

The background of the cover is a large aerial photograph of a residential area in Roseville, New South Wales. It shows a dense grid of houses with red-tiled roofs, green lawns, and trees. A major road, Boundary Street, runs diagonally from the top left towards the bottom right. Other streets visible include Pacific Highway and Melnotte Avenue. The image is divided into four quadrants by a white crosshair.

# Boundary Street Upgrade: Pacific Highway to Melnotte Avenue, Roseville

Project Review of Environmental Factors

FEBRUARY 2014



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# Roads and Maritime Services

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## Boundary Street Upgrade

Review of environmental factors  
February 2014

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# Executive summary

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## The proposal

Roads and Maritime Services propose to upgrade Boundary Street between the Pacific Highway and Melnotte Avenue, Roseville.

The general features of the proposal include the provision of:

- Two dedicated left turn and two dedicated right turn lanes from Boundary Street into the Pacific Highway.
- Two dedicated east-bound through lanes on Boundary Street between the Pacific Highway and Archer Street.
- A dedicated right turn lane from Boundary Street into Archer Street.
- Hill Street converted to left in/left out access.
- A shared pedestrian and cycle pathway on the northern side of Boundary Street, between Hill Street and Archer Street.
- A retaining wall on the northern side of Boundary Street.
- Landscaping and urban design in consultation with Willoughby Council and Ku-ring-gai Council.
- Property adjustments.
- Drainage and utility relocations.
- Upgrades of the existing signalised intersections at Boundary Street/Pacific Highway and Boundary Street/Archer Street.

Boundary Street is currently a two way carriageway of three traffic lanes and passes under the North Shore railway line bridge near the intersection with the Pacific Highway. The rail bridge was upgraded in 2012, allowing for up to five lanes of traffic as well as provision for improvements to pedestrian paths on both sides of Boundary Street.

Boundary Street forms the boundary between the Willoughby and Ku-ring-gai Local Government Areas (LGAs) and as such is located in both LGAs.

## Need for the proposal

The proposal is required to ease traffic congestion, improve traffic flow and improve safety at the intersections of Boundary Street/Pacific Highway, Boundary Street/Hill Street and Boundary Street/Archer Street. Currently, Boundary Street carries about 37,000 vehicle movements per day and experiences major traffic delays during the morning and afternoon peak periods. This has an impact on the operational performance of intersections at Boundary Street/Pacific Highway and Boundary Street/Archer Street. Traffic delays are due to:

- The limited number of traffic lanes.
- The right turn bay from Boundary Street to the Pacific Highway overflows and creates delays for traffic turning left.
- The right turn lane from Boundary Street to Archer Street creates delays for through traffic.



- Right turns in and out of Hill Street create delays for through traffic on Boundary Street.
- The average Level of Service (LoS) for Boundary Street and the Pacific Highway is rated as 'D', which relates to a roadway or intersection that is 'approaching unstable flows with tolerable delays'.

The proposal is required to:

- Improve pedestrian and cycle facilities on Boundary Street.
- Improve traffic flow and reliability for freight vehicles on Boundary Street, which is a tertiary freight route between the Pacific Highway and the northern beaches.
- Improve traffic flow for motorists using Boundary Street to reach the northern beaches as well as the Chatswood retail centre and employment hub.
- Improve safety for pedestrians, cyclists and motorists, particularly on Boundary Street.
- Address goals within State, regional and Roads and Maritime related strategies.

## Options considered

Three options were considered during the development of the proposal, including:

- Option 1 (Do-nothing): The do-nothing option would result in Boundary Street remaining a four-lane road, comprising one east-bound lane and three west-bound lanes between the Pacific Highway and Hill Street, and two eastbound lanes between Hill Street and Melnotte Avenue. Routine maintenance and safety activities would continue to be carried out where required.
- Option 2: Upgrade of Boundary Street. This option would involve the widening of Boundary Street to allow for two dedicated left turn lanes and two dedicated right turn lanes from Boundary Street to the Pacific Highway; two dedicated through lanes between the Pacific Highway and Archer Street; and a dedicated right turn lane from Boundary Street into Archer Street. Associated work would also be carried out including the construction of a retaining wall and a shared pedestrian and cycle pathway on the northern side of Boundary Street as well as implementation of a left in/left out turning arrangement at Hill Street.
- Option 3: Limited upgrade of Boundary Street. This option would involve a minor widening of existing lanes and pedestrian pathways on Boundary Street (an additional width of about 0.5 metres to each existing lane), but would not result in any additional lanes for through or turning traffic. Additionally, it would not include an upgrade of the existing pedestrian pathway. There would be no work on the Pacific Highway or Hill Street. Some changes to existing drainage infrastructure and relocation of existing underground telecommunication and water supply utilities would also be required for Option 3.

Option 2 was selected by Roads and Maritime as the preferred option as it best meets the objectives of the proposal and the strategic need for a reduction in congestion and improved traffic flow and improved safety on Boundary Street, particularly at peak travel periods.

## **Statutory and planning framework**

The State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) aims to facilitate the effective delivery of infrastructure across the State. Clause 94 of the ISEPP permits development on any land for the purpose of a road or road infrastructure facilities to be carried out by or on behalf of a public authority without consent. The proposal can therefore be assessed under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) by Roads and Maritime as both the proponent and the determining authority. Development consent from Willoughby Council or Ku-ring-gai Council is not required.

## **Community and stakeholder consultation**

Consultation has been ongoing since November 2012 and has included consultation with the Roseville community, Willoughby Council, Ku-ring-gai Council and Sydney Trains (previously RailCorp) including three information sessions. The consultation process has assisted the development of the proposal.

This Review of Environmental Factors (REF) will not be placed on public display. Community consultation will continue throughout the development of the detailed design and during construction.

## **Environmental impacts**

The following outlines the main environmental impacts of the proposal.

### **Noise and vibration**

During construction, noise management levels (NML) may be exceeded at a number of receivers next to the proposal during the day time and night time work periods. Where the NML is predicted to be exceeded, construction noise would be mitigated through management measures.

There is also the potential for two non-Aboriginal heritage buildings (Ku-ring-gai Court and Electrical Substation No. 312) to be impacted by vibration generated by construction work. The potential for structural or cosmetic damage to the heritage buildings is minor and would be managed through management measures.

### **Non-Aboriginal heritage**

Six listed heritage items (including conservation areas) are located within or next to the proposal area. These are Ku-ring-gai Court, Electrical Substation No. 312, North Chatswood Heritage Conservation Area, Chatswood Urban Conservation Area - North Chatswood Precinct, Willoughby Urban Conservation Area (Precinct 15, Roseville West) and Ku-ring-gai Urban Conservation Area (Precinct 3, Roseville and Precinct 4, Roseville West).

The proposal has the potential to directly impact on two of these items, including Ku-ring-gai Court and Electrical Substation No. 312 (#312 Corona Avenue Substation). However the potential impact would be very minor and would be managed through a comprehensive safeguard and management measures.

There are no items of National or State significance within close proximity to the proposal area.



## **Visual impacts**

The visual environment of the proposal area is typical of a developed urban setting. The proposal area is dominated by road and rail infrastructure as well as residential and commercial land uses. Views corridors to the site exist along roads, including the Pacific Highway, Boundary Street, Hill Street and Archer Street. The most distinctive visual feature of Boundary Street is a corridor of street tree plantings on both the northern and southern sides of the road. Residential properties along affected roads have filtered views to the road corridor, and in some cases are almost completely screened by the surrounding vegetation.

Visual impacts would occur during construction and operation. Construction impacts include a changed visual environment due to the presence of construction plant and equipment. During operation, the proposal would result in permanent visual changes to the streetscape at the western end of Boundary Street. The main visual changes would be those associated with the new retaining wall on the northern side of Boundary Street, new infrastructure (such as raised medians, signage and signals) and the removal of vegetation.

## **Contaminated land**

Three notices for contaminated land are located within one kilometre of the proposal area in the suburbs of Roseville and Chatswood. One of these sites, comprising a petrol station is within the proposal area and presents a potential moderate-high risk with respect to contamination. The remaining two sites present a low potential risk with respect to contamination due to the proximity to the proposal area, potential contamination types and migration pathways.

Issues associated with contaminated land may occur during construction. Construction work would occur within the bounds of the Seven Eleven petrol station (corner of Boundary Street and the Pacific Highway, Roseville) which may include potential contamination sources. Safeguards have been developed to avoid or mitigate this risk.

## **Socio-economic and property issues**

The proposal has the potential for both wider regional and local benefits in the medium to longer term through reduced traffic congestion and improved access and connectivity. The proposal would also provide improved pedestrian and cycle facilities on the northern side of Boundary Street.

During construction, the community would experience temporary traffic delays and noise, air quality and visual amenity impacts. During operation, existing turning arrangements would change at Hill Street which is currently used by motorists to access the Roseville train station, and local businesses located to the north of the proposal. The proposal would also require 12 partial (strip) property acquisitions, including 11 private residential properties and one commercial property (Seven Eleven petrol station).

## **Justification and conclusion**

This REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed activity. A number of potential environmental impacts resulting from the proposal have been avoided or reduced during the options assessment and development of the concept design. The proposal as described in this REF best meets the proposal objectives. The proposal would still result in some impacts including noise and vibration impacts, temporary disruptions to traffic flow and access, impacts on

biodiversity and property acquisition impacts. A range of measures have been developed to minimise and mitigate the potential adverse impacts of the proposal, and these are summarised in this REF.

This REF has concluded that the adverse impacts of the proposal would be outweighed by the longer term beneficial impacts of providing improved traffic flow, reduced congestion and improved safety for all road users. On balance the proposal is therefore considered justified.

This REF has concluded that the proposal would not have a significant impact on the environment and therefore an environmental impact statement and assessment under Part 5.1 of the EP&A Act is not required. This REF has also found there would be no significant impacts to matters of national environmental significance or to the environment of Commonwealth land.



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# 1 Introduction

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## 1.1 Proposal identification

### 1.1.1 The proposal

Roads and Maritime Services propose to upgrade Boundary Street between the Pacific Highway and Melnotte Avenue, Roseville. This will involve the design and construction of a 380 metre section of Boundary Street, with associated work at Hill Street and the Pacific Highway (from about 200 metres south of Maclaurin Parade and Findlay Avenue, Roseville). This work is hereafter referred to as ‘the proposal’.

Boundary Street currently experiences substantial traffic delays during the morning and afternoon peak periods. This is evident from the average Level of Service (LoS) experienced by Boundary Street and the Pacific Highway, which is at level ‘D’. Level D indicates a roadway or intersection that is ‘approaching unstable flows with tolerable delays’. The proposal is required to improve safety at the three intersections of Boundary Street/Pacific Highway, Boundary Street/Hill Street and Boundary Street/Archer Street as well as to ease traffic congestion.

An overview of the proposal is provided in **Figure 1-2** and the concept design is included in **Appendix A**. Further detail on each of the components of the proposal is provided in Chapter 3. The general features of the proposal include the provision of:

- Two dedicated west-bound left turn and two dedicated right turn lanes from Boundary Street into the Pacific Highway.
- Two dedicated east-bound through lanes on Boundary Street between the Pacific Highway and Archer Street.
- A dedicated right turn lane from Boundary Street into Archer Street.
- Conversion of the Hill Street and Boundary Street intersection into converted to left in/left out access only to Boundary Street.
- A shared pedestrian and bicycle path on the northern side of Boundary Street between Hill Street and Archer Street.
- A retaining wall on the northern side of Boundary Street.
- Landscaping and urban design in consultation with Willoughby Council and Ku-ring-gai Council.
- Property adjustments.
- Drainage and utility relocations.
- Upgrades to the existing signalised intersection at Boundary Street/Pacific Highway and Boundary Street/Archer Street.

### 1.1.2 The locality

As shown in **Figure 1-1**, Boundary Street forms the boundary between the Willoughby and Ku-ring-gai Local Government Areas (LGAs) and as such is located in both LGAs.

Boundary Street is a 2.5 kilometre corridor connecting the Pacific Highway and the suburb of Roseville, Roseville Chase and Castle Cove and further north to

Forestville/Killarney Heights and the northern beaches. Boundary Street and the Pacific Highway are classified as State roads under the Schedule of Classified Road and Unclassified Regional Roads (2013).

The area surrounding the proposal is characterised by an urban environment which including a mix of residential, commercial/business, industrial and transport related land uses. The main features of the area surrounding the proposal include:

- St Andrew's Anglican Church, Roseville town centre, Roseville train station, Roseville College, Roseville Public School and Bancroft Park, all located north of Boundary Street.
- Beauchamp Park, Chatswood town centre, and Chatswood train station, located south of the proposal.
- Commercial/business uses to the east of the proposal, including an industrial park between Penshurst Street and Eastern Valley Way.
- Residential neighbourhoods, comprising predominantly low density dwellings, located east and west of the Pacific Highway and north and south of Boundary Street.

### **1.1.3 Terms used in this report**

For the purposes of this report, the 'proposal area' refers to the area that would be potentially directly impacted by the proposal and is shown in **Figure 1-2**. The proposal area includes those areas that would be potentially directly impacted during construction including the location and access to the compound site, stockpile sites and storage of equipment and plant.

The 'study area' encompasses the proposal area and the area that may be indirectly impacted by the proposal and varies across individual specialist studies.

## **1.2 Purpose of the report**

This Review of Environmental Factors (REF) has been prepared by Sinclair Knight Merz on behalf of Roads and Maritime Sydney Region. For the purposes of this work, Roads and Maritime is the proponent and the determining authority under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The purpose of the REF is to describe the proposal, to document the likely impacts of the proposal on the environment, and to detail protective measures to be implemented.

The description of the proposed work and associated environmental impacts have been undertaken in context of clause 228 of the *Environmental Planning and Assessment Regulation 2000*, the *Threatened Species Conservation Act 1995* (TSC Act), the *Fisheries Management Act 1994* (FM Act), and the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). In doing so, the REF helps to fulfil the requirements of section 111 of the EP&A Act, that Roads and Maritime examines and takes into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity.

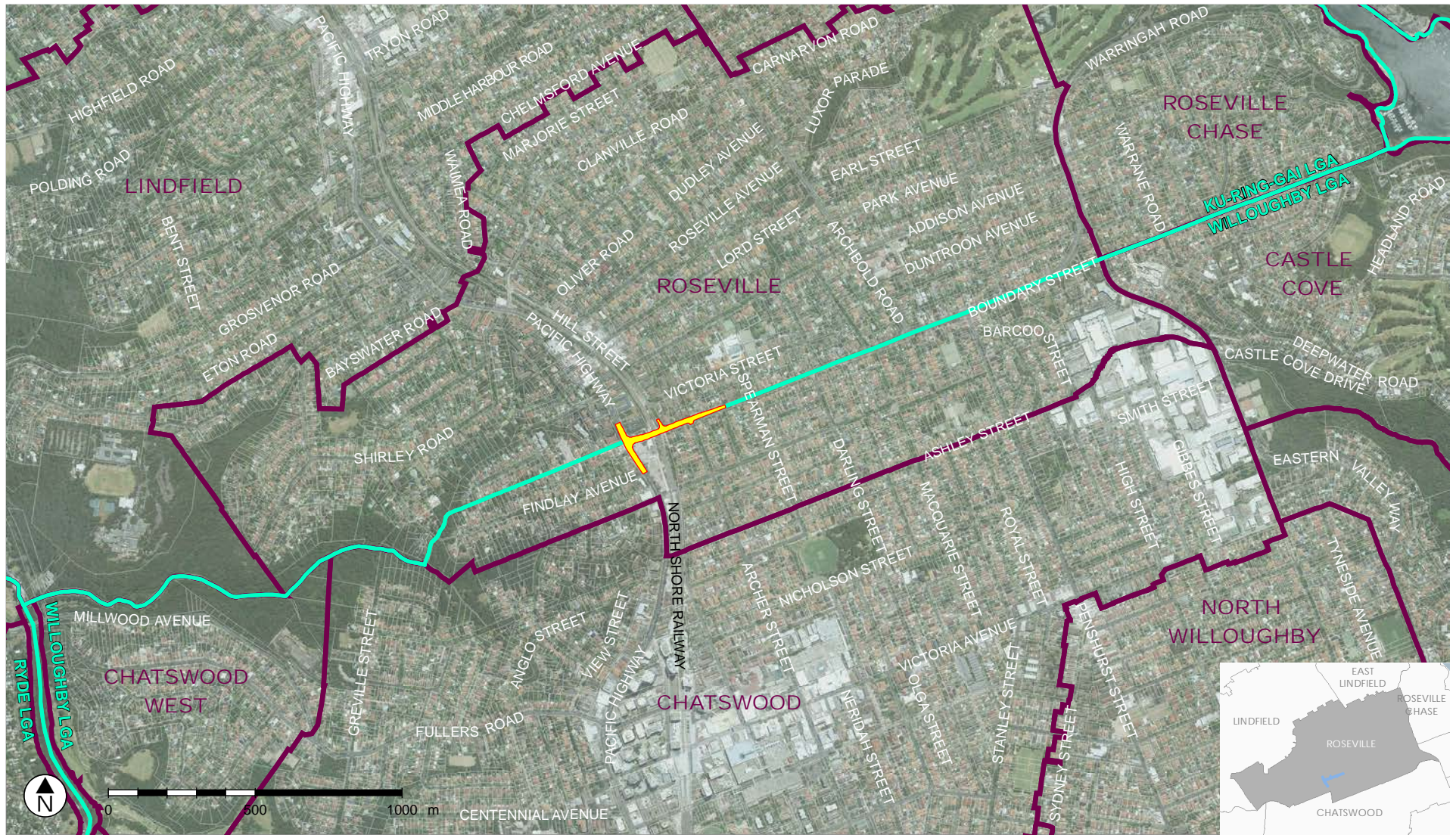
The findings of the REF would be considered when assessing:

- Whether the proposal is likely to have a significant impact on the environment and therefore the necessity for an environmental impact statement to be

prepared and approval to be sought from the Minister for Planning and Infrastructure under Part 5.1 of the EP&A Act.

- The significance of any impact on threatened species listed under the TSC Act or FM Act, based on consideration of the factors in section 5A of the EP&A Act, and the corresponding requirement for a Species Impact Statement.
- The potential for the proposal to significantly impact a matter of national environmental significance or Commonwealth land and the need to make a referral to the Australian Government Department of Sustainability, Environment, Water, Population and Communities for a decision by the Commonwealth Minister for the Environment on the need for approval under the EPBC Act.





NSW SPATIAL - GIS MAP file : EN04221\_GIS\_GEN\_F002\_r1v2

- Proposal area
- Suburb boundary
- LGA boundary

Figure 1-1 Boundary Street Upgrade - regional context



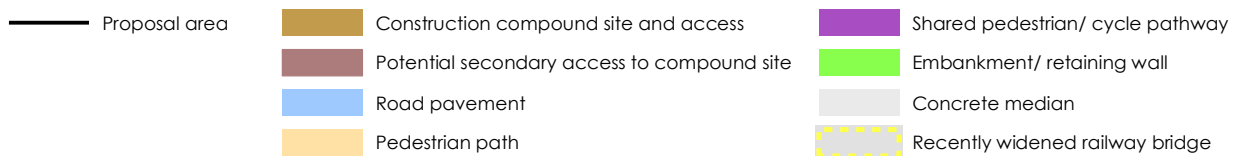
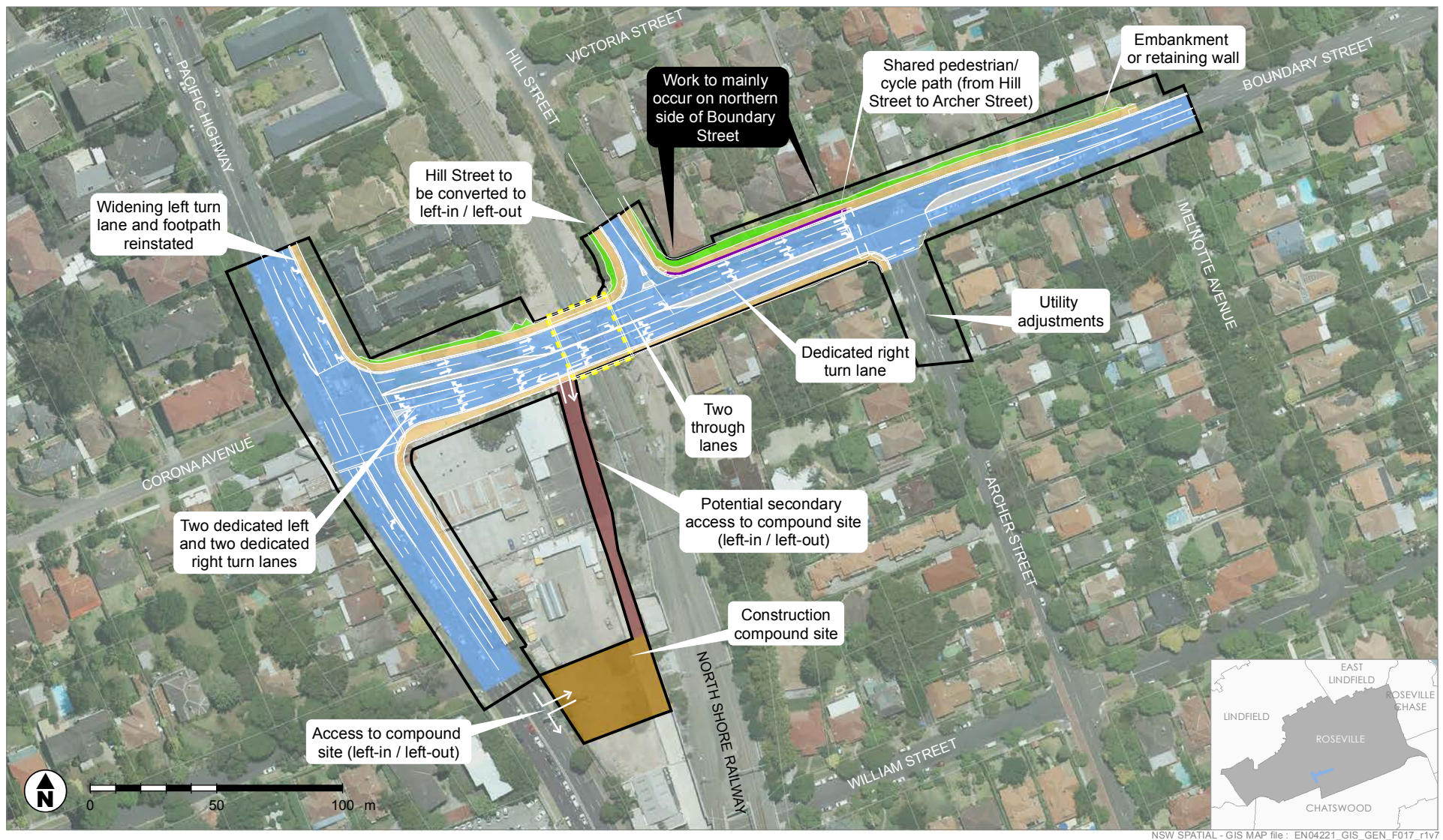


Figure 1-2 Boundary Street Upgrade - proposal area and key features



## 2 Need and options considered

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### 2.1 Strategic need for the proposal

The proposal is required to ease traffic congestion, improve traffic flow and improve safety at the three intersections of Boundary Street/Pacific Highway, Boundary Street/Hill Street and Boundary Street/Archer Street. Currently, Boundary Street carries about 37,000 vehicle movements per day and experiences major traffic delays during the morning and afternoon peak periods. This has an impact on the operational performance of intersections at Boundary Street/Pacific Highway and Boundary Street/Archer Street. Traffic delays are due to:

- The limited number of traffic lanes.
- The right turn bay from Boundary Street to the Pacific Highway overflows and creates delays for traffic turning left.
- The right turn lane from Boundary Street to Archer Street creates delays for through traffic.
- Right turns in and out of Hill Street create delays for through traffic on Boundary Street.
- The average Level of Service (LoS) for Boundary Street and the Pacific Highway is rated as 'D', which relates to a roadway or intersection that is 'approaching unstable flows with tolerable delays' (Austroads 1988).

The proposal is required to:

- Improve pedestrian and cycle facilities on Boundary Street.
- Improve traffic flow and reliability for freight vehicles on Boundary Street, which is a tertiary freight route between the Pacific Highway and the northern beaches.
- Improve traffic flow for motorists using Boundary Street to reach the northern beaches as well as the Chatswood retail centre and employment hub.
- Improve safety for pedestrians, cyclists and motorists, particularly on Boundary Street.
- Address goals within State, regional and Roads and Maritime related strategies.

A pedestrian pathway is provided on the northern side of Boundary Street, between Hill Street and Archer Street. Pedestrian access to the signalised crossing at Archer Street is via a set of steps which may present access issues for people with mobility difficulties. Currently there are no dedicated cycle facilities on Boundary Street, between Hill Street and Archer Street. The proposal is required to improve pedestrian and bicycle facilities on Boundary Street.

Boundary Street forms part of a freight corridor network for heavy vehicles connecting the Pacific Highway at Roseville to Pittwater Road at Dee Why, providing access to industrial areas in the northern beaches (Roads and Maritime 2012). The NSW Urban Freight Hierarchy identifies Boundary Street as a tertiary freight road, which provides freight connections to primary and secondary routes on the general State Road system (RTA 2011). Boundary Street is a B-double route.

Boundary Street provides access to places of work, recreation, shopping and to the Roseville railway station. Boundary Street also forms an important network for buses, servicing a limited number of bus routes for Transdev and Forest Coaches (Roads and Maritime 2012). About 46 per cent of Roseville residents rely on a vehicle, while about 18 per cent travel via train, and about five per cent via bus. When compared to Greater Sydney, a high proportion of residents rely on public transport to reach work. This reflects the suburb's high level of access to both train and bus services.

The proposal would also address objectives outlined in:

- NSW 2021: A plan to make NSW Number One.
- NSW State Infrastructure Strategy.
- NSW Long Term Transport Master Plan.
- NSW Bike Plan 2010.
- Draft Metropolitan Strategy for Sydney to 2031.
- Pinch Point Program.

These strategies and relevant objectives are discussed further in the following sections.

### **2.1.1 NSW 2021: A Plan to Make NSW Number One**

NSW 2021: A Plan to Make NSW Number One (NSW 2021 Plan) (NSW Department of Premier and Cabinet 2011) is the NSW Government's 10 year strategic business plan which sets priorities for action and guides resource allocation to deliver economic growth and critical infrastructure throughout NSW. NSW 2021 places emphasis on investing in and delivering an efficient and effective transport system including road infrastructure that will relieve congestion, improve safety and expand capacity on road corridors.

The proposal directly addresses two of the objectives relating to transport and infrastructure identified in the NSW 2021 Plan, including:

- Reduction of travel times.
- Improving road safety.

Through the provision of additional lanes on Boundary Street as well as the upgrade to turning arrangements from Boundary Street to Archer Street, there would be a reduction in traffic congestion on Boundary Street and the Pacific Highway. As such, travel times would be reduced. The provision of a shared cycle and pedestrian pathway on the northern side of Boundary Street would improve road safety for cyclists.

### **2.1.2 State Infrastructure Strategy 2012-2032**

The State Infrastructure Strategy 2012-2032 (SIS) developed by Infrastructure NSW is a 20 year strategy which identifies and prioritises the delivery of critical public infrastructure to drive productivity and economic growth (Infrastructure NSW 2012). This assessment of the State's existing infrastructure highlighted critical deficiencies in urban road capacity and provides strategic options to meet the challenges of population growth and substantial increases in freight volumes.

One of the objectives of the SIS is to reduce delays and manage traffic on major arterial roads across Sydney, including at pinch points (peak hour congestion problem areas). The Pacific Highway, which forms part of this proposal is an arterial road and is important for the movement of freight within Sydney. Locally, the Pacific

Highway provides a link with Boundary Street which is an important connection to industrial areas in Sydney's northern beaches. The proposal is consistent with the SIS as it would reduce traffic congestion and delays on Boundary Street and the intersection of Boundary Street/Pacific Highway, which has been identified as a pinch point.

### **2.1.3 NSW Long Term Transport Master Plan**

The NSW Long Term Transport Master Plan (LTTMP) (TfNSW 2012) provides a framework to deliver an integrated, modern transport system by identifying NSW's transport actions and investment priorities over the next 20 years.

The LTTMP has identified a number of challenges and actions relevant to the proposal including:

- Congestion and pinch point management in Greater Sydney to respond to the growing pressure on the road network. While Boundary Street has not been targeted as a pinch point within the LTTMP, it has been identified by Roads and Maritime as part of the Roads and Maritime Pinch Point Program. The proposal is consistent with the aim of the LTTMP of reducing congestion and improving safety at pinch point locations.
- Being able to travel safer, including the provision of safe travel options and networks. Vehicles turning left from Hill Street into Boundary Street are a potential safety issue due to the lack of visibility for motorists. The proposal would allow for safer access from Hill Street into and out of Boundary Street. The removal of the right turn into Hill Street from Boundary Street would also assist in the reduction of risk taking for turning vehicles.
- Increasing network efficiency for freight movements. Boundary Street is identified as a secondary B-Double truck route, linking the major north-south arterial road of the Pacific Highway to the industrial areas in northern Sydney, including Brookvale (Roads and Maritime 2012). The proposal would help to relieve congestion and improve network efficiency for freight movements between the Pacific Highway and northern Sydney.

### **2.1.4 NSW Bike Plan 2010**

The NSW Bike Plan 2010 (Bike Plan) outlines a ten year bicycle infrastructure plan for NSW (NSW Government 2011). Objectives include connecting Sydney's district centres by building missing links in the Metro Sydney Bike Network and completing neighbourhood cycleway networks. The Bike Plan identifies cycling as important to combat congestion as well as improving quality of life.

The Metro Sydney Bike Network shows Boundary Street as part of a 'missing link' to connect the Pacific Highway with the northern beaches. The section of Boundary Street between Hill Street and Archer Street is part of a local bicycle route (Sydney Publishing 2010). The proposal includes provision of a shared cycle and pedestrian pathway between Hill Street and Archer Street providing a link for the future bike plans proposed by Willoughby and Ku-ring-gai Council.

### **2.1.5 Draft Metropolitan Strategy for Sydney to 2031**

The Draft Metropolitan Strategy for Sydney to 2031 (Draft Metropolitan Strategy) (NSW Government 2013) was released for public comment in March 2013 and sets

the framework and strategic planning foundation for Sydney's housing and job growth to 2031.

Boundary Street is linked to the Pacific Highway, which is located within the Global Economic Corridor. The Global Economic Corridor is identified as a key 'city shaper' connecting Global Sydney (including Port Botany and Sydney Airport) with employment hubs and housing to the north-west, with Chatswood identified as a 'major centre'. The proposal would expand capacity on Boundary Street, which would allow for improved connection with the Pacific Highway.

### **2.1.6 Pinch Point Program**

The traffic Network Management Strategy (also known as the Pinch Point Program) is identified in the NSW Urban Transport Statement (NSW Government 2006). The Pinch Point Program targets 23 corridors within the Sydney Region which experience congestion and poor traffic flow at peak hours (Roads and Maritime 2011). The objectives of the program are to reduce delay for road users, manage congestion, improve safety, and maintain consistent travel times along about 23 road corridors identified by the NSW Government.

Boundary Street has been identified by Roads and Maritime as a road corridor which experiences traffic congestion, causing travel delays and build-up of traffic on the wider road network. Boundary Street therefore forms part of the Roads and Maritime Pinch Point Program.

### **2.1.7 Roads and Maritime Corporate Delivery Plan 2012-2013**

The Roads and Maritime 2012–2013 Corporate Delivery Plan outlines the delivery approach for the first year of the Roads and Maritime 2012–2016 Corporate Strategy. These two documents are intended to clearly outline what Roads and Maritime would deliver over the coming years. The Corporate Delivery Plan is structured around the transport result areas and contains direct responses to the strategy statements set out in the Roads and Maritime Corporate Strategy, setting out the deliverables and standards committed to in 2012–2013.

Strategy statements include achieving value for money, minimising impact on the environment, and improvements to the efficiency of the road network during peak times on Sydney's road corridors. The objectives of this proposal are consistent with the strategy statements outlined above. In addition, the corporate delivery plan outlines the delivery of the Pinch Point Program as a key deliverable.

## **2.2 Existing road and infrastructure**

The proposal would require the widening of Boundary Street and associated work at Hill Street and the Pacific Highway. A description of the existing road and infrastructure at these locations is provided below.

### **Boundary Street**

Boundary Street is an east-west arterial road connecting Roseville and Chatswood in the west with the northern beaches in the east. Boundary Street services private vehicles, buses, pedestrians, cyclists and is a B-Double truck route. It includes the following key features:

- One east-bound lane and three west-bound lanes between the Pacific Highway and Hill Street, and two west-bound lanes between Hill Street and Melnotte

Avenue with a speed limit of 60 kilometres per hour.

- Pedestrian footpaths on the northern and southern sides of Boundary Street.
- A pedestrian pathway between Hill Street and Archer Street on the northern side.
- Signalised pedestrian crossings of Boundary Street at the intersection with Archer Street and at the Pacific Highway.
- Signalised crossing of Archer Street at the intersection with Boundary Street.
- A rail overbridge located west of Hill Street, which forms part of the North Shore and Western railway line.

### **Pacific Highway**

The Pacific Highway is a major north-south arterial road connecting the Sydney CBD with Sydney's northern suburbs and the F3. The Pacific Highway forms part of National Route 1. At the Pacific Highway/Boundary Street intersection, the Pacific Highway consists of three northbound and three southbound lanes with a speed limit of 60 kilometres per hour. Pedestrian footpaths are provided on both sides of the Pacific Highway. A signalised pedestrian crossing is provided at the Boundary Street/Pacific Highway intersection.

### **Hill Street**

Hill Street is a north-south local road connecting the Roseville town centre and Roseville train station with Boundary Street. Hill Street consists of two lanes with a speed limit of 50 kilometres per hour. Pedestrian footpaths are provided on both sides of Hill Street, which are elevated between 0.5-2 metres above the road. A speed hump is located before the intersection of Boundary Street and Hill Street.

The right turn movement from Boundary Street into Hill Street is restricted from Monday to Friday (6am-10am and 3pm-7pm). Buses are excepted from this restriction.

### **Archer Street**

Archer Street is a north-south collector road connecting the Chatswood town centre with the Roseville town centre. At the Archer Street/Boundary Street intersection, Archer Street consists of two northbound lanes and one southbound lane with a speed limit of 50 kilometres per hour. Pedestrian footpaths are provided on both sides of Archer Street.

## **2.3 Proposal objectives**

The strategic objective of the proposal is to support the objectives of the Pinch Point Program, as discussed in **Section 2.1.6**.

The objectives of the proposal are to:

- Reduce traffic congestion and improve traffic flow.
- Improve accessibility and efficiency for freight vehicles, private vehicles and public transport.
- Improve safety for motorists, cyclists and pedestrians.
- Minimise socio-economic and environmental impacts.



## 2.4 Alternatives and options considered

In 2011, following the identification of the need for the proposal, Roads and Maritime developed options to improve the road alignment of Boundary Street between the Pacific Highway and Melnotte Avenue. During this process, three options were identified, including the do-nothing option (Option 1) and two alternative upgrade options (Option 2 and 3).

Following a detailed review of these options, which included a preliminary environmental investigation (PEI) and community consultation (refer to Chapter 5), a preferred option was identified. The options identified and selection of the preferred option is outlined in the following sections. The Boundary Street Intersection Improvements Concept Design Report (Roads and Maritime 2012) provides further detail and discussion of these options.

### 2.4.1 Methodology for selection of preferred option

As part of the options analysis, each option was reviewed against the proposal objectives outlined in Section 2.3 and the strategic need, identified in Section 2.1.

### 2.4.2 Identified options

The three options considered to meet the proposal objectives and strategic need are listed below:

- Option 1 (Do-nothing): The do-nothing option would result in Boundary Street remaining a four-lane road, comprising one east-bound lane and three west-bound lanes between the Pacific Highway and Hill Street, and two eastbound lanes between Hill Street and Melnotte Avenue. Routine maintenance and safety activities would continue to be carried out where required and an upgrade to the east-west pedestrian pathways would be considered.
- Option 2: Upgrade of Boundary Street, as shown in **Appendix A** (Roads and Maritime 2012). This option would involve the widening of Boundary Street to provide for two dedicated left turn lanes and two dedicated right turn lanes from Boundary Street to the Pacific Highway; two dedicated through lanes between the Pacific Highway and Archer Street; and a dedicated right turn lane from Boundary Street into Archer Street.

Associated work would also be carried out including the construction of a retaining wall and a shared pedestrian and cycle pathway on the northern side of Boundary Street as well as implementation of a left in/left out turning arrangement at Hill Street.

Four retaining wall options were considered for the retaining structure on the northern side of Boundary Street including a soil nail wall, permanent batter slope, interlocking block wall, and concrete cantilever wall. A preferred retaining wall option would be investigated at the detailed design phase.

- Option 3: Limited upgrade of Boundary Street, which would involve a minor widening of existing lanes and pedestrian pathways on Boundary Street (an additional width of about 0.5 metres to each existing lane), but would not result in any additional lanes for through or turning traffic. Additionally, it would not include an upgrade of the existing pedestrian pathway. There would be no work on the Pacific Highway or Hill Street. Some changes to existing drainage infrastructure and relocation of existing underground telecommunication and water supply utilities would also be required for Option 3.

### 2.4.3 Analysis of options

#### Option 1: Do-nothing

Retaining Boundary Street as a four-lane road (the 'do-nothing' option) would result in the existing Boundary Street continuing to operate at or above capacity, particularly during peak periods.

The do-nothing option would not fulfil the proposal objectives, particularly the following:

- It would result in existing turning arrangements at Hill Street remaining unsafe for motorists, pedestrians and cyclists. This situation would be worsened by projected population growth in the Willoughby and Ku-ring-gai LGAs and an associated increase in traffic volumes.
- It would not assist in reducing traffic congestion or improving traffic flow.
- Safety risks and accidents at Boundary Street, particularly at the intersection with Hill Street would not be addressed.
- It would fail to provide improved facilities for pedestrian and cyclist movements on the northern side of Boundary Street therefore not addressing the socio-economic objective.

Option 1 would not meet the objectives of the Pinch Point Program as it would not reduce delay for road users, manage congestion, improve safety or maintain consistent travel times. Accordingly, Option 1 was rejected.

#### Option 2: Upgrade of Boundary Street

- Option 2 would improve the traffic flow and reduce traffic delays currently experienced on Boundary Street through the implementation of dedicated turning lanes.
- Option 2 would also provide shared cycle and pedestrian facilities on the northern side of Boundary Street. The current pedestrian path is difficult for less mobile pedestrians to access.
- The implementation of a left in/left out turning arrangement at Hill Street would improve safety for motorists, cyclists and pedestrians at the Hill Street/Boundary Street intersection.

The upgrade of Boundary Street and associated work at Hill Street and the Pacific Highway was found to meet the objectives of the proposal. Option 2 was also found to best meet the objectives of the Pinch Point Program as it would reduce delay for road users, manage congestion, improve safety and maintain consistent travel times.

Option 2 was identified as the preferred option, which is discussed further in **Section 2.5**.

#### Option 3: Limited upgrade of Boundary Street

- Option 3 would involve widening of Boundary Street however would not provide additional traffic lanes. As such traffic congestion and traffic flow would not be improved.
- Option 3 would not provide changes to pedestrian or cyclist provisions on Boundary Street, therefore accessibility and safety for pedestrians and cyclists would not be improved.

Option 3 would not meet the objectives of the Pinch Point Program as it would not reduce delay for road users, manage congestion, improve safety or maintain consistent travel times.

Overall, Option 3 would not fulfil the proposal objectives nor would it satisfactorily meet the strategic need. Accordingly Option 3 was rejected.

## **2.5 Preferred option**

Option 2 was selected as the preferred option as it best meets the objectives of the proposal and the strategic need for a reduction in congestion and improved safety on Boundary Street, particularly at peak travel periods.

The preferred option would:

- Reduce congestion and improve traffic efficiency for all road users on Boundary Street.
- Provide improved pedestrian and cycle facilities on the northern side of Boundary Street and at the intersection of Boundary Street/Archer Street.
- Provide improved traffic conditions for freight vehicles accessing industrial areas in the northern beaches, via Boundary Street.

## 3 Description of the proposal

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This chapter describes the proposal and provides descriptions of existing conditions, the design parameters including major design features, the construction method and associated infrastructure and activities.

### 3.1 The proposal

The proposal involves the upgrade of Boundary Street between the Pacific Highway and Melnotte Avenue, Roseville. The total length of the upgrade would be 380 metres including associated work at Hill Street and the Pacific Highway (from about 200 metres south of Maclaurin Parade and Findlay Avenue, Roseville). Concept design drawings for the proposal are included in **Appendix A**.

The general features of the proposal are shown in **Figure 1-2** and include:

- Provision of two dedicated left turn and two dedicated right turn lanes from Boundary Street into the Pacific Highway.
- Two dedicated through lanes from the Pacific Highway to Archer Street.
- A dedicated right turn lane from Boundary Street into Archer Street.
- Hill Street converted to left in/left out access.
- A shared pedestrian and cycle pathway on the northern side of Boundary Street between Hill Street and Archer Street.
- Signalised crossing facilities for both pedestrians and cyclists across Boundary Street at Archer Street.
- A retaining wall on the northern side of Boundary Street. The type of retaining wall would be determined in consultation with the property owners during detailed design.
- Landscaping and urban design in consultation with Willoughby Council and Kuring-gai Council.
- Property adjustments.
- Drainage and utility relocations.
- Upgrades to the existing signalised intersections at Boundary Street/Pacific Highway and Boundary Street/Archer Street.

Widening of the road would mainly occur on the northern side of Boundary Street, between Hill Street and Archer Street. The widening would allow for dedicated through lanes from the Pacific Highway to Archer Street, a dedicated right turn lane from Boundary Street into Archer Street and a shared pedestrian and cycle pathway.

### 3.2 Design

The concept design was prepared to provide for a road geometry conforming to a 60 kilometres per hour design speed on Boundary Street and the Pacific Highway, as well as providing a more consistent intersection treatment at Hill Street and an improved pedestrian pathway on Boundary Street.

This section provides a description of the concept design of the proposal. The concept design would be further refined during the detailed design phase.

### 3.2.1 Design criteria

#### General

The road design has been developed in accordance with the following guidelines and standards:

- Austroads Guide to Road Design (Austroads 2009) and Roads and Maritime supplements to the Austroads Guide.
- Austroads Guide to Road Safety (Part 6: Road Safety Audit) (Austroads 2002).
- Roads and Maritime Road Design Guide (Roads and Maritime undated).
- Roads and Maritime Delineation Guidelines (Roads and Maritime undated).
- NSW Bicycle Guidelines (Roads and Maritime) and Planning Guidelines for Walking and Cycling, as mandated by Roads and Maritime Core Business Policy Number PN027.

#### The proposal

The design criteria specific to the concept design for the proposal are outlined in **Table 3-1**.

**Table 3-1 Design criteria**

Design features	Requirement
Design and posted speed	Design speed and posted speed limit of: <ul style="list-style-type: none"> <li>• 60 kilometres per hour on Boundary Street and the Pacific Highway.</li> <li>• 50 kilometres per hour on Hill Street, and Archer Street.</li> </ul>
Lane width	Lanes generally 3.5 metres in width.
Intersection treatment	Provide a signalised intersection at Boundary Street/Pacific Highway and Boundary Street/Archer Street with: <ul style="list-style-type: none"> <li>• A minimum approach sight distance and entering sight distance provided on all legs of the intersection.</li> <li>• Desirable minimum distance between signalised intersections to maintain an appropriate level of service.</li> <li>• Auxiliary lane lengths to be such that all speed reduction occurs within these lanes and not on the main carriageway.</li> </ul>
Design vehicle	<ul style="list-style-type: none"> <li>• Boundary Street and the Pacific Highway: B-doubles.</li> <li>• Boundary Street and Hill Street: 12.5m bus/truck.</li> <li>• Boundary Street and Archer Street: 12.5m bus/truck.</li> </ul>
Pedestrian / cycling	A minimum width of 3 metres for all new shared paths and consideration for disabled access.
Traffic barriers	No traffic barriers are included as part of the concept design.



Design features	Requirement
Pavement type	Asphalt over heavily bound base course or a full depth asphalt pavement.
Drainage	<p>Hydraulic modelling:</p> <ul style="list-style-type: none"> <li>• Design methodology - ILLSAX Method (drains).</li> <li>• Average recurrence interval (ARI) - 10 year (minor event).</li> <li>• Time of concentration - 5 minutes.</li> <li>• Percentage of impervious surface - 90%.</li> <li>• Flow width - 1m into trafficable lanes.</li> </ul> <p>Pipes and pits:</p> <ul style="list-style-type: none"> <li>• Maximum pit spacing - 60m.</li> <li>• Inlet type SA2 and SF.</li> <li>• Minimum pipe size - 450mm dia.</li> <li>• Minimum pipe grade - 1%.</li> </ul> <p>Design criteria for the pavement drainage includes:</p> <ul style="list-style-type: none"> <li>• Maximum 1m flow width in a lane.</li> <li>• 50% blockage for all sag pits, for the 10 year ARI pavement design.</li> <li>• Adoption of a 20% blockage for all on-grade pits.</li> <li>• Pit inlet capacities are based on the approach flow, depth of ponding and flow width.</li> <li>• 5 minute time of concentration for each road catchment.</li> <li>• 1 minute overland flow time for gutter flow between each pit.</li> <li>• 0.1% minimum grade on overland flow paths.</li> <li>• The road pavement catchments (including proposed upgrade pavements and medians) are 90% impervious.</li> </ul>
Retaining wall	A retaining wall would be provided between Hill Street and Melnotte Avenue, on the northern side of Boundary Street. The type of retaining wall would be determined in consultation with property owners during detailed design.
Rail access	Provision for Sydney Train's maintenance access.
Utilities	Adjustments to utilities such as gas, sewer, water, electricity and telecommunications have been designed in consultation with relevant authorities.

### 3.2.2 Engineering constraints

A series of engineering constraints were identified during the development of the concept design, including the construction and operational phases of the proposal. The main constraints associated with the proposal include:

- Minimising property acquisition on the northern side of Boundary Street.
- Urban design considerations for the retaining wall on the northern side of Boundary Street, between Hill Street and Archer Street including:
  - The integration with the existing structures along Boundary Street, including residential properties and garden structures.
  - The construction footprint, which should be minimised to reduce impact on

existing vegetation on the northern side of Boundary Street, between Hill Street and Archer Street.

- The urban design, which should facilitate an inclined face set back from the road / set-back face to emphasise the curvature in the road, soften the translation in the adjoining landscape and assist with sight distance.
- Staging of the proposal. The proposal would generally be constructed on the same alignment as the existing Boundary Street, the Pacific Highway and intersection of Hill Street/Boundary Street. This would pose staging challenges as traffic flows in both directions would be required to be maintained.
- The presence of existing utilities including electricity, telecommunications infrastructure and water services which may require adjustments.
- Access for maintenance (of road and rail assets).

### **3.2.3 Major design features**

Major design features located within the proposal area include a retaining wall, additional drainage, and a shared cycle and pedestrian pathway.

#### **Retaining wall**

It is proposed that a retaining wall would be constructed on the northern side of Boundary Street, between Hill Street and Archer Street (refer to **Figure 1-2**). Four different retaining wall options were considered during the development of the concept design, as described in **Section 2.4.1**. The preferred retaining wall option would be determined in consultation with the property owners during detailed design. Construction of a permanent batter slope retaining wall would involve excavation of an angled earth bank between the properties and the proposed pedestrian and cycle shared pathway. Stairs would be constructed between the pathway and each property located between Hill Street and Archer Street.

#### **Shared pedestrian and cycle pathway**

The existing pedestrian pathway located on the northern side of Boundary Street, between Hill Street and Archer Street (refer to **Figure 1-2**) would be upgraded to a 3.5 metre wide shared pedestrian and cycle pathway as part of the proposal. The pathway would include the following features:

- The level of the existing pathway would be lowered to the existing level of Boundary Street. Currently, the pathway is elevated above Boundary Street by about 1.5 metres and is accessed via a set of stairs at Hill Street and a set of stairs located on Boundary Street at the eastern end of the pathway adjacent to the Archer Street intersection.
- The pathway would be about 3.5 metres in width.
- Associated work would include:
  - Stair access to private properties on Boundary Street would be provided where required.
  - Removal of the set of stairs at the intersection of Hill Street and Boundary Street.
  - A pedestrian refuge on Hill Street to allow for improved safety for pedestrians and cyclists crossing Hill Street to the pathway.

## **Drainage**

New drainage is proposed at various locations in the proposal area, including:

- New drainage pipes in Boundary Street west of Hill Street are proposed to connect to the existing drainage line in the vicinity of the existing rail line;
- New drainage line between Hill Street and Archer Street is proposed to connect to the existing drainage network in Archer Street; and
- New drainage line between Archer Street and Melnotte Avenue is proposed to connect to the existing drainage network in Melnotte Avenue.
- New drainage pipes in Boundary Street west of Hill Street, to connect to the existing drainage line in the vicinity of the existing North Shore railway line.
- SA kerb and gutter along the southern side of Boundary Street to match existing levels.
- SF kerb median of varying widths along the centre of Boundary Street.
- Realignment and connection of two pits and pipes on the Pacific Highway, north of the intersection with Boundary Street.

## **3.3 Construction activities**

This section provides a summary of the likely construction methodology, staging, work hours, plant and equipment that would be used to construct the proposal and associated activities. For the purpose of this REF, an indicative construction plan and methodology are provided. The detailed construction staging plans and methods would be determined by the construction contractor(s) after completion of the detailed design.

The actual construction method may vary from the description in this chapter as a result of factors such as identification of on-site conditions identified during pre-construction activities, ongoing refinement of the detailed design and consultation with property owners and businesses.

### **3.3.1 Work methodology**

Construction activities would be guided by a Construction Environmental Management Plan (CEMP) that would be developed in accordance with the requirements of the Roads and Maritime QA Specification G36 Environmental Protection (Management System). Work would be located within the work area specified within the CEMP and completed to incorporate all safeguards as described in this REF and any other relevant Roads and Maritime environmental specifications.

The proposal would involve the following general work methodology and general sequencing:

- Establishment of temporary fencing.
- Installation of erosion and sediment controls
- Utility relocations.
- Establishment of construction compound sites and access.
- Vegetation clearing and grubbing.
- Stripping, stockpiling and management of topsoil and unsuitable material.
- Earthworks preparation.
- Bulk earthworks.
- Retaining wall work.

- Drainage work.
- Pavement and concrete barrier construction.
- Sub-grade preparation and pavement work.
- Rehabilitation of temporary stockpiles.
- Landscaping.
- Installation of permanent traffic control signals.
- Finishing work including installation of safety barriers, fencing, pavement marking, signposting, and street lights.
- Removal of construction compound and site tidy up.

### **Construction staging and program**

The following describes the indicative construction staging. The final work methodology for the proposal would be refined and determined during the detailed design phase.

#### ***Preliminary work***

- Establishment of the construction compound site, stockpile areas and access would commence first.

#### ***Stage 1 - Early work***

- Subject to investigations during detailed design, Roads and Maritime may commence utility relocations prior to commencement of the road construction activities where possible to minimise disruption to traffic and nearby residents.
- Vegetation clearing and grubbing may be required to undertake utility relocations.

#### ***Stage 2***

Stage 2 of the work would be undertaken on the north-western corner of Boundary Street at the Pacific Highway, and around to Hill Street. Concrete barriers would be temporarily established to permit work to be undertaken during day time hours at this location. Work would involve:

- Pavement construction.
- Drainage work.
- Traffic signal adjustments.
- Median work.
- Kerb and gutter installation.
- Relocation of utilities.

Drainage and kerb and gutter work on the Pacific Highway would need to be undertaken during night time hours. Property adjustments, retaining walls and landscaping would also be undertaken on the property at 5-17 Pacific Highway, Roseville during Stage 2.

#### ***Stage 3***

Stage 3 of the work would be undertaken on the south-western corner of Boundary Street at the Pacific Highway, up to a location opposite Hill Street. Temporary concrete barriers would be constructed to permit the majority of work to be undertaken during day time hours at this location. Work would include:

- Pavement construction.

- Drainage work.
- Traffic signal adjustments.
- Kerb and gutter installation.
- Relocation of utilities.
- Property adjustments to the Seven Eleven service station.

Drainage and kerb and gutter work on the Pacific Highway would need to be undertaken during night time hours.

#### **Stage 4**

Stage 4 of the work would be undertaken on the northern side of Boundary Street from Hill Street heading east. Work would include:

- Property adjustments.
- Relocation of utilities.
- Bulk earthworks.
- Retaining wall work.
- Pavement construction.
- Drainage work.
- Traffic signal adjustments.
- Median adjustments.
- Kerb and gutter installation.

#### **Stage 5**

Stage 5 of the works would be undertaken on the southern side of Boundary Street, between Archer Street and a location opposite Hill Street. Work would involve traffic signal adjustments, drainage works, kerb and gutter installation, and relocation of utilities.

The final asphalt wearing course would be undertaken for the full extent of the proposal during night time hours during this stage.

#### **Stage 6**

- Landscaping.
- Other ancillary work, such as line marking sign posting, safety barriers, and fencing.

### **3.3.2 Construction hours and duration**

Construction is anticipated to commence mid-2014 and would take about 18 months to complete, weather permitting.

Construction work for the proposal would be carried out during standard working hours where practicable, as follows:

- Monday to Friday, 7am to 6pm.
- Saturday, 8am to 1pm.
- Sunday and Public Holidays, generally no work.

Night and weekend work would also be required, subject to permitted road occupancy licences and construction staging. This is necessary to minimise traffic disruptions on a major road corridor. When out of hours work is required, work would



be undertaken in accordance with procedures contained within the Office of Environment and Heritage (OEH) Interim Construction Noise Guideline (DECC 2009) and the Roads and Maritime Environmental Noise Management Manual (RTA 2001): Practice Note vii – Road work outside normal working hours. Procedures would include notifying the local community including local residents and businesses prior to any work commencing.

### 3.3.3 Plant and equipment

Plant and equipment needed for the proposal would be determined during the construction planning phase. It is anticipated that the plant and equipment used for the proposal would include those outlined in **Table 3-2**.

**Table 3-2 Indicative construction plant and equipment**

Construction phase	Plant and equipment
General	<ul style="list-style-type: none"> <li>• Cranes</li> <li>• Excavators</li> <li>• Bulldozers</li> <li>• Bobcat</li> <li>• Road sweeper</li> <li>• Water cart</li> <li>• Haulage trucks</li> <li>• Fuel cart</li> <li>• Semi-trailers and large delivery trucks</li> <li>• Various small hand tools and equipment, including chainsaw</li> <li>• Water pumps</li> <li>• Light commercial and passenger vehicles</li> </ul>
Road embankment and drainage construction	<ul style="list-style-type: none"> <li>• Truck and dog</li> <li>• Semi-trailer</li> <li>• Excavator</li> <li>• Pad foot and smooth drum roller</li> <li>• Compactor</li> <li>• Hand compactor (various)</li> <li>• Grader</li> <li>• Backhoe</li> <li>• Trenching machine</li> <li>• Mulch blower</li> <li>• Hydro mulch truck (if required)</li> </ul>
Road pavement construction	<ul style="list-style-type: none"> <li>• Milling machine</li> <li>• Grader</li> <li>• Smooth drum roller</li> <li>• Bitumen sprayer</li> <li>• Asphalt paver</li> <li>• Asphalt roller</li> <li>• Truck and dog</li> <li>• Kerb extrusion machine (if required)</li> <li>• Line marking machine</li> <li>• Line Remover</li> </ul>
Traffic management and control	<ul style="list-style-type: none"> <li>• Trailer mounted traffic lights</li> <li>• Attenuation vehicles</li> <li>• Trailer mounted VMS boards</li> </ul>

Construction phase	Plant and equipment
	<ul style="list-style-type: none"> <li>Water filled and concrete barriers</li> </ul>

### 3.3.4 Earthworks

The proposal would require earthworks for the construction of a widened carriage way, and for construction of the retaining wall on the northern side of Boundary Street. The estimated quantities of earthworks required for the proposal are outlined in **Table 3-3**. These quantities would be refined during detailed design.

**Table 3-3 Earthworks required for the proposal**

Cut (m <sup>3</sup> )	Fill (m <sup>3</sup> )	Topsoil (m <sup>3</sup> )	Excess (m <sup>3</sup> )	Import (m <sup>3</sup> )
5500	0	330	5340	70

### 3.3.5 Source and quantity of materials

Materials and estimated quantities are outlined in **Table 3-4** and would be refined at the detailed design phase. Materials would be sourced from local areas where practicable.

**Table 3-4 Materials and estimated quantities required for the proposal**

Material	Estimated quantity
Pavement sealant	2460m <sup>2</sup>
Asphalt	2104t
Road base	1226m
Concrete	2600m <sup>2</sup>
Topsoil	330m

Surplus material that cannot be used on site would be reused or disposed of in the following order of priority:

- Transfer to other Roads and Maritime projects for immediate re-use in accordance with the NSW Environmental Protection Authority (EPA) Excavated Public Road Material resource recovery exemption.
- Transfer to an approved Roads and Maritime stockpile site for future re-use only if a specific project has been identified prior to stockpiling and *Protection of the Environment Operations Act 1997* (POEO Act) waste regulatory requirements are met. If a project cannot be identified the material would not be stockpiled.
- Transported off-site for re-use by a third party in accordance with a relevant EPA resource recovery exemption.
- Disposed of at an approved materials recycling or waste disposal facility.
- As otherwise provided for by the relevant waste legislation.

### Water use

Water would be required for activities such as the compaction of earthworks and pavement layers and dust suppression. Required quantities of water are not yet known and would be calculated during detailed design. Water for the work would be

sourced from authorised off-site sources, including recycled, re-used water or groundwater bores with appropriate licences.

### **3.3.6 Traffic management and access**

#### **Vehicle movements**

Road traffic, bicycles and pedestrians are likely to be impacted throughout all stages of construction. As identified in **Section 3.3.1**, construction has been staged to allow the Pacific Highway and Boundary Street intersection to remain open to traffic with only partial lane closure required. Pedestrian thoroughfare would also be maintained during construction.

It is anticipated that during normal working days 20 to 25 heavy vehicle and 20 to 30 light vehicle movements would be required per day on and off-site. Heavy vehicles would be used to deliver construction material to the site and the transfer of construction materials to nominated stockpile sites within the proposal area.

Construction traffic would generally use the Pacific Highway to get to and from Boundary Street. Construction vehicle movements would also occur to and from the main construction compound area located at Lot 1 DP531547 and Lot 19 DP135079, which is discussed further in **Section 3.4**. Access to construct the retaining wall located on the northern side of Boundary Street would be via Hill Street, Roseville.

It is unlikely that rail track possessions of the adjacent North Shore railway line would be required to complete the proposal.

#### **Traffic management, control and signage**

Where possible, the proposed construction work would be programmed to minimise impact on traffic using the local and regional road network.

Standard traffic management measures would be employed to minimise short-term traffic impacts expected during construction. These measures would be identified in a traffic management plan (TMP) for the proposal and would be developed in accordance with the Roads and Maritime's Traffic Control at Works Sites Manual (RTA 2010) and Roads and Maritime Specification G10 – Control of Traffic.

The TMP would provide details of traffic management to be implemented during construction, to ensure that traffic flow along the Pacific Highway and Boundary Street is maintained throughout construction. Impacts to the public (including traffic, pedestrians and cyclists) during construction would be managed through the TMP and detailed pedestrian traffic control plans. During all stages of construction, access to businesses and within the proposal would be maintained. Pedestrian and cyclist routes would be managed on a daily basis to suit construction activities. These routes would be coordinated with the stages of construction to ensure safe access.

Access to affected properties would be maintained during construction and temporary property access would be provided to residences where required. The management of property access would be considered by the construction contractor and detailed as part of the final staging plan for the proposal.

Bus stops may require relocation or modification during construction and this would be undertaken in consultation with the bus operators. Any relocation would take the implications for commuters into account. Additional access for garbage trucks during construction would be taken into account.

### **Road and lane closures**

The traffic staging would be designed to ensure maintenance of traffic flow throughout the construction period. Some short-term work under traffic control or lane closure would be required for traffic switches, barriers work and asphalt overlay work. There are four intersections within the proposal area. Traffic delays may occur as a result of construction and would be managed with the TMP (refer to **Section 6.2**).

Construction parking impacts would be managed through measures identified in the TMP that would form part of the CEMP.

Further details regarding the potential traffic impacts during construction is provided in **Section 6.2**.

## **3.4 Ancillary facilities**

A single construction compound would be required. The main compound site would be located on Lot 1 DP531547 and Lot 19 DP135079 (refer to **Figure 3-1**). Part of this site is currently used by McCarroll Automotive Group (the owner) for parking of new vehicles, with the remaining area of the site left vacant. Access to this site is via the Pacific Highway (southbound lane only) and an access lane located to the north of the compound site, which is accessed from Boundary Street. The Electricity Substation No. 312 is located next to the construction compound. The construction compound would typically include a combination of demountable offices, meal rooms, toilets/showers and parking facilities.

The construction compound is also the nominated stockpile area. Stockpiling near residential properties would be avoided wherever possible to avoid potential dust and erosion impacts. Stockpiles would be required to store materials such as spoil, stripped topsoil, excavated rock and building materials. The compound site would also typically allow for lay down areas, equipment storage, maintenance sheds, chemical/fuel stores and stockpile of earth and construction materials. They would be constructed on relatively level ground and away from areas of ecological and heritage conservation value. The stockpile areas would be managed in accordance with the Roads and Maritime's Stockpile Site Management Procedures (RTA 2011).

Each site would be securely fenced with temporary fencing. Signage would be erected advising the general public of access restrictions. Upon completion of the construction work, the temporary site compound, work area and stockpiles would be removed, the site cleared of all rubbish and materials and rehabilitated.

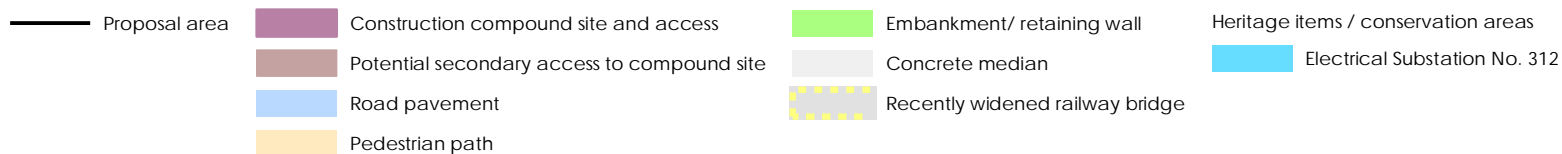
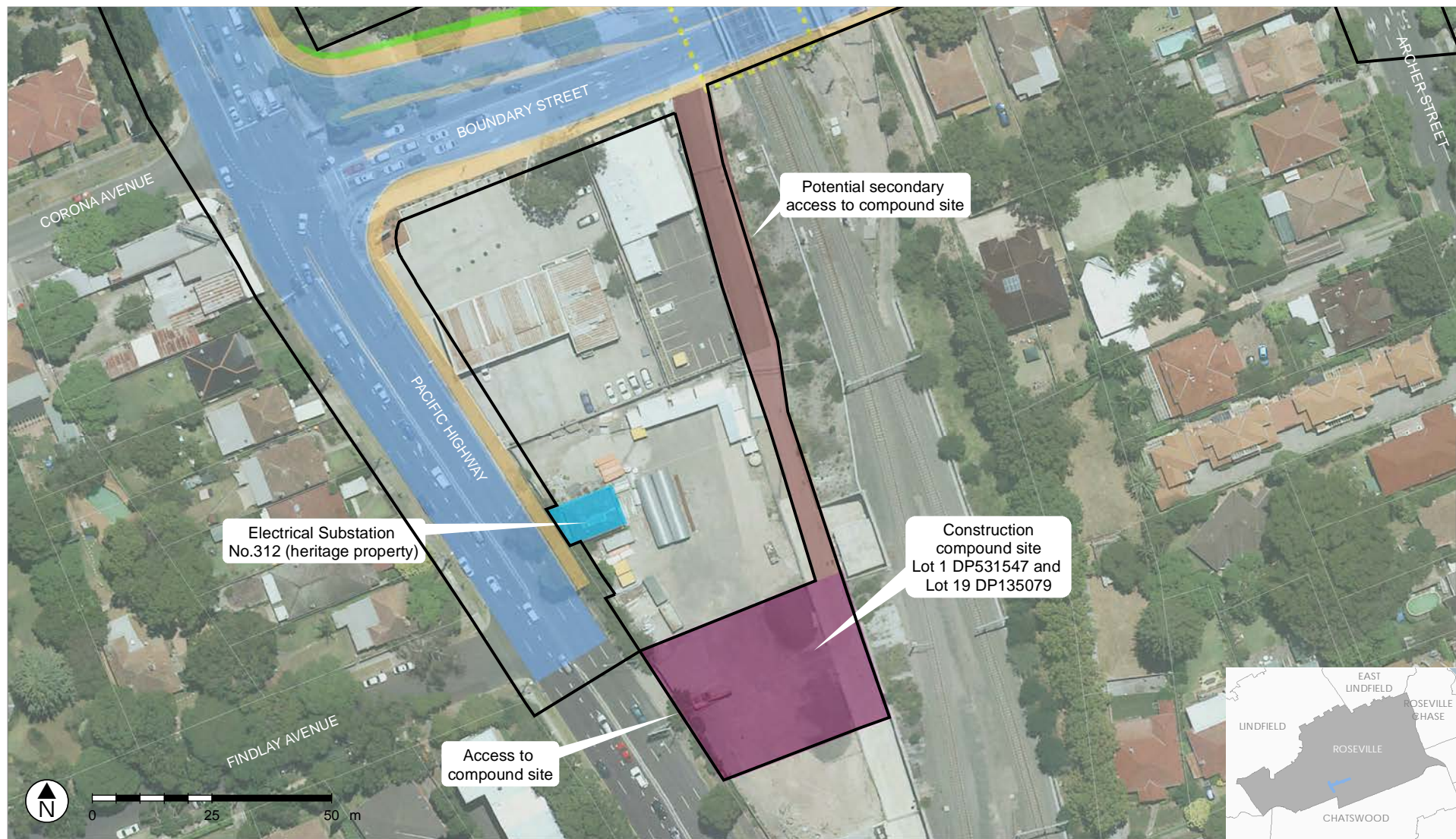


Figure 3-1 Construction compound site

### **3.5 Public utility adjustment**

Consultation with public utility authorities has been undertaken as part of the development of the concept design to identify and locate existing utilities and incorporate utility authority requirements for relocations and/or adjustments. Chapter 5 provides a summary of the consultation undertaken for the proposal.

Preliminary investigations have indicated that a number of utilities would require relocation or adjustment as part of the proposal. This would be undertaken in consultation with the utility authorities. Where possible, relocation would be undertaken before or during pre-construction, before construction activities commence. If access is not possible under existing traffic conditions, some utility relocations may be staged during construction (refer to **Section 3.3**).

Electrical transmission lines, telephone lines, water mains and traffic infrastructure would require relocation or adjustment as part of the proposal. Utility adjustments would be required on Boundary Street, Pacific Highway and local side streets, such as Hill Street and Archer Street. All utility relocations would be restricted to the proposal area as shown in **Figure 1-2**. Any impact outside of this proposal area is not part of this proposal and would be subject to separate assessment and approval.

It should be noted that the excavation required for utility relocations has the potential to sever adjacent tree roots which would lead to the death of the trees and therefore require vegetation removal within the proposal area. This includes both the northern and southern side of Boundary Street and along local side streets. This is detailed further with safeguards in **Section 6.9**.

#### **3.5.1 Electrical transmission lines**

Overhead and underground transmission lines in the proposal area are owned by Ausgrid. A number of conduits located along Boundary Street and the Pacific Highway would require relocation. Potential relocation on local side streets may also be required and would be confirmed during detailed design.

#### **3.5.2 Telecommunications infrastructure**

Telecommunications infrastructure in the proposal area is owned by Telstra. Some infrastructure is also operated by Optus/Uecomm. A number of conduits on the Pacific Highway, Hill Street and Boundary Street would require relocation.

#### **3.5.3 Water mains**

Water infrastructure in the proposal area is owned and operated by Sydney Water. Pipes along Boundary Street, the Pacific Highway and Hill Street would require relocation.

#### **3.5.4 Traffic infrastructure**

Traffic infrastructure in the proposal area is owned and operated by Roads and Maritime, Ku-ring-gai Council and Willoughby Council. Traffic detectors and traffic signal posts at the Pacific Highway/Boundary Street and Boundary Street/Archer Street intersections would require relocation.



### 3.6 Property acquisition and adjustments

The proposal would require the partial acquisition or adjustments to a total of 12 properties.

Properties impacted by partial acquisition or adjustments are listed in **Table 3-5** and are shown in **Figure 3-2**. Impacts associated with property adjustment include relocating property boundary fencing, driveway adjustments and loss of roadside trees and landscaped areas. The extent of property impacts would be refined and confirmed during detailed design in consultation with the property owners.

About 11 properties impacted by partial acquisition or adjustment would be private residential properties. This would include frontage strip acquisitions up to 10 metres wide. It is not anticipated that residents would need to relocate as a result of the partial property acquisition. One business would be affected by partial acquisition, being the Seven Eleven petrol station located at 2 Boundary Street. This would be a strip acquisition about five metres wide. This acquisition would not affect the operation of the business nor would it impact on operational access or parking provision.

Property adjustment plans would be developed during detailed design in consultation with the property owners.

All land acquisitions would be conducted in accordance with the Roads and Maritime Land Acquisition Policy and compensation would be based on the requirements of the *Land Acquisition (Just Terms) Compensation Act 1991*.

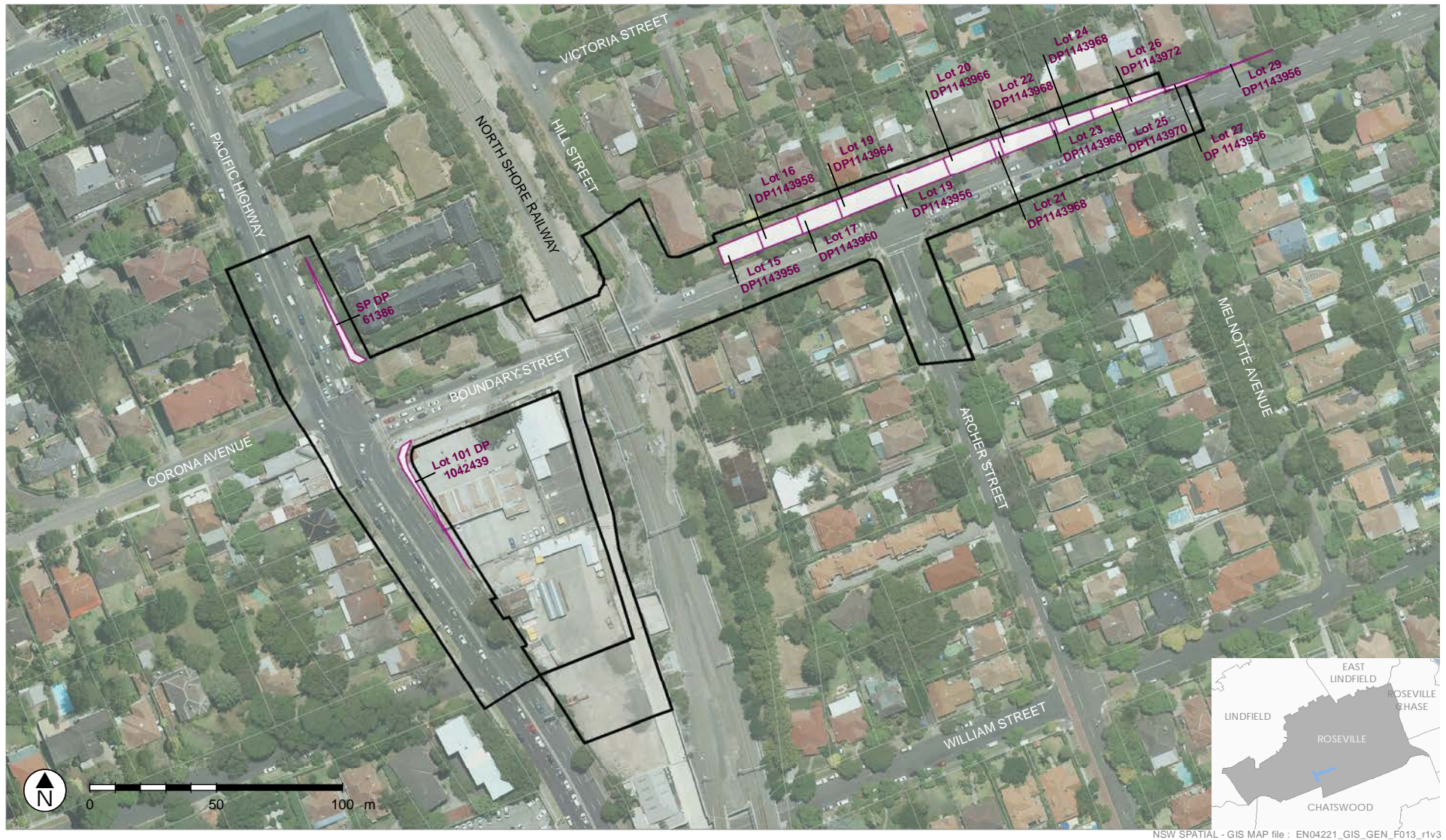
**Table 3-5 Property acquisition required for the proposal**

Address	Lot and DP	Acquisition type	Current land use	Approximate area (m <sup>2</sup> )
5 Pacific Highway	SP DP 61386	Partial	Residential	70
2 Boundary Street	Lot 101 DP 1042439	Partial	Business	70
5 Boundary Street	Lot 15 DP 1143956	Partial	Residential	126
7 Boundary Street	Lot 16 DP 1143958	Partial	Residential	127
9 Boundary Street	Lot 17 DP 1143960	Partial	Residential	127
11 Boundary Street	Lot 18 DP 1143962	Partial	Residential	173
15 Boundary Street	Lot 19 DP1143964	Partial	Residential	-
17 Boundary Street	Lot 20 DP 1143966 Lot 21 DP1143968	Partial	Residential	151 23
19 Boundary Street	Lot 22 DP1143968	Partial	Residential	137
21 Boundary Street	Lot 23 DP 1143968 Lot 24 DP1143968	Partial	Residential	-
23 Boundary Street	Lot 25 DP1143970	Partial	Residential	55

<b>Address</b>	<b>Lot and DP</b>	<b>Acquisition type</b>	<b>Current land use</b>	<b>Approximate area (m<sup>2</sup>)</b>
25 Boundary Street	Lot 26 DP 1143972	Partial	Residential	37
27 Boundary Street	Lot 27 DP 1143956	Partial	Residential	25
29 Boundary Street	Lot 29 DP1143956	Partial	Residential	5

A temporary lease of land would also be required to accommodate the temporary construction compound. A preliminary site has been identified at Lot 1 DP531547 and Lot 19 DP135079. Part of this site is currently used by McCarroll Automotive Group (the owner) for parking of new vehicles, with the remaining area of the site left vacant.





— Proposal area     Property subject to aquisition or adjustment

Figure 3-2 Property aquisition required for the proposal

## 4 Statutory and planning framework

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This chapter provides the statutory and planning framework for the proposal and considers provisions of relevant state environmental planning policies, local environmental plans and other legislation.

### 4.1 State Environmental Planning Policies

#### 4.1.1 State Environmental Planning Policy (Infrastructure) 2007

State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) aims to facilitate the effective delivery of infrastructure across the State.

Clause 94 of ISEPP permits development on any land for the purpose of a road or road infrastructure facilities to be carried out by or on behalf of a public authority without consent. As the proposal is for a road and is to be carried out by or on behalf of Roads and Maritime, it can be assessed under Part 5 of the *Environmental Planning and Assessment Act 1979*. Development consent from Willoughby Council or Ku-ring-gai Council is not required.

The proposal is not located on land reserved under the *National Parks and Wildlife Act 1974* and does not affect land or development regulated by State Environmental Planning Policy No. 14 - Coastal Wetlands, State Environmental Planning Policy No. 26 - Littoral Rainforests, State Environmental Planning Policy (State and Regional Development) 2011 or State Environmental Planning Policy (Major Projects) 2005.

Part 2 of the ISEPP contains provisions for public authorities to consult with local councils and other public authorities prior to the commencement of certain types of development. Consultation, including consultation as required by ISEPP (where applicable), is discussed in Chapter 5 of this REF.

#### 4.1.2 Other State Environmental Planning Policies

There are no other State Environmental Planning Policies (SEPPs) or deemed SEPPs that are applicable to the proposal.

### 4.2 Local Environmental Plans

Two local environmental plans (LEPs) apply to the land within the proposal area:

- Willoughby LEP 2012.
- Ku-ring-gai LEP (Local Centres) 2012.

As outlined in Section 4.1.1, the ISEPP removes the requirement for development consent from councils. The provisions of the relevant LEP zonings within the proposal area are identified in the following sections and shown in **Figure 4-1**.

#### 4.2.1 Willoughby Local Environmental Plan 2012

The section of the proposal area to the south of and including the southern side of Boundary Street falls within the Willoughby local government area (LGA) and is zoned under the Willoughby LEP 2012. As shown in **Figure 4-1**, the land traversed by the proposal in this area includes the following zones:

- SP2 Infrastructure (Classified Road) – This zoning applies to Boundary Street, the Pacific Highway and a narrow corridor of land on the western side of Archer Street.
- B5 Business development – This zoning applies to the section of the proposal area between the Pacific Highway and the rail corridor.
- R3 Medium density residential – This zoning applies to the section of the proposal area between the rail corridor and Archer Street.

**Table 4-1** outlines the current zoning objectives applicable to the proposal and consistency of the proposal against these objectives.

**Table 4-1 Consistency of proposal against relevant Willoughby LEP 2012 zoning objectives**

Zone	Objectives	Consistency of proposal against objectives and permissibility
SP2 Infrastructure (Classified Road)	<ul style="list-style-type: none"> <li>• To provide for infrastructure and related uses.</li> <li>• To prevent development that is not compatible with or that may detract from the provision of infrastructure.</li> <li>• To provide for classified roads.</li> </ul>	<p>Permitted with development consent; however, consent requirements are removed as the proposal falls under the ISEPP.</p> <p>The proposal is consistent with these objectives as it would increase the quality of infrastructure in the area.</p>
B5 Business development	<ul style="list-style-type: none"> <li>• To enable a mix of business and warehouse uses, and bulky goods premises that require a large floor area, in locations that are close to, and that support the viability of, centres.</li> <li>• To accommodate businesses, provided that their access needs and the traffic generated does not interfere with the safety and efficiency of the road network.</li> </ul>	<p>Permitted with development consent; however, consent requirements are removed as the proposal falls under the ISEPP.</p> <p>The proposal is consistent with the second objective as it would maintain the efficiency of the road network.</p>
R3 Medium density residential	<ul style="list-style-type: none"> <li>• To provide for the housing needs of the community within a medium density residential environment.</li> <li>• To provide a variety of housing types within a medium density residential environment.</li> <li>• To enable other land uses that provide facilities or services to meet the day to day needs of residents.</li> <li>• To accommodate development that is compatible with the scale and character of the surrounding residential development.</li> <li>• To allow for increased</li> </ul>	<p>Permitted with development consent; however, consent requirements are removed as the proposal falls under the ISEPP.</p> <p>The proposal is consistent with these objectives as it would provide upgraded road, pedestrian and cycle infrastructure for medium density residential developments, particularly on the northern side of Boundary Street.</p>

Zone	Objectives	Consistency of proposal against objectives and permissibility
	<p>residential density in accessible locations, while minimising the potential for adverse impacts of such increased density on the efficiency and safety of the road network.</p> <ul style="list-style-type: none"> <li>To encourage innovative design in providing a comfortable and sustainable living environment that also has regard to solar access, privacy, noise, views, vehicular access, parking and landscaping.</li> </ul>	

#### 4.2.2 Ku-ring-gai Local Environmental Plan (Local Centres) 2012

The section of the proposal area to the north of and including the northern side of Boundary Street falls within the Ku-ring-gai LGA and is zoned under the Ku-ring-gai LEP (Local Centres) 2012. As shown in **Figure 4-1**, the land traversed by the proposal in this area includes the following zones:

- SP2 Classified Road – This zoning applies to the Pacific Highway and Boundary Street.
- R4 High Density Residential – This zoning applies to the area between the Pacific Highway and the rail corridor, the area east of the rail corridor and north of Boundary Street, and to the area north of Corona Avenue.

**Table 4-2** outlines the current zoning objectives applicable to the proposal and consistency of the proposal against these objectives.

**Table 4-2 Consistency of proposal against relevant Ku-ring-gai LEP (Local Centres) 2012**

Zone	Objectives	Consistency of proposal against objectives and permissibility
SP2 Classified Road	<ul style="list-style-type: none"> <li>To provide for infrastructure and related uses.</li> <li>To prevent development that is not compatible with or that may detract from the provision of infrastructure.</li> </ul>	<p>Permitted with development consent; however, consent requirements are removed as the proposal falls under the ISEPP.</p> <p>The proposal is consistent with these objectives as it would increase the quality of infrastructure in the area.</p>
R4 High Density Residential	<ul style="list-style-type: none"> <li>To provide for the housing needs of the community within a high density residential environment.</li> <li>To provide a variety of housing types within a high density residential environment.</li> <li>To enable other land uses that provide facilities or</li> </ul>	<p>Permitted with development consent; however, consent requirements are removed as the proposal falls under the ISEPP.</p> <p>The proposal is consistent with these objectives as it would provide upgraded road, pedestrian and cycle infrastructure for high density residential developments, particularly</p>

Zone	Objectives	Consistency of proposal against objectives and permissibility
	<p>services to meet the day to day needs of residents.</p> <ul style="list-style-type: none"> <li>• To provide for high density residential housing close to public transport, services and employment opportunities.</li> </ul>	<p>on the northern side of Boundary Street.</p>



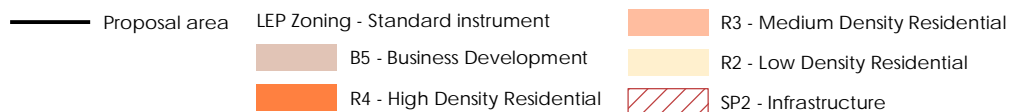
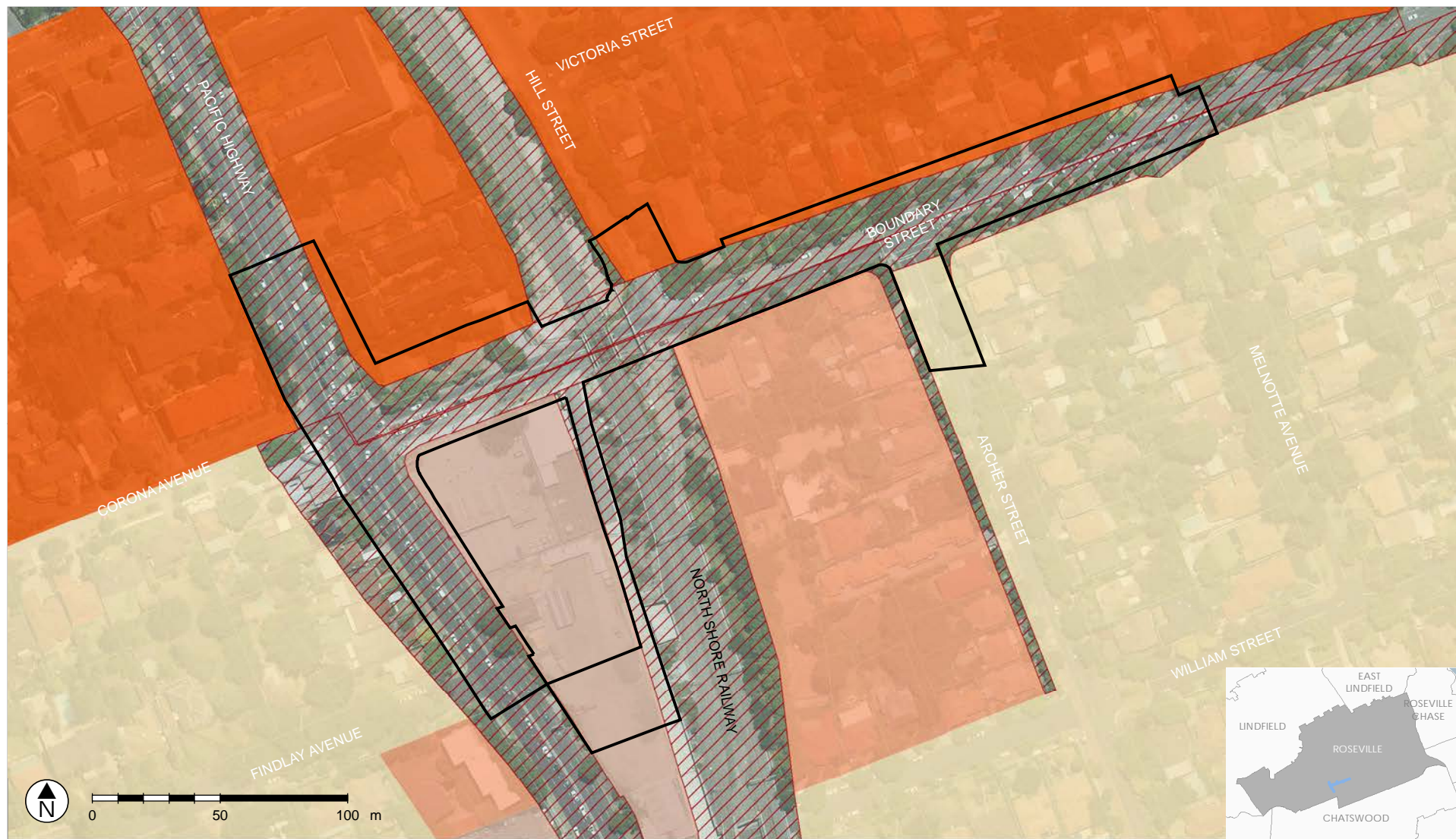


Figure 4-1 Willoughby and Ku-ring-gai zoning

## **4.3 Other relevant NSW legislation**

### **4.3.1 Heritage Act 1977**

The *Heritage Act 1977* (Heritage Act) provides for the conservation of buildings, work, relics and places that are of historic, scientific, cultural, social, archaeological, architectural, natural or aesthetic significance to the State. Matters protected under the Act include items subject to an Interim Heritage Order and items listed on the State Heritage Register, the heritage schedules of local council LEPs, and the heritage and conservation registers established under section 170 of the Act by NSW state government agencies (section 170 Registers). The Act also provides for the protection of archaeological 'relics', being any deposit, object or material evidence that relates to the non-Aboriginal settlement of NSW and is of State or local heritage significance.

Approval under section 60 of the Act is required for any action that would adversely affect an item that is subject to an Interim Heritage Order or a listing on the State Heritage Register. An excavation permit under section 139 of the Act is required for activities that will result in or are likely to result in the disturbance or excavation of a 'relic'.

Two heritage items with the potential to be directly impacted by the proposal include Ku-ring-gai Court and Electricity Substation No. 312. A section 139 excavation permit would not be required for the proposal for the two heritage items due to the low likelihood of archaeological potential.

Non-Aboriginal heritage is further discussed in **Section 6.2**.

### **4.3.2 Contaminated Land Management Act 1997**

The *Contaminated Land Management Act 1997* (CLM Act) establishes a process for investigating, managing and remediating contaminated land. The Office of Environment and Heritage (OEH) uses its powers under the CLM Act to regulate any site contamination that poses a significant risk of harm to current or approved land uses. This includes maintaining a register of contaminated sites and determining the remediation requirements. Where contamination is known to be present but does not pose an unacceptable risk to the current or approval land use, management of the contamination and identification of remediation requirements may be dealt with by the local council under the planning and development framework of the EP&A Act.

A site of potential contamination is located at the Seven Eleven petrol station, which comprises a 'moderate to high' risk rating.

## **4.4 Commonwealth legislation**

### **4.4.1 Environment Protection and Biodiversity Conservation Act 1999**

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) protects matters of national environmental significance (as defined under the Act) and the environment of Commonwealth land. Under the EPBC Act, a referral to the Australian Government is required for proposed 'actions' that have the potential to have a significant impact on any EPBC Act protected matters.

This REF has found that the proposal is unlikely to have a significant impact on any EPBC Act protected matter. Accordingly, the proposal has not been subject to an EPBC Act referral to the Australian government. The potential impacts of the proposal on matters of national environmental significance and the environment of commonwealth land are summarised in **Appendix I**.

#### **4.5 Confirmation of statutory position**

Clause 94 of the ISEPP provides that the proposal may be carried out without development consent. The proposal is not State significant infrastructure and is therefore subject to assessment under Part 5 of the EP&A Act. Roads and Maritime is both the proponent and the determining authority for the purposes of Part 5 of the Act.

It is also recommended to complete a Phase 2 Environmental Assessment (contaminated land investigation) to inform whether any requirements of the *Contaminated Land Management Act 1997* are triggered.



## 5 Stakeholder and community consultation

This chapter discusses the consultation undertaken to date for the proposal and the consultation proposed for the future. The description contains the consultation strategy or approach used and the results of consulting with the community, the Aboriginal community and relevant government agencies and stakeholders.

### 5.1 Consultation strategy

Consultation has been ongoing since November 2012 and has included consultation with the Roseville community, Willoughby Council, Ku-ring-gai Council and Sydney Trains. The aim of the consultation process is to keep the community and stakeholders informed about the proposal and to seek feedback for consideration in the development of the design.

Consultation activities undertaken to date have included advertisement of the proposal, public display of information on the proposal, and invitation to provide comment and feedback. Consultation would continue throughout the development of the proposal and during the construction phase.

Details of consultation activities are provided in the following sections.

### 5.2 Community involvement

Roads and Maritime has encouraged community feedback to the proposal through a combination of mail-outs, public displays, information sessions and meetings with residents. A summary of the community involvement activities undertaken to date is provided in **Table 5-1**. The Community Issues Report is also provided as **Appendix B**.

**Table 5-1 Summary of community involvement activities**

Date	Community involvement activity
November 2012	<ul style="list-style-type: none"><li>• Media release from the offices of the Member for Willoughby, Gladys Berejiklian, and Member for Davidson, Jonathan O'Dea, issued to local media, including the Manly Daily, Hornsby Advocate, 99.3 FM and NorthSide Magazine (14 November).</li><li>• Webpage created for public information and submissions (15 November).</li><li>• 'Have your say' advertisements placed in North Shore Times (14 and 16 November).</li><li>• Brochures on the proposal and community information sessions delivered to letterboxes around Boundary Street (16 and 27 November).</li><li>• Two information sessions held at East Roseville Community Centre (24 November 1pm - 4pm and 27 November 6.30pm - 8.30pm).</li></ul>

Date	Community involvement activity
December 2012	<ul style="list-style-type: none"> <li>• Response provided to a media inquiry from North Shore Times after community members voiced concern about lack of involvement in the information sessions (18 December 2012).</li> <li>• Media release issued through the office of the Member for Davidson, Jonathan O'Dea, advising community consultation would be extended to 8 February 2013 and inviting the community to an information session on Tuesday 5 February 2013 (18 December 2012).</li> <li>• Letter advising residents that the consultation period had been extended to 8 February delivered to 9000 households in the proposal area (18 December to 19 December).</li> </ul>
January 2013	<ul style="list-style-type: none"> <li>• Letter providing notification of the third community information session delivered to 9000 residents (week starting 7 January).</li> <li>• Advertisement for the third community information session and consultation placed in North Shore Times on 9 January and 23 January to capture residents returning from Christmas holidays.</li> <li>• Invitations sent to the community (via email, letter, webpage update and media release) to attend the third community information session on 5 February and to give feedback by 8 February.</li> </ul>
February 2013	<ul style="list-style-type: none"> <li>• Information session held at Dougherty Centre function room, Chatswood, Tuesday 5 February 6.30pm - 8.30pm (46 community members attended).</li> </ul>
July 2013	<ul style="list-style-type: none"> <li>• A meeting with the Strata Manager of BCS Strata Management and four residents of 5-17 Pacific Highway, Roseville on 31 July.</li> </ul>
August 2013	<ul style="list-style-type: none"> <li>• A meeting with residents of 3 Boundary Street, Roseville on 3 August.</li> </ul>

There were 204 persons who made comments and/or attended the information sessions during the November 2012 to February 2013 consultation period. Of these, 178 submitted comments about the proposal. Of the respondents to the information sessions and other community involvement activities:

- 46 per cent stated they had overall agreement with the proposal as presented.
- 21 per cent stated they disagreed with the proposal as presented.
- 33 per cent did not state whether they agreed or disagreed with the proposal as presented.

Over 63 per cent of submissions received during the consultation period came from residents in the Roseville area north of Boundary Street and west of the Pacific Highway. Many respondents indicated they understood the need to improve traffic flows on Boundary Street and that they agreed in principal with the proposal. The majority, however, expressed reservations about one or more aspects of the proposal. The most common concern was the flow on effects that the changes at Hill Street/ Boundary Street and Corona Street/ Pacific Highway intersections would have on access and congestion in Roseville west of the Pacific Highway and north of Boundary Street. Many of the respondents suggested alternative solutions to the traffic congestion issues. Community consultation feedback is provided in **Table 5-2** and the full Community Issues Report is provided in **Appendix B**.

**Table 5-2 Summary of community consultation feedback**

Issue	Comment	Response / where addressed within the REF
Opposed to Hill Street conversion to left in/ left out access	<ul style="list-style-type: none"> <li>• Positive – 19, Negative – 57</li> <li>• Improve surrounding access points</li> <li>• Could impact emergency access</li> <li>• Install traffic lights or roundabout instead</li> </ul>	<ul style="list-style-type: none"> <li>• The proposal provides a safer intersection.</li> <li>• The left in/out arrangement at Hill St will reduce amenity for residents, however Roads and Maritime is considering re-instating the right turn movement at Spearman Street outside the AM and PM commuter peak hours.</li> <li>• The proposed median island on Boundary Street at Hill Street will be mountable, thus access for emergency vehicles will be possible.</li> <li>• The suggestion for installing a roundabout or signalling the Hill Street/Boundary Street intersection is not a viable option.</li> </ul>
Opposed to Corona Avenue being converted to left in/ left out access	<ul style="list-style-type: none"> <li>• Positive - 1, Negative – 19</li> <li>• This change will make access to connecting local roads more difficult.</li> </ul>	<ul style="list-style-type: none"> <li>• Roads and Maritime has agreed to leave the intersection access arrangements as is.</li> </ul>
Feedback on the proposed pedestrian/ shared path between Hill St and Archer St	<ul style="list-style-type: none"> <li>• Positive – 9, Negative – 9</li> <li>• Existing stairs and narrow pathway make access difficult</li> <li>• Want a bridge for cyclists constructed adjacent to railway</li> <li>• Heritage concerns – works might impact foundations of Ku-ring-gai Court</li> <li>• Concerns about noise, loss of amenity and privacy from the associated works</li> <li>• Concern about risk to users of shared path due to no barrier protection</li> </ul>	<ul style="list-style-type: none"> <li>• The noise and vibration assessment (<b>Appendix C, Section 5.3</b>) concluded that the potential for structural or cosmetic damage of Ku-ring-gai Court is minimal. <b>Section 6.1</b> and <b>Section 6.3</b> of this REF also contain safeguards to avoid/minimise potential vibration impacts including preparation of a Noise and Vibration Management Plan.</li> <li>• The proposed shared path between Hill Street and Archer Street provides a link for future planning with the NSW Bike Plan, and Local Council Bike Plans. Provision of a grade separated crossing for pedestrians/cyclists is not within the scope of this proposal.</li> <li>• A protective barrier between the path and Boundary Street has not been provided for in the concept design but would be considered during detailed design.</li> <li>• Concerns about potential noise from the proposed works have been addressed within <b>Section 6.1</b> of the REF.</li> <li>• Concerns about potential privacy and amenity impacts from the proposed works have been addressed within <b>Section 6.4</b> of the REF.</li> </ul>
Request for signalised crossing facilities across Boundary Street and Archer Street	<ul style="list-style-type: none"> <li>• Positive – 3, Negative – 6</li> <li>• Will require two crossing legs to cross Archer St then</li> </ul>	<ul style="list-style-type: none"> <li>• The proposal will improve upon existing pedestrian/cyclist facilities.</li> <li>• The proposed shared path between Hill Street and Archer Street provides a link for future planning with the NSW Bike Plan and Local</li> </ul>

Issue	Comment	Response / where addressed within the REF
	<p>Boundary St.</p> <ul style="list-style-type: none"> <li>Request grade separated intersection for pedestrians/cyclists.</li> </ul>	<p>Council Bike Plans. Provision of a grade separated crossing for pedestrians/cyclists is not within the scope of this proposal.</p> <ul style="list-style-type: none"> <li>Providing an additional marked foot crossing on the eastern side of Boundary Street at Archer Street would impact significantly on the operational performance of Boundary Street. During detailed design Roads and Maritime will further investigate whether this request can be accommodated without creating significant impacts on the operation of the intersection.</li> </ul>
Feedback regarding two left turn and two right turn lanes from Boundary Street onto Pacific Highway	<ul style="list-style-type: none"> <li>Positive – 5, Negative - 4</li> <li>The right turn lane from Pacific Highway is not long enough to cater for traffic volumes and provide benefit to traffic flows.</li> <li>Acquire more land to create merge lanes for traffic on Pacific Highway turning onto Boundary Street.</li> <li>Acquire more land to create merge lanes for traffic exiting Boundary Street onto Pacific Highway southbound.</li> <li>Construct an underpass for westbound Boundary Street turning right onto Pacific Highway.</li> </ul>	<ul style="list-style-type: none"> <li>The proposed lane configuration is a substantial improvement to the existing intersection as it provides two additional lanes to Boundary Street.</li> <li>Requests for additional lanes in addition to what is proposed for Boundary Street and Pacific Highway will require significant land acquisition. The initial proposed works are essentially confined to Boundary Street. Provision of a second right turn bay from Pacific Highway into Boundary Street will form part of the next stage of improvement works in the area. Although funding for these works has not been allocated, some properties on the western side of the Pacific Highway have been acquired for the proposed future works.</li> <li>Following concerns raised by the community in regards to lane lengths, Roads and Maritime will undertake further investigations in the detailed design component of the proposal to further refine the intersection's configuration.</li> <li>Refer to additional information within <b>Section 6.2</b> (traffic and transport) of this REF.</li> </ul>
Feedback regarding the two dedicated through lanes from Pacific Highway to Archer Street	<ul style="list-style-type: none"> <li>Positive – 5, Negative - 1</li> <li>Concerned about increased noise.</li> <li>Concerned the acquisition would impact on property values.</li> </ul>	<ul style="list-style-type: none"> <li>An operational noise assessment (<b>Appendix C</b>) concluded that the proposal would not increase daytime or night time noise above the 2dB(A) threshold and therefore would not cause a noticeable increase in road traffic noise. Refer to <b>Section 6.1</b> (noise and vibration) of this REF for more detail.</li> <li>All land acquisitions including property adjustments would be conducted in accordance with the Roads and Maritime Land Acquisition Policy and the requirements of the <i>Land Acquisition (Just Terms) Compensation Act 1991</i>. Refer also to <b>Section 6.8</b> (land use and property) of this REF.</li> </ul>
Feedback about the right turn lane from	<ul style="list-style-type: none"> <li>Positive – 3, Negative – 8</li> </ul>	<ul style="list-style-type: none"> <li>The proposal will enhance the storage capacity of the existing right turn bay, with the signalised intersections of Boundary Street</li> </ul>

Issue	Comment	Response / where addressed within the REF
Boundary Street into Archer Street	<ul style="list-style-type: none"> <li>Concern about the difficulty for vehicles exiting Hill Street to cross two lanes to enter the right hand turn lane into Archer Street.</li> </ul>	<p>with Pacific Highway and Archer Street coordinated such that sufficient gaps are created to enable vehicles from Hill Street to access the right turn bay into Archer Street without impacting on the through flow of traffic on Boundary Street.</p>
Proposed retaining wall on the northern side of Boundary Street and at Ku-Ring-Gai Court premises	<ul style="list-style-type: none"> <li>Negative – 3</li> <li>Concerns about how close the proposed retaining wall/ embankment is to the building and the loss of privacy.</li> </ul>	<ul style="list-style-type: none"> <li>All land acquisitions including property adjustments would be conducted in accordance with the Roads and Maritime Land Acquisition Policy and the requirements of the <i>Land Acquisition (Just Terms) Compensation Act 1991</i>. Refer also to <b>Section 6.8</b> (land use and property) of this REF.</li> <li>A number of safeguards have been included within <b>Section 6.4</b> (visual impact) and <b>Section 6.9</b> (biodiversity) to mitigate potential visual and privacy impacts including considerations for landscaping and measures to minimise vegetation removal.</li> </ul>
Concern about visual / landscape character impacts	<ul style="list-style-type: none"> <li>Negative – 5</li> <li>Concern about vegetation removal and impact on visual amenity.</li> <li>Retain as much trees as possible.</li> <li>Concerned that vegetation removal will increase road traffic noise.</li> </ul>	<ul style="list-style-type: none"> <li>A number of safeguards have been included within <b>Section 6.4</b> (visual impact) and <b>Section 6.9</b> (biodiversity) to mitigate potential visual and privacy impacts including considerations for landscaping and measures to minimise vegetation removal.</li> <li>The removal of roadside vegetation would not increase the road traffic noise as it provides negligible noise reduction. Dense vegetation provides about 1 dB(A) reduction per 10 metres of dense vegetation, as discussed in the Environmental Noise Management Manual 2001 (RTA, 2001). The change to the human ear would need to be 3 dB(A) to be perceptible. Refer also to the <b>Section 6.1</b> (noise and vibration) of this REF.</li> </ul>
Proposal of a number of additional measures to address local traffic issues (refer to Community Issues Report for detail, <b>Appendix B</b> )	<ul style="list-style-type: none"> <li>Proposed additional signalised intersections.</li> <li>Proposed changes at the intersection of Clanville Road and Pacific Highway.</li> <li>Proposed local bicycle route facilities and connections.</li> <li>Request for grade separated intersections.</li> </ul>	<ul style="list-style-type: none"> <li>These changes were considered outside of the scope or beyond the budget of the proposal and are specifically addressed within the Community Issues Report (<b>Appendix B</b>).</li> </ul>

### 5.3 Aboriginal community involvement

The proposal has been considered against the requirements of the Procedure for Aboriginal Heritage Consultation and Investigation (PACHCI) (Roads and Maritime 2011). This procedure involves the following:

- Stage 1 – an internal Roads and Maritime assessment to determine whether a proposal is likely to affect Aboriginal cultural heritage.
- Stage 2 – a preliminary external assessment with limited stakeholder consultation to determine whether a proposal requires Part 6 approval from the NSW Office of Environment and Heritage under the *National Parks and Wildlife Act 1974*.
- Stage 3 – if approval is required, Aboriginal community consultation and investigation.
- Stage 4 – implementation of the assessment process.

Aboriginal cultural heritage impacts are not anticipated as a result of the proposal (refer to **Section 6.11**).

A search of the Aboriginal Heritage Information Management System database was undertaken in October 2013 as part of this REF. The results of this database search confirmed that there are no known Aboriginal heritage sites within or next to the proposal area.

The Aboriginal Cultural Heritage Adviser for Roads and Maritime Sydney Region has considered the documentation referred to above and has agreed there is no requirement to proceed to Stage 2 of the PACHCI. An Aboriginal Heritage Impact Permit under the *National Parks and Wildlife Act 1974* would not be required for the proposal.

### 5.4 ISEPP consultation

Part 2 Division 1 of the Infrastructure SEPP requires consultation with councils for development with impacts on council-related infrastructure or services, including excavation that is not minor or inconsequential of the surface of a road or a footpath adjacent to a road for which a council is the roads authority (ISEPP c.13(1)(f)). The consultation requirements must be met before carrying out the subject development and includes giving written notice of the intention to carry out the development and taking into consideration any response to the notification provided by council within 21 days after the notice is given.

In accordance with the requirements of Part 2 Division 1 of the ISEPP, Willoughby and Ku-ring-gai Councils were notified in writing of the proposal on 29 July 2013, with particular reference to the impacts on council infrastructure. **Sections 5.4.1** and **5.4.2** describe the response of each council to the proposal.

#### 5.4.1 Willoughby Council

Willoughby Council responded to the ISEPP letter by email on 13 June 2013 and by forwarding a previous letter (dated 14 December 2012). The email from Willoughby Council provides comment on the Roads and Maritime response to the Community Issues Report. **Table 5-3** presents a summary of issues raised by Willoughby Council.

**Table 5-3 Willoughby Council response to ISEPP letter**

<b>Issue</b>	<b>Comment</b>	<b>Response</b>	<b>Where addressed within the REF</b>
Design	The provision of an additional westbound lane west of Archer Street will reduce rat runs on local roads and is supported by Council.	The comment has been noted by Roads and Maritime.	—
Design	Eastbound traffic will benefit from right turn bay into Archer St	The comment has been noted by Roads and Maritime.	—
Pedestrian/cyclist access	Support the ramped shared path on north side of Boundary Street which will remove the existing steps	The comment has been noted by Roads and Maritime.	—
Design	Request consideration of dual right turn for traffic exiting from the Pacific Highway northbound to enter Boundary Street	Provision of a second right turn bay from Pacific Highway into Boundary Street will form part of the next stage of improvement work in the area. Although funding for this work has not been allocated, some properties on the western side of the Pacific Highway have been acquired for the proposed future work. Timing of the future work is currently unknown.	<b>Section 5.5</b>
Future upgrade	Request that Roads and Maritime also plan for future widening east of Archer St, specifically between Penshurst St and Archer St.	This work falls out of the scope of this proposal and will be raised with Transport for NSW (TfNSW) to investigate further.	<b>Section 5.5</b>
Future upgrade	Request that Roads and Maritime also plan for future widening Archer St (William St to Boundary St) to enable construction of an extra lane to facilitate the extension of the Bus Lane.	This work falls out of the scope of this proposal and will be raised with TfNSW to investigate further.	<b>Section 5.5</b>
Pedestrian/cyclist access	Request consideration of widening the footpath on the western side of Archer St to provide a shared path. Existing safety hazard from cyclists using road and path.	Widening of the footpath on the western side of Archer Street would be a proposal for council to investigate in the first instance regarding local bike plan connections. During detailed design Roads and Maritime will liaise with Council in regards to their proposed bike plan, and where feasible endeavour to provide a link to this.	<b>Section 5.6</b>

Issue	Comment	Response	Where addressed within the REF
Pedestrian/cyclist access	Query why the design does not include signalised pedestrian crossing on the eastern side of Boundary Street/Archer St intersection	The inclusion of a pedestrian crossing on the eastern side of the intersection reduces the efficiency of the intersection however this will be further investigated during detailed design.	Section 3.2
Hill Street access	The left-in/left-out arrangement proposed for Hill Street at Boundary Street is noted. Agree this removes the unsafe right hand turn. Express concern however over loss of direct access for people with mobility issues.	Comments acknowledged. Currently the right turn into Hill St is only permitted outside commuter peak hours. Roads and Maritime will assess whether this movement can be accommodated at Spearman Street during the same hours.	Section 3.2
Design	Consider acquisition of additional land on the southern side of Boundary Street to provide a left turn slip lane onto Pacific Highway.	Any further encroachment onto this land operating as a service station may impact fuel tanks and other utilities.	Section 3.2
Pedestrian/cyclist access	Council urge Roads and Maritime to develop plans for a grade separated pedestrian and cyclist crossing and to link it with existing Regional Routes to the Sydney CBD.	<p>The proposal is funded under the Pinch Point Program and provision of a bicycle bridge across Boundary Street is not within the scope of this proposal.</p> <p>The proposed shared cycle and pedestrian path between Hill Street and Archer Street provides a link for future planning with the NSW Bike Plan and Local Council Bike Plans.</p>	—

#### 5.4.2 Ku-ring-gai Council

Ku-ring-gai Council responded to the ISEPP letter on 9 September 2013. Table 5-4 presents a summary of issues raised by Ku-ring-gai Council.

**Table 5-4 Ku-ring-gai Council response to ISEPP letter**

Issue	Comment	Response	Where addressed within the REF
Design	Council is not initiating any changes affecting Hill Street. It is considered that Roads and Maritime needs to reconstruct Hill street	<p>The scope of work in Hill Street ties in with the existing driveway at 3 Boundary Street.</p> <p>Roads and Maritime would investigate whether there is a</p>	



Issue	Comment	Response	Where addressed within the REF
	up to Victoria Street, rather than leaving a short intermediate section in poor condition.	<p>benefit to extending the scope of work to Victoria Street during detailed design. Roads and Maritime will request Council provide a contribution for the construction of this additional work on a local road.</p> <p>Council had previously advised Roads and Maritime that Hill Street would be upgraded as it forms part of an on-road cycle route. This route would tie-in with the proposed shared cycle and pedestrian pathway proposed by Roads and Maritime.</p>	—
Hill Street access	The loss of access at Hill Street should be replaced with improved access at Clanville Road.	Any work at the intersection of Pacific Highway and Clanville Road are not within the scope of this proposal. Resident and Council concerns with this intersection will be raised and forwarded to TfNSW for consideration.	<b>Section 5.5</b>
Hill Street access - additional traffic on local roads	Concern about extra traffic on local roads from the proposed changes to Hill Street access arrangements.	Currently the right turn into Hill Street is only permitted outside commuter peak hours. Roads and Maritime will assess whether this movement can be accommodated at Spearman Street during the same hours.	<b>Section 3.2</b>
Shared pedestrian and cycle pathway, between Hill Street and Archer Street	It is suggested for road safety reasons that a fence between the path and Boundary Street be provided. Significant numbers of cyclists access Boundary Street from Hill Street.	<p>Suggestion noted.</p> <p>Width of shared user path is 3m, which places substantial distance between pedestrians and Boundary Street motorists. Consideration to this suggestion will be provided during detailed design.</p>	<b>Section 3.2</b>
Two dedicated left and two right turn lanes from Boundary Street into the Pacific Highway	Delaying provision of adequate turning capacity at the intersection of the two State roads of the Pacific Highway and Boundary Street, without providing details of when the work will be undertaken is unsatisfactory,	<p>Adequate turning capacity will be provided at the intersection.</p> <p>Provision of a second right turn bay from Pacific Highway into Boundary Street will form part of the next stage of improvement work in the area. Although funding for this work has not been allocated, some properties on the western side of the Pacific Highway have been acquired for the proposed future work. Timing of the future work</p>	<b>Section 3.2</b>

Issue	Comment	Response	Where addressed within the REF
		is unknown as this information comes from TfNSW and the funding allocated to the work.	
A dedicated right turn lane from Boundary Street into Archer Street	Increasing vehicle storage for right turn movements from Boundary Street into Archer Street will clearly impact on access into and out of Hill Street. Turning left out of Hill Street, crossing two through east bound traffic lanes and merging with queued right turning traffic in Boundary Street, is clearly a concern for Roseville residents.	The signalised intersections of Boundary Street with Pacific Highway and Archer Street will be coordinated such that sufficient gaps are created to enable vehicles from Hill Street to access the right turn bay into Archer Street without impacting on the through flow of traffic on Boundary Street.	<b>Section 3.2</b>
Pacific Highway/Clanville Road intersection	The impacts of Roads and Maritime restricting access into/out of Hill Street have been and continue to be a major concern for the community. Imposing turning restrictions at Hill Street will divert much of that traffic to the Pacific Highway/Clanville Road intersection. Addressing impacts of Roads and Maritime work on this intersection should be within the scope of the work. Simply stating that the problem created by Roads and Maritime work 'will be raised and forwarded onto TfNSW is not satisfactory. A satisfactory solution to the problem caused by restrictions at Hill Street must be addressed as part of the work proposed by Roads and Maritime and be undertaken as	The intersection of Pacific Highway and Clanville Road is not within the scope of this proposal. Residents and Council concerns with this intersection will be raised and forwarded onto TfNSW to consider for future improvement work in the area. This detail is unknown at the time of writing this REF.	<b>Section 5.5</b>

Issue	Comment	Response	Where addressed within the REF
	part of the work.		

## 5.5 Government agency and stakeholder involvement

The key government stakeholders for the proposal are Willoughby and Ku-ring-gai Councils. Roads and Maritime has had a number of site meetings with the councils to discuss the proposal and identify key issues to be addressed in design and construction. Some issues were raised that did not fall within the scope of the proposal and will be raised with Transport for NSW to investigate.

Roads and Maritime will also provide the councils with copies of this REF for information. Should Roads and Maritime determine that the proposal can proceed, consultation with the councils would continue throughout the detailed design and construction phase.

Consultation with Sydney Trains was carried out during the preliminary concept planning phase of the proposal. Sydney Trains approached Roads and Maritime in 2007 with plans to replace the rail overbridge that crosses Boundary Street between the Pacific Highway and Hill Street. In response to this proposal, Roads and Maritime requested that the rail overbridge upgrade be designed so as to provide adequate space for the future widening of Boundary Street. Sydney Trains accepted these design criteria and constructed the rail overbridge, thereby allowing Roads and Maritime to proceed with the planning and design of the proposal.

Consultation with bus providers, including Forest Coaches and TransDev-Shorelink, was also carried out. Roads and Maritime discussed potential impacts during construction, including temporary bus stop relocation as well as bus route changes during operation as a result of the closure of the right-turn into Hill Street. Potential impacts on bus providers are discussed further in **Section 6.7**.

## 5.6 Ongoing or future consultation

Community consultation will continue throughout the development of the detailed design and during construction. Consultation activities will include:

- Proposal information provided through the proposal website: [http://www.rta.nsw.gov.au/roadprojects/projects/sydney\\_region/northern\\_sydney\\_region/boundary\\_street\\_upgrade/index.html](http://www.rta.nsw.gov.au/roadprojects/projects/sydney_region/northern_sydney_region/boundary_street_upgrade/index.html)
- Consultation with Willoughby and Ku-ring-gai Councils would be ongoing, particularly regarding urban design and landscaping on Boundary Street.
- Consultation with Sydney Trains would be ongoing, particularly regarding work under the railway bridge over Boundary Street.
- Property owners identified in **Section 3.6** would continue to be consulted regarding property acquisition and adjustment requirements.
- All directly affected property owners would be consulted prior to commencement of construction activities and changes to access to private properties (if required).

## 6 Environmental assessment

This section of the REF provides a description of the potential environmental impacts associated with construction and operation of the proposal. It also identifies the environmental safeguards and management measures proposed to ameliorate the identified potential impacts.

All environmental factors potentially impacted by the proposal are considered. This includes consideration of the factors specified in *Is an EIS required?* (DUAP 1999) and *Roads and Related Facilities* (DUAP 1996), as required under clause 228(1)(b) of the *Environmental Planning and Assessment Regulation 2000*. A summary of considerations specified under clause 228(2) of the *Environmental Planning and Assessment Regulation 2000* is provided in **Appendix I**.

Unless otherwise stated, the proposal area assessed throughout the following sections includes the area covered by Option 2, as shown in **Figure 1-2**.

### 6.1 Noise and vibration

A specialist assessment of noise and vibration impacts has been undertaken for the proposal as part of this REF. The full impact assessment report is attached as **Appendix C** and is summarised below.

#### 6.1.1 Methodology

##### Study area

The study area for the noise and vibration assessment is defined by noise catchment areas (NCAs). NCAs are areas that are likely to have similar noise exposures on the basis of factors such as topography, road design, and types of residences or other noise receptors. The study area is shown in **Figure 6-1** and is divided into eight NCAs, which includes about 1000 receivers located up to 300 metres from the proposal area.

##### Noise monitoring

Attended and unattended noise monitoring was carried out within the study area, which is described as follows.

##### **Attended noise monitoring**

Existing background noise was monitored at eight receiver locations (M1 - M8) for a period of 24 hours, commencing on 18 July 2013. The monitoring locations are listed in

**Table 6-1** and shown in **Figure 6-1**.

**Table 6-1 Attended noise monitoring locations**

ID	Monitoring location
M1	12 Nola Lane, Roseville
M2	17 Pacific Highway, Roseville
M3	61 William Street, Roseville
M4	21 Boundary Street, Roseville
M5	14 Bancroft Avenue, Roseville
M6	39 William Street, Roseville

ID	Monitoring location
M7	36 Boundary Street, Roseville
M8	Roseville College

The measured noise levels were analysed to provide more detail of the character of the noise environment over the 24-hour period monitored. This information was separated into representative noise levels for the daytime (7am to 6pm), evening (6pm to 10pm) and night-time (10pm to 7am) periods, and used in the assessment of potential noise impacts.

### Unattended noise monitoring

Unattended monitoring was carried out within the study area at six locations (L1 – L6) between 21 and 29 August 2013. The monitoring locations are listed in **Table 6-2** and shown in **Figure 6-1**.

**Table 6-2 Unattended noise monitoring locations**

ID	Monitoring location
L1	2 Corona Avenue, Roseville
L2	5-17 Boundary Street, Roseville
L3	3 Boundary Street, Roseville
L4	138 Archer Street, Roseville
L5	18 Boundary Street, Roseville
L6	12 Victoria Street, Roseville





Figure 6-1 Noise catchment areas



## 6.1.2 Criteria

### Construction noise criteria

Construction noise for this proposal has been assessed in accordance with the Interim Construction Noise Guideline (ICNG) (DECC, 2009). The guideline was developed to assist with the management of noise impacts, rather than to present strict numeric noise criteria for construction activities.

The ICNG identifies a Noise Management Level (NML), which is the project specific noise criteria used to assess the level of impact at a receiver location. The NML is derived from the existing background noise levels at representative monitoring locations. The NML are also categorised for non-residential receivers with recommended noise criteria for both standard construction hours and for work to be undertaken outside of standard hours.

### Residential receivers

Management levels for construction noise at residential receivers and how they are applied to the proposal are outlined in **Table 6-3**, as are the standard and non-standard construction hours (or 'out of hours' work). The table identifies a category of 'highly noise affected' receivers that may be affected by significant noise levels during construction. Construction hours may need to be restricted to minimise these impacts.

**Table 6-3 Construction noise management levels (NML) and working hours**

Time of day	MML	How to apply
Recommended standard hours Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected (RBL + 10 dB )	The noise affected level represents the point above which there may be some community reaction to noise.  Where the predicted or measured LAeq (15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level.  The proponent should also inform all potentially impacted residents of the nature of work to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected (75 dB(A) )	The highly noise affected level represents the point above which there may be strong community reaction to noise.  Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account:  1. Times identified by the community when they are less sensitive to noise (such as before and after school for work near schools, or mid-morning or mid-afternoon for work near residences)  2. If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected (RBL + 5 dB )	A strong justification would typically be required for work outside the recommended standard hours  The proponent should apply all feasible and reasonable

Time of day	MML	How to apply
		<p>work practices to meet the noise affected level</p> <p>Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community</p> <p>For guidance on negotiating agreements see Section 7.2.2 of the ICNG (DECC, 2009).</p>

Source: Table 2, Interim Construction Noise Guideline (DECC, 2009)

RBL: Rating background level

### ***Non-residential receivers***

For other relevant land uses within the proposal area, the following noise criteria would apply:

- Industrial premises: External  $L_{Aeq(15min)}$  75 dB(A).
- Offices, retail outlets: External  $L_{Aeq(15min)}$  70 dB(A).
- Classrooms: Internal  $L_{Aeq(15min)}$  45 dB(A).
- Places of worship: Internal  $L_{Aeq(15min)}$  45 dB(A).
- Passive recreational areas: External  $L_{Aeq(15min)}$  60 dB(A).

Receivers have been separated into residential and non-residential and therefore the criteria outlined in **Table 6-3** are used in conjunction with the criteria for offices/retail outlets and passive recreational areas identified within the proposal area. No industrial premises, schools or churches were identified in the proposal area.

### **Vibration assessment criteria**

Vibration can have a continuous, impulsive or intermittent character, which are defined as follows:

- Continuous: Where vibration occurs uninterrupted for a defined period. This can include sources such as machinery and steady road traffic.
- Impulsive: Where vibration occurs over a short duration (typically less than two seconds) and occurs less than three times during the assessment period, which is not defined. This may include activities such as occasional dropping of heavy equipment or loading/unloading activities.
- Intermittent: Where continuous vibration activities are regularly interrupted, or where impulsive activities recur. This may include activities such as rock hammering, drilling, pile driving, heavy vehicle traffic or trains.

Vibration from construction activities must comply with Assessing Vibration – A Technical Guideline (DECC, 2006), British Standard BS 6472-1992, Evaluation of Human Exposure to Vibration in Buildings (1-80Hz, The Australian Standard AS2187.2-2006 Explosives – Storage, Transport and Use and Australian and New Zealand Environment Council (ANZEC) guidelines. These guidelines detail a range of criteria used to determine vibration impacts on sensitive receivers. The vibration limits for the minimum values for human comfort and building damage are summarised for the proposal in **Table 6-4**.

**Table 6-4 Vibration criteria summary**

Area	Vibration limit
Human comfort 1-80 Hz	0.01 m/sec <sup>2</sup> daytime

Area	Vibration limit
(continuous)	0.007 m/sec <sup>2</sup> night-time
Human comfort 1-80 Hz (impulsive)	0.3 m/sec <sup>2</sup> daytime
	0.1 m/sec <sup>2</sup> night-time
Human comfort 1-80 Hz (intermittent – vibration does value)	0.2 m/sec <sup>2</sup> daytime
	0.13 m/sec <sup>2</sup> night-time
Residential building damage – AS2187.2 (BS7385)	15 mm/sec
Heritage building damage – DIN4150-3	3 mm/sec
Airblast overpressure	Not more than 115 dB (Lin) peak for 95% of blasts over 12 months. Not to exceed 120 dB (Lin) peak for any blast.
Blast-induced ground-borne vibration	Must not exceed a peak particle velocity of 5 mm per second for nine out of any ten consecutive blasts initiated, regardless of the interval between blasts; and Must not exceed a peak particle velocity of 10 mm per second for any blast.

### Operational noise criteria

The following policies and guidelines are used to guide the assessment of operational noise:

- Road Noise Policy (DECCW, 2011).
- Environmental Noise Management Manual (ENMM) (RTA, 2001), including the ENMM, Practice Note (i).

For the purposes of the operational noise assessment, the proposal is considered as 'minor work'. This is because Boundary Street is not classed as a 'new road' nor is it a 'redevelopment' as per guidance contained with the ENMM.

### 6.1.3 Existing environment

The proposal is largely surrounded by residential land uses. The existing noise environment in the study area is dominated by road traffic noise from the Pacific Highway, Boundary Street and Archer Street. Traffic noise reduces at night and during early morning periods. There are no industrial noise sources within the study area.

### Noise sensitive receivers

As shown in **Figure 6-1**, the proposal area includes eight Noise Catchment Areas (NCAs), within which about 1000 receivers are located. There are about 114 receivers considered to be potentially directly affected by noise and vibration generated by the proposal. The identification of the affected receivers has been based on both construction and operational noise predictions.

The proposal area contains a mixture of residential and commercial receivers. The nearest residences are located along the western end of Boundary Street and on the

corner of the intersection of Boundary Street, Corona Avenue and the Pacific Highway.

Due to the sloping topography and the relatively built up nature of the proposal area, the impacts of operational and construction noise would generally be limited to the receivers adjacent to the proposal.

### Vibration sensitive receivers

All structures within or near to the proposal area have the potential to be affected by vibration generated during construction and operation. In particular, there are two non-Aboriginal heritage listed structures with the potential to be impacted. The two structures include a heritage listed house 'Ku-ring-gai Court' at 3 Boundary Street within the proposal area, and a heritage listed substation on the Pacific Highway, Roseville outside but immediately adjacent to the proposal area (see **Figure 6-1**). The heritage items are discussed further in **Section 6.3**. The heritage listed status means that a lower vibration criterion is set for these two receivers, therefore making them high risk during the construction of the proposal. These two vibration sensitive receivers will be quantitatively assessed during operation and construction phases, whereas the remainder of structures will only be qualitatively assessed.

### Noise measurements

**Table 6-5** displays the noise measurements for each unattended monitoring location and **Table 6-6** displays the noise measurements for each attended monitoring location.

**Table 6-5 Summary of noise measurements from unattended monitoring**

ID	Receiver	L <sub>A10</sub> , 18 hour dB(A)	L <sub>Aeq</sub> , 15 hour dB(A)	L <sub>Aeq</sub> , 9 hour dB(A)	L <sub>Amax</sub> , 15 hour dB(A)	L <sub>Amax</sub> , 9 hour dB(A)
L1	2 Corona Avenue	54.7	54.2	50.7	69.9	66.2
L2	5-17 Boundary Street	63.5	61.9	58.3	75.5	73.3
L3	3 Boundary Street	70.0	67.7	64.0	82.2	79.2
L4	138 Archer Street	65.6	63.3	59.5	81.2	76.8
L5	18 Boundary Street	65.3	63.5	58.8	77.6	74.5
L6	21 Victoria Street	53.0	52.9	45.8	68.7	65.5

**Table 6-6 Summary of noise measurements from attended monitoring**

ID Receiver Location	Time of day	Noise measurements, dB(A)			Noise sources
		L <sub>Aeq</sub>	L <sub>A90</sub>	L <sub>Amax</sub>	
		15 min	15min	15 min	
MP1 (R112) 12 Nola Lane	Day 11:29	56	48	80	Road traffic on Pacific Highway dominant. Faint background lawnmower noise. Bird noise.
	Night 01:02	49	37	66	Intermittent Pacific Highway Road Traffic Noise.
MP2 (R99- R104) 17 Pacific Highway	Day 13:51	67	61	81	Road traffic on Pacific Highway and Boundary Street dominant.
	Night 01:20	62	43	79	Intermittent traffic on Boundary Street and Pacific Highway noise
MP3 (R21)	Day 12:54	53	42	77	Distant traffic from Pacific Highway and localised road traffic noise

ID Receiver Location	Time of day	Noise measurements, dB(A)			Noise sources
		L <sub>Aeq</sub>	L <sub>A90</sub>	L <sub>Amax</sub>	
		15 min	15min	15 min	
61 William Street	Night 01:40	35	33	57	Distant traffic noise, insect noise
MP4 (R77) 21 Boundary Street	Day 14:16	66	56	79	Road traffic on Boundary Street dominant.
	Night 02:00	39	34	77	Intermittent Boundary Street Traffic Noise, insect noise
MP5 14 Bancroft Avenue	Day 13:45	57	41	80	Distant traffic from Pacific Highway and localised road traffic noise. Bird noise.
	Night 02:22	37	34	56	Distant traffic noise, insect noise
MP6 39 William Street	Day 12:34	56	40	77	Distant traffic from Pacific Highway and localised road traffic noise. Bird noise.
	Night 02:41	35	33	55	Distant traffic noise, insect noise
MP7 (R49) 36 Boundary Street	Day 13:19	66	56	77	Road traffic on Boundary Street dominant.
	Night 02:59	39	35	70	Intermittent Boundary Street Traffic Noise, insect noise
MP8 (R113) Roseville College	Day 11:52	61	41	81	Distant traffic from Pacific Highway and Boundary Street. Localised traffic movements, school pupil noise. Bird noise.
	Night 3:20	35	32	66	Distant traffic noise, insect noise

As shown in **Table 6-5** and **Table 6-6**, all receiver locations experience noise from road traffic on Corona Avenue, Boundary Street, Archer Street and Victoria Street. Background noise levels drop during the evening and night reflecting the intermittent traffic flows at this time.

## 6.1.4 Potential impacts

### Construction

#### Construction noise

The assessment of construction noise impacts is based on the construction activities outlined in **Section 3.3** and anticipated equipment. Typical sound power levels of the main construction equipment are summarised in **Table 6-7**.

**Table 6-7 Typical sound power levels from construction plant and equipment**

Activity	Sub-activity	Plant	Sound Power Level, dB(A)
Earthworks, foundations and excavations	Utility adjustments	Road Saw/concrete cutter	107
		Backhoe	110
		5t Dump truck	108
	Ground excavations	Backhoe	110
		5t Dump truck	108

Activity	Sub-activity	Plant	Sound Power Level, dB(A)
		12t excavator	112
		Truck	108
		5t excavator	108
	Fence/Barrier Installation	Franna Crane	105
		Truck	108
	Rock breaking	5t excavator with hammer	116
		Backhoe	110
		5t Dump Truck	108
	Compound installation	Franna Crane	105
		Truck	108
		Backhoe	110
	Retaining wall construction	Concrete pump	107
		Concrete truck	110
		Franna Crane	105
		Truck	108
		12t Excavator	112
		12t Excavator with Auger	112
Clearing and grubbing	Vegetation clearing	Chainsaw	109
		Hand tools	102
		Mulcher	109
		Ute	104
	Landscaping	Ute	104
		Backhoe	110
Paving and Asphaltting (Road and pavement)	Asphalt removal	Road saw	107
		Road Miller	115
		Truck	108
	Asphaltting	Truck	108
		Bobcat	106
		Compactor	107
		Roller	107
		Paver	111
		Asphalt truck	111
	Line marking removal	Water Cart	108
		Water Jet	112
	Line painting	Line painter	N/A

The construction of the retaining wall is not anticipated to require any piling activities. If required this would be subject to separate assessment and approvals.

Noise emissions were also predicted for each Noise Catchment Area (NCA) to determine the potential for the noise goals to be exceeded at these locations.

The predicted noise level for each NCA is presented in **Table 6-8**, along with the adopted day, evening and night time NML for each receiver location. The predicted levels in **Table 6-8** indicate potential for the noise goals to be exceeded within each of the NCAs when assessed against the modelled scenario.

**Table 6-8 Summary of day time construction noise by NCA**

NCA	NML dB(A)	Early Work L <sub>Aeq,15min</sub> range dB(A)	Compound Construction L <sub>Aeq,15min</sub> range dB(A)	Stage 1 L <sub>Aeq,15min</sub> range dB(A)	Stage 2 L <sub>Aeq,15min</sub> range dB(A)	Stage 3 L <sub>Aeq,15min</sub> range dB(A)	Stage 4 L <sub>Aeq,15min</sub> range dB(A)	Stage 5 L <sub>Aeq,15min</sub> range dB(A)
1	55	46-61	31-36	56-74	52-69	40-60	38-58	46-57
2	71	30-87	20-61	28-93	33-86	38-94	36-101	30-83
3	52	41-61	41-51	49-67	50-68	43-67	43-67	41-57
4	66	30-87	20-46	29-74	34-73	40-94	37-101	30-83
5	51	30-61	20-33	29-56	34-56	40-70	37-60	30-57
6	50	<44	<32	<38	<36	<39	<39	<38
7	66	<46	<35	<42	<37	<39	<39	<42
8	51	<48	<33	<50	<50	<55	<41	<36

Note: Cells highlighted in blue indicate where the night time NML is exceeded. Text highlighted in red indicates where the ICNG 'highly noise affected' criteria is exceeded.

As shown in **Table 6-8**, the project day time noise management levels would be exceeded at a number of residential properties in noise catchments 1 to 5 during different construction activities. The ICNG highly noise affected criteria would be exceeded in noise catchments 2, 3 and 4 during daytime construction. Where the NML is predicted to be exceeded, construction noise would be mitigated through management measures. Prior to commencing construction, a Construction Noise and Vibration Management Plan (CNVMP) would be prepared and adopted (see **Section 7**). The CNVMP would detail how work is to be carried out to minimise the impacts of noise and vibration on adjacent properties.

### ***Impacts of out of hours construction work***

As detailed in **Section 3.3.2**, work would be conducted during standard construction hours wherever possible. However, to minimise traffic impacts, some work would be required to be undertaken outside of the standard day-time working hours, including:

- Deliveries and demobilisation of plant and large construction equipment.
- Emergency work.
- Relocation of utilities.
- Major traffic diversions, including full or partial road closures.
- Road tie-in work, including paving and asphaltting.

The predicted levels in **Table 6-9** indicate potential for the night time noise goals to be exceeded within each of the NCAs when assessed against the modelled scenario.



**Table 6-9 Summary of night time construction noise by NCA**

NCA	Night time NML dB(A)	Utility Adjustments L <sub>Aeq,15min</sub> range dB(A)	Asphalt Removal L <sub>Aeq,15min</sub> range dB(A)	Asphalting L <sub>Aeq,15min</sub> range dB(A)	Line Marking Removal L <sub>Aeq,15min</sub> range dB(A)
1	42	56-71	38-56	46-55	38-58
2	48	28-79	36-97	30-82	38-87
3	38	49-65	43-65	41-57	43-67
4	39	29-70	37-97	30-81	40-87
5	40	29-56	37-60	30-57	40-68
6	38	<38	<39	<38	<39
7	40	<42	<39	<42	<39
8	37	<50	<41	<36	<55

Note: Cells highlighted in blue indicates where the night time NML is exceeded. Text highlighted in red indicates where the ICNG 'highly noise affected' criteria is exceeded.

As shown in **Table 6-9** the night time construction criteria would be exceeded at many of the locations within the study area. The ICNG highly noise affected criteria would be exceeded in noise catchments 2 and 4 during night time construction.

Where out of hours work extends into the night time period, consideration of sleep disturbance for residential receivers is required. Sleep disturbance is typically caused by a noise event that substantially exceeds the continuous ambient noise environment and would occur during periods of out of hours work. **Table 6-10** shows that the sleep disturbance criteria would be exceeded at some locations during selected construction activities.

**Table 6-10 Sleep disturbance criteria summary by NCA**

NCA	Night time NML dB(A)	Existing measured L <sub>Amax</sub> dB(A)	Sleep disturbance criteria* dB(A)	Utility adjustments L <sub>Amax</sub> dB(A)	Asphalt removal L <sub>Amax</sub> dB(A)	Asphalting L <sub>Amax</sub> dB(A)	Line marking removal L <sub>Amax</sub> dB(A)
1	42	66	80	79	64	63	66
2	48	79	80	87	105	90	95
3	38	57	80	73	73	65	75
4	39	77	80	78	105	89	95
5	40	56	80	64	68	65	76
6	38	55	80	46	47	46	47
7	40	70	80	50	47	50	47
8	37	66	80	58	49	44	63

\*Sleep disturbance criteria based on a lower RNP criteria of 70dB(A) allowing for 10dB(A) attenuation provided by an open window.

Note: Text highlighted in red indicates where the sleep disturbance criteria is exceeded.

## Vibration

Vibration impacts during construction are likely to occur where plant and equipment operates less than 10 metres from receivers, particularly on the northern side of Boundary Street. The CNVMP would manage impacts of vibration during construction on nearby receivers.

**Table 6-11** shows that there would be minimal potential for structural or cosmetic damage at the two heritage items.

**Table 6-11 Heritage vibration predictions**

Receiver	Separation distance	Criteria PPV, $\text{mms}^{-1}$	Estimated ground borne vibration PPV, $\text{mms}^{-1}$				
			Vibratory Roller*	Compactor (hand held)	2t rock hammer	Pile boring	Hand held jackhammer
<b>V1 (3 Boundary Street)</b> Ku-ring-gai Court is an Interwar period three storey brick block of flats with some elements of Mediterranean style decoration. Primarily constructed of dark red brick, the ground floor is either constructed from stone blocks or is clad with stone facing. The building has a tiled roof hip roof and a centrally located common entry and stairway on the westerly Hill Street frontage of the building.	<10 m	3	2.5 – 3.5	< 2	1.5 - 3	< 1	< 1
<b>V2 (312 Boundary Street Substation)</b> The substation is a 1929 modest single story brick structure designed in the Interwar Georgian Revival Style. The Substation is constructed using load bearing face brick and incorporates brick arches and a ceramic tiled roof. The Substation is bounded on the street frontage with a low brick fence in a similar style and brick to the Substation building. The Substation appears to be in good structural condition. The brick fence along the front boundary of the property is in fair condition with two large cracks in the northern, longer section of the fence.	<10 m	3	2.5 – 3.5	< 2	1.5 - 3	< 1	< 1

\*10 tonne roller (70Hz vibrating frequency) or vibratory plate.

Note: Text highlighted in red indicates where criteria is exceeded.

## Operation

### *Operational noise*

The noise associated with the opening year (2016) and design year (2026) is predicted to be within RNP and ENMM project adopted criteria. Maximum increases in daytime and night LAeq, period would be below the threshold level of 2dB (A). As such, there is no trigger for further investigation for noise mitigation measures in accordance with the ENMM.

It is also noted that the removal of roadside vegetation would not increase the road traffic noise as it provides negligible noise reduction. Dense vegetation provides about 1 dB(A) reduction per 10 metres of dense vegetation, as discussed in the Environmental Noise Management Manual 2001 (RTA, 2001). The change to the human ear would need to be 3 dB(A) to be perceptible.

### *Operational vibration*

The proposal consists of an activity which currently operates (ie a road). As such, operational vibration within the study area is expected to be similar to the existing environment and below perceptible levels at the closest receivers.

## 6.1.5 Safeguards and management measures

The proposed safeguards and management measures for noise and vibration are listed in **Table 6-12**.

**Table 6-12 Safeguards and management measures for noise and vibration**

Impact	Environmental safeguards	Responsibility	Timing
Construction noise	<ul style="list-style-type: none"><li>• A Construction Noise and Vibration Management Plan (CNVMP) would be prepared as part of the CEMP. This plan would include but not be limited to:<ul style="list-style-type: none"><li>○ A map indicating the locations of sensitive receivers including residential properties.</li><li>○ A quantitative noise and vibration assessment in accordance with the EPA Interim Construction Noise Guidelines (DECCW, 2009).</li><li>○ Management measures to minimise the potential noise impacts from the quantitative noise assessment and for potential work outside of standard working hours.</li><li>○ Mitigation measures to avoid noise and vibration impacts during construction activities including those associated with truck movements.</li><li>○ A process for assessing the performance of the</li></ul></li></ul>	Construction contractor	Pre-construction

Impact	Environmental safeguards	Responsibility	Timing
	<p>implemented mitigation measures.</p> <ul style="list-style-type: none"> <li>○ A process for documenting and resolving issues and complaints.</li> <li>○ A noise and vibration monitoring program for sensitive receivers.</li> <li>○ A process for updating the plan when activities affecting construction noise and vibration change.</li> <li>○ Identify in toolbox talks where noise and vibration management is required</li> <li>○ Consideration of respite during rock breaking/ hammering activities.</li> </ul> <ul style="list-style-type: none"> <li>• Implementation of EPA Interim Construction Noise Guidelines (DECCW, 2009).</li> </ul>		
Construction noise	<ul style="list-style-type: none"> <li>• Locate compressors, generators, pumps and any other fixed plant as far from residences as possible and behind site structures</li> <li>• Alternatives to reversing alarms will be considered for site equipment subject to WHS compliance requirements and risk assessments.</li> <li>• Vehicle delivery times will be scheduled where feasible to the recommended construction hours to minimise noise impacts from heavy vehicle movements and deliveries.</li> </ul>	Construction contractor	Construction
Construction noise	<ul style="list-style-type: none"> <li>• Any out of hours work would comply with G36 community notification requirements and the mitigation measures specified within the Roads and Maritime Noise Management Manual – Practice Note VII.</li> <li>• Communications material such as the project website and community notification would include a contact person and phone number to enable complaints to be received and responded to.</li> </ul>	Construction contractor	Pre-construction
Construction vibration	<ul style="list-style-type: none"> <li>• A vibration assessment is to be prepared and included in the NVMP. The vibration assessment is to include:</li> </ul>	Construction contractor	Pre-construction

Impact	Environmental safeguards	Responsibility	Timing
	<ul style="list-style-type: none"> <li>○ Assessment of the potential vibration impacts on sensitive receivers due to vibration.</li> <li>○ Detail which sensitive receivers will have building condition surveys</li> <li>○ Outline a monitoring program.</li> <li>○ Identify the activities and distances adjacent from the two heritage items at which attended vibration monitoring would be required to allow immediate identification of work exceeding criteria.</li> <li>○ Where vibration guidelines are exceeded or complaints occur, the management measures are to be reviewed and are to consider alternate equipment and construction methodologies</li> <li>• Buildings/structural conditions surveys would be undertaken prior to and following construction work at receivers within 15 metres of rock breaking and vibratory compaction activities, including the heritage items at V1 and V2.</li> <li>• No impact piling work would be undertaken within the proposal area unless additional assessment and monitoring confirm that vibration levels will be below project specific criteria</li> <li>• Rock breaking/hammering/vibratory compaction will not be undertaken within seven metres of any heritage item or building unless additional assessment and monitoring confirm that vibration levels will be below project specific criteria</li> <li>• Rock breaking/hammering/vibratory compaction will not be undertaken within five metres of any non-heritage building unless additional assessment and monitoring confirm that vibration levels will be below specific criteria relating to the area.</li> <li>• Where rock breaking/hammering is planned within 10 metres of any occupied dwelling, the occupants will be notified of the work and the duration of the activity will be restricted, unless otherwise agreed</li> </ul>		

Impact	Environmental safeguards	Responsibility	Timing
	<p>with affected residents.</p> <ul style="list-style-type: none"> <li>Where heavy plant is used within seven metres of a heritage structure, attended vibration monitoring will be undertaken to assess compliance with project specific vibration criteria.</li> <li>Where vibration criteria is to be exceeded specific to vibration for structural damage is recorded during monitoring, work will cease immediately and alternative construction methods will be used.</li> </ul>		

## 6.2 Traffic, transport and access

A traffic assessment was undertaken as part of the Boundary Street Intersection Improvements Concept Design Report (Roads and Maritime 2012). The following traffic, transport and access assessment is based on the outcomes of this report. A summary has been provided below. Access is also discussed in **Section 6.7**.

### 6.2.1 Methodology

#### Study area

The study area specific to the traffic, transport and access assessment includes the proposal area, as shown in **Figure 1-2**. Roads next to the proposal area are also considered, including Melnotte Avenue to the east and Corona Avenue to the west.

#### Traffic flows and composition

A range of traffic data has been used for the traffic assessment. The data reviewed included:

- Classification counts: Surveys were undertaken on 25 November 2010 between 6:00am and 10:00am and 3:00pm and 8:00pm. This survey recorded traffic volumes, traffic direction and vehicle type to provide counts for a typical week day (Roads and Maritime, 2012).
- Field and data observations: These observations were undertaken in parallel with the classification counts on 25 November 2010. These considered bus movements, pedestrian and cyclist movements and traffic flow characteristics (Roads and Maritime 2011, Roads and Maritime, 2012).

#### Road network performance

Level of service (LoS) is a qualitative measure used to assess the efficiency of a roadway or an intersection (Austroads 1988). For a roadway, LoS measures speed and travel time, traffic interruptions, freedom to manoeuvre, safety, driving comfort and convenience. LoS ranges from best conditions (LoS A) to worst conditions (LoS F). **Table 6-13** provides a description of each LoS category.

**Table 6-13 Mid-block level of service (LoS)**

LoS*	Description
A	Free flow, with almost no delays.
B	Stable flow with slight delays
C	Stable flow with acceptable delays.
D	Approaching unstable flows with tolerable delays.
E	Unstable flows with congestion and intolerable delays.
F	Forced flow, with traffic jams and no movement at times.

\* Note that these descriptions are based on those provided in the Austroads Guide to Traffic Engineering Practice (Austroads, 1988). It is noted that a new system for calculating LoS is provided in the Highway Capacity Manual (TRB, 2010), however this method is not discussed here. This is to ensure consistency with traffic information provided in the traffic assessment (Roads and Maritime 2012).

## 6.2.2 Existing environment

A description of the existing roads and road infrastructure is provided in **Section 2.2**. The main features of relevance are described below.

The road network considered in the vicinity of the proposal area includes a mix of state, regional and local links. The section of the Pacific Highway within the proposal area includes a three lane carriageway with a posted speed limit of 60 kilometres per hour. The section of Boundary Street within the proposal area consists of one eastbound and three westbound lanes between the Pacific Highway and Hill Street, and two westbound lanes between Hill Street and Melnotte Avenue with a posted speed limit of 60 kilometres per hour.

Four intersections are located within the proposal area and provide access to residential areas in Roseville and Chatswood. These intersections are described in **Table 6-14** and shown on **Figure 1-2**.

**Table 6-14 Existing intersections within the proposal area**

Intersection	Characteristics
Pacific Highway/ Boundary Street/ Corona Avenue	<ul style="list-style-type: none"> <li>• Signals for the Pacific Highway/ Boundary Street component of the intersection.</li> <li>• Give way, left turn only from Corona Avenue.</li> </ul>
Boundary Street/ Hill Street	<ul style="list-style-type: none"> <li>• Priority/ give way.</li> <li>• Restricted right turn from Boundary Street (westbound) outside the hours of 6:00am-10:00am and 3:00pm-7:00pm.</li> <li>• No restrictions to turning movement for buses.</li> </ul>
Boundary Street/ Archer Street	<ul style="list-style-type: none"> <li>• Signals at T-junction.</li> </ul>
Boundary Street/ Melnotte Avenue	<ul style="list-style-type: none"> <li>• Priority/ give way.</li> <li>• Clearway at Melnotte Avenue.</li> <li>• No right turn from Boundary Street (eastbound) into Melnotte Avenue.</li> </ul>



## Traffic environment

Traffic counts give an indication of the existing traffic distribution within the proposal area. The highest hourly mean morning and afternoon volumes for each location are shown in **Table 6-15**.

**Table 6-15 Peak hour traffic volumes**

Location	Morning peak period			Afternoon peak period		
	Direction	Vehicles/ hour	LoS	Direction	Vehicles/ hour	LoS
Boundary Street, east of Archer Street (two lanes in each direction)	Eastbound	1,014	B	Eastbound	1,694	D
	Westbound	1,507	D	Westbound	1,213	C
Pacific Highway, south of Boundary Street (two lanes northbound, three lanes southbound)	Northbound	1,684	D	Northbound	2,602	F
	Southbound	3,064	E	Southbound	2,028	C

Source: Roads and Maritime 2012

**Table 6-15** shows that during the morning peak period, the predominant traffic flow is in the westbound direction along Boundary Street, and the southbound direction along the Pacific Highway. During the afternoon peak period, the predominant traffic flow is in the northbound direction along the Pacific Highway and the eastbound direction along Boundary Street.

The Network and Corridor Planning Practice Notes (Roads and Maritime 2008) indicate that the class average LoS for the locations listed in **Table 6-15** is LoS D. **Table 6-15** indicates that during the morning peak period, the Boundary Street and the Pacific Highway (northbound) LoS is at or above the average of similar roads within its class. However, during this period, the Pacific Highway (southbound) LoS E is lower than the average of similar roads within its class. Similarly, during the afternoon peak period, the Boundary Street and the Pacific Highway (southbound) LoS is at or above the average of similar roads within its class. However, during this period, the Pacific Highway (northbound) LoS F is lower than the average performance of similar roads within its class.

Field observations during the traffic survey also indicate the following with regards to traffic characteristics:

- The morning peak traffic period is between 6:45am and 7:45am, while the afternoon peak traffic period is between 4:00pm and 5:00pm.
- Left turns from Corona Avenue to the Pacific Highway is very low, with a maximum of 13 vehicles in the AM peak.
- Traffic movements on the Pacific Highway are tidal in nature, with high traffic volumes southbound in the morning, and high traffic volumes northbound in the afternoon.
- Disproportionate traffic volumes (four times more) from Archer Street to Boundary Street in the afternoon peak period than in the morning peak period.

Heavy vehicle proportions on the Pacific Highway were about four per cent in the morning survey period and two per cent in the afternoon survey period. The

proportion of heavy vehicles recorded on Boundary Street ranged between four and eight per cent depending on the time of day and travel direction.

### **Public transport**

The North Shore and Western railway lines link Sydney's western suburbs (Penrith and Blacktown) with Sydney CBD and Sydney's northern suburbs (Hornsby and Berowra). It also provides an intercity transport link between the Blue Mountains, Sydney and Central Coast regions. The railway line is used daily for interstate, intercity and local rail services. Within the proposal area, the North Shore and Western railway line traverses in a north-south direction and passes over Boundary Street via a rail overbridge. Roseville train station is located about 400 metres to the north of the proposal, while Chatswood train station is located about 1 kilometre to the south of the proposal.

Bus services near the proposal are operated by a number of bus and coach operators including Sydney Buses, Forest Coaches, and TransDev-Shorelink. Many of these services use Archer Street to access Sydney's northern suburbs and northern beaches suburbs. Some services also use Hill Street to access Sydney's northern suburbs.

The main bus interchange is located at Chatswood, about one kilometre south of the proposal. Other bus stops located within or near to the proposal area are shown in **Figure 6-7** and include:

- Pacific Highway, adjacent to 17 and 22 Pacific Highway, Roseville (north of the Boundary Street/Pacific Highway intersection).
- Pacific Highway, adjacent to 1000 Pacific Highway, Roseville (south of the Boundary Street/Pacific Highway intersection).
- Hill Street, adjacent to 1 Victoria Street, Roseville.
- Boundary Street, adjacent to 16 and 33 Boundary Street, Roseville.
- Bus stops are also located on Archer Street and adjacent to the Roseville train station.

### **Other infrastructure**

Formal pedestrian pathways are located on both sides of the Pacific Highway, Boundary Street, Hill Street, Archer Street and Melnotte Avenue. The pedestrian pathway under the Boundary Street railway bridge is protected from traffic with a metal fence. The pedestrian pathway along the northern edge of Boundary Street to the Archer Street intersection is raised and separated from traffic by a vegetated slope. The field survey recorded a number of pedestrian and cyclist movements at the Boundary Street and Archer Street intersection, across the south and west sides of the intersection (signalised).

There are no crossing opportunities for pedestrians to cross from one side of the Pacific Highway to the other side within the proposal area. Signalised crossing opportunities are available at:

- Boundary Street, at the intersection with the Pacific Highway.
- Boundary Street, on the western side of the Archer Street intersection.
- Archer Street, at the intersection with Boundary Street.

Cyclist facilities are limited in the proposal area. Currently, cyclists use Boundary Street and there are no dedicated cycling facilities. The Northern Sydney Cycling Map indicates that there is a network of marked on-road routes as well as suggested unmarked on-road routes through many side-streets of Roseville (Sydney Publishing 2010).

There are no formal parking facilities within the proposal area. However, local roads such as Hill Street and Melnotte Street have on-road parking, with limited on-road parking available on some stretches of Archer Street.

### **Crash history and road safety**

Detailed crash data was collected by the Transport Centre for Road Safety (2013) between July 2007 and June 2012 between the Pacific Highway and Boundary Street intersection to Spearman Street. A total of 43 crashes were recorded during this period.

Out of the 43 crashes:

- The majority of crashes occurred on Boundary Street and the Pacific Highway, with twenty-two crashes (about 51 per cent) on Boundary Street and 17 crashes (about 40 per cent) on the Pacific Highway.
- Fifteen crashes (about 35 per cent) were injury crashes, while 28 crashes (about 65 per cent) were non-injury crashes.
- Nineteen crashes (about 44 per cent) involved turning vehicles, while 11 (about 26 per cent) were rear-end crashes.
- Eleven crashes (about 26 per cent) occurred in wet weather.

### **6.2.3 Potential impacts**

#### **Construction**

The proposed construction activities are outlined in **Section 3.3**. Potential construction related impacts of the proposal are generally associated with an increase in construction traffic volumes as well as a change in the type of traffic using Boundary Street and Hill Street.

#### ***Construction traffic volumes***

Construction is planned to occur over an 18 month period between 2014 and 2015. Construction traffic comprising light vehicles, haulage trucks, concrete trucks and delivery trucks would lead to a temporary increase in traffic along the Pacific Highway and Boundary Street and some local roads.

It is anticipated during normal working days that 20 to 25 heavy vehicle and 20 to 30 light vehicle movements would be required per day on and off site. Light vehicle movements generated by construction workers would coincide with the morning peak period, but would not coincide with the afternoon peak period. These movements are expected to have a minor impact on traffic flows, given the capacity of the roads being used. The additional vehicle movements associated with construction of the proposal is not expected to change the LoS for any of the roads in the proposal area. Wherever possible, light vehicles would be parked within the site compound to avoid the parking on local roads.

### ***Transport of excavated material and fill***

During construction, excavated material and fill may need to be moved to and from the construction site. Estimates for the volume of material associated with earthworks are provided in **Section 3.3**. Due to the narrow road corridor, haulage across the proposal may be required. Any haulage would be in accordance with a Construction Traffic Management Plan.

It is expected that the majority of construction truck movements for the proposal would be tipper trucks in the form of a truck and dog trailer or semi-trailer (articulated vehicle) (refer to **Section 3.3**). Vehicles which are over height, over size or over mass are not anticipated for this proposal.

### ***Construction access***

Access points to the construction site and the construction compound site at Lot 1 DP531547 and Lot 19 DP135079 would be required to facilitate construction activities. All access points and site roads would:

- Have safe intersection sight distance.
- Accommodate the turning movements of the largest heavy vehicles.
- Provide left and right deceleration lanes.
- Provide painted median treatments for vehicle delineation.
- Provide suitable intersection layouts during the work.

Private property access is proposed to be maintained during construction although localised changes to access arrangements and locations may be necessary. These would be dealt with on an individual basis (with property owners consulted prior to the works) and addressed in the CTMP for the proposal. Short term lane closures may be implemented for the construction work which could disrupt traffic on the Pacific Highway. Impacts to access to private property during construction are further discussed in **Section 6.7**.

### ***Increased travel times***

During construction, the speed limit may be reduced to 40 kilometres per hour where required through the proposal area. This would delay travel time across the proposal. There may also be additional delays due to traffic control to allow construction vehicles to travel through the proposal area. This would be monitored throughout construction to ensure traffic flow is maintained on the road network.

### ***Local access***

Temporary changes to local access would be required due to potential delays and disruptions associated with construction work. These include:

- Changes to access arrangements for vehicles using Hill Street, and for property access for residents.
- Disruption to the operation of bus stops within the proposal area, including changes to bus routes as a result of the removal of a right-turn on Hill Street.
- Restricted access to Hill Street having an indirect impact on access to Roseville railway station.
- Changes to access arrangements for pedestrians and cyclists within the proposal area.

## Operation

The change to left in-left out only traffic movements at Hill Street would require vehicles travelling north to Roseville and the eastern side of Roseville station to access the local area via Pacific Highway or alternate local access roads. Bus service providers that turn right into Hill Street were consulted regarding the need to alter the bus route (refer to **Section 5.5**). The signalised crossings would maintain north-south pedestrian and cyclist movements.

### ***Road network performance and safety benefits***

The proposal would provide the road network performance benefits due to the provision of:

- Additional dedicated turning lanes at Boundary Street and the Pacific Highway, which would reduce congestion by limiting queuing and queue overflows, particularly during peak periods.
- A dedicated turning lane at the Boundary Street and Archer Street intersection would assist in removing delays for through traffic on Boundary Street and Archer Street.
- A left-in/left-out only access at Hill Street would reduce delays on Boundary Street, currently caused by right turns in and out of Hill Street.

The construction of protected turning lanes and introduction of amended turning behaviour along Boundary Street is expected to result in an improvement in crash statistics, particularly for turning manoeuvres.

The proposed road network changes would improve traffic flow within the proposal area, and would result in benefits regarding safety for road users and road network performance. The proposal is expected to improve LoS as a result of improved traffic flow.

## 6.2.4 Safeguards and management measures

The proposed safeguards and management measures for traffic, transport and access are listed in **Table 6-16**.

**Table 6-16 Safeguards and management measures for traffic, transport and access**

Impact	Environmental safeguards	Responsibility	Timing
Construction traffic management	<ul style="list-style-type: none"><li>• A detailed traffic management plan will be prepared in accordance with the Roads and Maritime Traffic Control at Work Sites (2010) and Roads and Maritime Specification G10 - Control of Traffic, to provide a comprehensive and objective approach to minimise any potential impacts on-road network operations during construction.</li><li>• The traffic management plan will include measures to minimise heavy vehicle usage on local roads. Where practicable, deliveries of construction plant and materials will be undertaken outside of peak traffic periods.</li></ul>	Construction contractor	Pre-construction, construction

Impact	Environmental safeguards	Responsibility	Timing
	<ul style="list-style-type: none"> <li>Consultation with emergency services and maintenance of access for emergency vehicles.</li> </ul>		
Public transport	<ul style="list-style-type: none"> <li>Consultation with local bus operators and Sydney Trains would be undertaken during development of the detailed design. The consultation would include selection of temporary bus stop locations within the proposal area.</li> <li>Access to appropriate bus stop locations would be maintained during construction in consultation with bus operators.</li> <li>Ongoing updates on locations and access to bus stops would be provided to the community during construction period to ensure that disruption is minimised.</li> </ul>	Roads and Maritime and construction contractor	Pre-construction and construction
Traffic delays	<ul style="list-style-type: none"> <li>The community will be kept informed about upcoming road construction activities, including through advertisements in the local media and by prominently placed advisory notices and/or variable message signs.</li> </ul>	Roads and Maritime	Construction
Pedestrians and cyclists	<ul style="list-style-type: none"> <li>Pedestrian and cyclist access will be maintained throughout construction.</li> <li>Provision of signage outlining the pedestrians and cyclist diversion routes would be displayed during construction.</li> <li>There will be advance notification of any construction work that affect pedestrians and cyclists.</li> </ul>	Construction contractor	Construction
Design	<p>Detailed design would include consideration of the following;</p> <ul style="list-style-type: none"> <li>Possible extension of the tie in to Hill Street road pavement if justified to ensure a safe tie-in for cyclist thoroughfare.</li> <li>Assessment of the need for safety fence between the shared path and Boundary Street.</li> <li>Coordinating traffic light sequencing to minimise impact to traffic flow along Boundary Street.</li> </ul>	Roads and Maritime	Detailed design

### 6.3 Non-Aboriginal heritage

A specialist assessment of non-Aboriginal historic heritage impacts has been undertaken for the proposal as part of this REF. The following provides a summary of the non-Aboriginal heritage impact assessment. The full impact assessment report, including two Statements of Heritage Impact (SOHIs), is attached at **Appendix D**.



### 6.3.1 Methodology

#### Study area

The study area specific to the non-Aboriginal heritage impact assessment includes the proposal area, as shown in **Figure 1-2**. In addition, conservation areas outside of the proposal area are considered, as shown in **Figure 6-2**.

#### Register searches

Previously recorded heritage items within and adjacent to the study area were identified through a search of the following statutory and non-statutory heritage registers. This search was undertaken in July 2013. Databases searched include:

- World Heritage List.
- National Heritage List.
- State Heritage Register (SHR).
- Section 170 registers of Roads and Maritime, Sydney Water, Department of Planning and Infrastructure (DP&I), Energy Australia and Sydney Trains.
- Heritage schedules of the Willoughby LEP 2012 and Ku-ring-gai LEP (Local Centres) 2012.
- Register of the National Trust (RNT).
- Register of the National Estate (RNE).

Statements of heritage significance were sourced, where available, from the relevant heritage registers. Where existing statements of heritage significance were not available for the identified heritage items, brief statements of significance were prepared as part of this assessment in accordance with the NSW heritage assessment guidelines.

#### Site survey

A site visit of the study area was undertaken to verify previously recorded historical heritage items and associated heritage curtilages, identify any additional (previously unrecorded) historical heritage items or archaeological sites, assess the potential for archaeological resources, and assist in the assessment of potential heritage impacts. Potential archaeological resources within the study area are expected to be limited as the ground surface and soils have been extensively disturbed through urban development.

#### Literature review

The study area has been the subject of several previous heritage studies and the results of these studies were reviewed as part of this impact assessment.

### 6.3.2 Policy setting

#### Heritage legislation and statutory listings

Protection of historical heritage in NSW is provided for by the *Heritage Act 1977* and environmental planning instruments (such as LEPs) made under the EP&A Act (refer to Chapter 4). This legislation provides for the protection of items of State and local heritage significance. The Commonwealth EPBC Act provides additional protection for historical heritage items in NSW that are declared to be of National and/or World heritage significance. The Heritage Act also provides for the protection of historic archaeological 'relics', being archaeological material that relates to the non-Aboriginal settlement of NSW and is of State or local significance.

Recognised historical heritage items are provided with statutory protection through listing on statutory heritage registers made under the above-mentioned heritage legislation. The statutory registers providing protection for heritage items within the State of NSW are as follows:

- World Heritage List, which is maintained by the United Nations Educational, Scientific and Cultural Organisation and lists items that are recognised to be of international significance.
- National Heritage List, which is administered by the Australian Government under the EPBC Act and lists places of outstanding heritage significance to Australia.
- State Heritage Register (SHR), which is administered by the Heritage Branch of the Office of Environment and Heritage under the Heritage Act and lists places and objects of particular importance to the people of NSW.
- Section 170 Heritage and Conservation Registers (s.170 registers), which are created by government agencies under Section 170 of the Heritage Act to provide a record of heritage items owned, occupied or managed by those bodies.
- Heritage schedules of local government LEPs and Development Control Plans (DCPs), which are administered by local government councils and list all heritage items of National, State and local significance within the respective LGAs.

Depending on its level of heritage significance an item may be listed on one or more of the above-listed registers

### **Non-statutory heritage registers**

Items and places of historical heritage significance may also be listed on non-statutory registers. The key non-statutory registers in NSW are:

- The Register of the National Estate (RNE), which was originally established as a statutory register but was frozen in 2007, ceased to be a statutory register in 2012, and is now maintained by the Australian Government as a publicly available archive and educational resource listing natural, Indigenous and historic heritage places throughout Australia.
- The Register of the National Trust (RNT), which was established in 1949 and is maintained by the National Trust of Australia.

Listings on non-statutory registers do not provide statutory protection but demonstrate the recognised heritage value of the listed items.

### **Heritage assessment criteria**

Guidelines produced by the NSW Heritage Branch of OEH (formerly the NSW Heritage Office) include guidelines for assessing the significance of heritage items. The heritage assessment guidelines identify two significance thresholds: State significance and local significance. The guidelines are founded on the NSW heritage assessment criteria, which aim to minimise ambiguity and maintain consistency in the assessment process. The criteria encompass the four values identified in the Australia International Council on Monuments and Sites (ICOMOS) Burra Charter: historical significance, aesthetic significance, scientific significance, and social significance.

### 6.3.3 Existing environment

#### Historical context

European settlement to the north of Boundary Street began in the 1810s, with early land uses comprising cattle grazing, small-scale farming, dairying and orchards. Major land subdivisions did not occur in Roseville until after establishment of the railway in 1890. The first subdivision for housing in Roseville occurred in 1893 to the east of the Pacific Highway along Boundary Street and Victoria Street. This subdivision was known as Roseville Park Estate and provided large one acre blocks suitable for villa development. Between 1910 and 1920, subdivision and release of land began to increase and saw the subdivision of large land holdings into smaller residential blocks. Several shops, churches and schools were established before World War One.

Development to the south of Boundary Street began in 1825 when Richard Archbold was granted 600 acres of Crown land between Victoria Avenue, Boundary Street, Anderson Street and High Street, including most of the proposal area. Shortly afterwards the land was returned to the Crown until it was purchased in 1850 by John Stirling of the Bank of Australasia. In 1854, after being purchased by a retired Auditor General of Colonial Accounts and a shareholder of the Bank of Australasia, William Lithgow, 400 acres of the land was subdivided and put up for sale as part of the 'Township of North Sydney' plan. Development in the area was slow until the late nineteenth century when it was announced that a railway line was to be constructed. Following completion of the railway in 1890, the building of large Federation style homes on large allotments began to increase. The end of World War One saw another wave of subdivision and building activity. In the 1950s Boundary Street was realigned and the number of properties facing the road was reduced.

Eight listed heritage items and conservation areas) were identified within or next to the proposal area as a result of heritage register searches and literature review. These are presented in **Table 6-17** and shown in **Figure 6-2**. No previously unknown or unlisted heritage items or areas of archaeological potential are located within the proposal area.

All identified heritage items within and next to the proposal area are of local heritage significance. There are no items of National or State significance within or adjacent to the proposal area.

**Table 6-17 Historical heritage sites located within or adjacent to the proposal area**

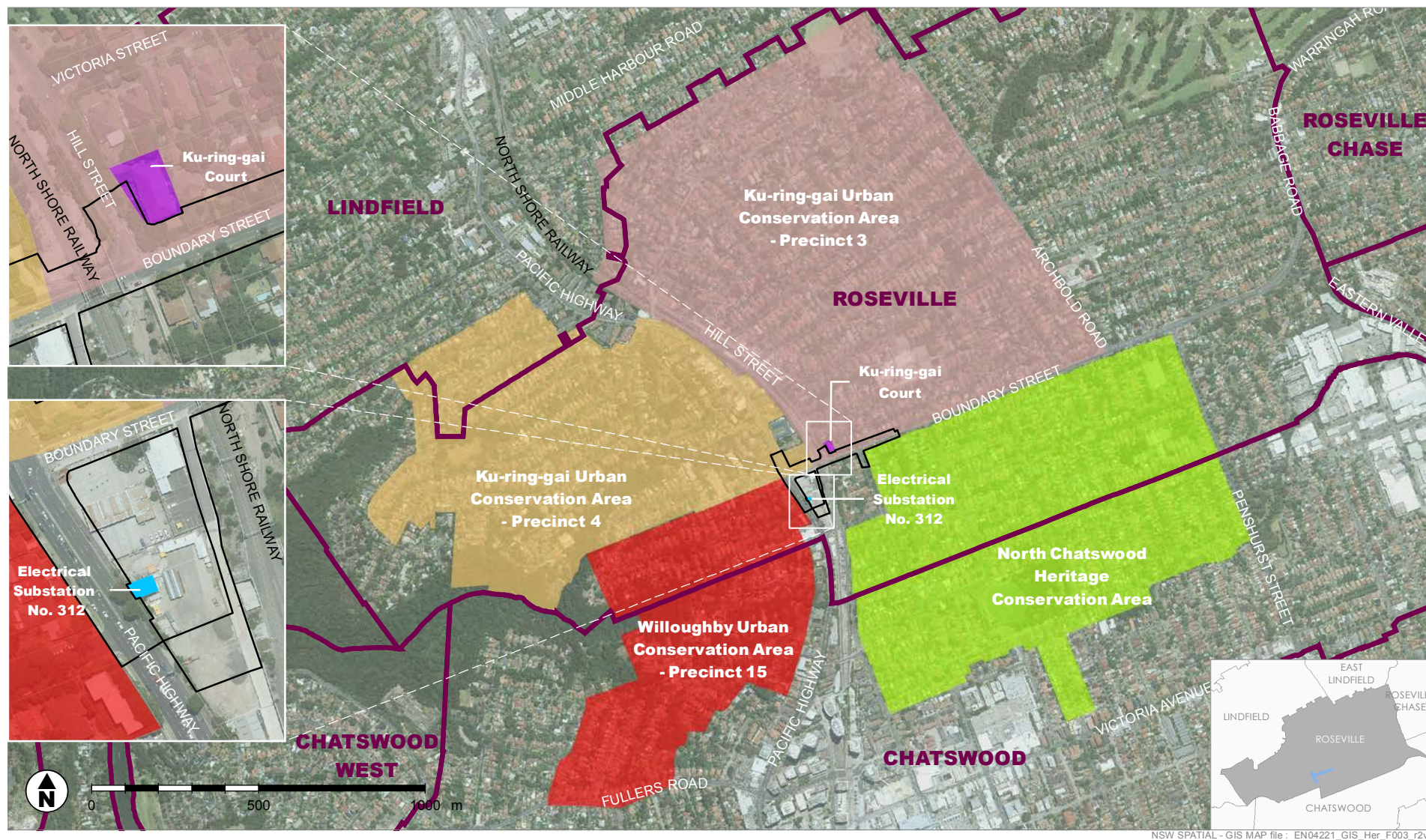
Item name	Location	Listing	Listing ID	Heritage significance
Ku-ring-gai Court	3 Boundary Street, Roseville, Lots 1-10 SP11664	Ku-ring-gai LEP	1100	Local
Electrical Substation No. 312 (#312 Corona Avenue Substation)	1011 Pacific Highway, Roseville, Lot 4 DP128375	Energy Australia s.170 Register	3430471	Local

Item name	Location	Listing	Listing ID	Heritage significance
North Chatswood Heritage Conservation Area <sup>1</sup>	Generally bounded by Boundary, Penshurst and Anderson Streets and Victoria Avenue	Willoughby LEP	C10	Local
Chatswood Urban Conservation Area - North Chatswood Precinct	Generally bounded by Boundary, Penshurst and Anderson Streets, Victoria Avenue and Pacific Highway	RNT	S6995	Local
Chatswood Urban Conservation Area	Generally bounded by Boundary, Macquarie, Nicholson, Blakesley and Havilah Streets and Victoria and Malvern Avenues	RNE	2956	Local
Willoughby Urban Conservation Area – Precinct 15, Roseville West	Generally bounded by Corona Avenue, Pacific Highway, Wyvern Avenue, View Street, Anglo Street, Tessa Street, Fullers Bridge Road and Davies Street	RNT	S10824	Local
Ku-ring-gai Urban Conservation Area - Precinct 3, Roseville	Generally bounded by Archbold Road and Boundary Street, North Shore railway line, Waimea Road, and Marjorie Street	RNT	S8699	Local
Ku-ring-gai Urban Conservation Area - Precinct 4, Roseville West	Generally bounded by Corona Avenue, Boundary Street, North Shore railway line, Pacific Highway, Shirley, Westbourne, Abingdon, Longford and Toongarah Roads, Blue Gum Creek, and Alexander Parade.	RNT	S8700	Local

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<sup>1</sup> Note: The boundaries for the LEP-listed North Chatswood Heritage Conservation Area, RNT-listed North Chatswood Precinct and RNE-listed Chatswood Urban Conservation Area are slightly different. However, as the three areas are substantially the same, these listings have been treated as a single heritage item for the purposes of the heritage impact assessment. Consequently, for the purposes of this assessment it is considered that there are six listings (not eight, as the three Chatswood conservation areas have been conflated into one listing) within and adjacent to the study area.





- |                   |  |  |
|-------------------|--|--|
| — Proposal area   | Heritage items / conservation areas  | <span style="display: inline-block; width: 20px; height: 10px; background-color: #f4a460; border: 1px solid black;"></span> Ku-ring-gai Urban Conservation Area - Precinct 4 |
| — Suburb boundary | <span style="display: inline-block; width: 20px; height: 10px; background-color: #e066ff; border: 1px solid black;"></span> Ku-ring-gai Court (see inset 1)                  | <span style="display: inline-block; width: 20px; height: 10px; background-color: #90ee90; border: 1px solid black;"></span> North Chatswood Heritage Conservation Area       |
|                   | <span style="display: inline-block; width: 20px; height: 10px; background-color: #00bfff; border: 1px solid black;"></span> Electrical Substation No. 312 (see inset 2)      | <span style="display: inline-block; width: 20px; height: 10px; background-color: #ff4500; border: 1px solid black;"></span> Willoughby Urban Conservation Area - Precinct 15 |
|                   | <span style="display: inline-block; width: 20px; height: 10px; background-color: #f08080; border: 1px solid black;"></span> Ku-ring-gai Urban Conservation Area - Precinct 3 |  |

Figure 6-2 Location of heritage items and conservation areas

With respect to two of the identified heritage items:

### **Ku-ring-gai Court**

The proposal area would encroach on the curtilage of Ku-ring-gai Court. The building is an interwar period three storey brick block of flats with some elements of Mediterranean style decoration (**Figure 6-3**). The building fronts onto both Hill Street and Boundary Street. The building is surrounded by a well-established garden comprising lawn areas, large trees, shrubs and ground cover plantings with both exotic and native species. Stone-lined garden beds surround the building and border the property boundary and central pathway to the main (Hill Street) entrance. The gardens extend outside the property boundary onto the nature strip on both the Hill Street and Boundary Street alignments. The building and grounds are in good condition.

### **Electricity Substation No. 312**

Electricity Substation No. 312 is located outside but immediately adjacent to the proposal area. The substation is a 1929 modest single story brick structure designed in the interwar Georgian Revival Style (**Figure 6-4**). The substation is bounded on the street frontage with a low brick fence that is similar in style to the substation building and appears to date from the same period. The fence is separated into two sections by a galvanised wire double gate. While the substation appears to be in good structural condition, there is painted graffiti on the front of the building and the yard between the building in the fence is filled with leaf litter and rubbish. There are two large cracks in brick fence along the front boundary of the property.

## **6.3.4 Potential impacts**

The potential impacts of the proposal on non-Aboriginal historic heritage are detailed in **Table 6-18**.

**Table 6-18 Potential impacts of the proposal on non-Aboriginal heritage items**

<b>Item name</b>	<b>Listing</b>	<b>Potential impacts</b>	<b>Mitigation required?</b>
Ku-ring-gai Court	Ku-ring-gai LEP	<p>Potential vibration impacts on building during construction</p> <p>The proposal will encroach into the curtilage of this property and will impact on garden and garden structures during construction, including stone edging along Hill Street.</p> <p>In some areas the proposal will encroach up to eight metres into the boundary. Consequently the proposal will remove landscaping and the stone edging around the premises. Property adjustment work including driveway adjustments will also change the visual setting.</p>	Yes



Item name	Listing	Potential impacts	Mitigation required?
Electrical Substation No. 312	Energy Australia s.170 Register	Potential vibration impacts on building and front brick fence during construction. Potential damage to the front brick fence during construction due to proximity of work.	Yes
North Chatswood Heritage Conservation Area (combined conservation area)	Willoughby LEP/ RNT/ RNE	No impact. Proposed work are situated outside the LEP heritage boundary. Proposed works within the RNT listed boundary will have no impact on heritage significance.	No
Willoughby Urban Conservation Area – Precinct 15, Roseville West	RNT	No impact. Proposed work outside the heritage boundary.	No
Ku-ring-gai Urban Conservation Area - Precinct 3, Roseville	RNT	Physical impact within heritage boundary, but no impact on heritage significance of precinct.	No
Ku-ring-gai Urban Conservation Area - Precinct 4, Roseville West	RNT	Physical impact within heritage boundary, no impact on heritage significance of the precinct.	No

The following four items would be impacted or potentially impacted by the proposal:

- Ku-ring-gai Urban Conservation Area - Precinct 3, Roseville.
- Ku-ring-gai Urban Conservation Area - Precinct 4, Roseville West.
- Ku-ring-gai Court.
- Electrical Substation No. 312 (#312 Corona Avenue Substation).

For the first two of the above-listed items (Ku-ring-gai Urban Conservation Area - Precinct 3 and Ku-ring-gai Urban Conservation Area - Precinct 4), there would be physical impacts within the heritage curtilage but no impacts on the heritage values or heritage significance of the items. For these items, measures to mitigate heritage impacts would not be required.

For the other two items (Ku-ring-gai Court and Electrical Substation No. 312), the proposal has the potential to result in adverse impacts on heritage values and significance. Measures would need to be implemented to mitigate impacts on these items. Further details on Ku-ring-gai Court and Electrical Substation No. 312 are provided in the following sections. SoHIs for these items are presented in the Non-Aboriginal Heritage Impact Assessment Report (see **Appendix D**).

All impacts would be limited to the construction phase.

### **Ku-ring-gai Court**

The potential impacts and the proposed mitigation measures which aim to reduce the level of heritage impact are discussed below.

#### ***Potential for physical damage to the building due to construction vibration.***

The Ku-ring-gai Court building appears to be in good condition and potential damage due to vibration impacts is unlikely due to the distance from the work, and stability and fabric of the construction. However, given the heritage status and age of the building, the following mitigation measures would be implemented:

- Construction methods with reduced levels of vibration, and the monitoring of vibration levels to ensure appropriate levels are maintained in accordance with the noise and vibration assessment for this REF.
- As per the Noise and Vibration Management Plan (NVMP), a dilapidation (building condition) report would be completed for this property to assess any vibration impact to the building structure.

#### ***Physical damage to existing gardens including stone garden edging along Hill Street due to design requirement for removal of stone edging and vegetation within the listed heritage boundary.***

In accordance with the Ku-ring-gai Local Centres DCP, the setting and context of a heritage item listed on the Ku-ring-gai LEP must be considered when proposing work adjacent to that heritage item. In addition, response from Ku-ring-gai Council to ISEPP consultation must also be considered. The current setting of Ku-ring-gai Court includes well established gardens both inside the listed heritage boundary and on the footpath/nature strip on both the Hill Street and Boundary Street frontages of the property, outside of the listed curtilage.

The existing gardens at Ku-ring-gai Court are situated on the boundary of the current footpath along Hill Street, and due to the design of the proposed work they will be subject to damage from construction work. The current stone garden edging and some of the existing vegetation, within the listed heritage boundary, will be removed. All property adjustments required at this location would be completed in accordance with the *(Just Terms) Compensation Act 1991*. These negotiations would include consultation regarding potential reinstatement of the stone edging.

#### ***Impact to the garden setting surrounding Ku-ring-gai Court (outside the heritage curtilage) due to removal of gardens and lawned area on the Boundary Street side of the property and along the footpath/nature strip on the Hill Street side of the property.***

In accordance with the Ku-ring-gai Local Centres DCP, the setting and context of a heritage item listed on the Ku-ring-gai LEP must be considered when proposing work adjacent to that heritage item. The current setting and context of Ku-ring-gai Court includes gardens and landscaping outside the existing heritage boundary (which corresponds with the cadastral property boundary). The current setback from the existing Boundary Street footpath to the southern side of Ku-ring-gai Court is approximately 11 metres, which comprises lawn and gardens associated with Ku-ring-gai Court. This will be reduced to a setback of three metres from the new pedestrian path. Gardens and vegetation including some well-established trees and shrubs also exist on the nature strip between the current footpath and Hill Street on the western frontage of Ku-ring-gai Court. These would all be removed as part of the proposed work. The history of the plantings surrounding Ku-ring-gai Court is

unknown. Given the requirements of the proposal, and the physical constraints imposed by the location and proximity of the railway reserve on the opposite side of Hill Street, and the railway bridge in Boundary Street, there appear to be no suitable alternatives to the proposed design.

### **Electricity Substation No. 312**

The potential impacts and the proposed mitigation measures which aim to reduce the level of heritage impact are discussed below.

#### ***Potential for physical damage to the Substation building due to construction vibration.***

The Substation building appears to be in good condition, though the front fence does show cracks, and damage due to vibration impacts is unlikely due to the distance from the work, and stability and fabric of the construction. However, given the heritage status and age of the building, the following mitigation measures are recommended. Construction methods with reduced levels of vibration, and the monitoring of vibration levels would be required in accordance with the NVMP for this proposal. As per the NVMP, a dilapidation (building condition) report would be completed for this premises, including the brick fence along the front boundary, to assess any vibration impact to the building structure.

#### ***Potential for physical damage to the brick fence at the front property boundary due to construction vibration.***

The brick fence along the front boundary of the Substation has cracks in the brickwork and has the potential to be impacted by construction vibration. The same mitigation measures which apply to the Substation building also apply to this brick fence. Construction methods with reduced levels of vibration, and the monitoring of vibration levels would be required in accordance with the NVMP this proposal.

#### ***Potential for physical damage to brick fence at the front property boundary due to proximity of construction work up to the listed heritage boundary.***

The brick fence is situated right on the boundary of the current footpath, and due to this close proximity to the proposed work and the current condition of the fence it could potentially be subject to damage from construction work. Physical damage may potentially be caused by construction machinery coming into direct contact with the fence. Potential impact to the Electricity Substation No. 312 can be managed through implementation of the identified safeguards within the heritage management plan. This includes a safeguard for the provision of a physical barrier to prevent impact to the brick fence. Any damage to the brick would be restored to the existing condition.



Front entrance (Hill Street)



South side entrance (Boundary Street)

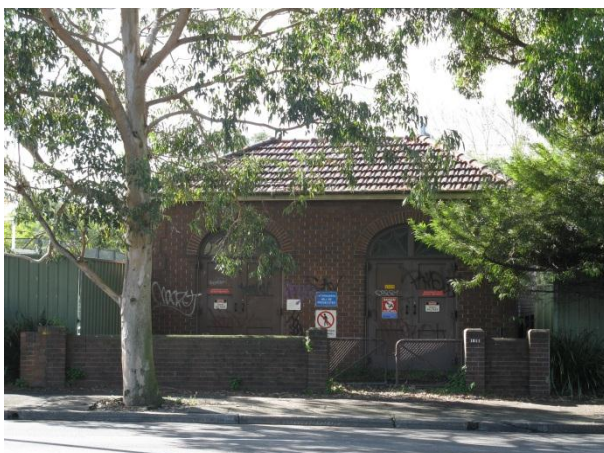


Garden plantings (Hill Street frontage)



Stone garden edging (Hill Street frontage)

**Figure 6-3 Ku-ring-gai Court**



Pacific Highway frontage



Brick wall in front of substation

**Figure 6-4 Electricity Substation No. 132**



### 6.3.5 Safeguards and management measures

The proposed safeguards and management measures for non-Aboriginal heritage are listed in **Table 6-19**.

**Table 6-19 Safeguards and management measures for non-Aboriginal heritage**

Impact	Environmental safeguards	Responsibility	Timing
Non-Aboriginal heritage	Safeguards and management measures for potential vibration impacts on Ku-ring-gai Court and Electricity Substation No.132 including monitoring and dilapidation surveys are outlined in Section 6.1.	-	-
	Detailed design is to consider opportunities to reuse the stone from the stone garden edging at Ku-ring-gai Court during property adjustment negotiations.	Roads and Maritime	Detailed design
	<ul style="list-style-type: none"> <li>A non-Aboriginal Heritage Management plan would be prepared and included in the CEMP. This plan would the following: <ul style="list-style-type: none"> <li>A map identifying locations of items or sites within and around the proposal area.</li> <li>Identification of potential environmental risks/impacts due to the work/activities.</li> <li>Mitigation measures for the identified risks.</li> <li>Measures to physically protect the brick fence around the substation.</li> <li>A physical construction barrier to identify the identified no-go zones.</li> <li>A procedure to report any damage to heritage items compliant with the Roads and Maritime Incident Classification and Reporting Procedure.</li> <li>Identify in toolbox talks where management of non-Aboriginal heritage is required such as identification of no go zones and responsibilities under the <i>Heritage Act 1977</i>.</li> </ul> </li> <li>Requirement to comply with Roads and Maritime Standard Management Procedure -Unexpected Heritage Items, 2013.</li> </ul>	Construction contractor	Construction

Impact	Environmental safeguards	Responsibility	Timing
	<ul style="list-style-type: none"> <li>Should heritage items be unexpectedly uncovered during construction, all work will cease within the vicinity of the item and the steps in the Roads and Maritime Standard Management Procedure: Unexpected Heritage Items (2013) would be followed.</li> </ul>	Construction contractor	Construction

## 6.4 Visual impact

A specialist assessment of potential visual impacts has been undertaken as part of this REF. The following provides a summary of the visual impact assessment. The full impact assessment report is attached as **Appendix E**.

### 6.4.1 Methodology

#### Study area

The study area includes the area covered by the proposal area, as shown in **Figure 1-2**. Streets surrounding the proposal area which have the potential to be visually impacted by the proposal are also considered.

#### Impact assessment

The visual impact assessment was undertaken in accordance with Roads and Maritime's Guidelines for Landscape Character and Visual Impact Assessment (2013) and involved a combination of desktop and field analysis. Key components of the methodology include:

- Site analysis – The natural environment, and the human intervention and shaping of that environment, is identified and described.
- Assessment of the visibility of the proposal – The extent of the development that is visible is defined.
- Identification of key viewpoints – A suite of key, representative locations from which the proposal is visible are identified and defined.
- Assessment of visual impacts – The unmitigated impact of the development on each viewpoint is assessed in terms of the 'sensitivity' of the view and the 'magnitude' of the development within that view.
- Cumulative impact analysis – The combined visual effect of the proposal with any other similar nearby developments and potential developments is assessed.
- Development of the mitigation strategy – Principles and strategies are developed to mitigate visual and landscape character impacts in the ongoing development of the design.

The overall impact rating on each viewpoint is based on consideration of two factors as follows:

- Sensitivity (the sensitivity of the viewpoint) - Each viewpoint has an inherent sensitivity to change based on the context in which the view is experienced. This has a direct bearing on the perception of visual impact experienced by

receptors. The levels of sensitivity for each receptor or viewpoint type are defined in the Visual Impact Assessment Report (refer to **Appendix E**).

- **Magnitude** (the magnitude of the visual impacts on the viewpoint) – To determine the magnitude of the visual impacts on the viewpoint, a series of quantitative factors are assessed. These factors include the distance from the development, the quantum of view, the duration of view (the length of time over which receptors experience the view) and the magnitude of change. The assessment of magnitude is explained further in the Visual Impact Assessment Report (refer to **Appendix E**).

Using the sensitivity and magnitude rating, an overall impact rating is determined using a sensitivity-magnitude rating matrix. The matrix applied is presented in the Visual Impact Assessment Report (refer to **Appendix E**).

The visual impact assessment examined both the construction and operational phases of the proposal.

#### **6.4.2 Existing environment**

The study area is located in a busy urban area in the Sydney suburb of Roseville. The predominant land uses within the study area include infrastructure (arterial and local roads) and residential (high and medium density), with some commercial land uses on the Pacific Highway. The North Shore railway line crosses the study area on an overbridge. There is a high density of street tree planting and other vegetation along Boundary Street.

The visual environment of the study area is that of a typical developed urban setting. View corridors to the site exist along the roads, including the Pacific Highway, Boundary Street, Hill Street and Archer Street. The most distinctive visual feature of Boundary Street is a corridor of street tree plantings on both the northern and southern sides of the road. Plantings on the northern side are particularly dense and include a variety of tree species of varying ages and heights, including Jacarandas and Melaleucas, as well as weed species such as Privet and Camphor Laurel. On the southern side of Boundary Street, plantings of Brush Box (*Lophostemon confertus*) are dominant. While the street trees are not ecologically significant, the mass of vegetation provides a visually important edge to the street and screens the residential properties behind.

Residential properties along affected roads have filtered views to the road corridor, and in some cases are almost completely screened by the surrounding vegetation. The existing local housing character is predominantly from the period 1920 – 1945 and includes examples of interwar housing. Due to changes in planning controls for housing density, the residential character of Boundary Street is anticipated to change in the near future with a greater number of multi-storey dwellings. As discussed in **Section 6.8** a Development Application for the re-development of 5-15 Boundary Street, Roseville was approved in 2012 for the construction of two residential dwellings containing 52 units and basement parking.

#### **6.4.3 Potential impacts**

##### **Key representative viewpoints**

During a visit to the site, eight key representative viewpoints with the potential to be visually impacted by some element of the proposal were selected for assessment. These viewpoints are shown in **Figure 6-5** and listed as follows:



- Viewpoint 1: Pacific Highway near Boundary Street intersection (looking north and south).
- Viewpoint 2: Boundary Street near railway bridge (looking west).
- Viewpoint 3: Boundary Street near Archer Street junction (looking east and west).
- Viewpoint 4: Five residential properties on the southern side of Boundary Street.
- Viewpoint 5: Five residential properties on northern side of Boundary Street.
- Viewpoint 6: Five residential properties on northern side of Boundary Street east of Archer Street.
- Viewpoint 7: Archer Street looking north towards Boundary Street junction.
- Viewpoint 8: Boundary Street near Spearman Street (looking west).

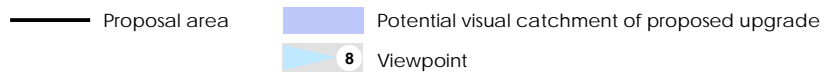


Figure 6-5 Key representative viewpoints

### Potential construction impacts

For the construction phase, the visual impact ratings for the eight identified viewpoints would range from Low-Moderate to High as shown in **Table 6-20**. Only one viewpoint (Viewpoint 6, corresponding to five residential properties on northern side of Boundary Street) would have a High visual impact rating. This rating reflects the proximity of this viewpoint to the road, the sensitivity of the viewpoint to change and the quantum of vegetation that would be removed. Some part of the construction work would be visible from all locations studied.

The majority of visual impacts during construction would be caused by the equipment associated with the road widening, including temporary fencing, signage and construction machinery. The presence of hoardings and temporary signage would result in a more cluttered streetscape and there may be a visible increase in traffic congestion due to construction zone speed limits and the presence of construction vehicles. Vegetation removal to accommodate the road widening work would also occur at this stage, which would reduce the screening of residential viewpoints.

Vegetation trimming and removal would also impact vegetation on the southern side of Boundary Street and along local side streets, including Hill Street and Archer Street. This is because of the excavation and potential tree trimming required for utility adjustments. Excavation may impact the tree roots of adjacent trees which can destabilise or lead to the death of the tree requiring the removal of the tree so it does not become a safety hazard. All vegetation impacts would be limited to within the proposal area as shown in **Figure 6-5**.

Construction phase impacts such as temporary fencing and construction compounds would be temporary. Worksites would be restored and landscaped following the completion of the construction phase in accordance with the proposal description presented in this REF (refer to **Chapter 3**).

### Potential operational impacts

The proposal would result in permanent visual changes to the streetscape at the western end of Boundary Street. The main visual changes would be those associated with the new retaining wall on the northern edge of Boundary Street, new infrastructure (such as raised medians, signage and signals) and the removal of vegetation along the northern and southern edge of Boundary Street. The greatest visual impact would be the removal of existing street trees, which would alter the character of the western end of Boundary Street.

For the operational phase, the visual impact ratings for the eight identified viewpoints ranged from Low to High as shown in **Table 6-20**. As for the construction phase, one viewpoint (Viewpoint 6, corresponding to five residential properties on the northern side of Boundary Street) would be subject to a High level of visual impact and two viewpoints (Viewpoints 3 and 4) would be subject to Moderate-High visual impacts.

It is important to note that five residential properties corresponding to the viewpoint with a High impact rating (Viewpoint 6) would be redeveloped as two multi-storey apartment buildings. The date of construction for the units at 5-15 Boundary Street, Roseville is unknown. This would potentially decrease sensitivity to visual impacts and their visual impact rating (relative to the visual impact rating identified in this assessment).

The Moderate-High visual impact rating for Viewpoints 3 and 4 reflects the removal of street trees from both sides of Boundary Street. The users of the western end of Boundary Street (Viewpoint 3) would experience a noticeable change in the character of the road as the green edge is lost on both sides. The properties on the southern edge of Boundary Street (Viewpoint 4) would be affected by a noticeable reduction in the level of visual screening between their frontages and the road.

In recognition of the potential visual impacts on key representative viewpoints, measures have been incorporated into the proposal design to minimise adverse impacts on the existing visual character of the streetscape as far as practicable within the constraints imposed by the need for road widening.

**Table 6-20 Summary of visual impact ratings for representative viewpoints**

Viewpoint	Visual impact rating: Construction phase	Visual impact rating: Operational phase
1	Moderate	Low
2	Moderate	Low-Moderate
3	Moderate-High	Moderate-High
4	Moderate-High	Moderate-High
5	Low-Moderate	Low-Moderate
6	High	High
7	Low-Moderate	Low-Moderate
8	Low-Moderate	Low-Moderate

### Summary of visual impacts

Overall, the proposal is considered to be in keeping with the scale and bulk of existing road infrastructure in the locality. There are a limited number of visual receptors within the visual catchment of the proposal and the visual changes would have adverse impacts on only a small number of properties. These impacts may also be balanced to some extent by reductions in local traffic congestion as a result of the road upgrade, which may improve the overall amenity of the area for local residents.

The future residential character and scale of the area is set to change in the short to mid-term future, with changes in planning controls permitting a higher density of development on Boundary Street. This is expected to result in the existing single storey properties being re-developed as multi-storey apartment blocks. This is likely to reduce the area's sensitivity to visual change.

The loss of existing mature street trees would be the most noticeable change for road users and existing residents that remain following future re-development.

### 6.4.4 Safeguards and management measures

The proposed safeguards and management measures for visual and landscape impacts are listed in **Table 6-21**. Tree protection safeguards are also detailed in **Section 6.9.4**.

**Table 6-21 Safeguards and management measures for visual and landscape impacts**

Impact	Environmental safeguards	Responsibility	Timing
Removal of street trees	<p>Detailed design will consider the following:</p> <ul style="list-style-type: none"> <li>• Utility adjustment options to minimise impact to tree roots and minimise tree trimming.</li> <li>• Vegetation clearing would be kept to the absolute minimum to accommodate the proposal.</li> <li>• Landscaping</li> <li>• Retaining walls and fencing would be residential in scale and consistent with the character of the existing streetscape.</li> <li>• Retaining wall options to maintain existing streetscape character and maximise planting opportunities.</li> </ul>	Roads and Maritime	Detailed design
	<p>Urban design and landscape objectives will be considered during detailed design, including:</p> <ul style="list-style-type: none"> <li>• Integrating access ways with walls and fencing.</li> <li>• Using a small palette of complimentary materials for all surface treatments.</li> </ul>	Roads and Maritime	Detailed design
Visual impacts of construction activities	The work site will be left in a tidy manner at the end of each work day.	Construction contractor	Construction
	Fencing with material attached (eg shade cloth) would be provided around the construction compounds to screen views of the construction compounds from adjoining properties	Construction contractor	Construction

## 6.5 Topography, geology and soils

### 6.5.1 Methodology

#### Study area

The study area specific to the assessment of topography, geology and soils includes the area covered by the proposal area, as shown in **Figure 1-2**.

#### Assessment

The analysis of topography, geology and soils is based on existing desktop information using topographic maps and database searches. A Phase 1 Environmental Assessment was carried out as part of this REF, and is discussed further in **Section 6.6**.

### 6.5.2 Existing environment

#### Topography

The topography of the proposal area is undulating throughout, with a moderate slope in an easterly direction along Boundary Street, and a moderate slope in a southerly direction from the main intersection along the Pacific Highway. The Spatial



Information Exchange Topographic Maps (Land and Property Management Authority 2007) of the Roseville area indicates that the height of the proposal area ranges from 95 mAHD at the eastern end to 111 mAHD at the northern end (refer to **Figure 6-6**).

### **Geology**

The proposal area is underlain by Bringelly shale, Minchinbury sandstone, and Ashfield Shale (ie shale with some sandstone beds) (Geological Survey of NSW Department of Mineral Resources 1966).

### **Soils**

Residual soils underlying the proposal area are from the Glenorie soil landscape group (Soil Conservation Service of NSW 1983). These soils are found on undulating to rolling low hills on Wianamatta Group shales with a local relief of 50 to 80 metres and slopes of 5-20 per cent. The soils of the group consist of red, brown and yellow podzolic soils with gleyed podzolic soils along drainage lines. The limitations of this soil landscape group are listed as high soil erosion hazard, localised impermeable highly plastic subsoil, and moderately reactive.

Acid sulfate soils are soils and sediments containing iron sulfides that, when disturbed and exposed to oxygen, generate sulfuric acid and toxic quantities of aluminium and other heavy metals. A search of the acid sulphate risk maps from the NSW Natural Resource Atlas database and Willoughby LEP was undertaken to ascertain the presence of ASS on the proposal area. No known areas of ASS risk on or immediately adjacent to the proposal area were identified.

## **6.5.3 Potential impacts**

### **Construction**

As discussed in **Section 6.9**, construction of the proposal would involve the removal of vegetation (clearing and grubbing) and disturbance of the ground surface through the widening on the northern side of Boundary Street, between Hill Street and Melnotte Avenue. The proposal would require earthworks through the construction of a retaining wall on the northern side of Boundary Street, between Hill Street and Archer Street. Earthworks would also be required for utility adjustments.

Construction activities such as vegetation removal and disturbance of the ground surface have the potential to result in erosion and sedimentation. If uncontrolled, the proposal could potentially result in impacts to downstream water quality, via the stormwater network. Water quality impacts from the proposal are discussed further in **Section 6.9**.

As the location of the proposal within an urban area, the distance to natural waterways (the nearest waterway is Blue Gum Creek, located about 500 metres to the west of the proposal), and the relatively flat nature of the topography, the erosion and sediment risks during construction are considered to be minor and can be readily mitigated with standard construction site management measures.

Contaminated land is discussed further in **Section 6.6**.

### **Operation**

Operation of the proposal is not anticipated to result in impacts on the topography, geology or soils of the proposal area.

#### 6.5.4 Safeguards and management measures

The proposed safeguards and management measures for topography, geology and soils are listed in **Table 6-22**. Safeguards and management measures specific to water quality and hydrology are outlined in **Table 6-30**.

**Table 6-22 Safeguards and management measures for topography, geology and soils**

Impact	Environmental safeguards	Responsibility	Timing
Soil and water quality	<ul style="list-style-type: none"> <li>During detailed design an Erosion and Sedimentation Management Report is to be prepared. The report is to include: <ul style="list-style-type: none"> <li>Identify site catchment and sub-catchments, high risk areas and sensitive areas</li> <li>Sizing of each of the above areas and catchments</li> <li>Proposed staging plans for the proposal to ensure appropriate erosion and sediment controls measures are possible</li> <li>The likely run-off from each catchment and sub-catchment and direction of off and on site water flow.</li> <li>Diversion of off-site water around or through the site or details of separation of on-site and off-site water</li> <li>The direction of runoff and drainage points during each stage of construction.</li> <li>The locations and sizing of sediment sumps as well as associated drainage.</li> <li>A mapped plan identifying the above.</li> </ul> </li> </ul>	Roads and Maritime	Pre-construction
Soil and water quality	<ul style="list-style-type: none"> <li>The Erosion and Sedimentation Management Report will be sent to the Roads and Maritime Senior Environmental Officer for review and verification prior to the construction tender.</li> </ul>	Roads and Maritime	Pre-construction

## 6.6 Contaminated land

The following section presents the results of a Phase 1 Environmental Assessment (contaminated land) carried out on the service station located at 2 Boundary Street, on the corner of Boundary Street and the Pacific Highway, Roseville.



## 6.6.1 Methodology

### Study area

The Phase 1 Environmental Assessment focused specifically on the potential contamination risks associated with the property located on the southern corner of Boundary Street and the Pacific Highway (hereafter referred to as the service station site), as shown in **Figure 6-6**. The property is identified as Lot 101 in Deposited Plan 1042439, and is currently occupied by a 7-Eleven service station. This assessment also includes a review of broader historical information and potential contamination risks relating to sites notified on the NSW EPA contaminated sites register, which extends to the surrounding suburbs of Roseville and Chatswood (hereafter referred to as the study area).

### Assessment

The assessment of contaminated land has been carried out in accordance with the requirements specified for a Phase 1 Environmental Assessment as published in the following guidelines:

- NSW EPA (2000) Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites (NSW EPA, 2000).
- Australian Standard AS 4482.1-2005 Guide to the investigation and sampling of sites with potentially contaminated soil. Part 1: Non-volatile and semi-volatile compounds (AS 4482.1-2005).
- Roads and Traffic Authority, Contaminated Land Management Guideline, (RTA, 2005). The aim of the Phase 1 Environmental Assessment is to identify past and/or current activities that may present or continue to present a potential for contaminated land.

The Phase 1 Environmental Assessment considered:

- The conditions of the service station site.
- The historical use of properties within the study area, including the analysis of historical aerial photographs.
- Reports from previous environmental investigations (where available).
- Other publicly available information used to identify potentially contaminating activities.
- The probability of encountering acid sulphate soils (ASS) during the proposed work.
- The local topography and potential pathways for migration of contaminants. Topography is shown in **Figure 6-6**.

The review of historical information for the study area to identify any known areas of potential site contamination included:

- NSW Land and Property Management Authority, Land and Property Information Division (LPI) historical aerial photographs for the years 1930, 1943, 1951, 1961, 1970, 1980, 1991, 2002 and 2007.
- NSW EPA Contaminated Sites Register and Record of Notices.
- NSW Natural Resources Atlas database for groundwater bores.
- A search of the POEO public register of environmental protection licences, applications, notices, audits or pollution studies and reduction programs for the

suburb of Roseville and Chatswood was also carried out.

The Phase 1 Environmental Assessment also involved a site inspection on 17 July 2013. The site inspection focussed on the service station site and the study area.

### 6.6.2 Existing environment

- The land use surrounding the service station site is primarily residential with some areas of commercial land use, as well as a nearby rail corridor. A review of historical aerial photography shows that the service station site has generally been used for residential and commercial land uses since the 1930s.
- Three notices for contaminated land are located within the suburbs of Roseville and Chatswood, as shown in **Table 6-23**. The service station site has been notified to the EPA and presents a high potential contamination risk. The remaining sites present a low contamination risk as they are located outside of the proposal area. Potential contamination types and migration pathways associated with the two sites are also considered to present a low risk of contamination.

**Table 6-23 Notices for land within the study area**

Suburb	Notified site address	Notified activity	Location
Roseville	2 Boundary Street	Service station	Within proposal area
Chatswood	877-879 Pacific Highway	Service station	About 400 metres south of the proposal area
Chatswood West	728 Pacific Highway	Service station	About 900 metres south of the proposal area

- As discussed in **Section 6.5** and shown in **Figure 6-6**, the topography of the study area is undulating throughout, with a moderate slope in an easterly direction along Boundary Street, and a moderate slope in a southerly direction from the main intersection along the Pacific Highway. The direction of groundwater flow and other migration pathways could not be assessed based on current information, although the surrounding topography suggests that groundwater and surface water would flow in a south easterly direction away from the service station site.
- No environmental protection licences, applications, notices, audits or pollution studies were recorded in Roseville. Seven records were identified in Chatswood. All of these records were located more than one kilometre from the service station site and therefore pose no contamination risk.
- No groundwater wells were identified within the service station site. Fourteen wells are registered within a two kilometre radius of the service station site.



NSW SPATIAL - GIS MAP file : EN04221\_GIS\_CON\_F016\_r1v5

- |                 |                         |   |                                  |                 |
|-----------------|-------------------------|---|----------------------------------|-----------------|
| — Proposal area | Elevation (2m Contours) | Construction compound site and access       | Shared pedestrian/ cycle pathway | Service station |
|                 | 114m                    | Potential secondary access to compound site | Embankment/ retaining wall       |                 |
|                 | 82m                     | Road pavement                               | Concrete median                  |                 |
|                 |                         | Pedestrian path                             | Recently widened railway bridge  |                 |

Figure 6-6 Topography and service station at 2 Boundary Street

### 6.6.3 Potential impacts

#### Construction

A risk rating was assigned to the service station site by evaluating the proposed construction activities at that location and review of the consequences of exposure of the potential contaminants and is shown in **Table 6-24**.

**Table 6-24 Contamination risk posed by activities at the service station site**

Potential contamination constraint	Proposed construction activities in this location	Potential exposure pathways	Risk
<b>7-Eleven Service Station</b>	The proposal encroaches on the northern and western perimeter of the service station site and would require excavation to construct the footpath, road pavement and adjust utilities.	Potential direct exposure of potential hydrocarbon contaminants from excavation within the site boundary and potential exposure also if the contaminants migrate through the groundwater onto site or produce vapour once exposed through excavation.	Moderate - High

#### Operation

Operation of the proposal is not anticipated to result in an increased risk of contaminated land or risk of spills due to the low speed of vehicles.

### 6.6.4 Safeguards and management measures

The proposed safeguards and management measures for contaminated land are listed in **Table 6-25**.

**Table 6-25 Safeguards and management measures for contaminated land**

Impact	Environmental safeguards	Responsibility	Timing
Potential exposure of contamination to site workers, public and environmental receptors.	<ul style="list-style-type: none"> <li>Undertake an intrusive Phase 2 Environmental Site Assessment for the service station in accordance with the requirements of the 2013 NEPM Guidelines and relevant EPA requirements.</li> </ul>	Roads and Maritime	Detailed design
Potential exposure of contamination to site workers, public and environmental receptors.	<ul style="list-style-type: none"> <li>A Contamination Management Plan (CMP) will be prepared in accordance with the <i>Contaminated Land Act 1997</i> and relevant EPA Guidelines. This plan will form part of the CEMP and will include at a minimum:               <ul style="list-style-type: none"> <li>Contaminated land legislation and guidelines including any relevant licences and approvals to be</li> </ul> </li> </ul>	Roads and Maritime and construction contractor	Pre-construction, construction

Impact	Environmental safeguards	Responsibility	Timing
	<p>obtained.</p> <ul style="list-style-type: none"> <li>○ Assessment to identify locations of known or potential contamination and preparation of a map showing these locations.</li> <li>○ Identification of rehabilitation requirements, classification, transport and disposal requirements of any contaminated land within the construction footprint.</li> <li>○ Contamination management measures including waste classification and reuse procedures and unexpected finds procedures.</li> <li>○ A procedure for dewatering and disposal of potentially contaminated liquid waste.</li> <li>○ In the event that indications of contamination are encountered (known and unexpected, including odorous or visual indicators), work in the area will immediately cease until a contamination assessment can be prepared to advise on the need for remediation or other action, as deemed appropriate.</li> <li>○ Procedures for disposal of asbestos in accordance with NSW EPA guidelines (including the waste guidelines) and relevant industry codes of practice.</li> <li>○ Incident management procedure and reporting procedure in accordance with Roads and Maritime and EPA requirements.</li> <li>○ A process for reviewing and updating the plan.</li> </ul> <p>The CMP would be reviewed by Roads and Maritime Senior Environment Officer and Roads and Maritime Land Management Specialist prior to the commencement of work.</p>		



## 6.7 Socio-economic

A specialist assessment of potential socio-economic impacts was undertaken as part of this REF. The following provides a summary of the socio-economic assessment. The full impact assessment report is attached as **Appendix F**.

### 6.7.1 Methodology

#### Study area

The study area for the socio-economic assessment is shown in **Figure 6-7** and includes the Roseville State Suburb, as defined by the Australian Bureau of Statistics (ABS). The study area includes those residents and businesses that are likely to be most affected by the proposal's construction or operation. Boundary Street is also an important connection for residents and business in the wider region. As such, the proposal's wider effects on businesses and communities in the Willoughby and Ku-ring-gai LGAs are also considered.

#### Assessment

The methodology for the socio-economic assessment is guided by the Roads and Maritime Draft Environmental Impact Assessment Practice Note: Socio-economic assessment (EIA-N05) (Roads and Maritime 2013) and involved a combination of desktop and field analysis.

### 6.7.2 Existing environment

#### Population and growth

At the 2011 Census, Roseville had an estimated residential population of about 9,170 people, of which about 1,434 people live in those neighbourhoods closest to the proposed work on Boundary Street. In 2011, the Willoughby and Ku-ring-gai LGAs had populations of about 64,859 people and 109,109 people respectively.

The Ku-ring-gai LGA experienced a growth in population of about nine per cent between 2006 and 2011. Over the same period, the rate of population growth in the Willoughby LGA was about six per cent. This is compared to about seven per cent in Greater Sydney for the same period. The population of both LGAs is projected to grow to 2031, although at considerably lower rates than NSW as a whole.

#### Demography

Roseville includes the following demographic characteristics:

- In 2011, Roseville's population had a median age of 39 years, compared to Greater Sydney at 36 years.
- The suburb had a relatively high proportion of children aged 0-14 years, with this group comprising about 22 per cent of the population in 2011, compared to 19 per cent in Greater Sydney. In addition, Roseville had a slightly higher proportion of older people compared to the wider Sydney region, with about 15 per cent of people aged 65 years or over, compared to about 13 per cent in Greater Sydney.
- Compared to Greater Sydney, Roseville generally had a higher proportion of families with children, with this group comprising about 60 per cent of families compared to about 50 per cent in Greater Sydney.
- Roseville is culturally diverse containing a large proportion of residents being of Asian descent. About 70 per cent of residents speak English at home, with other languages including Cantonese, Mandarin, Korean, Armenian and

German.

- The 2011 ABS Census indicates that the Roseville State Suburb contains the highest possible score of socio-economic advantage (decile of 10) as well as the highest score of economic advantage (decile of 10). This shows that Roseville residents experience a high level of access to employment, income and living conditions.

### **Social infrastructure**

Social infrastructure refers to community facilities, services and networks which help individuals, families, groups and communities meet their social needs, maximise their potential for development and enhance community well-being.

Social infrastructure located within Roseville, close to the proposal includes:

- Public transport facilities, including the Roseville train station to the north and the Chatswood train station to the south. Both train stations service the North Shore railway line, with the Chatswood train station also servicing the Northern railway line and providing a major bus transit centre.
- Bus stops located near to the proposal, as identified in **Section 6.2** and shown in **Figure 6-7**.
- Local parks, including:
  - Bancroft Park at Victoria Street.
  - Roseville Park at Clanville Road.
  - Little Digger Park at Archbold Road.
  - Muston Park at Lord Street.
  - Beauchamp Park at Beauchamp Avenue.
- Roseville Golf Club to the north at Links Avenue.
- St Andrews Church, Roseville to the north at Bancroft Avenue.
- Roseville Public School and Roseville College to the north at Archbold Road and Bancroft Avenue respectively.

An existing pedestrian pathway is also located on the northern side of Boundary Street. The pathway is elevated and includes steps connecting to a pedestrian crossing. It was noted during consultation for the proposal that these steps currently impact on access for elderly people and others with mobility difficulties.

### **Local and regional economy**

Roseville includes a number of local businesses, which mainly service local residents of Roseville and surrounding suburbs of Chastwood West, Lindfield and East Lindfield. These are mainly located along the Pacific Highway near the intersection with Boundary Street as well as near the Roseville train station, on the Pacific Highway and Hill Street. Businesses located near the Roseville train station include retail, restaurants and local services, such as veterinary, real estate and medical services. Three businesses are located at the intersection of Boundary Street and the Pacific Highway, including:

- Seven Eleven petrol station, comprising fuelling and other vehicle related services as well as a retail shop.
- The Framing Factory (framing and mirror retail).



- White Lady Funerals (funeral director services).

The businesses are likely to serve both local and wider regional catchments.

More broadly, Roseville is connected to Chatswood in the south which is identified as a major centre and an area for future economic growth in the Draft Metropolitan Strategy. In addition, Chatswood contains office space for a number of domestic and international businesses as well as a number of local services, including a range of medical services and the Dougherty Community Centre.

Boundary Street is identified as a secondary B-Double truck route, linking the major north-south arterial road of the Pacific Highway to the industrial areas in northern Sydney, including Brookvale and Dee Why.

### **Community values**

Residents within the Willoughby and Ku-ring-gai LGAs value the presence of established trees and gardens and heritage buildings within the local area, and acknowledge that these aspects are rapidly disappearing and are motivated to preserve these aspects of their environment. This is also consistent with the concerns raised by residents during consultation for the proposal about impacts on amenity due to the removal of vegetation (Roads and Maritime 2013).

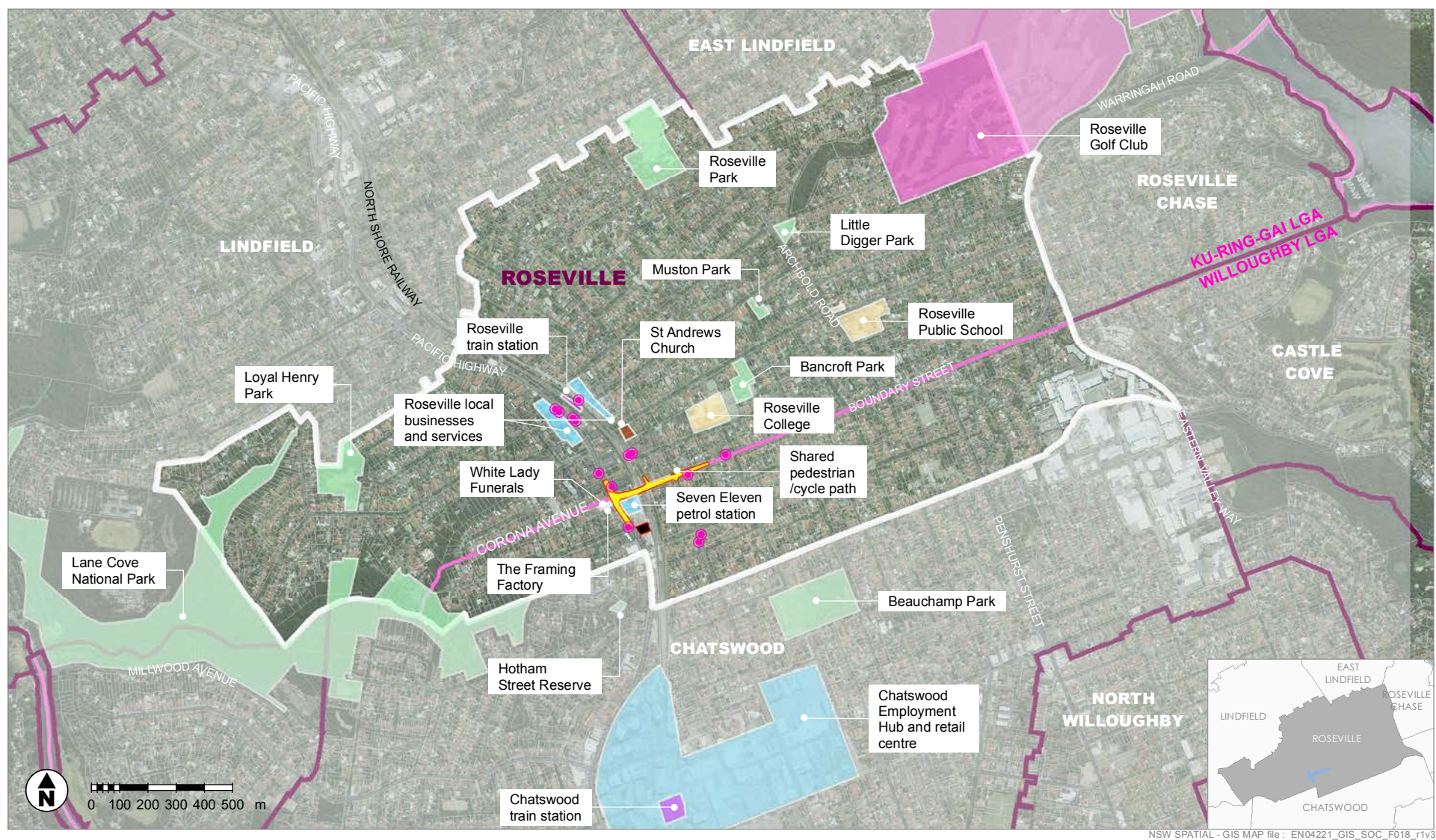


Figure 6-7 Roseville State Suburb and socio-economic features

### 6.7.3 Potential impacts

The proposal has the potential for both wider regional and local benefits in the medium to longer term through reduced traffic congestion and improved access and connectivity. However, the proposal would also result in impacts and changes to the existing socio-economic environment for communities and businesses in Roseville and the wider region.

This section describes the potential impacts of the proposal's design, construction and operation for local and regional communities.

#### Design

##### ***Property acquisition and property adjustments***

As discussed in **Section 3.6**, the proposal would require the partial acquisition or adjustment of 12 properties.

Roads and Maritime would need to undertake property adjustment work within these properties to reinstate their existing features. During detailed design Property Adjustment Plans would be prepared in consultation with the property owners.

Impacts arising from property acquisition include potential uncertainty for affected residents, property owners and the business owner of the Seven Eleven petrol station about the property acquisition process. Roads and Maritime has been consulting with property owners, business owners and local residents since November 2012 (Roads and Maritime 2013). This has included consultation with directly affected residents and businesses about potential impacts and the property acquisition process and opportunities for property owners, business owners and residents to input into the development of the concept design. Roads and Maritime would continue to consult with these groups, as discussed in **Section 5.6**. In addition, Roads and Maritime would continue to consult with affected property owners throughout construction.

##### ***Community values***

The proposal would require the removal of shrubs and mature street trees on the northern and southern side of Boundary Street as well as along the side streets, including Hill Street and Archer Street. Removal of shrubs and street trees would be limited to within the proposal area as shown in **Figure 1-2**. The number of trees to be removed would be determined at detailed design. The proposal would also involve trenching for utility work and the construction of a retaining wall on the northern side of Boundary Street close to Ku-ring-gai Court (3 Boundary Street, Roseville), which is a local heritage listed item under the Ku-ring-gai LEP.

During consultation for the proposal, residents of Ku-ring-gai Court raised concerns around the impact on the heritage values of this property. During consultation, the community also queried whether the construction work had the potential to impact the property foundations. The noise and vibration assessment (refer to **Section 6.1**) concludes that the potential for structural or cosmetic damage at the two heritage items (Ku-ring-gai Court and Electricity Substation No. 312) within the proposal area is minimal. Impacts to Ku-ring-gai Court include loss of landscaped areas.

## **Construction**

### ***Access and connectivity***

Potential impacts to access and connectivity during construction include:

- Potential for changes in access arrangements for local residents and people accessing services and facilities such as St Andrew's Anglican Church, Roseville College, Roseville train station, and businesses to the north of the proposal.
- Interruption of the operation of bus stops, particularly bus stops located adjacent to the proposed construction compound, at the intersection of the Pacific Highway/Boundary Street, and on Boundary Street.
- Potential for changes to access for pedestrian and cyclists near to construction work, including the existing pedestrian pathway between Hill Street and Archer Street.
- Potential for changes to property access particularly on the northern side of Boundary Street and Hill Street.

### ***Local economy***

Boundary Street forms part of a freight route, providing access for freight trucks and commercial vehicles between the Pacific Highway and the industrial areas of northern Sydney. It is anticipated that construction activities at Boundary Street, the Pacific Highway and Hill Street may result in delays and disruption for day-time and night-time freight and commercial traffic.

In addition, parking on Hill Street may be temporarily impacted during construction work at the Hill Street/Boundary Street intersection due to the potential for construction vehicles and plant to occasionally require parking facilities on the eastern side of Hill Street. Safeguards have been included within the traffic and transport section (**Section 6.2.4**) to avoid potential impacts on parking wherever possible. If parking is required, this may result in impact on parking facilities for businesses located on Hill Street requiring visitors to seek alternate parking elsewhere. Alternative parking for businesses to the north of Hill Street is available on the western side of Hill Street as well as streets to the east of Hill Street, including Victoria Street, Bancroft Avenue, Lord Street and Roseville Avenue.

During construction, temporary changes to the existing access arrangements to Seven Eleven petrol station access may also be required.

### ***Local amenity***

Construction activities may result in potential impacts on amenity for local residents and businesses such as The Mirror Factory, White Lady Funerals and the Seven Eleven petrol station. In particular, impacts on amenity may result from increased construction noise and vibration as well as visual impacts. Consultation would be required with the owners of these businesses to ensure that potential impacts are appropriately managed.

Impacts on amenity may be experienced by residents within the proposal area, particularly those located on the northern side of Boundary Street as well as at residential properties near the intersection of Boundary Street/Pacific Highway. Residents located on the southern side of the proposal may also experience impacts on amenity. During consultation, residents of Ku-ring-gai Court and residents on Boundary Street, raised concerns about noise impacts and loss of amenity and privacy. The proposal area also has a relatively high proportion of people who work

from home and elderly people. These people may experience greater disruption from construction noise given that they are more likely to be at home during day-time work during key construction periods, including night time work.

## **Operation**

### ***Access and connectivity***

The proposal would provide improved access and connectivity for pedestrians and cyclists on Boundary Street, between Hill Street and Archer Street through the provision of a shared pedestrian and cycle pathway. In addition, traffic flow would improve through the provision of a dedicated east-bound right turn lane on Boundary Street and west-bound turning lanes on Boundary Street.

Locally, the proposal would result in changed access arrangements for motorists and buses, including:

- Hill Street, which would be converted into a left in/left out turning arrangement. This would change access for some motorists that currently use Hill Street to access the Roseville train station, and businesses and social infrastructure located to the north of the proposal. A right turn from Boundary Street would no longer be permitted at all times. Changes to these access arrangements would require some motorists to use alternate routes to access these businesses and facilities, such as Victoria Street, Bancroft Avenue or Lord Street, via Wandella Street.
- Changes to the intersection arrangements at Hill Street would mean buses would no longer be able to turn into Hill Street. This would require a change to the route for Forest Coaches route number 558. Bus providers were consulted during the early concept phase (refer to **Section 5.5**).

### ***Social infrastructure***

During operation of the proposal there would be no direct impacts on social infrastructure identified within Roseville.

Indirect impacts include changed access arrangements to community facilities located to the north of the proposal, which is discussed above. For example, access arrangements would change at Hill Street for vehicles which currently rely on a right-turn to access Roseville College and St Andrew's Anglican Church.

### ***Local economy***

Direct impacts on businesses include partial property acquisition and property adjustments of the Seven Eleven petrol station property, which would require the relocation of existing signage located on the north-western corner of the property. A Property Adjustment Plan will be prepared during Detailed Design in consultation with both the property and business owners.

Ongoing consultation will be maintained throughout construction to minimise disruption. The partial property acquisition and relocation of the existing signage would not impact on the viability or operation of the Seven Eleven fuelling activities or retail component.

Indirect impacts on the local economy include:

- Changed access arrangements at Hill Street, which could change the way vehicles access businesses located on Hill Street to the north of the proposal. Vehicles would be required to use alternate routes to access businesses located on Hill Street, which could potentially deter the use of or way-finding to



these businesses and services.

- Potential for changed parking arrangements on the southern end of Hill Street, which could change the way vehicles park near businesses located on Hill Street, to the north of the proposal.

#### 6.7.4 Safeguards and management measures

The proposed safeguards and management measures for socio-economic impacts are listed in **Table 6-26**. Refer to **Section 6.1** for noise and vibration management measures and **Section 6.4** for visual impact management measures.

**Table 6-26 Safeguards and management measures for socio-economic impacts**

Impact	Environmental safeguards	Responsibility	Timing
Local amenity, social infrastructure, property acquisition	<ul style="list-style-type: none"> <li>• A Communication Plan will be prepared and included in the CEMP. The Communication Plan will include: <ul style="list-style-type: none"> <li>○ Requirements to provide details and timing of proposed activities to affected residents as well as: <ul style="list-style-type: none"> <li>• Forest Coaches, Transdev and Sydney Buses</li> <li>• Roseville College and Roseville Public School.</li> <li>• St Andrew's Church</li> <li>• Ku-ring-gai Council and Willoughby Council.</li> </ul> </li> <li>○ Contact name and number for complaints.</li> <li>○ Procedure to notify adjacent land users for changed conditions during the construction period such as traffic, pedestrian or driveway access.</li> </ul> </li> <li>• The communications plan will be prepared in accordance with G36 requirements and Roads and Maritime Community Engagement and Communications Manual (2012).</li> <li>• The communications plan would include a complaint handling procedure and register and maintained for the duration of the proposal.</li> </ul>	Construction contractor	Pre-construction and construction
Access and connectivity	<ul style="list-style-type: none"> <li>• Maintain access to properties on the Pacific Highway, Boundary Street and Hill Street during construction.</li> <li>• Signage to be provided during construction to communicate</li> </ul>	Construction contractor	Construction

Impact	Environmental safeguards	Responsibility	Timing
	<p>changes, to ensure safety for pedestrians near to construction work.</p> <ul style="list-style-type: none"> <li>• Access to appropriate bus stop locations would be maintained during construction in consultation with bus operators.</li> <li>• Ongoing updates on locations and access to bus stops would be provided to the community during construction period to ensure that disruption is minimised.</li> <li>• The traffic management plan will include measures to minimise heavy vehicle usage and parking on local roads. Where practicable, deliveries of construction plant and materials will be undertaken outside of peak traffic periods.</li> </ul>		

## 6.8 Land use and property

### 6.8.1 Methodology

#### Study area

The study area specific to the land use and property assessment includes the proposal area, as shown in **Figure 1-2**.

#### Assessment

The assessment of land use is guided by the land use zones contained within the Willoughby and Ku-ring-gai LEPs as well as observations made during a site visit on 28 June 2013. The assessment of property is based on property acquisition and adjustment information provided by Roads and Maritime.

### 6.8.2 Existing environment

#### Land use

The proposal is located within the Willoughby and Ku-ring-gai LGAs. LEP zoning for the proposal is referred to in **Chapter 4** and shown in **Figure 4-1**.

Land uses located directly within the proposal area include:

- Residential properties, mainly including low density residential dwellings as well as some high density residential dwellings at the Boundary Street/Pacific Highway intersection.
- Seven Eleven petrol station and retail shop.
- Road infrastructure, including the Pacific Highway, Hill Street, Archer Street as well as Boundary Street itself.
- Railway infrastructure, including a railway overbridge west of Hill Street and the railway line servicing the North Shore railway line.

Land uses near to the proposal are outlined in **Section 1.1** and **Section 6.5**. Key features are also shown in **Figure 6-7**. The proposal is located within a highly urbanised area and as such is surrounded by the following urban related land uses:



- Residential land uses, comprising established low density and some high density residential properties.
- Local town centres located near to the train stations at Roseville and Chatswood, comprising retail and commercial land uses.
- Local and regional parks, including Lane Cove National Park to the west.
- An industrial park to the east, between Penshurst Street and Eastern Valley Way.

### Property

The proposal area would encroach onto private properties to the north of Boundary Street, comprising residential uses as well as the Seven Eleven petrol station located at 2 Boundary Street, Roseville on the southern side of Boundary Street.

### 6.8.3 Potential impacts

#### Property

As discussed in **Section 3.6** and outlined in **Table 3-5**, the proposal would require the partial acquisition or adjustment of 12 properties. The majority of properties impacted by partial acquisition include residential uses. The extent of property acquisition is relatively small with the majority being strip acquisitions encroaching less than 10 metres. Property adjustment impacts include relocating property boundary fencing, driveway adjustments and loss of roadside trees and landscaped areas.

A development application was submitted to Ku-ring-gai Council in June 2012 for the demolition of the existing buildings and construction of two high density residential buildings, comprising 53 units. The development application has since been approved by Ku-ring-gai Council.

#### Land use

The main construction impacts to land use would include the temporary leasing of land at Lot 1 DP531547 and Lot 19 DP135079 (near 1000 Pacific Highway, Roseville). The construction compound would be temporary and would be rehabilitated for re-use in accordance with local Council land use and development controls.

During operation, the proposal would not result in any long-term impacts in land use.

### 6.8.4 Safeguards and management measures

The proposed safeguards and management measures for land use and property are listed in **Table 6-27**.

**Table 6-27 Safeguards and management measures for land use and property**

Impact	Environmental safeguards	Responsibility	Timing
Property acquisition	All land acquisitions would be conducted in accordance with the Roads and Maritime Land Acquisition Policy and the requirements of the <i>Land Acquisition (Just Terms) Compensation Act 1991</i> .	Roads and Maritime	Pre-construction

## 6.9 Biodiversity

### 6.9.1 Methodology

#### Study area

The biodiversity assessment uses the following terms:

- The 'study area', which refers to the area within a radius of ten kilometres of the proposal area.
- The 'proposal area' is as per the definition provided in **Figure 1-2** of this REF.

#### Database review

The biodiversity assessment is based on a desktop review of existing information. Government databases were reviewed to identify potential threatened species, populations and ecological communities of the study area. Databases were consulted on 4 November 2013. Databases include:

- The NPWS Geographic Information System data layer of Cumberland Plain Woodland (2002) for canopy cover greater than 10 per cent and less than 10 per cent (urban).
- The EPBC Act Protected Matters Search Tool (DSEWPC online) was searched to identify any records of nationally threatened and migratory species listed under the EPBC Act.
- The NSW NPWS Wildlife Atlas database (Office of Environment and Heritage 2013) was searched to identify any records of species listed under the *NSW Threatened Species Conservation Act 1995*.

### 6.9.2 Existing environment

#### Study area

The study area is located in an urban area and is entirely within the bounds of the Sydney Basin bioregion (Interim Biogeographic Regionalisation for Australia 2012). The Sydney Basin bioregion is one of the most diverse areas of flora species in Australia (Office of Environment and Heritage, 2011). The study area has generally been cleared previously for urban development.

**Appendix G** outlines the full results of the database searches identified in **Section 6.9.1**. Note that only 'vulnerable' and 'endangered' search results of species or populations known to occur within 10 kilometres of the proposal area were identified. A summary of the findings is outlined in **Table 6-28**.

**Table 6-28 Biodiversity database search results**

Database	Summary of listing
NSW National Parks and Wildlife Search (NPWS) Wildlife Atlas	<ul style="list-style-type: none"><li>• 23 Threatened Ecological Communities.</li><li>• 1 species of reptile (vulnerable under the TSC Act)</li><li>• 3 species of frogs (2 vulnerable, 1 endangered under the TSC Act and 2 vulnerable under the EPBC Act).</li><li>• 18 species of birds (14 vulnerable, 5 endangered under the TSC Act and 3 endangered and 1 vulnerable under the EPBC Act).</li><li>• 11 species of mammals (9 vulnerable and 1 endangered under the TSC Act and 4 vulnerable and 1 endangered under the EPBC Act).</li></ul>

Database	Summary of listing
	<ul style="list-style-type: none"> <li>• 18 species of flora (9 vulnerable and 9 endangered under the TSC Act and 9 vulnerable, 5 endangered and 1 critically endangered under the EPBC Act).</li> <li>• 9 species of fungi (4 vulnerable and 5 endangered under the TSC Act).</li> </ul>
EPBC Act Protected Matters Search Tool	<ul style="list-style-type: none"> <li>• Three Threatened Ecological Communities.</li> <li>• 77 Threatened Species.</li> <li>• 61 Migratory Species.</li> </ul>

### Proposal area

As shown in **Figure 6-8**, a small area of Turpentine-Ironbark Forest and Blue Gum High Forest (Endangered Ecological Communities (EECs) listed as threatened under the EPBC Act) is mapped within the proposal area, to the north-west. Blue Gum High Forest (also and EEC under the EPBC Act) is located next to the proposal area, to the north-west. During a site visit it was identified that the mapped area of EEC within the proposal area is cleared of vegetation and generally did not conform to the EEC listing due to the absence of key canopy species and understorey.

Magenta Lilly Pilly (*Syzygium paniculatum*) (listed as 'vulnerable' under the EPBC Act) is recorded at a location about 50 metres from the proposal area, to the north-west.

A visual inspection of the existing vegetation within the proposal area was carried out during a site inspection on 28 June 2013. Vegetation located on Boundary Street includes:

- About sixteen street trees on the northern side of Boundary Street, located east of the Boundary Street/Hill Street intersection.
- About seven street trees on the southern side of Boundary Street, located between the rail overbridge and Archer Street.
- About three street trees and isolated patches of vegetation on the northern side of Boundary Street between the Pacific Highway and the rail overbridge.

During the site visit, habitat features such as tree hollows were not identified. Existing vegetation on the Pacific Highway includes about six trees on the eastern side of the Pacific Highway (north and south of Boundary Street). Existing vegetation on Hill Street includes about three trees on each side just north of the Boundary Street/Hill Street intersection.

Other vegetation within the proposal area comprises garden plantings of trees, shrubs and horticultural species. There is no evidence of remnant native vegetation communities present, although a full field investigation has not been undertaken to preclude the presence of remnant trees or other species occurring within planted garden or other areas.

There are species present within the proposal area that are considered weed species, such as lawn grasses; Kikuyu (*Pennisetum clandestinum*) and shrubs; Broad-leaved privet (*Ligustrum sinense*) and Ochna (*Ochna serrulata*) typical of an urban residential setting. The Broad-leaved privet and Ochna are considered Class 4 weeds and Kikuyu is considered a nuisance plant under the *Noxious Weeds Act 1993*.



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- Proposal area
- Construction compound site and access
- Potential secondary access to compound site
- Road pavement
- Pedestrian path
- Shared pedestrian/ cycle pathway
- Embankment/ retaining wall
- Concrete median
- Recently widened railway bridge

Area Containing Species of Endangered Ecological Community

- 15 - Turpentine-Ironbark Forest\*
- 152 - Blue Gum High Forest\*

\* Listed as threatened ecological community under EPBC Act 1999

Threatened Flora (EPBC Act)

- Syzygium paniculatum* (Magenta Lilly Pilly)

Figure 6-8 Proposed vegetation removal



### 6.9.3 Potential impacts

#### Construction

The proposal would require removal of street trees and garden plantings associated with the widening of Boundary Street, including the construction of a retaining wall and shared pedestrian and cycle pathway as well as the widening of the Pacific Highway. All vegetation removal would be within the proposal area as shown in **Figure 6-8** and includes:

- About 16 mature trees on the northern side of Boundary Street east of the Hill Street intersection.
- About three mature trees and isolated patches of vegetation on the northern side of Boundary Street between the Pacific Highway and the rail overbridge.
- About three mature trees on each side of Hill Street, north of the Boundary Street intersection.
- About six mature trees on the eastern side of the Pacific Highway north and south of Boundary Street.
- Garden trees, shrubs and other plantings within acquired properties on the northern side of Boundary Street and at the corner of Pacific Highway.

The proposal would also require trenching on the northern and southern side of Boundary Street as well as along Archer Street and Hill Street. This has the potential to damage the root zones of trees (generally determined by the drip line of the tree) and potentially require the removal of affected trees. Trenching requirements would be determined during detailed design and an arborist would be consulted prior to vegetation removal to advise whether the tree can be retained.

The removal of vegetation is unlikely to have any substantial impact on the habitat or viability of any species, including any threatened flora or fauna species. The removal of vegetation is unlikely to require the removal or disturbance of the Turpentine-Ironbark Forest

The recorded Magenta Lilly Pilly is located outside of the proposal area and would not be impacted by the proposal.

Vegetation clearing may result in the spread of weed species, by distribution of weed seeds, stolons and rhizomes.

### 6.9.4 Safeguards and management measures

The safeguards and management measures for biodiversity that would be implemented as part of the proposal are listed in **Table 6-29**.

**Table 6-29 Safeguards and management measures for biodiversity**

Impact	Environmental safeguards	Responsibility	Timing
Clearing of street trees and shrubs	Opportunities for minimising the clearing of trees and shrubs would be identified during detailed design.	Roads and Maritime	Detailed design
	A level 5 qualified and experienced arborist is to be present during work within the drip line of trees on the	Construction contractor	Construction

Impact	Environmental safeguards	Responsibility	Timing
	<p>southern side of Boundary Street and on Archer Street for the following activities</p> <ul style="list-style-type: none"> <li>• During detailed design, assess the potential impact of utility work on the root zone and prepare a report on the findings</li> <li>• During construction, to inspect actual work zones as indicated by Roads and Maritime staff and advise on whether the tree root zone can be avoided and provide recommendations</li> </ul>		
	<p>A Biodiversity Management Plan (BMP) is to be prepared and included within the CEMP and is to be in accordance with Biodiversity Guidelines: Protecting and managing biodiversity on Roads and Maritime projects (Roads and Maritime Environment Branch, 2011). The BMP is to include the following:</p> <ul style="list-style-type: none"> <li>• A suitably qualified ecologist is to be engaged to visit the site prior to any clearing work to clearly demarcate vegetation protection areas (including habitat trees) and complete a pre-clearing survey report</li> <li>• A pre-clearing survey plan describing survey methodology and targeted species. Target species are to include as a minimum; <ul style="list-style-type: none"> <li>○ Potential Urban Remnant Trees EEC or the Magenta Lilly Pilly (<i>Syzygium paniculatum</i>).</li> </ul> </li> <li>• A site walk with the Roads and Maritime Environmental Officer to confirm clearing boundaries prior to the commencement of work.</li> <li>• A map which clearly shows vegetation clearing boundaries and exclusion/no-go zones</li> <li>• Identification of measures to mark the clearing boundary and protect sensitive areas.</li> <li>• A procedure for clearing of vegetation in accordance with Biodiversity Guidelines: Protecting and managing biodiversity on Roads and Maritime</li> </ul>	Construction contractor	Pre-construction, construction

Impact	Environmental safeguards	Responsibility	Timing
	<p>projects (Roads and Maritime 2011) and Roads and Maritime Specification G40.</p> <ul style="list-style-type: none"> <li>• Incorporation of management measures identified as a result of the pre-clearing survey report and nomination of actions to respond to the recommendations made. This must include details of measures to be implemented to identify and protect clearing limits, habitat features and no-go areas.</li> <li>• Outline a process to communicate biodiversity management measures to all staff including subcontractors.</li> <li>• A stop work procedure in the event of identification of unidentified species, habitats or populations.</li> <li>• A process to review and update the adequacy of the plan in the event of a biodiversity incident.</li> </ul>		
Weed management	<ul style="list-style-type: none"> <li>• Declared noxious weeds are to be managed according to requirements under the <i>Noxious Weeds Act 1993</i> and Guide 6 (Weed Management) of the Roads and Maritime Biodiversity Guidelines 2011.</li> </ul>	Construction contractor	Construction

## 6.10 Water quality and hydrology

### 6.10.1 Methodology

#### Study area

The study area specific to the water quality and hydrology assessment includes the proposal area, as shown in **Figure 1-2**. Water catchment areas located within about two kilometres of the proposal area are also considered.

#### Assessment

The assessment of water quality and hydrology is based on the analysis of existing catchment areas within about two kilometres of the proposal area.



### 6.10.2 Existing environment

The proposal area has been highly modified by urban development and contains no natural waterways. The existing drainage system is an urban stormwater system, comprising road gutters draining to underground pipes and culverts.

The proposal area is located on a ridgeline and is well-drained. As shown in **Figure 6-6** the topography along the length of the proposal is also relatively flat. The stormwater system is designed to convey flows in a manner that minimises flooding of roads during rainfall.

The proposal area is located in the catchment areas of Lane Cove River and Middle Harbour and drains to the following natural waterways:

- The area to the west of the Pacific Highway drains to Blue Gum Creek (a tributary of Lane Cove River and located around 500 metres from the proposal).
- The area to the east of the Pacific Highway and north of Boundary Street drains to Moores Creek (a tributary of Middle Harbour Creek and located around one kilometre from the proposal).
- The area to the east of the Pacific Highway and south of Boundary Street drains to Scotts Creek (a tributary of Middle Harbour and located around 1.5 kilometres from the proposal).

The water quality of Blue Gum Creek, Moores Creek and Scotts Creek is heavily influenced by urban runoff and associated pollutant inflows. The creeks are also affected to varying degrees by overflows from the sewerage system, which generally follows the creeklines. Water quality typically deteriorates after rain due to inflows of urban stormwater and overflows from the sewerage system, with high levels of nutrients, turbidity and faecal coliforms. The creeks nevertheless support important aquatic and riparian ecosystems and add to the natural values of surrounding bushland areas.

### 6.10.3 Potential impacts

#### Construction

##### *Surface water quality and hydrology*

Construction of the proposal would involve changes to the topography and major earthworks through the widening on the northern side of Boundary Street, between Hill Street and Archer Street as well as the construction of a retaining wall at this location. Earthworks would also be required for construction of pedestrian path and utility adjustments.

The construction phase of the proposal has the potential to result in impacts on local water quality through:

- Erosion of soil and sedimentation through stormwater runoff and transport of eroded sediments to nearby waterways, particularly Blue Gum Creek located 500 metres to the west of the proposal.
- Accidental spills of fuels, oils or other chemicals from construction vehicles or equipment. Contaminants could enter the local stormwater system and be transported to nearby waterways, as identified in **Section 6.10.1**. This impact can be managed through mitigation measures and therefore the risk to water quality is low.

Given the proposal's location within an urban area, the distance to natural waterways, and the relatively flat nature of the topography, the risks to water quality during construction are considered to be minor and can be readily mitigated with standard construction site management measures. With the implementation of the proposed safeguards and management measures, the risks to water quality would be minimal.

### **Groundwater**

The construction work does not involve deep excavation or drilling and are therefore is unlikely to have a substantial impact on groundwater.

### **Operation**

The proposal would not alter the topography of the locality or result in any changes to surface drainage pathways. Appropriate road drainage mechanisms have been incorporated into the design of the proposal. Drainage is designed to accommodate stormwater flows generated from the upgraded road sections, as well as the existing roads and landscape features that contribute to local flows. Of particular note, the proposal would be designed so that it addresses existing local drainage issues, such as the need to accommodate stormwater flows from the adjacent railway embankment and overbridge. The drainage design has also considered predicted future climate change effects. As a result, the operation of the proposal would have no adverse impacts on drainage or hydrology and is expected to improve road drainage in the local area.

The operation of the proposal would have no substantial impacts on downstream water quality. The downstream receiving waterways are impacted by runoff from urban areas, including roadways under the existing situation. The proposal constitutes minor widening of short sections of existing roads and incorporates appropriate road drainage. As such, it would not have a substantial influence on either the quality or quantity of inflows to waterways.

## **6.10.4 Safeguards and management measures**

The proposed safeguards and management measures for water quality and hydrology are listed in **Table 6-30**. Safeguards and management measures specific to soils are outlined in **Table 6-22**.

**Table 6-30 Safeguards and management measures for water quality and hydrology**

Impact	Environmental safeguards	Responsibility	Timing
Water quality	<ul style="list-style-type: none"> <li>A Soil and Water Management Plan (SWMP) will be prepared as part of the CEMP in accordance with the requirements of Roads and Maritime contract specification G38 prior to the commencement of construction. The SWMP will also address the: <ul style="list-style-type: none"> <li>Roads and Maritime Code of Practice for Water Management, the RMS Erosion and Sedimentation Procedure</li> <li>The NSW Soils and Construction – Managing</li> </ul> </li> </ul>	Construction contractor	Pre-construction

Impact	Environmental safeguards	Responsibility	Timing
	<p>Urban Stormwater Volume 1 “The Blue Book”(Landcom, 2004) and Volume 2 (DECC, 2008).</p> <ul style="list-style-type: none"> <li>○ Roads and Maritime Technical Guideline: Temporary Stormwater Drainage for Road Construction, 2011.</li> <li>○ Roads and Maritime Technical Guideline: Environmental Management of Construction Site Dewatering, 2011.</li> </ul>		
Water quality	<p>Prior to the commencement of work, an Erosion and Sediment Control Plan (ESCP) is to be prepared in accordance with the requirements of the Blue Book and reviewed by the Roads and Maritime environment officer. The ESCP is also to address the following as a minimum:</p> <ul style="list-style-type: none"> <li>• A process to routinely monitor the BOM weather forecast and identification of additional controls to be implemented ahead of rain</li> <li>• A procedure for routine inspection and maintenance of erosion and sediment controls</li> <li>• Nominated concrete washout areas</li> <li>• Nominated spill kit locations</li> <li>• Progressive stabilisation plan</li> <li>• Stockpiles are to be restricted to identified construction compounds, and managed in accordance with Roads and Maritime Stockpile Site Management Guideline, RTA Environmental Protection (Management System) QA Specification G36 and RTA Vegetation QA Specification R178.</li> <li>• Any dewatering required would be in accordance with Roads and Maritime Environmental Management of Construction Site Dewatering 2011.</li> <li>• Controls are to be implemented at exit points to minimise tracking soil and particulates onto pavement surfaces.</li> <li>• Any material transported onto pavements will be swept and removed at the end of each working shift and prior to rainfall.</li> </ul>	Construction contractor	Construction

## 6.11 Air quality

### 6.11.1 Criteria

Air quality criteria are used to assess the potential for ambient air quality to give rise to adverse health or nuisance effects. For this proposal, emissions from construction equipment and vehicles using the roadway have the potential to impact on local amenity. The most substantial emissions produced from motor vehicles are:

- Oxides of nitrogen (NO<sub>x</sub>).
- Carbon monoxide (CO).
- Particulate matter (PM<sub>10</sub>).

Of particular relevance to the proposed construction activities are criteria for particulate matter. There are various classifications of particulate matter, with the EPA providing assessment criteria for:

- Total suspended particulates (TSP).
- Particulate matter with equivalent aerodynamic diameter less than or equal to 10 microns (PM<sub>10</sub>).
- Deposited dust.

The EPA has set air quality assessment criteria as part of the Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (DEC 2005). **Table 6-31** summarises the EPA air quality assessment criteria that are relevant to the proposal. Note that while health research identifies PM<sub>2.5</sub> as a particular concern, there are currently no EPA assessment criteria for PM<sub>2.5</sub>.

**Table 6-31 EPA assessment criteria for relevant air pollutants**

Pollutant	Averaging time	Criterion
Carbon monoxide (CO)	Maximum 1-hour average	30 mg/m <sup>3</sup>
	Maximum 8-hour average	10 mg/m <sup>3</sup>
Nitrogen dioxide (NO <sub>2</sub> )	Maximum 1-hour average	246 µg/m <sup>3</sup>
	Annual average	62 µg/m <sup>3</sup>
Particulate matter (as PM <sub>10</sub> )	Maximum 24-hour average	50 µg/m <sup>3</sup>
	Annual average	30 µg/m <sup>3</sup>
Total suspended particulates (TSP)	Annual average	90 µg/m <sup>3</sup>
Dust deposition	Annual average (maximum increase)	2 g/m <sup>2</sup> /month
	Annual average (maximum total)	4 g/m <sup>2</sup> /month

### 6.11.2 Existing environment

No air quality monitoring was undertaken specifically for this proposal, however, OEH operate an air quality monitoring station at Lindfield, about 1.5 kilometres north of the proposal. The Lindfield air quality monitoring station currently records ozone (O<sub>3</sub>), nitrogen oxides (NO, NO<sub>2</sub> and NO<sub>x</sub>), particulates under 10 microns in size (PM<sub>10</sub>) and sulphur dioxide (SO<sub>2</sub>).

A review of data collected in 2012 from the Lindfield station against EPA assessment criteria (refer to **Table 6-31**) identified that PM<sub>10</sub> or NO<sub>2</sub> criteria have not been exceeded. No measurements of CO are made at Lindfield.

Air quality in the Sydney region has improved since the 1980s largely due to initiatives to reduce air pollution from industry, motor vehicles, business and homes. The State of the Environment Report (EPA, 2012) notes that concentrations of four of the six main indicators of air quality (carbon monoxide, nitrogen dioxide, sulphur dioxide and lead) have complied with national air quality standards in recent years. However, national standards of ozone and particulate matter (PM<sub>10</sub>) continue to be exceeded in some regions of the state, including Sydney.

### 6.11.3 Potential impacts

#### Construction

Potential air quality impacts during construction would largely result from dust generated during earthworks, particularly excavation activities on the northern side of Boundary Street. As shown in **Table 3-3**, about 5500 metres cubed would need to be excavated for the proposal. Particulate emissions from construction have the potential to affect amenity and, in extreme cases, health.

Primary sources of emissions of airborne particulate matter associated with the construction of the proposal would include:

- Clearing of vegetation and topsoil.
- Demolition, handling and removal of concrete and pavement materials by excavators and trucks.
- Wind erosion from unsealed surfaces and stockpiles.
- Vehicle (exhaust) emissions.

There is potential for dust to cause nuisance as residential land uses are located within the proposal area.

Safeguards from **Section 6.10** including stockpile management in accordance with the guidelines and progressive stabilisation plans would also reduce the potential to generate dust.

#### Operational

No adverse air quality impacts are expected to result from the proposal during operation. Improved traffic flow and reduced congestion could potentially have a beneficial effect to air quality in the immediate vicinity of the proposal (as discussed in **Section 6.7**).

#### 6.11.4 Safeguards and management measures

The proposed safeguards and management measures for air quality are listed in **Table 6-32**.

**Table 6-32 Safeguards and management measures for air quality**

Impact	Environmental safeguards	Responsibility	Timing
Dust from construction activities	<ul style="list-style-type: none"><li>• Measures (including watering or covering exposed areas) are to be used to minimise or prevent air pollution and dust.</li><li>• Work (including the spraying of paint and other materials) are not to be carried out during strong winds or in weather conditions where high levels of dust or air borne particulates are likely.</li><li>• Vehicles transporting waste or other materials that may produce odours or dust are to be covered during transportation.</li><li>• Stockpiles or areas that may generate dust are to be managed to suppress dust emissions in accordance with the Roads and Maritime Stockpile Site Management Guideline (2011).</li><li>• Communications material such as the project website and community notification would include a contact person and phone number to enable complaints to be received and responded to.</li><li>• The ESCP would be reviewed for adequacy in response to any dust complaints.</li></ul>	Construction contractor	Pre-construction

## 6.12 Aboriginal heritage

### 6.12.1 Existing environment

The proposal area and surrounds has a long history of disturbance and modification for urban development and is unlikely to contain any items of Aboriginal heritage or Aboriginal archaeological remains.

A search of the Aboriginal Heritage Information Management System database was carried out in October 2013 as part of this REF (attached in **Appendix H**). The results of this database search confirmed that there are no known Aboriginal heritage sites or places within or next to the proposal area.

### 6.12.2 Potential impacts

Any potential for impacts on Aboriginal heritage would be limited to the construction phase. Given the history and extent of urban development in the proposal area, and

the absence of recorded Aboriginal sites and places, the proposal is not expected to impact any Aboriginal heritage items or Aboriginal cultural heritage values.

It is highly unlikely that any previously undiscovered Aboriginal objects or remains would be found during construction. However, in the event that unexpected Aboriginal objects, historical archaeological relics, historic work, structures, buildings or movable objects, or human skeletal remains are uncovered during the work, all work would cease in the vicinity of the material/find and the steps in the Standard Management Procedure: Unexpected Heritage Items (Roads and Maritime 2013) would be followed.

### 6.12.3 Safeguards and management measures

The safeguards and management measures for Aboriginal heritage that would be implemented as part of the proposal are listed in **Table 6-33**.

**Table 6-33 Safeguards and management measures for Aboriginal heritage**

Impact	Environmental safeguards	Responsibility	Timing
Discovery/ disturbance of previously unrecorded Aboriginal sites	In the event of an unexpected find of Aboriginal cultural heritage, work will cease in the affected area and the Roads and Maritime Standard Management Procedure - Unexpected Heritage Items (2013) will be implemented. This would include stopping all work in the vicinity of the find and contacting Roads and Maritime's Aboriginal cultural heritage advisor or the relevant Roads and Maritime environmental officer immediately to identify the appropriate course of action. Work would not recommence until receipt of written approval from Roads and Maritime.	Construction contractor	Construction

## 6.13 Resource use and waste

### 6.13.1 Policy setting

The NSW Government has released the NSW Waste Avoidance and Resource Recovery Strategy 2007 (WARR Strategy) to minimise waste generated across all government sectors and improve the efficient use of resources. This reflects the community's view that waste should be treated as a resource. The WARR Strategy identifies the following waste avoidance and resource recovery goals and targets:

- Prevent and avoid waste.
- Increase recovery and use of secondary materials.
- Reducing toxicity in products and materials.
- Reducing litter and illegal dumping.

Roads and Maritime is dedicated to the minimisation of waste and the use of recycled products where possible. Roads and Maritime contractors are required to propose recycled-content materials where they are cost and performance competitive.



By adopting the principles of the WARR Act, Roads and Maritime seeks to ensure the most efficient use of resources and reduce cost and environmental harm in accordance with the principles of ecologically sustainable development, as outlined in Section 8.2 of this REF.

### 6.13.2 Existing environment

The existing road network within the proposal area currently generates minimal waste. Waste sources are currently limited to roadside litter, some waste material from clearing roadside drainage features and green waste associated with the maintenance of roadside vegetation.

### 6.13.3 Potential impacts

#### Construction

Construction would generate waste streams typical of road construction work, including:

- Green waste from cleared vegetation.
- Waste road infrastructure materials (signposts, guard rails, and old signalling equipment).
- Oil, grease and other liquid wastes from the maintenance of construction plant and equipment.
- General wastes and sewage from site compounds and offices.
- Packaging materials from items delivered to site, such as pallets, crates, cartons, plastics and wrapping materials.
- Potential contaminated material unearthed during construction.

In addition, spoil would be generated during the construction of the retaining wall on the northern side of Boundary Street. Earthworks requirements are identified in **Section 3.3.4**. Material such as metal, timber, concrete, bricks and stone waste would also be generated during the construction of the retaining wall.

#### Operation

Potential impacts associated with the operation of the proposal include littering by road users and potential vehicle spills. The risk for vehicle spills however is considered low due to the low speed vehicle environment and distance to a major watercourse.

### 6.13.4 Safeguards and management measures

The proposed safeguards and management measures for resource use and waste are listed in **Table 6-34**.

**Table 6-34 Safeguards and management measures for resource use and waste**

Impact	Environmental safeguards	Responsibility	Timing
Resource use and waste	Resource management hierarchy principles are to be followed: <ul style="list-style-type: none"> <li>• Avoid unnecessary resource consumption as a priority.</li> <li>• Avoidance is followed by resource recovery (including</li> </ul>		

Impact	Environmental safeguards	Responsibility	Timing
	<p>reuse of materials, reprocessing, recycling and energy recovery).</p> <ul style="list-style-type: none"> <li>Disposal is undertaken as a last resort (in accordance with the <i>Waste Avoidance &amp; Resource Recovery Act 2001</i>).</li> </ul> <p>All waste would be disposed of in accordance with the EPA waste classification guidelines at an appropriately licensed waste facility.</p> <p>Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day.</p> <p>Procurement will endeavour to use materials and products with a recycled content where that material or product is cost and performance effective.</p>		

## 6.14 Greenhouse gas emissions and climate change

### 6.14.1 Existing environment

Greenhouse gases include carbon dioxide, methane, nitrous oxide, sulphur hexafluoride, hydrofluorocarbons and perfluorocarbons. These gases have heat absorbing capacity or global warming potential. They absorb heat that is reflected from the earth, which results in warming of the air. This effect is known as the greenhouse effect. The primary human produced greenhouse gas is carbon dioxide. Human activities such as the combustion of carbon-based fuels increase the amount of greenhouse gases in the atmosphere. This leads to an increase in atmospheric temperatures and is known as the enhanced greenhouse effect.

Climate change refers to the projected long-term changes to global climatic patterns as a result of increases in the concentration of greenhouse gases in the atmosphere. There is a need to understand these projected changes to future climatic conditions and the effect they could have on existing and potential projects and infrastructure. Moreover, it is important to understand how the proposal might influence these changes.

Climate change projections detailed in this assessment have utilised publicly available information. **Table 6-35** provides information on climate change forecasts for the Sydney/ Central Coast region of NSW (an area surrounding Sydney fringed by the Blue Mountains and the Woronora, Yengo and Wollemi plateaus). The table provides details of the climatic change projections for the area surrounding the proposal to the year 2050, adapted from the NSW Climate Impact Profile (DECCW, 2010).

**Table 6-35 Projected climatic change predictions for the Sydney/ Central Coast region, NSW**

Season	Seasonal rainfall	Temperature		Evaporation
		Minimum	Maximum	
Spring	↑ 10-20%	↑ 2.0-3.0°C	↑ 2.0-3.0°C	↑ 10-20%
Summer	↑ 20-50%	↑ 1.5-3.0°C	↑ 1.5-2.0°C	↑ 10-20%
Autumn	No change	↑ 1.5-3.0°C	↑ 1.5-3.0°C	No clear pattern
Winter	↓ 10-20%	↑ 1.5-3.0°C	↑ 2.0-3.0°C	No clear pattern

Expected regional climatic changes for the Sydney/ Central Coast region of NSW as defined in DECCW (2010) are as follows:

- Increase in average daily minimum and maximum temperatures.
- Shifts in current patterns of climate variability, including increased rainfall in summer and decreased rainfall in winter.
- Increased intensity of extreme events (eg droughts, floods, severe storm events).
- Changes in seasonality and amount of precipitation (the direction and magnitude of changes will vary between geographic locations).

By 2050, the Sydney/ Central Coast region of NSW is expected to experience a hotter climate, with temperatures projected to increase by between 1.5°C to 3°C throughout the year. Rainfall is projected to increase in spring and summer, with no change in autumn, and a decrease in winter. Evaporation in spring and summer will increase, with no clear change in evaporation patterns in autumn and winter.

## 6.14.2 Potential impacts

### Construction

Construction of the proposal is anticipated to be completed within an 18 month period. During this time, greenhouse gas emissions would be produced, including:

- Carbon dioxide, methane and nitrous oxide generated from liquid fuel use in plant and vehicles (diesel, petrol).
- Embedded emissions associated with the manufacture and delivery of construction materials.
- Methane generated from land filling any carbon based waste.

Increases in average temperature and heatwaves may affect the integrity of pavements and other construction materials. Direct impacts include more rapid deterioration of infrastructure, which may result in higher operational and maintenance costs. Indirectly, evaporative changes can result in changes to soil moisture content and soil instability, which may impact foundations of structures, cause cracking and/or softening of pavements and road rutting.

The impacts on climate change from construction of the proposal would however be minimal due to the relatively small size and scale of the proposal.

### Operation

Emissions would be generated during maintenance activities and would depend on the frequency and intensity of maintenance activities required. These emissions are

expected to be minimal and would be negligible in comparison with emissions associated with traffic using the road network.

Boundary Street would continue to operate as a road servicing vehicles. As such, it is not anticipated that there would be a reduction in emissions generated by vehicles during operation of the proposal.

### 6.14.3 Safeguards and management measures

The proposed safeguards and management measures for greenhouse gas emissions and climate change are listed in **Table 6-36**.

**Table 6-36 Safeguards and management measures for greenhouse gas emissions and climate change**

Impact	Environmental safeguards	Responsibility	Timing
Impacts on climate change from construction activities	<ul style="list-style-type: none"> <li>Plant and equipment will be switched off when not in use.</li> <li>Vehicles, plant and construction equipment will be appropriately sized for the task and properly maintained so as to achieve optimum fuel efficiency.</li> <li>Materials will be delivered with full loads and will come from local suppliers, where possible.</li> <li>The energy efficiency and related carbon emissions will be considered in the selection of vehicle and plant equipment.</li> </ul>	Construction contractor	Construction

## 6.15 Cumulative environmental impacts

Cumulative impacts have the potential to arise from the interaction of individual elements within the proposal and the additive effects of the proposal with other external proposals. Roads and Maritime is required under clause 228 (2) of the Environmental Planning and Assessment Regulation 2000, to take into account potential cumulative impacts as a result of the proposal.

### 6.15.1 Potential impacts

#### Construction

##### *Concurrent development*

Development located within the proposal area is limited to the re-development at 5-15 Boundary Street, Roseville (DA0053/12). The proposal is to demolish existing dwellings at 5-15 Boundary Street and construct two residential buildings containing 53 units and basement parking. Landscaping and associated work would also be carried out. The development was approved by Ku-ring-gai Council on 18 December 2012.

The Statement of Environmental Effects submitted for the development application does not provide a construction start date or construction timeframes (Boston Blyth

Fleming Town Planners 2012). However, it is anticipated that the construction of the development has the potential to coincide with construction activities on Boundary Street. It is anticipated that construction of the residential buildings would involve increased impacts on amenity, including noise and vibration and visual impacts for residents located on the northern and southern sides of Boundary Street. In addition, it is anticipated that there would be increased traffic delays due to the increase of construction vehicles. These impacts would need to be managed through consultation with Ku-ring-gai Council and relevant stakeholders, including construction contractor pertaining to the residential development.

A search of the Ku-ring-gai Council and Willoughby Council development application database was carried out on 14 August 2013. In addition, a search of other road work or roads proposals was carried out. There are no other known developments within or close to the proposal area.

## Operation

The completed proposal would improve traffic flows, reducing traffic delays and improving safety for motorists, cyclists and pedestrians on Boundary Street. These improvements form an important component in addressing congestion issues for freight vehicles and buses as well as traffic congestion related objectives outlined in NSW 2021: A Plan to Make NSW Number One, NSW State Infrastructure Strategy, and NSW Long Term Transport Master Plan. **Section 6.5** discusses socio-economic benefits of the proposal in more detail. It is considered that the proposal would have an overall positive cumulative effect on the road environment within the proposal area.

### 6.15.2 Safeguards and management measures

The proposed safeguards and management measures for cumulative impacts are listed in **Table 6-37**.

**Table 6-37 Safeguards and management measures for cumulative impacts**

Impact	Environmental safeguards	Responsibility	Timing
Cumulative impacts from concurrent developments	The CEMP would be revised to consider potential cumulative impacts from surrounding development activities as they become known, including the re-development of 5-15 Boundary Street, Roseville. This would include a process to review and update mitigation measures as new work begins or if complaints are received.	Construction contractor	Pre-construction

## 6.16 Summary of beneficial effects

Beneficial effects of the proposal on completion include:

- Reduced traffic congestion and improvement to traffic flow, improving access and connectivity for motorists travelling in an east-west direction between the Pacific Highway, northern Sydney and to the Chatswood town centre via Archer Street. Traffic flow would also improve for buses turning at the Pacific Highway, turning left out of Hill Street and Archer Street.
- Improved access, connectivity and reliability for local and regional freight vehicle movements, particularly between the Pacific Highway and the industrial areas of northern Sydney.
- Improved access and connectivity for pedestrians and cyclists on Boundary Street between Hill Street and Archer Street.
- Improved safety for pedestrians, cyclists and motorists due to the changed turning arrangements at Hill Street and Boundary Street and the improvement in pedestrian and cycling facilities and phasing of pedestrian crossings.
- Improved access for pedestrians with mobility difficulties due to the removal of the stairs used to access the pedestrian crossing at the intersection of Boundary Street and Archer Street.
- Improved flow and reduced congestion may have beneficial effects on local air quality

## 6.17 Summary of adverse effects

Adverse effects of the proposal include:

- Temporary construction impacts including disruptions to traffic, noise and vibration, dust generation, risk of spills and contamination and the occurrence of erosion and sedimentation.
- The Seven Eleven petrol station (located within the proposal area) presents a potential high risk for contamination during construction.
- Two heritage properties may be impacted by construction noise and vibration from the proposal, including Ku-ring-gai Court and Electrical Substation No. 312.
- Partial property acquisition of 12 properties and a short-term lease of two properties (Lot 1 DP531547 and Lot 19 DP135079) for the construction compound.
- Changed access arrangements at Hill Street, which change the way vehicles access businesses located on Hill Street to the north of the proposal. In addition, buses would no longer be able to turn into Hill Street, which would require a change to Forest Coaches route number 558.
- Changes to the visual environment through the widening of the road and removal of vegetation.

## 7 Environmental management

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### 7.1 Environmental management plans (or system)

A number of safeguards and management measures have been identified in order to minimise adverse environmental impacts, including social impacts, which could potentially arise as a result of the proposal. Should the proposal proceed, these management measures would be incorporated into the detailed design and applied during the construction and operation of the proposal.

A Project Environmental Management Plan (PEMP) and a Contractors Environmental Management Plan (CEMP) will be prepared to describe safeguards and management measures identified. These plans will provide a framework for establishing how these measures will be implemented and who would be responsible for their implementation.

The plans will be prepared prior to construction of the proposal and must be reviewed and certified by the Roads and Maritime Services Environmental Officer, Sydney Region, prior to the commencement of any on-site work. The CEMP will be a working document, subject to ongoing change and updated as necessary to respond to specific requirements. The CEMP and PEMP would be developed in accordance with the specifications set out in the QA Specification G36 – Environmental Protection (Management System), QA Specification G38 – Soil and Water Management (Soil and Water Plan) and the QA Specification G40 – Clearing and Grubbing.

### 7.2 Summary of safeguards and management measures

Environmental safeguards outlined in this document would be incorporated into the detailed design phase of the proposal and during construction and operation of the proposal, should it proceed. These safeguards would minimise any potential adverse impacts arising from the proposed work on the surrounding environment. The safeguards and management measures are summarised in **Table 7-1**.



**Table 7-1 Summary of site specific environmental safeguards**

No.	Impact	Environmental safeguards	Responsibility	Timing
1	General	All environmental safeguards must be incorporated within the following documents: <ul style="list-style-type: none"> <li>• Project Environmental Management Plan</li> <li>• Detailed design stage</li> <li>• Contract specifications for the proposal</li> <li>• Contractor's Environmental Management Plan</li> </ul>	Project manager	Pre-construction
2	General	A risk assessment must be carried out on the proposal in accordance with the Roads and Maritime Services Audit Pack and OSD risk assessment procedures to determine an audit and inspection program for the work. The recommendations of the risk assessment are to be implemented. A review of the risk assessment must be undertaken after the initial audit or inspection to evaluate if the level of risk chosen for the project is appropriate. Any work resulting from the proposal and as covered by the REF may be subject to environmental audit(s) and/or inspection(s) at any time during their duration.	Project manager and regional environmental staff	Pre-construction       After first audit
3	General	The environmental contract specification must be forwarded to the Roads and Maritime Services Senior Environmental Officer for review at least 10 working days prior to the tender stage. A contractual hold point must be maintained until the CEMP is reviewed by the Roads and Maritime Services Senior Environmental Officer.	Project manager	Pre-construction
4	General	The Roads and Maritime Services Project Manager must notify the Roads and Maritime Services Environmental Officer Sydney Region at least five days prior to work commencing.	Project manager	Pre-construction
5	General	All businesses and residences likely to be affected by the proposed work must be notified at least five working days prior to the commencement of the proposed activities.	Project manager	Pre-construction
6	General	Environmental awareness training must be provided, by the contractor, to	Construction contractor	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		all field personnel and subcontractors.		and during construction as required.
<b>Noise and vibration</b>				
7	Construction noise	<ul style="list-style-type: none"> <li>A Construction Noise and Vibration Management Plan (CNVMP) would be prepared as part of the CEMP. This plan would include but not be limited to: <ul style="list-style-type: none"> <li>A map indicating the locations of sensitive receivers including residential properties.</li> <li>A quantitative noise and vibration assessment in accordance with the EPA Interim Construction Noise Guidelines (DECCW, 2009).</li> <li>Management measures to minimise the potential noise impacts from the quantitative noise assessment and for potential work outside of standard working hours.</li> <li>Mitigation measures to avoid noise and vibration impacts during construction activities including those associated with truck movements.</li> <li>A process for assessing the performance of the implemented mitigation measures.</li> <li>A process for documenting and resolving issues and complaints.</li> <li>A noise and vibration monitoring program for sensitive receivers.</li> <li>A process for updating the plan when activities affecting construction noise and vibration change.</li> <li>Identify in toolbox talks where noise and vibration management is required</li> <li>Consideration of respite during rock breaking/ hammering activities.</li> </ul> </li> <li>Implementation of EPA Interim Construction Noise Guidelines</li> </ul>	Construction contractor	Pre- construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		(DECCW, 2009).		
8	Construction noise	<ul style="list-style-type: none"> <li>• Locate compressors, generators, pumps and any other fixed plant as far from residences as possible and behind site structures</li> <li>• Alternatives to reversing alarms will be considered for site equipment subject to WHS compliance requirements and risk assessments.</li> <li>• Vehicle delivery times will be scheduled where feasible to the recommended construction hours to minimise noise impacts from heavy vehicle movements and deliveries.</li> </ul>	Construction contractor	Construction
8	Construction noise	<ul style="list-style-type: none"> <li>• Any out of hours work would comply with G36 community notification requirements and the mitigation measures specified within the Roads and Maritime Noise Management Manual – Practice Note VII.</li> <li>• Communications material such as the project website and community notification would include a contact person and phone number to enable complaints to be received and responded to.</li> </ul>	Construction contractor	Pre-construction
10	Construction vibration	<ul style="list-style-type: none"> <li>• A vibration assessment is to be prepared and included in the NVMP. The vibration assessment is to include: <ul style="list-style-type: none"> <li>○ Assessment of the potential vibration impacts on sensitive receivers due to vibration.</li> <li>○ Detail which sensitive receivers will have building condition surveys</li> <li>○ Outline a monitoring program.</li> <li>○ Identify the activities and distances adjacent from the two heritage items at which attended vibration monitoring would be required to allow immediate identification of work exceeding criteria.</li> <li>○ Where vibration guidelines are exceeded or complaints occur, the management measures are to be reviewed and are to consider alternate equipment and construction methodologies</li> </ul> </li> <li>• Buildings/structural conditions surveys would be undertaken prior to</li> </ul>	Construction contractor	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<p>and following construction work at receivers within 15 metres of rock breaking and vibratory compaction activities, including the heritage items at V1 and V2.</p> <ul style="list-style-type: none"> <li>No impact piling work would be undertaken within the proposal area unless additional assessment and monitoring confirm that vibration levels will be below project specific criteria</li> <li>Rock breaking/hammering/vibratory compaction will not be undertaken within seven metres of any heritage item or building unless additional assessment and monitoring confirm that vibration levels will be below project specific criteria</li> <li>Rock breaking/hammering/vibratory compaction will not be undertaken within five metres of any non-heritage building unless additional assessment and monitoring confirm that vibration levels will be below specific criteria relating to the area.</li> <li>Where rock breaking/hammering is planned within 10 metres of any occupied dwelling, the occupants will be notified of the work and the duration of the activity will be restricted, unless otherwise agreed with affected residents.</li> <li>Where heavy plant is used within seven metres of a heritage structure, attended vibration monitoring will be undertaken to assess compliance with project specific vibration criteria.</li> <li>Where vibration criteria is to be exceeded specific to vibration for structural damage is recorded during monitoring, work will cease immediately and alternative construction methods will be used.</li> </ul>		
<b>Traffic, transport and access</b>				
11	Construction traffic management	<ul style="list-style-type: none"> <li>A detailed traffic management plan will be prepared in accordance with the Roads and Maritime Traffic Control at Work Sites (2010) and Roads and Maritime Specification G10 - Control of Traffic, to provide a comprehensive and objective approach to minimise any potential</li> </ul>	Construction contractor	Pre-construction, construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<p>impacts on-road network operations during construction.</p> <ul style="list-style-type: none"> <li>The traffic management plan will include measures to minimise heavy vehicle usage on local roads. Where practicable, deliveries of construction plant and materials will be undertaken outside of peak traffic periods.</li> <li>Consultation with emergency services and maintenance of access for emergency vehicles.</li> </ul>		
12	Public transport	<ul style="list-style-type: none"> <li>Consultation with local bus operators and Sydney Trains would be undertaken during development of the detailed design. The consultation would include selection of temporary bus stop locations within the proposal area.</li> <li>Access to appropriate bus stop locations would be maintained during construction in consultation with bus operators.</li> <li>Ongoing updates on locations and access to bus stops would be provided to the community during construction period to ensure that disruption is minimised.</li> </ul>	Roads and Maritime and construction contractor	Pre-construction and construction
13	Traffic delays	<ul style="list-style-type: none"> <li>The community will be kept informed about upcoming road construction activities, including through advertisements in the local media and by prominently placed advisory notices and/or variable message signs.</li> </ul>	Roads and Maritime	Construction
14	Pedestrians and cyclists	<ul style="list-style-type: none"> <li>Pedestrian and cyclist access will be maintained throughout construction.</li> <li>Provision of signage outlining the pedestrians and cyclist diversion routes would be displayed during construction.</li> <li>There will be advance notification of any construction work that affect pedestrians and cyclists.</li> </ul>	Construction contractor	Construction
15	Design	<p>Detailed design would include consideration of the following;</p> <ul style="list-style-type: none"> <li>Possible extension of the tie in to Hill Street road pavement if justified to ensure a safe tie-in for cyclist thoroughfare.</li> <li>Assessment of the need for safety fence between the shared path and Boundary Street.</li> <li>Coordinating traffic light sequencing to minimise impact to traffic flow</li> </ul>	Roads and Maritime	Detailed design

No.	Impact	Environmental safeguards	Responsibility	Timing
		along Boundary Street.		
<b>Non-Aboriginal heritage</b>				
16	Non-Aboriginal heritage	Safeguards and management measures for potential vibration impacts on Ku-ring-gai Court and Electricity Substation No.132 including monitoring and dilapidation surveys are outlined in Section 6.1.	-	-
17	Non-Aboriginal heritage	Detailed design is to consider opportunities to reuse the stone from the stone garden edging at Ku-ring-gai Court during property adjustment negotiations.	Roads and Maritime	Detailed design
18	Non-Aboriginal heritage	<ul style="list-style-type: none"> <li>• A non-Aboriginal Heritage Management plan would be prepared and included in the CEMP. This plan would the following: <ul style="list-style-type: none"> <li>○ A map identifying locations of items or sites within and around the proposal area.</li> <li>○ Identification of potential environmental risks/impacts due to the work/activities.</li> <li>○ Mitigation measures for the identified risks</li> <li>○ Measures to physically protect the brick fence around the substation</li> <li>○ A physical construction barrier to identify the identified no-go zones</li> <li>○ A procedure to report any damage to heritage items compliant with the Roads and Maritime Incident Classification and Reporting Procedure</li> <li>○ Identify in toolbox talks where management of non-Aboriginal heritage is required such as identification of no go zones and responsibilities under the <i>Heritage Act 1977</i>.</li> </ul> </li> <li>• Requirement to comply with Roads and Maritime Standard Management Procedure -Unexpected Heritage Items, 2013.</li> </ul>	Construction contractor	Construction
19	Non-Aboriginal heritage	<ul style="list-style-type: none"> <li>• Should heritage items be unexpectedly uncovered during construction, all work will cease within the vicinity of the item and the steps in the Roads and Maritime Standard Management</li> </ul>	Construction contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		Procedure: Unexpected Heritage Items (2013) would be followed.		
<b>Visual impact</b>				
20	Removal of street trees	<p>Detailed design will consider the following:</p> <ul style="list-style-type: none"> <li>• Utility adjustment options to minimise impact to tree roots and minimise tree trimming.</li> <li>• Vegetation clearing would be kept to the absolute minimum to accommodate the proposal.</li> <li>• Landscaping</li> <li>• Retaining walls and fencing would be residential in scale and consistent with the character of the existing streetscape.</li> <li>• Retaining wall options to maintain existing streetscape character and maximise planting opportunities.</li> </ul>	Roads and Maritime	Detailed design
21	Removal of street trees	<p>Urban design and landscape objectives will be considered during detailed design, including:</p> <ul style="list-style-type: none"> <li>• Integrating access ways with walls and fencing.</li> <li>• Using a small palette of complimentary materials for all surface treatments.</li> </ul>	Roads and Maritime	Detailed design
22	Visual impacts of construction activities	The work site will be left in a tidy manner at the end of each work day.	Construction contractor	Construction
23	Visual impacts of construction activities	Fencing with material attached (eg shade cloth) would be provided around the construction compounds to screen views of the construction compounds from adjoining properties	Construction contractor	Construction
<b>Topography, geology and soils</b>				
24	Soil and water quality	<ul style="list-style-type: none"> <li>• During detailed design an Erosion and Sedimentation Management Report is to be prepared. The report is to include: <ul style="list-style-type: none"> <li>○ Identify site catchment and sub-catchments, high risk areas and sensitive areas</li> </ul> </li> </ul>	Roads and Maritime	Pre-construction



No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> <li>○ Sizing of each of the above areas and catchments</li> <li>○ Proposed staging plans for the proposal to ensure appropriate erosion and sediment controls measures are possible</li> <li>○ The likely run-off from each catchment and sub-catchment and direction of off and on site water flow.</li> <li>○ Diversion of off-site water around or through the site or details of separation of on-site and off-site water</li> <li>○ The direction of runoff and drainage points during each stage of construction.</li> <li>○ The locations and sizing of sediment sumps as well as associated drainage.</li> </ul> <p>A mapped plan identifying the above.</p>		
25	Soil and water quality	<ul style="list-style-type: none"> <li>• The Erosion and Sedimentation Management Report will be sent to the Roads and Maritime Senior Environmental Officer for review and verification prior to the construction tender.</li> </ul>	Roads and Maritime	Pre-construction
<b>Contaminated land</b>				
26	Potential exposure of contamination to site workers, public and environmental receptors	<ul style="list-style-type: none"> <li>• Undertake an intrusive Phase 2 Environmental Site Assessment for the service station in accordance with the requirements of the 2013 NEPM Guidelines and relevant EPA requirements.</li> </ul>	Roads and Maritime	Detailed design
27	Potential exposure of contamination to site workers, public and environmental	<ul style="list-style-type: none"> <li>• A Contamination Management Plan (CMP) will be prepared in accordance with the <i>Contaminated Land Act 1997</i> and relevant EPA Guidelines. This plan will form part of the CEMP and will include at a minimum: <ul style="list-style-type: none"> <li>○ Contaminated land legislation and guidelines including any relevant licences and approvals to be obtained.</li> </ul> </li> </ul>	Roads and Maritime and construction contractor	Pre-construction, construction

No.	Impact	Environmental safeguards	Responsibility	Timing
	receptors	<ul style="list-style-type: none"> <li>○ Assessment to identify locations of known or potential contamination and preparation of a map showing these locations.</li> <li>○ Identification of rehabilitation requirements, classification, transport and disposal requirements of any contaminated land within the construction footprint.</li> <li>○ Contamination management measures including waste classification and reuse procedures and unexpected finds procedures.</li> <li>○ A procedure for dewatering and disposal of potentially contaminated liquid waste.</li> <li>○ In the event that indications of contamination are encountered (known and unexpected, including odorous or visual indicators), work in the area will immediately cease until a contamination assessment can be prepared to advise on the need for remediation or other action, as deemed appropriate.</li> <li>○ Procedures for disposal of asbestos in accordance with NSW EPA guidelines (including the waste guidelines) and relevant industry codes of practice.</li> <li>○ Incident management procedure and reporting procedure in accordance with Roads and Maritime and EPA requirements.</li> <li>○ A process for reviewing and updating the plan.</li> </ul> <p>The CMP would be reviewed by Roads and Maritime Senior Environment Officer and Roads and Maritime Land Management Specialist prior to the commencement of work.</p>		
<b>Socio-economic</b>				
28	Local amenity, social infrastructure,	<ul style="list-style-type: none"> <li>• A Communication Plan will be prepared and included in the CEMP. The Communication Plan will include: <ul style="list-style-type: none"> <li>○ Requirements to provide details and timing of proposed activities</li> </ul> </li> </ul>	Construction contractor	Pre-construction and construction

No.	Impact	Environmental safeguards	Responsibility	Timing
	property acquisition	<p>to affected residents as well as:</p> <ul style="list-style-type: none"> <li>• Forest Coaches, Transdev and Sydney Buses</li> <li>• Roseville College and Roseville Public School.</li> <li>• St Andrew's Church</li> <li>• Ku-ring-gai Council and Willoughby Council.</li> </ul> <ul style="list-style-type: none"> <li>○ Contact name and number for complaints.</li> <li>○ Procedure to notify adjacent land users for changed conditions during the construction period such as traffic, pedestrian or driveway access.</li> </ul> <ul style="list-style-type: none"> <li>• The communications plan will be prepared in accordance with G36 requirements and Roads and Maritime Community Engagement and Communications Manual (2012).</li> <li>• The communications plan would include a complaint handling procedure and register and maintained for the duration of the proposal.</li> </ul>		
29	Access and connectivity	<ul style="list-style-type: none"> <li>• Maintain access to properties on the Pacific Highway, Boundary Street and Hill Street during construction.</li> <li>• Signage to be provided during construction to communicate changes, to ensure safety for pedestrians near to construction work.</li> <li>• Access to appropriate bus stop locations would be maintained during construction in consultation with bus operators.</li> <li>• Ongoing updates on locations and access to bus stops would be provided to the community during construction period to ensure that disruption is minimised.</li> <li>• The traffic management plan will include measures to minimise heavy vehicle usage and parking on local roads. Where practicable, deliveries of construction plant and materials will be undertaken outside of peak traffic periods.</li> </ul>	Construction contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
<b>Land use and property</b>				
30	Property acquisition	All land acquisitions would be conducted in accordance with the Roads and Maritime Land Acquisition Policy and the requirements of the <i>Land Acquisition (Just Terms) Compensation Act 1991</i> .	Roads and Maritime	Pre-construction
<b>Biodiversity</b>				
31	Clearing of street trees and shrubs	Opportunities for minimising the clearing of trees and shrubs would be identified during detailed design.	Roads and Maritime	Detailed design
32	Clearing of street trees and shrubs	<p>A level 5 qualified and experienced arborist is to be present during work within the drip line of trees on the southern side of Boundary Street and on Archer Street for the following activities</p> <ul style="list-style-type: none"> <li>• During detailed design, assess the potential impact of utility work on the root zone and prepare a report on the findings</li> <li>• During construction, to inspect actual work zones as indicated by Roads and Maritime staff and advise on whether the tree root zone can be avoided and provide recommendations</li> </ul>	Construction contractor	Construction
33	Clearing of street trees and shrubs	<p>A Biodiversity Management Plan (BMP) is to be prepared and included within the CEMP and is to be in accordance with Biodiversity Guidelines: Protecting and managing biodiversity on Roads and Maritime projects (Roads and Maritime Environment Branch, 2011). The BMP is to include the following:</p> <ul style="list-style-type: none"> <li>• A suitably qualified ecologist is to be engaged to visit the site prior to any clearing work to clearly demarcate vegetation protection areas (including habitat trees) and complete a pre-clearing survey report</li> <li>• A pre-clearing survey plan describing survey methodology and targeted species. Target species are to include as a minimum; <ul style="list-style-type: none"> <li>○ Potential Urban Remnant Trees EEC or the Magenta Lilly Pilly (<i>Syzygium paniculatum</i>).</li> </ul> </li> <li>• A site walk with the Roads and Maritime Environmental</li> </ul>	Construction contractor	Pre-construction, construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<p>Officer to confirm clearing boundaries prior to the commencement of work.</p> <ul style="list-style-type: none"> <li>• A map which clearly shows vegetation clearing boundaries and exclusion/no-go zones</li> <li>• Identification of measures to mark the clearing boundary and protect sensitive areas.</li> <li>• A procedure for clearing of vegetation in accordance with Biodiversity Guidelines: Protecting and managing biodiversity on Roads and Maritime projects (Roads and Maritime 2011) and Roads and Maritime Specification G40.</li> <li>• Incorporation of management measures identified as a result of the pre-clearing survey report and nomination of actions to respond to the recommendations made. This must include details of measures to be implemented to identify and protect clearing limits, habitat features and no-go areas.</li> <li>• Outline a process to communicate biodiversity management measures to all staff including subcontractors.</li> <li>• A stop work procedure in the event of identification of unidentified species, habitats or populations.</li> <li>• A process to review and update the adequacy of the plan in the event of a biodiversity incident.</li> </ul>		
34	Weed management	<ul style="list-style-type: none"> <li>• Declared noxious weeds are to be managed according to requirements under the <i>Noxious Weeds Act 1993</i> and Guide 6 (Weed Management) of the Roads and Maritime Biodiversity Guidelines 2011.</li> </ul>	Construction contractor	Construction
<b>Water quality and hydrology</b>				
35	Water quality	<ul style="list-style-type: none"> <li>• A Soil and Water Management Plan (SWMP) will be prepared as part of the CEMP in accordance with the requirements of Roads and Maritime contract specification G38 prior to the commencement of construction. The SWMP will also address the: <ul style="list-style-type: none"> <li>○ Roads and Maritime Code of Practice for Water Management,</li> </ul> </li> </ul>	Construction contractor	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<p>the Roads and Maritime Erosion and Sedimentation Procedure</p> <ul style="list-style-type: none"> <li>○ The NSW Soils and Construction – Managing Urban Stormwater Volume 1 “The Blue Book”(Landcom, 2004) and Volume 2 (DECC, 2008).</li> <li>○ Roads and Maritime Technical Guideline: Temporary Stormwater Drainage for Road Construction, 2011.</li> <li>○ Roads and Maritime Technical Guideline: Environmental Management of Construction Site Dewatering, 2011.</li> </ul>		
36	Water quality	<p>Prior to the commencement of work, an Erosion and Sediment Control Plan (ESCP) is to be prepared in accordance with the requirements of the Blue Book and reviewed by the Roads and Maritime environment officer. The ESCP is also to address the following as a minimum:</p> <ul style="list-style-type: none"> <li>• A process to routinely monitor the BOM weather forecast and identification of additional controls to be implemented ahead of rain</li> <li>• A procedure for routine inspection and maintenance of erosion and sediment controls</li> <li>• Nominated concrete washout areas</li> <li>• Nominated spill kit locations</li> <li>• Progressive stabilisation plan</li> <li>• Stockpiles are to be restricted to identified construction compounds, and managed in accordance with Roads and Maritime Stockpile Site Management Guideline, RTA Environmental Protection (Management System) QA Specification G36 and RTA Vegetation QA Specification R178.</li> <li>• Any dewatering required would be in accordance with Roads and Maritime Environmental Management of Construction Site Dewatering 2011.</li> <li>• Controls are to be implemented at exit points to minimise tracking soil and particulates onto pavement surfaces.</li> <li>• Any material transported onto pavements will be swept and removed</li> </ul>	Construction contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		at the end of each working shift and prior to rainfall.		
<b>Air quality</b>				
37	Dust from construction activities	<ul style="list-style-type: none"> <li>Measures (including watering or covering exposed areas) are to be used to minimise or prevent air pollution and dust.</li> <li>Work (including the spraying of paint and other materials) are not to be carried out during strong winds or in weather conditions where high levels of dust or air borne particulates are likely.</li> <li>Vehicles transporting waste or other materials that may produce odours or dust are to be covered during transportation.</li> <li>Stockpiles or areas that may generate dust are to be managed to suppress dust emissions in accordance with the Roads and Maritime Stockpile Site Management Guideline (2011).</li> <li>Communications material such as the project website and community notification would include a contact person and phone number to enable complaints to be received and responded to.</li> <li>The ESCP would be reviewed for adequacy in response to any dust complaints.</li> </ul>	Construction contractor	Pre-construction
<b>Aboriginal heritage</b>				
38	Discovery/ disturbance of previously unrecorded Aboriginal sites	In the event of an unexpected find of Aboriginal cultural heritage, work will cease in the affected area and the Roads and Maritime Standard Management Procedure - Unexpected Heritage Items (2013) will be implemented. This would include stopping all work in the vicinity of the find and contacting Roads and Maritime's Aboriginal cultural heritage advisor or the relevant Roads and Maritime environmental officer immediately to identify the appropriate course of action. Work would not recommence until receipt of written approval from Roads and Maritime.	Construction contractor	Construction
<b>Resource use and waste</b>				
39	Resource use and waste	Resource management hierarchy principles are to be followed: <ul style="list-style-type: none"> <li>Avoid unnecessary resource consumption as a priority.</li> </ul>	Construction contractor	Construction



No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> <li>Avoidance is followed by resource recovery (including reuse of materials, reprocessing, recycling and energy recovery).</li> <li>Disposal is undertaken as a last resort (in accordance with the <i>Waste Avoidance &amp; Resource Recovery Act 2001</i>).</li> </ul> <p>All waste would be disposed of in accordance with the EPA waste classification guidelines at an appropriately licensed waste facility.</p> <p>Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day.</p> <p>Procurement will endeavour to use materials and products with a recycled content where that material or product is cost and performance effective.</p>		
<b>Greenhouse gas emissions and climate change</b>				
40	Impacts on climate change from construction activities	<ul style="list-style-type: none"> <li>Plant and equipment will be switched off when not in use.</li> <li>Vehicles, plant and construction equipment will be appropriately sized for the task and properly maintained so as to achieve optimum fuel efficiency.</li> <li>Materials will be delivered with full loads and will come from local suppliers, where possible.</li> <li>The energy efficiency and related carbon emissions will be considered in the selection of vehicle and plant equipment.</li> </ul>	Construction contractor	Construction
<b>Cumulative environmental impacts</b>				
41	Cumulative impacts from concurrent developments	The CEMP would be revised to consider potential cumulative impacts from surrounding development activities as they become known, including the re-development of 5-15 Boundary Street, Roseville. This would include a process to review and update mitigation measures as new work begins or if complaints are received.	Construction contractor	Pre-construction

### **7.3 Licensing and approvals**

No licences or approvals are required for the proposal.

## 8 Conclusion

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This chapter provides the justification for the proposal taking into account its biophysical, social and economic impacts, the suitability of the site and whether or not the proposal is in the public interest. The proposal is also considered in the context of the objectives of the EP&A Act, including the principles of ecologically sustainable development as defined in Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*.

### 8.1 Justification

Boundary Street is an important connection for motorists and freight vehicles travelling between the Pacific Highway and the northern suburbs of Sydney. In addition, Boundary Street forms part of a bus network and provides facilities for cyclists and pedestrians.

Currently, Boundary Street experiences major traffic delays during the morning and afternoon peak periods. This affects motorists and freight vehicles travelling between the Pacific Highway and the northern suburbs of Sydney. In addition, the steps on the pedestrian pathway on the northern side of Boundary Street provide a constraint to disabled access.

The following considers the justification of the proposal in relation to biophysical, social and economic factors and the public interest.

#### Biophysical

There would be minimal impacts on the biophysical environment as a result of the proposal and those impacts occurring would be during construction. The proposal would not alter the biophysical environment during operation.

#### Social and economic

Social and economic factors contributing to the justification of the proposal include:

- Reduced traffic congestion and improvement to traffic flow, improving access and connectivity for motorists travelling east-west between the Pacific Highway and northern Sydney and to the Chatswood town centre via Archer Street; as well as buses turning at the Pacific Highway, Hill Street and Archer Street.
- Improved access, connectivity and reliability for local and regional freight vehicle movements, particularly between the Pacific Highway and the industrial areas of northern Sydney.
- Improved safety for pedestrians, cyclists and motorists due to the changed turning arrangements at Hill Street and Boundary Street and the improvement in shared pathway facilities and phasing of pedestrian crossings.
- Improved access for pedestrians with mobility difficulties due to the removal of the stairs used to access the pedestrian crossing at the intersection of Boundary Street and Archer Street.

#### Public interest

The proposal would be in the public interest as it would contribute to improving the overall traffic flow of Boundary Street, allowing for more efficient connections

between the Pacific Highway and the northern suburbs of Sydney. The proposal would also improve cycle and pedestrian facilities on the northern side of Boundary Street.

## 8.2 Objects of the EP&A Act

**Table 8-1 Summary of Objects of the EP&A Act**

Object	Comment
5(a)(i) To encourage the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment.	The proposal is for the purpose of providing dedicated through lanes and turning lanes to improve traffic flow, reduce traffic congestion and improve safety on Boundary Street. Social and economic impacts are assessed in <b>Section 6.5</b> and a full socio-economic assessment is attached at <b>Appendix F</b> . The assessment includes management measures to avoid and /or minimise impacts.
5(a)(ii) To encourage the promotion and co-ordination of the orderly economic use and development of land.	The proposal would not impact on the economic use of land.
5(a)(iii) To encourage the protection, provision and co-ordination of communication and utility services.	The proposal has been designed to minimise impacts on communication and utility services (refer to Section 3.5).
5(a)(iv) To encourage the provision of land for public purposes.	The proposal would upgrade the existing shared pedestrian and cycle path on the northern side of Boundary Street, which would be used by the public.
5(a)(v) To encourage the provision and co-ordination of community services and facilities.	The proposal would provide improved access to the Chatswood town centre, via Archer Street due to improved traffic flows.
5(a)(vi) To encourage the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats.	The proposal would operate within an established urban environment. Impacts on biodiversity are discussed in Section 6.8, including provision of management measures to minimise potential impacts to biodiversity.
5(a)(vii) To encourage ecologically sustainable development.	Ecologically sustainable development is considered in Sections 8.2.1 – 8.2.4 below.
5(a)(viii) To encourage the provision and maintenance of affordable housing.	Not relevant to the proposal.
5(b) To promote the sharing of the responsibility for environmental planning between different levels of government in the State.	Not relevant to the proposal.
5(c) To provide increased opportunity for public involvement and participation in environmental planning and assessment.	The development of the concept design has considered community feedback (Chapter 5). There would be ongoing consultation prior to the commencement of construction and during the construction period.

### **8.2.1 The precautionary principle**

The precautionary principle deals with certainty in decision-making. It provides that where there is a threat of serious or irreversible environmental damage, the absence of full scientific certainty should not be used as a reason to postpone measures to prevent environmental degradation.

Alternative design options were considered and assessed to reduce the risk of serious and irreversible impacts on the environment, including avoiding significant environmental aspects (such as non-Aboriginal heritage), where feasible.

The detailed assessment of potential environmental impacts has sought to minimise impacts of the proposal on the environment. Where information has been lacking, a conservative approach has been adopted for the assessment. Safeguards have been proposed to minimise potential impacts. These safeguards would be implemented during construction and operation of the proposal. No safeguards have been postponed as a result of a lack of scientific certainty.

### **8.2.2 Intergenerational equity**

Intergenerational equity provides that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.

The proposal would provide improved road infrastructure for future generations of motorists, cyclists and pedestrians. Should the proposal not proceed, the principle of intergenerational equity may be compromised as future generations would inherit a lower level of service by the road transport network. Travel times on Boundary Street could increase as a result of an increase in traffic volume over time.

The proposal would also benefit future generations by ensuring that road safety is improved, with this being a positive benefit for all road users.

### **8.2.3 Conservation of biological diversity and ecological integrity**

The conservation of biological diversity and ecological integrity properties that the diversity of genes, species, populations and communities, as well as the ecosystems and habitats to which they belong, must be maintained and improved to ensure their survival.

An assessment of the existing local environment has been undertaken to identify and manage any potential impact of the proposal on local biodiversity. The potential impacts of the proposal on biodiversity would be limited to the construction phase and would be limited to removal of street trees in areas of road widening.

The proposal would not significantly fragment or isolate any existing large patches of vegetation and would not compromise biological diversity or ecological integrity. No significant impacts to flora and fauna species were identified.

### **8.2.4 Improved valuation, pricing and incentive mechanisms**

Improved valuation, pricing and incentive mechanisms provide that cost to the environment should be factored into the economic costs of a proposal. This REF has examined the environmental consequences of the proposal and identified mitigation measures for areas which have the potential to experience adverse impacts.

Requirements imposed in terms of implementation of these mitigation measures would result in an economic cost to Roads and Maritime. The implementation of mitigation measures would increase both the capital and operating costs of the proposal. This signifies that environmental resources have been given appropriate valuation.

### **8.3 Conclusion**

The proposed upgrade of Boundary Street between the Pacific Highway and Melnotte Avenue, Roseville is subject to assessment under Part 5 of the EP&A Act. The REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed activity. This has included consideration of conservation agreements and plans of management under the NPW Act, joint management and biobanking agreements under the TSC Act, wilderness areas, critical habitat, impacts on threatened species, populations and ecological communities and their habitats and other protected fauna and native plants.

A number of potential environmental impacts from the proposal have been avoided or reduced during the concept design development and options assessment. The proposal as described in the REF best meets the project objectives but would still result in some impacts on noise and vibration, socio-economic factors, non-Aboriginal heritage and visual impact. Mitigation measures as detailed in this REF would ameliorate or minimise these expected impacts. The proposal would also reduce traffic congestion and travel times as well as improve safety for motorists, cyclists and pedestrians. On balance the proposal is considered justified.

The environmental impacts of the proposal are not likely to be significant and therefore it is not necessary for an environmental impact statement to be prepared and approval to be sought for the proposal from the Minister for Planning under Part 5.1 of the EP&A Act. The proposal is unlikely to affect threatened species, populations or ecological communities or their habitats, within the meaning of the *Threatened Species Conservation Act 1995* or *Fisheries Management Act 1994* and therefore a Species Impact Statement is not required. The proposal is also unlikely to affect Commonwealth land or have an impact on any matters of national environmental significance.

## 9 Certification

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This review of environmental factors provides a true and fair review of the proposal in relation to its potential effects on the environment. It addresses to the fullest extent possible all matters affecting or likely to affect the environment as a result of the proposal.



Whitney Taylor  
Environmental Planner  
Sinclair Knight Merz  
Date: 7 February 2014

I have examined this review of environmental factors and the certification by Whitney Taylor of Sinclair Knight Merz and accept the review of environmental factors on behalf of Roads and Maritime Services.

John Kalantzis  
Project Manager  
Roads and Maritime Sydney Region  
Date:



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# 11 Terms and acronyms used in this REF

Acronym/Term	Definition
ABS	Australian Bureau of Statistics
AHD	Australian Height Datum
CEMP	Construction environmental management plan
Decile	Decile is an ABS term. Deciles divide a distribution into ten equal groups. The lowest scoring 10 per cent of areas are given a decile number of one, the second-lowest 10 per cent of areas are given a decile number of two, up to the highest 10 per cent of areas that are given a decile number of 10.
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i> (NSW). Provides the legislative framework for land use planning and development assessment in NSW
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Commonwealth). Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process.
ESD	Ecologically sustainable development. Development which uses, conserves and enhances the resources of the community so that ecological processes on which life depends, are maintained and the total quality of life, now and in the future, can be increased
Heritage Act	<i>Heritage Act 1977</i> (NSW)
ICOMOS	International Council on Monuments and Sites
ISEPP	State Environmental Planning Policy (Infrastructure) 2007
LEP	Local Environmental Plan. A type of planning instrument made under Part 3 of the EP&A Act.
LoS	Level of Service. A qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers.
NES	Matters of national environmental significance under the Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i> .
PACHCI	Procedure for Aboriginal Heritage Consultation and Investigation
PEI	Preliminary Environmental Investigation
Permanent batter slope	A type of retaining wall characterised by sloped fill batters.
SEPP	State Environmental Planning Policy. A type of planning instrument made under Part 3 of the EP&A Act.
SA kerb and gutter	Typically used as a barrier kerb and gutter adjacent to a footway
SF kerb median	Raised median and traffic island
QA Specifications	Specifications developed by Roads and Maritime Services for use with roadworks and bridgeworks contracts let by Roads and Maritime Services
VMP	Vehicle Movement Plan
Viewpoint	The area to which the proposal is visible to the human eye from a fixed vantage point.