

Pennant Hills Road and North Rocks Road, Carlingford – Intersection Upgrade

Review of environmental factors

April 2018

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Roads and Maritime Services

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Prepared by Roads and Maritime Services.

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Executive summary

The proposal

Roads and Maritime Services NSW (Roads and Maritime) proposes to upgrade the intersection at Pennant Hills Road and North Rocks Road in Carlingford. The proposal involves the provision of additional lanes and new intersection configurations on Pennant Hills Road and North Rocks Road, which would ease congestion and improve traffic flow along the corridor.

Key features of the proposal include:

- Widen Pennant Hills Road to three through lanes (northbound only, currently two lanes with a merge lane), from the intersection of North Rocks Road to the BP service station (ties back into the existing three lane arrangement). Utilising the existing merge lane (kerbside) and minor widening (within the road reserve)
- Property driveway and property front fence modification in front of four residences and the BP service station due to the widening (within the road reserve)
- Modification of the bus lane to a through lane in front of the BP service station including road regrade to remove the small drain
- Install a concrete median along Pennant Hills Road from North Rocks Road intersection up to Murray Farm Road (connects to existing concrete median)
- Dedicated right turn bay from North Rocks Road (eastern leg) onto Pennant Hills Road (travelling north)
- Lengthen existing left turn only bay from North Rocks Road (eastern leg) onto Pennant Hills Road (travelling south) to make this a shared left and through lane
- Dedicated high entry left slip lane from Pennant Hills Road (southbound) onto North Rocks Road (eastern leg)
- Utility relocation requiring underboring under Pennant Hills Road in two locations
- Vegetation and tree removal due to the widening works
- Realignment of the pedestrian footpath to the edge of the new kerb due to the widening works on Pennant Hills Road (northbound lane).

Need for the proposal

Pennant Hills Road (A28), is a state urban road that links the Pacific Motorway (M1), Pacific Highway (A1) and (B83) at Wahroonga in the north east, with the major central business district of Parramatta in the south west and is located 850 metres south of the M2 Motorway. Pennant Hills Road at the proposal area, has an average daily traffic count of over 30 000 vehicles per day.

Currently, motorists are experiencing delays travelling through the intersection of Pennant Hills Road and North Rocks Road. The aim of this proposal is to increase the capacity of the intersection by reducing queue lengths and improving safety. Traffic assessments conducted by Roads and Maritime identified a pinch point for through traffic in both directions on Pennant Hills Road, between North Rocks and Murray Farm Roads. This is attributed to lane geometry, where a 415m length of the northbound carriageway between the two intersections is reduced from three to two lanes (the proposal location). The existing performance of Pennant Hills Road ranges from a Level of Service D (northbound in the AM peak period) to a Level of Service F (northbound in the PM peak period) with the overall intersection performing at a Level of Service E during both the AM and PM peak periods.

The proposal forms part of the Roads and Maritime Pinch Points Program which aims to relieve traffic congestion and improve traffic flow on Sydney's major corridors, including maximising capacity at key intersections.

Proposal objectives and development criteria

The objectives of the proposal are:

- Improve the operational efficiency of the Pennant Hills Road corridor, specifically at the North Rocks Road intersection
- Improve traffic flow and maximise use of road space
- Improve road safety and minimise non-recurrent congestion events
- Ease traffic congestion and improve the consistency of travel times for motorists, particularly during peak hours.

The development criteria for the proposal include:

- Constructability
- Lane use and community impacts
- Utility relocation
- Environmental impact

Options considered

A base case 'do nothing' option and two options were considered for this proposal:

Option 1 – do nothing

This option retains the existing road arrangement and assumes ongoing maintenance of the road.

Option 2 - upgrade and widen Pennant Hills Road to three through lanes north and south bound, including widening on the north east and south east corners of the intersection.

This option would allow three through lanes on both the north and south bound lanes on Pennant Hills Road, an added right turn lane from North Rocks Road onto Pennant Hills northbound, a high entry left slip lane from Pennant Hills Road (southbound) onto North Rocks Road and extension of the dual right turn lanes northbound lane on Pennant Hills Road onto North Rocks Road. This option would involve the installation of a median along Pennant Hills Road.

Option 3 - widen Pennant Hills Road to three through lanes (northbound only) from the intersection of North Rocks Road to Murray Farm Road (ties back into the existing three lane arrangement), and retaining the existing southbound lanes of Pennant Hills Road as two through lanes. This option also includes a dedicated high entry left slip lane from Pennant Hills Road (southbound) onto North Rocks Road.

This option would provide an additional lane on Pennant Hills Road, northbound only (currently two lanes with a merge lane). The existing merge lane (kerbside) would be utilised and would involve minor widening in front of four residences including property fence and driveway adjustment (within the road reserve, no property acquisition required). A dedicated right turn bay from North Rocks Road (eastern leg) onto Pennant Hills Road (travelling north), lengthened existing left turn only bay from North Rocks Road (eastern leg) onto Pennant Hills Road (southbound). This option also includes a high entry left slip lane from Pennant Hills Road (southbound) onto North Rocks Road (east leg).

Statutory and planning framework

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 Roads and Maritime, it can be assessed under Part 5 of the Environmental Planning and Assessment Act 1979. Development consent from council is not required.

Community and stakeholder consultation

Roads and Maritime has consulted with potentially affected residents and business owners, community members, relevant government agencies and other stakeholders. All stakeholders were encouraged to provide their feedback and comments via mail, email and phone.

Roads and Maritime invited feedback on the proposal in December 2017. Feedback was received from 61 people, with 28 people supporting the proposal, 21 people against the proposal and 12 people who did not state a preference.

Key matters raised include:

- Proposal justification
- North Rocks Road and Pennant Hills Road (south of the intersection) issues
- Environmental impacts
- Pedestrian and cyclist safety
- Traffic signal phasing

Environmental impacts

A summary of the main environmental impacts associated with the proposal is provided below.

Biodiversity

The proposal would require the removal of trees from the northbound kerbside lane of Pennant Hills Road for the widening, and at the corner of North Rocks Road and Pennant Hills Road for the new high entry slip lane and the compound site, some tree removal is also required where the widening is occurring on North Rocks Road on the grass verge. The trees to be removed comprise native and introduced species and recent plantings, and do not comprise threatened species or form part of threatened ecological communities. Due to the mostly scattered layout of the trees along the verge and their location along a busy and noisy urban road, it is unlikely that any threatened fauna species would be dependent on these trees.

Soil and water

Impacts would be associated with sediment migration as a result of excavation associated with the road widening and utility trenching, the erosion of exposed soils and stockpiles and tree clearing.

As the location of the proposal is within an urban area surrounded by residential and commercial properties and of a relatively flat nature (slope of <5%), the erosion and sediment risks during construction are considered to be minor and any impacts can be mitigated with implementation of standard construction management measures and the safeguards outlined in this REF.

Traffic and transport

During construction, temporary traffic capacity reductions would be required including lane closures and reduced speed limits. Additional vehicle movements would be generated along Pennant Hills Road and North Rocks Road and the surrounding road network due to construction equipment and staff. Traffic disruptions would be minimised as the majority of construction activities would occur outside of standard construction hours. Disruption to existing property access would be minimised during construction however there would be some access impacts to properties during operation due to the construction of a concrete median on Pennant Hills Road (between North Rocks Road and Murray Farm Road).

Noise and vibration

Receivers within close proximity of Pennant Hills Road already experience traffic background noise from existing traffic flows. During the construction phase of the proposal, work outside normal hours may be required to reduce disruptions to daily traffic and surrounding receivers. Residential sensitive receivers near the proposal would potentially be impacted by construction activities. In

particular, receivers located adjacent to the Pennant Hills Road and North Rocks Road intersection and adjoining roads would be impacted most.

Construction activities are anticipated to occur within 10 m of the most affected residential receivers, and within 20 m of some commercial receivers. Results indicate that noise levels would exceed NMLs for all construction scenarios in this area. No receivers would experience noise increases above 2dB as a result of the proposal.

Activities occurring outside standard hours would also result in exceedances of NMLs at the nearest sensitive receivers. Safeguard measures have been proposed to mitigate noise impacts during construction.

Aboriginal Heritage

The proposal area has been previously disturbed as a result of the construction of the original Pennant Hills Road and North Rocks Road carriageways as well as residential and business developments. These previous impacts have resulted in removal or disturbance to, the upper layers of the natural soil profile. It is unlikely there would be impacts to Aboriginal heritage as a result of the proposal.

Non Aboriginal heritage

There are no expected impacts to places with non-Aboriginal heritage significance.

Landscape character and visual Impacts

Due to the small section of widening works (relative to the area covered by residential and commercial areas); the proposal would not change the overall character of the area, and would affect a small area directly facing onto the proposal. The removal of vegetation and the movement of the road closer to properties on Pennant Hills Road, Northbound, would have some visual impacts however these are considered moderate.

Socio economic

The Roselea community centre, residents and businesses would be exposed temporarily to increased noise and traffic due to reduced speed limits and construction activities. As part of preliminary construction staging, it is likely the existing pedestrian footpaths adjacent to the work areas (including Pennant Hills Road where the widening is occurring in front of the four residential properties and for the new high entry slip lane) will be temporarily occupied. Wayfinding signage will be used to direct pedestrians to the other side of the footpath using the existing at grade pedestrian crossing near the Roselea Community Centre.

Properties on the western side of Pennant Hills Road and southern side of North Rocks Road would have access restrictions to their driveways temporarily as the roadworks take place. As part of the proposal, a concrete median along Pennant Hills Road would be constructed to prevent the right turn movement of vehicles across Pennant Hills Road. Affected road users will need to re-route up to 2.3km.

Cumulative impacts

Some cumulative traffic and noise impacts with NorthConnex and the pinch point intersection upgrade projects in Eastwood are anticipated during construction.

Other impacts

Other impacts that have been considered and assessed include waste and air quality.

Justification and conclusion

The proposed upgrade of the Pennant Hills Road and North Rocks Road intersection 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.

A number of potential environmental impacts from the proposal have been avoided or reduced during the concept design development and options assessment, including avoiding the need for private property acquisition.

The proposal as described in the REF best meets the proposal objectives but would still result in some impacts to noise, landscape (tree removal), traffic and visual impacts. Safeguards and management measures as detailed in this REF would minimise these impacts. The proposal long term, would reduce congestion, improve travel reliability, support population growth and labour accessibility to key employment centres, improve road safety and improve freight efficiency. On balance the proposal is considered justified.

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1 Introduction

This chapter introduces the proposal and provides the context of the environmental assessment.

1.1 Proposal identification

Roads and Maritime Services NSW (Roads and Maritime) proposes to upgrade the intersection at Pennant Hills Road and North Rocks Road in Carlingford. The proposal involves the provision of an additional through lane and new intersection configurations on Pennant Hills Road and North Rocks Road, which would ease congestion and improve traffic flow along the corridor. This Review of Environmental Factors (REF) assesses the potential impacts of the proposal on the environment.

Pennant Hills Road (A28), is a state urban road that links the Pacific Motorway (M1), Pacific Highway (A1) and (B83) at Wahroonga in the north east, with the major central business district of Parramatta in the south west and is located 850 metres south of the M2 Motorway. Pennant Hills Road at the proposal area, has an average daily traffic count of over 30 000 vehicles per day. The existing performance of Pennant Hills Road ranges from a Level of Service D to a Level of Service F with the overall intersection performing at a Level of Service E. The State Infrastructure Strategy highlights the government's commitment to easing traffic congestion along Sydney's main roads which includes allocating \$300 million to address pinch points across Sydney's busiest corridors.

Currently, motorists are experiencing delays travelling through the intersection of Pennant Hills Road and North Rocks Road. The aim of this proposal is to increase the capacity of the intersection by reducing queue lengths and improving safety.

The proposal forms part of the Roads and Maritime Pinch Points Program which aims to relieve traffic congestion and improve traffic flow on Sydney's major corridors, including maximising capacity at key intersections.

The proposal is located in the City of Parramatta Local Government Area (LGA), approximately 26 kilometres from the Sydney Central Business District (CBD). The proposal extends from the intersection at Pennant Hills Road and North Rocks Road to the existing concrete median before Murray Farm Road, covering a distance of approximately 415m. The proposal is located in an urban setting, surrounded by low density residential housing, a community centre and some commercial properties.

Key features of the proposal would include:

- Widen Pennant Hills Road to three through lanes (northbound only, currently two lanes with a merge lane), from the intersection of North Rocks Road to the BP service station (ties back into the existing three lane arrangement). Utilising the existing merge lane (kerbside) and minor widening (within the road reserve)
- Property driveway and property front fence modification in front of four residences and the BP service station due to the widening (within the road reserve)
- Modification of the bus lane to a through lane in front of the BP service station including road regrade to remove the small drain
- Install a concrete median along Pennant Hills Road from North Rocks Road intersection up to Murray Farm Road (connects to existing concrete median)
- Dedicated right turn bay from North Rocks Road (eastern leg) onto Pennant Hills Road (travelling north)
- Lengthen existing left turn only bay from North Rocks Road (eastern leg) onto Pennant Hills Road (travelling south) to make this a shared left and through lane
- Dedicated high entry left slip lane from Pennant Hills Road (southbound) onto North Rocks Road (eastern leg)
- Utility relocation requiring underboring under Pennant Hills Road in two locations

- Vegetation and tree removal due to the widening works in front of four residences
- Realignment of the pedestrian footpath to the edge of the new kerb due to the widening works on Pennant Hills Road (northbound lane)

The location of the proposal is shown in Figure 1-1 and an overview of the proposal is provided in Figure 1-2. Chapter 3 describes the proposal in more detail.



Figure 1-1: Location of the proposal

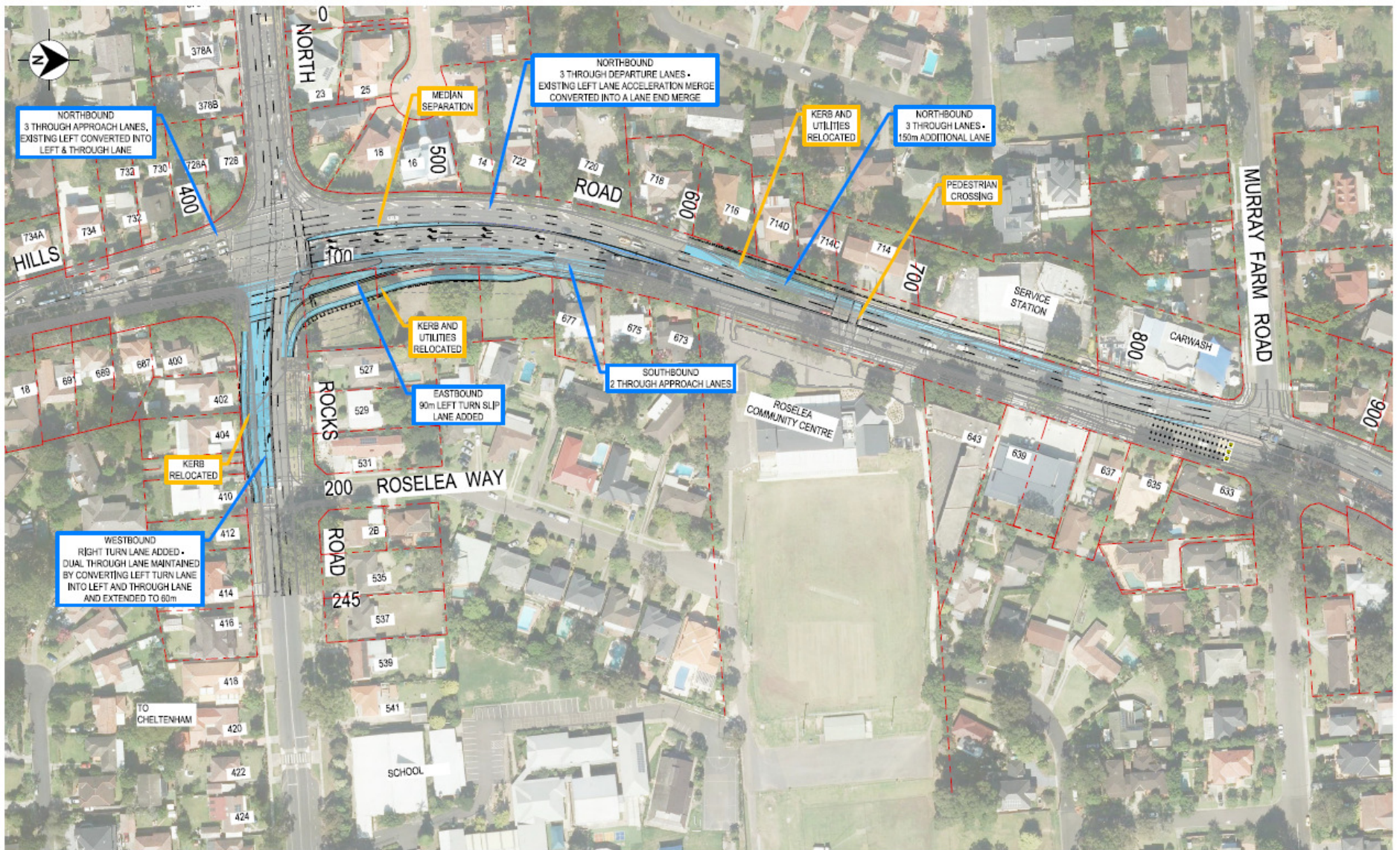


Figure 1-2: The proposal

Easing Sydney's Congestion Pinch Points-Pennant Hills Road/North Rocks Road, Carlingford
 Review of Environmental Factors

1.2 Purpose of the report

This REF has been prepared by Roads and Maritime, Easing Sydney's Congestion. For the purposes of these works, 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 the context of clause 228 of the *Environmental Planning and Assessment Regulation 2000*, the factors in *Is an EIS Required? Best Practice Guidelines for Part 5 of the Environmental Planning and Assessment Act 1979* (Is an EIS required? guidelines) (DUAP, 1995/1996), the *Biodiversity Conservation Act 2016* (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 examine and take 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 under Part 5.1 of the EP&A Act
- The significance of any impact on threatened species as defined by the BC Act and/or FM Act, in section 5A of the EP&A Act and therefore the requirement for a Species Impact Statement
- The significance of any impact on nationally listed biodiversity matters under the EPBC Act, including whether there is a real possibility that the activity may threaten long-term survival of these matters, and whether offsets are required and able to be secured
- The potential for the proposal to significantly impact any other matters of national environmental significance or Commonwealth land and the need, subject to the EPBC Act strategic assessment approval, to make a referral to the Australian Government Department of the Environment for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the EPBC Act.

2 Need and options considered

This chapter describes the need for the proposal in terms of its strategic setting and operational need. It identifies the various options considered and the selection of the preferred option for the proposal.

2.1 Strategic need for the proposal

Pennant Hills Road (A28), is a state urban road that links the Pacific Motorway (M1), Pacific Highway (A1) and (B83) at Wahroonga in the north east, with the major central business district of Parramatta in the south west and is located 850 metres south of the M2 Motorway.

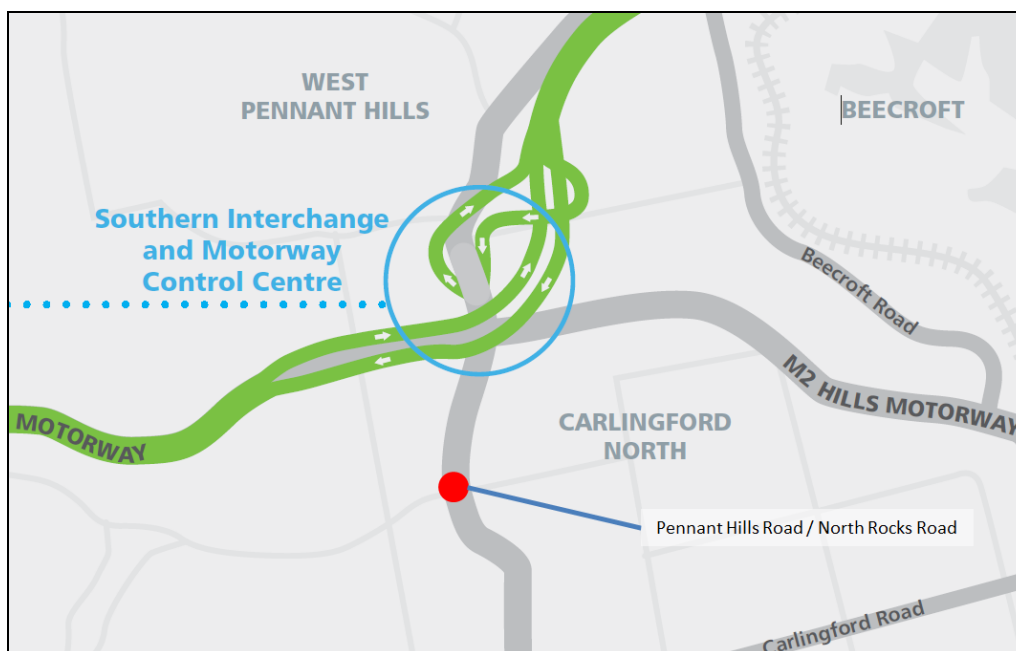
NorthConnex is a nine kilometre tunnel that will link the M1 Pacific Motorway at Wahroonga to the Hills M2 Motorway at West Pennant Hills, as shown in Figure 2-1, removing around 5,000 trucks off Pennant Hills Road each day. The nine kilometre tunnel motorway includes interchanges to the north and south to accommodate connections at either end. When complete in 2019, it will link Sydney's north to the Orbital network.

The southern interchange will provide connections between the tunnel, Hills M2 Motorway and Pennant Hills Road. The northbound on-ramp and southbound off-ramp joining Pennant Hills Road would be located south of Copeland Road approximately one kilometre north of the Pennant Hills Road / North Rocks Road intersection.

The tunnel portals provide accessibility for both northbound and southbound vehicles to and from Pennant Hills Road. North Rocks Road is a potential major east-west traffic distributor for traffic accessing Pennant Hills Road and the NorthConnex tunnel.

Traffic assessments conducted by Roads and Maritime identified an existing pinch point for through traffic in both directions on Pennant Hills Road, between North Rocks and Murray Farm Roads. This is primarily attributed to lane geometry, where a 415m length of the northbound carriageway between the two intersections is reduced from three to two lanes (the proposal location). The existing performance of Pennant Hills Road ranges from a Level of Service D (northbound in the AM peak period) to a Level of Service F (northbound in the PM peak period) with the overall intersection performing at a Level of Service E during both the AM and PM peak periods.

Figure 2-1 NorthConnex Southern Interchange



Source: Roads and Maritime; 2016

2.1.1 NSW 2021: A Plan to Make NSW Number One

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. The NSW 2021 Plan 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 three goals relating to transport and infrastructure identified in the NSW 2021 Plan. These are:

- Improves the operational efficiency of the road
- Reduction of travel times by improving traffic flows
- Improving road safety

By adding an additional northbound lane on Pennant Hills Road as well as reconfiguring and upgrading the intersection with North Rocks Road, the efficiency of the intersection and Pennant Hills Road corridor would improve. The construction of a concrete median along Pennant Hills Road is anticipated to restrict right turn movements therefore further improving traffic flow and reducing the potential for rear end crashes hence improving road safety. As such, the proposal's objectives are consistent with the NSW 2021 Plan.

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.

The proposal will improve the efficiency of the Pennant Hills Road corridor and improve safety; therefore it aligns with the SIS.

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 sets a number of targets including implementing a program to identify pinch points and alleviate traffic congestion by upgrading motorway infrastructure and more efficient management of road space.

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 growing pressure on the road network
- Being able to travel safer, including the provision of safe travel options and networks

The intersection of Pennant Hills Road and North Rocks Road was identified as a pinch point by Roads and Maritime. The proposal would improve both congestion and safety at the intersection by allowing better through traffic flow on Pennant Hills Road and therefore is aligned with the aim of the LTTMP of reducing congestion and improving safety at pinch point locations.

2.1.4 Metropolitan Plan for Sydney 2036

The Metropolitan Plan sets the boundaries for future urban development and identifies the strategic transport corridors and major centres best placed to focus sustainable commercial and residential

growth in the future. One key principle of this plan is to ensure connectivity of centres with a networked transport system. This comprises of the implementation of major rail expansion projects and road upgrades to increase capacity across the transport system.

The additional through lane on Pennant Hills Road and the intersection upgrade at North Rocks Road would increase capacity across the road network in Carlingford and onto the Hills M2 Motorway.

2.1.5 Parramatta Strategic Plan

The Parramatta Community Strategic Plan 2038 was adopted by Council in June 2013. It is a continuation of the previous Community Strategic Plan Parramatta Twenty25.

The strategic plan describes Parramatta as aspiring to serve as a major economic hub to one of Australia's fastest growing areas. The strategy identifies the need for a number of transport investments to make all of the city's commercial and cultural precincts accessible to people, and to improve the ease of travelling within the region and between the precincts.

Of the six strategic objectives of the Strategic Plan, the following align with this proposal;

- *Connectivity- Parramatta will be a city with fast, reliable transport and digital networks that connect people to each other, to the information and services they need and to where they need to go.*

2.1.6 Future Transport Strategy 2056

Future Transport Strategy 2056 is NSW Government's vision for the next 40 years of transport in NSW and is a result of the review of the NSW Long Term Transport Master Plan. The purpose of the strategy is to guide integrated transport and land use planning across regional NSW and Greater Sydney. Transport and customer outcomes to be achieved over the short, medium and long term to provide better and safer journeys for all transport customers are set out in the strategy.

The Future Transport Strategy will be supported by a suite of issue-specific and place-based plans that focus on the role transport plays in the land use, tourism and economic development of towns and cities. Plans under the strategy that have been finalised include; Greater Sydney Services and Infrastructure Plan, Regional NSW Services and Infrastructure Plan and the Road Safety Plan.

A key priority and direction under the Future Transport Strategy 2056 relates to movement and place; balancing the efficient movement of people and goods with the liveability of places on the transport network. A part of the vision for Greater Sydney is that of a 30 minute city where anyone can reach their nearest Metropolitan and Strategic centre within 30 minutes by public transport 7 days a week. Enhanced centre to centre networks and movement corridors are identified as important to achieve that vision.

The Future Transport Strategy 2056's vision is to provide better and safer journey for transport customers around Sydney. Improvements to the transport corridor along the Pennant Hills Road corridor aligns with the outcomes sought in in the Future Transport Strategy 2056 through improving the travel time and reliability along the corridor.

2.2 Existing infrastructure

The proposal is located at the Pennant Hills Road and North Rocks Road signalised intersection (Figure 1-1 and Figure 2-2).

Pennant Hills Road from North Rocks Road to Murray Farm Road

Pennant Hills Road at this location is an undivided single carriageway separated by a painted barrier line. From North Rocks Road to Murray Farm Road, Pennant Hills Road is generally two through lanes. The lane configurations at the intersection with North Rocks Road are as follows:

- Northbound approach has two through lanes, a dedicated left turn lane and dual right turn lanes
- Northbound departure has two through lanes
- Southbound approach has two through lanes and dual right turn lanes
- Southbound departure has two through lanes and a merge lane.

Pennant Hills Road has a pedestrian footpath along the kerbside lane on both sides of the road, with a signalised crossing on the northern leg across Pennant Hills Road (at the intersection of North Rocks Road) and another signalised crossing at the Roselea Community Centre. Refer Figure 2-2 for an aerial layout of the existing intersection arrangement.

North Rocks Road

North Rocks Road at this location is an undivided single carriageway separated by a painted barrier line. The lane configurations at the intersection with Pennant Hills Road are as follows:

- Eastbound approach has a single through lane and a dedicated right turn lane
- Eastbound departure has two lanes, which merge approximately 100m east of the intersection
- Westbound approach has three lanes. The median lane is a shared right turn and through lane, the central lane is a dedicated through lane and the kerbside lane is a short (approximately 30m) left turn lane
- Westbound departure has two lanes.

North Rocks Road has a pedestrian footpath along the kerbside lane on both sides of the road, with a signalised pedestrian crossing on the eastern and western legs of the intersection at Pennant Hills Road. There is also a zebra crossing on the left turn slip lane from North Rocks Road to Pennant Hills Road (northbound). Refer Figure 2-2 for an aerial layout of the existing intersection arrangement.

The speed limit is 60 km/h at both Pennant Hills Road and North Rocks Road. School zones reduce the speed to 40 km/h on both roads in the vicinity of the intersection between;

- 8.00am to 9.30am
- 2.30pm to 4.00pm.

Local roads intersecting the proposal have a speed limit of 50 km/h. North Rocks Road has a weight restriction of 3 tonnes and over, east bound.



Figure 2-2 Existing intersection layout at the Pennant Hills Road – North Rocks Road intersection

Land use

The existing land use around the proposal consists of:

- Low density residential
- Commercial property (BP Service Station, fitness centre, mowing service) about 300m north of the intersection
- School (St Gerard’s Catholic Primary School, Carlingford High School and Roselea Public School)
- Church
- Roselea Park / Community Centre; and
- Vacant land at the north east corner of North Rocks Road intersection (land owned by Roads and Maritime).

The existing land use around the compound site consists of low density residential property.

Utilities

The following service providers have utilities that could be affected by the proposal;

- Ausgrid
- Jemena
- Communications (including Telstra assets)
- Roads and Maritime Services traffic control signals; and
- Sydney Water

Further detail is provided in Section 3.5.

Public transport- bus services, bus stops

There are a number of bus routes in close proximity to the proposal as follows:

- Bus route 549 travels the length of North Rocks Road from Parramatta to Epping Station
- Bus route 553 travels between Beecroft and North Rocks along North Rocks Road and Pennant Hills Road
- Bus route 625 travels from Parramatta Station to Pennant Hills Station along Pennant Hills Road

- Bus route 630 Epping to Blacktown travels along Pennant Hills Road and North Rocks Road.

For most of the routes, the bus service operates Monday to Friday at an approximate frequency of 30 minute intervals, hourly intervals on Saturdays and once every two hours on Sundays and public holidays. Generally, the bus routes are operational 6.00am to 6.00pm, with the exception of bus route 549 terminating at 10pm Monday to Friday.

There is a short bus only lane on Pennant Hills Road northbound. This lane begins and ends outside the BP service station at the end of the proposal area.

Parking

'No Stopping' and 'No Parking' zones are provided along both directions of Pennant Hills Road and North Rocks Road at the vicinity of the intersection. In addition, clearways are in operation along Pennant Hill Road during the hours of 6am to 7pm on weekdays and 8am to 8pm on weekends and public holidays.

Drainage infrastructure

The existing drainage along the proposal consists of pits, pipes and kerb gutters. Pennant Hills Road grades longitudinally towards the north. The road currently has one way cross fall towards the east for the first 100m from North Rocks Road and Pennant Hills Road intersection. The cross fall then transitions to two way cross fall crowned between the northbound and southbound lanes. Approximately 200m north of the intersection there is a low point on the northbound kerb adjacent to the existing bus bay.

Street lighting

The existing street lighting on Pennant Hills Road and at the intersection with North Rocks Road consists of poles with outreach arm and luminaires. On the east side of Pennant Hills Road the lighting poles also contain both HV and LV overhead conductors. Lights within the proposal on North Rocks Road and Pennant Hills Road may need to be relocated to allow for road widening. Preliminary investigations have identified potential for improved lighting as part of the proposal.

2.3 Proposal objectives and development criteria

2.3.1 Proposal objectives

The objectives of the proposal include:

- Improve the operational efficiency of the Pennant Hills Road corridor, specifically at the North Rocks Road intersection
- Improve traffic flow and maximise use of road space
- Improve road safety and minimise non-recurrent congestion events
- Ease traffic congestion and improve the consistency of travel times for motorists, particularly during peak hours.

The development criteria for the proposal include:

- Constructability
- Lane use and community impacts
- Utility relocation
- Environmental impact

2.4 Alternatives and options considered

2.4.1 Methodology for selection of preferred option

A strategic investigation was undertaken to provide an overview of the physical constraints of the intersection, including utilities, property boundaries and bus zones.

In response to the physical constraints of the intersection a traffic analysis was conducted to determine the optimal configuration for the Pennant Hills and North Rocks Road intersection. During the traffic analysis, preliminary design elements were investigated by Roads and Maritime for the proposal area, which identified two main options. Each option was assessed against the proposal objectives and development criteria outlined above in section 2.3.

2.4.2 Identified options

During strategic design three options were considered:

Option 1 – do nothing

This option retains the existing road arrangement and assumes ongoing maintenance of the road.

Option 2 - upgrade and widen Pennant Hills Road to three through lanes north and south bound, including widening on the north east and south east corners of the intersection (see Figure 2-3). This option would allow three through lanes on both the north and south bound lanes on Pennant Hills Road, an added right turn lane from North Rocks Road onto Pennant Hills northbound, a high entry left slip lane from Pennant Hills Road (southbound) onto North Rocks Road and extension of the dual right turn lanes northbound lane on Pennant Hills Road onto North Rocks Road. This option would involve the installation of a median along Pennant Hills Road.

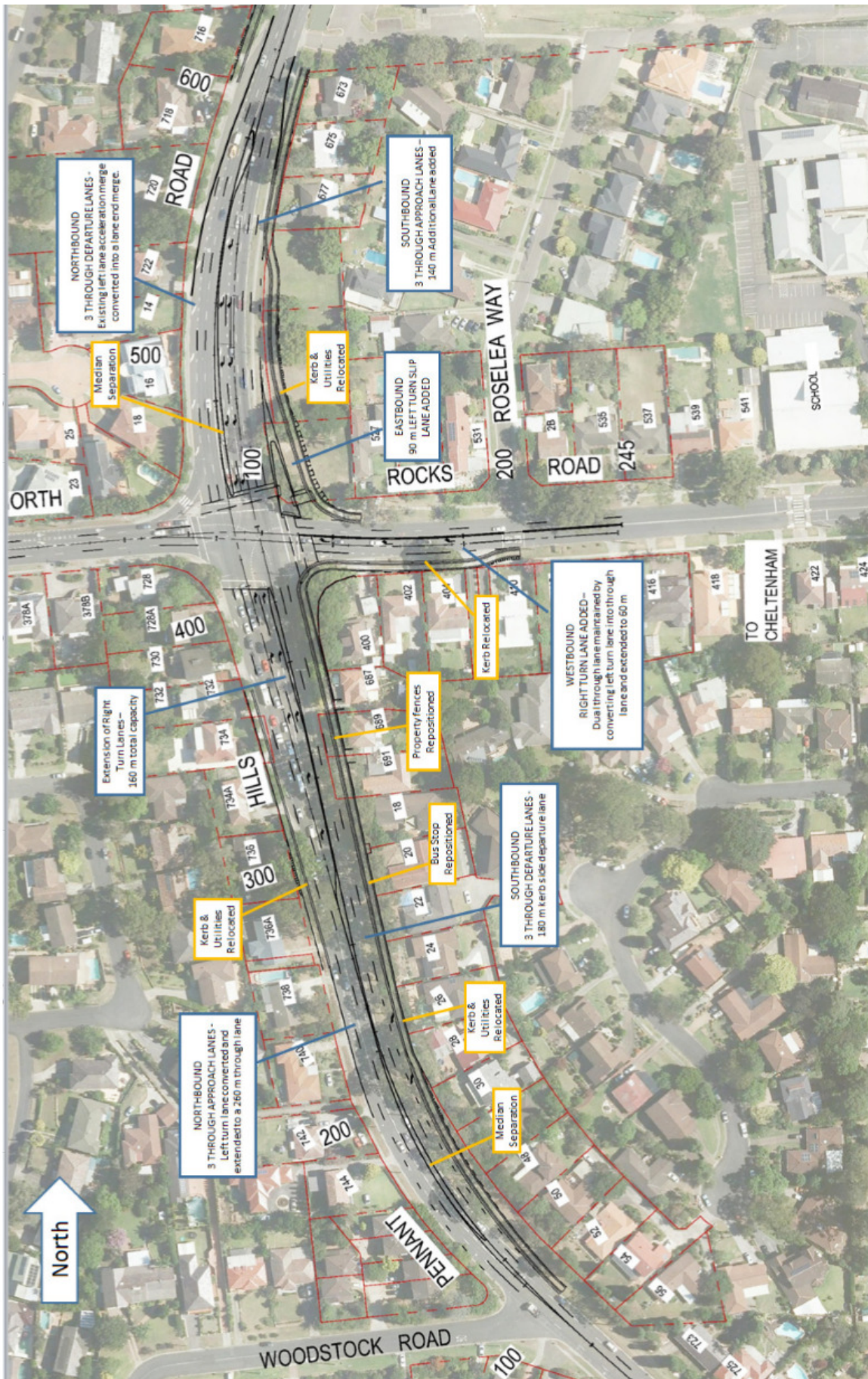


Figure 2-3 Option 2 - widen Pennant Hills Road to 3 through lanes northbound and southbound

Option 3 - widen Pennant Hills Road to three through lanes (northbound only) from the intersection of North Rocks Road to Murray Farm Road (ties back into the existing three lane arrangement), and retaining the existing southbound lanes of Pennant Hills Road as two through lanes. This option also includes a dedicated high entry left slip lane from Pennant Hills Road (southbound) onto North Rocks Road (see Figure 1-2).

This option would provide an additional lane on Pennant Hills Road, northbound only (currently two lanes with a merge lane). The existing merge lane (kerbside) would be utilised and would involve minor widening in front of 4 residences including property fence and driveway adjustment (within the road reserve, no property acquisition required). A dedicated right turn bay from North Rocks Road (eastern leg) onto Pennant Hills Road (travelling north), lengthened existing left turn only bay from North Rocks Road (eastern leg) onto Pennant Hills Road (southbound). This option also includes a high entry left slip lane from Pennant Hills Road (southbound) onto North Rocks Road (east leg).

2.5 Analysis of options

	Options		
Objectives	Option 1: Do-nothing	Option 2: Upgrade and widen Pennant Hills Road to three through lanes north and south bound,	Option 3: Widen Pennant Hills Road to three through lanes (northbound only) from the intersection of North Rocks Rd to Murray Farm Road
Improve the operational efficiency of the Pennant Hills Road corridor, specifically at the North Rocks Road intersection	<input checked="" type="checkbox"/> <p>It would not improve the operational efficiency of the Pennant Hills Road corridor, existing congestion would remain as is</p>	<input checked="" type="checkbox"/> <p>It would improve the operational efficiency of the Pennant Hills Road corridor, specifically at the North Rocks Road intersection through the provision of an additional north and south bound lane</p>	<input checked="" type="checkbox"/> <p>It would improve the operational efficiency of the Pennant Hills Road corridor, specifically at the North Rocks Road intersection through the provision of an additional northbound lane</p>
Improve traffic flow and maximise use of road space	<input checked="" type="checkbox"/> <p>It would not improve traffic flow</p>	<input checked="" type="checkbox"/> <p>It would improve traffic flow and maximise use of road space by minimising property acquisition</p>	<input checked="" type="checkbox"/> <p>It would improve traffic flow and maximise use of road space by minimising the road widening impacts to properties by only widening on one side of Pennant Hills Road</p>
Improve road safety and minimise non-recurrent congestion events	<input checked="" type="checkbox"/> <p>It would not improve road safety and minimise non-recurrent congestion events</p>	<input checked="" type="checkbox"/> <p>It would improve road safety and minimise non-recurrent congestion events through the provision of additional through lanes on Pennant Hills Road and LoS improvements at the intersection.</p>	<input checked="" type="checkbox"/> <p>It would improve road safety and minimise non-recurrent congestion events through the provision of an additional through lane on Pennant Hills Road and LoS improvements at the intersection. The median on Pennant Hills Road would restrict right turn movements therefore improving traffic flow and reducing the potential for rear end crashes.</p>

	Options		
Objectives	Option 1: Do-nothing	Option 2: Upgrade and widen Pennant Hills Road to three through lanes north and south bound,	Option 3: Widen Pennant Hills Road to three through lanes (northbound only) from the intersection of North Rocks Rd to Murray Farm Road
Ease traffic congestion and improve the consistency of travel times for motorists, particularly during peak hours.	<input checked="" type="checkbox"/> <p>It would not ease traffic congestion and improve the consistency of travel times for motorists, as it will retain the existing congestion conditions.</p>	<input checked="" type="checkbox"/> <p>It would ease traffic congestion and improve the consistency of travel times for motorists, particularly during peak hours at the Pennant Hills Road and North Rocks Road interchange</p>	<input checked="" type="checkbox"/> <p>It would ease traffic congestion and improve the consistency of travel times for motorists, particularly during peak hours at the Pennant Hills Road and North Rocks Road interchange</p>

	Options		
Criteria	Option 1: Do-nothing	Option 2: Upgrade and widen Pennant Hills Road to three through lanes north and south bound,	Option 3: Widen Pennant Hills Road to three through lanes (northbound only) from the intersection of North Rocks Rd to Murray Farm Road
Minimise environmental impacts	N/A	<input checked="" type="checkbox"/> <p>Vegetation on both sides of Pennant Hills Road would require removal</p>	<input checked="" type="checkbox"/> <p>Only vegetation on the northbound verge would require removal to accommodate road widening</p>
Minimise community issues and land acquisition impacts	N/A	<input checked="" type="checkbox"/> <p>Properties on both sides of the road would have driveways and property walls impacted.</p>	<input checked="" type="checkbox"/> <p>Only properties on the northbound side of North Rocks Road would have driveways and property walls impacted</p>

	Options		
Criteria	Option 1: Do-nothing	Option 2: Upgrade and widen Pennant Hills Road to three through lanes north and south bound,	Option 3: Widen Pennant Hills Road to three through lanes (northbound only) from the intersection of North Rocks Rd to Murray Farm Road
Minimise constructability issues	N/A	<input checked="" type="checkbox"/> Road widening on the southbound side of Pennant Hills Road as well as the northbound side would increase the scope of works and construction footprint.	<input checked="" type="checkbox"/> Construction activities limited to the road verge on the northbound lane of Pennant Hills Road.
Minimise impact on utility services	N/A	<input checked="" type="checkbox"/> Utilities on the northbound and southbound side of Pennant Hills Road will require relocation or protection as part of the work	<input checked="" type="checkbox"/> Some utilities on the northbound side of Pennant Hills Road will require relocation or protection as part of the work

2.6 Preferred option

As assessed in section 2.4.3, Option 1 would not meet the objectives of the strategic programs or proposal objectives detailed in section 2.3.1 and section 2.1, as it would not reduce delay for road users, manage congestion, improve safety or maintain consistent travel times. Therefore, Option 1 was rejected. Both option 2 and 3 meet the objectives of the strategic programs and proposal objectives.

The original preferred option was Option 2 as it provided the greatest traffic benefit to the Pennant Hills Road corridor and improvement to the level of service at the intersection, however due to funding allocated to the Pennant Hills Road corridor, this option was discarded to be investigated at a later stage. Option 3 was selected as it achieved the proposal objectives, performed well against the development criteria, with a lower cost to implement and indicates the intersection will operate adequately based on peak period traffic demands.

3 Description of the proposal

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

Roads and Maritime Services NSW (Roads and Maritime) proposes to expand and widen the Pennant Hills Road and North Rocks Road Intersection. Details of the upgrade are outlined below.

Pennant Hills Road

- Widen Pennant Hills Road to three through lanes (northbound only, currently two lanes with a merge lane), from the intersection of North Rocks Road to the BP service station, near Murray Farm Road where it ties back into the existing three lane arrangement
- The widening of Pennant Hills Road northbound lane, will utilise the existing merge lane (kerbside) from the left slip lane from North Rocks Road (western side), by removing the existing merging line marking
- As the existing merge lane on Pennant Hills Road terminates after approximately 170m, the widening on Pennant Hills Road northbound lane will also require minor widening (within the road reserve) in front of four residential properties (716, 714D, 714C and 714 Pennant Hills Road) and one commercial property (BP service station). No property acquisition is required however these properties will require driveway modification and property front fence modification
- Modification of the existing “bus only lane” on Pennant Hills Road which occurs along the frontage of the BP service station, to a trafficable through lane. This will also include road regrading to remove the small stormwater kerbside drain
- Install a narrow concrete median along Pennant Hills Road from North Rocks Road intersection up to Murray Farm Road (connects to existing concrete median) to avoid right turning traffic
- Install a new dedicated high entry left slip lane from Pennant Hills Road (southbound) onto North Rocks Road (eastern leg) with a 90m storage utilising the vacant land owned by Roads and Maritime at the corner of the intersection. The traffic island on this left slip lane will be paved. There is an existing retaining wall at this corner which will require rebuilding and some planted vegetation removal of large shrubs located adjacent to this existing retaining wall
- Maintain the existing at grade pedestrian crossing in front of 714 Pennant Hills Road and the Roselea Community Centre
- Where the widening works are occurring on Pennant Hills Road (northbound lane), realign the pedestrian footpath to the edge of the new kerb
- Due to the widening works on Pennant Hills Road (northbound lane) along the private property frontages, vegetation removal is required including shrubs and planted mature trees
- The through lane configuration on Pennant Hills Road southbound will remain as is
- Utility relocation due to the widening works on Pennant Hills Road northbound, underground and above ground assets will require relocation and is detailed in section 3.5
- Install formalised kerbs, pram ramps, new line marking and road furniture signage

North Rocks Road

- Widen North Rocks Road (eastern leg) to lengthen the existing left turn only bay onto Pennant Hills Road (southbound) by 60m and re-line mark to make this a shared left and through lane. Widening will occur into the existing wide grass verge within the road corridor, no property acquisition is required

- Re-line mark the existing two through lanes on North Rocks Road (eastern leg) to a dedicated right turn bay to travel onto Pennant Hills Road (northbound) and one through lane
- No pedestrian footpath will require realignment, as the existing grass verge is wide on North Rocks Road
- Maintain the existing at grade pedestrian crossing on North Rocks Road at the Pennant Hills Road intersection
- Due to the widening works on North Rocks Road (eastern leg) on the grass verge, some vegetation removal is required including shrubs and planted mature trees
- The departure lane configuration on North Rocks Road will remain as is
- Utility relocation and underboring due to the widening works on North Rocks Road eastern leg, underground and above ground assets will require relocation and is detailed in section 3.5. Underboring will be required to install underground services across Pennant Hills Road to minimise disturbance to roads and other infrastructure. The chosen sites for the two underbores are within the site compound area, and within the carpark of the community centre as detailed below in Figure 3-1. The underbore at the intersection is for Roads and Maritime electrical TCS assets and the underbore near the community centre is for a 415V electrical supply and Telstra communications cable (combined in one underbore)
- Install formalised kerbs, pram ramps, new line marking and road furniture signage



Figure 3-1 Locations of underboring across Pennant Hills Road

A compound site would be required for the proposal and will be located on the vacant land Roads and Maritime owned land on the north east corner of Pennant Hills Road and North Rocks Road intersection. Further detail about the site compound is provided in section 3.4.

The location of the proposal is shown in Figure 1-1 and an overview of the proposal is provided in Figure 1-2.

3.2 Design

3.2.1 Design criteria

Design considerations taken into account include site topographical constraints, existing utilities, and civil design standards, outcomes from the road safety audit, existing active transport routes, and freight routes. The design criteria for the proposal include those identified in Table 3-1.

Table 3-1: Design criteria

Requirement	Design
Civil	<ul style="list-style-type: none"> ▪ Pennant Hills Road is classified as a state road and North Rocks Road is classified as a local road. The design options are to be designed in accordance with Roads and Maritime supplements to AustRoads, AustRoads Guide to Road Design standards, Roads and Maritime publications and Australian Standards. ▪ No change to other roads in the area.
Design Speed	<ul style="list-style-type: none"> ▪ Pennant Hills Road is 60km/h ▪ North Rocks Road is 60km/h ▪ School zones apply to both roads and reduce the above posed speed to 40km/h at the intersection and in the general vicinity.
Lane Width	<ul style="list-style-type: none"> ▪ 3 to 3.3 metres
Roads Safety Audit	<ul style="list-style-type: none"> ▪ Standard safety inspection checklist provided in Austroads' "Guide to Road Safety, Part 6: Road Safety Audit" and RTA's (Roads and Maritime) "Accident Reduction Guide – Part 2: Road Safety Audits".
Active Transport	<ul style="list-style-type: none"> ▪ Pedestrian connectivity will be maintained by securing a path on the eastern side of Pennant Hills Road, both sides of North Rocks Road near the intersection and some parts of the western side of Pennant Hills Road during the construction period, with pedestrians re-directed to the opposite side using way-finding signage.
Freight and Trucks	<ul style="list-style-type: none"> ▪ Pennant Hills Road is a B-Double route and will be designed to accommodate these vehicles. The design vehicle for the project is a 19m semi-trailer for North Rocks Road West and 12.5m standard bus for North Rocks Road East. Specific features relating to the bus stops have been designed to accommodate expected bus traffic.

3.2.2 Typical cross section

The cross section of Pennant Hills Road is shown in Figure 3-2.

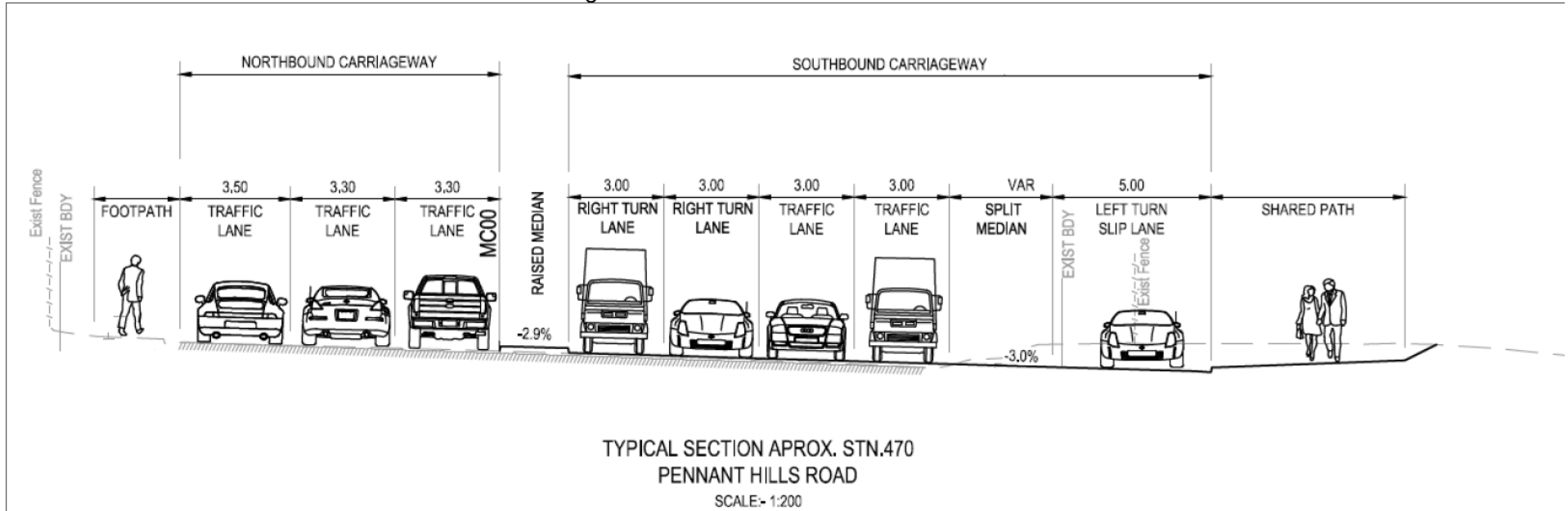


Figure 3-2 Typical cross section of Pennant Hills Road

3.3 Construction activities

3.3.1 Work methodology

Early Works

- Compound set up at RMS vacant block at the north east corner of the intersection
- Early utility adjustments as required

Stage 1 West side Pennant Hills Road additional lane

- Property adjustments and tree clearing to relocate boundary fences for 714C, 741D and 716 Pennant Hills Road to correct alignments
- Ground clearing / grubbing
- Utility adjustments into new service corridor
- Removal of existing footpath, driveways and kerb
- Excavate to foundation level (behind barriers)
- Install new stormwater pit and pipes
- Place and compact foundation and concrete pavement materials to finished levels
- Place new kerb, driveway, footpath and landscaping (turf)
- Seal and asphalt new lane (night works)
- Line marking (night works)

Stage 2 North East side turning lane on Pennant Hills Road

- Adjustments to RMS vacant land – rebuild existing retaining wall, tree removal
- Ground clearing / grubbing and earthworks to finished property levels
- Utility adjustments into new service corridor
- Excavate to foundation level for new road area
- Place and compact foundation and base materials to finished levels for new lane and footpath
- Relocate traffic control signals
- Concrete pavement works
- Build new footpath and kerb for new centre island
- Place new kerb, driveway, footpath and landscaping (turf)
- Seal and asphalt new lane (night works)
- Line marking (night works)

Stage 3 - South East Side Additional lane on North Rocks Road

- Ground clearing / grubbing
- Utility adjustments into new service corridor
- Excavate to foundation level
- Place and compact foundation and base materials to finished levels for new lane and footpath
- Place new kerb, driveway, footpath and landscaping (turf)
- Seal and asphalt new lane (night works)
- Line marking (night works)

Underboring for utilities on Pennant Hills Road

- Excavation of pits at either end of the underboring route, typically these would be up to five metres long by one metre wide and two metres deep
- Site preparation at the location where the underboring equipment would be located (within the pit shown in Figure 3-3). This will include minor earthworks, installation of a concrete thrust block and environmental protection measures such as sediment and erosion control measures and temporary stockpiling areas
- Installation of the underboring machinery

- Underboring including operation of the underboring equipment, spoil management and installation of conduits
- Pulling cables through the conduits from the entry to receival pits
- Removal of the underboring equipment and restoration of disturbed areas

Construction activities associated with trenching include:

- Site preparation
- Trench excavation, stockpiling of spoil material on the upslope side of trenches
- Shoring and dewatering of trenches, depending upon trench depth and groundwater levels
- Spreading of granular material such as sand or gravel along the bottom of the trench prior to laying
- Installing pipeline
- Backfilling the trench with bedding material and excavated soil
- Compacting trench fill material
- Testing and commissioning pipeline Implementing traffic management measures
- Providing temporary access to properties where trench routes impact driveways
- Site reinstatement.

The construction boundary for the proposal including the additional space required for the underboring is shown below in Figure 3-3.



Figure 3-3 Construction boundary for the proposal

3.3.2 Construction hours and duration

It is expected that the proposed works would commence in late 2018 and take approximately 18 months to complete. Due to the requirement of lane closures and utility relocations on Pennant Hills Road and North Rocks Road, the majority of works would be undertaken under a Road Occupancy Licence (ROL) outside of standard working hours:

Monday to Friday: 7am and 6pm

Saturday: 8am and 1pm

Work outside of standard working hours are typically 10pm to 5am however the timing of night works will be confirmed during construction scheduling by the contractor. Night works are likely to be implemented during construction due to the volume of traffic on Pennant Hills Road; however sections of works can be done during the day.

3.3.3 Plant and equipment

The following heavy plant and machinery is expected to be used in the construction of the proposal:

- Rigid and articulated trucks
- Semi-trailers to deliver materials
- Bobcat
- Forklift
- Up to 20 tonne excavators with hammer for demolition of concrete pavements
- Vibrating and smooth drum rollers
- Asphalt paver
- Multi tyred roller
- 30 tonne trucks for delivering asphalt and concrete
- Road profiler
- Lighting towers
- Generators
- Light vehicles
- Electric and fuel powered hand tools
- Water cart
- Line marking machine
- Concrete saw / Road cutting saw
- Bitumen sprayer
- Tree pruning truck and mulcher
- Trucks with boom lift and hiab
- Jack hammers

3.3.4 Earthworks

The proposal would require earthworks for road widening, the new high entry slip lane and utility trenching.

- Approximate quantities of material are as follows:
- 5200m³ of excavated material (cut)
- 1500m³ of concrete
- 420m³ of asphalt concrete (pavement)

3.3.5 Source and quantity of materials

Fill would be required at various locations. Aggregate pavement materials would be imported from a local quarry using truck and dog. Concrete for kerbs would be sourced from local suppliers.

As outlined in section 3.3.4 above, approximately 5,200 m³ of earthworks would be cut from the removal of the footpath, verge and road and disposed of offsite. Approximately 1500 m³ of concrete would be installed and 420m³ of asphalt concrete would be required.

The source and quantity of materials would be determined during the detailed design phase of the proposal, and would consider the requirements of the *NSW Sustainable Design Guidelines – Version 3.0*. Materials would be sourced from local suppliers where practicable. Surplus material that is not able to be used on-site as part of the proposal would be reused or disposed of in the following order of priority:

- Transfer to a Roads and Maritime approved site for reuse (with appropriate approvals as required)
- Disposal at an approved materials recycling or waste disposal facility
- As otherwise provided for by the relevant waste legislation.

The process for management of excess material would be detailed in a Resource and Waste Management Plan (RWMP) that would form part of the CEMP. Water for construction would be sourced from available hydrants in the area. The required quantities of water are not yet known, however the use of material such as ready mix concrete (required for pavement and kerbs) would reduce the amount of onsite water required during construction. Water would also be required for compaction of pavement layers, such as select layers to adjust the moisture content, and for dust suppression.

3.3.6 Traffic management and access

Traffic management

A Traffic Management Plan (TMP) would be prepared in accordance with Roads and Maritime Services Traffic Control at Work Sites Manual (RTA, 2010), Roads and Maritime Specification G10 – Traffic Management (RMS, 2015). The TMP would provide details of the traffic management to be implemented during construction to ensure that traffic flow is maintained where possible. The TMP would also detail specific routes that construction traffic would follow throughout the construction phase. The TMP would be reviewed by Roads and Maritime prior to commencement of construction.

The works consist of typical construction activities undertaken on typical urban road widening projects throughout Sydney in recent decades. Timing of construction activities and traffic management during construction would be detailed in the TMP.

All routes would remain open during construction, with potential kerbside or median lane closures using concrete barriers, and reduced speed limits. Any changes to existing traffic movements would be made available to the public through a communications strategy.

Traffic management measures considered above would be confirmed in the TMP prior to construction. Temporary traffic capacity reductions are essential to maintain scheme 'constructability', minimise risks to construction workers and the general public during construction. Access will remain restricted to one lane at times, traffic controllers would be employed and reduced speed limits would be put in place.

Public Transport

There are two bus stops in the proposal area as shown in Figure 3-4 (bus ID 211825 2118174). Both bus stops would remain operational during construction.



Figure 3-4 Location of the two bus stops along within the proposal footprint

Access

Properties which have direct access to Pennant Hills Road and North Rocks Road may require temporary access adjustments, during the construction phase. Access to all properties would be maintained during construction.

Pedestrian access

As part of preliminary construction staging plans, it is likely the existing pedestrian footpaths adjacent to the work areas (including Pennant Hills Road where the widening is occurring in front of the four residential properties and for the new high entry slip lane) will be temporarily occupied. Wayfinding signage will be used to direct pedestrians to the other side of the footpath using the existing at grade pedestrian crossing near the Roselea Community Centre.

No new pedestrian crossings are proposed as part of the intersection upgrade.

3.4 Ancillary facilities

Ancillary facilities for the proposal would be located on vacant Roads and Maritime land, located on the north east corner of Pennant Hills Road and North Rocks Road (Figure 1-1). The facility would be a site compound and stockpile site and provide:

- The site office
- Staff parking
- Stockpile area
- Concrete washout
- Ablution block
- Fuel storage
- Temporary plant and equipment parking area

Up to six trees may need to be removed on the Roads and Maritime owned land to accommodate the compound site and the road widening for the new high entry slip lane.

Stockpiles would be required for the duration of construction including road base constituents, stripped topsoil, and excess spoil unsuitable for project use. Stockpiles would be managed in accordance with the requirements of Roads and Maritime's Stockpile Site Management Procedure (2011) and the QA Specification R44 – Earthworks. Site establishment activities for all stockpile sites would include activities such as the erection of site fencing and establishment of sediment and erosion control measures. Stockpiles would be located within the boundaries of the compound site, at an area that would be determined prior to construction to avoid impacts to any tree exclusion zones.



Figure 3-5 Vacant land for compound site. Vegetation on the left would be removed for compound site and road widening

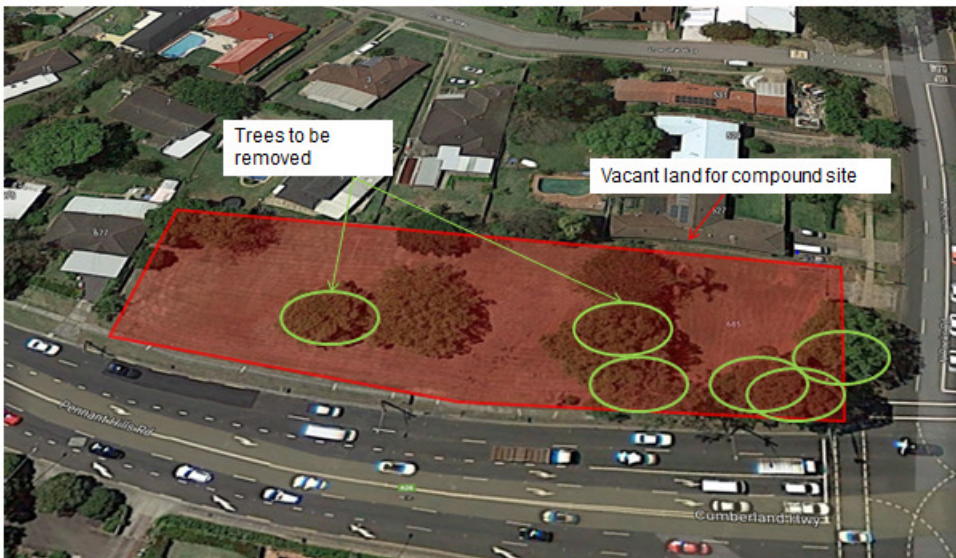


Figure 3-6 Proposed compound site



Figure 3-7 Street view of compound site

3.5 Public utility adjustment

Public utility adjustments are required for the proposal and will be confirmed pending further utility investigation. The following utilities would likely include the relocation of;

a) Ausgrid

The following underground Ausgrid assets may be impacted by the proposal;

- One 50mm PVC Conduit and four 150mm PVC Conduit, between 2.0m and 3.9m from the property boundary and between 0.6m and 0.8m underground, extending along the eastern side of Pennant Hills Road and along the northern side of North Rocks Road east of the intersection
- One x 125 mm PVC Conduit, between 1.5m to 1.8m from the property boundary and 0.6m underground extending along the eastern side of Pennant Hills Road and the northern side of North Rocks Road
- Two x 140 AC Conduit and one x direct buried cable, 0.8m underground crossing North Rocks Road approximately 60m east of the intersection with Pennant Hills Road
- Two x 125 PVC Conduit and two x direct buried cables (occasionally housed in a one x 125 PVC Conduit), 0.6m from the property line and 0.6m underground, extending along the western side of Pennant Hills Road and ceasing in front of property no. 716.

b) Jemena

The following Jemena assets are in the vicinity of the proposal, however are unlikely to be affected by the proposal;

- 210 kPa Gas in 110mm Nylon Main, extending along the eastern side of Pennant Hills Road and crossing beneath North Rocks Road
- 210 kPa Gas in 32mm Nylon Main, extending along the southern side of North Rocks road east of the intersection.

c) Roads and Maritime

Traffic signal cables and ITS infrastructure are located within the proposal footprint. These will require relocation and upgrade as part of the proposal.

d) Sydney Water

The following Sydney Water assets may be impacted by the proposal:

- A 100mm cast iron cement lined water main extending along the eastern side of Pennant Hills Road crossing North Rocks Road at the intersection
- A 600mm cast iron cement lined water main extending along the eastern side of Pennant Hills Road crossing North Rocks Road at the intersection
- A 450mm ductile iron cement lined water main extending along the western side of Pennant Hills Road north of the intersections with North Rocks Road

- A 250mm ductile iron cement lined water main extending along the western side of Pennant Hills Road north of the intersection with North Rocks Road
- A 250mm cast iron cement lined water main extending along the western side of Pennant Hills Road north of the intersection with North Rocks Road. There are no sewer mains within the proposed scope of works.

e) Telstra

The following Telstra assets may be impacted by the proposal

- Two x 100mm PVC Conduits (P100), containing assorted cables, including optical fibre, runs between cable jointing pit (6) and footway access chamber 186.2m apart along the eastern side of Pennant Hills Road and around the north east corner of the intersection with North Rocks Road;
- One x 100mm PVC Conduit (P100), containing assorted cables, including optical fibre, runs between two footway access chambers 37.2m apart along the northern side of North Rocks Road west of the intersection with Pennant Hills Road;
- Five x 100mm PVC Conduit (P100), containing assorted cables, including optical fibre, runs between two footway access chambers 46.9m apart along the northern side of North Rocks Road crossing beneath the intersection of Roselea Way;
- Eight x 100mm PVC Conduit (P100), containing assorted cables, including optical fibre, runs between two footway access chambers 87.5m apart along the northern side of North Rocks Road crossing beneath the intersection of Pennant Hills Road
- One x 100mm Asbestos Cement Conduit containing a 30-pair cable and a dead 20-pair cable between a cable jointing pit (4) and footway access chamber 89.1m apart, along the eastern side of Pennant Hills Road and around the north east corner of the intersection with North Rocks Road;
- One x 20mm PVC Conduit containing a 2-pair cable between a footway access chamber and a cable jointing pit (2) 21.0m apart, along the northern side of North Rocks Road east of the intersection with Pennant Hills Road
- One x 100mm Asbestos Cement Conduit containing 2 x 100-pair cable and 50-pair cable between two footway access chambers 27.5m apart, along the northern side of North Rocks Road east of the intersection with Pennant Hills Road;
- One x 20mm PVC Conduit containing a 10-pair cable between a footway access chamber and cable jointing pit (B) 9.4m apart, along the northern side of North Rocks Road east of the intersection with Pennant Hills Road
- One x 100 Asbestos Cement Conduit containing 2 x 100-pair cable and 50-pair cable between two footway access chambers 46.9m apart, along the northern side of North Rocks Road crossing beneath Roselea Way
- One x 100mm Asbestos Cement Conduit containing 2 x100-pair cable and 50-pair cable between two footway access chambers 87.5m apart, along the northern side of North Rocks Road crossing beneath Pennant Hills Road
- One x 100mm PVC Conduit containing a 30-pair cable between two cable jointing pits (4) 48.5m apart, along the western side of Pennant Hills Road
- One x 100mm PVC Conduit containing a 30-pair cable and a 2-pair cable between two cable jointing pits (4) 10.5m apart, along the western side of Pennant Hills Road; and
- One x 35mm PVC Conduit containing a 30-pair cable between two cable jointing pits (4) 35.7m apart, along the western side of Pennant Hills Road.

As part of the underboring works, a Roads and Maritime electrical asset (TCS) will require underboring at the intersection across Pennant Hills Road and a 415V electrical supply and Telstra communications cable will be underbored together across Pennant Hills Road opposite the Roselea community centre.

The following utilities were identified as not being impacted by the proposal;

- Endeavour Energy
- NBN Co.

- Nextgen
- Optus
- Pipe Networks.

3.6 Property acquisition

The proposal does not require private property acquisition; however there will be property boundary and driveway modifications along Pennant Hills Road due to the widening works. This is assessed in section 6.8. There is also a parcel of vacant land at the north east corner of the Pennant Hills Road and North Rocks Road intersection, which is owned by Roads and Maritime.

4 Statutory and planning framework

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

4.1 Environmental Planning and Assessment Act 1979

4.1.1 State Environmental Planning Policies

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 road infrastructure facilities and is to be carried out under Part 5 of the Environmental Planning and Assessment Act 1979 (EP&A Act). Development consent from 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 Development) 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 Section 5 of this REF.

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 Local Environmental Plans

Parramatta Local Environmental Plan 2011

The proposal is located within the Parramatta Local Government Area (LGA) (former Hills Shire Council as shown in Figure 4-1), which is governed by the planning provisions outlined in the Parramatta Local Environment Plan 2011 (Parramatta LEP). There are no local heritage items that will require consideration and land zoning provisions.

The proposal is located on land classified as SP2 infrastructure (Figure 4-2). The objectives of the SP2 infrastructure is to:

- To provide for infrastructure and related uses.
- To prevent development that is not compatible with or that may detract from the provision of infrastructure.

The proposal is consistent with the objectives of this zone and the LEP states that it is permissible with consent. However, the proposal is permissible under Clause 94 of the ISEPP and can be carried out by or on behalf of a public authority without consent.

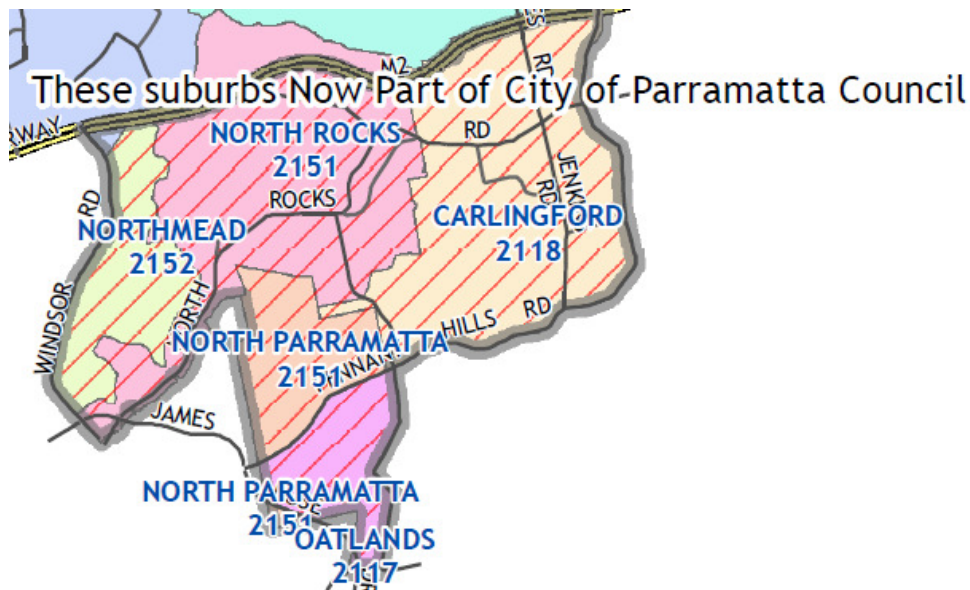


Figure 4-1 Rezoning of the Hills Council and City of Parramatta Council

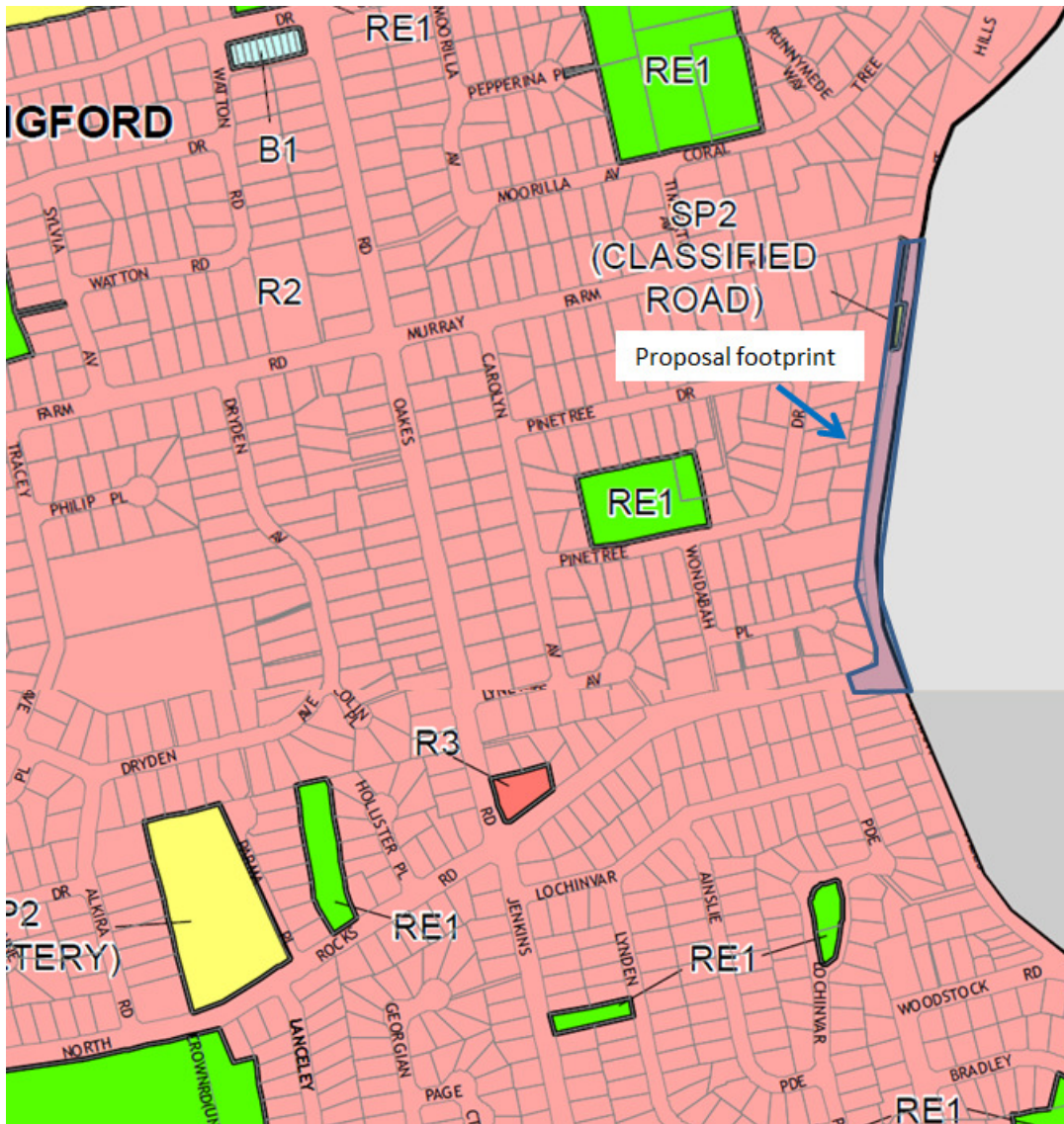


Figure 4-2 Land zoning in the proposal area

4.2 Other relevant NSW legislation

4.2.1 Biodiversity Conservation Act 2016

The Biodiversity Conservation Act 2016 (BC Act) replaced the Threatened Species Conservation Act 1995 (TSC Act) as of 25th August 2017. The purpose of the BC Act is to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development.

Under the BC Act if a Part 5 activity has the potential to have a significant impact on biodiversity, the proponent must prepare a Species Impact Statement (SIS) or opt-in to the Biodiversity Offsets Scheme which includes preparation of a Biodiversity Development Assessment Report (BDAR) to determine whether Serious and Irreversible Impacts (SAIL) are likely.

The proposal corridor does not contain suitable habitat for any listed threatened species, population or community listed under the BC Act and as such, the proposal is unlikely to result in a significant impact upon any threatened species or community listed under the BC Act.

4.2.2 National Parks and Wildlife Act 1974

The National Parks and Wildlife Act 1974 (NPW Act) aims to conserve nature, habitat, ecosystems, ecosystem processes and biological diversity at the community, species and genetic levels. It also

legislates Aboriginal heritage in NSW. This Act is administered by the Office of Environment and Heritage (OEH). The proposal is not located on land reserved under this Act.

Part 6 of this Act refers to Aboriginal objects and places and prevents persons from impacting on an Aboriginal place or relic, without consent or a permit. The Roads and Maritime Procedure for Aboriginal cultural heritage consultation and investigation was followed. Potential impacts on Aboriginal heritage are considered unlikely and are discussed further in Section 6.5.

4.2.3 Heritage Act 1977

The Heritage Act 1977 (Heritage Act) aims to protect and preserve items of non-Aboriginal heritage significance. The Heritage Act provides for the protection of items of local, regional and State heritage significance. It establishes a list of State Heritage Items and outlines process for approval of development which may impact items of non-Aboriginal heritage significance. Database searches showed there are a number of heritage items in the vicinity of the proposal. As they are located outside of the proposal footprint, the assessment concluded that the project is unlikely to impact on any items of local, regional and State heritage significance.

4.2.4 The Protection of the Environment Operations Act 1997

The Protection of the Environment Operations Act 1997 (POEO Act) regulates certain activities with respect to pollution impacts (such as air, water and noise pollution). Part 3.2 of the POEO Act requires an Environmental Protection Licence (EPL) for scheduled development work and carrying out scheduled activities.

Item 35 of Schedule 1 of the Act applies to road construction, meaning the construction, widening or rerouting of roads. Any activity to which the definition applies is declared to be a scheduled activity if it results in the existence of four or more traffic lanes (other than bicycle lanes or lanes use for entry or exit) for at least:

- Where the road is classified, or proposed to be classified as a freeway or tollway under the Roads Act 1993:
 - 1 kilometre of their length in the metropolitan area
 - 5 km of their length in any other area.
- Where the road is classified, or proposed to be classified, as a main road (but not a freeway or tollway under the Roads Act 1993:
 - 3 km of their length in the metropolitan area
 - 5 km of their length in any other service.

The proposal involves the upgrade of an intersection in the Sydney metropolitan area and is therefore not a 'scheduled activity' under Schedule 1 of the POEO Act and would not require an EPL.

The POEO Act also identifies a number of pollution offences, including offences relating to:

- The wilful or negligent disposal of waste in a manner that harms or is likely to harm the environment
- The wilful or negligent causing of a substance to leak, spill or otherwise escape
- (whether or not from a container) in a manner that harms or is likely to harm the environment
- The excavated public road material can only be applied to land within the road corridor for public road related activities including road construction, maintenance and installation of road infrastructure facilities
- The excavated public road material can only be stored within the road corridor at the site where it is to be applied to land
- The excavated public road material cannot be applied to private land
- The consumer must ensure that any application of excavated public road material to land must occur within a reasonable period of time after its receipt.

The construction contractor and Roads and Maritime are obliged to notify the EPA if a pollution incident occurs that causes or threatens material harm to the environment. Appropriate mitigation and management measures would be established and maintained to avoid pollution incidents and these are outlined in Section 6 of this REF.

4.3 Commonwealth legislation

4.3.1 Environment Protection and Biodiversity Conservation Act 1999

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) a referral is required to the Australian Government for proposed actions that have the potential to significantly impact on matters of national environmental significance or the environment of Commonwealth land. These are considered in Appendix A and chapter 6 of the REF.

A referral is not required for proposed road activities that may affect nationally listed threatened species, populations, endangered ecological communities and migratory species. This is because requirements for considering impacts to these biodiversity matters are the subject of a strategic assessment approval granted under the EPBC Act by the Australian Government in September 2015.

Potential impacts to these biodiversity matters are also considered as part of chapter 6 of the REF and Appendix A.

Findings – matters of national environmental significance (other than biodiversity matters)

The assessment of the proposal's impact on matters of national environmental significance and the environment of Commonwealth land found that there is unlikely to be a significant impact on relevant matters of national environmental significance or on Commonwealth land. Accordingly, the proposal has not been referred to the Australian Government Department of the Environment under the EPBC Act.

Findings – nationally listed biodiversity matters

The assessment of the proposal's impact on nationally listed threatened species, populations, endangered ecological communities and migratory species found that there is unlikely to be a significant impact on relevant matters of national environmental significance. Chapter 6 of the REF describes the safeguards and management measures to be applied.

4.4 Confirmation of statutory position

The proposal is categorised as development for the purpose of a road and/or road infrastructure facilities and is being carried out by or on behalf of a public authority. Under clause 94 of the ISEPP the proposal is permissible without consent. The proposal is not State significant infrastructure or State significant development. The proposal can be assessed under Part 5 of the EP&A Act.

Roads and Maritime is the determining authority for the proposal. This REF fulfils Roads and Maritime's obligation under clause 111 of the EP&A Act to examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the activity.

5 Consultation

This chapter discusses the consultation undertaken to date for the proposal and the consultation proposed for the future.

5.1 Consultation strategy

Roads and Maritime proposed the following activities as part of their consultation strategy:

- Community update through a Have Your Say letter
- Display of the REF on the Roads and Maritime project website
- Consultation with the City of Parramatta Council in accordance with the ISEPP.

5.2 Community involvement

Roads and Maritime communicated with community members and stakeholders on the proposal. They were invited to provide feedback on the proposal in December 2017. Community members and stakeholders were encouraged to provide their comments via email, mail or phone contact with the project team. The communication tools are presented in **Error! Reference source not found..**

Table 5-1 Communication tools

Tools	Method
Have Your Say community update - December 2017 (refer Appendix A)	<ul style="list-style-type: none">• Distributed to 2375 local resident and businesses in local area (refer Appendix B for distribution area)• Copies of letter sent to key stakeholders, including local council, via email.• Door Knock was done to contact directly affected residents.
Website	<ul style="list-style-type: none">• Roads and Maritime project webpage updated with the latest project information, including the community update: www.rms.nsw.gov.au/projects/sydney-north/pennant-hills-rd-north-rocks-rd-carlingford/index.html.

Roads and Maritime invited feedback on the proposal in December 2017. We received feedback from 61 people, with 28 people supporting the proposal, 21 people against the proposal and 12 people who did not state a preference. Key matters raised included:

- Proposal justification
- North Rocks Road and Pennant Hills Road (south of the intersection) issues
- Environmental impacts
- Pedestrian and cyclist safety
- Traffic signal phasing issues.

A summary of the issues is presented in Table 5-1 below.

Table 5-1: Summary of issues raised by the community

Category	Roads and Maritime response
<p>Proposal justification and design modifications</p>	<p>The NSW Government is funding improvements at the intersection of Pennant Hills Road and North Rocks Road to reduce congestion and improve travel time for road users.</p> <p>Currently, motorists are experiencing long delays travelling through the intersection of Pennant Hills Road and North Rocks Road. The aim of this proposal is to increase the capacity of the intersection by reducing queue lengths and improving safety.</p> <p>The intersection was evaluated considering all traffic directions. The proposed improvements and upgraded traffic signals will balance the competing needs of traffic and provide the best improvement to traffic flow, travel time and safety at the intersection.</p> <p>Refer to Section 2 in the REF for proposal justification</p>
<p>Environmental impact – noise generated from construction and operation including truck compression brakes</p>	<p>A site specific noise and vibration assessment was undertaken for this project and the results and recommendations will be incorporated into the construction methodology to reduce where possible the amount of noise generated by this project.</p> <p>Roads and Maritime will carry out the work in compliance with the Environmental Management Plan and implement standard safeguards to help reduce the overall impact on the community. The standard action and mitigation measures as provided in the Roads and Maritime Construction Noise and Vibration Guideline will be applied.</p> <p>Roads and Maritime's Enforcement Operations will be notified of your comment regarding compression breaking in this area for further investigation. For further information regarding heavy vehicle exhaust noise please contact Roads and Maritime Heavy Vehicle Hotline on 1300 786 748.</p> <p>Refer to Section 6.4 in the REF for noise impact associated with the proposal.</p>

Category	Roads and Maritime response
Environmental impact – tree removal	<p>Roads and Maritime has developed the proposed design to reduce the number of trees, shrubs and vegetation that need to be removed to enable road widening to fit in the proposed additional lanes.</p> <p>A Review of Environmental Factors will be prepared to assess the environmental impacts of the proposal and to outline the measures that must be taken in order to manage and mitigate these impacts. A noise impact assessment will also be carried out. It will only be of concern if future noise levels to surrounding properties increase existing levels by more than 2 decibels after completion of the project which is unlikely.</p> <p>Refer to Section 6.1 in the REF for impacts to biodiversity.</p>
Pedestrian and cyclist safety	<p>All elements of this project have been reviewed for safety and have been designed to ensure the safety of all road users and pedestrians.</p> <p>Refer to Section 6.8 in the REF for socio-economic impacts associated with access.</p>
Traffic Lights	<p>Traffic lights in NSW are controlled by the Sydney Coordinated Adaptive Traffic System (SCATS), which allocates the length of green time based on real time traffic flow. Sensors beneath the road measure the flow and density of traffic approaching the lights in each direction and the green time is allocated accordingly. The length of time the light stays green varies in response to changing traffic conditions. This ensures that the traffic light phasing is operating at maximum efficiency.</p> <p>The new intersection improvements and upgraded traffic signals have been designed to control and balance the competing needs of traffic in all the directions.</p> <p>Refer to Section 6.3 in the REF for the traffic assessment.</p>
Other suggestions (out of scope)	<p>The purpose of this proposal was to seek feedback on the proposed intersection improvements on Pennant Hills Road and North Rocks Road. While your suggestion isn't included as part of the proposal and it's out of the scope, it has been noted for any future upgrades within the area.</p>

5.3 Aboriginal community involvement

The Roads and Maritime Procedure for Aboriginal cultural heritage consultation and investigation (PACHCI) is a four stage process used to assess the potential impact on Aboriginal cultural heritage and ensure effective consultation with the Aboriginal community is completed for all Roads and Maritime developments.

A Stage 1 assessment was undertaken for this proposal. This found that the proposal is unlikely to affect Aboriginal cultural heritage and therefore the proposal was not required to progress to Stage 2. Further detail is provided in section 6.5.

5.4 ISEPP consultation

Part 2, Division 1, Clauses 13-15 of the ISEPP specify consultation requirements for infrastructure development to be carried out under the ISEPP. These largely relate to the requirement for public authorities other than local councils to consult with the relevant local council as part of the assessment process. Consultation is required if the proposal would affect council infrastructure or services, impact on a local heritage item or if development would impact on flood liable lands.

Parramatta City Council has been consulted about the proposal as per the requirements of clause 13(1) of the ISEPP. Consultation under ISEPP is required as the proposal would include:

- Permanent traffic changes to North Rocks Road near the intersection of Pennant Hills Road
- Permanent realignment of the pedestrian footpath on the eastern and western side of Pennant Hills Road due to the widening works
- Additional drainage pipes and pits along North Rocks Road

Parramatta City Council has been consulted on the proposal since the strategic design and are in support of the proposal. A response from Council was provided on 11 December 2017. A summary of the issues raised by Council and a response from Roads and Maritime is provided below:

Council issue	Roads and Maritime response
<p>A pedestrian crossing should be added across the southern leg of the intersection. This will provide improved connections across Pennant Hills Road and reduce delays for pedestrians on the southern side of North Rocks Road.</p>	<p>RMS has not installed a pedestrian crossing at this intersection because pedestrians crossing time on this leg exceeds the corresponding traffic phase. To install a pedestrian crossing on this leg will increase delays to traffic flow in through on the intersection. The majority of pedestrians at this intersection cross to / from the NE corner. There is very limited demand to only cross from the SE to the SW corners. This item is currently with RMS Network Operations for approval to keep the existing situation and not install this pedestrian crossing.</p>
<p>North Rocks Road in this area is one of Council's cycle routes as a consequence; cycle route requirements should be incorporated into the design.</p>	<p>This is acknowledged, and where affected by this proposal, the cycle route requirements will be implemented.</p>

Council issue	Roads and Maritime response
<p>Council could not agree to the narrowing of the footway below 3.5m wide on these two busy roads. The maintenance of the footway width is seen as important to encourage use for active transport rather than vehicle trips.</p>	<p>Pennant Hills Rd and North Rocks Rd Intersection is a major intersection which is currently operating at capacity with significant peak hour delays. To achieve a suitable lane configuration which will increase the intersection capacity without property acquisition requires the footpaths to be less than 3.5 m in some locations mainly in areas where they are currently less than 3.5m.</p>

Appendix B contains an ISEPP consultation checklist that documents how ISEPP consultation requirements have been considered. Appendix C (a) contains the ISEPP letter provided to council.

5.5 Government agency and stakeholder involvement

Key stakeholders associated with this proposal are:

- Parramatta City Council
- Utility authorities (Endeavour Energy, NBN Co., Nextgen, Optus, Pipe Networks)
- Residents in the proposal area
- Customers using the road
- Roselea Community Centre
- Businesses along the proposal (fitness centre, BP Service Station and mowing service).

5.6 Ongoing or future consultation

Should Roads and Maritime proceed with the proposal, consultation activities would continue up to and during construction. These consultation activities would include:

- Consultation with directly impacted community stakeholders to assist in managing impacts during construction
- Ongoing updates to the immediately affected community during the detailed design phase and the construction period.
- Ongoing consultation with Parramatta City Council and other relevant government agencies

6 Environmental assessment

This section of the REF provides a detailed description of the potential environmental impacts associated with the construction and operation of the proposal. All aspects of the environment potentially impacted upon by the proposal are considered. This includes consideration of:

- Potential impacts on matters of national environmental significance under the EPBC Act
- The factors specified in the guidelines *Is an EIS required?* (DUAP 1995/1996) as required under clause 228(1) of the *Environmental Planning and Assessment Regulation 2000* and the *Roads and Related Facilities EIS Guideline (DUAP 1996)*. The factors specified in clause 228(2) of the *Environmental Planning and Assessment Regulation 2000* are also considered in Appendix A.

Site-specific safeguards and management measures are provided to mitigate the identified potential impacts.

6.1 Biodiversity

6.1.1 Methodology

Database Searches and Literature Review

A desktop review was undertaken to identify current records of threatened flora, fauna and ecological communities, migratory species, critical habitats and Key Threatening Processes (KTP) within five kilometres of the proposal. This included searches of online databases and a review of available spatial data and literature:

- The NSW Office of Environment and Heritage (OEH) Atlas of NSW Wildlife database, which contains records of threatened species, populations and ecological communities, critical habitat and KTPs listed under the TSC Act (Reviewed: 29 June 2017);
- The Commonwealth Department of the Environment and Energy (DoEE) Protected Matters Search Tool (PMST) was used to identify MNES listed under the Commonwealth EPBC Act (Reviewed: 26 June 2017);
- Local vegetation mapping – The Native Vegetation of the Sydney Metropolitan Area (OEH 2016); and
- Habitat profiles for all threatened, populations and ecological communities, and migratory species that are known to or have potential to occur within the locality. Marine species were not considered in this assessment as the project site does not contain any marine habitat.

Field Survey

A field survey was undertaken on 11th January 2018 by an ecologist to assess the vegetation and habitat in the area.

The database searches are included as Appendix D and the ecological report is included as Appendix E.

6.1.2 Existing environment

The vegetation within the proposal area occurs in highly disturbed and modified land that is predominantly cleared to accommodate the existing road, driveways, housing and footpaths. The remaining vegetation occurred as mowed lawns and planted exotic and native street trees. Common introduced tree species observed within the project site include *Cupressus macrocarpa* (Monterey Cypress), *Cinnamomum camphora* (Camphor Laurel), *Jacaranda mimosifolia* (Jacaranda) and *Erythrina x sykesii* (Coral tree). Commonly observed native trees, many of which appeared planted, included *Angophora floribunda* (Rough-barked Apple), *Eucalyptus punctata* (Grey Gum), *Eucalyptus saligna* (Sydney Blue Gum) and *Lophostemon confertus* (Brush Box). Much of the understorey had been cleared and considered of mowed lawns and patches of weed, included *Lantana camara* (Lantana), *Asparagus aethiopicus* (Asparagus Fern) however, there was clear evidence of recent weed removal.



Tree on the compound site likely to be removed for the extension of the left slip lane



Stand of vegetation to be removed on North Rocks Road opposite Roselea Way



Trees to be removed on the corner of Pennant Hills Road and North Rocks Road to accommodate the extended left slip lane



Tree to be removed on Pennant Hills northbound, before the BP service station

Figure 6-1 Trees to be removed

Noxious Weeds

Weed species were observed within the proposal site, which is typical of urban dominated habitat areas of the Sydney region. In particular, three species observed were declared noxious weeds under the Noxious Weed Act 1993 (NW Act) within the Parramatta LGA, namely:

- *Olea europaea* subsp. *cuspidata** (African Olive) - Regional Recommended Measure: The plant or parts of the plant are not traded, carried, grown or released into the environment;
- *Lantana camara* (Lantana) - Mandatory Measure: Must not be imported into the State or sold. This species is also a Weed of National Significance (WoNS); and
- *Asparagus aethiopicus* (Asparagus Fern) – Mandatory Measure: Must not be imported into the State or sold. This species is also a WoNS.

Fauna

No threatened fauna species listed under the BC Act and / or EPBC Act were observed within the proposal site during the field survey. The most commonly observed fauna were birds. Bird species observed were those known to be common within the urban Sydney region and included the native Noisy Miner (*Manorina melanocephala*), Australian Raven (*Corvus coronoides*) and Rainbow Lorikeet (*Trichoglossus moluccanus*).

Fauna Habitat Features

The habitat features for threatened fauna within the project site were predominantly restricted to the planted native/exotic trees. Whilst no hollow-bearing trees were detected within the proposal site, the trees provide potential foraging and nesting habitat for fauna species. However, the value of these habitat features is low due to their limited extent and highly disturbed condition.

Eucalyptus species, other flowering plants, and fruiting trees have the potential to provide a seasonal foraging resource for nectar feeding birds and bats species. In addition, there were a number of *Cupressus macrocarpa* (Monterey Cypress) that are often used as drey site from the non-threatened native Ring-tailed Possum (*Pseudocheirus peregrinu*).

6.1.3 Potential impacts

Construction

The proposal would require the removal of trees from the northbound kerbside lane of Pennant Hills Road, the corner of North Rocks Road and Pennant Hills Road for the new high entry slip lane and the compound site, some tree removal is also required where the widening is occurring on North Rocks Road on the grass verge (refer to Figure 6-1 for the images of the vegetation to be removed and Figure 6-2 for a tree removal plan). These trees consist of a mix of planted native and ornamental trees that exist in highly urban and modified environments. The trees to be removed comprise native and introduced species and recent plantings, and do not comprise threatened species or form part of threatened ecological communities.

Whilst small number native trees occurred within the project area, these were considered to not form part of any potentially occurring listed BCs. The field surveys of the subject site did not detect any threatened species listed under the BC Act or EPBC Act. Non-threatened native bird species were detected during the field survey which are common for Sydney's urban areas.



Figure 6-2 Tree removal plan

As shown above in Figure 6-2, the areas of tree removal have been zoned into seven sections.

- Zone 1 – up to five trees, ten shrubs and 10m of hedges will require removal due to the relocation of the front property fence and the relocated pedestrian footpath on North Rocks Road
- Zone 2 – up to two trees and ten shrubs will require removal due to the relocation of the front property fence and the relocated pedestrian footpath on North Rocks Road
- Zone 3 – up to eight trees and 20m of hedges will require removal due to the relocation of the front property fence and the relocated pedestrian footpath on North Rocks Road
- Zone 4 and Zone 5 – small section of hedges will require removal due to the relocation of the front property fence and the relocated pedestrian footpath on North Rocks Road
- Zone 6- up to five trees and some mixed shrubs will require removal due to the new slip lane and the site compound operation
- Zone 7 – up to two trees and two shrubs will require removal due to the widening works on North Rocks Road

Operation

There would be no operational impacts to biodiversity due to the proposal, provided the recommendations and safeguards are implemented below. The proposal is unlikely to remove, modify, fragment or isolate any area of habitat important to the long-term survival of the addressed threatened flora and fauna species, population or ecological communities in the locality.

Conclusion on significance of impacts

The proposal is not likely to impact 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 not likely to impact threatened species, populations, ecological communities or migratory species, within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999*.

6.1.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Biodiversity	A Flora and Fauna Management Plan will be prepared in accordance with Roads and Maritime's <i>Biodiversity Guidelines: Protecting and Managing Biodiversity on RMS Projects</i> (RTA, 2011) and implemented as part of the CEMP. It will include, but not be limited to: <ul style="list-style-type: none"> plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and revegetation areas requirements set out in the <i>Landscape Guideline</i> (RTA, 2008) pre-clearing survey requirements procedures for unexpected threatened species finds and fauna handling Protocols to manage weeds and pathogens. 	Contractor	Detailed design / pre-construction
Biodiversity	Measures to further avoid and minimise the construction footprint and native vegetation or habitat removal will be investigated during detailed design and implemented where practicable and feasible.	Contractor	Detailed design / pre-construction
Biodiversity	A landscaping plan will be developed in consultation with Parramatta Council prior to construction.	Contractor	Detailed design / pre-construction
Biodiversity	Exclusion zones will be set up at the limit of clearing in accordance with Guide 2: Exclusion zones of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RMS projects</i> (RTA 2011).	Contractor	Pre-construction

Impact	Environmental safeguards	Responsibility	Timing
Biodiversity	If unexpected threatened fauna or flora species are discovered, stop works immediately and follow the Roads and Maritime Services Unexpected Threatened Species Find Procedure in the Roads and Maritime Services Biodiversity Guidelines 2011 – Guide 1 (Pre-clearing process).	Contractor	Construction
Biodiversity	All pathogens (e.g. Chytid, Myrtle Rust and <i>Phytophthora</i>) are to be managed in accordance with the Roads and Maritime Services Biodiversity Guidelines - Guide 7 (Pathogen Management) and DECC Statement of Intent 1: Infection of native plants by <i>Phytophthora cinnamomi</i> (for Phytophthora).	Contractor	Construction
Biodiversity	Declared noxious weeds are to be managed according to requirements under the Noxious Weeds Act 1993 and Guide 6 (Weed Management) of the Roads and Maritime Services Biodiversity Guidelines 2011.	Contractor	Construction
Biodiversity	All pruning and trimming of trees is to be in accordance with the Australian Standard 4373-2007 Pruning of amenity trees. Pruning of mature trees is to be undertaken by a qualified arborist.	Contractor	Construction

6.2 Soil and water

6.2.1 Methodology

A review of the following publicly available registers maintained by the Office of Environment and Heritage was conducted on the 28 June 2017:

- Acid Sulfate Soil Risk
- LEP layers and land use City of Parramatta Council and NSW Government Planning and Environment Planning Viewer
- Soil Landscapes of the Sydney 1:100 000 Sheet
- Contaminated land (Environmental Protection Authority).

The searches are included in Appendix F.

6.2.2 Existing environment

Geology, soils and surface water

The proposal is located with the West Pennant Hills colluvial landscape which is characterised by steep, narrow, generally south west facing, hill slopes on the Hornsby Plateau. The geological profile consists of the Wianamatta Group shale, Ashfield shale formation-laminite and dark grey shale. Bringelly shale- shale, calcareous claystone, laminate, fine to medium grained lithic quartz sandstone.

The soils are characterised as:

- Deep red and brown podzolic soils on upper mid slopes
- Yellow and brown podzolic soils on colluvial benches
- Yellow podzolic soils and greyed podzolic soils in drainage lines and poorly drained areas.

The topography of the proposal is located on a gentle undulating hill slope. There are no waterways in close proximity to the proposal. The closest waterway to the proposal is Devlin Creek, located approximately 680 metres from the proposal. Pennant Hills Road grades longitudinally towards the north. The road currently has a one way cross fall towards the east for the first 100m from North Rocks Road and Pennant Hills Road intersection. The cross fall then transitions to two way cross fall crowned between the northbound and southbound lanes. Approximately 200m north of the intersection there is a low point on the northbound kerb adjacent to the existing bus bay.

Acid Sulfate Soils

Acid sulfate soil occurs predominantly on low lying coastal estuary and embayment. Due to their estuarine origin, acid sulfate soils are found close to sea level, generally less than 1 metre Australian Height Datum (AHD) and are therefore not expected within the proposal area. A search of the Parramatta Council Local Environment Plan (2011) indicated acid sulfate soils were not present within the proposal area. A search of the NSW Government Planning and Environment Planning Viewer identified Class 5 acid sulfate soils 1.5km south of the proposal area and are likely associated with the low lying banks of the Parramatta River 6.5km further south of the proposal area.

Contamination

A search of the NSW Environmental Protection Agency (EPA) database (conducted on 28 June 2017) identified two sites of potential contamination concern in proximity to the proposal. Table 6-1 displays contaminated site notified to EPA which has been assessed in accordance with the Contaminated Land Management Act 1997 (CLM Act).

Table 6-1 Proximity of contamination causing activity

Contamination causing activity	Site description and address	EPA site management class	Distance from the proposal
Service station	Pennant Hills- Caltex Service Station 797 Pennant Hills ROAD, (-33.7757819,151.0516532)	Under assessment	1.2km
Service station	7-Eleven Service Station 340 North Rocks ROAD	Under assessment	1.6km

The sites would not be impacted by excavation activities undertaken for the proposal.

There is a BP service station located at the northern end of the proposal area. Impacts to the service station would be an adjustment to the driveway (entrance) of the service station to accommodate the widening of Pennant Hills Road. Construction activities are unlikely to impact the site and it would remain in operation throughout construction.

6.2.3 Potential impacts

Construction

Primary impacts would be associated with sediment migration as a result of excavation associated with the road widening, underboring and utility trenching, the erosion of exposed soils and stockpiles and tree clearing. The mechanisms through which sediment could migrate would be a

result of rainfall events and vehicle tracking. Implementing appropriate management techniques would effectively mitigate such impacts.

During construction, work elements have the potential to expose soils which can lead to erosion and sedimentation including:

- Earthworks within the construction impact area
- Drainage works
- Vehicle movements
- Removal and installation of general fill material
- Stockpiling
- Vegetation removal
- Grubbing processes
- Underboring (entry and exit points)

The identified risk areas of erosion and sedimentation resulting from earthworks are as follows:

- Road widening
 - Road widening is required along Pennant Hills Road northbound lane, at the north east corner of the North Rocks Road intersection and on the eastern leg of North Rocks Road kerbside lane to allow for the widening
 - Construction of the new lanes would require excavation into the existing road verge, and placement of new pavement material using earth moving equipment
- Trenching for utilities
 - Construction would include trenching along Pennant Hills Road mostly due to the widening and for the underbore establishment entry and exit points
 - Excavation for trenching is required to accommodate the relocation of existing utilities and installation of new services and would involve the removal and placement of fill material using earthmoving equipment.

Potential contaminated land may be uncovered during the construction phase. Although it is considered unlikely, the prospect of encountering contaminated land should not be discounted.

Operation

It is not expected that the proposal would have any ongoing contaminated land or soil erosion sedimentation impacts after the completion of construction because any identified contaminated material would be removed off site to be legally disposed of or managed safely onsite. Disturbed areas would be stabilised and suitable pavement and cross drainage would be in place.

6.2.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Contaminated land	If contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the immediate risks of contamination. All other works that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with the Roads and Maritime Environment Manager and/or EPA.	Contractor	Detailed design / Pre-construction

Impact	Environmental safeguards	Responsibility	Timing
Accidental spill	A site specific emergency spill plan will be developed, and include spill management measures in accordance with the Roads and Maritime <i>Code of Practice for Water Management</i> (RTA, 1999) and relevant EPA guidelines. The plan will address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities (including Roads and Maritime and EPA officers).	Contractor	Detailed design / Pre-construction
Fuel spills	Vehicles and machinery should be properly maintained to minimise the risk of fuel/oil leaks. Routine inspections of all construction vehicles and equipment should be undertaken for evidence of fuel/oil leaks	Contractor	Construction
Erosion and sedimentation	<p>Erosion and sediment control measures are to be implemented and maintained to:</p> <ul style="list-style-type: none"> • Prevent sediment moving off-site and sediment laden water entering any water course, drainage lines, or drain inlets. • Reduce water velocity and capture sediment on site. • Minimise the amount of material transported from site to surrounding pavement surfaces. • Divert clean water around the site. <p>(in accordance with the Landcom/Department of Housing <i>Managing Urban Stormwater, Soils and Construction Guidelines</i> (the Blue Book)).</p>	Contractor	Construction
Erosion and sedimentation	Erosion and sedimentation controls are to be checked and maintained on a regular basis (including clearing of sediment from behind barriers) and records kept and provided on request.	Contractor	Construction
Erosion and sedimentation	Erosion and sediment control measures are not to be removed until the works are complete and areas are stabilised.	Contractor	Construction

Impact	Environmental safeguards	Responsibility	Timing
Erosion and sedimentation	Work areas are to be stabilised progressively during the works.	Contractor	Construction
Erosion and sedimentation	The maintenance of established stockpile sites during is to be in accordance with the Roads and Maritime Services <i>Stockpile Site Management Guideline (EMS-TG-10)</i> .	Contractor	Construction
Water quality	Water quality control measures are to be used to minimise any materials (e.g. concrete, grout, sediment etc.) entering drain inlets or waterways.	Contractor	Construction

6.3 Traffic and transport

6.3.1 Methodology

A traffic and transport report was prepared to assess the modelled traffic predictions for the proposal.

The traffic report considered the following:

- Assessment of the current configuration of the Pennant Hills Road and North Rocks Road intersection
- Impacts of the proposal on travel time and travel speed
- Operational performance of the Pennant Hills Road and North Rocks Road intersection for 2016 and 2026

Refer to Appendix G for the traffic report.

To assist in the assessment of the intersection performance, traffic modelling was undertaken. Traffic models are used to estimate the number of trips that would be made on a transportation system as a result of change in the road network (for example, the introduction of a new or upgraded road) or a change in travel demand (for example, the impact of a local development).

For the proposal, traffic models were developed using SIDRA software. The analysis used traffic data and intersection data collected through traffic surveys and validated and calibrated with site observations and SCATS data. The traffic survey was undertaken by Matrix in September 2016.

SIDRA analysis modelled intersection enhancements resulting from the proposal in terms of improvements to average delays, queue lengths and Level of Service (LOS) for 2016 and 2026, with and without the proposal.

Overall intersection performance is reported as an estimate of the average delay that all vehicles encounter at a particular intersection; the detailed measure is commonly expressed qualitatively as Level of Service which categorises the average delay into bands A to F, with LoS A representing the best operation and LoS F representing the worst operation. The banded categories are defined in Table 6-2.

Table 6-2: Level of Service

Level of Service (LoS)	Average delay per vehicle in seconds
	Signalised Movements
A	< 14.5
B	14.5 to 28.5
C	28.5 to 42.5
D	42.5 to 56.5
E	56.5 to 70.5
F	> 70.5

6.3.2 Existing environment

Pennant Hills Road (A28), is a major urban highway that links the Pacific Motorway (M1), Pacific Highway (A1) and (B83) at Wahroonga in the north east, with the major central business district of Parramatta in the south west, and is located 850 meters south of the M2 Motorway intersection.

Existing Traffic Volumes

The 2016 traffic volumes are presented in Figure 6-3 and Figure 6-4. The volumes suggest that southbound direction along Pennant Hills Road is the peak direction during the AM peak hour, and the northbound direction along Pennant Hills Road is the peak direction during the PM peak hour.

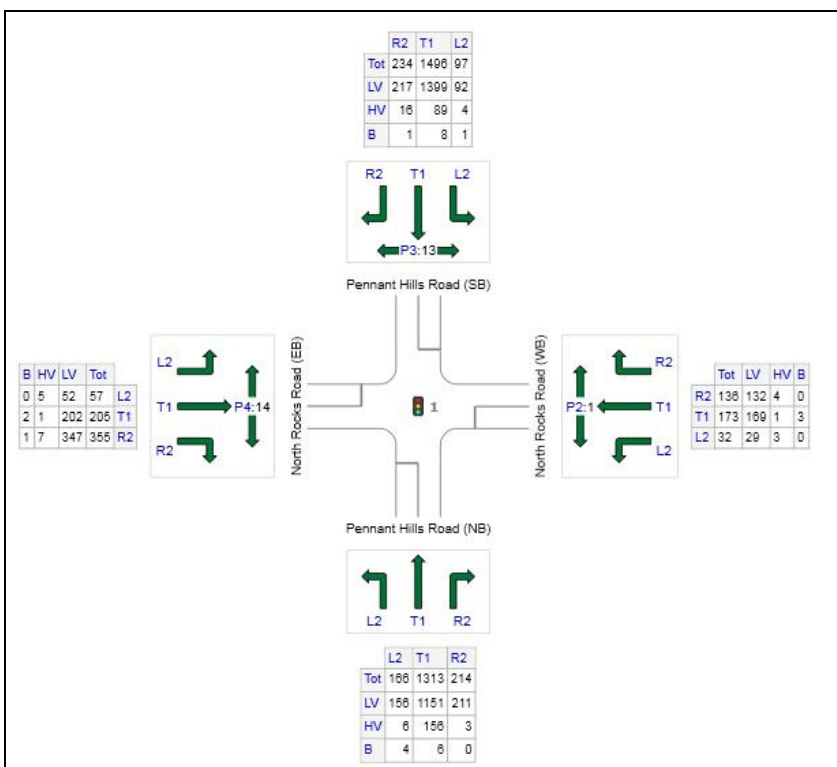


Figure 6-3 2016 AM Peak Traffic Volumes

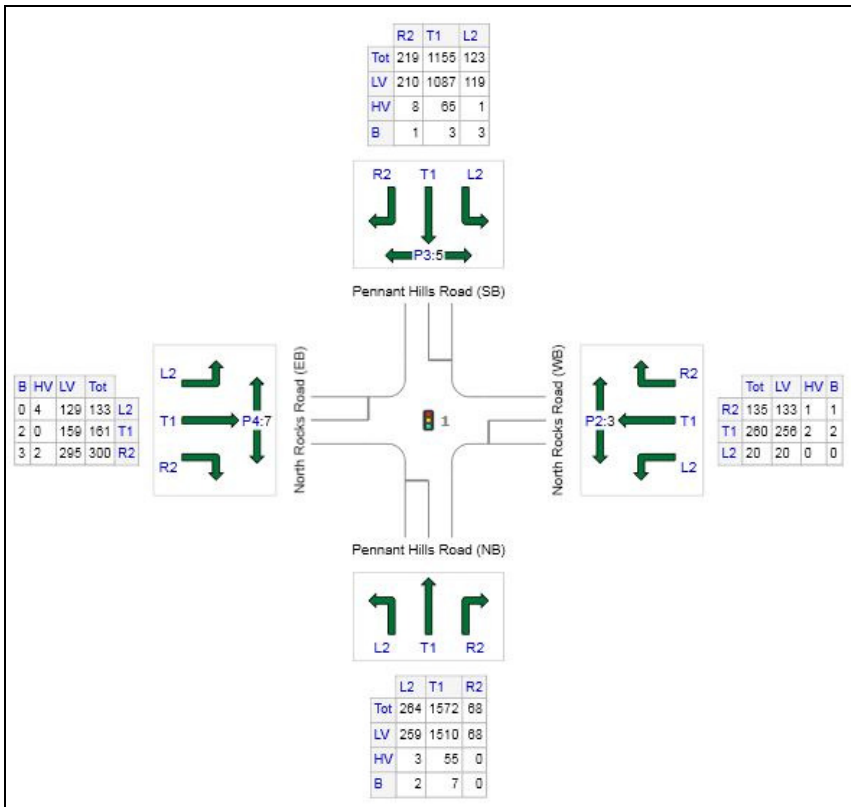


Figure 6-4 2016 PM Peak Traffic Volumes

The most recent average daily traffic (ADT) data for Pennant Hills Road was collected in 2017. The data was obtained from one permanent mid-block counting station (74090) located along Pennant Hills Road (Cumberland Highway) approximately 2.4km north of M2 Motorway and provide ADT data in both directions. Table 6-3 shows the historical growth experienced at the counting station.

Table 6-3 Pennant Hill Road historical daily traffic count

Station	Location	Direction	Two-way traffic volumes					% Total Growth
			2013	2014	2015	2016	2017	
74090	Pennant Hill Road, 2.4km north of M2 Motorway	Northbound	26,687	22,233	27,500	30,458	30,137	13%
		Southbound	31,323	31,397	32,002	32,225	32,339	3%

Source: Roads and Maritime 2017

Existing Intersection performance

A 2016 Base Case scenario was developed to quantify existing performance of the intersection and formed the basis for comparison of the existing (2016) and future (2026) year assessment of the proposal.

Existing intersection performance was assessed by considering the estimated average vehicle delays, average queue lengths and Level of Service (LoS) during the AM and PM peak hours. Table 6-4 summarises the existing AM and PM weekday peak performance of the intersection for the base year (2016).

Table 6-4: 2016 SIDRA Outputs

Approach		Existing Scenario (2016)			
		DoS	Delays (s)	LoS	Avg Queues (Veh)
AM	Northbound	1.01	53	D	69

	(Pennant Hills Road)				
	Southbound (Pennant Hills Road)	0.91	57	E	66
	Eastbound (North Rocks Road)	0.99	135	F	33
	Westbound (North Rocks Road)	1.01	138	F	18
	Intersection	1.01	72	E	-
PM	Northbound (Pennant Hills Road)	1.00	72	F	113
	Southbound (Pennant Hills Road)	0.91	42	D	38
	Eastbound (North Rocks Road)	0.97	116	F	29
	Westbound (North Rocks Road)	0.89	83	F	16
	Intersection	1.00	69	E	-

The base case assessment indicates:

- The intersection operates with a LoS E and average delays of 72 and 69 seconds during the AM and PM peak hours respectively
- Northbound movements experience average delays of 53 and 72 seconds and average queues of 69 and 113 vehicles during the AM and PM peak hours respectively
- Southbound movements experience average delays of 57 and 42 seconds and average queues of 66 and 38 vehicles during the AM and PM peak hours respectively
- Eastbound movements experience average delays of 135 and 116 seconds and average queues of 33 and 29 vehicles during the AM and PM peak hours respectively
- Westbound movements experience average delays of 138 and 83 seconds and average queues of 18 and 16 vehicles during the AM and PM peak hours respectively.

Future Traffic growth

The proposal is located within 1 kilometre of the NorthConnex tunnel portals scheduled for opening in 2019. The tunnel portals will allow for both north bound and south bound vehicle access to and from Pennant Hills Road. North Rocks Road is a potential major east-west traffic distributor for traffic accessing Pennant Hills Road and the NorthConnex tunnel. The opening of NorthConnex is predicted to reduce the traffic demand of Pennant Hills Road.

Roads and Maritime provided the predicted traffic volumes using the new growth rate data for 2020 and 2030. It was identified the proposal would be at capacity post 2028 'without' NorthConnex and post 2030 'with' NorthConnex.

Pedestrian Movement

The existing pedestrian facilities are as follows:

- Existing zebra pedestrian crossing on the left slip lane east bound approach along North Rocks Road
- The existing Pennant Hills Road intersection facilitates a three approach signal controlled pedestrian crossing (across North Rocks Road) both east and west and across Pennant Hills Road on the northern side of the intersection.

Parking

'No Stopping' and 'No Parking' zones are provided along both directions of Pennant Hills Road and North Rocks Road at the vicinity of the intersection. In addition, clearways are in operation along Pennant Hills Road during the hours of 6am to 7pm on weekdays and 8am to 8pm on weekends and public holidays.

Public Transport

There are two bus stops in the proposal area (bus ID 211825 2118174). There are a number of bus routes in close proximity to the proposal as follows:

- Bus route 549 runs the length of North Rocks Road from Parramatta to Epping Station
- Bus route 553 runs between Beecroft and North Rocks along North Rocks Road and Pennant Hills Road
- Bus route 625 runs from Parramatta Station to Pennant Hills Station along Pennant Hills Road.
- Bus route 630 Epping to Blacktown along Pennant Hills Road and North Rocks Road

No changes to the current bus services are proposed as part of the proposal.

6.3.3 Potential impacts

Construction

Some impacts on traffic flow may be apparent during the construction phase of the works. Construction is planned to occur over an 18 month period from late 2018. During construction it is anticipated that roads are to remain open for the construction period, however some lane closures may occur. Construction speed limits would be in place during construction, and stop/slow controls would be used during construction activities for workforce safety. Speed controls would temporarily impact travel times along roads in the proposal area.

In addition, a small increase in traffic along the Pennant Hills Road and North Rocks Road intersection may be experienced as a result of construction vehicles and contractors utilising the road, however any increases in traffic are expected to be negligible due to the existing average daily traffic count on Pennant Hills Road.

Pedestrians

As part of preliminary construction staging plans, it is likely the existing pedestrian footpaths adjacent to the work areas (including Pennant Hills Road where the widening is occurring in front of the four residential properties and for the new high entry slip lane) will be temporarily occupied. Wayfinding signage will be used to direct pedestrians to the other side of the footpath using the existing at grade pedestrian crossing near the Roselea Community Centre.

Access

Properties along Pennant Hills Road between North Rocks Road and North Murray farms can be accessed by right turn traffic crossing the BB line in the existing conditions.

The proposal includes adding an additional lane on the northbound direction on that segment and a new raised median will be provided to increase the safety along that section of the Road. The new median will restrict the access to the properties on in this area of the road from the opposing side which would require the use of alternative routes to access those properties as shown in Figure 6-5 and Figure 6-6.

Public transport

Both bus stops in the proposal corridor would remain operational during construction.

Northbound right turn across Pennant Hills Road to the Community Centre

Vehicles would continue north of the Community Centre and turn left down Murray Farm Road – right down Oakes Road- right down Eaton Road – left onto Karloon Road – right onto Pennant Hills Road and turn left into the Community Centre (Figure 6-5).

This route is approximately 3.5 kilometres longer and would take an additional seven minutes to drive.

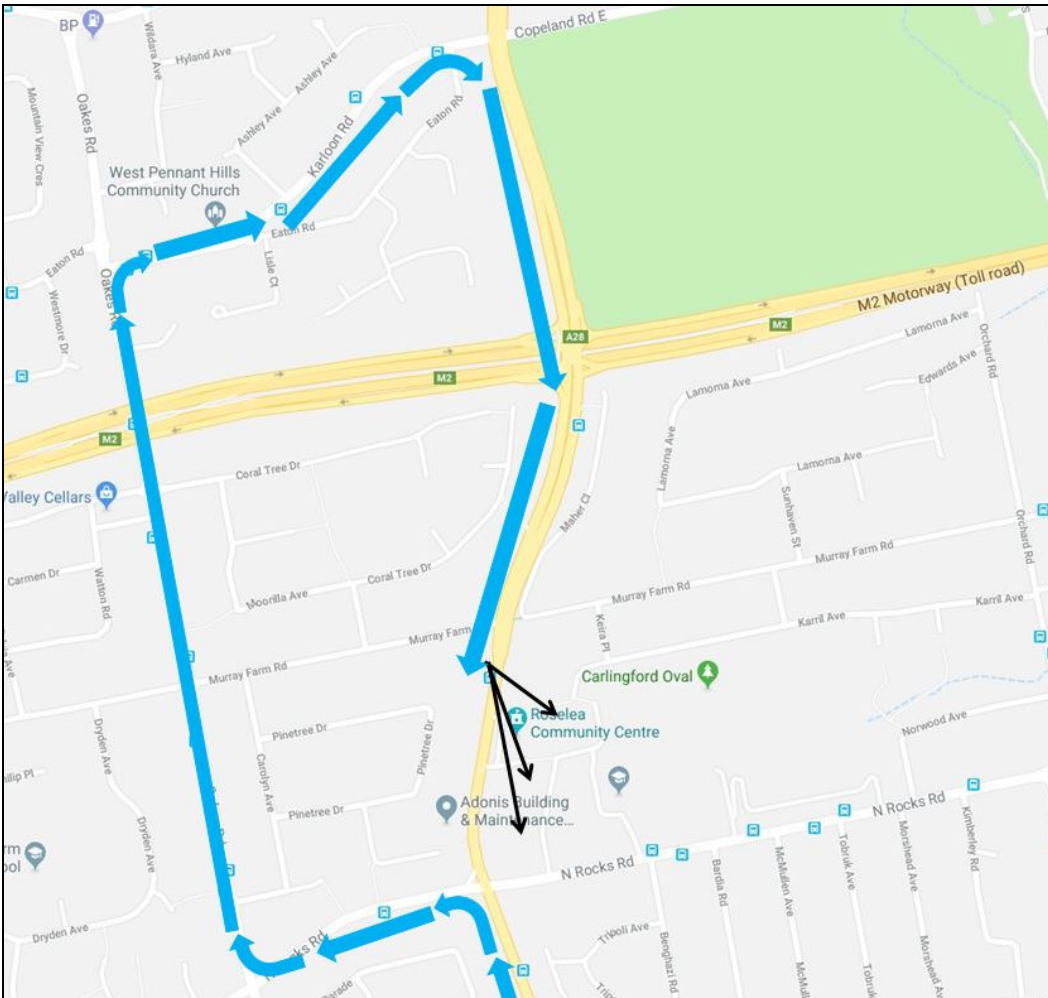


Figure 6-5 Alternative route for vehicles travelling north on Pennant Hills Road and wanting to turn right to the Community Centre

Southbound right turn across Pennant Hills Road from the community Centre to access properties on Pennant Hills Road before North Rocks Road

Properties along Pennant Hills Road between North Rocks Road and Murray Farm Road will require the use of alternative routes to access those properties as shown in (Figure 6-6 and Figure 6-7).

The alternative property access route for southbound traffic is expected to increase travel time by eight minutes and travel distance by 3.1 kilometres.

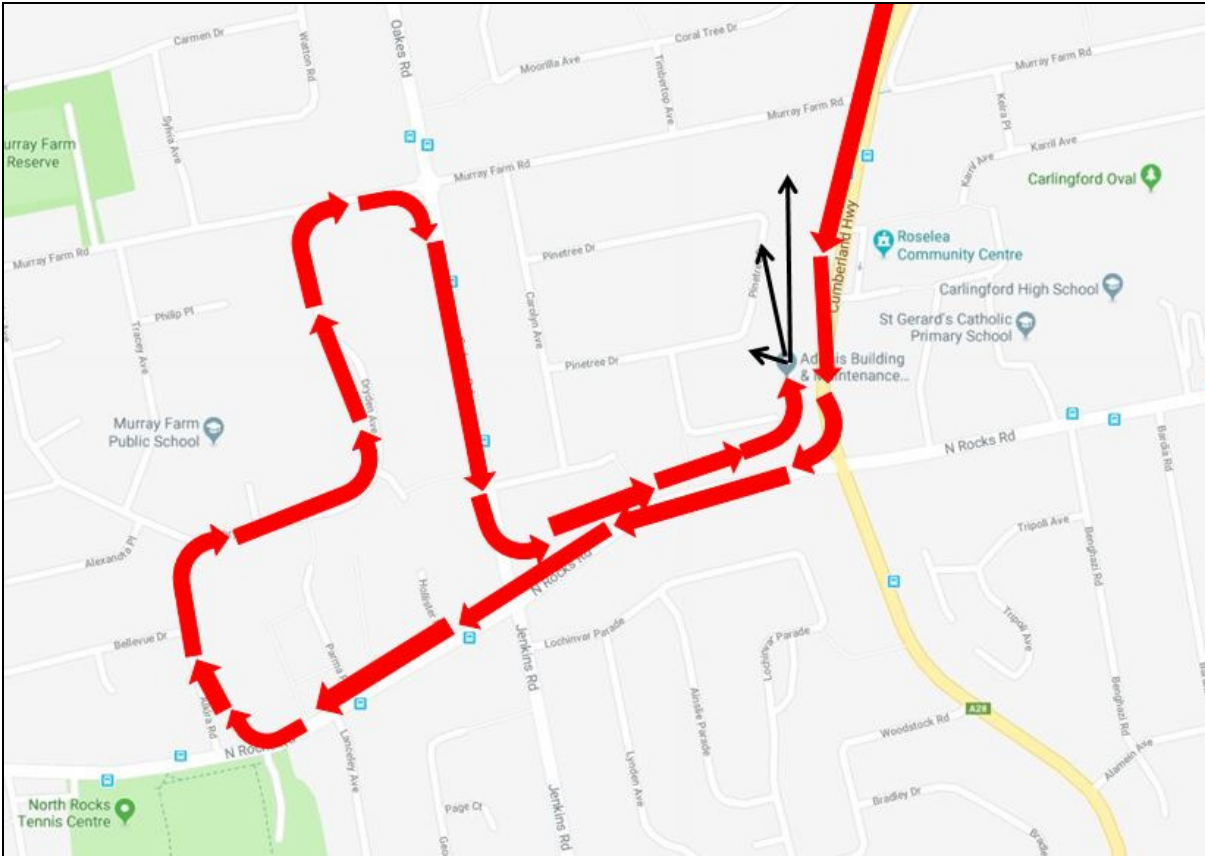


Figure 6-6 Alternative route for vehicles travelling south from the Community Centre and wanting to turn right across Pennant Hills Road before North Rocks Road. (Source: Google Maps)

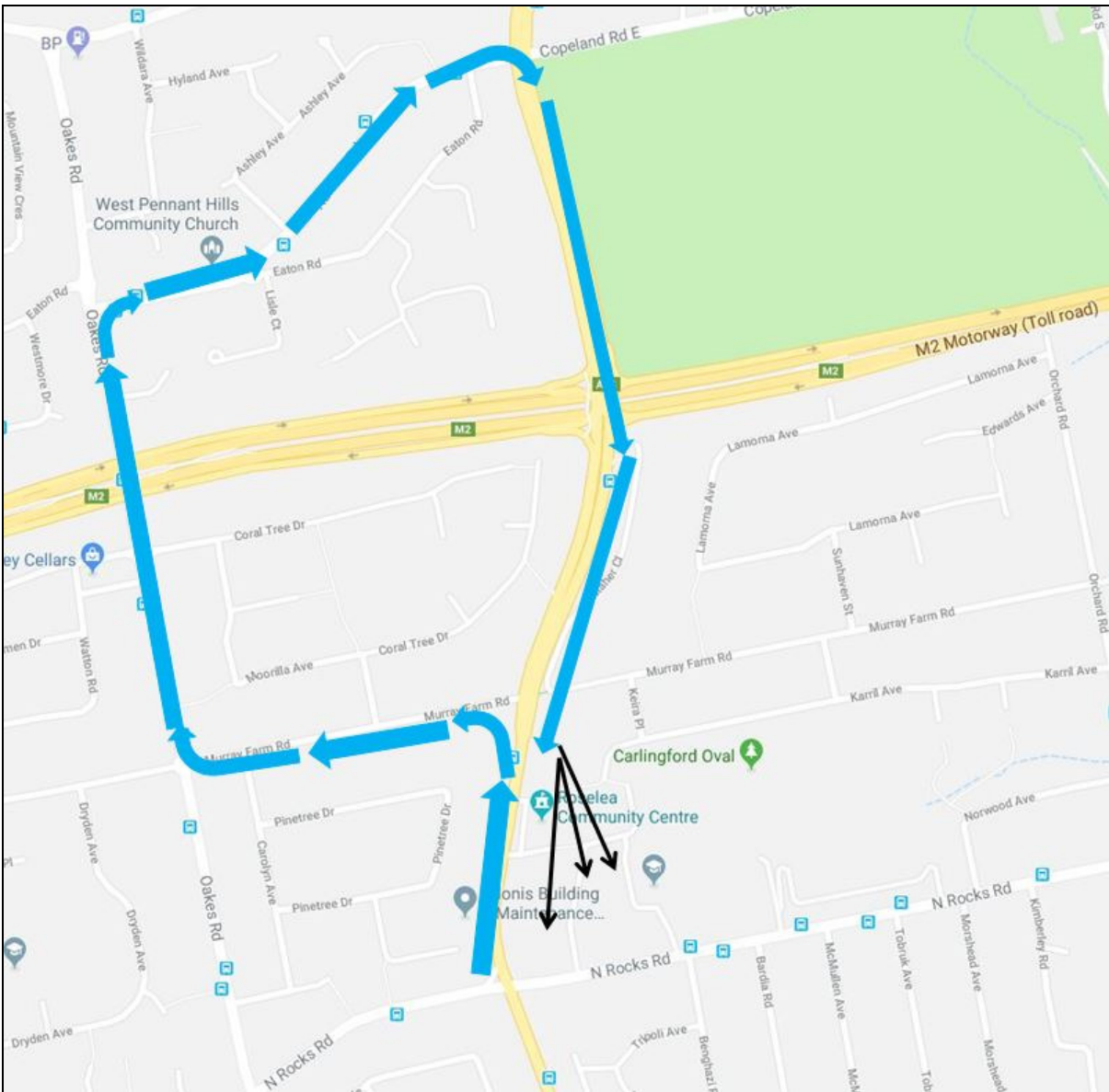


Figure 6-7 Alternative route for vehicles travelling north down Pennant Hills road and wanting to turn right into properties between North Rocks Road and Murray Farm Road (Source: Google Maps)

Should Roads and Maritime Services proceed with the proposal, consultation activities would continue up to and during construction. In particular, consultation activities would be undertaken with directly impacted community stakeholders to assist in managing access and other impacts during construction.

Operation

The projected 2026 peak hour traffic volumes are presented in Figure 6-8.

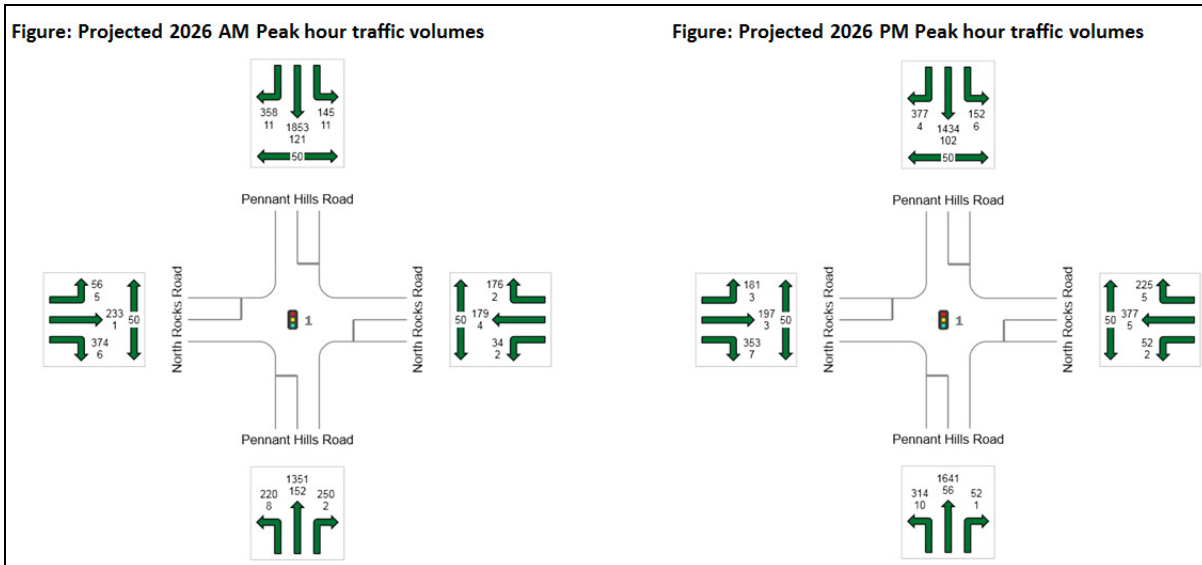


Figure 6-8 Projected 2026 peak hour volumes

Future intersection performance

Similar to 2016 assessment, the intersection performance was assessed by considering the estimated average vehicle delays, average queue lengths and Level of Service (LoS) during the AM and PM peak periods. Table 6-5 and Table 6-6 summarises the estimated AM and PM weekday peak performance of the intersection for the base year (2016) and 2026.

Table 6-5 Base year (2016) Assessment (with and without proposal)

Approach		Without Proposal (2016)				With Proposal (2016)			
		DoS	Delays (s)	LoS	Avg Queues (Veh)	DoS	Delays (s)	LoS	Avg Queues (Veh)
AM	Northbound	1.01	53	D	69	0.84	36	D	27
	Southbound	0.91	57	E	66	0.89	47	D	53
	Eastbound	0.99	135	F	33	0.99	131	F	33
	Westbound	1.01	138	F	18	0.86	80	F	11
	Intersection	1.01	72	E	-	0.98	59	E	59
PM	Northbound	1.01	72	F	113	0.75	31	C	41
	Southbound	0.91	42	D	38	0.91	38	D	31
	Eastbound	0.97	116	F	29	0.97	114	F	29
	Westbound	0.89	83	F	16	0.61	71	E	10
	Intersection	1.01	69	E	-	0.97	48	D	-

Table 6-6: 2026 SIDRA Outputs

Approach		Future No Build Scenario (2026)			
		DoS	Delays (s)	LoS	Avg Queues (Veh)
AM	Northbound	1.14	161	F	166
	Southbound	1.23	423	F	252
	Eastbound	1.08	217	F	50
	Westbound	1.17	361	F	38
	Intersection	1.23	300	F	-

PM	Northbound	1.11	156	F	193
	Southbound	1.55	268	F	92
	Eastbound	1.21	436	F	81
	Westbound	1.45	805	F	108
	Intersection	1.55	313	F	-

The assessment for the future 2026 scenario indicates that:

- Average delays of 300 and 313 seconds with LoS F are estimated at the intersection during the AM and PM peak hours under the existing layout.
- Average delays of 161 and 156 seconds are estimated for northbound movements with estimated average queues of 166 and 193 vehicles during the AM and PM peak hours respectively.
- Average delays of 423 and 268 seconds are estimated for southbound movements with estimated average queues of 252 and 92 vehicles during the AM and PM peak hours respectively.
- Average delays of 217 and 436 seconds are estimated for eastbound movements with estimated average queues of 50 and 81 vehicles during the AM and PM peak hours respectively.
- Average delays of 361 and 805 seconds are estimated for westbound movements with estimated average queues of 38 and 108 vehicles during the AM and PM peak hours respectively.

Overall this intersection has insufficient capacity to cater for the projected traffic demands, creating significant delays for traffic and negatively impacts the safety of the intersection. The detail of the SIDRA analysis is provided in the attachment of this memo.

6.3.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Traffic and transport	<p>A Traffic Management Plan (TMP) will be prepared and implemented as part of the CEMP. The TMP will be prepared in accordance with the Roads and Maritime Traffic Control at Work Sites Manual (RTA, 2010) and QA Specification G10 Control of Traffic (Roads and Maritime, 2008). The TMP will include:</p> <ul style="list-style-type: none"> • Confirmation of haulage routes. • Measures to maintain access to local roads and properties. • Site specific traffic control measures (including signage) to manage and regulate traffic movement. • Measures to maintain pedestrian and cyclist access. • Requirements and methods to consult and inform the local community of impacts on the local road network. • Access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads. • A response plan for any construction 	Contractor	Detailed design / Pre-construction

Impact	Environmental safeguards	Responsibility	Timing
	<p>traffic incident.</p> <ul style="list-style-type: none"> • Consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic. • Monitoring, review and amendment mechanisms. 		
Traffic congestion and safety	Traffic control will be provided in accordance with the approved construction TMP to manage traffic movements (vehicular, cycle and pedestrian) during construction.	Contractor	Construction
Traffic and transport	VMS boards will be set up to inform motorists, cyclists and pedestrians of the work and changed traffic conditions during construction.	Contractor	Pre-construction / construction
Public transport	Access to bus stop locations would be maintained during construction. Any temporary changes to bus stops will be undertaken in consultation with bus service provider.	Contractor	Pre-construction / construction
Pedestrian and cyclist access	<p>Traffic controllers will manage the work area and will assist pedestrians and cyclists and maintain access along the work location.</p> <p>Additionally, signage outlining pedestrian and cyclist diversion routes would be displayed during construction (where required).</p>	Contractor	Construction
Property access	<p>Access to affected residential properties would be maintained during construction and temporary property access would be provided to residences where required.</p> <p>The management of property access would be considered by the construction contractor and detailed in the traffic management plan.</p>	Contractor	Pre-Construction and Construction
Property access	Roads and Maritime will continue to consult with all properties that will have altered access following construction of the Proposal.	Roads and Maritime	Detailed design
Property access	Residents and businesses will be notified of any specific impacts to property access and arrangements required during construction.	Roads and Maritime	Detailed design

Socio economic safeguards and management measures that would address traffic and transport impacts are identified in section 6.8.3.

6.4 Noise and vibration

6.4.1 Methodology

A noise and vibration assessment was developed by Wilkinson Murray (March 2018) to investigate operational road traffic noise and construction noise and vibration for the proposal. The assessment is included in Appendix H of this REF.

The methodology of the noise and vibration assessment involved:

- Development of operational noise models with detailed design topographical information
- Identification of sensitive receivers for operational and construction noise
- Background noise monitoring and simultaneous traffic counts to quantify the background environment, develop relevant noise goals and validate the noise model.
- Noise measurements were carried out between Monday 22 January and Wednesday 31 January 2018 at residential property 716 Pennant Hills Road
- Preparation of a construction noise and vibration assessment based on construction methods and staging
- Assessment of road noise impacts from traffic generated during construction.

The Roads and Maritime Construction noise estimator tool was used to assess the construction noise impacts of the compound site.

6.4.2 Existing environment

Noise monitoring location

Noise monitoring was undertaken within the proposal corridor to evaluate the existing traffic noise and background noise environment. Unattended monitoring has been undertaken at the location identified in Figure 6-9, to broadly characterise the noise environment and to verify the traffic noise model.



Figure 6-9 Noise monitoring location at 716 Pennant Hills Road

Table 6-7: Summary of Measured Noise Levels (22-31 January 2018)

Site	Approx. Setback Distance to the Nearside Carriageway (metres)	Daytime $L_{Aeq,15hr}$ (dBA)	Night Time $L_{Aeq,9hr}$ (dBA)	Rating Background Level (RBL) (dBA)		
				Day	Evening	Night
L1	6	74	72	58	53	40

Sensitive Receivers

Figure 6-10 shows the sensitive receivers within the vicinity of the proposal and compound site. Sensitive receivers include residents, Roselea community Centre, St Gerard Majella's Catholic Parish Church, businesses such as a gym, BP service station, car service centre, a mowing service, St Gerard's Catholic Primary school, Carlingford High School and Roselea Public School, Carlingford oval and Murray Farm reserve.



Figure 6-10 sensitive receivers in the vicinity of the compound site

Noise Catchment Area

The proposal area consists of urban developments including residential and commercial properties. Sensitive receivers were identified in noise catchment areas (NCAs). Noise at each NCA was assessed according to geographical location and background monitoring.

Figure 6-11 shows the sensitive receivers in the proposal area.

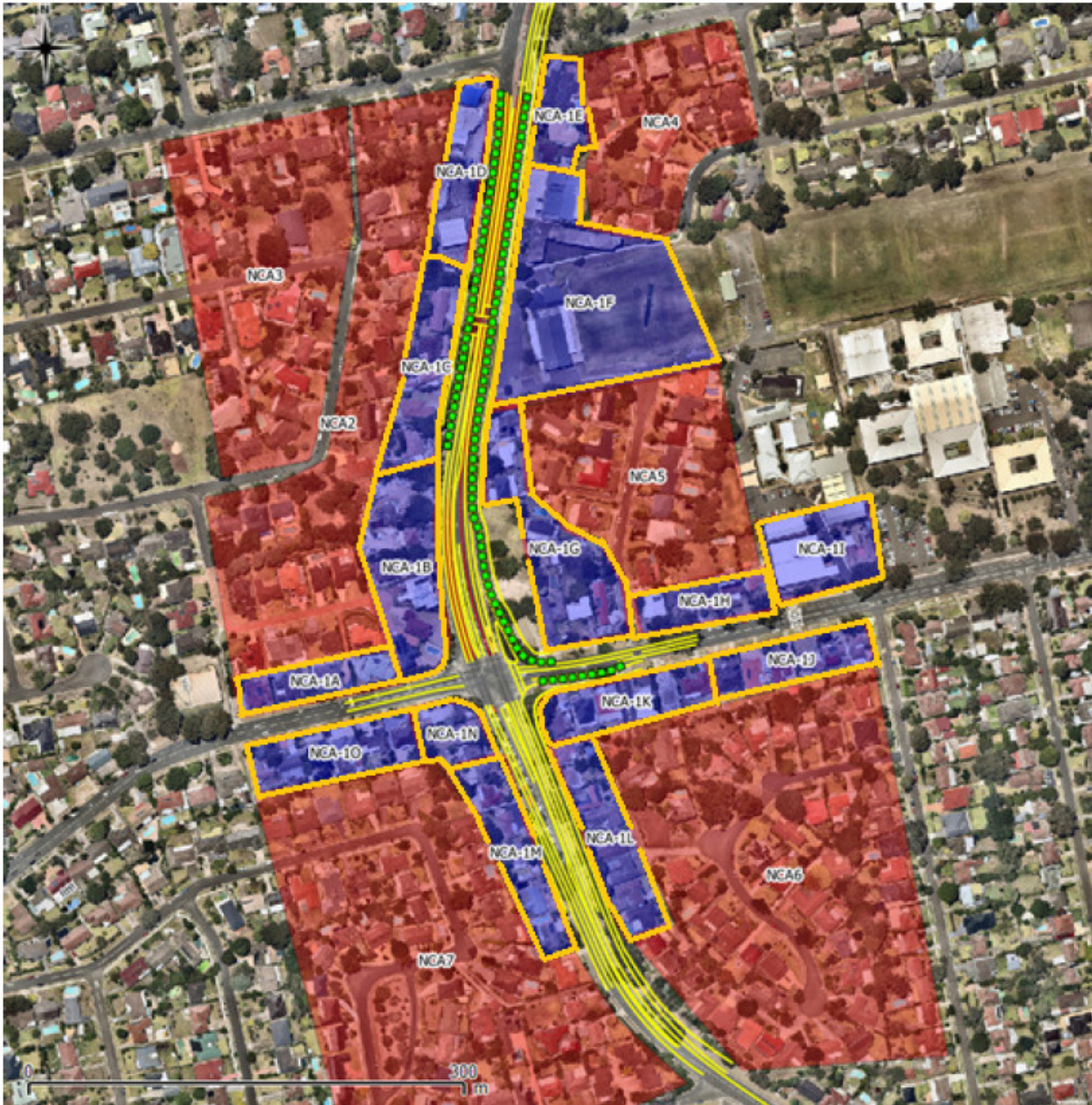


Figure 6-11 Site Plan Identifying Noise Catchment Areas Considered

6.4.3 Criteria

Construction noise criteria

The noise criteria set out in the *ICNG* have been used to assess the potential impacts from construction noise. This document guides the EPA in setting statutory conditions in licences or other regulatory instruments for construction noise.

Table 6-8 summarises the construction noise management levels (NMLs) relevant to residences, as specified in the *ICNG*.

Table 6-8 Construction Noise Management Levels – Residences

Time of Day	Management Level $L_{Aeq,15min}$	How to Apply
-------------	-------------------------------------	--------------

Time of Day	Management Level $L_{Aeq,15min}$	How to Apply
Recommended Standard Hours: Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays or Public Holidays	Noise affected RBL + 10dBA	<p>The noise affected level represents the point above which there may be some community reaction to noise.</p> <ul style="list-style-type: none"> Where the predicted or measured $L_{Aeq,15min}$ 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 works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75dBA	<p>The highly noise affected level represents the point above which there may be strong community reaction to noise.</p> <ul style="list-style-type: none"> 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: <ol style="list-style-type: none"> times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences; 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 + 5dB	<ul style="list-style-type: none"> A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5dB(A) above the noise affected level, the proponent should negotiate with the community. For guidance on negotiating agreements see section 7.2.2 of the Guideline.

Project specific Construction Noise Management Levels

For the purpose of assessment, the daytime, evening and night time RBLs determined by the monitoring have been used to establish construction NMLs for all residential receivers potentially impacted by the works. In accordance with the above guideline, the construction NMLs set out in Table 6-9 would be applicable during the works.

Table 6-9 Project-Specific Construction Noise Management Levels for Standard Hours and Outside Standard Construction Hours

Receivers	Standard Construction Hours		Outside Standard Construction Hours		
	Noise Affected Level $L_{Aeq,15min}$ dB(A)	Highly Noise Affected Level $L_{Aeq,15min}$ dB(A)	Noise Affected Level – Day $L_{Aeq,15min}$ dB(A)	Noise Affected Level – Evening $L_{Aeq,15min}$ dB(A)	Noise Affected Level – Night $L_{Aeq,15min}$ dB(A)
Residential	68	75	63	58	45

Note: The determined residential criteria apply at the most affected point on or within the receiver property boundary.

The ICNG does not include any criteria to assess off-site traffic noise associated with the construction. For the purpose of this assessment construction road traffic noise is assessed using the same approach as minor works under the NCG, that is, construction traffic should not increase existing traffic noise levels by more than 2 dB.

Construction vibration criteria

Impacts from vibration can be considered both in terms of effects on building occupants (human comfort) and the effects on the building structure (building damage). Of these considerations, the human comfort limits are the most stringent. Therefore, for occupied buildings, if compliance with human comfort limits is achieved, it will follow that compliance will be achieved with the building damage objectives.

The EPA administered guideline relevant to human comfort is Assessing Vibration: A Technical Guideline (DEC 2004) provides acceptable values for continuous and impulsive vibration in the range 1-80Hz. German Standard DIN 4150-3-1999 “Structural Vibration – Part 3 Effects of vibration on structures” provides methods for evaluating the effects of vibration on structures.

The Construction Noise and Vibration Guideline (Roads and Maritime 2016) provides recommended safe working distances for a range of construction activities. The guideline provides for minimum safe working distances to prevent cosmetic damage and human response, and must be complied with at all times, unless additional assessment or monitoring is completed to determine site specific safe working distances.

Table 6-10 Vibration guide values for cosmetic damage

Guideline Values for Velocity – mm/s		
Type of Building	PCPV in frequency range of predominant pulse	
	4 to 15 Hz	15 Hz and above
Reinforced or framed structures. Industrial and heavy commercial buildings.	50mm/s at 4 Hz and above	
Unreinforced or light framed structures. Residential or light commercial type buildings.	15mm/s at 4 Hz increasing to 20mm/s at 15 Hz	20mm/s at 15 Hz increasing to 50mm/s at 40 Hz and above

Operational noise criteria

Roads and Maritime recently released the *Noise Criteria Guideline (NCG)* which states the following in relation to minor works:

- *Minor works are works that primarily improve safety, including minor straightening of curves, installing traffic control devices, intersection widening, turning bay extensions or making minor road realignments.*
- *These (minor) works are not considered ‘redeveloped’ or ‘new’ (in the context of the Road Noise Policy definitions) as they are not intended to increase the traffic carrying capacity of the overall road or accommodate a significant increase in heavy vehicle traffic.*
- *Roads and Maritime applies existing road criteria (as set out in Table 8 of the NSW Road Noise Policy (RNP)) where the minor works increase noise levels by more than 2 dB relative to the existing noise levels at the worst affected receiver.*

In accordance with the NCG, for this proposal, there is considered to be negligible impact where operational noise levels increase by less than 2 dB relative to the existing noise level. Under such circumstances, mitigation is not required to be considered.

In cases where the proposal results in operational noise level increases of more than 2 dB, the NSW RNP criteria of $L_{Aeq,15\text{ hour}}$ 60 dBA (daytime) and $L_{Aeq,9\text{ hour}}$ 55 dBA (night-time) apply.

6.4.4 Potential impacts

Construction

Compound site

Roads and Maritime Construction Noise Estimator tool was used to assess the noise impacts during construction from operation of proposed compound site. For location of the proposed compound sites refer to Figure 3-6. The compound is proposed to be located in the area surrounded by low to medium density residential properties, community centre and schools located on the corner of North Rocks Road and Pennant Hills Road.

The distance based assessment (scenario) was selected for assessment as it considers a number of plants operating together during a certain construction activity. Operation of compound sites was evaluated to identify the extent of noise impact. Operation of compound sites includes, but not limited to: deliveries of materials, operation of construction plants and equipment, office and storage areas.

The noise estimator tool produced predicted noise levels at different locations for the residential receivers in the vicinity. The results of the construction noise assessment are summarised in Table 6-11 below and shown in Figure 6-12. NCA1 and NCA2 are residences located directly in line of sight from the proposal. NCA3 are the receivers located behind the rows of other buildings. A number of additional safeguards are proposed and are listed in Section 6.4.5.

Table 6-11 Predicted noise levels during operation of compound site

Catchment distances	NML, dB(A)	Predicted noise levels, dB(A)	Recommended additional mitigation measures
NCA1 (up to 40m) – In line of sight	45	70	N, SN, PC, R2, DR
NCA2 (125m) – In line of sight	45	50	N, R2, DR
NCA3 (200m) – behind the rows of buildings	45	45	N

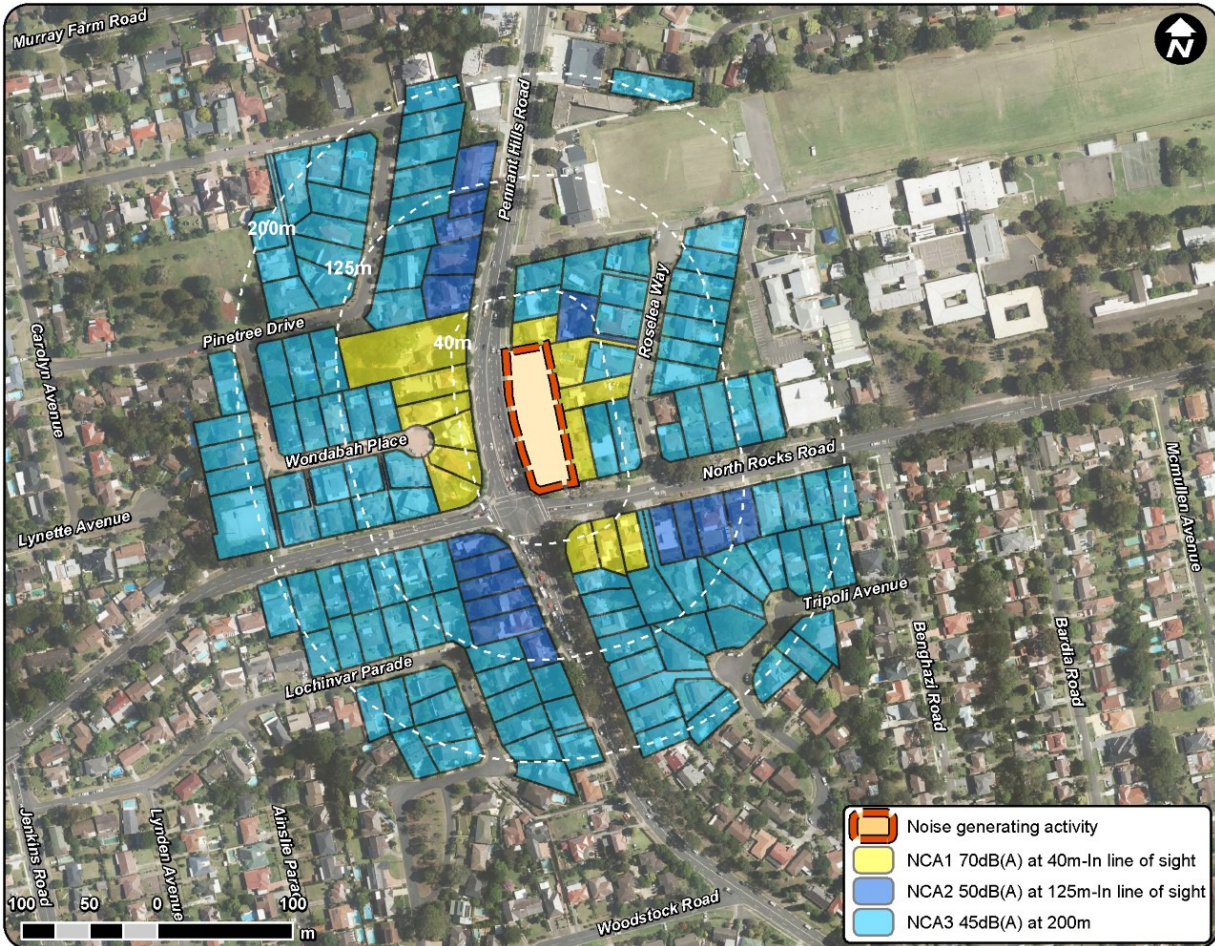
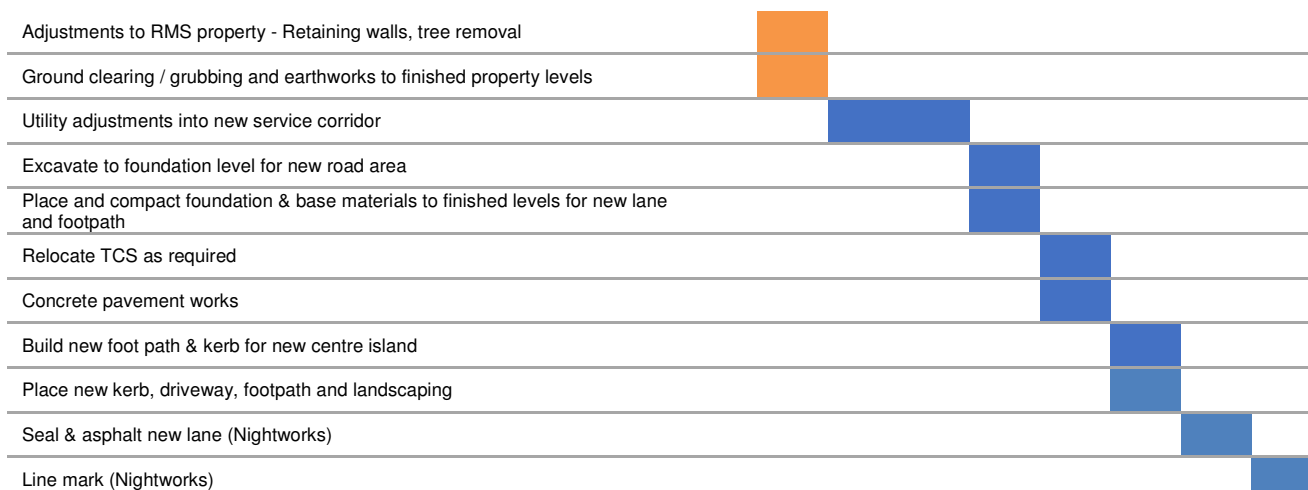


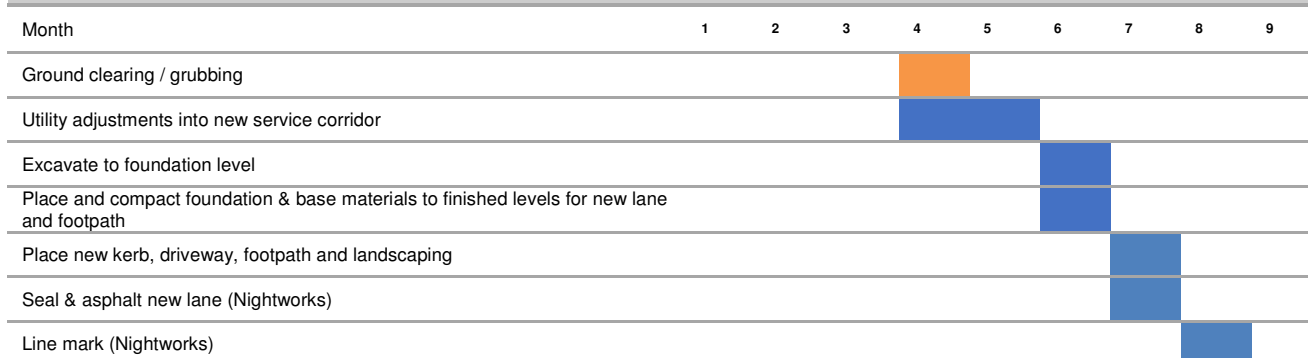
Figure 6-12 Noise impacts to receivers from the compound site

Table 6-12 Indicative constructive schedule

Early Works - Indicative Works Schedule									
Month	1	2	3	4	5	6	7	8	9
Compound Setup	█								
Early Utility Adjustments	█	█	█	█					
Stage 1 - West Side Pennant Hills Road - Additional Lane - Indicative Works Schedule									
Month	1	2	3	4	5	6	7	8	9
Property adjustments and tree clearing to relocate boundary fences for 714C, 741D and 716 Pennant Hills Rd to correct alignments	█								
Ground clearing / grubbing		█							
Utility adjustments into new service corridor		█	█	█					
Removal of existing footpath, driveways and kerb				█	█				
Excavate to foundation level (behind barriers)				█	█				
Install new stormwater pit and or pipes					█	█			
Place and compact foundation & concrete pavement materials to finished levels					█	█	█		
Place new kerb, driveway, footpath and landscaping							█	█	
Seal & asphalt new lane (Nightworks)							█	█	
Line mark (Nightworks)								█	█
Stage 2 - North East Side Turning Lane on Pennant Hills Road - Indicative Works Schedule									
Month	1	2	3	4	5	6	7	8	9



Stage 3 - South East Side Additional Lane on North Rocks Rd - Indicative Works Schedule



Construction Equipment

The construction equipment to be used is set out in Table 6-13.

Associated sound power levels for the identified plant are also included in Table 6-13. These sound power levels have been applied in the predictions of ‘worst-case’ noise that may arise during the identified construction stages.

Table 6-13: Assumed Construction Equipment used during Works

Equipment Used	Equipment SWL, dB(A)
Rigid and articulated trucks	109
Semi-trailers to deliver materials	109
Bobcat	95
Forklift	90
Up to 20 tonne excavators with hammer for demolition of concrete pavements	122
Vibrating and smooth drum rollers	107
Asphalt paver	114
Multi tyred roller	109
30 tonne trucks for delivering asphalt and concrete	109
Road profiler	114
Lighting towers	85
Generators	90
Light vehicles	80
Electric and fuel powered hand tools	100
Water cart	107
Line marking machine	108
Concrete saw / Road cutting saw	118
Bitumen sprayer	106
Tree pruning truck and mulcher	116
Trucks with boom lift and hiab	98
Jackhammers	113

Construction noise predictions

Noise emissions would impact different receivers to various degrees as construction progresses. Based on the preliminary work schedule, the upper $L_{Aeq,15min}$ construction noise levels predicted within each NCA for the key stages are provided in Table 6-14. Levels exceeding the standard hours NML are highlighted in red and those exceeding the 'highly affected' 75 dBA criterion are shown in bold. As shown in the table, significant exceedances of the night-time 45 dBA NML are to be expected for works undertaken out-of-hours.

Table 6-14: Worst-Case Predicted Construction Noise Levels ($L_{Aeq,15min}$ dBA)

NCA	Compound Setup	Clear & Grub			Excavate			New Kerb			Seal & Asphalt			Line Mark		
		Work Stage			Work Stage			Work Stage			Work Stage			Work Stage		
		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
NCA1-A	56	54	60	65	54	60	65	54	61	64	48	55	58	42	49	52
NCA1-B	70	70	72	68	70	72	68	70	73	67	64	67	61	58	61	55
NCA1-C	64	81	72	55	81	72	55	81	73	54	75	67	48	69	61	42
NCA1-D	50	73	53	45	73	53	45	73	54	45	67	48	39	61	42	33
NCA1-E	50	67	58	45	67	58	45	67	58	45	61	52	39	55	46	33
NCA1-F	62	70	64	50	70	64	50	70	65	50	64	59	44	58	53	38
NCA1-G	79	74	77	76	74	77	76	74	78	77	68	72	71	62	66	65
NCA1-H	58	56	71	72	56	71	72	57	60	74	51	54	68	45	48	62
NCA1-I	50	53	50	50	53	50	50	53	50	50	47	44	44	41	38	38
NCA1-J	51	52	67	67	52	67	67	52	62	69	46	56	63	40	50	57
NCA1-K	64	54	73	84	54	73	84	54	73	83	48	67	77	42	61	71
NCA1-L	58	50	60	65	50	60	65	50	61	65	44	55	59	38	49	53
NCA1-M	61	51	64	68	51	64	68	51	66	68	45	60	62	39	54	56
NCA1-N	62	55	65	69	55	65	69	55	67	68	49	61	62	43	55	56
NCA1-O	58	49	61	66	49	61	66	49	62	65	43	56	59	37	50	53
NCA2	49	68	61	46	68	61	46	67	60	45	61	54	39	55	48	33
NCA3	48	57	49	44	57	49	44	57	50	45	51	44	39	45	38	33
NCA4	51	57	53	49	57	53	49	56	53	50	50	47	44	44	41	38
NCA5	59	62	61	53	62	61	53	62	61	53	56	55	47	50	49	41
NCA6	51	46	61	62	46	61	62	46	54	62	40	48	56	34	42	50
NCA7	51	42	51	53	42	51	53	42	52	53	36	46	47	30	40	41

Predictions indicate that during standard hours exceedances of up to approximately 16 dB may be expected at the most affected receivers. Additionally, exceedances of the 'highly affected' 75 dBA criterion by up to 9 dB may be expected. The out-of-hours works have the greatest potential to generate noise impacts. Some exceedances are indicated for the out-of-hours works at the most exposed residential receivers, with exceedances of up to 39 dB predicted.

Operation

No change in vehicle volumes are associated with the proposal. On this basis, for the purpose of this assessment the vehicle volumes and average speeds provided by Roads and Maritime have been used in existing (No Build) and future (Build) traffic noise predictions. Predicted traffic noise levels for the No Build and Build scenarios within the identified NCAs are set out in

Table 6-15.

Table 6-15: Predicted Traffic Noise Levels – ‘Build’ of ‘No Build’

Receiver ID	L _{Aeq,Period} (dBA) 'No Build'		L _{Aeq,Period} (dBA) 'Build'		NCG Assessment Criteria		NCG Criteria Exceeded?		Change in Noise Levels – Build of No Build		Consider Mitigation?
	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	
NCA1-A	70	65	70	65	60	55	Yes	Yes	0.0	0.0	No
NCA1-B	73	70	73	70	60	55	Yes	Yes	0.0	0.1	No
NCA1-C	72	69	72	69	60	55	Yes	Yes	0.3	0.3	No
NCA1-D	73	70	74	71	60	55	Yes	Yes	0.4	0.3	No
NCA1-E	72	69	72	69	60	55	Yes	Yes	0.0	0.0	No
NCA1-F	72	69	72	69	60	55	Yes	Yes	0.0	0.0	No
NCA1-G	72	70	72	70	60	55	Yes	Yes	0.3	0.1	No
NCA1-H	62	57	63	57	60	55	Yes	Yes	0.1	0.1	No
NCA1-I	54	50	54	50	60	55	No	No	0.0	0.0	No
NCA1-J	62	57	62	57	60	55	Yes	Yes	0.0	0.1	No
NCA1-K	72	69	72	69	60	55	Yes	Yes	0.4	0.2	No
NCA1-L	73	70	73	70	60	55	Yes	Yes	0.1	0.0	No
NCA1-M	73	70	73	70	60	55	Yes	Yes	0.0	0.0	No
NCA1-N	72	69	72	69	60	55	Yes	Yes	0.1	0.1	No
NCA1-O	68	63	68	63	60	55	Yes	Yes	0.0	0.0	No
NCA2	60	58	60	58	60	55	Yes	Yes	0.0	0.0	No
NCA3	55	53	55	53	60	55	No	No	0.0	0.0	No
NCA4	58	55	58	55	60	55	No	Yes	0.0	0.0	No
NCA5	61	59	61	59	60	55	Yes	Yes	0.0	0.0	No
NCA6	59	56	59	56	60	55	No	Yes	0.0	0.0	No
NCA7	54	51	54	51	60	55	No	No	0.0	0.0	No

Note: Build and No-Build traffic noise predictions have been undertaken at each receiver within the NCAs. For reporting purposes, the maximum predicted L_{Aeq,Period} noise levels are shown.

As shown in the table, whilst the existing traffic noise levels already exceed the NCG criteria, the project is only expected to result in marginal traffic noise increases at the closest (most affected) receivers. At the most affected receivers, the LAeq daytime and night time levels are predicted to increase by less than 0.5 dB, which would not be perceptible to most people and well within the 2 dB criteria.

6.4.5 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Noise and vibration	<p>A Noise and Vibration Management Plan (NVMP) will be prepared and implemented as part of the CEMP. The NVMP will generally follow the approach in the <i>Interim Construction Noise Guideline</i> (ICNG) (DECC, 2009) and identify:</p> <ul style="list-style-type: none"> all potential noise and vibration generating activities associated with the activity a monitoring program to assess performance against relevant noise and vibration criteria arrangements for consultation with affected neighbours and sensitive receivers, including notification and complaint handling procedures 	Contractor	Detailed design / pre-construction

Impact	Environmental safeguards	Responsibility	Timing
	<ul style="list-style-type: none"> contingency measures to be implemented in the event of non-compliance with noise and vibration criteria. 		
Noise and vibration	<p>All sensitive receivers (e.g. schools, local residents) likely to be affected will be notified at least 7 days prior to commencement of any works associated with the activity that may have an adverse noise or vibration impact. The notification will provide details of:</p> <ul style="list-style-type: none"> the project the construction period and construction hours contact information for project management staff complaint and incident reporting how to obtain further information. 	Contractor	Detailed design / pre-construction
Noise	<p>Very noisy activities should, as much as practicable, be programmed for normal working hours. If the work cannot be undertaken during the day, it should be completed before 12:00 am. In particular, there should be no jackhammering or saw cutting after midnight.</p> <p>If it is not practical to apply these minimum programming requirements, extra care will need to be taken in selecting and applying alternative and effective noise and vibration management measures.</p>	Contractor	Construction
Noise and vibration impacts to sensitive receivers day and night works	<p>Works to be carried out during normal work hours (i.e. 7am to 6pm Monday to Friday; 8am to 1pm Saturdays). Any work that is performed outside normal work hours or on Sundays or public holidays is to minimise noise impacts.</p>	Contractor	Construction
Vibration impacts to properties adjacent to the construction works	<p>Measures, including allowing adequate distance that rollers can come to adjacent buildings and/or using non vibrating rollers, are to be used to minimise or prevent vibration impacts.</p>	Contractor	Construction
Noise associated with compound site	<p>Letterbox drop (N = notification) has been recommended for receivers within a 200m radius of the compound site (light blue NCA3).</p>	Contractor	Pre-Construction

6.5 Aboriginal heritage

6.5.1 Methodology

An database search of the Aboriginal Heritage Information Management System (AHIMS) was undertaken on 10 November 2018, with a search area of 50 metres around the proposal area and site compound.

The Roads and Maritime Procedure for Aboriginal cultural heritage consultation and investigation (PACHCI) is a four stage process used to assess the potential impact on Aboriginal cultural heritage and ensure effective consultation with the Aboriginal community is completed for all Roads and Maritime developments.

A Stage 1 assessment was undertaken for this proposal. This found that the proposal is unlikely to affect Aboriginal cultural heritage and therefore was not required to progress to Stage 2. The assessment was based on the following diligence considerations:

- The project is unlikely to harm known Aboriginal objects or places.
- The AHIMS search did not indicate any known Aboriginal objects or places in the immediate proposal area.
- The area does not contain landscape features that indicate the presence of Aboriginal objects, based on the Office of Environment and Heritage's *Due diligence Code of Practice for the Protection of Aboriginal objects in NSW* and the Roads and Maritime Services' procedure.
- The cultural heritage potential of the proposal area appears to be reduced due to past disturbance.

The AHIMS search and PACHCI letter are included in Appendix I.

6.5.2 Existing environment

The AHIMS search showed no Aboriginal heritage sites or Aboriginal objects were found within the proposal area and site compound area within the 50m buffer.

6.5.3 Potential impacts

Construction

The proposal is unlikely to have construction impacts on Aboriginal cultural heritage in the proposal area due to urbanised environment and previous ground disturbance from construction of the original road and residential properties. The potential for unexpected Aboriginal cultural objects to be discovered is unlikely; however the Standard Management Procedure for Unexpected Heritage Items will be followed.

Operation

No impacts on Aboriginal heritage items are expected following construction.

6.5.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Aboriginal heritage	<ul style="list-style-type: none"> The <i>Standard Management Procedure - Unexpected Heritage Items</i> (Roads and Maritime, 2015) will be followed in the event that an unknown or potential Aboriginal object/s, including skeletal remains, is found during construction. This applies where Roads and Maritime does not have approval to disturb the object/s or where a specific safeguard for managing the disturbance (apart from the Procedure) is not in place. Work will only re-commence once the requirements of that Procedure have been satisfied. Procedures for unexpected finds will be addressed in the CEMP. 	Contractor	Construction

6.6 Non-Aboriginal heritage

6.6.1 Methodology

The following database searches were conducted on 27 June 2017;

- Australian Heritage Database with the define search area Carlingford, NSW
- NSW State Heritage Inventory search was conducted with the define search area of Parramatta LGA & Carlingford.
- Hills Shire Local Environmental Plan 2012 (prior to the council amalgamation, the proposal area was in the Hills LGA)

The heritage searches are included as Appendix J.

6.6.2 Existing environment

There are a number of heritage items listed in the registers that are in the vicinity of the proposal. See Table 6-16 for a list of the heritage items and Figure 6-13 for their location in relation to the proposal site.

Table 6-16 Identified Non-Aboriginal heritage

Place Name	Location	Register/List	Distance to site (approximately)
Carlingford Public School Building & Cottage	Marsden Road, corner of Rickard Street, Carlingford, 2118. NSW	Register of National Estate	2 km
St Pauls Anglican Church (former)	346 Marsden Rd, Carlingford, 2118. NSW	State Heritage Register (SHR 00056)	1.8 km

Place Name	Location	Register/List	Distance to site (approximately)
Dundas Valley, Corridor through Time	Intersection of Pennant Hills Road and Marsden Road, Carlingford, 2118. NSW	Register of the National Estate	1.8 km
Mobbs Hill Reservoir (WS 0068) & (WS0069)	224, Marsden Road Carlingford, 2118. NSW 226, Marsden Road Carlingford	NSW State Government (SGOV) S170 register	3 km

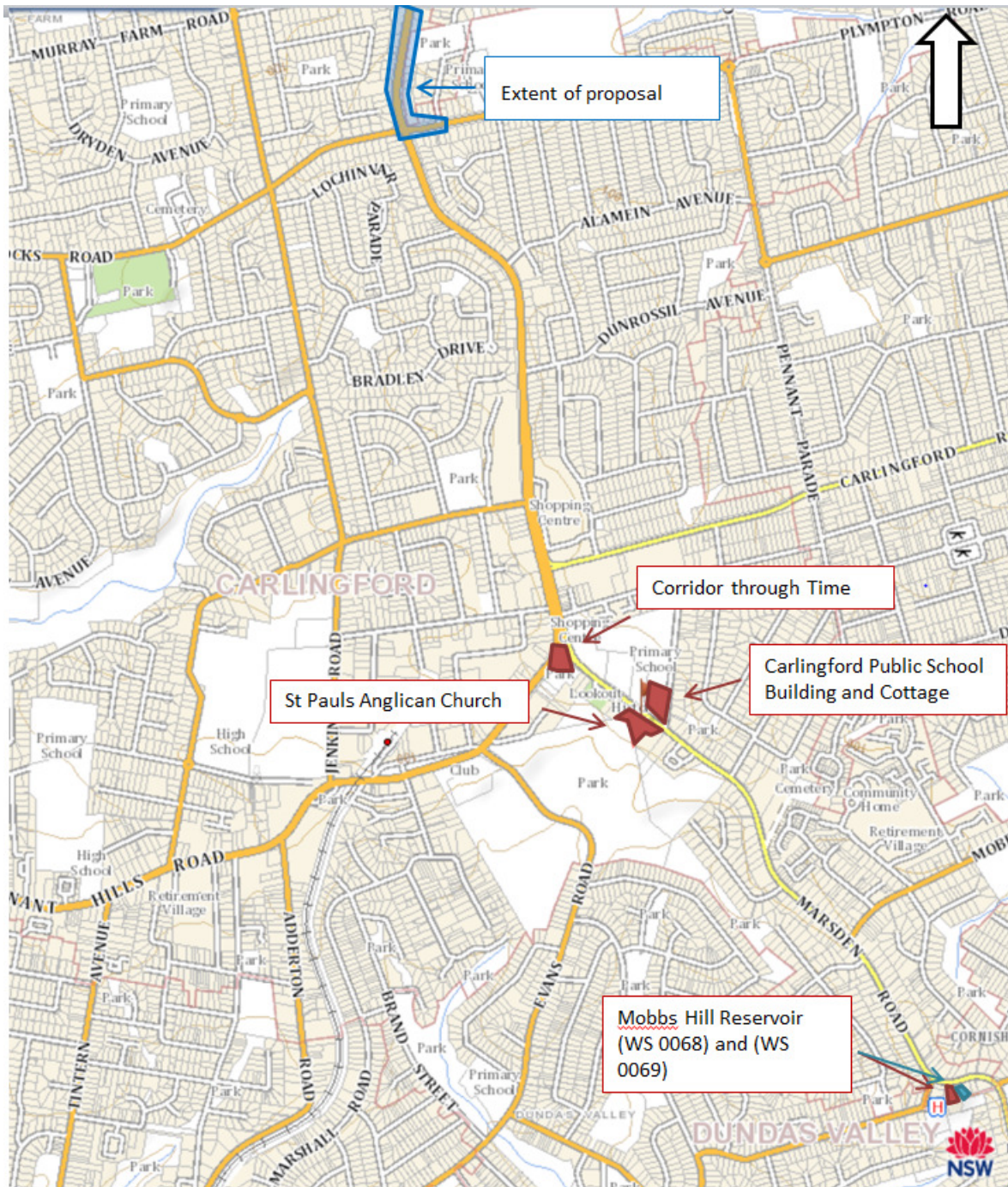


Figure 6-13 Location of heritage items in the vicinity of the proposal

6.6.3 Potential impacts

No construction impact to the places listed on Australian Heritage Database or State Heritage Register is expected due to their distance from the proposal. The closest heritage item is the 'Corridor through Time' located approximately 1.6 kilometres south of the proposal.

Operation

No impacts on non-Aboriginal heritage items are expected following construction.

6.6.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Non-Aboriginal heritage	<ul style="list-style-type: none"> The <i>Standard Management Procedure - Unexpected Heritage Items</i> (Roads and Maritime, 2015) will be followed in the event that any unexpected heritage items, archaeological remains or potential relics of Non-Aboriginal origin are encountered. Work will only re-commence once the requirements of that Procedure have been satisfied. Procedures for unexpected finds will be addressed in the CEMP 	Contractor	Detailed design / pre-construction

6.7 Landscape character and visual impacts

6.7.1 Methodology

Assessment criteria based on landscape character zones (LCZ) has been developed in response to the uses and function of the upgraded intersection. Visual impacts have been assessed by identifying a key viewpoint and determining the overall impact of key features of the proposal.

The assessment was carried out accordance with the Environmental Impact Assessment Practice Note: Guideline for Landscape Character and Visual Impact Assessment (Roads and Maritime, 2013).

The method to measure landscape character and visual impact is based on the combination of the sensitivity of the existing area or view to change and the magnitude (scale, character, distance) of the proposal on that area or view.

Sensitivity refers to the qualities of an area, the number and type of receivers and how sensitive the existing character of the setting is to the proposed change. Magnitude refers to the nature of the project.

The combination of sensitivity and magnitude will provide the visual impact for viewpoints (refer to for grading values).

Table 6-17: Impact grading matrix (Roads and Maritime 2013)

		Magnitude			
		High	Moderate	Low	Negligible
Sensitivity	High	High Impact	High-Moderate	Moderate	Negligible
	Moderate	High-Moderate	Moderate	Moderate-Low	Negligible
	Low	Moderate	Moderate-Low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

Landscape Character Zones

For the purpose of the landscape character assessment, the proposal area was divided into two key character zones. They are:

LCZ 1: Mixed residential

LCZ 2: Commercial

Viewpoints

For the purpose of the visual impact assessment, one observer location (OL) viewpoint was identified. It is the residents on Pennant Hills Road.

6.7.2 Existing environment

The proposal is located in an urban area in the suburb of Carlingford. The surrounding land uses include infrastructure (arterial and local roads), low density residential, a community centre and commercial properties on Pennant Hills Road (mowing service, gym and BP service station).

Vehicles travel in a north/south direction along Pennant Hills Road and east/ west along North Rocks Road. There are a number of bus routes that service this corridor (refer to Section 6.3). Cycle access is not specifically catered for in the proposal area and pedestrian access along Pennant Hills Road is limited to footpaths on the kerbside lane of both sides of the road with a number of at grade pedestrian crossings (across Pennant Hills Road at the community centre, and at all four legs of the intersection with North Rocks Road).

Pennant Hills Road has a pedestrian footpath along the kerbside lane on both sides of the road, with a signalised crossing on the northern leg across Pennant Hills Road (at the intersection of North Rocks Road) and another signalised crossing at the Roselea Community Centre. North Rocks Road has a pedestrian footpath along the kerbside lane on both sides of the road, with a signalised pedestrian crossing on the eastern and western legs of the intersection at Pennant Hills Road. There is also a zebra crossing on the left turn slip lane from North Rocks Road to Pennant Hills Road (northbound).

Landscape character zones

LCZ 1: Mixed residential

The Mixed residential LCZ comprises of low to medium density residential properties on Pennant Hills Road and North Rocks Road (Figure 6-14). There is a pedestrian footpath on both sides of Pennant Hills Road. A tall hedge is planted on the northbound verge of Pennant Hills Road. There are a number of street trees along the both sides of Pennant Hills Road. While the street trees are not ecologically significant, the mass of vegetation provides a visually important edge to the street.



Figure 6-14 Landscape Character Zone 1 – mixed residential

LCZ 2: Commercial

There are a number of small businesses on the southbound side of Pennant Hills Road including:

- BP Service Station
- Plus Fitness gym
- Prompt Movers Carlingford, Temple Patrol Accommodation
- Describe the shops, small businesses – gym mowing etc. add photo from google

Existing viewpoint

Viewpoint 1 looks east onto Pennant Hills road from the residents on the western side of Pennant Hills Road (Figure 6-15 and Figure 6-16).

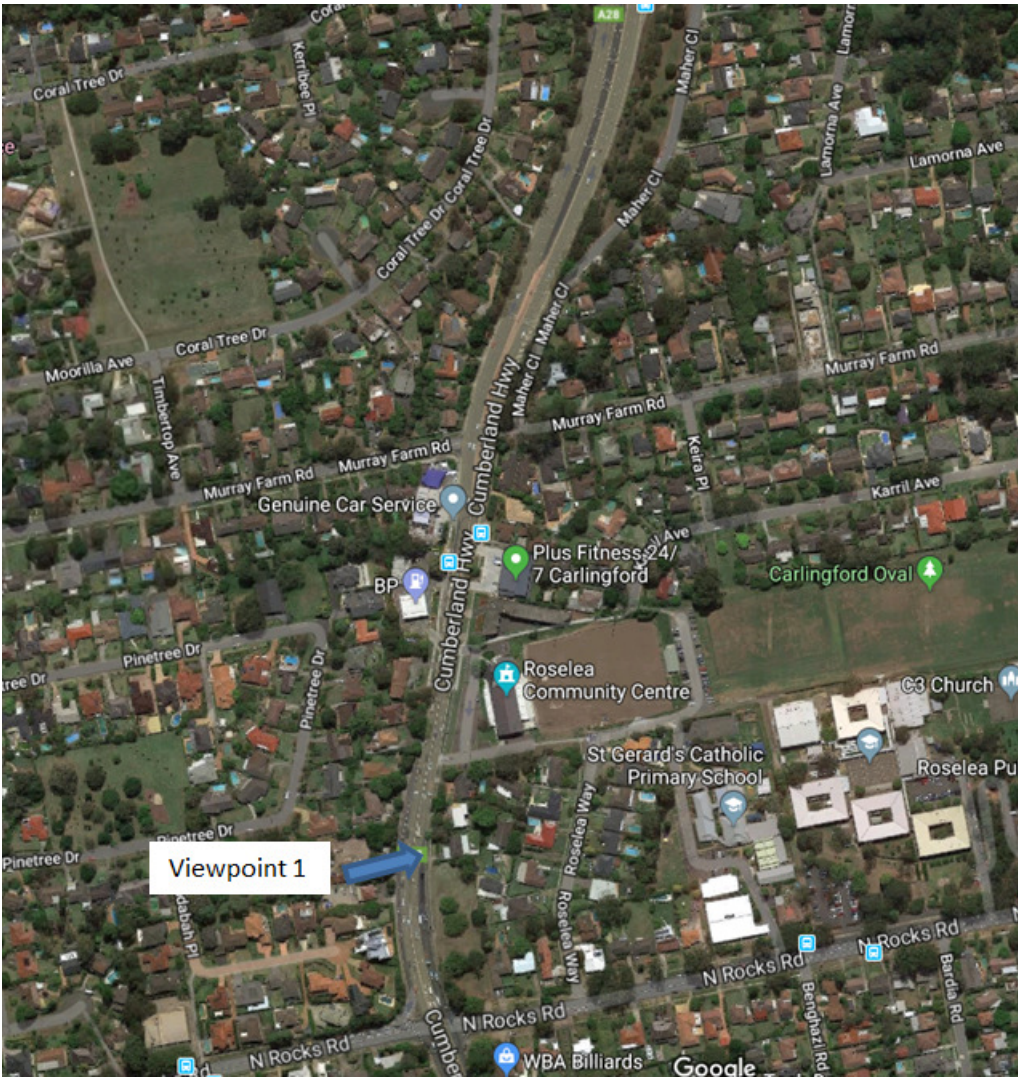


Figure 6-15 Aerial figure showing the viewpoint





Figure 6-16 Viewpoint 1

6.7.3 Potential impacts

Table 6-18 Landscape character zone assessment

landscape character zone	Proposal effects	Sensitivity	Magnitude	Overall assessment
Mixed residential	<p>The proposal would span over this LCZ. The road widening on Pennant Hills Road and North Rocks Road would take place within the existing road reserve between the existing road and residential properties.</p> <p>Changes to the landscape would include removal of vegetation along North Rocks Road and Pennant Hills Road and the widening of Pennant Hills Road northbound.</p>	<p>The sensitivity of this LCZ is Moderate due to the residential neighbourhood character with street trees however the area is already located on a busy road and exposed to live traffic.</p>	<p>The effect of the proposal would be Moderate. The residential area is already located on a busy road and exposed to live traffic. The road is being widened within road reserve. It is utilising already used space (footpath) for the new lane.</p>	<p>The landscape impact rating is Moderate.</p> <p>Due to the small size of the development (relative to the area covered by this LCZ), the proposal would not change the overall character of the LCZ, and would only affect a small area directly surrounding the proposal.</p>
Commercial	<p>The proposal would span over this LCZ. The installation of a concrete median on Pennant Hills Road would prevent access to the businesses from Pennant Hills Road northbound. The businesses would also be exposed to increased noise and traffic due to reduced speed limits and construction activities during construction</p>	<p>The sensitivity of this LCZ is low due to the small number of businesses.</p>	<p>The magnitude of this LCZ is moderate as there would be restricted access to the businesses from the northbound lane on Pennant Hills Road.</p>	<p>The landscape impact rating is moderate- low.</p> <p>Due to the small size of the development, it would not change the overall character of the LCZ, and would only affect a small area directly surrounding the proposal.</p>

Table 6-19 Visual Impact assessment viewpoints

Viewpoint	Proposal effects	Sensitivity	Magnitude	Overall assessment
1	The visual impact from the residences on the western side of Pennant Hills Road was identified as having the greatest visual impact as the road widening occurs at their frontage and moves the road towards their property. The greatest visual impact would be due to vegetation removal, widening of the road and relocation of the footpath closer to the properties.	The sensitivity of this viewpoint is Moderate due to the residential neighbourhood character with street trees however the area is already located on a busy road and exposed to live traffic.	The proposal is expected to have a moderate impact to residents along Pennant Hills Road due to the removal of trees, the widening of the road and the alteration of the property fences. The road however is being widened within road reserve. The property boundary fences that require adjustments would be replaced with a matching fence (like for like) to minimise the visual impact to properties. With the fence modification, vegetation removal will also be triggered. A like for like with the vegetation replanting is proposed however it will take some time for this new vegetation to establish and provide screening again.	The visual impact would be moderate. Properties would have the road move towards their properties and vegetation removed however they are already exposed to live traffic on Pennant Hills Road.

6.7.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Removal of street trees	<p>Detailed design will consider the following:</p> <ul style="list-style-type: none"> • Utility adjustment options to minimise impact to tree roots and minimise tree removal • Vegetation clearing would be kept to the absolute minimum to accommodate the proposal. • 	Roads and Maritime	Detailed design / pre-construction
Visual impacts of construction activities	<ul style="list-style-type: none"> • The work site will be left in a tidy manner at the end of each work day. • Fencing with material attached (e.g. shade cloth) would be provided around the construction compounds to screen views of the construction compounds from adjoining properties • Landscaping will to be managed in accordance with the Roads and Maritime Services <i>Landscape guideline, 2008</i>. 	Contractor	Construction
Visual impact of construction activities	Works to be carried out in accordance with EIA-N04 <i>Guideline for Landscape Character and visual impact assessment</i> .	Contractor	Construction
Tree removal and replanting	A landscaping plan will be developed in consultation with Parramatta City Council prior to Construction and will include detail on the planting species mix.	Roads and Maritime / Contractor	Pre-construction

6.8 Socio-economic

6.8.1 Existing environment

Demographics

The proposal is located within the Parramatta Local Government Area in Western Sydney.

According to the latest census from the Australian Bureau of Statistics (ABS), the population of the Parramatta LGA was 166,858 people. Between 2001 and 2006 population growth in the LGA was 3.62% and between 2006 and 2011 was 12.50%.

The median age was 33 and there were 50.1% male and 49.9% female. Children aged 0 - 14 years made up 19.8% of the population and people aged 65 years and over made up 11.8% of it. The majority of the population is between 14 and 65 years old.

Besides, the population in the suburb of Carlingford in 2016 was 24,394 with a median age of 39 and being 49.1% male and 50.9% female. In 2011, the population of the suburb was 21,570, so the

increment is 13.1%, slightly greater than for the LGA. The population of Carlingford suburb represented about 0.05% of the 4.8 million people that lived in the Greater Sydney Metropolitan Area (Greater Sydney) in 2016. However, the population growth in Carlingford suburb since 2011 was higher than the growth experienced by Greater Sydney's population, estimated in 9.8%. The demographic of Carlingford is characterised by young families with children.

Of occupied private dwellings in Carlingford, 75.0% were separate houses, 11.8% were semi-detached, row or terrace houses, townhouses etc., 12.9% were flats, units or apartments and 0.1% were other dwellings (ABS, 2011).

The average household in the suburb include 3.1 persons, with a weekly income slightly superior to the NSW and Australian median. They own an average of 1.9 vehicles per dwelling. It is a cultural diverse suburb as only 45.5% of the inhabitants were born in Australia, being the most common ancestries Chinese and Hong Kong.

In Carlingford the most common occupations were professionals, clerical and administrative workers and managers. On the day of the Census, the methods of travel to work were: Car, as driver 57.4%, train 6.4% and bus 6.2%. 67% of employed people travelled to work by car either as a driver or passenger.

Social infrastructure

The Roselea community Centre is located at 645-671 Pennant Hills Road, within the proposal area.

Local businesses

There are a number of businesses within the proposal area including:

- BP Service Station
- Plus Fitness gym
- Prompt Mowers Carlingford,
- Temple Patrol Accommodation

Access and connectivity

There are a number of properties that have driveways onto Pennant Hills Road and North Rocks Road and fences which encroaches the Roads and Maritime owned road reserve (Figure 6-17).



Figure 6-17 Property driveways and fences to be impacted by the proposal that are within the Roads and Maritime road reserve

6.8.2 Potential impacts

Construction

Social infrastructure

The community centre would be exposed to increased noise and traffic due to reduced speed limits and construction activities during construction. There will also be some temporary access restrictions particularly during the underboring works where there will be partial temporary occupation of their carpark and frontage for plant and equipment set up.

Local businesses

The community centre and commercial properties including the BP Service Station, Plus Fitness gym, Prompt Mowers Carlingford and Temple Patrol Accommodation would be exposed to increased noise and traffic due to reduced speed limits and construction activities during construction. There may be temporary access restrictions to the BP service station as widening works occur on Pennant Hills northbound. There would be access restrictions to the other residential properties and community centre during the construction of the median as vehicles travelling northbound would no longer be able to turn right into these properties.

Access and connectivity

As part of preliminary construction staging plans, it is likely the existing pedestrian footpaths adjacent to the work areas (including Pennant Hills Road where the widening is occurring in front of the four residential properties and for the new high entry slip lane) will be temporarily occupied. Wayfinding signage will be used to direct pedestrians to the other side of the footpath using the existing at grade pedestrian crossing near the Roselea Community Centre.

Properties on the western side of Pennant Hills Road and southern side of North Rocks Road would have temporary access restrictions to their driveways as construction at their frontage occurs.

Operation

Social infrastructure

The new concrete median will restrict the access to the Roselea Community Centre from Pennant Hills Road northbound. This would require the use of alternative routes as shown in Figure 6-5 and Figure 6-6. The alternative route for vehicles travelling north down Pennant Hills Road and wanting to turn right to the Community Centre and businesses is approximately 3.4 kilometres longer and would take an additional seven minutes to drive.

Local businesses

The new median will restrict the access to the Plus Fitness gym, Prompt Mowers Carlingford and Temple Patrol Accommodation from Pennant Hills Road northbound. This would require the use of alternative routes as shown in Figure 6-5 and Figure 6-6. There would be access restrictions to the other residential properties and community centre during the construction of the median as vehicles travelling northbound would no longer be able to turn right into these properties.

Access and connectivity

As part of the proposal, a concrete median along Pennant Hills Road would be constructed from the North Rocks Road intersection up to the existing concrete median at Murray Farm Road. This will improve the through flow of vehicles on Pennant Hills Road by removing vehicles potentially stopping on the median side lane to make a right turn into residential properties, the community centre and commercial premises, causing queuing.

The alternative property access route for southbound traffic is expected to increase travel time by eight minutes and travel distance by 3.1 kilometres. The alternative property access route for northbound traffic is expected to increase the travel time by seven minutes and the distance by 3.5 kilometres.

There are four properties on Pennant Hills Road and three properties on North Rocks Road that would have their driveways and front fences adjusted due to the road widening within the existing Roads and Maritime reserve. Properties whose fences are removed to accommodate road widening would have their driveways and fences reinstated to match the existing ones.

Public Transport

There would be no impacts to public transport as a result of the proposal.

6.8.3 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Socio-economic	<p>A Communication Plan (CP) will be prepared and implemented as part of the CEMP to help provide timely and accurate information to the community during construction. The CP will include (as a minimum):</p> <ul style="list-style-type: none"> mechanisms to provide details and timing of proposed activities to affected residents, including changed traffic and access conditions contact name and number for complaints. <p>The CP will be prepared in accordance with the <i>Community Involvement and Communications Resource Manual</i> (RTA, 2008).</p>	Contractor	Detailed design / pre-construction
Community consultation	Community consultation is to be undertaken in accordance with the <i>Community Involvement Practice Notes and Resource Manual</i> .	All	Construction
Community consultation	Complaints received are to be recorded and attended to promptly in accordance with the <i>Community Involvement Practice Notes and Resource Manual</i> .	All	Construction
Community consultation	Existing access for nearby and adjoining properties is to be maintained at all times during the works unless otherwise agreed to by the affected property owner.	All	Construction
Community consultation	All residences likely to be affected by the proposed works must be notified at least five working days prior to the commencement of the proposed activities.	All	Construction

6.9 Cumulative impacts

There is a requirement under Clause 228(2) of the EP&A Regulations to take into account any cumulative environmental impacts of the proposed works with other existing or planned future activities. Cumulative impacts have the potential to arise from the interaction of individual

components within the proposed site and the effects of the proposal with other projects in the local area.

6.9.1 Proposal area

The proposal area is located in an area of residential and commercial properties and is based within the suburb of Carlingford. As a part of the City of Parramatta LGA, the proposal area is bordered by West Pennant Hills and Beecroft to the north, Epping to the east, North Rocks and North Parramatta to the west and Telopea and Dundas Valley to the south. These suburbs are linked by Pennant Hills Road and North Rocks Road.

6.9.2 Other projects and developments

A review of the Department of Planning and Environment (DP&E) Major Projects Register on 7 July 2017 returned the following results for the Parramatta LGA:

- NorthConnex M1 - M2 - (Former F3 - M2)
- Modification to NorthConnex M1 - M2.

A review of the City of Parramatta's website showed the following Development Approval's advertised in the vicinity of the proposal:

- 331 North Rocks Road (Lot 5 DP 25327): Change of use, fitout and associated signage from dwelling to health consulting rooms.

A review of the Roads and Maritime Projects page returned the following results for the Carlingford area:

- Blaxland Road/ Ball Avenue/ Balaclava Road intersection upgrade

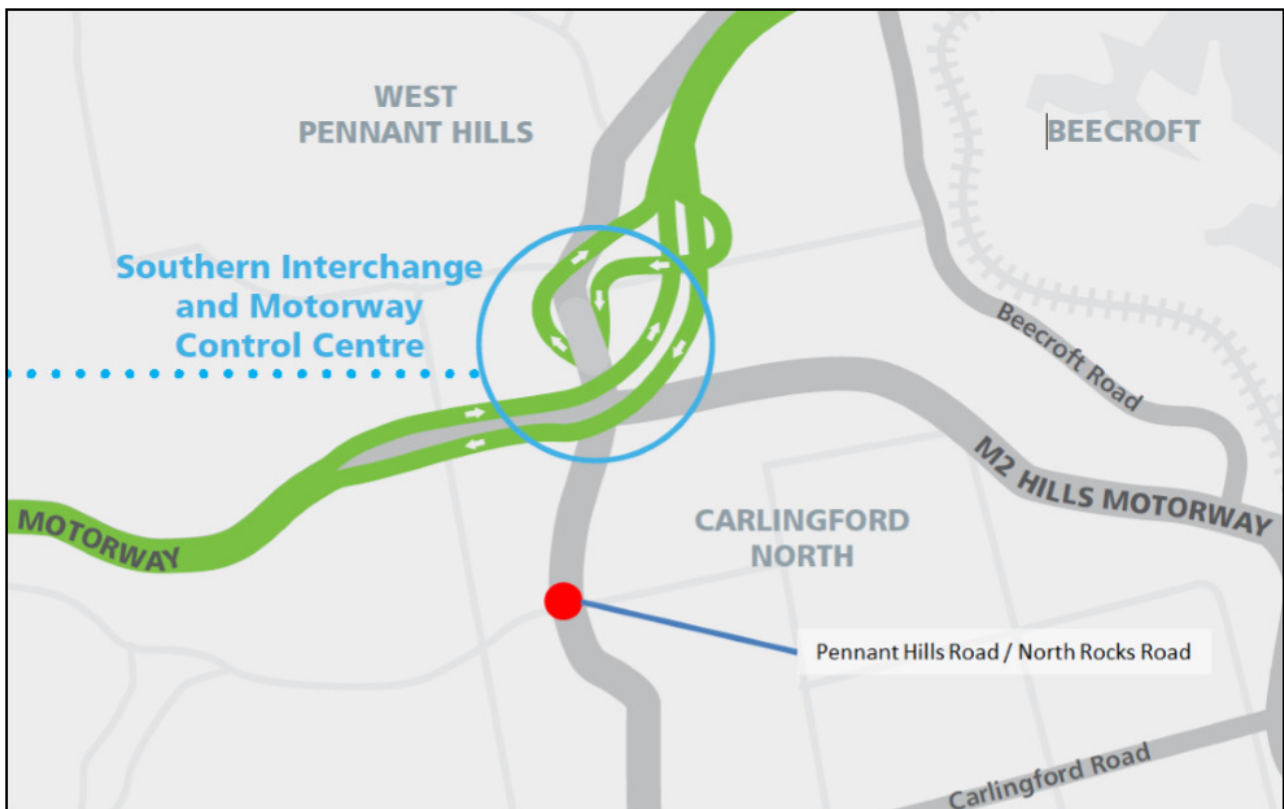


Figure 6-18: NorthConnex southern interchange in proximity to the proposal, (Source: Roads and Maritime, 2016)

Table 6-20 Past, present and future projects

Project	Construction impacts	Operational impacts
<p>NorthConnex NorthConnex is a nine kilometre tunnel that will link the M1 Pacific Motorway at Wahroonga to the Hills M2 Motorway at West Pennant Hills. The southern interchange would provide connections between the tunnel, Hills M2 Motorway and Pennant Hills Road. The northbound on-ramp and southbound off-ramp joining Pennant Hills Road would be located about one kilometre north of the Pennant Hills Road and North Rocks Road intersection.</p> <ul style="list-style-type: none"> • Currently under construction. • Expected to be operational from 2019 	<p>A cumulative construction impact is anticipated as NorthConnex is proposed to be completed in 2019 and this proposal would commence in March 2018.</p>	<p>The operational impacts of the NorthConnex project would include the removal of around 5,000 trucks off Pennant Hills Road each day.</p>
<p>Eastwood Blaxland Rd/Balaclava Rd intersection Roads and Maritime have proposed to upgrade the Eastwood Blaxland Rd/Balaclava Rd intersection to ease traffic congestion in the area. The proposal would involve road widening, reconfiguration of lanes and upgrading the traffic lights.</p>	<p>These sites are approximately 6 kilometres apart and hence are unlikely to generate much cumulative impacts.</p>	<p>The operational impacts of the Eastwood project would include the easing of traffic congestion in the area.</p>

6.9.3 Potential impacts

Cumulative impacts such as increased traffic and noise and local impacts to air quality may occur as a result of the combined impacts of projects in the vicinity, however due to minor nature of the works this impact is expected to be negligible, however are discussed in Table 6-8.

Table 6-21: Potential cumulative impacts

Environmental factor	Construction	Operation
Cumulative traffic, noise, visual and biodiversity impacts	<p>This proposal forms part of the wider Pinch Point program along Pennant Hills Road. Construction at the North Rocks Road intersection is anticipated to commence late 2018.</p> <p>Due to both the scale and spatial location of the proposal, it is unlikely there would be any cumulative impact with NorthConnex or the Eastwood intersection upgrades. However, potential cumulative impacts may include:</p> <ul style="list-style-type: none"> • Additional traffic impacts as a result of multiple construction projects. This may increase traffic and travel times, however, due to proposal staging and individual traffic management at the project level, impacts are anticipated to be minimal • Noise, vibration and air quality impacts associated with each of the proposals are expected to be managed at project level through appropriate noise, vibration and air quality mitigation measures. Due to the distance between the proposals and proposal staging, impacts are anticipated to be minimal • Visual impacts from construction equipment, materials, stockpile sites and vehicles in the area. 	<p>As part of The Pennant Hills and North Rocks Road intersection upgrade program, this proposal would contribute to the overall safety of the road network across Sydney. The operation of the proposal and other projects on the RMS road network would improve congestion and travel time for road users.</p>

6.9.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Cumulative construction impacts	<p>If there is a project overlap with NorthConnex or the Eastwood intersection upgrades, or other Pinch Point program works, consultation will occur with the objective to:</p> <ul style="list-style-type: none"> • Increase awareness of construction timeframes and impacts • Coordinate impact mitigation and management (e.g.: respite periods). 	Contractor	Construction

6.10 Other impacts

6.10.1 Existing environment and potential impacts

Environmental factor	Existing environment	Potential impacts
Waste	<p>The existing waste producing activities in the immediate vicinity of the proposal are the council bins from residential properties and small businesses along Pennant Hills Road and litter from passing vehicles. A small amount of general litter was observed along the roadside at the location of the proposed works on a site inspection undertaken in January 2018. Section 143 of the POEO Act requires waste to be transported to a place that can lawfully accept it and that the owner of the waste and the transporter are responsible for ensuring that waste is transported to a suitable waste facility. Principles of waste management and the Resource Management Hierarchy (e.g. avoid, reduce, reuse, dispose) are embodied in the Waste Avoidance & Resource Recovery Act 2001 and through the NSW Waste Avoidance and Resource Recovery Strategy 2007.</p>	<p>The following waste streams are expected to be produced during the construction phase of the works:</p> <ul style="list-style-type: none"> • Green waste during tree removal and vegetation clearing • Waste road material from the road widening works • General rubbish from the site compound. <p>Waste oils and other materials from the maintenance of construction machinery may also be produced.</p> <p>Waste would be managed in accordance with the NSW Waste Classification Guidelines (EPA, 2014).</p>

Environmental factor	Existing environment	Potential impacts
Air quality	<p>No air quality monitoring or modelling has been undertaken for the proposal. The existing air quality in the area surrounding the North Rocks Road and Pennant Hills Road intersection would be heavily influenced by emissions from motor vehicles from the surrounding road network. Other local sources of air emission would include residential and commercial land uses particularly the BP petrol station.</p> <p>Data from the Macquarie Park (Willandra Village) weather station (site number 066156) indicated the average wind speed at 9am is between 6.5km/h to 9km/hr with a maximum of 10.2km/h in October. The average wind speed at 3pm is between 10km/h and 15km/h with a maximum of 18.5km/h in December.</p>	<p>Air quality impacts during construction would largely result from dust generated during earthworks and other engineering activities associated with road construction including:</p> <ul style="list-style-type: none"> • Clearing of vegetation • Construction of new lane • Transport and handling of soils and materials • Road pavement works <p>Areas of exposed land would be susceptible to dust generation from wind erosion and mechanical disturbance, depending on the size of exposed areas, the frequency of water spraying and the speed of machinery.</p> <p>Potential impacts would be temporary, localised and readily manageable.</p> <p>Improved traffic flow and reduced congestion may have a positive effect on air quality in the area due to less stop/start traffic.</p>

6.10.2 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Air quality	<p>An Air Quality Management Plan (AQMP) will be prepared and implemented as part of the CEMP. The AQMP will include, but not be limited to:</p> <ul style="list-style-type: none"> • potential sources of air pollution • air quality management objectives consistent with any relevant published EPA and/or OEH guidelines • mitigation and suppression measures to be implemented • methods to manage work during strong winds or other adverse weather conditions • a progressive rehabilitation strategy for exposed surfaces. 	Contractor	Detailed design / pre-construction
Vehicles emissions	<ul style="list-style-type: none"> • Plant and machinery must be maintained in accordance with manufacturer's specification. • Vehicles must not be left running when idle. 	Contractor	Construction
Dust generation	<ul style="list-style-type: none"> • Any material transported in trucks must be appropriately covered to reduce dust generation. • Measures including watering or covering exposed areas must be used to minimise or prevent dust generation. • Visual surveillance for dust generation must occur at all times. Work must cease when high levels of airborne dust cannot be controlled. 	Contractor	Construction
Waste management	<p>Resource management hierarchy principles are to be followed:</p> <ul style="list-style-type: none"> • Avoid unnecessary resource consumption as a priority • Avoidance is followed by resource recovery (including reuse of materials, reprocessing, recycling and energy recovery) • Disposal is undertaken as a last resort <p>(in accordance with the <i>Waste Avoidance & Resource Recovery Act 2001</i>).</p>	Contractor	Construction

Impact	Environmental safeguards	Responsibility	Timing
Waste management	<p>A Waste Management Plan (WMP) will be prepared and implemented as part of the CEMP. The WMP will include but not be limited to:</p> <ul style="list-style-type: none"> • measures to avoid and minimise waste associated with the project • classification of wastes and management options (re-use, recycle, stockpile, disposal) • statutory approvals required for managing both on and off-site waste, or application of any relevant resource recovery exemptions • procedures for storage, transport and disposal • monitoring, record keeping and reporting. <p>The WMP will be prepared taking into account the <i>Environmental Procedure - Management of Wastes on Roads and Maritime Services Land</i> (Roads and Maritime, 2014) and relevant Roads and Maritime Waste Fact Sheets.</p>	Contractor	Detailed design / pre-construction
Waste management	Bulk project waste (e.g. fill) sent to a site not owned by the Roads and Maritime Services (excluding Office and Environment and Heritage licensed landfills) for land disposal is to have prior formal written approval from the landowner, in accordance with <i>Environmental Direction No. 20 – Legal Off-site disposal of Bulk RTA Project Wastes</i> .	Contractor	Construction
Waste management	There is to be no disposal or re-use of construction waste on to other land.	Contractor	Construction
Waste management	Waste material, other than vegetation and tree mulch, is not to be left on site once the works have been completed.	Contractor	Construction
Waste management	Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day.	Contractor	Construction

7 Environmental management

This chapter describes how the proposal will be managed to reduce potential environmental impacts throughout detailed design, construction and operation. A framework for managing the potential impacts is provided. A summary of site-specific environmental safeguards is provided and the licence and/or approval requirements required prior to construction are also listed.

7.1 Environmental management plans (or system)

A number of safeguards and management measures have been identified in the REF 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 safeguards and management measures would be incorporated into the detailed design and applied during the construction and operation of the proposal.

A Construction Environmental Management Plan (CEMP) will be prepared to describe the safeguards and management measures identified. The CEMP will provide a framework for establishing how these measures will be implemented and who would be responsible for their implementation.

The CEMP will be prepared prior to construction of the proposal and must be reviewed and certified by the Roads and Maritime Environment Officer, Easing Sydney's Congestion prior to the commencement of any on-site works. The CEMP will be a working document, subject to ongoing change and updated as necessary to respond to specific requirements. The CEMP 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), QA Specification G40 – Clearing and Grubbing, QA Specification G10 - Traffic Management.

7.2 Summary of safeguards and management measures

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

Table 7-1: Summary of safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
General - minimise environmental impacts during construction	<p>A CEMP will be prepared and submitted for review and endorsement of the Roads and Maritime Environment Manager prior to commencement of the activity.</p> <p>As a minimum, the CEMP will address the following:</p> <ul style="list-style-type: none"> • any requirements associated with statutory approvals • details of how the project will implement the identified safeguards outlined in the REF • issue-specific environmental management plans • roles and responsibilities • communication requirements • induction and training requirements • procedures for monitoring and evaluating environmental performance, and for corrective action • reporting requirements and record-keeping • procedures for emergency and incident management • procedures for audit and review. <p>The endorsed CEMP will be implemented during the undertaking of the activity.</p>	Contractor / Roads and Maritime project manager	Pre-construction / detailed design
General - notification	All businesses, residential properties and other key stakeholders (e.g. schools, local councils) affected by the activity will be notified at least five days prior to commencement of the activity.	Contractor / Roads and Maritime project manager	Pre-construction
General – environmental	All personnel working on site will receive training to ensure awareness of environment protection requirements to be implemented during the project. This	Contractor / Roads and Maritime project	Pre-construction / detailed design

Impact	Environmental safeguards	Responsibility	Timing
awareness	<p>will include up-front site induction and regular "toolbox" style briefings.</p> <p>Site-specific training will be provided to personnel engaged in activities or areas of higher risk. These include:</p> <ul style="list-style-type: none"> • areas of Aboriginal heritage sensitivity • threatened species habitat • adjoining residential areas requiring particular noise management measures 	manager	
Biodiversity	<p>A Flora and Fauna Management Plan will be prepared in accordance with Roads and Maritime's <i>Biodiversity Guidelines: Protecting and Managing Biodiversity on RMS Projects</i> (RTA, 2011) and implemented as part of the CEMP. It will include, but not be limited to:</p> <ul style="list-style-type: none"> • plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and revegetation areas • requirements set out in the <i>Landscape Guideline</i> (RTA, 2008) • pre-clearing survey requirements • procedures for unexpected threatened species finds and fauna handling <p>Protocols to manage weeds and pathogens.</p>	Contractor	Detailed design / pre-construction
Biodiversity	Measures to further avoid and minimise the construction footprint and native vegetation or habitat removal will be investigated during detailed design and implemented where practicable and feasible.	Contractor	Detailed design / pre-construction
Biodiversity	A landscaping plan will be developed in consultation with Parramatta Council prior to construction.	Contractor	Detailed design / pre-construction
Biodiversity	Exclusion zones will be set up at the limit of clearing in accordance with Guide 2: Exclusion zones of the Biodiversity Guidelines: Protecting and managing biodiversity on RMS projects (RTA 2011).	Contractor	Pre-construction
Biodiversity	If unexpected threatened fauna or flora species are discovered, stop works immediately and follow the Roads and Maritime Services Unexpected Threatened Species Find Procedure in the Roads and Maritime Services Biodiversity	Contractor	Construction

Impact	Environmental safeguards	Responsibility	Timing
	Guidelines 2011 – Guide 1 (Pre-clearing process).		
Biodiversity	All pathogens (e.g. Chytid, Myrtle Rust and <i>Phytophthora</i>) are to be managed in accordance with the Roads and Maritime Services Biodiversity Guidelines - Guide 7 (Pathogen Management) and DECC Statement of Intent 1: Infection of native plants by <i>Phytophthora cinnamomi</i> (for <i>Phytophthora</i>).	Contractor	Construction
Biodiversity	Declared noxious weeds are to be managed according to requirements under the Noxious Weeds Act 1993 and Guide 6 (Weed Management) of the Roads and Maritime Services Biodiversity Guidelines 2011.	Contractor	Construction
Biodiversity	All pruning and trimming of trees is to be in accordance with the Australian Standard 4373-2007 Pruning of amenity trees. Pruning of mature trees is to be undertaken by a qualified arborist.	Contractor	Construction
Contaminated land	If contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the immediate risks of contamination. All other works that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with the Roads and Maritime Environment Manager and/or EPA.	Contractor	Detailed design / Pre-construction
Accidental spill	A site specific emergency spill plan will be developed, and include spill management measures in accordance with the Roads and Maritime <i>Code of Practice for Water Management</i> (RTA, 1999) and relevant EPA guidelines. The plan will address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities (including Roads and Maritime and EPA officers).	Contractor	Detailed design / Pre-construction
Fuel spills	Vehicles and machinery should be properly maintained to minimise the risk of fuel/oil leaks. Routine inspections of all construction vehicles and equipment should be undertaken for evidence of fuel/oil leaks	Contractor	Construction

Impact	Environmental safeguards	Responsibility	Timing
Erosion and sedimentation	<p>Erosion and sediment control measures are to be implemented and maintained to:</p> <ul style="list-style-type: none"> • Prevent sediment moving off-site and sediment laden water entering any water course, drainage lines, or drain inlets. • Reduce water velocity and capture sediment on site. • Minimise the amount of material transported from site to surrounding pavement surfaces. • Divert clean water around the site. <p>(in accordance with the Landcom/Department of Housing <i>Managing Urban Stormwater, Soils and Construction Guidelines</i> (the Blue Book)).</p>	Contractor	Construction
Erosion and sedimentation	Erosion and sedimentation controls are to be checked and maintained on a regular basis (including clearing of sediment from behind barriers) and records kept and provided on request.	Contractor	Construction
Erosion and sedimentation	Erosion and sediment control measures are not to be removed until the works are complete and areas are stabilised.	Contractor	Construction
Erosion and sedimentation	Work areas are to be stabilised progressively during the works.	Contractor	Construction
Erosion and sedimentation	The maintenance of established stockpile sites during is to be in accordance with the Roads and Maritime Services <i>Stockpile Site Management Guideline (EMS-TG-10)</i> .	Contractor	Construction
Water quality	Water quality control measures are to be used to minimise any materials (e.g. concrete, grout, sediment etc.) entering drain inlets or waterways.	Contractor	Construction
Traffic and transport	A Traffic Management Plan (TMP) will be prepared and implemented as part of the CEMP. The TMP will be prepared in accordance with the Roads and Maritime Traffic Control at Work Sites Manual (RTA, 2010) and QA Specification G10 Control of Traffic (Roads and Maritime, 2008). The TMP will include:	Contractor	Detailed design / Pre-construction

Impact	Environmental safeguards	Responsibility	Timing
	<ul style="list-style-type: none"> • Confirmation of haulage routes. • Measures to maintain access to local roads and properties. • Site specific traffic control measures (including signage) to manage and regulate traffic movement. • Measures to maintain pedestrian and cyclist access. • Requirements and methods to consult and inform the local community of impacts on the local road network. • Access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads. • A response plan for any construction traffic incident. • Consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic. <p>Monitoring, review and amendment mechanisms.</p>		
Traffic congestion and safety	Traffic control will be provided in accordance with the approved construction TMP to manage traffic movements (vehicular, cycle and pedestrian) during construction.	Contractor	Construction
Traffic and transport	VMS boards will be set up to inform motorists, cyclists and pedestrians of the work and changed traffic conditions during construction.	Contractor	Pre-construction / construction
Public transport	Access to bus stop locations would be maintained during construction. Any temporary changes to bus stops will be undertaken in consultation with bus service provider.	Contractor	Pre-construction / construction
Pedestrian and cyclist access	<p>Traffic controllers will manage the work area and will assist pedestrians and cyclists and maintain access along the work location.</p> <p>Additionally, signage outlining pedestrian and cyclist diversion routes would be displayed during construction (where required).</p>	Contractor	Construction
Property	Access to affected residential properties would be maintained during construction	Construction	Pre-

Impact	Environmental safeguards	Responsibility	Timing
access	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 in the traffic management plan.	Contractor	Construction and Construction
Property access	Roads and Maritime will continue to consult with all properties that will have altered access following construction of the Proposal.	Roads and Maritime	Detailed design
Property access	Residents and businesses will be notified of any specific impacts to property access and arrangements required during construction.	Roads and Maritime	Detailed design
Noise and vibration	A Noise and Vibration Management Plan (NVMP) will be prepared and implemented as part of the CEMP. The NVMP will generally follow the approach in the <i>Interim Construction Noise Guideline</i> (ICNG) (DECC, 2009) and identify: <ul style="list-style-type: none"> • all potential noise and vibration generating activities associated with the activity • a monitoring program to assess performance against relevant noise and vibration criteria • arrangements for consultation with affected neighbours and sensitive receivers, including notification and complaint handling procedures • contingency measures to be implemented in the event of non-compliance with noise and vibration criteria. 	Contractor	Detailed design / pre-construction
Noise and vibration	All sensitive receivers (e.g. schools, local residents) likely to be affected will be notified at least 7 days prior to commencement of any works associated with the activity that may have an adverse noise or vibration impact. The notification will provide details of: <ul style="list-style-type: none"> • the project • the construction period and construction hours • contact information for project management staff • complaint and incident reporting • how to obtain further information. 	Contractor	Detailed design / pre-construction
Noise	Very noisy activities should, as much as practicable, be programmed for normal	Contractor	Construction

Impact	Environmental safeguards	Responsibility	Timing
	working hours. If the work cannot be undertaken during the day, it should be completed before midnight. In particular, there should be no jackhammering or saw cutting after midnight. If it is not practical to apply these minimum programming requirements, extra care will need to be taken in selecting and applying alternative and effective noise and vibration management measures.		
Noise and vibration impacts to sensitive receivers day and night works	Works to be carried out during normal work hours (i.e. 7am to 6pm Monday to Friday; 8am to 1pm Saturdays). Any work that is performed outside normal work hours or on Sundays or public holidays is to minimise noise impacts.	Contractor	Construction
Vibration impacts to properties adjacent to the construction works	Measures, including allowing adequate distance that rollers can come to adjacent buildings and/or using non vibrating rollers, are to be used to minimise or prevent vibration impacts	Contractor	Construction
Noise associated with compound site	Letterbox drop (N = notification) has been recommended for receivers within a 200m radius of the compound site (light blue NCA3).	Contractor	Pre-Construction
Aboriginal heritage	<ul style="list-style-type: none"> The <i>Standard Management Procedure - Unexpected Heritage Items</i> (Roads and Maritime, 2015) will be followed in the event that an unknown or potential Aboriginal object/s, including skeletal remains, is found during construction. This applies where Roads and Maritime does not have approval to disturb the object/s or where a specific safeguard for managing the disturbance (apart from the Procedure) is not in place. Work will only re-commence once the requirements of that Procedure have 	Contractor	Construction

Impact	Environmental safeguards	Responsibility	Timing
	<p>been satisfied. Procedures for unexpected finds will be addressed in the CEMP.</p>		
Non-Aboriginal heritage	<ul style="list-style-type: none"> The <i>Standard Management Procedure - Unexpected Heritage Items</i> (Roads and Maritime, 2015) will be followed in the event that any unexpected heritage items, archaeological remains or potential relics of Non-Aboriginal origin are encountered. Work will only re-commence once the requirements of that Procedure have been satisfied. <p>Procedures for unexpected finds will be addressed in the CEMP</p>	Contractor	Detailed design / pre-construction
Removal of street trees	<p>Detailed design will consider the following:</p> <ul style="list-style-type: none"> Utility adjustment options to minimise impact to tree roots and minimise tree removal Vegetation clearing would be kept to the absolute minimum to accommodate the proposal. 	Roads and Maritime	Detailed design / pre-construction
Visual impacts of construction activities	<ul style="list-style-type: none"> The work site will be left in a tidy manner at the end of each work day. Fencing with material attached (e.g. shade cloth) would be provided around the construction compounds to screen views of the construction compounds from adjoining properties Landscaping will to be managed in accordance with the Roads and Maritime Services <i>Landscape guideline, 2008</i>. 	Contractor	Construction
Visual impact of construction activities	Works to be carried out in accordance with EIA-N04 <i>Guideline for Landscape Character and visual impact assessment</i> .	Contractor	Construction
Tree removal and replanting	A landscaping plan will be developed in consultation with Parramatta City Council prior to Construction and will include detail on the planting species mix.	Roads and Maritime / Contractor	Pre-construction
Socio-economic	A Communication Plan (CP) will be prepared and implemented as part of the	Contractor	Detailed design /

Impact	Environmental safeguards	Responsibility	Timing
	<p>CEMP to help provide timely and accurate information to the community during construction. The CP will include (as a minimum):</p> <ul style="list-style-type: none"> mechanisms to provide details and timing of proposed activities to affected residents, including changed traffic and access conditions contact name and number for complaints. <p>The CP will be prepared in accordance with the <i>Community Involvement and Communications Resource Manual</i> (RTA, 2008).</p>		pre-construction
Community consultation	Community consultation is to be undertaken in accordance with the <i>Community Involvement Practice Notes and Resource Manual</i> .	All	Construction
Community consultation	Complaints received are to be recorded and attended to promptly in accordance with the <i>Community Involvement Practice Notes and Resource Manual</i> .	All	Construction
Community consultation	Existing access for nearby and adjoining properties is to be maintained at all times during the works unless otherwise agreed to by the affected property owner.	All	Construction
Community consultation	All residences likely to be affected by the proposed works must be notified at least five working days prior to the commencement of the proposed activities.	All	Construction
Cumulative construction impacts	<p>If there is a project overlap with NorthConnex or the Eastwood intersection upgrades, or other Pinch Point program works, consultation will occur with the objective to:</p> <ul style="list-style-type: none"> Increase awareness of construction timeframes and impacts <p>Coordinate impact mitigation and management (e.g.: respite periods).</p>	Contractor	Construction
Air quality	<p>An Air Quality Management Plan (AQMP) will be prepared and implemented as part of the CEMP. The AQMP will include, but not be limited to:</p> <ul style="list-style-type: none"> potential sources of air pollution air quality management objectives consistent with any relevant published EPA and/or OEH guidelines mitigation and suppression measures to be implemented 	Contractor	Detailed design / pre-construction

Impact	Environmental safeguards	Responsibility	Timing
	<ul style="list-style-type: none"> • methods to manage work during strong winds or other adverse weather conditions • a progressive rehabilitation strategy for exposed surfaces. 		
Vehicles emissions	<ul style="list-style-type: none"> • Plant and machinery must be maintained in accordance with manufacturer's specification. • Vehicles must not be left running when idle. 	Contractor	Construction
Dust generation	<ul style="list-style-type: none"> • Any material transported in trucks must be appropriately covered to reduce dust generation. • Measures including watering or covering exposed areas must be used to minimise or prevent dust generation. • Visual surveillance for dust generation must occur at all times. Work must cease when high levels of airborne dust cannot be controlled. 	Contractor	Construction
Waste management	<p>Resource management hierarchy principles are to be followed:</p> <ul style="list-style-type: none"> • Avoid unnecessary resource consumption as a priority • Avoidance is followed by resource recovery (including reuse of materials, reprocessing, recycling and energy recovery) • Disposal is undertaken as a last resort <p>(in accordance with the <i>Waste Avoidance & Resource Recovery Act 2001</i>).</p>	Contractor	Construction
Waste management	<p>A Waste Management Plan (WMP) will be prepared and implemented as part of the CEMP. The WMP will include but not be limited to:</p> <ul style="list-style-type: none"> • measures to avoid and minimise waste associated with the project • classification of wastes and management options (re-use, recycle, stockpile, disposal) • statutory approvals required for managing both on and off-site waste, or application of any relevant resource recovery exemptions • procedures for storage, transport and disposal 	Contractor	Detailed design / pre-construction

Impact	Environmental safeguards	Responsibility	Timing
	<ul style="list-style-type: none"> monitoring, record keeping and reporting. <p>The WMP will be prepared taking into account the <i>Environmental Procedure - Management of Wastes on Roads and Maritime Services Land</i> (Roads and Maritime, 2014) and relevant Roads and Maritime Waste Fact Sheets.</p>		
Waste management	Bulk project waste (e.g. fill) sent to a site not owned by the Roads and Maritime Services (excluding Office and Environment and Heritage licensed landfills) for land disposal is to have prior formal written approval from the landowner, in accordance with <i>Environmental Direction No. 20 – Legal Off-site disposal of Bulk RTA Project Wastes</i> .	Contractor	Construction
Waste management	There is to be no disposal or re-use of construction waste on to other land.	Contractor	Construction
Waste management	Waste material, other than vegetation and tree mulch, is not to be left on site once the works have been completed.	Contractor	Construction
Waste management	Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day.	Contractor	Construction

7.3 Licensing and approvals

Table 7-2: Summary of licensing and approvals required

Instrument	Requirement	Timing
<i>Roads Act 1993</i>	Approval under Section 138 from the appropriate road authority prior to works on roads.	Prior to start of the activity.
<i>Road Occupancy Licence from Roads and Maritime</i>	For lane closures.	Prior to start of the activity.
<i>REF Approval</i>	Determination of this REF by RMS	Prior to the start of the activity

8 Conclusion

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

The REF has assessed the potential, biophysical, social and economic impacts of the preferred option. The proposed road widening of Pennant Hills Road and upgrade of the Pennant Hills Road/North Rocks Road intersection would result in a number of environmental impacts including:

- Construction noise levels
- Traffic impacts for the duration of construction
- Visual impact through the removal of road side trees and hedges, the adjusting of property fences and the widening of the road

The proposal involves the provision of additional lanes and new intersection configurations on Pennant Hills Road and North Rocks Road, which would ease congestion and improve traffic flow along the corridor. The proposal would deliver a rapid improvement to the recognised pinch point through improved intersection performance.

This REF has concluded that the impacts of the proposal would be outweighed by the long term beneficial impacts of providing improved traffic flow, reduced congestion and improved safety for road users. Therefore the proposal is considered justified.

8.2 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.	<p>The proposal design, impact mitigation and management measures detailed in this REF allow for the proper management, development and conservation of natural and artificial resources. The main objective of the proposal is to provide additional through lanes along Pennant Hills Road to reduce congestion and improve the safety at the intersection.</p> <p>Where possible throughout the design of the proposal, management and conservation of natural resources has been incorporated. This has included optimising the balance between cut and fill, minimising the need to import additional natural resources. Additionally, vegetation removal has been minimised as far as possible to reduce the potential impact on the potential sensitive receivers.</p>
5(a)(ii) To encourage the promotion and co-ordination of the orderly economic use and development of land.	The improvement to the intersection would increase efficiency in accordance with the designated land use.

Object	Comment
5(a)(iii) To encourage the protection, provision and co-ordination of communication and utility services.	Utilities are expected to be impacted by the proposal, however relocation and management will mitigate against any potential loss of services.
5(a)(iv) To encourage the provision of land for public purposes.	The proposal would be used for public purposes.
5(a)(v) To encourage the provision and co-ordination of community services and facilities.	The proposal would improve safety for local motorists and those in the broader community.
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 has been designed to minimise impacts on the environment, including threatened species, populations and ecological communities and their habitats.
5(a)(vii) To encourage ecologically sustainable development.	Ecologically sustainable development is considered in Sections 8.2.1 to 8.2.4 below.
5(a)(viii) To encourage the provision and maintenance of affordable housing.	Not relevant to the project.
5(b) To promote the sharing of the responsibility for environmental planning between different levels of government in the State.	Not relevant to the project.
5(c) To provide increased opportunity for public involvement and participation in environmental planning and assessment.	Not relevant to the project.

8.2.1 The precautionary principle

The assessment of the potential impacts of the proposal is considered to be consistent with the precautionary principle. The detailed environmental investigations carried out for this REF have been consistent with accepted scientific and assessment methodologies. The investigations have identified a range of potential impacts associated with the construction and operation of the proposal.

The evaluation and assessment of alternative options within the proposal have also aimed to reduce the risk of serious and irreversible impacts on the environment as a result of the proposal.

The proposal has sought to take a precautionary approach to minimising environmental impacts. This has been applied through the development of a range of environmental safeguards, as summarised in Section 7.2. These safeguards would be implemented during construction and operation of the proposal.

No safeguards have been postponed as a result of lack of scientific certainty. The selected construction contractor would be required to prepare CEMP before starting construction. No mitigation measures or management mechanisms would be postponed as a result of a lack of information.

8.2.2 Intergenerational equity

The proposal would benefit future generations by improving congestion and travel times. Implementation of the safeguards contained in this REF (Chapter 7) would ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.

8.2.3 Conservation of biological diversity and ecological integrity

Conservation of biological diversity and ecological integrity has been considered during all stages of the proposal's development. Potential impacts have been avoided where possible, and safeguarded against or offset where necessary.

The biodiversity assessment (refer to Section 6.1) concludes that the proposal would not have an impact on the existing ecological environment. Impacts would be minimised through the safeguards summarised in Section 7.

8.2.4 Improved valuation, pricing and incentive mechanisms

Environmental and social issues were considered in the strategic planning and establishment of the need for the proposal, and in consideration of various proposal options. The value placed on environmental resources is evident in the extent of the planning and environmental investigations, and in the design of the proposed mitigation measures and safeguards. Implementation of these mitigation measures and safeguards would result in an economic cost to Roads and Maritime, which would be included in the capital cost of the proposal.

8.3 Conclusion

The proposed intersection upgrade at Pennant Hills and North Rocks Road 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 (where relevant) of conservation agreements and plans of management under the NPW Act, joint management and biobanking agreements under the BC Act, wilderness areas, critical habitat, impacts on threatened species, populations and ecological communities and their habitats and other protected fauna and native plants. It has also considered potential impacts to matters of national environmental significance listed under the Federal EPBC Act.

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 biodiversity (tree removal) and reduced visual amenity. Safeguards and management measures as detailed in this REF would ameliorate or minimise these expected impacts. The proposal would also reduce congestion, improve travel reliability, support population growth and labour accessibility to key employment centres, improve road safety and improve freight efficiency. On balance the proposal is considered justified and the following conclusions are made.

Significance of impact under NSW legislation

The proposal would be unlikely to cause an impact on the environment. Therefore it is not necessary for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning under Part 5.1 of the EP&A Act. A Species Impact Statement is not required. The proposal is subject to assessment under Part 5 of the EP&A Act. Consent from Council is not required.

Significance of impact under Australian legislation

The proposal is not likely to have an impact on matters of national environmental significance or the environment of Commonwealth land within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999*. A referral to the Australian Department of the Environment is not required.

10 References

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<https://www.cityofparramatta.nsw.gov.au/about-parramatta/key-council-documents/community-strategic-plan> on 7 July 2017.

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<http://majorprojects.planning.nsw.gov.au/> on 7 July 2017

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Terms and acronyms used in this REF

Term / Acronym	Description
AusLink	Mechanism to facilitate cooperative transport planning and funding by Commonwealth and state and territory jurisdictions
CEMP	Construction environmental management plan
EIA	Environmental impact assessment
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
FM Act	<i>Fisheries Management Act 1994</i> (NSW)
Heritage Act	<i>Heritage Act 1977</i> (NSW)
ISEPP	State Environmental Planning Policy (Infrastructure) 2007
LALC	Local Aboriginal Land Council
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> .
Noxious Weeds Act	<i>Noxious Weeds Act 1993</i> (NSW)
NPW Act	<i>National Parks and Wildlife Act 1974</i> (NSW)
Roads and Maritime	NSW Roads and Maritime Services
SEPP	State Environmental Planning Policy. A type of planning instrument made under Part 3 of the EP&A Act.
TSC Act	<i>Threatened Species Conservation Act 1995</i> (NSW)
QA Specifications	Specifications developed by Roads and Maritime Services for use with road work and bridge work contracts let by Roads and Maritime Services.

Appendix A

Consideration of clause 228(2) factors and matters of national environmental significance

Clause 228(2) Checklist

In addition to the requirements of the *Is an EIS required?* guideline (DUAP 1995/1996) and the *Roads and Related Facilities EIS Guideline* (DUAP 1996) as detailed in the REF, the following factors, listed in clause 228(2) of the *Environmental Planning and Assessment Regulation 2000*, have also been considered to assess the likely impacts of the proposal on the natural and built environment.

Factor	Impact
<p>a. Any environmental impact on a community?</p> <p>Construction of the proposal would result in short-term negative impacts on the local community, as discussed in Section 6.3 and Section 6.8. Potential impacts include traffic and transport delays, local traffic changes, construction noise and vibration, changes to amenity and accessibility. These impacts would be managed through the implementation of safeguards outlined in Section 6.3.4. The proposal would have a positive benefit on the local and wider community by improving the road capacity on Pennant Hills Road, by reducing congestion, and alleviating the identified pinch points.</p>	<p>Short term negative Long term positive</p>
<p>b. Any transformation of a locality?</p> <p>During construction, the proposal would have a negative impact on the Pennant Hills Road and North Rocks Road corridor through Carlingford through the introduction of construction activities and traffic controls. The proposal would result in Pennant Hills and having an increased number of through lanes within the existing road reserve. It has been assessed that the proposal would result in a moderate visual impact. The transformation would be consistent with the existing infrastructure and would not change the land use. The proposal has sought to minimise the footprint where possible. Visual impacts of the proposal on the locality would be reduced through the implementation of safeguards and management measures outlined in Section 6.7.4.</p>	<p>Short term negative</p>
<p>c. Any environmental impact on the ecosystems of the locality?</p> <p>The proposal would involve the removal of limited vegetation on the property boundary of a number of houses on Pennant Hills Road. The habitat value of these trees is considered to be low due to their location within the road reserve of a busy road. The proposal would not have any impact on threatened flora and fauna species, populations or communities of their habitats. The implementation of safeguards and management measures outlined in Section 6.1.4 would minimise biodiversity impacts.</p>	<p>Short term negative</p>

Factor	Impact
<p>d. Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality?</p> <p>During construction, there would be some temporary impacts particularly in relation to noise, traffic and access and visual amenity. There would be a reduction in the aesthetic quality of the locality as the vehicle lanes of the widened Pennant Hills Road move closer to properties on the northbound side of the road. The removal of some vegetation would also impact the visual outlook of residences in the immediate area. Safeguards and management measures outlined in Section 6.7.4 would be implemented to minimise these impacts.</p>	
<p>e. Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations?</p> <p>The proposal would not impact on any Aboriginal heritage items, places or areas. There are a number of non-Aboriginal heritage items in the vicinity of the proposal. The closest site with Non-aboriginal heritage significance is located approximately 1.6 kilometres from the proposal site. Due to the confined nature of the proposal, it is unlikely that they would be impacted construction activities.</p>	<p>Aboriginal heritage – nil</p> <p>Non-aboriginal heritage – nil</p>
<p>f. Any impact on the habitat of protected fauna (within the meaning of the <i>National Parks and Wildlife Act 1974</i>)?</p> <p>There would be no impact on the habitat of protected fauna (within the meaning of the <i>National Parks and Wildlife Act 1974</i>)</p>	<p>Nil</p>
<p>g. Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air?</p> <p>There are no records of endangered species in or near the proposal area.</p>	<p>Nil</p>
<p>h. Any long-term effects on the environment?</p> <p>There would be no long-term effects on the environment as a result of the proposal.</p>	<p>Nil</p>
<p>i. Any degradation of the quality of the environment?</p> <p>The proposal would be constructed within the road reserve of Pennant Hills Road and North Rocks Road. The proposal would require earthworks and some vegetation removal. The safeguards and management measures in Section 7.2 would minimise the long-term impacts of these activities. Air quality, noise, traffic and visual impacts would result from the construction and operation phases of the proposal. These impacts would be minimised through the implementation of safeguards outlined in Section 7.2.</p>	<p>Short term negative</p>

Factor	Impact
<p>j. Any risk to the safety of the environment?</p> <p>There is potential for road safety to be decreased during construction due to construction to be undertaken adjacent to live traffic. There would potentially be risks associated with pedestrian interaction with construction sites.</p> <p>Traffic and access management safeguards outlined in Section 6.3.4 include the preparation of a traffic management plan which would address safety risks during construction.</p> <p>The proposal would improve road safety during operation through the provision of additional capacity on Pennant Hills Road and upgrading the intersection</p>	<p>Short term negative Long term positive</p>
<p>k. Any reduction in the range of beneficial uses of the environment?</p> <p>There would be no reduction in the range of beneficial uses of the environment.</p>	<p>Nil</p>
<p>l. Any pollution of the environment?</p> <p>The proposal would result in minor short-term air pollution from plant and machinery and the generation of dust during construction. There is the potential for chemical and fuel spills to occur during construction. Pollution risks associated with the construction of the proposal would be managed through the implementation of the safeguards and management measures outlined in Section 6.10.2.</p>	<p>Short term negative</p>
<p>m. Any environmental problems associated with the disposal of waste?</p> <p>The proposal would result in the generation of waste from road construction. While no environmental problems would be expected with the disposal of construction waste, the safeguards and management measures outlined in Section 6.10.2 would minimise the environmental impacts associated with waste on the proposal.</p>	<p>Short term negative</p>
<p>n. Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply?</p> <p>The proposal would not increase demands on resources (natural or otherwise) that are, or are likely to become, in short supply.</p>	<p>Nil</p>
<p>o. Any cumulative environmental effect with other existing or likely future activities?</p> <p>Construction activities undertaken for the proposal would overlap with the construction activities associated with NorthConnex and the intersection upgrade at Eastwood. Local residents, business owners and motorists using this section of Pennant Hills Road at Carlingford would be exposed to noise, air quality and construction traffic associated with both projects.</p> <p>This proposal forms part of the Roads and Maritime Pinch Points Program which aims to relieve traffic congestion and improve traffic flow on Sydney's corridors. Collectively, these projects would have a beneficial local and wider impact by improving traffic flow, reducing travel times and improving the infrastructure available to the community.</p>	<p>Short term negative, long term positive</p>

Factor	Impact
<p>p. Any impact on coastal processes and coastal hazards, including those under projected climate change conditions?</p> <p>There would be no impact on coastal processes and coastal hazards, including those under projected climate change conditions as a result of the proposal.</p>	Nil

Matters of National Environmental Significance

Under the environmental assessment provisions of the *Environment Protection and Biodiversity Conservation Act 1999*, the following matters of national environmental significance and impacts on Commonwealth land are required to be considered to assist in determining whether the proposal should be referred to the Australian Government Department of the Environment.

A referral is not required for proposed actions that may affect nationally listed threatened species, populations, endangered ecological communities and migratory species. Impacts on these matters are still assessed as part of the REF in accordance with Australian Government significant impact criteria and taking into account relevant guidelines and policies.

Factor	Impact
a. Any impact on a World Heritage property?	Nil
b. Any impact on a National Heritage place?	Nil
c. Any impact on a wetland of international importance?	Nil
d. Any impact on a listed threatened species or communities?	Nil
e. Any impacts on listed migratory species?	Nil
f. Any impact on a Commonwealth marine area?	Nil
g. Does the proposal involve a nuclear action (including uranium mining)?	Nil
Additionally, any impact (direct or indirect) on Commonwealth land?	Nil

Appendix B

Statutory consultation checklists

Infrastructure SEPP

Council related infrastructure or services

Issue	Potential impact	Yes / No	If 'yes' consult with	ISEPP clause
Stormwater	Are the works likely to have a <i>substantial</i> impact on the stormwater management services which are provided by council?	No		ISEPP cl.13(1)(a)
Traffic	Are the works likely to generate traffic to an extent that will <i>strain</i> the existing road system in a local government area?	No		ISEPP cl.13(1)(b)
Sewerage system	Will the works involve connection to a council owned sewerage system? If so, will this connection have a <i>substantial</i> impact on the capacity of any part of the system?	No		ISEPP cl.13(1)(c)
Water usage	Will the works involve connection to a council owned water supply system? If so, will this require the use of a <i>substantial</i> volume of water?	No		ISEPP cl.13(1)(d)
Temporary structures	Will the works involve the installation of a temporary structure on, or the enclosing of, a public place which is under local council management or control? If so, will this cause more than a <i>minor</i> or <i>inconsequential</i> disruption to pedestrian or vehicular flow?	No		ISEPP cl.13(1)(e)
Road & footpath excavation	Will the works involve more than <i>minor</i> or <i>inconsequential</i> excavation of a road or adjacent footpath for which council is the roads authority and responsible for maintenance?	Yes	Parramatta City Council	ISEPP cl.13(1)(f)

Local heritage items

Issue	Potential impact	Yes / No	If 'yes' consult with	ISEPP clause
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Issue	Potential impact	Yes / No	If 'yes' consult with	ISEPP clause
Local heritage	Is there is a local heritage item (that is not also a State heritage item) or a heritage conservation area in the proposal area for the works? If yes, does a heritage assessment indicate that the potential impacts to the item/area are more than <i>minor</i> or <i>inconsequential</i> ?	No		ISEPP cl.14

Flood liable land

Issue	Potential impact	Yes / No	If 'yes' consult with	ISEPP clause
Flood liable land	Are the works located on flood liable land? If so, will the works change flood patterns to more than a <i>minor</i> extent?	No		ISEPP cl.15

Public authorities other than councils

Issue	Potential impact	Yes / No	If 'yes' consult with	ISEPP clause
National parks and reserves	Are the works adjacent to a national park or nature reserve, or other area reserved under the <i>National Parks and Wildlife Act 1974</i> ?	No	Office of Environment and Heritage	ISEPP cl.16(2)(a)
Marine parks	Are the works adjacent to a declared marine park under the <i>Marine Parks Act 1997</i> ?	No	Department of Planning and Environment	ISEPP cl.16(2)(b)
Aquatic reserves	Are the works adjacent to a declared aquatic reserve under the <i>Fisheries Management Act 1994</i> ?	No	Office of Environment and Heritage	ISEPP cl.16(2)(c)
Sydney Harbour foreshore	Are the works in the Sydney Harbour Foreshore Area as defined by the <i>Sydney Harbour Foreshore Authority Act 1998</i> ?	No	Department of Planning and Environment	ISEPP cl.16(2)(d)
Bush fire prone land	Are the works for the purpose of residential development, an educational establishment, a health services facility, a correctional centre or group home in bush fire prone land?	No	Rural Fire Service	ISEPP cl.16(2)(f)

Appendix C

Community Consultation report

Appendix D

Biodiversity database searches

Appendix E

Ecology Assessment

Appendix F

Soil and contamination database searches

Appendix G

Traffic report

Appendix H

Operational and construction noise & vibration impact assessment

Appendix I

AHIMS search and PACHCI letter

Appendix J

Non Aboriginal database searches



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Customer feedback
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