
<td>Existing built form is primarily single storey residential and one and two storey commercial buildings. The NBH development will be substantially bigger in scale than the existing built form. Road verges and remnant lands resulting from acquisition are to be planted, wherever possible, with native street trees and shrubs.</td>
</tr>
<tr>
<td>4B Apply landscape strategies that complement the future character and scale of built form elements of the precinct</td>
<td>Pedestrian and vehicular conflicts would be managed through signalisation of pedestrian crossings and provision of pathways and shared path bridges across Warringah Road. The pathways would connect with the broader region via new pathways and shared pathways along Frenchs Forest Road and Warringah Road in Stages 1 and 2. Noise impacts resulting from Warringah Road widening would be addressed by noise abatement walls, which would be designed to integrate visually with other elements.</td>
</tr>
<tr>
<td>4C Minimise pedestrian and vehicular conflicts and noise impacts for residents along Warringah Road as much as practical</td>
<td>Pedestrian crossings points would be rationalised in accordance with the road widening and signalisation, however these new and existing crossings would be upgraded to improve safety. A new shared path bridge would be provided across Warringah Road at Hilmer Street to ensure safe pedestrian access to The Forest High School.</td>
</tr>
<tr>
<td>4D Enhance pedestrian facilities and crossing points along Warringah Road to enhance pedestrian safety for school children</td>
<td>The hospital would be visible from Frenchs Forest Road, Wakehurst Parkway and Warringah Road, as well as from longer range viewpoints situated on higher ground. Gateway landscape treatments and robust urban design would assist with reinforcing the ‘sense of place’ and mitigating visual impacts. Ensure integration of the hospital frontage landscape with the streetscape landscape along Warringah Road and Wakehurst Parkway.</td>
</tr>
<tr>
<td>5 Define the address of the hospital locality as well as expressing the area as a gateway to the Northern Beaches</td>
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<tr>
<td>5A The opportunity exists to make the hospital site a strong visual marker along the journey, reinforcing the sense of place.</td>
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NBH CONNECTIVITY AND NETWORK ENHANCEMENTS : STAGE 2
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<tr>
<td>6 Create a clear structural framework for streetscapes that enhances the legibility, way-finding and functioning of the precinct</td>
<td>Local traffic would continue to use Frenchs Forest Road, and the Warringah Road (surface carriageway), with regional through-traffic using Warringah Road (central slot), Wakehurst Parkway and Forest Way. Signalised intersections would be provided in order to facilitate local traffic access to Warringah Road (via the surface carriageway) at all times, in particular during peak hours.</td>
</tr>
<tr>
<td>6A Consider separating regional from local traffic to enhance legibility and way-finding around the precinct</td>
<td>Environmental studies, including noise monitoring and assessment, have indicated that it is likely that noise walls would be required as part of the Stage 2 project works along the section of road currently occupied by Karingal Reserve between Bantry Bay Road and Fitzpatrick Avenue East. Noise would also be managed by the use of architectural treatments to buildings if required.</td>
</tr>
<tr>
<td>6B If possible, avoid the introduction of noise barriers that visually bisect the community/precinct. If these elements are required integrate these with fencing elements and soften their appearance with vegetation</td>
<td>Due to demands on the corridor, it has been necessary to remove existing vegetation to allow for road widening. Where front-line vegetation such as street trees would be removed, this would be mitigated by revealing second-line vegetation and replacement with new planting. Land owners would be encouraged to plant trees in the front of their properties where applicable.</td>
</tr>
<tr>
<td>6C Minimise impacts to existing vegetation and utilise it as green buffers/visual foils to new built form, and urban infrastructure</td>
<td>In Stage 2, signalised crossings and shared path bridges would be provided in order to ensure safe pedestrian movements into the hospital precinct and schools.</td>
</tr>
<tr>
<td>6D Reinforce/formalise the existing pedestrian link between the hospital site and school</td>
<td>Pedestrian access would be maintained along both sides of Warringah Road and generally throughout Stage 2. Important suburban connections will be maintained across Warringah Road via shared path bridges and signalised intersections.</td>
</tr>
<tr>
<td>6E Ensure existing pedestrian links are retained and proper connectivity is achieved to road crossings, particularly for Warringah Road</td>
<td>On Warringah Road, a planted strip would be provided adjacent to the kerb in order to provide greater separation of vehicles and pedestrians. Where screening is not required or not feasible along property boundaries, pedestrian footpaths are to be set back from the kerb and separated by landscape.</td>
</tr>
<tr>
<td>6F Create a buffer zone between road and path to increase pedestrian safety and articulate the paved surfaces</td>
<td>Barriers would be required for the Stage 2 project where pedestrian access is provided next to the intersection of Warringah Road and Forest Way or next to distinct level change that would pose a safety risk.</td>
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<td>6G Avoid as much as practical the introduction of barriers</td>
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<td>6H Evaluate opportunities to introduce pedestrian crossings as overpasses, acting as legible markers to both drivers and pedestrians</td>
<td>In the Stage 2 project, shared path bridge crossings would be replace the existing footbridge at Warringah Road/ Forest Way intersection and an existing footbridge retained across Wakehurst Parkway near Fitzpatrick Avenue. A new shared path bridge would be provided in order to maintain access to the The Forest High School and to service the NBH near the intersection of Warringah Road/ Hilmer Street.</td>
</tr>
<tr>
<td>6I Ensure hospital access/entry points allow proper connectivity to major arterial roads</td>
<td>The primary access to the hospital would be via a new signalised intersection of Frenchs Forest Road. A secondary access would be provided off Warringah Road.</td>
</tr>
<tr>
<td>6J Apply CPTED (Crime Prevention Through Environmental Design) principles in the design resolution of the Stage 2 project</td>
<td>CPTED has informed the design of pedestrian routes throughout the Stage 2 project. In particular, sightlines on footpaths, shared paths and shared path bridges has been considered. CPTED is to be considered in more detail during the detailed design stage. Sightlines and safety would be maintained at all times during construction for motorists and pedestrians through careful staging and provision of temporary barriers. Security would be maintained at all times during construction through the provision of temporary fencing along school boundaries and following construction through reinstatement of permanent security fencing. Any new access points would require security gates to be installed.</td>
</tr>
<tr>
<td>7 Design integrated urban infrastructure/landscape design elements that allow the landscape to dominate and built forms to recede</td>
<td>On arterial roads, walls facing the road would be faced with a high quality concrete panel, with textures and colours appropriate to the setting. For walls facing private property a stone finish would be preferred. Wall finishes are to be designed to a high level of finish generally, as is required of an urban setting such as this.</td>
</tr>
<tr>
<td>7A Consider the use of natural materials in built form elements to reinforce the setting's character</td>
<td>Substantial underground utilities exist across the concept project area, which, in combination with topographical issues, make it difficult to accommodate additional underground services. The undergrounding of overhead services is to be considered further during detailed design.</td>
</tr>
<tr>
<td>7B Consider, if practical, under grounding power lines particularly on the high ridge area, and in constrained areas, to enhance opportunities for planting</td>
<td>Colour schemes are to be selected during detailed design in consideration of local textures and colours of the surrounding bushland in accordance with the urban design framework.</td>
</tr>
<tr>
<td>7C Use colour schemes that complement the area’s character or that help recede built form elements</td>
<td></td>
</tr>
<tr>
<td>Framework objective and principle</td>
<td>Concept design strategy</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>7D  Apply landscape strategies that complement the future character and scale of built form elements of the precinct</td>
<td>Where possible, revegetation would consist of mature potted stock including canopy trees, with species informed by the Duffy’s Forest EEC.</td>
</tr>
<tr>
<td>7E  Apply darker colours in areas where structures should visually recede</td>
<td>Colour schemes are to be selected during detailed design in consideration of local textures and colours of the surrounding bushland in accordance with the urban design framework.</td>
</tr>
<tr>
<td>7F  Introduce stepped retaining walls (where possible) with planted benches to reinforce the green character of the setting</td>
<td>In Stage 2, several walls are required in both cut and fill scenarios, facing both the road upgrade, private residents and facing away from the upgrade towards bushland. Walls facing the road upgrade (in Cut) are to be clad in a high quality material, preferably locally sourced natural sandstone if possible. Walls facing private property or public land should be constructed of stone block facing. Incorporation of terracing and planting into wall design would be undertaken wherever possible in order to reduce the bulk, scale and visible surface area of walls, however increasing the footprint of the walls should not be undertaken at the expense of existing vegetation or extend beyond the project boundary.</td>
</tr>
<tr>
<td>7G  Consider widening the road corridor in strategic areas to allow better greening opportunities</td>
<td>Widening for the purpose of greening is unlikely due to demands on the road corridor within a primarily residential precinct. Opportunity exists within the Stage 2 project area to utilise land acquired for road widening that is considered surplus to the immediate needs of the road corridor. In addition to an extensive street tree strategy, planting on private property may also be considered subject land owner consent.</td>
</tr>
<tr>
<td>7H  Introduce vegetated batters where practical to conceal the apparent height of structures</td>
<td>Cut and fill would generally be reconciled through the construction of low retaining walls. Where retaining walls are not employed, batters and embankments would be revegetated.</td>
</tr>
<tr>
<td>7I  Introduce water sensitive design and minimise hard surface engineered drainage concepts.</td>
<td>Due to the upgrade being confined to a narrow road corridor, there are only limited opportunities to introduce water sensitive urban design landscape treatments. Run off is not to be allowed to enter native bushland or creeks in an uncontrolled fashion and should be improved and slowed at every opportunity.</td>
</tr>
</tbody>
</table>
Figure 3-1: Urban design strategy plan

NOTE: This drawing illustrates the urban design recommendations to be considered further during detailed design development and are subject to change.
This drawing illustrates the urban design recommendations to be considered further during detailed design development and are subject to change.
3.2 Road design elements

The general approach to the design of road elements would be undertaken in such a way as to satisfy the functional requirements for the safe and efficient operation of the road, while also being appropriate to their location. In all cases, the design and implementation of the road elements would need to satisfy the requirements of Austroads and Roads and Maritime design guidelines and practice notes, as well as local government policies, if necessary.

It is also important that in detailed resolution, the visual expression of the road elements is true to their function as items of contemporary road infrastructure that are consistent with other road upgrades in the region.

The following categories of urban design elements have been identified for the Stage 2 project, as follows:

• Structures eg, road bridges, shared path bridges, underpasses and retaining walls
• Landscape formations eg cuttings and embankments
• Roadside furniture including shelters, safety barriers and noise attenuation walls.

Principles specific to road design elements

The development of principles and recommendations has been guided by the following specific design criteria:

• Simplicity in the design expression of the elements relating to the enhancement works, in order to allow the existing natural and cultural landscapes to provide the primary interest to the motoring experience
• Practicality for ease of construction and reduced long-term maintenance
• Site-specific design that acknowledges and responds to the character of the local area, while not necessarily replicating existing features
• Consistency with other road upgrades in the region, by using elements that are identifiably part of the road-user experience in this region
• Integrity to the materials and method of construction in the final finish and appearance of the road elements
• Consideration of sustainability in the choice of materials and resources.
3.3 Structures

The design of structures is required as a response to the inter-relationship between road alignment and levels with the existing landscape that results in earthworks (cutting and filling). The Stage 2 project will require substantial structures including shared path bridges, underpasses and walling associated with grade-separated interchanges. Design of these elements would be in accordance with the urban design framework and the relevant Roads and Maritime guidelines. Structures required as part of the Stage 2 project are more substantial than in Stage 1, due to the larger extent of the upgrade proposed and more substantial widening.

Retaining walls

Retaining walls would be required as part of the project in several locations as follows:

- A retaining wall facing away from the road (in fill), with a maximum height of about 1.0 metres, would be required along the front curtilage of existing residential properties on Warringah Road west of the intersection with Fitzpatrick Avenue in order to prevent a fill batter from encroaching on private property.
- Retaining walls facing the road (in cut), with a maximum height of about 4.5 metres, would be required either side of a central slot in the roadway in order to allow four lanes of Warringah Road to pass beneath the intersections at Forest Way, Hilmer Street and Wakehurst Parkway.
- A retaining wall facing the road (in cut), with a maximum height of about 4.3 metres, would be required to minimise encroachment on private property backing on to Warringah Road from Karingal Crescent.
- A retaining wall facing away from the road (in fill), with a maximum height of about 6.0 metres, would be required in order to minimise encroachment on the Brick Pit Reserve, south of the intersection of Warringah Road with Wakehurst Parkway.
- A retaining wall facing away from the road (in fill), with a maximum height of about 6.1 metres, would be required in order to minimise encroachment on vegetation consistent with the Duffy’s Forest Ecological Community and commercial properties, south of the intersection of Warringah Road with Wakehurst Parkway.
- Retaining walls facing away from the road (in fill), with a maximum height of about 3.9 metres, would be required either side of Wakehurst Parkway, in order to minimise encroachment on existing vegetation.
- Retaining walls facing the road (in cut), with a maximum height of about 2.0 metres, would be required either side of Wakehurst Parkway, in order to minimise encroachment on existing vegetation.

Retaining wall finishes

All walls are to be finished in materials and colours that are complementary to the urban bushland setting. A combination of sandstone cladding, stone filled gabion and stone block construction is recommended where facing residential properties, Wakehurst Parkway or other side roads. Where facing Warringah Road, walls are to be faced with precast concrete panels with textured/ form-lined finish. Due to the urban nature of the project, retaining wall finishes are to be of a high quality and visible shotcrete is not to be employed as a finished material.
Bridges and underpasses
Bridges would be required at selected intersections in order to maintain vehicle movements and traffic flows.

- A new bridge would be required at the intersection of Warringah Road and Forest Way, allowing vehicles that are entering Forest Way to pass over the Warringah Road central slot.
- A new bridge would be required at the intersection of Warringah Road, Hilmer Street and the NBH entry road, allowing vehicles that are entering or exiting Hilmer Street or the NBH entry road to pass over the Warringah Road central slot.
- A new bridge would be required at the intersection of Warringah Road and Wakehurst Parkway, allowing vehicles heading north or south on Wakehurst Parkway to pass over the Warringah Road central slot.

Principles specific to bridge and underpass design
The following design principles are provided in order to guide the detailed design of the bridges:

- Bridge design is to be in accordance with Roads and Maritime Bridge Aesthetics guidelines.
- Bridge substructure is to be integrated with retaining walls associated with the central slot so that no additional piers are required.
- Bridge abutments are to be recessive in terms of both bulk and scale and materials. Mould linings and recessive colours should be employed.
- Portals are to incorporate rounding and tapering and high quality finishes.
- Parapets are to sit proud of the bridge deck so that substructural elements are in shadow.
- Bridge rails are to maximise transparency of the structure and permit road user views to the wider landscape.
- Lighting pedestals are to be detailed to a high level of finish, reflect urban quality and be integrated with structural elements or parapets and be cast-in.

Shared path bridges
Shared path bridges are required in order to maintain pedestrian and cyclist connectivity between suburban areas and across arterial roads.

Existing footbridges requiring replacement
Two existing footbridges are located within the Stage 2 project area. One footbridge exists across Warringah Road immediately south of the Forest Way intersection, providing access between a shared path next to Karingal Crescent residences, Forestway Shopping Centre and associated facilities, and Frenchs Forest Public School. Constructed in the 1970s, the footbridge is an arched concrete structure with integrated haunching and circular columns.

The footbridge does not comply with current accessibility standards, both in terms of slope and railing heights, nor does it satisfy clearance heights over the road or safety standards such as cyclist barrier rails or pedestrian safety screens.

A replacement shared path bridge (refer Figure 3-2) would be required in order to maintain connectivity in the area, which must be maintained at all times during construction. This means...
the replacement shared path bridge must be constructed prior to removal of the existing structure.

An elevated access ramp would be required immediately north of the intersection of Warringah Road and Fitzpatrick Avenue East, in order to provide an accessible route from the existing footpath to the new shared path bridge over Warringah Road (refer Figure 3-7 page 66). This ramp is to exhibit the same level of finish as the shared path bridge due to its exposed position, minimal screening opportunities and proximity to local residents.

An existing footbridge across Wakehurst Parkway would be retained for pedestrians and cyclists between Fitzpatrick Avenue and Aquatic Drive, including the Warringah Aquatic Centre should the project extent impact the existing footbridge (refer Figure 3-4).

**New shared path bridges**

A new shared path bridge would be required in order to maintain pedestrian connectivity due to the removal of an at grade crossing at the signalised intersection of Warringah Road and Hilmer Street (refer Figure 3-3). The shared path bridge will maintain access between the southern verge of Warringah Road, The Forest High School and the NBH.

**Principles specific to shared path bridge design**

The following design principles are provided in order to guide the detailed design of the bridges:

• Design is to be in accordance with Roads and Maritime Bridge Aesthetics and Pedestrian bridge design standard for built up areas guidelines

• Shared path bridges are to span the entire roadway without the need for supporting piers where possible

• Substructure is to be integrated with other structures associated with the road design

• Shared path bridges are to be designed to a level of finish suitable for a high profile urban setting

• Colours and finishes are to complement the surrounding bushland setting

• Urban design of the shared path bridges is to focus on reducing visibility of the main structural members so that the structures appear lighter.

**Noise Walls**

Noise walls would be required along the southern verge of Warringah Road next to residential properties along Karingal Crescent, between Fitzpatrick Avenue East and Bantry Bay Road, in order to mitigate noise impacts to residents. Noise walls would be up to four metres in height. Refer to Section 3.7 of this report for locations of noise walls.

**Principles specific to noise walls**

The following specific principles should be adopted:

• The ultimate form, material, colour and texture of noise walls, is to be sensitive to local context

• The finishes of the wall are to be designed to a high level of quality and in accordance with Roads and Maritime’s Noise Wall Guidelines.
• Noise walls should also be designed in consideration of residents living behind, road users and pedestrians and cyclists using the nearby shared path
• Planting is to be provided in order to integrate the wall into the landscape setting
• Walls should be integrated with other wall types and with barriers where these other elements are required
• The upper panels of the wall are to comprise translucent panels in order to allow solar access to private property. Translucent surfaces should include patternation or colour in order to mitigate bird strike. Translucent panels are to be integrated with the wall as whole.

Drainage and water quality structures
Due to road widening within the available corridor and the need to minimise encroachment on residential properties and existing vegetation, minimal water detention opportunities exist. For the most part, drainage is currently proposed to be managed through a new pit and pipe regime, which connects to the existing drainage network (which itself would be amplified in some locations) that discharges into natural drainage lines. As a result of the widening there will be increased areas of impermeable surfaces and relatively minor changes to the percentage distribution of flows into surrounding catchments.

Potential detention facilities would be located:
• South of the intersection of Warringah Road with Fitzpatrick Avenue East where land is to be acquired for widening
• East of Wakehurst Parkway within the extension of Aquatic Drive in order to minimise impacts on surrounding vegetation.

Principles specific to water quality structures
Impact mitigation and water quality improvement would be required due to the increase in hard surfaces associated with the road network. Incorporation of water sensitive urban design measures into the Stage 2 project would be limited, however this would be reviewed during the detailed design stage. The following specific principles should be adopted:
• In locations where the new drainage regime increases flows into natural drainage lines and where the potential for erosion and scour becomes likely, suitable erosion control measures including planting and jute lining, rock armouring, gabion baskets, matting or concrete lining; depending on the specific site conditions, should be implemented
• Consideration should be given during detailed design to the incorporation of ‘end-of-line’ and ‘slot spill capture’ to account for the increased risk of spill due to increased traffic volumes. These measures typically comprise an ‘end-of-line’ facility that is capable of intercepting and temporarily storing up to 25 m³ of spill material
• Assessment is to be undertaken during detailed design with regards to control of nutrients entering specific habitat areas such as the Red-crowned Toadlet habitat areas in to the east of Wakehurst Parkway in the Manly Dam catchment

Refer to the Northern Beaches Hospital Connectivity and Network Enhancements Stage 2 Environmental Impact Statement: Surface Water Assessment (GHD, April, 2015) for a detailed description of impacts and objectives.
Concept urban design of replacement shared path bridge over Warringah Road near Forest Way (looking north)

NOTE: This drawing illustrates the urban design recommendations to be considered further during detailed design development and are subject to change.
Figure 3-3: Concept urban design of new shared path bridge over Warringah Road near Hilmer Street (looking east)

NOTE: This drawing illustrates the urban design recommendations to be considered further during detailed design development and are subject to change.
3.4 Landscape formations

Overview
The design of earthworks would be required as a response to the inter-relationship between road alignment and levels with the existing landscape that results in cutting and filling. Where cut and fill embankments are not retained by walling structures, they remain in the landscape as formations. Surface treatments of these formations would include retention of exposed rock (where the geotechnical properties allow) or revegetation and planting. In some instances, shotcreting of exposed rock may be assessed as being required however; a shotcrete avoidance strategy would be developed during detailed design to minimise this and ensure finishes are of a high quality.

Cuttings
Cutting is required where the vertical alignment of the road is not able to follow existing raised topography. Treatment of the cutting faces would be exposed rock if hard, or revegetated if soft. In most cases associated with the Stage 2 project, retaining walls would be employed (refer Structures).

Cutting would be required due to the upgrading of Wakehurst Parkway. The road is to be widened, resulting in widening of existing cuttings on both sides of the road. As the road is surrounded by forest in this location, the cut slope would be steepened to the maximum allowable grade in order to minimise its footprint.

Due to limited road corridor widths, existing vegetation and a desire to minimise the footprint of the Stage 2 project, retaining wall systems would generally be employed to stabilise the cut surfaces. Refer to the Retaining Walls section of this report.

Fill embankments
Filling is required where the vertical alignment of the road is not able to maintain the same gradient as existing topography or where the road traverses a siding. Treatment of the embankment faces would consist of planting in order to reduce the potential for erosion. In most cases associated with Stage 2 of the concept proposal, retaining walls would be employed (refer Structures).

Filling would be required due to the widening of Warringah Road and Wakehurst Parkway, however, these would generally be removed through the construction of retaining walls, a solution that is supported in order to reduce encroachment on native bushland or private property. Minor filling surfaces would be addressed through landscape treatments such as planting.

Due to limited road corridor widths, existing vegetation and a desire to minimise the footprint of the Stage 2 project, retaining wall systems would generally be employed to negate the need for fill embankments. Refer to the Retaining Walls section of this report.
3.5 Roadside furniture

Bus shelters
Locations would be redesigned to suit planned bus route upgrades by Transport for New South Wales (TfNSW). Shelter designs would be designed to Warringah Council requirements and be consistent with council’s guidelines. Currently bus stops have been proposed in order to maintain existing services, routes and locations. Bus stops along Warringah Road would be in-line wherever possible in order to avoid further widening of the footprint. Bus services along this section of Warringah Road are seen as relatively infrequent as a major bus stop is located at Forestway Shopping Centre.

Fences and barriers
Some fencing would need to be replaced, modified or repaired as a result of the Stage 2 project. These fences would primarily be associated with strips of private property that would be acquired for road widening. Suitable fencing materials would include timber, brick and pressed steel or aluminium fencing in colours suited to the local area. Where possible, vegetative screening would be provided to mitigate the visual impact of fencing.

Principles specific to barriers
Barriers would be required along the central slot, bridges, shared path bridges and next to retaining walls and consider the following specific principles:

• Barriers next to the central slot should incorporate planted garden beds and allow views across the slot and increase solar access to road users in the central slot where practicable
• Barriers should form part of an integrated design with the overall structure of the slot and allow visual permeation where possible, in order to allow road user views and to reduce the physical bulk and vertical scale of the structures
• Barriers next to retaining walls are to allow visual permeation where possible, in order to allow road user views unless the barrier coincides with fencing of private property.

Intelligent transport systems
Intelligent traffic system (ITS) infrastructure is required to support the efficient operation of the upgraded road network. This will primarily take the form of variable message sign (VMS) structures.

Variable message signs
Variable message signs (VMS) display traffic related advice to motorists, such as traffic delays, severe weather conditions, maintenance operations, incident reporting and incident management (refer Plate 3-1 and Figure 3-4): They comprise a steel pole and electronic sign board structure that requires a substantial engineering design component. Whilst there are no existing VMS structures in the immediate corridor, there are several in existence or planned within the surrounding region on motorways and routes to the city.

Roads and Maritime has developed three VMS types, A, B and C, with Type B being the type specifically designed for circumstances similar to the Warringah Road corridor. The selection, placement and assessment of VMS structures is guided by the Roads and Maritime TDT
Guidelines for the location and placement of variable message signs (Roads and Traffic Authority, 2008), which states that for a three lane arterial road with a speed limit of 70 km/h and a relatively low complexity in terms of manoeuvring, the VMS:

- Must be visible along the road for a length of 220 metres
- Centre panel must be offset within six to nine metres from the driver’s eye
- Must be located between 80-120 metres from the decision point or intersection i.e. slot entry
- Be protected by a barrier if located with the clear zone
- Comprise a monochrome (orange text with black background), two-panel display.

Refer to the concept urban design plans for currently proposed locations (subject to change during detailed design). Locations have been selected in order to provide advanced warning to motorists and to allow sufficient alternative route options. Refer to Section 4 of this report for visual impact assessment of VMS structures.

Principles specific to variable message signs

- Selection of the proposed VMS type is to minimise overall bulk and massing in consideration of the sizing that is required in order to deliver efficient and legible information to motorists
- Selection of VMS structures to be considered in conjunction with other VMS installations in the region (particularly on the Warringah Road corridor) in order to provide a coordinated visual outcome for the Northern Beaches area
- Limit signage to the minimum technical requirements in order to minimise visual clutter and motorist confusion
- Design all lighting and signage for the Stage 2 project to be unobtrusive and integrate into the landscape, particularly for areas where the new ITS would introduce new illuminated visual elements
- Use robust, high quality and durable materials appropriate to the urban setting and minimise opportunities for vandalism
- Cabling should be located to minimise the disturbance to existing vegetation. Where this is not possible, replacement planting with similar species is to be provided
- Locations should be conspicuous in order to deliver important message to motorists, however should avoid intrusion on motorist views along the corridor as well as impacts on local resident views and amenity wherever possible.
Plate 3-1: Example of similar VMS Type B signage structure

Figure 3-4: VMS Tpe B placement guidelines extracted from TDT 2005/02b (Roads and Traffic Authority, 2008)
3.6 Landscape treatments

The general approach to the landscape design is to provide a well-vegetated road corridor that aims to integrate the project with the surrounding landscape, minimise visual and physical impacts for local residents and to reinforce a sense of place. In order to achieve this, the landscape revegetation must strike a balance between screening the project from sensitive views from surrounding areas and maintaining key views from the project to the surrounding landscape.

Landscape implementation methods would be developed to support the urban design mitigation measures and to restore the vegetative qualities of the place. Several treatments would be required to suit the existing conditions and to integrate the project with the surrounding landscape, thereby assisting to minimise the potential visual and ecological impact of the new works.

The planting and revegetation design also aims to minimise the potential ecological impacts of the project by stabilising earthworks to prevent erosion, and reinforce existing habitats and ecological corridors through indigenous species selection.

The scale of the project and minimal curtilage may prevent the use of translocation and bushland reconstruction techniques, however this is to be explored during later design stages. Felled tree material should be incorporated into the works, eg coarse woody debris and seed used along bushland edges and mulch used in planting areas.

Principles specific to landscape treatments

The following landscape design principles would be applied to the project:

- Revegetation is to be undertaken to all areas affected by construction work
- The revegetation technique is to be determined by a combination of surrounding landscape character, as well proximity to existing ecological habitats and wildlife corridors
- Use of bush reconstruction and regeneration as a revegetation technique is to be employed for areas next to endemic bushland
- Revegetation in the form of seeding would be used in areas that are not visible to road users and local residents and also in areas adjoining stands of existing vegetation
- Revegetation of fill embankments and shallow cut batters is to be undertaken in order to stabilise the earthworks, minimise visual impact and integrate them with the character of the surrounding landscape
- Provision of planting and revegetation to screen the upgrade from sensitive surrounding land uses
- Limited use of ‘feature’ planting at key intersections and important cultural areas along the road to provide visual landmarks and enhance local identity
- Use of provenance plant material (plants grown from locally collected seeds) wherever possible and if not available, use of bioregionally sourced seed and plants
- Seed is to be sourced from areas of Duffys Forest Ecological Community, particularly any areas that have been cleared for the road upgrade.
**Planting**

Planting would be employed in the form of indigenous street trees and mass shrub planting to assist with screening the upgrade and reducing scale. Feature planting is to be employed in gateway locations. In all cases, due to the scale of the project and the urban setting, larger mature potted stock is to be employed.

**Revegetation**

Seeding techniques would likely comprise hydromulching only as the treatment would be limited to key areas that are potentially (but preferably not) visible to road users or local residents and workers. Seeding would be used where in close proximity to existing bushland and indigenous species used. Seeding techniques employing soil binders and mulch would be employed due to the need to ensure comprehensive erosion control.

**Landscape treatment summary**

The following table summarises potential landscape treatments that would be employed in the Stage 2 project.

**Table 3-2: Landscape treatment summary**

<table>
<thead>
<tr>
<th>Technique</th>
<th>Location for use</th>
<th>Roads and Maritime documentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revegetation/Seeding</td>
<td>Fill embankments or batter-to-boundary areas</td>
<td>Specifications R178 (revegetation)</td>
</tr>
<tr>
<td>Planting</td>
<td>Fill embankments, wall terraces, verges, private property, gateways</td>
<td>Specification R179 (planting)</td>
</tr>
<tr>
<td>Turfing</td>
<td>Verges, private property</td>
<td>Specification R179 (planting)</td>
</tr>
</tbody>
</table>
3.7 Concept urban and landscape design drawings

Concept design plans

Concept design plans have been prepared following the identification of urban design objectives and principles, contextual analysis and the development of urban design strategy and mitigation measures, which combine to form the urban design response to the project in its current form (refer Figure 3-5). The design would be further developed in subsequent design stages.

For concept urban design drawings describing the Stage 1 project, please refer to *Northern Beaches Hospital Connectivity and Network Enhancements Concept Proposal and Stage 1 Urban Design Report and Landscape Character and Visual Impact Assessment* (SMM, October 2014).
NOTE: This drawing illustrates the urban design recommendations to be considered further during detailed design development and are subject to change.
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NOTE: This drawing illustrates the urban design recommendations to be considered further during detailed design development and are subject to change.

NOTE: Minimum clearing of Duffy's Forest vegetation and replant/revegetate all areas affected by the project works.
Concept design sections

Cross-sections (refer Figures 3-7 to 3-14) have been prepared in order to describe the road design including the proposed urban and landscape design and mitigation measures (refer Figure 3-6 for locations of sections). The detailed design would be further developed in subsequent design stages.

Figure 3-6: Cross section key plan (refer to plans for exact locations)
Figure 3-7: Section A: Warringah Road, south of the intersection with Fitzpatrick Avenue (looking north)
Figure 3-8: Section B: Warringah Road, south of the intersection with Forest Way (looking north)

NOTE: This drawing illustrates the urban design recommendations to be considered further during detailed design development and are subject to change.
NOTE: This drawing illustrates the urban design recommendations to be considered further during detailed design development and are subject to change.
NOTE: This drawing illustrates the urban design recommendations to be considered further during detailed design development and are subject to change.
Figure 3-11: Section E: Warringah Road, west of the intersection with Bantry Bay Road (looking...
Figure 3-12: Section F: Warringah Road, east of the intersection with Wakehurst Parkway (looking east)

NOTE: This drawing illustrates the urban design recommendations to be considered further during detailed design development and are subject to change.
NOTE: This drawing illustrates the urban design recommendations to be considered further during detailed design development and are subject to change.
NOTE: This drawing illustrates the urban design recommendations to be considered further during detailed design development and are subject to change.
4. Impact assessment

4.1 Overview

The following section of the report comprises a landscape character and visual impact assessment. This has been undertaken in accordance with the Roads and Maritime EIA N04 Practice Note: Guidelines for Landscape Character and Visual Impact Assessment V2.0 (Roads and Maritime, 2013) and has been undertaken in parallel with development of the concept design. Outcomes of the impact assessment have been incorporated directly into the concept design, or are recommended to be incorporated into the Tender Design.

Landscape character assessment

Impacts on landscape character have been interpreted through the identification of landscape character zones distributed across the concept proposal study area. In this report, which is mainly focused on the Stage 2 project area, landscape character zones have been described where they fall within the Stage 2 project area followed by an assessment of potential impacts resulting from the Stage 2 project.

Visual impact assessment

Visual impacts have been interpreted based on a series of visual assessment precincts that are located on key areas of the Stage 2 project. The areas have been determined by the amount of change that is likely to occur or by proximity to key stakeholders. An assessment of potential impacts is made for each precinct based on an assessment of several viewpoints within the precinct and determining an overall value. In both the landscape character and visual impact assessments, the Roads and Maritime impact grading matrix is employed.
4.2 Landscape character assessment

The landscape contextual studies have demonstrated that the concept proposal area, including the Stage 2 project, has an identifiable sense of place. The combination of bushland, cultural tree planting, low-density residential and open space exhibits the visual and landscape qualities that are consistent with the northern beaches of Sydney. The historical development of the area has seen recognisable cultural patterns on the landscape, juxtaposed with road alignments that respond to natural landscape features such as topography. Remnant bushland can be found in dedicated corridors and residual patches within the urban fabric of the area.

Landscape character assessment methodology

Roads and Maritime Guidelines for Landscape Character and Visual Impact Assessment (RMS, 2013) provides the following definition of landscape character -

‘Landscape character is the aggregate of built, natural and cultural aspects that make up an area and provide its unique sense of place. Landscape in this context is taken to include all aspects of a tract of land - the built, planted and natural topographical and ecological features.’

In applying this definition to the specific conditions within the study area and the features of the project, the landscape character assessment also considers how the road upgrade would be used and how it would function as a part of the region. The assessment has considered both existing landscape character and potential landscape character post-completion.

Magnitude

In landscape character assessment, magnitude refers to the type of project and its compatibility with the existing landscape character. All anticipated elements of the project, including bridge and road infrastructure, shared paths, planting, lighting, etc, are considered. The scale of the element (height, length), as well as its location or setting, all have a bearing on the magnitude of the physical presence of the works.

A high magnitude results if the project constitutes a major development or piece of road infrastructure and contrasts highly with the surrounding landscape, or entails heavy modification of the existing landscape, for example, the large-scale removal of existing vegetation. A moderate magnitude rating would result if the project is moderately integrated into the landscape. A low magnitude rating would occur if the project is of a small scale and integrates well into the landscape. The magnitude impact rating also considers whether the project has a positive or negative impact on the landscape character of the zone. For example, a project may be of a large scale but may provide beneficial outcomes such as increased open space, enhancement of the areas ‘sense of place’, and better connectivity.
Sensitivity

Sensitivity is assessed on the perceived value of the existing landscape character. A judgment has been made as to the quality of the landscape, its cultural and historical importance to the community, scenic quality, and overall composition of the place and its inhabitants. The following sensitivity judgments have been used as the basis for this assessment:

- Places with high social, recreational, and historical significance to local residents have higher sensitivity
- Generally, water and natural environments are more highly valued than modified areas
- Areas of unique scenic quality have higher sensitivity
- A pristine environment would have greater sensitivity with less ability to absorb new elements in the landscape than modified landscapes or those areas with contrast and variety of landscape types
- The number and frequency of viewers affects sensitivity, with retail, residential and open space.

Impact

Impact is the combination of the magnitude and sensitivity rating in accordance with the Impact Assessment Grading Matrix (refer Table 4-1).

<table>
<thead>
<tr>
<th>Sensitivity</th>
<th>High</th>
<th>Moderate</th>
<th>Low</th>
<th>Negligible</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>High impact</td>
<td>High to Moderate impact</td>
<td>Moderate to Low impact</td>
<td>Negligible</td>
</tr>
<tr>
<td>Moderate</td>
<td>High to Moderate impact</td>
<td>Moderate impact</td>
<td>Moderate to Low impact</td>
<td>Negligible</td>
</tr>
<tr>
<td>Low</td>
<td>Moderate impact</td>
<td>Moderate to Low impact</td>
<td>Low impact</td>
<td>Negligible</td>
</tr>
<tr>
<td>Negligible</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Negligible</td>
</tr>
</tbody>
</table>

Table 4-1: Roads and Maritime impact grading matrix
Landscape character zone identification

The Urban Design Framework report (KI Studio, 2012) identified eight landscape character types within the study area, namely ‘National Park Corridor’, ‘Parkway to Beaches’, Residential, Business park, Commercial Strip, School, Bushland and Disturbed Bushland. Sensitivity ratings for these zones ranged from high to moderate – low. These character types have been used as a basis for developing seven Landscape Character Zones (LCZ) for the concept proposal area, five of which are impacted by the Stage 2 project (refer Figure 4-1 and Table 4-2).

LCZs are defined for the purpose of gaining an understanding of land use, topography and vegetation in combination with other factors intrinsic to the local landscape. The landscape character zones facilitate detailed assessment of the character of the concept proposal study area, including the Stage 2 project area and of the magnitude, sensitivity and impact likely on the landscape character of each zone to be experienced as a result of the project.

Visual Assessment Precincts (assessed in Section 4.3 of this report) overlay the LCZs and are also used to assess, in detail, the impacts that would result from the Stage 2 project. Mitigation measures described in Section 4.7 of this report would apply to both LCZs and VAPs.

The LCZ identification is based on the entire concept proposal area, whereas their individual impact assessment ratings are only based on the Stage 2 project area.

**Table 4-2: Landscape character zones**

<table>
<thead>
<tr>
<th>Zone</th>
<th>VAP</th>
<th>Description</th>
<th>Key project element</th>
</tr>
</thead>
<tbody>
<tr>
<td>01 Frenchs Forest Road East/ Allambie Road (north)</td>
<td>N/A</td>
<td>Frenchs Forest Road East and immediate curtilage</td>
<td>Refer Stage 1 report.</td>
</tr>
<tr>
<td>02 Frenchs Forest West/ Naree Road</td>
<td>N/A</td>
<td>Frenchs Forest Road West and immediate curtilage</td>
<td>Refer Stage 1 report.</td>
</tr>
<tr>
<td>03 Wakehurst Parkway</td>
<td>07, 11 - 12</td>
<td>Wakehurst Parkway and immediate curtilage, including the intersection with Frenchs Forest Road including approaches</td>
<td>Underpass of Warringah Road, retaining walls and widening</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>New intersection with Aquatic Drive</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Retained footbridge</td>
</tr>
<tr>
<td>04 Warringah Road (east)</td>
<td>08 - 09</td>
<td>Warringah Road and immediate curtilage from west of Allambie Road to Courtley Road in the east</td>
<td>Widening along southern verge</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Street tree removal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Variable Message Sign structure</td>
</tr>
<tr>
<td>05 Warringah Road (west)/ Forest Way</td>
<td>01 - 07</td>
<td>Warringah Road, between Wakehurst Parkway and Fitzpatrick Avenue and Forest Way, between Naree Road and Warringah Road</td>
<td>Open slot with underpasses of Forest Way and Hilmer Street, retaining walls and bridge structures</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>One new shared path bridge</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>One replacement shared path bridge</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Two Variable Message Sign structures</td>
</tr>
<tr>
<td>06 Karingal Crescent/ Bantry Bay Road</td>
<td>02, 03, 06, 07</td>
<td>Residential and commercial area bordered by Karingal Crescent, Fitzpatrick Avenue East and Bantry Bay Road</td>
<td>Substantial widening and cutting, removal of parkland edge and local shops</td>
</tr>
<tr>
<td>07 Aquatic Drive/ Allambie Road (south)</td>
<td>09 - 11</td>
<td>Commercial area along Aquatic Drive between and Allambie Road in the east and Wakehurst Parkway to the west</td>
<td>Aquatic Road extension</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Widened intersection with Warringah Road</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Compound site during construction</td>
</tr>
</tbody>
</table>
Figure 4-1: Landscape character zones of the concept proposal study area.

**LEGEND**
- CREEK
- PRIMARY INTERSECTION
- SECONDARY INTERSECTION

**LCZ 01** FRENCHS FOREST ROAD EAST/ALLAMBIE ROAD (NORTH)
**LCZ 02** FRENCHS FOREST ROAD WEST/INAREREE ROAD
**LCZ 03** WAKEHURST PARKWAY
**LCZ 04** WARRINGAH ROAD (WEST)/ FOREST WAY
**LCZ 05** KARINGAL CRESCENT/BANTRY BAY ROAD
**LCZ 06** AQUATIC DRIVE/ALLAMBIE ROAD (SOUTH)
Landscape character zone 03: Wakehurst Parkway

Existing landscape character

The main component of landscape character zone 03 is Wakehurst Parkway, which comprises a single carriageway road for much of its length and is densely enclosed by predominantly native bushland. The dense vegetation reinforces the northern beaches character as many people enter the area via this gateway. On approach to Warringah Road from the north, Wakehurst Parkway rises sharply from the Middle Creek valley. The southern approach to Warringah Road is characterised by an enclosed ridgetop driving experience, which opens out at the intersection. From both directions 'sense of arrival' is experienced by the road user upon reaching Warringah Road. The road, which bisects the Stage 2 project area and connects the suburbs of Seaforth and Narrabeen, is heavily used in morning peak times causing the intersections with Frenchs Forest Road and Warringah Road to be heavily congested.

Pedestrian engagement with this character zone is limited to signalised crossings at the major intersection and occasional walking trails, such as the one linking Aquatic Drive and Fitzpatrick Avenue East via an existing footbridge. Vegetation is presently a dominant feature of the pedestrian experience also, as there is no development along this section of the road, within a 100 metre wide corridor.

While the intersection footprint is large, it is currently bordered by dense vegetation. This is expected to change as a result of the NBH and future development resulting from the Warringah Council Structure Plan.

Refer to Plate 4-1 and Plate 4-2 for existing character images.

The project

The Stage 2 project would see widening along Wakehurst Parkway, south of Warringah Road and a new intersection with Aquatic Drive. An existing footbridge connecting Bantry Bay Road and Fitzpatrick Avenue with Aquatic Drive via an existing pedestrian pathway would be retained. The intersection of Wakehurst Parkway with Warringah Road would comprise widening and an underpass allowing through traffic on Warringah Road to pass under Wakehurst Parkway. Widening of the intersection would impact on vegetation as well as Brick Pit Reserve.

Landscape character assessment

The impact on landscape character is described in Table 4-3.

<table>
<thead>
<tr>
<th>Zone</th>
<th>Sensitivity</th>
<th>Magnitude</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>03 Wakehurst Parkway</td>
<td>Moderate</td>
<td>High</td>
<td>High to moderate</td>
</tr>
<tr>
<td></td>
<td>Bushland edges</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Large pavement area at intersection</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cutting/widening (and potentially walls)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Underpass/bridge/portals</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vegetation loss.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Dense vegetation either side of Wakehurst Parkway creates a strong ‘sense of enclose’. Existing rock cuttings form a solid edge to the road.

On approach to the intersection with Warringah Road, a ‘sense of arrival’ is experienced due to the elevated and exposed position.

Plate 4-1: Wakehurst Parkway northbound approach to Warringah Road intersection (looking south)

Plate 4-2: Wakehurst Parkway northbound approach to Warringah Road intersection (looking north)
Landscape character zone 04: Warringah Road (east)

Existing landscape character

Warringah Road is an important transport corridor for the Northern Beaches and is situated on an east-west ridgeline. The road currently experiences heavy congestion at peak times of the day. In this section of the road, mature Liquidambar street trees and native trees dominate the road corridor and are associated with verge planting, business parks, schools and further to the east and west, residential gardens.

The road exhibits a ‘parkway’ character as a result, and in combination, with its position on relatively high ground and wide vegetated verges and roadside vegetation, forms a gateway to the Forest district of the Northern Beaches. An opening and closing of vistas occurs due to the ridgeline position and the variations in density of roadside vegetation.

Pedestrian footpaths line both sides of Warringah Road for much of its length, occasionally winding through wider areas of trees in turf. Footpaths range from kerbside positions to being set behind grassed verges with street trees. The pedestrian experience is therefore also one of a ‘parkway’ character.

Commercial properties in this zone currently enjoy large setbacks from Warringah Road and are often densely vegetated.

Refer to Plate 4-3 and Plate 4-4 for existing character images.

The project

The Stage 2 project would see widening of Warringah Road from the underpass portal west of Wakehurst Parkway to Allambie Road in the east. This widening would primarily be located on the southern verge and allow the construction of a central depressed slot that will allow through traffic and a shared path along the southern side. Widening would also result in retaining walls (primarily in fill) in several locations and the construction of new kerb and gutter, linemarking, as well as substantial removal of street trees, replacement footpaths and landscape planting. The northern verge would be largely untouched.

Landscape character assessment

The impact on landscape character is described in Table 4-4.

Table 4-4: Landscape character zone 04 rating

<table>
<thead>
<tr>
<th>Zone</th>
<th>Sensitivity</th>
<th>Magnitude</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>04 Warringah Road (East)</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td></td>
<td>- Existing six lane road</td>
<td>- Widening/walling primarily on southern verge</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Vegetated parkway character</td>
<td>- Underpass/bridge/portals</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Corporate business parks dominate built form.</td>
<td>- Shared path and fences</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Vegetation loss</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Variable Message Sign structure</td>
<td></td>
</tr>
</tbody>
</table>
Plate 4-3: Heading east away from Wakehurst Parkway intersection towards Allambie Road

Plate 4-4: Corporate business parks on Warringah Road (east)

Strongly vegetated parkway character. Corporate business parks with large setbacks dominate the built form.
Landscape character zone 05: Warringah Road (west) and Forest Way

Existing landscape character

This landscape character zone comprises a highly urbanised road corridor located within a suburban landscape and is bisected by Forest Way, which connects Warringah Road to Mona Vale Road. Further north, outside of the study area, Forest Way adopts a strongly vegetated parkway character; while further west, Warringah Road descends into the more residential setting of the suburb of Forestville.

A major feature of the landscape character zone is the Forestway Shopping Centre, a 3-storey structure, with entrances off Forest Way and Russell Avenue. A smaller group of shops known locally as Bantry Bay Shops is located on the corner of Warringah Road and Bantry Bay Road. Other notable features are the The Forest High School and Frenchs Forest Public schools, both which front the arterial roads in this zone and provide visual relief in terms of open space and mature vegetation.

Karingal Reserve is a road reserve sandwiched between Warringah Road and Karingal Crescent, which provides a substantial forested edge to this section of Warringah Road and contrasts with the broad expanse of the existing intersection of Warringah Road and Forest Way. An existing concrete footbridge crosses over Warringah Road from Karingal Reserve towards Frenchs Forest Public School and Forestway Shopping Centre. Its location, arched form and integrated haunching comprise a locally identifiable landmark at the intersection with Forest Way.

Refer to Plates 4-5 to 4-7 for existing character images

The project

The Stage 2 project would involve widening of the intersection of Warringah Road and Forest Way, the construction of a central depressed slot with two underpasses (at Forest Way and Hilmer Street) and two shared path bridges (one existing replaced, one new). A surface road would run either side of the slot and connect with existing roads at intersections sitting over the central slot. Widening would result in retaining walls (primarily in cut) and the removal of mature vegetation from Karingal Reserve. Noise walls and screening devices would be required in order to mitigate noise associated with the roadway from local residents. Footpaths and ramps would be constructed in order to provide access to the shared path bridges and to connect with existing pathways.

Landscape character assessment

The impact on landscape character is described in Table 4-5.

<table>
<thead>
<tr>
<th>Zone</th>
<th>Sensitivity</th>
<th>Magnitude</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>05 Warringah Road (West)</td>
<td>High</td>
<td>Existing six lane road</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Densely vegetated parkway character</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mix of commercial, residential and community (schools) land uses.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Widening, walling and noise walls primarily on southern verge</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Underpass/ bridge/ portals</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Replacement shared path bridge</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Substantial vegetation loss along corridor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Two Variable Message Sign structures</td>
<td></td>
</tr>
</tbody>
</table>
Table 4-5: Landscape character zone 05 rating

<table>
<thead>
<tr>
<th>Zone Sensitivity</th>
<th>Magnitude</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warringah Road (West)</td>
<td>High</td>
<td>Widening, walling and noise walls primarily on southern verge</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Underpass/ bridge/ portals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Replacement shared path bridge</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Substantial vegetation loss along corridor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Two Variable Message Sign structures</td>
</tr>
</tbody>
</table>

Plate 4-5: Eastbound approach on Warringah Road towards the intersection with Forest Way

Plate 4-6: Views from the existing footbridge over Warringah Road looking south/west (left) and north/east (right)

Plate 4-7: Eastbound approach on Warringah Road towards Hilmer Street
Landscape character zone 06: Karingal Crescent/ Bantry Bay Road

Existing landscape character

This landscape character zone comprises a well-vegetated suburban area bordered by Warringah Road along its northern and western edges and on two sides by existing vegetation associated with the Bantry Bay catchment. The zone is not accessed directly by Warringah Road, road users must use Fitzpatrick Avenue, Hilmer Street or Bantry Bay Road, which results in a more secluded environment. The zone is set back from Warringah Road and Wakehurst Parkway by vegetation ranging from 50 to 100 metres in width, which in combination with tree lined streets and well-vegetated back yards, defines the character of this zone.

Karingal Reserve, a road reserve sandwiched between Warringah Road and Karingal Crescent, provides a substantial forested edge to this corresponding section of Warringah Road and offers a rare experience of separation from the main roads for pedestrians and cyclists who use the shared path that winds through the reserve. Residents on Karingal Crescent, which back on to this reserve, enjoy a degree of amenity as well as separation and privacy from Warringah Road.

A small park known as Brick Pit Reserve falls within 100 metres of Wakehurst Parkway and is accessed via Bantry Bay Road. The park comprises historical information in the form of plaques, a children’s play area and seating. Residents have good access to retail, being either the Bantry Bay Shops or via the footbridge over Warringah Road to Forestway Shopping Centre. Local schools are also in close proximity via similar connections.

Refer to Plate 4-8 to 4-10 for existing character images

The project

Widening and earthworks resulting from the southern realignment of Warringah Road would see the removal of large setbacks and vegetation associated with Karingal Reserve as well as the removal of Bantry Bay shops. Pedestrian ramps servicing the replacement shared path bridge over Warringah Road located near the intersection of Fitzpatrick Avenue East and Warringah Road would be required in order to provide access to the new shared path bridge. A new shared path bridge would be provided at the intersection of Warringah Road and Hilmer Street. Noise walls and screening devices would be required in order to mitigate noise associated with the roadway from local residents. Footpaths and ramps would be constructed in order to provide access to the shared path bridges and to connect with existing pathways.

Landscape character assessment

The impact on landscape character is described in Table 4-6.

Table 4-6: Landscape character zone 06 rating

<table>
<thead>
<tr>
<th>Zone</th>
<th>Sensitivity</th>
<th>Magnitude</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>06 Karingal Crescent/ Bantry Bay Road</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>- Quiet residential area with access to shops, schools and community facilities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Substantial vegetative buffer strips between residential properties and roads</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Attractive vegetated streets</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Connected open space and shared path access</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Widening, walling and noise walls primarily on southern verge of Warringah Road</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- New and replacement shared path bridges</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Substantial vegetation loss along corridor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Removal of Bantry Bay shops</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Plate 4-8: Suburban Karingal Crescent (left) and Bantry Bay Shops (right)

Plate 4-9: Shared path at Karingal Reserve (left) and seating at Brick Pit Park (right)

Plate 4-10: Shared path connectivity at the eastern (left) and western (right) ends of the existing footbridge over Warringah Road
Landscape character zone 07: Aquatic Drive/Allambie Road (south)

Existing landscape character

Located to the south of Warringah Road and east of Wakehurst Parkway, this zone comprises commercial buildings set amongst landscaped carparks and setbacks. The zone is accessed via Allambie Road and Aquatic Drive, which terminates at the Warringah Aquatic Centre about 100 metres short of Wakehurst Parkway.

Other notable features of this zone are the existing substation and a now disused property operated by the Sunnyfield Association, which is to be converted into the site office and compound during construction. The compound was assessed in the Concept Proposal/Stage 1 report.

Commercial properties have generous setbacks of around 40 metres from Warringah Road, which are well-vegetated, contributing to both the parkway character of Warringah Road in zone 4, as well as the business park character of this zone.

At peak times during office opening and closing, traffic delays are experienced due to limited local road connections and capacity.

Refer to Plate 4-11 to 4-13 for existing character images.

The project

This zone has limited work directly associated with the project, however is directly impacted by the upgrade in zone 05. The extension of Aquatic Drive and new intersection with Wakehurst Parkway will open up traffic in both directions along Aquatic Drive, not only to workers associated with the commercial properties but also through traffic moving in and out of the area. Widening of Warringah Road and intersections with Wakehurst Parkway and Allambie Road will result in vegetation removal and modified traffic flows in the zone.

Landscape character assessment

The impact on landscape character is described in Table 4-7.

Table 4-7: Landscape character zone 07 rating

<table>
<thead>
<tr>
<th>Zone</th>
<th>Sensitivity</th>
<th>Magnitude</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>07 Aquatic Drive/Allambie Road (South)</td>
<td>Moderate</td>
<td>Low</td>
<td>Moderate to low</td>
</tr>
<tr>
<td></td>
<td>- Densely vegetated parkway character, with planted setbacks</td>
<td>- Minor widening</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Mix of commercial, residential and community (swim centre) land uses.</td>
<td>- New road connection to Wakehurst Parkway and increased traffic</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Footbridge retained</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Relatively minor vegetation loss</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Site office/ compound site</td>
<td></td>
</tr>
</tbody>
</table>
Plate 4-11: Carpark and entry to Warringah Aquatic Centre from the western end of Aquatic Drive (left) and Warringah Road frontage of business parks accessed via Aquatic Drive (right)

Plate 4-12: Westbound view of Aquatic Drive near eastern end (left) near western closure (right)

Plate 4-13: Former Sunnyfield Association building frontage (a) and rear (b) would be used as the site compound during construction of Stage 2
Landscape character assessment summary

Stage 2 of the concept proposal study area generally consists of three landscape character types.

Residential villages are populated by a high proportion of people who consider the bushland environment, recreational amenities and proximity to natural features as an important component of their day-to-day life. Suburban streets within the study area tend to be quiet and well-vegetated, with limited exposure to main arterial roads, due to generous vegetated road reserve setbacks and limited local road connections. High degrees of impact are expected due to a substantial removal of well-vegetated road reserve setbacks and replacement with hard surfaces and structures, particularly to residents on Karingal Crescent.

Corporate business parks form another character type in Stage 2. These are typically located on Warringah Road (east) and are set back from the road with generous frontages comprising substantial landscaped areas and well established trees. Moderate to high impact is likely in these zones due to the loss in part of these setbacks, particularly along the southern verge of Warringah Road.

Motorists using the road infrastructure in Stage 2 typically experience large stands of indigenous vegetation, occasional vistas to surrounding natural landscapes, street trees and the relatively low vertical scale of the surrounding development. Motorists using Warringah Road experience the bushland character immediately after crossing Roseville Bridge to the west of the study area, an experience that continues in an easterly direction, as well as to the north and south. Wakehurst Parkway, which links Seaforth in the south with Narrabeen in the north, generally comprises a densely enclosed bushland character that is consistent with the northern beaches and similar to other arterial connections in the region such as Forestway and Mona Vale Road. Vegetation removal will be particularly noticeable by motorists using Warringah Road in the vicinity of Forest Way, as well as motorists approaching Warringah Road on Wakehurst Parkway. This is expected to result in a moderate impact.

The landscape character impact of the Stage 2 project across the concept proposal area is summarised in Table 4–8. Zones 01 and 02 and the site office/compound site are assessed in the Stage 1 report.
<table>
<thead>
<tr>
<th>No.</th>
<th>Landscape character zone</th>
<th>Sensitivity</th>
<th>Magnitude</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>03</td>
<td>Wakehurst Parkway</td>
<td>Moderate</td>
<td>High</td>
<td>High to moderate</td>
</tr>
<tr>
<td>04</td>
<td>Warringah Road (East)</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td>05</td>
<td>Warringah Road (West)/ Forest Way</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>06</td>
<td>Karingal Crescent/ Bantry Bay Road</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>07</td>
<td>Aquatic Drive/ Allambe Road (South)</td>
<td>Moderate</td>
<td>Low</td>
<td>Moderate to low</td>
</tr>
</tbody>
</table>
4.3 Visual impact assessment - road viewers

Overview
The potential visual impact of the Stage 2 project has been assessed in relation to a number of key viewpoints. It is based on the existing pattern of land use and development adjoining the works. The method of assessment has involved:

- Defining the scale or size, form and type of the project within the context of the study area
- Establishing an estimated visual catchment, through desktop analysis and ground-truthing on site
- Identifying key viewpoints from where the upgrade would be visible
- Identifying key viewpoints within the project area (road user views)
- Assessing the level of potential visual impact on viewers at these viewpoints as a result of the Stage 2 project.

Visual impact of the concept proposal relating to the Stage 1 area has been assessed in the Stage 1 EIS report.

Visual impact assessment methodology
The magnitude of change to existing views and the sensitivity of the viewers has been assessed for each of the chosen viewpoints in accordance with the Roads and Maritime impact grading matrix (refer Table 4-1).

Magnitude
Magnitude of change to existing views refers to the nature and scale of the upgrade, and the extent and proximity of the view to the work. Magnitude represents the contrast in scale, form and type of work and to the location and context to which it is to be placed. A high magnitude results if the upgrade is of a major scale and are considered out of scale or uncharacteristic of the existing visual character, or if there is considerable modification to the existing landscape. A moderate magnitude would result if the upgrade is prominent but not considered to be substantially uncharacteristic with the existing visual character. A low magnitude results if there is minimal alteration to the existing view and the upgrade is of a scale and nature that is consistent with the existing visual character.

Sensitivity
Sensitivity is the measure of the visual importance of the view and is dependent on the following:

- Distance between viewer and the works
- The category of viewer such as resident, visitor or worker
- The elements of the upgrade that are visible
- Importance of the view.

Visual sensitivity includes the consideration of the perceived cultural and historical values of the visual environment and the elements within it. Generally, viewers with the highest sensitivity include:
Residents who have existing views that would be affected by the upgrade

Users of public open space where their attention is focused on the visual landscape, for example, lookouts or other scenic natural areas

Communities that place high cultural and historical significance on the visual landscape.

Viewers with the lowest sensitivity are most likely to be:

Employees working within an enclosed workplace and focused on their work – however interesting views should be provided for them within a short walk from their workplace

Motorists (apart from tourists) whose attention is focused on driving – however it is important to provide a stimulating motorist experience.

Impact

Impact is the combination of the magnitude and sensitivity rating in accordance with the Impact Assessment Grading Matrix (refer to Table 4-1).

Visual catchment zones

A combination of the physical characteristics of the site, the nature of the existing road corridor and the proposal itself define the visible area and the catchment from where the works are visible. This visual catchment has then been defined as visual catchment zones (VCZ).

Refer to Figure 4-2 for visual catchment zone and visual assessment precinct identification. Two Visual Catchment Zones have been identified based on geographic proximity to the proposal, as follows:

- Primary visual catchment zone approximately 0 – 25 m
- Secondary visual catchment approximately 25 – 100 m.

Visual assessment precincts and viewpoints

Within the Primary Visual Catchment Zone (VCZ), Visual Assessment Precincts (VAP) have been identified based on key centres of activity associated with the project.

Viewpoints within visual assessment precincts have been selected and assessed as a group for potential impacts.

The chosen viewpoints within the visual assessment precincts have been assessed using the following methods:

- Field investigations, site photography and mapping
- Computer generated visualisations based on 3-dimensional design and survey data
- Aerial views and transects using Google Earth Professional software.

In measuring the impact of change within the visual assessment precinct, the following conditions have been taken into account:

- Distance between viewer and road
- Elevation change between viewer and road
• A visual and desktop assessment made of the vertical and horizontal field of view impacted on by physical site features
• An assessment made of the type of intervention made by the upgrade into the existing landscape.

The assessments are undertaken against the following primary conditions:
• Public domain impacts
• The impact from private properties or other selected locations
• The impact upon users of the road itself or other connecting roads.

Primary visual catchment zone
An assessment of the immediate terrain, built form and vegetation has determined the Primary visual catchment zone as an approximate 25 metre band around the project kerb line. The zone captures the front line of resident houses and front facades of commercial buildings from where the most impacted views are located.

Local residences tend to be located at similar elevations to the road, typically slightly above on the southern side of Warringah Road and slightly below on the northern side, although there are locations where this varies. Commercial properties would have views over the upgrade from higher floors, as many buildings would be set below road level, particularly on the southern side. Many commercial properties and residences are surrounded by vegetation.

Users of institutions and community facilities would also be impacted, namely The Forest High School, Frenchs Forest Public School and Warringah Aquatic Centre. In these locations, widening and vegetation loss would be experienced, which would potentially open up views of the upgrade and associated infrastructure such as retaining walls.

Another aspect of visual impact is its relationship to headlight glare and noise walls. Residences in close proximity to the upgrade may also experience these changes in their environmental conditions. Refer to Section 4 of this report for strategies that deal with these issues. Vegetation loss associated with widening would tend to open up views in some locations, which highlights why new planting would be critical.
Figure 4-2: Visual assessment precinct plan.
Visual assessment precinct 01: Frenchs Forest Public School

Location and description

This visual assessment precinct is located at the western end of the Stage 2 area, on the north-western verge of Warringah Road, immediately south of the intersection with Forest Way.

The precinct contains viewpoints: 01-03. Refer Figures 4-3 to 4-5 and Plates 4-14 to 4-16.

Visible elements of the upgrade:

- Widening of Warringah Road far side (southern verge) and associated walling (in cut)
- Central depressed slot and associated barriers and walling (in cut)
- Replacement shared path bridge and associated barriers and ramping
- Substantial vegetation removal on southern verge
- Tree planting and landscaping

Affected viewers:

- Staff and students at Frenchs Forest Public School
- Workers at Forestway Shopping Centre and associated community facilities (youth centre, day care centre)
- Residents on Warringah Road (510, 512, 514 and 516), Ann Street (2A, 2, 4, 6 and 8) and Fitzpatrick Avenue West
- Pedestrians and cyclists
- Road users (assessed separately).

Description of impacts

- Limited immediate physical impacts on the near side verge
- Views of substantially widened road footprint, including a depressed central slot, at the expense of existing vegetation on the far side of the road
- Retaining walls (in cut), barriers and noise walls would be visible across the far side of the road.

The visual impact on these viewpoints is summarised in Table 4-9.
Figure 4-4: VAP 01 viewpoint locations

Figure 4-5: VAP 01 aerial oblique view, looking north-east along Warringah Road from the intersection of Fitzpatrick Avenue East

Legend
- Aerial oblique view
- Viewpoint on aerial oblique view

Warringah Road and Forest Way intersection
Plate 4-14: Viewpoint 01, looking north-east along Warringah Road from the intersection of Fitzpatrick Avenue West

Plate 4-15: Viewpoint 02, looking north-east along Warringah Road towards the Forest Way intersection
### Table 4-9: VAP 01 impact rating

<table>
<thead>
<tr>
<th>Precinct</th>
<th>Sensitivity</th>
<th>Magnitude</th>
<th>Impact</th>
</tr>
</thead>
</table>
| 01 Frenchs Forest Public School | Moderate
- Partly commercialised mixed with suburban residences and a school
- Existing six lane road
- Existing footbridge
- Densely vegetated backdrop (Karingal Reserve) and parkway character. | High
- Widening
- Underpass/ bridge/ portals
- Replacement shared path bridge
- Substantial retaining structures
- Fencing and barriers
- Substantial vegetation loss including street trees. | High to moderate |
NOTE: This montage illustrates the urban design recommendations to be considered further during detailed design development and are subject to change.

Vegetation to line either side of slot road in order to mitigate loss of vegetation from outside edge of surface road on southern verge.

Shared path bridge spans ridge line cutting associated with slot road portal.

Shared path ramps associated with bridge to incorporate vegetation and design to reduce views of nearby residences.

Retaining walls facing the mainline and noise walls to comprise finishes that are complimentary to the urban bushland setting.

Vegetation to line either side of slot road in order to mitigate loss of vegetation from outside edge of surface road on southern verge.

Figure 4-6: Montage A - Warringah Road looking north towards Forest Way intersection, shared path bridge and slot road portal. Refer to Figure 4-2 for location of view.
Visual assessment precinct 02: Fitzpatrick Avenue

Location and description

This precinct is located on the south-eastern verge of Warringah Road, between Fitzpatrick Avenue and the existing footbridge.

Viewpoints: 04-05. Refer Figures 4-7 to 4-9, and Plates 4-17 and 4-18.

Visible elements of the upgrade:

• Widening of Warringah Road south-eastern verge and associated walling (in fill)
• Central depressed slot and associated barriers and walling (in cut)
• Replacement shared path bridge and associated barriers, shared paths and ramping
• Noise wall
• Substantial vegetation removal on southern verge
• Tree planting and landscaping.

Affected viewers:

• Residents on Warringah Road (587), Karingal Crescent (1-14), Panorama Crescent (20) and Fitzpatrick Avenue East (3, 5 and 7)
• Pedestrians and cyclists
• Road users (assessed separately).

Description of impacts

• Views of substantially widened road footprint, including a depressed central slot, at the expense of existing vegetation currently screening the existing road
• Retaining walls (in fill), barriers and noise walls would be visible in foreground
• View of ramping associated with replacement shared path bridge
• Limited immediate physical impacts on the far side verge as a result of minimal work at this location.

The visual impact on these viewpoints is described in Table 4-10

Figure 4-7: Key plan
Figure 4-8: VAP 02 viewpoint locations

Figure 4-9: VAP 02 aerial oblique view looking north along the southern verge of Warringah Road from Fitzpatrick Avenue East

(Source: Background terrain image: Copyright Google, Digital Globe, 2010)
Plate 4-17: Viewpoint 04, looking west along Fitzpatrick Avenue East adjacent the setback adjacent Warringah Road

Plate 4-18: Viewpoint 05, looking north east along the pedestrian footpath located in the southern setback adjacent Warringah Road

Table 4-10: VAP 02 impact rating

<table>
<thead>
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<th>Precinct</th>
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<th>Magnitude</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>02 Fitzpatrick Avenue</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td></td>
<td>^ Primarily suburban residences</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>^ Existing six lane road</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>^ Existing footbridge</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>^ Densely vegetated screen vegetation (Karingal Reserve) and parkway character.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>^ Property acquisition</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>^ Widening</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>^ Replacement shared path bridge, shared paths and associated ramps</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>^ Substantial retaining structures</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>^ Fencing, noise walls and barriers</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>^ Substantial vegetation loss including street trees.</td>
<td></td>
</tr>
</tbody>
</table>
Visual assessment precinct 03: Karingal Crescent

Location and description

This precinct is located between Karingal Crescent and Warringah Road from the existing footbridge in the west until the street turns sharply to the south.

Viewpoints: 06-12. Refer Figure 4-10 to 4-12 and Plates 4-19 to 4-25.

Visible elements of the upgrade:

- Widening of Warringah Road southern verge and associated walling (in fill)
- Central depressed slot and associated barriers and walling (in cut)
- Replacement shared path bridge and associated barriers, shared paths and ramping
- Widened intersection with Forest Way
- Underpass/ bridge/ portals
- New pathways/ shared paths
- Substantial vegetation removal on southern verge
- Tree planting and landscaping.

Affected viewers:

- Residents on Karingal Crescent (16 to 64 - even numbers and 13 to 33 - odd numbers)
- Pedestrians and cyclists
- Road users (assessed separately).

Description of impacts

- Views of substantially widened road footprint, including a depressed central slot, at the expense of existing vegetation and parkland currently screening the existing road
- Retaining walls (in cut), barriers and noise walls would be visible in foreground
- View of ramping associated with replacement shared path bridge and new shared path bridge
- Limited physical impacts on the far side verge
- Distance views of the future NBH building in the background (not assessed).

The visual impact on these viewpoints is described in Table 4-11.
Figure 4-11: VAP 03 viewpoint locations

Figure 4-12: VAP 03 aerial oblique view looking north east over the intersection of Warringah Road and Forest Way

Legend

Aerial oblique view
Viewpoint on aerial oblique view

NBH site
Forest High School
Warringah Road and Forest Way intersection
Replacement shared path bridge
Widening of Warringah Road

(Source: Background terrain image: Copyright Google, Digital Globe, 2010)
Plate 4-19: Viewpoint 06, looking north from Karingal Crescent towards the southern setback along Warringah Road.

Plate 4-20: Viewpoint 07, looking south towards the rear property boundaries of Karingal Crescent residences which face Warringah Road.
Plate 4-21: Viewpoint 08, looking west through the southern vegetated verge of Warringah Road and rear property boundaries of Karingal Road residences.

Plate 4-22: Viewpoint 09, looking west through the southern setback next to Warringah Road.
Plate 4-23: Viewpoint 10, north-east across the southern setback along Warringah Road towards the proposed Northern Beaches Hospital site

Plate 4-24: Viewpoint 11, looking north across the southern setback next to Warringah Road towards Forest High School
### Table 4-11: VAP 03 impact rating

<table>
<thead>
<tr>
<th>Precinct</th>
<th>Sensitivity</th>
<th>Magnitude</th>
<th>Impact</th>
</tr>
</thead>
</table>
| 03 Karingal Crescent | High                         | - Primarily suburban residences  
- Existing six lane road  
- Existing footbridge  
- Densely vegetated screen vegetation (Karingal Reserve) and parkway character. | High    |
Visual assessment precinct 04: Forest Way

Location and description
This precinct is located on the northern verge of Forest Way near the intersection with Warringah Road, next to The Forest High School.

Viewpoint: 13. Refer Figures 4-13 to 4-15 and Plate 4-26.

Visible elements of the upgrade:
• Widening of Warringah Road southern verge and associated walling (in fill)
• Central depressed slot and associated barriers and walling (in cut)
• Replacement shared path bridge and associated barriers and ramping
• Widened intersection with Forest Way
• Underpass/bridge/portals
• New pathways/shared paths
• Substantial vegetation removal on southern verge
• Tree planting and landscaping.

Affected viewers:
• Residents at 500 Warringah Road and Holland Crescent (26 to 38 - even numbers)
• Pedestrians and cyclists
• Road users (assessed separately).

Description of impacts
• Views from rear of property of substantially widened road footprint, including a depressed central slot, at the expense of existing vegetation and parkland
• Retaining walls (in cut), barriers and noise walls would be visible in foreground
• View of ramping associated with replacement shared path bridge and new shared path bridge
• Limited immediate physical impacts on the near side verge.

The visual impact on these viewpoints is described in Table 4-12.

Figure 4-13: Key Plan
Figure 4-14: Viewpoint 13 looking towards VAP 04

Figure 4-15: VAP 04 aerial oblique view north-west towards the northern verge of the Warringah Road and Forest Way intersection

Legend

Aerial oblique view
Viewpoint on aerial oblique view
Table 4-12: VAP 04 impact rating

<table>
<thead>
<tr>
<th>Precinct</th>
<th>Sensitivity</th>
<th>Magnitude</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>04 Forest Way</td>
<td>Moderate</td>
<td>High</td>
<td>High to moderate</td>
</tr>
<tr>
<td></td>
<td>- Primarily suburban residences set below and facing away from the road</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Existing six lane road</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Existing footbridge</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Densely vegetated screen vegetation (Karingal Reserve) and street trees next to The Forest High School.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Plate 4-26: Viewpoint 13, looking north-west from the existing pedestrian bridge towards the northern verge of the Warringah Road and Forest Way intersection
Figure 4.16: Montage B - View from pedestrian bridge looking east over the intersection of Warringah Road and Forest Way. Refer to Figure 4.2 for location of view.

NOTE: This montage illustrates the urban design recommendations to be considered further during detailed design development and are subject to change.

- Retaining walls facing the mainline and noise walls to comprise finishes that are complimentary to the urban bushland setting.
- Vegetation to line either side of slot road in order to mitigate loss of vegetation from outside edges of surface road on southern verge.
- Tree retention beside The Forest High School in order to screen views and maintain vegetated backdrop.
- Vegetation to line either side of slot road in order to mitigate loss of vegetation from outside edges of surface road on southern verge.
Visual assessment precinct 05: The Forest High School

Location and description

This precinct is located within the grounds of the high school, on the northern verge of Warringah Road.

Viewpoint: 14. Refer Figures 4-17 to 4-19 and Plate 4-27.

Visible elements of the upgrade:

• Widening of Warringah Road southern verge
• Central depressed slot and associated barriers and walling (in cut)
• New shared path bridge and associated barriers and ramping
• Widened intersection with Hilmer Street
• Underpass/bridge/portals
• New pathways/shared paths
• Substantial vegetation removal on southern verge
• Tree planting and landscaping.

Affected viewers:

• School staff and students
• Pedestrians and cyclists
• Road users (assessed separately).

Description of impacts

• Views from school buildings of substantially widened road footprint on far side verge, including a depressed central slot and road bridge, at the expense of existing vegetation and parkland
• Barriers and noise walls would be visible in the background
• View of ramping associated with new shared path bridge
• Limited immediate physical impacts on the near side verge
• The future NBH would also be visible (not assessed).

The visual impact on these viewpoints is described in Table 4-13.

Figure 4-17: Key plan
Figure 4-18: VAP 05 viewpoint locations

Figure 4-19: VAP 05 aerial oblique view south-west from The Forest High School
Table 4-13: VAP 05 impact rating

<table>
<thead>
<tr>
<th>Precinct</th>
<th>Sensitivity</th>
<th>Magnitude</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>05 The Forest High School</td>
<td>Moderate</td>
<td>High</td>
<td>High to moderate</td>
</tr>
<tr>
<td></td>
<td>School set within landscaped open space with tree planting</td>
<td>Widening</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Existing six lane road</td>
<td>New shared path bridge, shared path and ramps</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Underpass/ bridge/ portals</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fencing, noise walls and barriers</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vegetation loss including street trees</td>
<td></td>
</tr>
</tbody>
</table>

Plate 4-27: Viewpoint 14, looking north-west along northern verge of Warringah Road and towards The Forest High School
Visual assessment precinct 06: Bantry Bay Shops

Location and description
This precinct is located on Warringah Road, between Bantry Bay Road and Hilmer Street. The dominant land use in this precinct is primarily commercial with neighbouring residential to the south and a small pocket of residential houses (one with commercial suites) to the west. The shops comprise a mixture of tenancies including several restaurants, a medical centre, funeral parlour and a service station.

Viewpoints: 15-17. Refer Figures 4-20 to 4-22 and Plates 4-28 to 4-30.

Visible elements of the upgrade:
• Widening of Warringah Road southern verge
• Central depressed slot and associated barriers and walling (in cut)
• New shared path bridge and associated barriers and ramping
• Widened intersection with Hilmer Street
• Underpass/ bridge/ portals
• New pathways/ shared paths
• Substantial vegetation removal on southern verge
• New tree planting and landscaping
• Demolished properties - Bantry Bay shops, 463, 465 and 467 Warringah Road and 2A Hilmer Street.

Affected viewers:
• Residents at 62 and 64 Karingal Crescent, 44 Bantry Bay Road and 1 and 2 Hilmer Street
• Park and playground users, pedestrians and cyclists
• Road users (assessed separately).

Description of impacts
• Shops, service station and three residential properties demolished
• Views from remaining properties of substantially widened road footprint, including a depressed central slot, at the expense of existing vegetation, backyards and parkland

Figure 4-20: Key plan
• Barriers and noise walls would be visible in foreground
• View of ramping associated with new shared path bridge.

The visual impact on these viewpoints is described in Table 4-14
Plate 4-28: Viewpoint 15, looking east along Warringah Road towards the Bantry Bay shops and petrol station

Plate 4-29: Viewpoint 16, looking south along Bantry Bay Road with the Bantry Bay Shops
Plate 4-30: Viewpoint 17, looking north on Bantry Bay Road towards Warringah Road

Table 4-14: VAP 06 impact rating

<table>
<thead>
<tr>
<th>Precinct</th>
<th>Sensitivity</th>
<th>Magnitude</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>05 Bantry Bay Shops</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Mix of commercial and suburban residences</td>
<td>Widening and property acquisition</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Shops provide important local resource</td>
<td>New shared path bridge, shared paths and ramps</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Existing six lane road.</td>
<td>Underpass/ bridge/ portals</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fencing, noise walls and barriers</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vegetation loss including street trees.</td>
<td></td>
</tr>
</tbody>
</table>
Visual assessment precinct 07: Brick Pit Reserve

Location and description
This precinct is located on Warringah Road, immediately east of the intersection with Bantry Bay Road. It consists of a small parkland within an existing vegetation corridor, containing a playground, seating and plaques relating to local history. The sites former use is a brick pit as outlined in Section 2 of this report.

Viewpoint: 18. Refer Figures 4-24 to 4-53 and Plate 4-31.

Visible elements of the upgrade:
• Widening of Warringah Road southern verge and associated walling (in fill)
• Central depressed slot and associated barriers and walling (in cut)
• Widened intersection with Bantry Bay Road
• Underpass/bridge/portals
• New pathways/shared paths
• Substantial vegetation removal on southern verge of Warringah Road
• New tree planting and landscaping.

Affected viewers:
• Park users
• Pedestrians and cyclists
• Road users (assessed separately).

Description of impacts
• Views from park of substantially widened road footprint, including a depressed central slot, at the expense of existing vegetation and parkland, including seating areas and play equipment
• Retaining walls would be visible in foreground
• The future NBH would be visible in the background (not assessed).

The visual impact on these viewpoints is described in Table 4-15.
Intersection of Warringah Road and Wakehurst Parkway

Figure 4-24: VAP 07 viewpoint locations

Legend
- Aerial oblique view
- Viewpoint on aerial oblique view

Widening of Warringah Road

Figure 4-25: VAP 07 aerial oblique view south-east towards Brick Pit Reserve and Wakehurst Parkway behind

(Source: Background image: Copyright Google, Digital Globe, 2010)
Table 4-15: VAP 07 impact rating

<table>
<thead>
<tr>
<th>Precinct</th>
<th>Sensitivity</th>
<th>Magnitude</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>07 Brick Pit Reserve</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Local park and playground set in vegetation corridor</td>
<td>Widening</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Local history</td>
<td>Underpass/ bridge/ portals</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Existing six lane road</td>
<td>Shared paths and footpaths</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Retaining walls</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Substantial vegetation loss.</td>
<td></td>
</tr>
</tbody>
</table>
Visual assessment precinct 08: Skyline Business Park

Location and description

This precinct is located on the northern verge of Warringah Road, east of the intersection with Wakehurst Parkway. The corporate business park is set well back from Warringah Road and its frontage comprises a landscaped area with trees. Buildings are accessed via Frenchs Forest Road, some with internal drives connecting multiple buildings.

Viewpoints: 19-20. Refer Figures 4-26 to 4-28 and Plates 4-32 and 4-33.

Visible elements of the upgrade:

• Widening of Warringah Road southern verge and associated walling (in fill) at western end of precinct
• Central depressed slot and associated barriers and walling (in cut) at western end of precinct
• New pathways/ shared paths
• Substantial vegetation removal on southern verge of Warringah Road
• New tree planting and landscaping.

Affected viewers:

• Corporate staff
• Pedestrians and cyclists
• Road users (assessed separately).

Description of impacts

• Views of widened road footprint, including a depressed central slot, at the expense of existing vegetation including street trees
• Retaining walls would be visible in cut as they taper out at the western end.

The visual impact on these viewpoints is described in Table 4-16.
### Table 4-16: VAP 08 impact rating

<table>
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<td>08 Skyline Business Park</td>
<td>Moderate</td>
<td>Low</td>
<td>Moderate to low</td>
</tr>
<tr>
<td></td>
<td>Business park</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Landscaped offset with trees</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Existing six lane road</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Figure 4-27: VAP 08 viewpoint locations

#### Figure 4-28: VAP 08 aerial oblique view south-west from the Skyline Business Park

Intersection of Warringah Road and Wakehurst Parkway

Widening of Warringah Road

Legend

- Aerial oblique view
- Viewpoint on aerial oblique view

(Source: Background image: Copyright Google, Digital Globe, 2010)
Plate 4-32:  Viewpoint 19, looking north-east across the northern vegetated verge along Warringah Road towards Allambie Grove Business Park

Corporate buildings with generous setbacks on northern edge of Warringah Road

Plate 4-33:  Viewpoint 20, looking north-east through established trees within the northern verge of Warringah Road
Visual assessment precinct 09: Aquatic Business Park A

Location and description
This precinct is located on the southern verge of Warringah Road, east of the intersection with Wakehurst Parkway. The corporate business park includes buildings with various setbacks from Warringah Road and its frontage comprises a landscaped area with trees. Buildings are accessed via Aquatic Drive and two driveways.

Viewpoints: 21-30. Refer Figures 4-29 to 4-31 and Plates 4-34 to 4-43.

Visible elements of the upgrade:
• Widening of Warringah Road southern verge and associated walling (in fill) at western end of precinct
• Central depressed slot and associated barriers and walling (in cut) at western end of precinct
• New pathways/ shared paths
• Substantial vegetation removal on southern verge of Warringah Road
• Tree planting and landscaping.

Affected viewers:
• Corporate staff within buildings and those using the outdoor cafes, smoking areas and BBQ areas
• Pedestrians and cyclists
• Road users (assessed separately).

Description of impacts
• Views of widened road footprint, including a depressed central slot, at the expense of existing vegetation including street trees
• Reduction in setback from road
• Retaining walls would be visible (in fill) in foreground.

The visual impact on these viewpoints is described in Table 4-17.

Figure 4-29: Key plan
Table 4-17: VAP 09 impact rating

<table>
<thead>
<tr>
<th>Precinct</th>
<th>Sensitivity</th>
<th>Magnitude</th>
<th>Impact</th>
</tr>
</thead>
</table>
| 09 Aquatic Business Park A | Moderate  
  - Business park  
  - Landscaped offset with trees  
  - Existing six lane road. | Moderate  
  - Widening on near side verge  
  - Retaining walls (in fill)  
  - Reduced offset from road  
  - Shared paths and footpaths  
  - Vegetation loss on near side verge. | Moderate |
Plate 4-34: Viewpoint 21, looking east along the southern verge of Warringah Road next to the Aquatic Business Park.

Plate 4-35: Viewpoint 22, looking east across the carpark of various businesses associated with the Aquatic Business Park.
Plate 4-36: Viewpoint 23, looking south towards an outdoor picnic and BBQ area within the Aquatic Business Park.

Plate 4-37: Viewpoint 24, looking west along the southern footpath and setback along Warringah Road.
Plate 4-38: Viewpoint 25, looking south on the driveway to the Aquatic Business Park

Plate 4-39: Viewpoint 26, looking west along the Warringah Road verge towards one of two driveways which service the business parks
Outdoor seating areas

Substantial tree removal would be required along southern edge due to road widening.

Plate 4-40: Viewpoint 27, looking east along service road within Innovations Park

Plate 4-41: Viewpoint 28, looking west along the vegetated setback area of Warringah Road
Plate 4-42: Viewpoint 29, looking south along the driveway into Innovations Park.

Plate 4-43: Viewpoint 30, looking west along the vegetated setback area of Warringah Road.
Street tree planting and dense screening shrub planting in selected locations to screen views from existing corporate buildings.

Shared paths to be separated from carriageways with nature walks wherever possible in order to improve pedestrian and cyclist experience.

Vegetation to line either side of slot road in order to mitigate loss of vegetation from outside edges of surface road on southern verge.

NOTE: This montage illustrates the urban design recommendations to be considered further during detailed design development and are subject to change.
Visual assessment precinct 10: Aquatic Business Park B

Location and description
This precinct is located on the northern verge of Aquatic Drive, at the western end of the road, near (but not currently connected to) Wakehurst Parkway. The corporate business park includes buildings with various setbacks from Warringah Road and Aquatic Drive and its frontage comprises a landscaped area with trees. Buildings are accessed via Aquatic Drive, some with internal drives connecting multiple buildings. Aquatic Drive is currently closed to traffic at the western end.

Viewpoints: 31-33. Refer Figures 4-33 to 4-35 and Plates 4-44 to 4-46.

Visible elements of the upgrade:
• Extension of Aquatic Drive and new intersection with Wakehurst Parkway
• New pathways/ shared paths
• Vegetation removal on Aquatic Drive alignment
• New tree planting and landscaping.

Affected viewers:
• Corporate staff, day care centre workers and carers
• Pedestrians and cyclists
• Road users (assessed separately).

Description of impacts
• Views of a small section of new road and intersection with underlying water detention structure
• Increased through traffic on Aquatic Drive
• Improved access to Wakehurst Parkway
• Retaining walls would be visible (in fill) in foreground.

The visual impact on these viewpoints is described in Table 4-18.
**Figure 4-34**: VAP 10 viewpoint locations

**Figure 4-35**: VAP 09 aerial oblique view north-west across Aquatic Drive and Tilley Lane

_Sources: Background images Copyright Google, Digital Globe, 2010._
Plate 4-44: Viewpoint 31, looking east along Aquatic Drive

Plate 4-45: Viewpoint 32, looking west along Aquatic Drive towards the existing road closure

Substantial car parking on both sides of Aquatic Drive

Wakehurst Parkway
Plate 4-46: Viewpoint 33, looking west from the western end of Aquatic Drive towards Wakehurst Parkway.

Table 4-18: VAP 10 impact rating

<table>
<thead>
<tr>
<th>Precinct</th>
<th>Sensitivity</th>
<th>Magnitude</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 Aquatic Business Park B</td>
<td>Low</td>
<td>Moderate</td>
<td>Moderate to low</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Business park</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Retaining walls (in fill)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- New intersection and associated footpaths</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Vegetation loss</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Improved access, through traffic.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Road extended</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Landscaped offset with trees.</td>
<td></td>
</tr>
</tbody>
</table>
Visual assessment precinct 11: Warringah Aquatic Centre

Location and description
This precinct is located at the end of Aquatic Drive on an internal network of roads and carparks, servicing both the Aquatic Centre and nearby playing fields. The Aquatic Centre building is set amongst carparking and bushland with a large setback from Aquatic Drive. The facility was established 1979.

Viewpoints: 34-37. Refer Figures 4-36 to 4-38 and Plates 4-47 to 4-50.

Visible elements of the upgrade:
- Widening and vegetation removal on Aquatic Drive alignment and at intersection with Wakehurst Parkway.

Affected viewers:
- Aquatic Centre staff and users, playing field users
- Pedestrians and cyclists
- Road users (assessed separately).

Description of impacts
- Exiting footbridge retained
- Views of a small section of new road and intersection
- Increased through traffic on Aquatic Drive
- Improved access to Wakehurst Parkway.

The visual impact on these viewpoints is described in Table 4-19.
Figure 4-37: VAP 11 viewpoint locations

Figure 4-38: VAP 11 and 12 aerial oblique looking west along Aquatic Drive toward the intersection with Wakehurst Parkway

(Source: Background image: Copyright Google, Digital Globe, 2010)
Plate 4-47: Viewpoint 34, looking east towards the existing footbridge over Wakehurst Parkway

Plate 4-48: Viewpoint 35, looking west along pedestrian path linking to the existing footbridge over Wakehurst Parkway
Table 4-19: VAP 11 impact rating

<table>
<thead>
<tr>
<th>Precinct</th>
<th>Sensitivity</th>
<th>Magnitude</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>11 Warringah Aquatic Centre</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Community building and sportsfields with large expanses of car parking</td>
<td>Existing footbridge retained</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Surrounded by bushland.</td>
<td>Vegetation loss</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Improved access, through traffic.</td>
<td></td>
</tr>
</tbody>
</table>
Visual assessment precinct 12: Wakehurst Parkway (south)

Location and description
This precinct is located at the southern end of the Stage 2 project on Wakehurst Parkway and centred on an existing footbridge, which links both the Aquatic Centre and nearby playing fields with Bantry Bay Road.

Viewpoints: 38-39. Refer Figures 4-39 to 4-40 and Plates 4-51 to 4-53

Visible elements of the upgrade:
- Widening and vegetation removal on Aquatic Drive and Wakehurst Parkway.

Affected viewers:
- Pedestrians and cyclists
- Road users (assessed separately).

Description of impacts
- Existing footbridge retained
- Increased through traffic entering Wakehurst Parkway from Aquatic Drive
- Modified traffic associated with turning movements in and out of Aquatic Drive
- Removal of vegetation.

The visual impact on these viewpoints is described in Table 4-20.
Figure 4-40: VAP 12 viewpoint locations

Plate 4-51: Viewpoint 38-A, looking south along Wakehurst Parkway from the existing footbridge

Plate 4-52: Viewpoint 38-B, looking north along Wakehurst Parkway from the existing footbridge towards the intersection with Warringah Road
Table 4-20: VAP 12 impact rating

<table>
<thead>
<tr>
<th>Precinct</th>
<th>Sensitivity</th>
<th>Magnitude</th>
<th>Impact</th>
</tr>
</thead>
</table>
| 12 Wakehurst Parkway (south) | Low  
- Infrequently used pedestrian/bicycle route along parkway (higher cyclist usage on weekends)  
- Surrounded by bushland. | Moderate  
- Existing footbridge retained  
- Vegetation loss  
- Retaining walls facing towards and away  
- Improved access, increased traffic. | Moderate to low |
Figure 4-41: Montage D - View from existing footbridge over Wakehurst Parkway looking north towards Warringah Road intersection and overpass. Refer to Figure 4-2 for location of view.

- Retaining walls to be provided along Wakehurst Parkway in order to reduce footprint.
- Right lane turn bay to be further developed during detailed design.
- Retain sense of enclosure along Wakehurst Parkway through dense revegetation along edges.

NOTE: This montage illustrates the urban design recommendations to be considered further during detailed design development and are subject to change.
Secondary visual catchment zone

The Secondary VCZ has been determined as an approximate 100 metre wide band around the Stage 2 area.

This zone captures residences, commercial properties and school grounds that are:

- Well away from the upgrade
- Often on the other side of a ridge line and therefore oriented away from the upgrade
- Screened by built form
- Situated on more elevated positions and may therefore have glimpses of the upgrade
- May have longitudinal views up or down the upgrade due to steel elevation changes.

Generally, many of the residences are screened by vegetation, however some of this vegetation would be reduced as a result of widening and therefore opening up views of the upgrade, although these views would be limited to small openings between other buildings.

The visual impact on secondary VCZ views is described in Table 4-21.

Table 4-21: Secondary VCZ impact rating

<table>
<thead>
<tr>
<th>Precinct</th>
<th>Sensitivity</th>
<th>Magnitude</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>01 Frenchs Forest Public School</td>
<td>Low</td>
<td>Suburban residences, a church and a school on higher ground orientated away from the upgrade</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Widening</td>
<td>Moderate to low</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Substantial retaining structures</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Substantial vegetation loss including street trees.</td>
<td></td>
</tr>
<tr>
<td>02 Fitzpatrick Avenue</td>
<td>Moderate</td>
<td>Primarily suburban residences on higher ground orientated away from the upgrade</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Densely vegetated screen vegetation (Karingal Reserve).</td>
<td>Moderate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Widening</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fencing, noise walls and barriers</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Substantial vegetation loss including street trees.</td>
<td></td>
</tr>
<tr>
<td>03 Karingal Crescent</td>
<td>Moderate</td>
<td>Primarily suburban residences on higher ground orientated away from the upgrade</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Densely vegetated screen vegetation (Karingal Reserve).</td>
<td>Moderate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Widening</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fencing, noise walls and barriers</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Substantial vegetation loss including street trees.</td>
<td></td>
</tr>
<tr>
<td>Precinct</td>
<td>Sensitivity</td>
<td>Magnitude</td>
<td>Impact</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-------------</td>
<td>---------------------------------------------------------------------------</td>
<td>---------------------------------------</td>
</tr>
<tr>
<td>04 Forest Way</td>
<td>Low</td>
<td>- Primarily suburban residences set below and facing away from the road</td>
<td>Moderate to low</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Well vegetated, tree-lined streets with limited easterly viewing opportunities.</td>
<td></td>
</tr>
<tr>
<td>05 The Forest High School</td>
<td>Moderate</td>
<td>- School set within landscaped open space with tree planting on elevated ground</td>
<td>Moderate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Viewing opportunities from upper levels</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Vegetated edge to road.</td>
<td></td>
</tr>
<tr>
<td>06 Bantry Bay Shops</td>
<td>High</td>
<td>- Mix of commercial and suburban residences on flat ground</td>
<td>High to moderate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Shops provide important local resource</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Well vegetated, tree-lined streets with limited easterly viewing opportunities.</td>
<td></td>
</tr>
<tr>
<td>07 Brick Pit Reserve</td>
<td>High</td>
<td>- Local park and playground set in vegetation corridor</td>
<td>High to moderate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Local history.</td>
<td></td>
</tr>
<tr>
<td>08 Skyline Business Park</td>
<td>Low</td>
<td>- Business park on flat to lower ground with predominantly internal views</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Landscaped offset with trees</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Existing six lane road.</td>
<td></td>
</tr>
</tbody>
</table>
### Road viewer visual impact assessment summary

The visual impact assessment summary for the Stage 2 project is described in Table 4-22 and 4-23. Potential impacts in the primary visual catchment zone are generally higher than that in the secondary zone due to proximity and reduced viewing opportunities. Secondary zone locations are often 50 metres away from the road and would often be separated by topography, vegetation and built form.

In the primary zone, the greatest potential impacts would be experienced by residents on Karingal Crescent following the removal of a vegetation setback associated with Karingal Reserve, at Bantry Bay Road and Brick Pit reserve following the removal of the shops and vegetation. Other notable impacts have been demonstrated in relation to Forest High School and commercial buildings within the Aquatic Business Park.

In the secondary zone, impacts would be felt in similar locations but to a lesser extent.

Elsewhere, visual impacts would be at more readily acceptable levels and are considered reasonable for the type of work proposed within a semi-urban setting such as this.

Refer to Section 4.7 of this report for mitigation measures which address these impacts.
Table 4-22: Primary VCZ visual impact rating

<table>
<thead>
<tr>
<th>Precinct</th>
<th>Sensitivity</th>
<th>Magnitude</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>01 Frenchs Forest Public School</td>
<td>Moderate</td>
<td>High</td>
<td>High to moderate</td>
</tr>
<tr>
<td>02 Fitzpatrick Avenue</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>03 Karingal Crescent</td>
<td>High</td>
<td>High</td>
<td>High to moderate</td>
</tr>
<tr>
<td>04 Forest Way</td>
<td>Moderate</td>
<td>High</td>
<td>High to moderate</td>
</tr>
<tr>
<td>05 The Forest High School</td>
<td>Moderate</td>
<td>High</td>
<td>High to moderate</td>
</tr>
<tr>
<td>06 Bantry Bay Shops</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>07 Brick Pit Reserve</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>08 Skyline Business Park</td>
<td>Moderate</td>
<td>Low</td>
<td>Moderate to low</td>
</tr>
<tr>
<td>09 Aquatic Business Park A</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td>10 Aquatic Business Park B</td>
<td>Low</td>
<td>Moderate</td>
<td>Moderate to low</td>
</tr>
<tr>
<td>11 Warringah Aquatic Centre</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>12 Wakehurst Parkway &amp; Footbridge</td>
<td>Low</td>
<td>Moderate</td>
<td>Moderate to low</td>
</tr>
</tbody>
</table>

Table 4-23: Secondary VCZ visual impact rating

<table>
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<th>Precinct</th>
<th>Sensitivity</th>
<th>Magnitude</th>
<th>Impact</th>
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</thead>
<tbody>
<tr>
<td>01 Frenchs Forest Public School</td>
<td>Low</td>
<td>Moderate</td>
<td>Moderate to low</td>
</tr>
<tr>
<td>02 Fitzpatrick Avenue</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td>03 Karingal Crescent</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td>04 The Forest Way</td>
<td>Low</td>
<td>Moderate</td>
<td>Moderate to low</td>
</tr>
<tr>
<td>05 The Forest High School</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td>06 Bantry Bay Shops</td>
<td>High</td>
<td>Moderate</td>
<td>High to moderate</td>
</tr>
<tr>
<td>07 Brick Pit Reserve</td>
<td>High</td>
<td>Moderate</td>
<td>High to moderate</td>
</tr>
<tr>
<td>08 Skyline Business Park</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>09 Aquatic Business Park A</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td>10 Aquatic Business Park B</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>11 Warringah Aquatic Centre</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>12 Wakehurst Parkway (south)</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
</tbody>
</table>
4.4 Visual impact assessment - road users

Road user views within the Stage 2 project area have been assessed in order to better understand the visual changes that would be experienced by motorists. The views and visual experience of road users are different from ‘road viewers’ and need to be carefully considered in order to promote a visually attractive, stimulating and safe experience for the motorist. Thoughtfully considered and well-executed urban design principles can improve this driver experience and contribute to a ‘sense of place’.

The visual experience of the road user is similar to other viewers, however they can be amplified in some locations, eg proximity to the face of a retaining wall, and subdued in others, eg road surfaces and road furniture. Road user views are also impacted by the speed of the road user and the amount of time available for looking at other elements beside the road. Reduced speed limits and signalised intersections would emphasise views.

The road user viewing experience is summarised as follows:

• Partially enclosed vegetated corridor with fleeting glimpses or vistas into residential and commercial properties
• Retaining walls (in cut and in central slot) and associated walling and noise walls
• Shared path bridges
• Sequential street tree arrangement, broken at major buildings entrances, residential driveways and at intersections
• Vegetation removal
• Road surface and associated linemarking, signage and road furniture
• At night, views would be constrained to the road surface itself, with limited measures provided in order to reduce headlight glare from oncoming traffic.

The visual impact on road user views is described below and summarised in Table 4-24.

Road user impacts

Warringah Road (north/ eastbound)

Heading north and east along Warringah Road from Forestville, motorists would initially be aware of changed conditions through the introduction of a VMS opposite the corner of Maxwell Parade. Immediately after this, motorists would commence the ascent of a small rise to the intersection with Forest Way and the new pedestrian overbridge will be clearly visible, as the current one is now. Elevated ramping would be more prominent than it is now and be visible on both sides of Warringah Road. Distinct vegetation loss would be evident when viewing the southern verge from the northbound lanes, particularly when rounding the bend to the east opposite Forest Way. The removal of the Bantry Bay Road shops would also produce a distinct change for the motorist.

The central lanes would be funnelled into a portal opening to a central slot that would service through traffic heading east. Surface lanes would follow existing grades and connect with local roads at Forest Way, Hilmer Street, and Wakehurst Parkway, before reconnecting with the central slot east of Wakehurst Parkway. A new shared path bridge would be visible at Hilmer Street, providing access to The Forest High School and the NBH.
The addition of the central depressed slot and entry portals, new shared path bridges and substantially widened road surface and associated walling and barriers would comprise a distinct change for the motorist, particularly those using the central slot, who would also get the benefit of a more streamlined journey. Upon existing the slot, motorists would see widened road pavement, footpaths and barriers associated with the southern verge widening, followed by a rear view of the VMS structure located next to the electrical substation and partially obscured by existing vegetation.

**Warringah Road (south/ westbound)**

Having passed the intersection with Allambie Road at the commencement of Stage 2, through traffic would pass a new VMS structure alerting them to the modified conditions ahead. After passing a long section of new footpaths and balustrades along the southern verge, motorists would enter the central slot via a portal immediately east of Wakehurst Parkway. This journey would be a similar sequence of views and roadside elements. Those using the surface carriageway would encounter a distinct visual change due to widening, walling and barriers and vegetation loss. Corporate buildings on the southern verge would be more exposed to the motorists view.

At the intersection with Wakehurst Parkway, the motorist would have the option of heading south along Wakehurst Parkway and would be aware of a substantially wider road platform. Vegetation would be visible beyond that removed and supplemented by tree planting next to Brick Pit Reserve and over the remnant land resulting from the removal of Bantry Bay Shops, the latter of which would contribute to the parkway character of the road and assist with offsetting the increased hard surfaces and built form associated with the NBH.

After passing the new shared path bridge and widened intersection at Hilmer Street, noise walls and street tree planting would dominate the streetscape, with rooftops visible beyond. This would constitute a dramatic change in road user views. Continuing on, the landform would rise in relation to the road pavement resulting in the need for retaining walls, which would increase in height, reaching a pinnacle once in-line with the intersection with Forest Way. The replacement shared path bridge and associated ramping would dominate the motorists view due to its long span and height. Upon descending from the intersection with Forest Way, motorists heading on to Forestville would see the rear of a new VMS structure, well-exposed due to its substantial cantilevered form.

**Forest Way (southbound)**

On approach to the widening associated with the Stage 1 project, the motorist would initially be made aware of modified traffic conditions through the introduction of a new VMS structure next to an existing reserve. Following this the motorist would pass through the modified intersection with Naree Road and then be confronted with views across the Warringah Road central slot, terminating with views directly at the retaining wall and associated barriers along the southern verge of Warringah Road. Heading east on Warringah Road would comprise a similar experience to the existing road, however, southbound would comprise crossing the Warringah Road underpass. Views up and down the depressed central slot would be possible from the elevated position, a markedly different experience to the present-day.
Wakehurst Parkway (southbound)
Having passed the widening associated with the Stage 1 project, the motorist would be presented with a substantially larger intersection to negotiate. Views across the expanse of pavement would comprise the depressed central slot and associated walling and barriers, with vegetation on the southern side of the intersection providing a backdrop. Views during east and west turning movements would initially comprise views up and down the central slot.

After crossing the intersection in a southbound direction, motorists would be aware of road widening and vegetation loss, rock cuttings and walling. Views of the elements would be an exaggerated form of the view encountered today. About 200-250 metres down the road, a new intersection with Aquatic Drive would be encountered allowing a left turn in and out. Widening and vegetation loss would be evident in this location.

An existing footbridge located about another 80-100 metres down the road would be retained.

Wakehurst Parkway (northbound)
Widening of Wakehurst Parkway would commence immediately to the north of the existing footbridge, resulting in new rock cuttings and walling for most of its length on approach to Warringah Road. Dense vegetation would enclose the road on either side as it does today, however, would be setback further due to the widening required. Arrival at the intersection with Warringah Road will present a large expanse of pavement with multiple turning movements possible.

Aquatic Drive (westbound)
Having descended from the intersection with Allambie Road, the motorist passes existing corporate buildings with various setbacks and landscaped frontages. The entrance to the Aquatic Centre remains on the left. The previous closure at the western end of Aquatic Drive would be opened and extended to provide access to Wakehurst Parkway. This would produce a distinct difference to the motorist experience of the present day. Retaining walls in both cut and fill would line either side of the extension due to the landform present. Dense vegetation would enclose the road on either side on approach to Wakehurst Parkway.

Table 4-24: Road user visual impact rating summary

<table>
<thead>
<tr>
<th>Precinct</th>
<th>Sensitivity</th>
<th>Magnitude</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warringah Road north/ eastbound</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td>¬ Partly commercialised mixed with suburban residences and schools</td>
<td>¬ Widened intersections</td>
<td></td>
<td></td>
</tr>
<tr>
<td>¬ Existing six lane road</td>
<td>¬ Retaining structures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>¬ Existing footbridge</td>
<td>¬ 3 no. bridges over central slot</td>
<td></td>
<td></td>
</tr>
<tr>
<td>¬ Consistent street trees, vegetation and parkway character</td>
<td>¬ Fencing and barriers</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>¬ Replacement and new shared path bridges and shared paths</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>¬ New footpaths and tree planting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Precinct</td>
<td>Sensitivity</td>
<td>Magnitude</td>
<td>Impact</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-------------</td>
<td>-------------------------------------------------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>Warringah Road south/ westbound</td>
<td>Moderate</td>
<td>High</td>
<td>High to moderate</td>
</tr>
<tr>
<td></td>
<td>- Partly commercialised mixed with suburban residences and schools</td>
<td>- Widened intersections, widening and cuttings</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Existing six lane road</td>
<td>- Retaining structures</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Existing footbridge</td>
<td>- Bridges over central slot</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Densely vegetated edges</td>
<td>- Fencing and barriers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Karingal Reserve, Brick Pit Reserve) and parkway character</td>
<td>- Replacement and new shared path bridges and shared paths</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- New footpaths and tree planting</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Substantial vegetation loss including street trees.</td>
<td></td>
</tr>
<tr>
<td>Forest Way southbound</td>
<td>Low</td>
<td>Moderate</td>
<td>Moderate to low</td>
</tr>
<tr>
<td></td>
<td>- Urbanised road corridor including major shopping centre</td>
<td>- Widened intersections</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Existing six lane road, wide road pavement</td>
<td>- Retaining structures</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Minimal street trees/ street tree opportunities present.</td>
<td>- Bridges over central slot</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Fencing and barriers</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Replacement and new shared path bridges</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- New footpaths and tree planting</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Substantial vegetation loss on far side verge.</td>
<td></td>
</tr>
<tr>
<td>Wakehurst Parkway southbound</td>
<td>High</td>
<td>Moderate</td>
<td>High to moderate</td>
</tr>
<tr>
<td></td>
<td>- Rare, densely vegetated bushland corridor with virtually no development</td>
<td>- Widening of pavement and existing cuttings</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Existing two to six lane road</td>
<td>- Retaining structures</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Existing footbridge</td>
<td>- Existing footbridge retained</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Shared path</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Bridge and barriers</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Vegetation loss.</td>
<td></td>
</tr>
<tr>
<td>Wakehurst Parkway northbound</td>
<td>High</td>
<td>Moderate</td>
<td>High to moderate</td>
</tr>
<tr>
<td></td>
<td>- Rare, densely vegetated bushland corridor with virtually no development</td>
<td>- Widening of pavement and existing cuttings</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Existing two to six lane road</td>
<td>- Retaining structures</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Existing footbridge</td>
<td>- Existing footbridge retained</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Shared path</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Bridge and barriers</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Vegetation loss.</td>
<td></td>
</tr>
<tr>
<td>Aquatic Drive westbound</td>
<td>Low</td>
<td>Moderate</td>
<td>Moderate to low</td>
</tr>
<tr>
<td></td>
<td>- Mix of commercial, community, institutional and suburban residences</td>
<td>- Road extension/ new local road connections</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Two lane road with road closure.</td>
<td>- New intersection</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Vegetation loss including street trees.</td>
<td></td>
</tr>
</tbody>
</table>
4.5 Visual impact assessment - variable message signs

Variable message signs as described in Section 3.5 of this report would be provided in three separate locations as shown in Table 4-25 and Figure 4-24 below, as well as in concept design drawings in Section 3.7 of this report.

<table>
<thead>
<tr>
<th>No.</th>
<th>Type</th>
<th>H (m)</th>
<th>W (m)</th>
<th>Road</th>
<th>Facing</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>V1</td>
<td>B</td>
<td>7.6</td>
<td>8.5</td>
<td>Warringah Road</td>
<td>Westbound</td>
<td>Between Allambie Road and Rodborough Road at Chainage 2,000, Beacon Hill</td>
</tr>
<tr>
<td>V2</td>
<td>B</td>
<td>7.6</td>
<td>8.5</td>
<td>Warringah Road</td>
<td>Eastbound</td>
<td>Approaching Forest Way at Chainage 0,000, Forestville</td>
</tr>
<tr>
<td>V3</td>
<td>B</td>
<td>7.6</td>
<td>8.5</td>
<td>Forest Way</td>
<td>Southbound</td>
<td>Approaching Naree Road, Frenchs Forest</td>
</tr>
</tbody>
</table>

Note:
- Locations, dimensions and types provide a guide only and are subject to change and further detailed assessment during detailed design.
- Approximate locations of these signage structures has been assessed for visual impacts in the following pages. Once detailed placement is known, further detailed assessment is to be undertaken to assess visual impacts and night time light spill.
- Descriptions of impacts on motorist views are also described in Section 4.4 of this report and incorporated into the following assessment.

Figure 4-42: Location plan of VMS signage structures
Variable message sign (V1)

Location and description

VMS V1 would be approximately located at the eastern end of the Stage 2 project on Warringah Road between Allambie Road and Rodborough Road, next to an existing electrical substation about 100 metres east of the central slot portal, facing westbound traffic (refer Figure 4-42).

Function

To provide messages for motorists on approach to a decision point at the central slot/ surface road split.

Affected viewers:

- Corporate staff, visitors and clients at Allambie Grove Business Park and staff at other nearby corporate buildings, an electrical substation and an Australia Post Delivery Centre
- Road users, pedestrians and cyclists.

Description of impacts

- View of steel post and beam structure with cantilevered electronic message board
- Minor night time light spill

The visual impact on these viewpoints is described in Table 4-25.
Table 4-25: VMS V1 impact rating

<table>
<thead>
<tr>
<th>VMS</th>
<th>Sensitivity</th>
<th>Magnitude</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Moderate</td>
<td>Low</td>
<td>Moderate to low</td>
</tr>
</tbody>
</table>

- Located next to a well vegetated area opposite a business park with a generous landscaped offset with trees
- Located on outside bend with vegetative backdrop and motorist views along corridor
- Existing six lane road with widening associated with the Allambie Road intersection

Plate 4-54: Approximate location and size of VMS (V1) on Warringah Road facing west bound traffic viewed from west bound footpath (above) and from east bound footpath (below)
Variable message sign (V2)

Location and description
VMS #V2 would be approximately located at the western end of the Stage 2 project on Warringah Road opposite Maxwell Parade and 50 metres south of Fitzpatrick Avenue West and the central slot portal, facing eastbound traffic (refer Figure 4-43).

Function
To provide messages for motorists on approach to a decision point at the central slot/surface road split.

Affected viewers:
- Residents on Warringah Road, particularly those along the northern verge, attendees of the Forest Kirk Uniting Church and Guan Yin Temple
- Road users, pedestrians and cyclists.

Description of impacts
- View of steel post and beam structure with cantilevered electronic message board
- Minor night time light spill

The visual impact on these viewpoints is described in Table 4-26.
### Table 4-26: VMS V2 impact rating

<table>
<thead>
<tr>
<th>VMS</th>
<th>Sensitivity</th>
<th>Magnitude</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>02</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td></td>
<td>- Next to a vegetated service easement in close proximity to elevated residential buildings</td>
<td>- Single steel post and cantilevered electronic message board</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Located on straight section of road on approach to a slight incline</td>
<td>- Footing construction within concrete footpath</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Existing six lane road with widening associated with the Allambie Road intersection</td>
<td>- Overhead utilities modified</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Proximity of elevated residences with potential views of VMS</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Variable message sign (V3)

Location and description
VMS #V3 would be approximately located beyond the northern end of the Stage 1 project on Forest Way next to Wareham Reserve and 50 metres north of Naree Road, facing southbound traffic (refer Figure 4-44).

Function
To provide messages for motorists on approach to a decision point at the intersection of Forest Way and Warringah Road (surface road).

Affected viewers:
• Residents on Forest Way, particularly those either side of Wareham Reserve, attendees of the Forest Alliance Church, workers and staff of several small professional suites
• Park users, potentially over extended periods of time
• Road users, pedestrians and cyclists.

Description of impacts
• View of steel post and beam structure with cantilevered electronic message board
• Minor night time light spill

The visual impact on these viewpoints is described in Table 4-26.

Figure 4-45: Location of VMS #V2, eastbound on Warringah Road
### Table 4-27: VMS V3 impact rating

<table>
<thead>
<tr>
<th>VMS</th>
<th>Sensitivity</th>
<th>Magnitude</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>02</td>
<td>Moderate</td>
<td>Low</td>
<td>Moderate to low</td>
</tr>
<tr>
<td></td>
<td>- Located next to a public reserve with landscaped open space and trees</td>
<td>- Single steel post and cantilevered electronic message board</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Located on straight, flat section of road on approach to heritage listed church building</td>
<td>- Footing construction within concrete footpath</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Existing six lane road with widening associated with the Allambie Road intersection</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Visual impact summary - Variable Message Signs

The visual impact assessment summary for the inclusion of Variable Message Signs into the Stage 2 project is described in Table 4-28.

Impacts on motorists and other road user views are considered to be low, as they typically have only fleeting views of the VMS structures as they pass by rapidly. As VMS usage is increasing on road corridors in this region, motorists have come to expect them as part of the visual landscape and driving experience. In addition, other overhead structures i.e. existing footbridges and proposed shared path bridges are more dominant of road user views.

Potential impacts are considered highest at location V2 due to proximity to elevated residential properties. Views from residential properties tend to be over longer periods of time and require screening in day and night time conditions due to the potential for light spill.

At location V1, motorist corridor views are briefly impacted, however the vegetative backdrop assists with visual mitigation of these impacts. There are relatively few non-road user views due to vegetative screening and building setbacks.

At location V3, while the VMS would be placed within a highly urbanised corridor, its proximity to a local park increases what would be a lower rating due to the potential for longer views by park users.

Generally, visual impacts are considered to be at acceptable levels and are considered reasonable for the type of work proposed within a semi-urban setting such as this.

Table 4-28: VMS visual impact summary

<table>
<thead>
<tr>
<th>No.</th>
<th>Sensitivity</th>
<th>Magnitude</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>V1</td>
<td>Moderate</td>
<td>Low</td>
<td>Moderate to low</td>
</tr>
<tr>
<td>V2</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td>V3</td>
<td>Moderate</td>
<td>Low</td>
<td>Moderate to low</td>
</tr>
</tbody>
</table>

Table 4-28: VMS visual impact summary
4.6 Impacts during construction

Road Construction and Staging
Construction of the Stage 2 project would be undertaken in stages to minimise disruption on road users and maintain safety of pedestrians and cyclists. Staging details would be determined during the detailed design stage. During earthworks construction, there would be large areas of exposed rock and earth as well as stockpiled materials, stored equipment and vehicles accessing the site.

Safety
Safety of pedestrians, particularly students attending The Forest High School and Frenchs Forest Public School would be a major priority during construction. Footpaths are to be clearly delineated, with barriers wherever possible in order to provide safe passage next to construction areas. Safety of motorists during construction will be addressed by ensuring barriers are located in accordance with relevant guidelines, including ensuring lane widths required for buses.

Footbridges/ shared path bridges
Existing footbridges provide access between residential areas and commercial and community facilities, therefore it is critical that access is maintained at all times. In order to achieve this, replacement shared path bridges must be constructed prior to demolition of existing footbridges. This will have an impact on staging of various components of the work.

Where new shared path bridges replace signalised crossings and signalised crossings can not be maintained during the works, new shared path bridges would be constructed prior to closure of signalised pedestrian crossings.

Primary site compound
The main site compound would be located to the south east of the project at the corner of Allambie Road and Aquatic Drive. The immediate area consists of a combination of industrial and commercial properties, as well as care facilities such as the Cerebral Palsy Alliance Centre. With Allambie Road providing an alternative route between Frenchs Forest and Manly, truck access to the compound would likely periodically inhibit some traffic flows. The compound and stockpile areas would be located behind what is currently an existing redundant building, that will likely be demolished in the future as part of a separate Development (refer to Plates 4-57 to 4-58) Application. Existing vegetation would screen the site from most viewpoints from the north.

In order to mitigate visual impacts from the east and south, mesh screening and temporary landscape and architectural treatments would be required during construction. Other environmental controls such as noise and dust would also be required. These measures would be developed in more detail as part of the separate Development Application, however should include these measures as a minimum.

A visual impact assessment relating to the site compound was previously undertaken in the Stage 1 report, has been updated below in the context of the building’s potential removal (refer Table 4-29) and would be subject to further development as part of the separate Development Application that would include stakeholders to the south. This future detailed assessment should include these measures as a minimum.
Plate 4-57: Viewpoint 34, site compound site located behind an existing building on Allambie Road

Plate 4-58: Viewpoint 35, site compound located behind existing vegetation on private property
Secondary site compound

A second site compound is proposed at the intersection of Warringah Road and Wakehurst Parkway (north eastern corner) on land currently owned by Roads and Maritime. The site is not visible from neighbouring properties and is vegetated with regrowth as the site has previously been cleared. The site would be used for staged stockpiling and storage of materials.

During construction, vegetation should be retained around the perimeter of the site in order to reduce visual impacts. Upon completion, exposed surfaces should be reinstated with native grass seeding subject to requirements for ongoing use.

Table 4-29: Primary site compound impact rating

<table>
<thead>
<tr>
<th>Precinct</th>
<th>Sensitivity</th>
<th>Magnitude</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary VCZ</td>
<td>Moderate</td>
<td>High</td>
<td>High to moderate</td>
</tr>
<tr>
<td></td>
<td>▶ Existing redundant building exhibits decorative style and is a long-serving local landmark ▶ Primarily commercial/service-related area ▶ Low number of residential properties to the east with viewing opportunities due to topography and aspect</td>
<td>▶ Demolition of existing building and landscaped gardens ▶ Erection of temporary offices and ancillary structures ▶ Car parking and large vehicle parking ▶ Stockpiles and stockpile management processes ▶ Heavy vehicle traffic increased on Allambie Road and Aquatic Drive</td>
<td></td>
</tr>
<tr>
<td>Secondary VCZ</td>
<td>Low</td>
<td>High</td>
<td>Moderate</td>
</tr>
<tr>
<td></td>
<td>▶ Residential properties generally located below ridge ▶ Longitudinal views emphasised due to topography</td>
<td>▶ As above</td>
<td></td>
</tr>
<tr>
<td>Road User</td>
<td>Low</td>
<td>High</td>
<td>Moderate</td>
</tr>
<tr>
<td></td>
<td>▶ Views limited by boundary fencing ▶ Occasional views of interaction with heavy vehicles ▶ Passing traffic on bend with limited northbound viewing opportunities.</td>
<td>▶ As above</td>
<td></td>
</tr>
</tbody>
</table>
4.7 Mitigation measures

This section describes the mitigation measures that have been included as part of the Stage 2 project, described in Section 3 of this report and a summary of further mitigation measures to be considered during the detailed design and construction phases of the project. They have been developed in accordance with the urban design and landscape principles and objectives outlined in Table 1-3 in Section 1 and the urban design and landscape strategy summarised in Table 3-1 in Section 3 of this report.

Mitigation incorporated in the concept design

The integration of the engineering and performance objectives with urban and landscape design objectives for the Stage 2 project, aims to produce a design outcome that fits sensitively with the existing qualities and characteristics of the area. In order to achieve this, a range of mitigation measures have been incorporated into the project as the concept has developed. These measures combine to develop a solution that seeks to protect and enhance the existing visual character of the area. It is recognised that the scale of work proposed in various locations within Stage 2 will substantially modify the existing environment therefore placing even more priority on developing mitigation measures.

Mitigation to be incorporated into detailed design

Further work would be required to develop the final urban and landscape design. While development of the concept design has aimed to mitigate the overall impact of the concept proposal with a focus on the Stage 2 project’s major project components, their detailed design and integration within the study area’s landscape and cultural setting, opportunities will arise during detail design to further refine the design of the project in order to produce enhanced urban design outcomes. The urban design objectives and principles outlined in Section 1, together with the urban design and landscape concept included in Section 3, would be used to further guide the detailed design of key project elements of the road network and public domain areas.

A summary of the key mitigation and management strategies that would be considered during the detail design phase of the project is provided in the following table: (refer Table 4-30).

Table 4-30: Summary of urban design and landscape mitigation measures

<table>
<thead>
<tr>
<th>Mitigation measure</th>
<th>Location for use</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Replacement of street tree planting</td>
<td>All areas impacted by the upgrade and ancillary works</td>
<td>1A Assists with visual and character impact mitigation 1B Refer species selection and procurement guidelines.</td>
</tr>
<tr>
<td>2 Landscape screen planting</td>
<td>Private property boundary along Warringah Road southern verge and along noise wall, The Forest High School and NBH frontage along Warringah road, Along edges of central depressed slot (at surface level).</td>
<td>2A Assists with visual and character impact mitigation 2B Landscape buffer screening for sensitive viewers 2C Planting to front and rear of noise walls in order to integrate with existing landscape setting</td>
</tr>
<tr>
<td>Mitigation measure</td>
<td>Location for use</td>
<td>Requirement</td>
</tr>
<tr>
<td>--------------------</td>
<td>------------------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| 3 Landscaped verges | New shared paths and footpaths on Warringah Road, Wakehurst Parkway and Aquatic Drive | 3A Separation from kerb would benefit pedestrian comfort in higher speed limits  
3B Use integral oxide to delineate shared paths. |
| 4 Exposed rock in cuttings | Wakehurst Parkway widening where road corridor permits and retaining walls are not required. | 4A Subject to further investigation. Where exposed rock can not be used, revegetate or provide stone cladding  
4B Stone rubble and crushed sandstone from cuttings to be reused into the project. |
| 5 Retaining wall finishes | Facing private property and Wakehurst Parkway. | 5A Sandstone coloured texture block, stone filled gabion or stone block construction  
5B Stone to be sourced from the greater Sydney region. |
| 6 Retaining wall design | All retaining wall locations. | 6A Terracing of walls where possible and provision of planting on benches  
6B Taper ends of walls and integrate with other new or existing walls  
6C Provision of retaining walls in order to reduce footprint |
| 7 Noise wall design | Warringah Road southern verge next to Karingal Crescent. | 7A Use of concrete panels employing textured and form-lined surface and colours appropriate to the urban bushland setting and local context  
7B Translucent material to upper level of wall to include pattern or colouring in order to reduce bird strike and to ensure privacy for overlooked residences  
7C Alignment to allow planting treatments to front (public face) of wall |
| 8 Shared path bridges, stairs and ramp structures | New and replacement shared path bridges. | 8A Design in accordance with Roads and Maritime pedestrian bridge guidelines for urban setting  
8B Reduction of apparent visual bulk of structural members, barriers and screens  
8C Colours appropriate to the urban bushland setting and local context  
8D Provide glazed or steel mesh panels on bridge, stair and ramp structures in order to screen views to/from residential properties  
8E Do not increase floor levels (FL) or height of bridge structures unless detailed visual impact analysis is undertaken and mitigation measures are adequately provided  
8F Ensure adequate sightlines on bridges, by providing lighting, adequate widths and uncluttered entry spaces. On curved bridges assess the introduction of linemarking to separate cyclists and pedestrians |
| 9 Improvements to pedestrian network | All streetscapes impacted by the project. | 9A Design widened footpaths and form continuous routes with adequate sightlines for safety and other measures in accordance with CPTED principles  
9B Ensure connection with key attractors and existing footpaths. |
<table>
<thead>
<tr>
<th>Mitigation measure</th>
<th>Location for use</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 Barriers</td>
<td>Above central slot and retaining walls</td>
<td>10A Employ visually permeable barriers to minimise scale of cutting and allow views and light 10B Minimise use of concrete barriers</td>
</tr>
<tr>
<td>11 Fences</td>
<td>Road boundary</td>
<td>11A Ensure fences complement existing character and materials</td>
</tr>
<tr>
<td>12 Water sensitive urban design</td>
<td>Discharge points between downstream drainage network and natural drainage lines</td>
<td>12A Planting and jute lining, rock armouring, gabion baskets, matting or concrete lining; depending on the specific site conditions, should be implemented 12B Locate detention tank structures underneath road pavement in order to minimise encroachment of existing vegetation 12C Assessment is to be undertaken during detailed design with regards to control of nutrients entering specific habitat areas such as the Red-crowned Toadlet habitat areas to the east of Wakehurst Parkway in the Manly Dam catchment 12D Screen planting around basins to be provided next to residences</td>
</tr>
<tr>
<td>13 Reinforcement of bicycle network</td>
<td>Warringah Council's regional connections along Warringah Road and Wakehurst Parkway.</td>
<td>13A Ensure as a minimum on-road facilities are provided. 13B Provision of connected shared path network in accordance with council's strategy 13C Integral oxide used in shared paths to differentiate from footpaths and potentially reduce the need for shared path markings and signage</td>
</tr>
<tr>
<td>14 Fauna furniture</td>
<td>Wakehurst Parkway</td>
<td>14A Satisfy environmental requirements and connect with existing vegetation 14B Design unobtrusive furniture from natural materials 14C Provide new planting to assist with integration of furniture with the existing landscape setting</td>
</tr>
<tr>
<td>15 Widening reductions</td>
<td>Wakehurst Parkway next to bushland</td>
<td>15A Consider reduction of the number and widths of lanes 15B On-road bicycle usage or shared paths as opposed to separated bicycle facilities.</td>
</tr>
<tr>
<td>16 NBH interface</td>
<td>Warringah Road and Wakehurst Parkway frontages</td>
<td>16A Ensure landscape designs are integrated through the use and appropriate placement of indigenous tree species 16B Extend NBH landscape treatments and species into road corridor verges where appropriate</td>
</tr>
<tr>
<td>17 Construction compound</td>
<td>Allambie Road, intersection of Warringah Road with Wakehurst Parkway and intersection of Aquatic Drive with Wakehurst Parkway</td>
<td>17A Detailed reassessment of visual impacts and other impacts associated with removal of existing redundant building 17B Undertake boundary screening including temporary landscape and architectural devices</td>
</tr>
<tr>
<td>18 Variable Message Signs (VMS)</td>
<td>Warringah Road and Forest Way</td>
<td>18A Undertake detailed visual impact assessment once locations finalised 18B Select smallest VMS type possible in order to reduce visual intrusion, particularly where next to residential properties</td>
</tr>
</tbody>
</table>
Mitigation measures would be applied across the Stage 2 project as described in the previous table and shown in the concept design drawings. Mitigation measures have been specifically described in relation to the visual assessment precincts (and by default to landscape character precincts with impact ratings ranging between high and moderate) in Table 4-31 below. Mitigation measures would be required to be implemented in order to achieve stated impact rating. Where measures can not be implemented, alternative measures should be developed otherwise ratings would potentially increase. Refer to Table 4-30 for mitigation codes and descriptions.

**Table 4-31**: Required mitigation measures applied to visual assessment precincts with a visual impact rating ranging from high to moderate

<table>
<thead>
<tr>
<th>Visual assessment precinct</th>
<th>Primary VCZ visual impact rating</th>
<th>Secondary VCZ visual impact rating</th>
<th>Road user visual impact rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>01: Frenchs Forest Public School</td>
<td>High to moderate</td>
<td>Moderate to low</td>
<td>Ranging from High to moderate - Moderate</td>
</tr>
<tr>
<td>Mitigation measures</td>
<td>I A-B: Tree planting along southern verge and northern abutment of pedestrian bridge</td>
<td>I A-B: Tree planting along southern verge</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>3A-B: Landscaped southern verges and along northern verge if work undertaken</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>5C: High quality wall finishes along southern verge</td>
<td>5C: High quality wall finishes along southern verge</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>6B: Taper ends of walls along southern verge and integrate with other structures</td>
<td>N/A</td>
<td>6B: Taper ends of walls along southern verge and integrate with other structures</td>
</tr>
<tr>
<td></td>
<td>7A, 7C: High quality noise wall finishes and planting in front of wall along southern verge</td>
<td>7A, 7C: High quality noise wall finishes and planting in front of wall along southern verge</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>8A-C: High quality pedestrian bridge design</td>
<td>8A-C: High quality pedestrian bridge design</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>9A-B: Ensure connectivity of pedestrian network</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>10A-B: Visually permeable barriers along surface road and central slot</td>
<td>10A-B: Visually permeable barriers on pedestrian bridge improves long range views of bridge</td>
<td>10A-B: Visually permeable barriers along surface road and central slot</td>
</tr>
<tr>
<td></td>
<td>13A-C: Ensure connectivity of bicycle network</td>
<td>N/A</td>
<td>13A-C: Ensure connectivity of bicycle network</td>
</tr>
<tr>
<td>02 Fitzpatrick Avenue</td>
<td>High</td>
<td>Moderate</td>
<td>Ranging from high to moderate - Moderate</td>
</tr>
<tr>
<td>Mitigation measures</td>
<td>I A-B: Tree planting along southern verge</td>
<td>I A-B: Tree planting along southern verge</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>2A-C: Screen planting along southern verge properties and next to noise wall and shared path ramps</td>
<td>N/A</td>
<td>2A-C: Screen planting along slot</td>
</tr>
<tr>
<td></td>
<td>3A-B: Landscaped southern verges and along northern verge if work undertaken</td>
<td>N/A</td>
<td>3A-B: landscaped southern verges and along northern verge if work undertaken</td>
</tr>
<tr>
<td>Visual assessment precinct</td>
<td>Primary VCZ visual impact rating</td>
<td>Secondary VCZ visual impact rating</td>
<td>Road user visual impact rating</td>
</tr>
<tr>
<td>---------------------------</td>
<td>--------------------------------</td>
<td>----------------------------------</td>
<td>------------------------------</td>
</tr>
<tr>
<td>N/A</td>
<td>N/A</td>
<td>5C: wall finishes along southern verge, portal and slot</td>
<td></td>
</tr>
<tr>
<td>6B: Taper ends of walls along southern verge and integrate with other structures</td>
<td>N/A</td>
<td>6B: Taper ends of walls along southern verge and integrate with other structures</td>
<td></td>
</tr>
<tr>
<td>7A, 7C: High quality noise wall finishes and planting in front of wall along southern verge</td>
<td>7A, 7C: High quality noise wall finishes and planting in front of wall along southern verge</td>
<td>7A, 7C: High quality noise wall finishes and planting in front of wall along southern verge</td>
<td></td>
</tr>
<tr>
<td>8A-C: High quality pedestrian bridge design 8D, 8E: Provide screening on structures and maintain heights of structures</td>
<td>8A-C: High quality pedestrian bridge design</td>
<td>8A-C: High quality pedestrian bridge design</td>
<td></td>
</tr>
<tr>
<td>9A-B: Ensure connectivity of pedestrian network</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>10A-B: Visually permeable barriers along surface road and central slot</td>
<td>10A-B: Visually permeable barriers on pedestrian bridge improves long range views of bridge</td>
<td>10A-B: Visually permeable barriers along surface road and central slot</td>
<td></td>
</tr>
<tr>
<td>12-D: Provide indigenous tree and shrub screening of WSUD and detention basins</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>13A-C: Ensure connectivity of bicycle network</td>
<td>N/A</td>
<td>13A-C: Ensure connectivity of bicycle network</td>
<td></td>
</tr>
<tr>
<td>15A-B: Road widening reduction along southern verge</td>
<td>N/A</td>
<td>15A-B: Road widening reduction may not benefit road users</td>
<td></td>
</tr>
</tbody>
</table>

03 Karingal Crescent: High

Mitigation measures:

<p>| 1A-B: Tree planting along southern verge and next to central slot | 1A-B: Tree planting along southern verge | 1A-B: Tree planting next to central slot |
| 2A-C: Screen planting along southern verge properties and next to noise wall and shared path ramps | N/A | 2A-C: Screen planting along slot |
| 3A-B: Landscaped southern verges and along northern verge if work undertaken | N/A | 3A-B: Landscaped southern verges and along northern verge if work undertaken |
| N/A | N/A | 5C: High quality wall finishes along southern verge, portal and slot |
| 6B: Taper ends of walls along southern verge and integrate with other structures | N/A | 6B: Taper ends of walls along southern verge and integrate with other structures |
| 7A-C: High quality noise wall finishes, translucent upper panels and planting in front of wall along southern verge | 7A, 7C: High quality noise wall finishes and planting in front of wall along southern verge | 7A, 7C: High quality noise wall finishes and planting in front of wall along southern verge |</p>
<table>
<thead>
<tr>
<th>Visual assessment precinct</th>
<th>Primary VCZ visual impact rating</th>
<th>Secondary VCZ visual impact rating</th>
<th>Road user visual impact rating</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>8A-C: High quality pedestrian bridge design</td>
<td>8A-C: High quality pedestrian bridge design</td>
</tr>
<tr>
<td></td>
<td>8D, 8E: Provide screening on structures and maintain heights of structures</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>9A-B: Ensure connectivity of pedestrian network</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>10A-B: Visually permeable barriers along cutting</td>
<td>10A-B: Visually permeable barriers along cutting and on pedestrian bridges improves long range views of bridge</td>
<td>10A-B: Visually permeable barriers along cutting, surface road and central slot</td>
</tr>
<tr>
<td></td>
<td>13A-C: Ensure connectivity of bicycle network</td>
<td>N/A</td>
<td>13A-C: Ensure connectivity of bicycle network</td>
</tr>
<tr>
<td></td>
<td>15A-B: Road widening reduction along southern verge</td>
<td>N/A</td>
<td>15A-B: Road widening reduction may not benefit road users</td>
</tr>
<tr>
<td>04 Forest Way</td>
<td><strong>High to moderate</strong></td>
<td><strong>Moderate to low</strong></td>
<td><strong>Moderate to low</strong></td>
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<tr>
<td>Mitigation measures</td>
<td>1A-C: Tree planting along southern and northern verges and northern abutment of pedestrian bridge. Minimise removal of existing street trees</td>
<td>1A-C: Tree planting along southern and northern verges and northern abutment of pedestrian bridge. Minimise removal of existing street trees</td>
<td>1A-C: Tree planting along northern verge. Minimise removal of existing street trees</td>
</tr>
<tr>
<td></td>
<td>3A-B: Landscaped southern verges and northern verge if work undertaken</td>
<td>N/A</td>
<td>N/A</td>
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<td></td>
<td>5C: High quality wall finishes along southern verge</td>
<td>5C: High quality wall finishes along southern verge</td>
<td>5C: High quality wall finishes along southern verge, portal and slot</td>
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<td></td>
<td>6B: Integrate walls with other structures</td>
<td>N/A</td>
<td>6B: Integrate walls with other structures</td>
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<td></td>
<td>7A, 7C: Quality of noise wall finishes and planting in front of wall along southern verge</td>
<td>7A, 7C: Quality of noise wall finishes and planting in front of wall along southern verge</td>
<td>7A, 7C: Quality of noise wall finishes and planting in front of wall along southern verge</td>
</tr>
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<td></td>
<td>8A-C: High quality pedestrian bridge design</td>
<td>8A-C: High quality pedestrian bridge design</td>
<td>8A-C: High quality pedestrian bridge design</td>
</tr>
<tr>
<td></td>
<td>8D, 8E: Provide screening on structures and maintain heights of structures</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>9A-B: Ensure connectivity of pedestrian network</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>10A-B: Visually permeable barriers along central slot</td>
<td>10A-B: Visually permeable barriers on pedestrian bridge improves long range views of bridge</td>
<td>10A-B: Visually permeable barriers along central slot</td>
</tr>
<tr>
<td></td>
<td>13A-C: Ensure connectivity of bicycle network</td>
<td>N/A</td>
<td>13A-C: Ensure connectivity of bicycle network</td>
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<td>Visual assessment precinct</td>
<td>Primary VCZ visual impact rating</td>
<td>Secondary VCZ visual impact rating</td>
<td>Road user visual impact rating</td>
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<td>------------------------------</td>
</tr>
<tr>
<td><strong>05 The Forest High School</strong></td>
<td>High to moderate</td>
<td>Moderate</td>
<td>Ranging from high to moderate - Moderate</td>
</tr>
<tr>
<td>Mitigation measures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1A-C: Tree planting along southern and northern verges and northern abutment of pedestrian bridge. Minimise removal of existing street trees</td>
<td>I A-C: Tree planting along southern and northern verges and northern abutment of pedestrian bridge. Minimise removal of existing street trees</td>
<td>I A-C: Tree planting along northern verge and next to central slot. Minimise removal of existing street trees</td>
<td></td>
</tr>
<tr>
<td>2A-C: Planting along edges of slot road in order to mitigate cross views and loss of existing vegetation along corridor</td>
<td>2A-C: Planting along edges of slot road in order to mitigate cross views and loss of existing vegetation along corridor</td>
<td>2A-C: Planting along edges of slot road in order to mitigate cross views and loss of existing vegetation along corridor</td>
<td></td>
</tr>
<tr>
<td>3A-B: Landscaped southern and northern verges</td>
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<td>N/A</td>
<td></td>
</tr>
<tr>
<td>5C: High quality wall finishes along southern verge</td>
<td>5C: High quality wall finishes along southern verge</td>
<td>5C: High quality wall finishes along southern verge, portal and slot</td>
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</tr>
<tr>
<td>6B: Integrate walls with other structures</td>
<td>N/A</td>
<td>6B: Integrate walls with other structures</td>
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</tr>
<tr>
<td>7A, 7C: Quality of noise wall finishes and planting in front of wall along southern verge</td>
<td>7A, 7C: Quality of noise wall finishes and planting in front of wall along southern verge</td>
<td>7A, 7C: Quality of noise wall finishes and planting in front of wall along southern verge</td>
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<tr>
<td>8A-C: High quality pedestrian bridge design</td>
<td>8A-C: High quality pedestrian bridge design</td>
<td>8A-C: High quality pedestrian bridge design</td>
<td></td>
</tr>
<tr>
<td>9A-B: Ensure connectivity of pedestrian network</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>10A-B: Visually permeable barriers along central slot</td>
<td>10A-B: Visually permeable barriers on pedestrian bridge improves long range views of bridge</td>
<td>10A-B: Visually permeable barriers along central slot</td>
<td></td>
</tr>
<tr>
<td>13A-C: Ensure connectivity of bicycle network</td>
<td>N/A</td>
<td>13A-C: Ensure connectivity of bicycle network</td>
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<tr>
<td>16A-B: Integrate landscape treatments and species with NBH frontage</td>
<td>N/A</td>
<td>16A: Integrate landscape treatments and species with NBH frontage</td>
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<tr>
<td><strong>06 Bantry Bay Shops</strong></td>
<td>High</td>
<td>High to moderate</td>
<td>Ranging from high to moderate - Moderate</td>
</tr>
<tr>
<td>Mitigation measures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1A-B: Tree planting along southern verge and next to central slot. Minimise removal of existing trees</td>
<td>I A-B: Tree planting along southern verge</td>
<td>I A-B: Tree planting next to central slot</td>
<td></td>
</tr>
<tr>
<td>2A-C: Screen planting along southern verge properties and next to noise wall and shared path bridge ramps</td>
<td>N/A</td>
<td>2A-C: Screen planting along slot</td>
<td></td>
</tr>
<tr>
<td>3A-B: Landscaped southern and northern verges</td>
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<td>3A-B: Landscaped southern and northern verges</td>
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<tr>
<td>N/A</td>
<td>N/A</td>
<td>5C: High quality wall finishes along central slot</td>
<td></td>
</tr>
<tr>
<td>Visual assessment precinct</td>
<td>Primary VCZ visual impact rating</td>
<td>Secondary VCZ visual impact rating</td>
<td>Road user visual impact rating</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>----------------------------------</td>
<td>-----------------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>6B: Taper ends of walls along southern verge and integrate with other structures</td>
<td>N/A</td>
<td>6B: Taper ends of walls along southern verge and integrate with other structures</td>
<td></td>
</tr>
<tr>
<td>7A-C: High quality noise wall finishes, translucent upper panels and planting in front of wall along southern verge</td>
<td>7A, 7C: High quality noise wall finishes and planting in front of wall along southern verge</td>
<td>7A, 7C: High quality noise wall finishes and planting in front of wall along southern verge</td>
<td></td>
</tr>
<tr>
<td>8A-C: High quality pedestrian bridge design&lt;br&gt;8D, 8E: Provide screening on structures and maintain heights of structures</td>
<td>8A-C: High quality pedestrian bridge design</td>
<td>8A-C: High quality pedestrian bridge design</td>
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</tr>
<tr>
<td>9A-B: Ensure connectivity of pedestrian network</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>10A-B: Visually permeable barriers along central slot</td>
<td>10A-B: Visually permeable barriers on pedestrian bridge improves long range views of bridge</td>
<td>10A-B: Visually permeable barrier along cutting, surface road and central slot</td>
<td></td>
</tr>
<tr>
<td>13A-C: Ensure connectivity of bicycle network</td>
<td>N/A</td>
<td>13A-C: Ensure connectivity of bicycle network</td>
<td></td>
</tr>
<tr>
<td>15A-B: Road widening reduction along southern verge</td>
<td>N/A</td>
<td>15A-B: Road widening reduction may not benefit road users</td>
<td></td>
</tr>
<tr>
<td>16A: Integrate landscape treatments with NBH frontage on northern verge</td>
<td>N/A</td>
<td>16A: Integrate landscape treatments with NBH frontage on northern verge</td>
<td></td>
</tr>
<tr>
<td>07 Brick Pit Reserve</td>
<td>High</td>
<td>High to moderate</td>
<td>Ranging from high to moderate - low to moderate</td>
</tr>
<tr>
<td>Mitigation measures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1A-B: Tree planting along southern verge, next to central slot and along Wakehurst Parkway</td>
<td>1A-B: Tree planting along southern verge and Wakehurst Parkway</td>
<td>1A-B: Tree planting along southern verge, next to central slot and along Wakehurst Parkway</td>
<td></td>
</tr>
<tr>
<td>2A-C: Screen planting along southern verge next to retaining wall and playground</td>
<td>N/A</td>
<td>2A-C: Screen planting along southern verge next to retaining wall and playground</td>
<td></td>
</tr>
<tr>
<td>3A-B: Landscaped southern verge</td>
<td>N/A</td>
<td>3A-B: Landscaped southern verge</td>
<td></td>
</tr>
<tr>
<td>N/A</td>
<td>N/A</td>
<td>5C: High quality wall finishes along central slot</td>
<td></td>
</tr>
<tr>
<td>6C: Provision of retaining wall along southern verge and along Wakehurst Parkway in order to reduce impacts on reserve and playground</td>
<td>N/A</td>
<td>6C: Provision of retaining wall along southern verge and along Wakehurst Parkway in order to reduce impacts on reserve and playground</td>
<td></td>
</tr>
<tr>
<td>9A-B: Ensure connectivity of pedestrian network</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>10A-B: Visually permeable barriers along central slot</td>
<td>N/A</td>
<td>10A-B: Visually permeable barriers along central slot</td>
<td></td>
</tr>
<tr>
<td>Visual assessment precinct</td>
<td>Primary VCZ visual impact rating</td>
<td>Secondary VCZ visual impact rating</td>
<td>Road user visual impact rating</td>
</tr>
<tr>
<td>----------------------------</td>
<td>---------------------------------</td>
<td>-----------------------------------</td>
<td>------------------------------</td>
</tr>
<tr>
<td>09 Aquatic Business Park A</td>
<td>Moderate</td>
<td>Moderate</td>
<td>High to moderate</td>
</tr>
</tbody>
</table>

Mitigation measures

| 1A-B: Tree planting along southern verge on private property and next to central slot | 1A-B: Tree planting along southern verge on private property | 1A-B: Tree planting along southern verge on private property and next to central slot |
| 2A-C: Screen planting along southern verge next to retaining wall and corporate rest areas | N/A | 2A-C: Screen planting along southern verge next to retaining wall |
| 3A-B: Landscaped southern verge and private property where remediation of damaged areas required | N/A | 3A-B: Landscaped southern verge |
| N/A | N/A | 5C: High quality wall finishes on portal and along central slot |
| 6C: Provision of retaining wall along southern verge and along Wakehurst Parkway in order to reduce impacts on reserve and playground | N/A | 6C: Provision of retaining wall along southern verge and along Wakehurst Parkway in order to reduce impacts on reserve and playground |
| 9A-B: Ensure connectivity of pedestrian network including on private property impacted by work | 9A-B: Ensure connectivity of pedestrian network including that on private property impacted by work | N/A |
| 10A-B: Visually permeable barriers along southern verge and central slot | N/A | 10A-B: Visually permeable barriers along southern verge and central slot |
| 13A-C: Ensure connectivity of bicycle network including on private property impacted by work | N/A | 13A-C: Ensure connectivity of bicycle network |
| 15A-B: Road widening reduction along southern verge | N/A | 15A-B: Road widening reduction may not benefit road users |

| 10 Aquatic Business Park B | Moderate to low | Low | Moderate to low |

Mitigation measures

<p>| 1A-B: Tree planting along both sides of the Aquatic Drive extension | 1A-B: Tree planting along both sides of the Aquatic Drive extension | 1A-B: Tree planting along both sides of the Aquatic Drive extension |
| 3A-B: Landscaped verges along both sides of the Aquatic Drive extension | N/A | 3A-B: Landscaped verges along both sides of the Aquatic Drive extension |</p>
<table>
<thead>
<tr>
<th>Visual assessment precinct</th>
<th>Primary VCZ visual impact rating</th>
<th>Secondary VCZ visual impact rating</th>
<th>Road user visual impact rating</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5A-B: Low walls to comprise stone finish</td>
<td>N/A</td>
<td>5A-B: Low walls to comprise stone finish</td>
</tr>
<tr>
<td></td>
<td>6B: Taper ends of walls</td>
<td>N/A</td>
<td>6B: Taper ends of walls</td>
</tr>
<tr>
<td></td>
<td>6C: Provision of retaining wall along Aquatic Drive and along Wakehurst Parkway in order to reduce impacts on bushland</td>
<td>N/A</td>
<td>6C: Provision of retaining wall along Aquatic Drive and along Wakehurst Parkway in order to reduce impacts on bushland</td>
</tr>
<tr>
<td></td>
<td>9A-B: Ensure connectivity of pedestrian network including on private property impacted by work</td>
<td>9A-B: Ensure connectivity of pedestrian network including that on private property impacted by work</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>12A: Stormwater discharge locations to incorporate planting and rock lining in preference to concrete where possible</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>12B: Locate detention structures under Aquatic Drive extension to avoid impacts on bushland</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>13A-C: Ensure connectivity of bicycle network along Aquatic Drive to recent cycleways installed at Allambie Drive</td>
<td>N/A</td>
<td>13A-C: Ensure connectivity of bicycle network along Aquatic Drive to recent cycleways installed at Allambie Drive</td>
</tr>
<tr>
<td></td>
<td>14A-C: Assess fauna furniture requirement across Aquatic Drive and implement using unobtrusive, natural materials where possible</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Warringah Aquatic Centre</td>
<td>Low</td>
<td>Low</td>
<td>N/A</td>
</tr>
<tr>
<td>Mitigation measures</td>
<td>1A-B: Tree planting along Wakehurst Parkway to mitigate views from the pedestrian bridge</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>3A-B: Landscaped verges along Wakehurst Parkway to mitigate views from the pedestrian bridge</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>5A-B: Low walls to comprise stone finish in order to blend in with bushland setting when viewed from pedestrian bridge</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>6C: Provision of retaining wall along Wakehurst Parkway in order to reduce impacts on bushland when viewed from pedestrian bridge</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>
### Visual assessment precinct

<table>
<thead>
<tr>
<th>Visual assessment precinct</th>
<th>Primary VCZ visual impact rating</th>
<th>Secondary VCZ visual impact rating</th>
<th>Road user visual impact rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>9A-B: Ensure connectivity of pedestrian network including between Aquatic Drive and existing footbridge</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>13A-C: Ensure connectivity of bicycle network between Aquatic Drive and existing footbridge</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>14A-C: Assess fauna furniture requirement across Wakehurst Parkway and implement using unobtrusive, natural materials where possible</td>
<td>N/A</td>
<td>N/A</td>
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</table>

### Mitigation measures

<table>
<thead>
<tr>
<th>Mitigation measures</th>
<th>N/A</th>
<th>N/A</th>
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</thead>
<tbody>
<tr>
<td>1A-B: Tree planting along both sides of Wakehurst Parkway to mitigate views of retaining walls</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>3A-B: Landscaped verges along Wakehurst Parkway and intersection with Aquatic Drive</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>4A: Retain exposed rock in cuttings if possible</td>
<td>N/A</td>
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</tr>
<tr>
<td>5A-B: Low walls to comprise stone finish</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>6B: Taper ends of walls</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>6C: Provision of retaining wall along Wakehurst Parkway in order to reduce impacts on bushland</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>9A-B: Ensure connectivity of pedestrian network along Wakehurst Parkway into Aquatic Drive</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>12A: Stormwater discharge locations to incorporate planting and rock lining in preference to concrete where possible</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>13A-C: Ensure connectivity of bicycle network along Wakehurst Parkway and into Aquatic Drive</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>14A-C: Assess fauna furniture requirement across Aquatic Drive and implement using unobtrusive, natural materials where possible</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>
5. Conclusion

Following an analysis of landscape context, the development of objectives, principles, strategies and mitigation measures, an assessment of landscape character and visual impact has been undertaken in accordance with Roads and Maritime guidelines. The results of this assessment have been incorporated into the concept design and has been recommended for further consideration in both the detailed design, once the concept proposal and Stages 1 and 2 are approved in their entirety.

The landscape character and visual impact assessment of the project represents a qualitative assessment based on the landscape character zones and selected representative viewpoints which have been determined based on an investigation of landscape and cultural context and an analysis of land use, vegetation, topography and scenic values. Impacts have been identified and mitigation measures proposed in order to address these impacts.

While the project would have the potential to provide a more efficient transport system along all corridors, and maintain and improve access for pedestrians and cyclists, overall, the project would result in substantial impacts on both landscape character and visually, as experienced by road viewers, sensitive receptors and road users. This would be particularly evident along the southern side of Warringah Road as a result of the removal of large stands of existing vegetation, whereby residents along Karingal Crescent which back on to Warringah Road would experience the highest impacts.

In some locations, pedestrian access may become more convoluted due the reliance on overbridges and less scenic, due to reduced curtilage and loss of existing vegetation. The removal of the local shops and restaurants at Bantry Bay Road will also substantially impact the local community, as well as motorists, due to the loss of convenient retail facilities and a local landmark and greater visual exposure to a substantially widened road environment.

Similarly to Stage 1, landscape character impact and visual impact would be greatest along the east west corridors, primarily due to the magnitude of the work proposed as well as the close proximity of residential viewers to the work.

The north south transport corridors have a lesser magnitude of work proposed and are more resilient to change. On Wakehurst Parkway an existing signalised intersection would be widened resulting vegetation loss in an existing vegetated corridor and few residents would be impacted. Vegetation loss should be minimised due to its status as an endangered ecological community. Vegetative backgrounds would remain along this corridor in the context of the road upgrade.

In order to mitigate visual impacts within this urban bushland setting special consideration would be required in all landscape character zones of the concept proposal, particularly where resident views, lifestyle and bushland are impacted. Mitigation measures as described, must be employed in order to reduce these impacts. Road user views are to be mitigated through the adoption of high quality design outcomes that are complimentary to the urban bushland setting, as well as the design of landmark structures (eg shared path bridges and central slot portals) and suitable finishes. Landscape treatments that interface with the NBH are to be integrated.
Looking east towards the existing footbridge over Warringah Road
References

Stage 2 Network Enhancement reports


Concept proposal and Stage 1 reports
SMM, *Northern Beaches Hospital Connectivity and Network Enhancements Urban design and landscape character and visual impact assessment report: Concept Proposal and Stage 1*, October 2014.


Background reports


Roads and Maritime Services (formerly RTA) references and guidelines

Roads and Maritime Services, *Beyond the Pavement*, Urban design policy, procedure and design principles, 2013.

Roads and Maritime Services, *Appendix D Pedestrian bridge standard for built up areas*, Not dated.

Looking east towards the existing footbridge over Warringah Road