# 7.18 Cromwell Property Group (Northpoint Tower)

## 7.18.1 Geotechnical

**Issue raised**

The commercial tower at Northpoint sits on a rock pedestal at level 6 with the basement carpark being excavated around this pedestal. Cromwell Property Group understands that a number of issues were encountered during the excavation works to expose this pedestal. These issues related to stress relief of the pedestal during excavation and the presence of seams and soft layers running through the pedestal. As a result of these seams and soft layers, a significant underpinning exercise was undertaken to enhance the vertical capacity of the pedestal. A concrete buttress (some 11 metres x eight metres in section) was also constructed in the south east corner of the pedestal to bridge the seam.

Given that the Northpoint tower foundations lie within the Transport for NSW typical zone of influence, we believe that it would be prudent to make a formal submission alerting the tunnel designers to the remedial works that were undertaken on the site.

**Response**

Transport for NSW appreciates the geotechnical information being provided by Cromwell Property Group in relation to Northpoint Tower in North Sydney and the information has been provided to the tunnel designers.

Geotechnical investigations would continue to occur to inform the design development and further investigations would be conducted as required during detailed design. The information provided by Cromwell Property Group would be considered as part of this process. At this stage, given the known geotechnical conditions, distance from construction activities and building characteristics, preliminary ground movement contours indicate that for most of the project alignment there would be a negligible ground movement risk, with superficial damage to buildings unlikely. Some buildings and structures close to station site excavations may be at risk of superficial damage and therefore may require future building strain and structural assessment to address settlement related risks.

Mitigation measure GWG1 commits to the development of a detailed geotechnical model that would allow more specific assessment of the potential for damage to structures, services, basements and other sub-surface elements through settlement or strain. Where building damage risk is rated as moderate or higher (as per adopted risk based criteria), a structural assessment of the affected buildings and structures would be carried out and specific measures implemented to address the risk of damage. Pre-excavation condition surveys of buildings and structures in the vicinity of the tunnel and excavations are also planned (refer to mitigation measure GWG2).

# 7.19 Anonymous

## 7.19.1 Property damage

**Issue raised**

Concerns raised regarding damage to property including tanks and LPG pumps which are susceptible to vibration. Any damage due to vibration will need to be rectified immediately and any contamination that results from the damage will be the responsibility of the entity conducting the proposed works, and the entity will be liable for any damages that result from contamination to our site and any adjacent site.

### Response

The assessment of construction vibration in Section 10.4 of the Environmental Impact Statement has adopted cosmetic damage screening levels based on guidance from British Standard BS 7385 Evaluation and Measurement for Vibration in Buildings. The assessment shows that a number of buildings adjacent to the construction sites are predicted to have vibration levels above these screening criteria. In this case, and in accordance with mitigation measure NV4, a more detailed site specific assessment of the structure would be carried out to ensure vibration levels remain below appropriate limits for that structure.

The Sydney Metro Construction Noise and Vibration Strategy (Appendix C of this report) identifies that some structures may be particularly sensitive to vibration and more stringent damage goals may need to be adopted. In this case, consultation would be carried out with the owner of the structure to determine acceptable vibration levels on a case by case basis.

In the unlikely event that damage does occur as a result of the project, this would be rectified by the project at no cost to the owner.

## 7.19.2 Business impacts

### Issue raised

Concerns raised that the proposed works may directly impact the business by obstructing traffic entering and exiting the site.

### Response

Given the anonymous nature of the submission, it is difficult to provide a specific response to the issue. In general terms the potential impacts to businesses are assessed in Section 13.4 of the Environmental Impact Statement. Specifically, this section acknowledges the potential for negative impacts on businesses during construction in terms of customer access and passing trade. Potential positive impacts may also occur such as increased trade from construction workers, or greater pedestrian volumes increasing passing trade when operational. Access would be maintained to all businesses in consultation with the property owner / business operator (refer to mitigation measures T8 and BI1 in Chapter 11 of this report).

The traffic assessment in Section 8.4 of the Environmental Impact Statement identifies that the addition of construction traffic would have a negligible impact on the surrounding road network. The project would have minimal operational traffic impacts.

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# COMMUNITY AND OTHER SUBMISSIONS

CHAPTER EIGHT

# 8 Community and other submissions

This chapter provides responses to issues raised in submissions from the community and other stakeholders.

## 8.1 Planning and assessment process

### 8.1.1 Assessment process

Six submissions raised issues regarding the assessment process.

**Stakeholder identification numbers**

20, 62, 171, 173, 273, 301

**Issue raised**

Submissions raised concerns regarding the assessment process documented in the Environmental Impact Statement. In summary, the submissions raised the following issues:

- The Environmental Impact Statement and the community drop in session at McMahons Point provided clarity around the implementation of the project
- Only public submissions that support the proposal will be considered in the decision-making process
- The time period provided for public exhibition of the Environmental Impact Statement is not sufficient

**Response**

The Environmental Impact Statement and associated process has been carried out in accordance with the provisions of the *Environmental Planning and Assessment Act 1979* and the *Environmental Planning and Assessment Regulation 2000*. The assessment carried out complies with the requirements of the Secretary's environmental assessment requirements.

Transport for NSW has considered and provided a response to all issues raised in submissions. Further, the Department of Planning and Environment will consider all submissions in making a decision whether to approve the project and, if approved, in issuing conditions of approval.

The minimum public exhibition period for State significant infrastructure is 30 days, as per clause 194 of the *Environmental Planning and Assessment Regulation 2000*. The Sydney Metro City & Southwest Chatswood to Sydenham Environmental Impact Statement was placed on public exhibition for a period of 48 days.

### 8.1.2 Adequacy of the Environmental Impact Statement

Thirty five submissions raised issues regarding the adequacy of the Environmental Impact Statement.

**Stakeholder identification numbers**

15, 43, 46, 47, 74, 77, 85, 88, 110, 112, 151, 173, 182, 183, 184, 185, 186, 187, 188, 189, 191, 192, 193, 194, 195, 196, 197, 204, 221, 236, 238, 262, 263, 264, 273

**Issue raised**

Submissions relating to the adequacy of the Environmental Impact Statement raised the following issues:

- Damage to the local environment is trivialised in the Environmental Impact Statement
- The proposal as described in the Environmental Impact Statement is imprecise, inaccurate and inconsistent – for example:
  - The exact position of the tunnels is unclear
  - There are inconsistencies between the Project Summary and the Technical Appendices
  - There are several labelling errors around the proposed Crows Nest Station
  - There are several drawing errors concerning the existing environment at Blues Point.

- The Environmental Impact Statement lacks detail, critical analysis and meaningful assessment on the short and long terms impacts of the proposal – for instance, the consideration of the impact on local residents of trucks using the Sydney Yard Access Bridge
- Some issues are not addressed in the Environmental Impact Statement – for instance, issues concerning the Chatswood dive site are not dealt with in the conclusions
- The Environmental Impact Statement does not adequately assess impacts of the proposal on future environments and land-uses
- The Environmental Impact Statement should have included evaluation by a behavioural scientist to investigate how people interact with the built environment
- The air quality assessment, waste assessment and construction environmental management plan in the Environmental Impact Statement are inadequate and should be revised – there are particular concerns with regard to the Pitt Street Station site and the risk of contamination from demolition activities. Community consultation should be extended to allow for consideration of the revised assessment.

**Response**

The assessment carried out as part of the Environmental Impact Statement complies with the Secretary's environmental assessment requirements. Appendix A of the Environmental Impact Statement provides a cross-reference to where each of the Secretary's environmental assessment requirements have been addressed, and each chapter provides further details regarding relevant Secretary's environmental assessment requirements.

## 8.2 Strategic need and justification

### 8.2.1 Support for the project

Twenty-eight submissions raised issues regarding support for the project in terms of both general comment and specific elements.

**Stakeholder identification numbers**

9, 17, 20, 51, 69, 71, 73, 75, 83, 93, 100, 102, 106, 107, 113, 126, 143, 157, 174, 206, 231, 240, 253, 255, 259, 271, 297, 301

**Issue raised**

In summary, these submissions included a statement of support for the project, or for specific elements of the project.

**Response**

Support for the project is noted.

### 8.2.2 Need for the project

Eight submissions raised issues regarding the need for the project.

**Stakeholder identification numbers**

1, 4, 25, 108, 171, 174, 218, 301

**Issue raised**

***Support the need for the project***

In summary, the submissions raised the following issues:

- The project is needed as effective, frequent and high capacity public transport for Sydney
- The project is necessary if Sydney is to become a truly international player
- Need for the Crows Nest Station is recognised as overdue

***Did not support the need for the project***

In summary, the submissions raised the following issues:

- The existing heavy rail network can handle the demand for rail transport
- Concern regarding the ongoing viability of the existing heavy rail network once the Sydney Metro network is operational
- The project serves to justify redevelopment of large tracts of the CBD and suburbs along the existing T3 Bankstown Line rather than providing additional rail capacity.

**Response**

The support for the need for the project is noted.

The need for the project is provided in Chapter 3 of the Environmental Impact Statement.

It identifies the constraints on the existing rail network in meeting future transport demand. These constraints, among others, include:

- A large number of junctions on the rail network
- A large number of tracks entering Sydney's CBD
- A limitation on the number of services (generally limited to 20 per hour per line)
- Crowded stations and narrow platforms in busy Sydney CBD stations.

Without investment, Sydney's rail network will reach capacity in the Sydney CBD and on critical suburban lines by the mid to late 2020s.

To cater for this demand and to meet the transport needs of Sydney, a number of strategic alternatives were investigated as part of *Sydney's Rail Future*. This identified that use of the existing suburban rail network would not meet short term or long term demand. Sydney Metro was identified as the preferred solution as it would:

- Be more flexible and provide frequent services that would benefit customers
- Provide the required capacity and flexibility to respond to growing demand for rail in Sydney
- Create a more modern, resilient and faster service
- Deliver a seamless and less disruptive way of modernising Sydney's rail
- Deliver transport benefits more cost effectively.

This assessment of strategic alternatives is documented in Chapter 4 of the Environmental Impact Statement.

Notwithstanding, the existing heavy rail network would continue to provide an important public transport function for Sydney.

The need for the project is clearly established based on public transport capacity requirements for Sydney. Section 3.4.1 of the Environmental Impact Statement identifies the additional rail capacity which would be provided by the introduction of Sydney Metro. This section identifies that Sydney Metro, together with signalling and infrastructure upgrades across the existing network, would increase the capacity of the rail network through the Sydney CBD from about 120 services per hour during peak periods today, to up to 200 services per hour beyond 2024, including capacity for up to 60 metro trains per hour during peak periods (or 30 trains per hour in each direction). This would equate to an increase of up to 60 per cent capacity across the network.

Along with these, and other, public transport benefits, Sydney Metro would also provide city building opportunities in relation to a higher intensity of land uses around new and converted stations.

### 8.2.3 Benefits of the project and the broader metro network

Thirty-six submissions raised issues regarding the benefits of the project and the broader metro network.

**Stakeholder identification numbers**

11, 14, 108, 110, 118, 122, 171, 218, 221, 230, 239, 240, 251, 257, 258, 271, 272, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 296, 301

**Issue raised**

***Support the benefits of the project and the broader metro network***

In summary, the submissions raised the following issues:

- The project will benefit customers by providing an additional Sydney Harbour crossing and bypass the CBD bottleneck
- The project and the metro network will benefit customers by providing interchanges with the existing heavy rail network
- The project will provide benefits to customers through separation from existing heavy rail infrastructure and operational issues
- The metro network will relieve pressure and limitations on the existing heavy rail network, particularly across Sydney Harbour
- The metro network will provide direct connection from the North Shore to the eastern areas of the CBD
- The new line will align through new living areas and destress the existing Chatswood to Sydney CBD section
- The metro network will reduce congestion
- The metro network provides the travel time standards required and expected of an international city and provides economic advantages
- International visitors expect the same level of service they are accustomed to

### *Did not support the benefits of the project and the broader metro network*

In summary, the submissions raised the following issues:

- The project will not increase the capacity and coverage of Sydney's rail network, with the exception of providing new stations at Crows Nest and Waterloo
- The benefits of the project and the metro network to increase capacity are misleading. Double deck trains would provide higher capacity
- Sydney public transport users will have access to only five new train stations. It is misleading for the government to claim it will deliver "31 metro stations" through Sydney Metro Northwest and City & Southwest when a majority of these stations are simply expanded or converted existing stations.
- The 'city building' benefits of the project as stated in the Environmental Impact Statement are not proven and should be removed
- The benefits of the metro network put forward in the Environmental Impact Statement are easily countered based on international experience and current transport initiatives
- The benefits of the metro network will not be realised as it will not integrate effectively with the existing heavy rail network
- The stated benefit of the metro network supporting mode shift from car to public transport will not be realised, as almost all of the areas serviced by the metro network have existing heavy rail or bus services
- The metro network will not benefit suburbs between Chatswood and Sydney CBD as the existing transport system is regular and reliable
- North Sydney Council will benefit more from the metro network than Willoughby Council, as the former will gain two additional stations.

### Response

The following responses are provided to the specific issues raised:

- Support for the benefits of the project and the broader metro network are noted.
- The opportunity to expand the rail catchment was an important consideration in the station locations assessment. This was part of the balanced consideration with the other project objectives to provide a robust assessment and optimum outcome. This process is documented in Section 4.4 of the Environmental Impact Statement
- Section 3.4.1 of the Environmental Impact Statement identifies that the reliable capacity of an existing Sydney Trains double deck train is about 1,200 passengers. With the Sydney Trains network generally being limited to 20 trains per line per hour this equates to a reliable capacity of around 24,000 passengers per line per hour. In contrast, a Sydney Metro single deck train would have an ultimate capacity of 1,500 passengers. At the ultimate capacity of 30 trains per hour, this equates to around 45,000 passengers per hour
- The Chatswood to Sydenham project would deliver five new underground metro stations. The conversion of 11 existing stations to metro operations represents an important investment decision to realise wider strategic transport and land use benefits for Sydney, as well as significant economic benefits as described in Chapter 3 of the Environmental Impact Statement. The specific benefits of the Sydenham to Bankstown component will be described further in the Environmental Impact Statement to be prepared for that component.

- The city building benefits are considered as secondary to the public transport benefits of the project. However, the project would provide real city building opportunities through improved business connectivity and transit orientated development
- The benefits anticipated by the Sydney Metro network have been realised in cities throughout the world that have modern metro rail systems
- The benefits of the metro network as described in Section 3.4 of the Environmental Impact Statement are based on the network proposed with strategic points of integration with the existing network. Section 4.3 provides analysis of the strategic alternatives and the reasons for the differentiated service with strategic integration points with the existing network
- Although some areas that would be serviced by the metro network have existing rail or bus services, the metro network would improve public transport capacity and facilitate a shift from road to rail. Additionally, the station location assessment considered the desire to expand the metro network which would be achieved through new stations at Crows Nest, Barangaroo, Pitt Street and Waterloo
- The metro network would benefit suburbs between Chatswood and Sydney CBD by providing additional rail capacity through this constrained section of the network. The metro network would also provide direct access to parts of the Sydney CBD which are not serviced by the Sydney Trains network
- The station location assessment was based on the needs of Sydney for public transport services, not on council boundaries. Willoughby Council would also benefit from the introduction of metro services at Chatswood (as part of Sydney Metro Northwest) and Crows Nest Station.

### 8.2.4 Consistency with strategic planning and transport policy

One submission raised issues regarding consistency with strategic planning and transport policy.

**Stakeholder identification number**

28

**Issue raised**

The submission raised the issue that there has been an unacceptable lack of integrated planning with regard to this project.

**Response**

Section 3.7 of the Environmental Impact Statement provides a consideration of the project against strategic planning and transport policy. These strategic planning documents perform the role of integrated planning between land use and transport infrastructure. The project is consistent with the objectives and goals of these documents. Further, Section 12.5 of the Environmental Impact Statement identifies locations where the project would support broader land use. For example, the provision of a station at Waterloo directly supports the proposed revitalisation of public housing, and the station at Barangaroo provides public transport connectivity to the new development and public open space.

### 8.2.5 Project cost and funding

Thirty-three submissions raised issues regarding project cost and funding.

**Stakeholder identification numbers**

20, 108, 122, 131, 149, 160, 171, 216, 218, 239, 251, 257, 258, 272, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 296, 298

**Issue raised**

In summary, the submissions raised the following issues:

- Suggestion that the cost of converting the T3 Bankstown Line from heavy rail to metro rail could be redistributed to other transport projects
- Expense should be avoided on items that do not deliver any significant benefit, with funding redistributed to other transport projects
- The project is a very expensive way to increase track capacity through the Sydney CBD
- The Sydney Metro City & Southwest project is a questionable investment if the end goal is to expand rail access to as many people as possible
- Increased rail capacity could be achieved at a cheaper price by increasing capacity on the existing heavy rail network rather than the construction of the metro network
- The government should release full costing details to allow the public to be convinced of the economic benefits of the project before it proceeds
- The metro will be operated privately and for profit, but is being constructed using public funding. Private interests are dominating what should be a public utility. Particular concern raised regarding the location of Barangaroo Station to provide access to the proposed casino development at Barangaroo Central
- It is not in the public interest to invest billions of dollars of public money in a privately operated transport project that will funnel profits to private corporations. NSW has a long history of public-private partnership fiascos, such as the Cross City Tunnel and the Airport Line, where corporations get the benefits, while the public underwrite the risk and foot the bill. There is no reason to believe that the Sydney Metro will be any different
- Concern regarding possible deals with developers as part of the project and possible project funding through associated high-rise development
- The business case for the project should be publicly available.

**Response**

The cost of the project is considered to be justified based on the need for the project, and the anticipated benefits as identified in Chapter 3 of the Environmental Impact Statement.

The Sydney Metro network would be operated and maintained under a Public Private Partnership with ownership of the infrastructure remaining with the NSW State Government.

Public Private Partnerships are one of the options the Government uses to procure infrastructure and offers opportunities to improve services and provide better value for money, primarily through appropriate risk transfer, encouraging innovation, greater asset utilisation and integrated whole-of-life management.

The procurement of infrastructure and associated services through Public Private Partnerships by any NSW Government agency need to comply with:

- The National Public Private Partnerships Policy and Guidelines
- NSW specific requirements in the *NSW Public Private Partnerships Guidelines* (2012).

The business case has been prepared for the Chatswood to Sydenham project and endorsed by the NSW Government. This document includes an assessment of economic benefits. This has not been publicly released as certain details are considered commercial-in-confidence. Relevant information from the business case has been incorporated into the Environmental Impact Statement.

The *State Infrastructure Strategy* (Infrastructure NSW, 2012) proposes a variety of funding strategies to realise infrastructure priorities within a sustainable budgetary framework. These include:

- Tolls on new and upgraded motorway links
- Restart NSW funding, using net proceeds of asset sales and other windfall gains
- Reduction of public transport subsidies, consistent with regulatory determinations
- Limited reprioritisation of current capital plans
- Commonwealth contributions for projects that align with Infrastructure Australia's key themes
- Value capture from beneficiaries of new infrastructure where feasible.

The cost and economic benefits of the proposed Sydenham to Bankstown component of Sydney Metro City & Southwest will be provided as part of the separate assessment for that project.

## 8.3 Project development and alternatives

### 8.3.1 Alternatives and options assessment process

Two submission raised issues regarding alternatives and the options assessment process.

**Stakeholder identification number**

96, 239

**Issue raised**

In summary, the submissions raised the following issues:

- The options assessment documented in the Environmental Impact Statement does not pursue options in enough depth to demonstrate their inferiority on a cost / benefit ratio
- The business case and cost-benefit analysis that assess the various alternatives should be released
- There is no optimisation study based on recent experience on the North West Metro construction
- A base case and independent assessment of additional options is required and should be monitored by the Auditor General's office
- The justification for how crucial transport decisions around station location options for Sydney University versus Waterloo were made must be made public.

**Response**

The strategic alternatives and options assessment provided in Chapter 4 the Environmental Impact Statement meets the Secretary's environmental assessment requirements. This includes consideration of the consequences of not proceeding with the project (or the do-nothing option). The consequences of not proceeding with the project would include:

- Insufficient transport capacity would prevent Sydney from reaching its economic potential, leading to worse economic outcomes for the State and nation
- Sydney's transport network will not provide the minimum standard of service expected by rail customers and there will be major impacts on the operational efficiency, reliability and capacity of the suburban rail network in the medium to long term.

The project has also been subject to relevant NSW Treasury Guidelines for Capital Business Cases that identify a robust process for the preparation, review, and approval of final business cases. This has not been publicly released as certain details are considered commercial-in-confidence. Relevant information from the business case has been incorporated into the Environmental Impact Statement.

The factors influencing the decision of a station at Waterloo is outlined in Section 4.4.3 of the Environmental Impact Statement. In summary, this location was preferred as it would take pressure off Redfern and Green Square stations, provide local residents with more public transport options and encourage the introduction of new homes, jobs, parks and community facilities to meet the needs of a growing Sydney. Whilst a station at The University of Sydney performed well against the project objectives and would provide connectivity to the university as well as health and retail precincts, a station at Waterloo was preferred based on the above factors.

### 8.3.2 Strategic alternatives

Twenty three submissions raised issues regarding strategic alternatives.

**Stakeholder identification numbers**

1, 8, 22, 23, 25, 35, 52, 69, 107, 108, 110, 111, 131, 146, 150, 159, 160, 171, 172, 180, 216, 218, 271

**Issue raised**

***Strategic alternatives***

In summary, the submissions raised the following issues:

- A cheaper alternative to the metro network should be pursued
- Ultra-fast rail should be developed instead of metro technology – for instance, Hyperloop technology
- The metro network should not be built and the existing double deck heavy rail system should be retained
- Investment should be made to upgrade and expand the existing heavy rail network
- Double deck trains should be used on the metro network to provide additional capacity
- Capacity should be increased on the existing heavy rail network by increasing the frequency of trains
- The metro network should be constructed using the same gauge as the existing heavy rail network to ensure the two networks can be integrated
- The heavy rail network and the metro network should be integrated and linked around Alexandria
- The Sydney Harbour crossing should utilise Cahill Expressway rather than a new tunnel

- Waterloo Station should have been provided on the existing heavy rail network to allow the metro network to service to The University of Sydney Station option
- The metro network should service Sydney Airport, directly or via Wolli Creek
- The metro network should provide rail services where there are currently no existing heavy rail services, rather than replace the existing T3 Bankstown Line
- The metro network should service other inner and middle-ring areas of Sydney that currently need rail services
- The metro network should follow a different alignment from that proposed, including:
  - The University of Sydney, Sydenham, Regent Park, Ashbury, South Strathfield, Belfield, Greenacre and Chullora
  - Sydenham to Tempe, Wolli Creek, Earlwood, Belmore, South Strathfield, Strathfield, Five Dock
  - Central, Victoria Park (The University of Sydney East), Royal Prince Alfred Hospital (The University of Sydney West), Newtown, Enmore Park, Sydenham
  - Parramatta Road alignment
  - The University of Sydney, South Strathfield, Sefton, Regents Park, Liverpool
  - Epping, Ryde, Gladesville, Abbotsford, Ashfield, Campsie, Kingsgrove, Hurstville, Blakehurst
  - Chatswood to Sydenham and Stanmore, utilizing road capacity on the Harbour Bridge
  - Eastern suburbs areas that have no rail services
- The metro network should be constructed to service the Central Coast, Central West and/or Eastern Sydney, with connections to the Sydney CBD.

### *T1 North Shore Line*

In summary, the submissions raised the following issues:

- The realignment of the T1 heavy rail line should occur north of Chatswood Station
- Grade separation of the existing T1 rail line and metro line should be preferred over the construction of a rail bridge at the Chatswood dive site

## Response

### *Strategic alternatives*

Section 4.3 of the Environmental Impact Statement provides the assessment of strategic alternatives to the project. Key points are provided below.

*Sydney's Rail Future*, the long term rail strategy for Sydney, investigated a number of strategic alternatives. This identified that use of the existing suburban rail network (or an upgrade to the network) would not meet short term or long term demand. Sydney Metro was identified as the preferred solution as it would:

- Be more flexible and provide frequent services that would benefit customers
- Provide the required capacity and flexibility to respond to growing demand for rail in Sydney
- Create a more modern, resilient and faster service
- Deliver a seamless and less disruptive way of modernising Sydney's rail
- Deliver transport benefits more cost effectively.

The preferred Sydney Metro option would operate independently of the existing Sydney Trains network, however it would provide strategic integration and interchange points with the existing rail network.

The proposed broad alignment of Sydney Metro through Sydney's North Shore, under Sydney Harbour, through the Sydney CBD and the conversion of the T3 Bankstown Line was determined as the best option to address the constraints and need for the project as established in Chapter 3 of the Environmental Impact Statement.

Sections 4.5 and 4.6 of the Environmental Impact Statement provide consideration of a number of alignment options, including different methods to cross Sydney Harbour. The use of the Sydney Harbour Bridge was not a preferred option as the necessary alignment would have replicated the catchment of the existing T1 North Shore Line and operational limitations of using the bridge would not have met long term capacity requirements. Options using the Sydney Harbour Bridge were also estimated to cost substantially more than tunnelling options.

*Sydney's Rail Future* also identified the conversion of the T3 Bankstown Line between Sydenham and Bankstown as Stage 5 (Southern Sector Conversion) of the five-stage plan.

A number of options for converting existing lines to metro operation were considered. The investigation identified the T3 Bankstown Line as the next stage of the Sydney Metro network as it would provide a significant increase in Sydney CBD rail capacity, enable increased frequencies on the T2 (Airport, Inner West and South) Line, and simplify the rail network by removing the T3 Bankstown Line from the existing, complex rail network. The conversion of the T3 Bankstown Line would remove the need for Bankstown services to use the City Circle, providing for additional train paths for other lines using the City Circle.

The increase in network capacity and ability to make a significant change to how the existing rail network operates would provide the following benefits:

- Reduced train crowding
- Decreased station crowding at key CBD stations during peak periods
- Improved network resilience.

The construction of a new metro line to the southwest of Sydenham, rather than the conversion of the T3 Bankstown Line, would not enable increased frequencies on the T2 Airport, Inner West and South Line or the simplification of the existing rail network to be achieved.

Section 4.4.3 of the Environmental Impact Statement summarised the assessment of additional station options including a station between Central and Sydenham. Of the long list of station options identified, it was decided to further consider two locations: The University of Sydney and Waterloo. Both station locations supported the Sydney Metro project objectives; however a new metro station at Waterloo was chosen as it would revitalise the Waterloo precinct and would also:

- Provide a high quality connection with bus services along Botany Road
- Provide additional connectivity to Australian Technology Park and Redfern Station
- Contribute to the NSW Government objective to transform Waterloo and Redfern.

A metro station at Waterloo would also allow further development and expansion of the Global Economic Corridor between the Sydney CBD and Green Square.

The CBD and South East Light Rail, currently under construction, will offer very frequent, high capacity transit from the Eastern Suburbs to the Sydney CBD and serve areas of the Eastern Suburbs not currently serviced by rail. In addition, the *NSW Long Term Transport Master Plan* identifies the need for further investigation of potential extensions of the light rail line to Malabar as well as feasibility investigations of mass transit options to Malabar and Maroubra.

***T1 North Shore Line***

As described in Section 4.7.1 of the Environmental Impact Statement, a number of options were investigated for the location of the northern dive structure and tunnel portal. In summary, the location was chosen as it would (compared to the other options) avoid the acquisition of residential properties, reduce the amount of work within the T1 North Shore Line and impacts to Sydney Trains operations, and reduce construction impacts in relation to heritage and noise and vibration.

The T1 North Shore Line needs to be realigned to the south of Chatswood Station to enable efficient cross-platform interchange at Chatswood Station between metro and Sydney Trains services. The rail bridge near the Chatswood dive site is required to enable the grade separation of the services. This would allow the metro and Sydney Trains services to efficiently operate together without a physical interface (which may result in delays on both lines).

### 8.3.3 Alternative station locations

Seventy-two submissions raised issues regarding station location options.

**Stakeholder identification numbers**

2, 3, 6, 10, 11, 13, 16, 17, 26, 27, 28, 29, 31, 32, 33, 34, 35, 36, 39, 41, 45, 67, 72, 78, 79, 82, 83, 86, 89, 100, 101, 103, 104, 106, 107, 109, 115, 116, 117, 119, 120, 121, 123, 124, 130, 131, 132, 133, 136, 138, 140, 144, 146, 147, 148, 149, 156, 160, 162, 163, 164, 165, 175, 177, 205, 206, 218, 228, 236, 239, 249, 253

**Issue raised**

***Station location options assessment process***

In summary, submissions raised issues that the station location process has provided an inadequate model for future value creation and the preservation of health and amenity of inner city neighbourhoods.

***Suggestions for additional stations***

In summary, submissions raised the following issues:

- More stations should be built on the metro network to attract maximum patronage and revenue
- An additional station at Artarmon should be considered to service the business park, Royal North Shore Hospital and residents that are not within the existing heavy rail catchment, to relieve traffic and parking congestion in the local area and to make the area more attractive for potential employees. It was argued that the limited capacity for development around the station prevented the station from being pursued, even though it would have improved access for the many people who work in this area.
- An additional station at Lane Cove should be considered to service new apartments and reduce strain on existing bus services
- An additional station at Gore Hill should be considered to service office developments and to align the tunnel under the industrial area and away from residential areas in Artarmon
- An additional station at Sydney Opera House should be considered

- New underground metro platforms at Green Square Station should be considered to provide connection to Sydney Airport
- Additional stations in the inner southern suburbs and between Waterloo and Sydenham (Alexandria, Erskineville, St Peters, Mascot) should be constructed for the following reasons:
  - To reduce the distance between metro stations
  - To provide a mass transit system and increase cross-town connectivity
  - To provide more public transport in the local area that is not road-based
  - To provide interchange facilities with existing bus services
  - To cater for increasing residential population and high-density housing development, including the redevelopment of public housing at Waterloo and the Ashmore Estate development
  - To cater for development at Australian Technology Park and Alexandria Super School
  - To address overcrowding at Erskineville Station, St Peters Station and at other inner-city heavy rail stations
  - To diversify and strengthen the rail network
  - To reduce road traffic impacts, including flow-on effects from WestConnex
  - To reduce pollution and preserve local amenity
  - If a metro station is not provided, people will want to leave this area
- Metro tunnels will be built under residences in Newtown, but the metro network will not be used by Newtown residents due to the proximity of the existing heavy rail network compared to metro stations.

***Issues regarding proposed metro station locations***

In summary, submissions raised to following issues in relation to the location of the proposed metro stations:

- Crows Nest Station is not required as the area is serviced by St Leonards Station on the heavy rail network
- Barangaroo Station should be reconsidered to achieve the objects stated in the Environmental Impact Statement. The current location is within the Wynyard Station walking catchment and is not close enough to the Darling Harbour precinct
- Barangaroo Station should include an additional platform for future expansion, with possible integration with the heavy rail network or future metro network extension west to Parramatta
- Station development at Pitt Street should be located under existing buildings and utilise existing basement entries for construction access to minimise aboveground impacts
- Waterloo Station should not be constructed for the following reasons:
  - The area is already congested with residents, shops and cars
  - The station development would create major adverse impacts on natural and built environments
  - The area is already serviced by Redfern Station and Green Square Station on the heavy rail network
  - The existing Green Square Station on the heavy rail network should be expanded instead

- There should be a station at The University of Sydney rather than Waterloo. The University of Sydney is considered to be a larger trip generator than Waterloo. Concerns raised that this location decision included impacts on the T3 Bankstown Line, general public transport issues and political support for developers.
- The Sydenham metro station should be underground and the dive site constructed west of the existing Sydenham Station to remove construction and operational complexities and maintain greater flexibility on the heavy rail network at this location.

**Response**

***Station location options assessment process***

As described in Section 4.4 of the Environmental Impact Statement, all station locations were evaluated against eight project objectives to provide a balanced consideration of the station options. These objectives included serving and stimulating urban development, among a number of transport related objectives.

***Suggestions for additional stations***

Section 4.4 of the Environmental Impact Statement provides a detailed station location options evaluation process. This involved a balanced consideration of all potential station locations against the project objectives.

*Stations between Central and Sydenham*

Planning for urban renewal in the South Sydney area predates the proposed Sydney Metro City & Southwest. Masterplanning for the area has been led by the City of Sydney and has included detailed technical studies, including traffic and parking studies. In particular, an Infrastructure Plan identifies the strategic infrastructure requirements to support development of the Ashmore precinct.

During the development stage of the Sydney Metro City & Southwest, consideration was given to opportunities to improve transport accessibility, consistent with the Department of Planning and Environment's A Plan for Growing Sydney and UrbanGrowth NSW's Central to Eveleigh Urban Transformation and Transport Program. During this stage, the opportunity to include an additional station between Central and Sydenham was subject of a strategic evaluation of station locations.

The evaluation subjected the Sydney Metro City & Southwest to a Strategic Merit Test. A Strategic Merit Test is used to quantify expected broad benefits of a transport option against project objectives. As part of the Strategic Merit Test, Sydney Metro investigated a number of station locations between Central and Sydenham.

A range of station locations in the South Sydney area were evaluated against the project objectives. The locations included at the Australian Technology Park, Waterloo, McEvoy Street, Green Square, Erskineville, Ashmore, and St Peters. The evaluation results are provided in Section 4.4.3 of the Environmental Impact Statement. In summary, where there is an existing rail station, or the potential station location is within close proximity to an existing station there would be limited increase in rail catchment, limited change to public transport from private vehicles and no significant relief to existing public transport services.

In addition, the station location options were part of a broad public consultation process between 4 June and 17 July 2015. During this time Transport for NSW hosted an online forum and sought feedback on Sydney Metro and particularly the station options around The University of Sydney and Waterloo. The results of the consultation were considered in Section 5.6 of the Environmental Impact Statement and influenced the overall decision of the station location between Central and Sydenham.

In response to the submission from the City of Sydney, a further Strategic Merit Test has been conducted to investigate the opportunity for an additional metro station near the junction of McEvoy Street and Euston Road, Alexandria. A station at this location would serve a predominantly residential catchment with some mixed use developments and provide a new connection to the City of Sydney's Southern Employment Lands. It would have some overlapping catchments with Green Square Station, Erskineville Station and the new Waterloo Metro station, so would serve a partial new rail catchment. The size of the new catchment is relatively small and contains very limited potential for employment and population growth.

As demonstrated in Figure 8-1, this station location at Alexandria performed similarly to the Strategic Merit Test results of a metro station location at Ashmore, Australian Technology Park, Erskineville, Newtown, Redfern, St Peters and Wilson Street (Eveleigh) (as referred to in Section 4.4.3 of the Environmental Impact Statement).

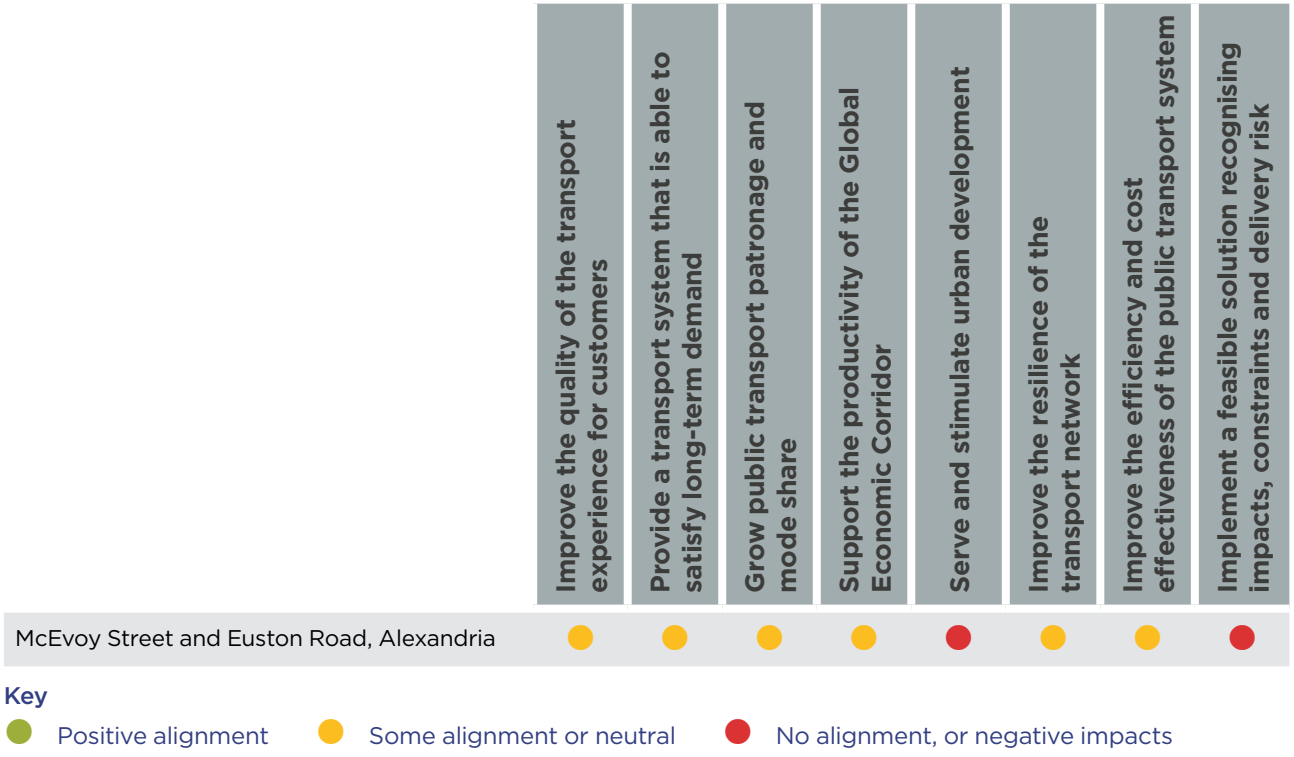


**Figure 8-1 Performace of a station at Alexandria**

In response to the objective noted in the table above to 'improve the resilience of the transport network', analysis of Erskineville Station patronage in 2014 found that customers can experience train loading of above 135 per cent, which is the benchmark beyond which passengers start to experience crowding and dwell times can impact on-time running. However, it was one of the lower patronised stations on the Sydney Trains network (ranked 118th) with the average number of customers using Erskineville Station during the morning 3.5 hour AM peak period was 1,360 (entries and exits). A station in Alexandria may attract customers from Erskineville Station; however the number of customers would not be high.

Therefore, a more appropriate response to the overcrowding is to increase services or reduce the load on the line. Changes to the train timetable along the Bankstown Line are expected to provide some relief to St Peters (through increased services) and Erskineville stations (through reduced line loads).

It is therefore recommended to not pursue a station at this as part of the Sydney Metro City & Southwest as it would not contribute strongly to the Sydney Metro City & Southwest objectives.

Further, land use change around the McEvoy Street area would occur regardless of a new station, and would be in close proximity to a new Waterloo Metro station and the existing Green Square Station.

Waterloo Metro station is forecast to relieve Green Square Station once operational. The addition of another metro station in the South Sydney area would have significant technical, property, operational, and cost implications. On balance of all these issues to consider, the inclusion of another metro station as part of the project at this location is not supported.

Notwithstanding the above, it is noted the Central to Eveleigh is subject to significant urban transformation and studies are being progressed between Transport for NSW and Urban Growth NSW on how best to grow the active and public transport modes within the broader area.

*Additional stations north of Sydney Harbour*

A range of station locations north of Sydney Harbour were investigated as part of the stations options evaluation process described in Section 4.4 of the Environmental Impact Statement.

The round of consultation in June 2015 also sought feedback on the station locations to the north of Sydney Harbour.

A station in the Artarmon Industrial Area was considered as part of the station options evaluation process. The Artarmon Industrial Area provides an important role with light industrial, and specialist health and media activities. This area supports about 11,000 jobs and has an estimated contribution of $1.6 billion to the NSW economy each year. There are limited alternative industrial locations in the region, and none play as significant role as Artarmon, in part because they do not offer the same locational benefits for a range of industries. The benefits of this station would be dependent on the urban renewal of the area. Consultation with stakeholder indicated that there was limited support for such a major land use change due to the importance of the existing industrial use. As a result of the above factors, a station within the Artarmon Industrial Area was not pursued.

Lane Cove was suggested as a station location during community consultation however it was not investigated as a station option as part of the Sydney Metro City & Southwest project, as the area is outside the footprint of the project. A station at Lane Cove would have resulted in a substantial increase in tunnel length and associated travel time on Sydney Metro, and may have precluded stations at Crows Nest and Victoria Cross. In addition, the Lane Cove area is currently served efficiently by bus services directly to the Sydney CBD.

*Sydney Opera House*

A station at Sydney Opera House would be broadly consistent with the Macquarie Place Station that was evaluated as part of the stations evaluation process in Section 4.4 of the Environmental Impact Statement. Compared to other Sydney CBD station location options, this location would have a smaller catchment and would overlap with the existing Circular Quay Station. Further, it is not possible to provide a station at Barangaroo and also near the Sydney Opera House, given the geometry requirements.

### *Issues regarding proposed metro station locations*

The station locations options evaluation is described in Section 4.4 of the Environmental Impact Statement. This process involved a balanced consideration of the project objectives and the results of stakeholder and community consultation.

The design development of each proposed station, and the location of specific station elements, considered a range of factors including potential construction impacts, potential operational impacts and property acquisition requirements. The potential impacts of each station and station facilities is described and assessed in the Environmental Impact Statement.

Responses to the specific issues raised are as follows:

- Crows Nest Station would extend the rail catchment and facilitate employment and dwelling growth in areas currently beyond the catchment of St Leonards Station
- Although there would be some cross over with the catchment of Wynyard Station, a station at Barangaroo would extend the rail catchment, provide a direct public transport connection to the Barangaroo development, deliver a unique east-west connection between Martin Place and Barangaroo, improve travel times within the Global Economic Corridor and serve special events. Barangaroo Station would also help reduce future passenger demand at Wynyard Station
- Potential methods to expand the metro network in the future are discussed in Section 9.5 of this report
- Construction access to Pitt Street Station using existing building basements would not provide the necessary space to support construction works. This would likely result in a substantial increase in the construction program due to inefficient excavation rates and methodology
- Waterloo Station would take pressure off Redfern and Green Square stations, provide local residents with more public transport options and encourage the introduction of new homes, jobs, parks and community facilities to meet the needs of a growing Sydney
- Expansion of Green Square Station on the Airport Line would not meet the needs of the area around Waterloo Station and would not support the revitalisation of the Waterloo public housing estate
- While a station at The University of Sydney performed well against the project objectives and would provide connectivity to the university as well as health and retail precincts, a station at Waterloo was preferred based on the above factors. The round of consultation in June 2015 also sought feedback on stations a Waterloo or The University of Sydney
- The design details of the metro platforms at Sydenham Station will be described and assessed as part of the Sydenham to Bankstown Environmental Impact Statement. Underground metro platforms at Sydenham and a dive structure further south or west would likely have resulted in increased acquisition of residential properties or public open space, additional construction impacts to residential areas and more complex construction at Sydenham Station (and associated impacts to Sydney Trains services and customers).

### 8.3.4 Station design development

One submission raised issues regarding station design development.

**Stakeholder identification number**

24

**Issue raised**

This submission raised an alternative design option for Central Station, including the use of existing heavy rail platforms under Central Station for metro operations, the use of a binocular mined technique in construction, and to rebuild any affected platforms above the new metro station at Central as soon as possible following construction.

### Response

The design development of the metro platforms at Central Station is described in Section 4.8.2 of the Environmental Impact Statement.

The use of the existing disused platforms at Central Station was discounted as the associated tunnel alignment would have resulted in impacts to the T4 Eastern Suburbs and Illawarra Line and an Ausgrid cable tunnel, and sub-optimal customer outcomes with respect to customer comfort and connectivity.

A mined construction technique was considered at Central Station for the platforms, however some cut-and-cover excavation would be unavoidable to provide suitable vertical transport for interchange purposes.

The existing Sydney Trains platforms would be reinstated as soon as feasible following construction of the metro platforms at Central Station.

## 8.3.5 Alignment options

Thirty-six submissions raised issues regarding alignment options.

### Stakeholder identification numbers

21, 42, 43, 46, 47, 49, 59, 60, 62, 64, 68, 73, 76, 77, 81, 85, 87, 88, 93, 99, 107, 134, 143, 151, 204, 247, 248, 253, 255, 261, 262, 263, 264, 265, 267, 269

### Issue raised

In summary, the submissions raised the following issues:

- Request for the metro tunnels at St Leonards to be realigned to avoid impacts to the residential Forum East building
- Suggestion that the North Shore alignment include Willoughby, Naremburn, Crows Nest, North Sydney and Neutral Bay to maximise the rail catchment
- Objection to the tunnel alignment between Victoria Cross and Barangaroo at Blues Point
- Suggestion to realign the metro tunnels at Blues Point to align with Blues Point Road to reduce potential impacts on residential properties – the suggestion was to align under the former Pacific Magazines building (which is a commercial receiver)
- Concern from residents in Millers Point regarding the metro tunnel alignment under buildings on Dalgety Road, Towns Place and Hickson Road, specifically the proximity of the tunnel to basement car parking facilities and related noise, vibration and structural impacts. Request that tunnels be realigned to avoid these properties. Suggestions for realignment include Barangaroo Reserve or sandstone cliffs to the west of the current alignment
- The rail alignment in the Sydney CBD passes under residential buildings on Kent Street that are misidentified in the Environmental Impact Statement
- Support for the University of Sydney alignment option over the Waterloo alignment option due to the immediate need of transport facilities at The University of Sydney and the proximity of Green Square and Redfern stations to the proposed Waterloo Station
- Request for the metro tunnels between Waterloo and Sydenham to be realigned to avoid residential properties
- Concern regarding the tunnel alignment under residential properties on Lawrence and Belmont streets and Sydney Park Village, Alexandria

**Response**

Alignment options are described in Section 4.5 of the Environmental Impact Statement. In general, the tunnel alignment is influenced by:

- Station locations
- Design criteria such as vertical and horizontal alignment requirements
- Avoidance of underground constraints such as deep basements and major utilities.

Wherever possible, the tunnels have been aligned along other transport infrastructure such as under road alignments rather than under residential properties. However, passing under residential properties is unavoidable in some circumstances.

In relation to the rail alignment through Millers Point, Figure 6-2d of the Environmental Impact Statement identifies that the depth from the ground surface to the top of the tunnel at Towns Place is around 37 metres. Taking into account a 20 metre deep car park basement, the offset distance to the tunnels would be around 17 metres.

The operational noise and vibration assessment, presented in Chapter 11 of the Environmental Impact Statement, predicts that noise levels from trains would comply with the relevant guidelines. As part of the detailed design process, additional operational noise modelling would be carried out which would take into account the presence of basements.

### 8.3.6 Location of the Chatswood dive structure

Six submissions raised issues regarding the location of the Chatswood dive structure.

**Stakeholder identification numbers**

15, 19, 94, 110, 241, 253

**Issue raised**

In summary, the submissions raised the following issues:

- The water tower site on the corner of the Pacific Highway and Mowbray Road at Chatswood should be considered as a location for the Chatswood dive site
- Support for the alternative options for the Chatswood dive site identified in the Environmental Impact Statement as better options that retain the Nelson Street bridge
- Support for retaining the Nelson Street bridge at the Chatswood dive site to enable pedestrian and cycle connectivity and to avoid re-routing services and utilities
- Suggestion to increase the length of the Chatswood dive site to avoid the need to construct a rail bridge near Nelson Street
- The Chatswood dive site should be moved to avoid structural impacts to residential properties at Nelson Street
- Chatswood dive site is wrongly placed and should have been evaluated during Epping to Chatswood Rail Link work
- Suggestion to move the Chatswood dive site south to allow for an above-ground metro station using the existing platforms at St Leonards Station.

### Response

Section 4.7.1 provides the options process for the location of the Chatswood dive site. This includes evaluation of two options at St Leonards and three options at Chatswood. The location of the proposed Chatswood dive site was preferred as it would:

- Avoid acquisition of residential properties
- Avoid impacts on a heritage listed item and Chatswood Heritage Conservation Zone
- Reduce the extent, intensity and duration of construction work next to and impact upon operational Sydney Trains assets
- Avoid impacts to Mowbray Road Bridge during construction
- Provide for the establishment of a tunnel support site away from surrounding residential properties, which would reduce construction noise and other amenity impacts on adjacent receivers

It was also recognised that this location would result in a number of impacts, including:

- The need to permanently close the road bridge at Nelson Street
- Acquisition of an Ausgrid property, containing one heritage listed property ('Mowbray House' located at 339 Mowbray Road) and a number of business properties along the eastern side of the Pacific Highway (571 585 Pacific Highway)
- Acquisition of up to five commercial premises
- The need to tunnel beneath a heritage listed water reservoir, a substation and a communications tower
- Impacts on a major Telstra utility adjacent to the Ausgrid facility / rail corridor boundary.

The proposed location represents the best balance between environmental, economic, social and engineering requirements.

## 8.3.7 Issues associated with the Sydenham to Bankstown project

Nineteen submissions raised issues associated with the Sydney Metro City & Southwest Sydenham to Bankstown project.

### Stakeholder identification numbers

1, 13, 20, 22, 38, 40, 83, 129, 131, 150, 159, 172, 176, 203, 216, 221, 224, 230, 301

### Issue raised

In summary, the submissions raised the following issues:

- Opposition to the Chatswood to Sydenham project as it provides a precedent for the approval of Sydenham to Bankstown project
- The T3 Bankstown Line should not be converted to metro rail. The T3 Bankstown Line is currently underutilised and services could be increased to provide additional capacity
- The Sydenham to Bankstown metro line should align with new developments between the centres
- Consideration should be given to using shorter metro rail cards to enable use of existing station infrastructure on the Bankstown Line and reduce associated costs
- The duplication of an existing line and functional stations is wasteful and not justified. It would not increase the rail catchment of Sydney
- The operation of metro services on the T3 Bankstown Line every few minutes is a waste of power

- Concern regarding the operation of heavy rail and metro rail together on the T3 Bankstown Line
- The conversion of the T3 Bankstown Line to metro rail would require new construction to connect with Liverpool
- Concern regarding the closure of the T3 Bankstown Line for six to 12 months and relevant delays and disruption to local communities, including increased travel time for local commuters and local business impacts
- The conversion of the T3 Bankstown Line to metro rail would permanently disadvantage customers due to the requirement to change trains
- Concern regarding air quality and traffic impacts from additional road traffic during the closure of the T3 Bankstown Line
- Transport strategies for the T3 Bankstown Line during the Sydenham to Bankstown project should be included for comment in this Environmental Impact Statement
- Optimisation options for Sydenham to Bankstown, costs, and impacts of the Sydenham to Bankstown project should be considered in this Environmental Impact Statement
- Concern regarding the location of additional concourses at Sydenham, Campsie and Canterbury stations for metro services
- Concern regarding the suitability of the existing Sydenham Station for metro operations and constraints posed by nearby infrastructure to the south and south-west of Sydenham Station. Suggestion for a cross-platform interchange between metro and heavy rail services at Sydenham for ease of access
- Concern regarding the need to expand and relocate station elements (such as platforms, stairs, ramps etc) at existing stations on the T3 Bankstown Line to cater to metro operations, including at Canterbury, Cabramatta and Warwick Farm
- Concern regarding the privatisation of larger parts of the heavy rail network in the future
- Concern regarding the impact to the Illawarra Line and remaining stations on the T3 Bankstown Line (Erskineville and St Peters)
- Concern regarding the future viability of the heavy rail line between Birrong and Lidcombe after the Bankstown Line is converted to metro operations
- Concern regarding the impact of the conversion of the T3 Bankstown Line on any existing plans for redevelopment around Campsie Station
- The Sydenham to Bankstown project presents an opportunity to improve cycle parking facilities.

### Response

*Sydney's Rail Future*, the long term rail strategy for Sydney, identified the conversion of the T3 Bankstown Line between Sydenham and Bankstown as Stage 5 (Southern Sector Conversion) of the five-stage plan.

A number of options for converting existing lines to metro operation were considered. The investigation identified the T3 Bankstown Line as the next stage of the Sydney Metro network as it would provide a significant increase in CBD rail capacity, enable increased frequencies on the T2 (Airport, Inner West and South) Line, and simplify the rail network by removing the Bankstown Line from the existing, complex rail network. The conversion of the T3 Bankstown Line would remove the need for Bankstown services to use the City Circle, providing for additional train paths for other lines using the City Circle.

The increase in network capacity and ability to make a significant change to how the existing rail network operates would provide the following benefits:

- Reduced train crowding
- Decreased station crowding at key CBD stations during peak periods
- Improved network resilience.

The construction of a new metro line to the southwest of Sydenham, rather than the conversion of the T3 Bankstown Line, would not enable increased frequencies on the T2 Airport, Inner West and South Line or the simplification of the existing rail network to be achieved.

The Sydenham to Bankstown project will be subject to a separate environmental assessment process. This process will detail the works required at each station to convert the existing rail line to the standards required for metro services. This process will also provide further details on the potential for cumulative impacts between the two projects, particularly in the area around Sydenham and Marrickville. The trains will be compatible with Sydney Metro Northwest to allow for direct services to and beyond the CBD, thereby avoiding the need for large numbers of customers to interchange at stations such as Chatswood.

### 8.3.8 Issues associated with the broader metro network

Nine submissions raised issues associated with the broader metro network.

**Stakeholder identification numbers**

1, 13, 30, 96, 135, 159, 216, 240, 260

**Issue raised**

In summary, the submissions raised the following issues:

- A larger bus interchange will be required to accommodate services during the closure of the Epping Line during metro construction
- The arrangement of the T1 Line and metro tracks should have been considered at the same time as the Epping to Chatswood Rail Link
- The rail system should have sub-tiers to identify suburban and intercity services
- The metro network should be extended to Lidcombe and link with the existing T1 Western Line on the heavy rail network
- The metro network should be integrated with broader CBD mass transit initiatives to maximise positive socio-economic impacts
- Suggestion that stub tunnels should be constructed between Central and Waterloo to enable future metro extensions with minimal disruption to services
- Future metro expansion plans are unclear in the Environmental Impact Statement
- Support for the conversion of the Epping to Chatswood Line and the T3 Bankstown Line to metro rail

### Response

Issues associated with other parts of the metro network (such as Sydney Metro Northwest and the conversion of the Epping to Chatswood Rail Line) have been described and assessed in their relevant planning documents. These do not form part of the Chatswood to Sydenham project.

Section 6.3.1 of the Environmental Impact Statement identifies the need to accommodate stub tunnels to the north of Victoria Cross Station and between Waterloo Station and the Marrickville dive structure. The stub tunnels are one method to ensure any potential future extensions to the network can be constructed in the future. However, given the complexity of designing for this long term potential, an alternative approach is proposed that establishes a more flexible tunnel design and track alignment with the ability to build extensions in the future. This approach could result in disruption to the operating metro network during construction of any potential future extensions to the network, which would need to be considered at the time of any proposed extension. Further information regarding safeguarding for future extensions to the network is provided in Section 9.5 of this report.

The preferred approach reduces tunnelling impacts, complexity, and costs; and provides more flexibility in the future to accommodate any potential future extensions consistent with *Sydney's Rail Future* and the Northern Beaches Transport Action Plan. Any construction impacts associated with future extensions (in the long term) would be assessed at that time.

The project also provides integration with the existing Sydney Trains network and other transport modes to allow efficient interchange at strategic locations including Martin Place and Central stations.

The NSW Government is investigating how to improve transport connections between Bankstown and Liverpool including a possible extension of Sydney Metro. The benefits of providing mass public transit between Bankstown and Liverpool include reducing growth pressure on road infrastructure and the rail network and the potential to relieve crowding on the T1 Western Line, T2 South Line and T2 Airport Line. It would also support growth in Sydney's south west by connecting communities, businesses, jobs and services.

## 8.3.9 Out of scope

Fifty-six submissions raised issues that were considered outside of the scope for assessment in the Environmental Impact Statement.

### Stakeholder identification numbers

1, 4, 13, 38, 40, 56, 83, 94, 96, 100, 118, 122, 125, 131, 139, 140, 145, 150, 153, 159, 172, 181, 206, 216, 218, 224, 228, 230, 251, 253, 257, 258, 271, 272, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 294, 296, 297, 298, 301

### Issue raised

In summary, the submissions raised the following issues:

- High Speed Rail should be provided between all capital cities
- Australia's transport infrastructure is at least 30 years behind Spain
- Redfern Station should be upgraded to include accessible lifts to all platforms
- 1 Lawson Square, Redfern should be upgraded to include accessible lifts
- The heavy rail line between Strathfield and Chatswood via Concord West should be converted to light rail or a metro line
- An additional pedestrian and cycle bridge over Bayview Road, Earlwood, should be constructed

- Concern regarding how a Hurstville metro service and how Illawarra trains would go through to the CBD, and the need for a turn back at Penshurst
- A Bondi Junction to Hurstville rapid service would require undergrounding of the Wolli Creek and Turrella platforms to untangle tracks
- The existing Birrong to Lidcombe heavy rail line could be converted to light rail following the development of Sydney Metro, based on the assumption that Clyde to Carlingford in part would be converted to light rail
- A direct footpath corridor involving ramps and avoiding stairs and steep gradients is required between Canterbury Station and the playground on Cooks River near former Sugar Mill.
- Concern regarding the Sydenham to Bankstown Urban Renewal Corridor, including:
  - Insufficient consultation on rezoning around the Sydenham to Bankstown corridor. It is unclear why there is no Environmental Impact Statement process for rezoning
  - Effective community consultation (which reaches culturally and linguistically diverse communities and people who do not use information and computer technology) is required regarding the Sydenham to Bankstown Corridor
  - The destruction of communities, heritage and resources (waste, water, air)
  - Traffic flow planning around Marrickville
  - Additional schools and pre-schools
  - Lack of affordable housing and gentrification of Marrickville
  - Sustainability is not included in this plan
  - Road network concerns during the Sydenham to Bankstown construction in the context of population increases and higher density development
  - Heritage protection in relation to re-zoning
  - Consideration and compliance with the Urban Renewal Strategy is required
  - Development strategy, heritage preservation and infrastructure needs should be incorporated
  - The population and dwelling forecasts by the Government do not fully account for proposed developments and underestimate growth
  - The Government needs to assess impacts and infrastructure needs of future residents and businesses that are expected in the region
- Objection to the density levels proposed for redevelopment around Eveleigh and Waterloo
- Concern regarding servicing Erskineville and St Peters by existing Sydney Trains services, including the East Hills Line and Illawarra Line
- Concern regarding heavy rail capacity in the vicinity of Erskineville, St Peters and Sydenham following conversion of the T3 Bankstown Line to metro rail
- Support for the construction of a stub tunnel to enable extension of metro rail to Hurstville
- Governments should commit to long term infrastructure planning. Sydney needs a second airport and improved intercity trains

- Chatswood interchange needs to be re-constructed. The current bus terminal does not provide as many stops as the previous bus terminal and is dispersed from the train station and shopping areas.
- This has resulted in the loss of the village shops.
- Issues raised regarding freeway planned for the St Peters / Erskineville area which will destroy the area
- Opposition to Sydney Metro as it will result in more high density housing along the route resulting in more congestion and be detrimental to quality of health and life
- Concern regarding the overdevelopment around stations on the T3 Bankstown Line
- Suggestion that Sydney is being sold to developers and being destroyed for profit and power
- Suggestion that the metro line, mass rezoning plans and the forced council amalgamations are linked
- Concern that the existing noise train noise levels around Chatswood are excessive
- Concern regarding the redevelopment of the community housing at Waterloo, as two thousand public housing residences are set to be demolished to make way for the development built around the Waterloo metro station. The Environmental Impact Statement does not address the public housing redevelopment
- There has been very little information provided on this topic
- Concern regarding increasing development densities around stations on the T3 Bankstown Line in conjunction with the Sydenham metro line construction. Increased densities driven by metro would smash nuance and cogency from the existing planned densification in these areas
- Project staff should have the same industrial rights as current NSW Government employees. Work health and safety of employees is a number one priority
- Support to integrate Platform 15 at Central as a terminating suburban platform. Suggestion to rebuild Platform 15 track during construction of the Sydney Yard access. Support for reinstatement of Platforms 13-15 following Metro construction
- Suggestions for an integrated public transport plan that includes a Sydney Metro connection to the Northern Beaches and light rail lines connecting Crows Nest and Brookvale to Balmoral Beach and Manly. This would make Victoria Cross a 'metro hub' and reduce congestion and greenhouse gas emissions
- Concern regarding the restoration of footpath and commemorative plaque on the south-east corner of the Pacific Highway-Mowbray Road
- The Environmental Impact Statement does not give adequate consideration to capacity issues on the western lines, and Strathfield to Central in particular. An extension of the metro or a second metro could relieve pressure on the train line
- Concern regarding social impacts of relocation of Waterloo residents
- Concern regarding overdevelopment of Bankstown with high-rise towers
- Suggestion to operate a circle line, closing the gap between the North West Growth Centre (Rouse Hill, Riverstone and Schofields) and the South West Growth Centre (Leppington, Austral, Oran Park)
- Concern regarding the overdevelopment of Waterloo, Sydenham and stations on the T3 Bankstown Line. Associated development would displace existing residents and create high-rise slums

- Concern regarding strategic planning for rail in Sydney to cater for future provisions. Train travel should not necessitate going through the city and be more like the London Underground with interconnecting lines
- North Sydney Council should try to ensure that the development of the Hume Street Car Park and park area is carried out at the same time as Crows Nest Station to reduce impacts and increase design cohesion
- Concern regarding noise through residential areas of Wollstonecraft and Waverton due to an increase in heavy rail services until the completion of metro in 2024. Noise monitoring by state rail is requested and dampening mechanisms proposed to reduce noise impact
- The Waterloo Precinct redevelopment as part of the Central to Eveleigh Corridor Renewal Project will enable substantial uplift of the development density in and around Waterloo
- Careful coordination is required between Roads and Maritime Services, City of Sydney Council, UrbanGrowth NSW and the Department of Family and Community Services to ensure all public infrastructure within the Waterloo Precinct is upgraded.
- Accessibility upgrades at Redfern must be made a priority, to allow equitable use of the train network by all. The construction of new transport services like the Sydney Metro cannot come at the expense of improving the accessibility of existing services
- The Environmental Impact Statement only addresses the immediate construction implications of the metro rail corridor and metro station at Waterloo. It does nothing to allay concerns around the associated development and population increase in Waterloo. Those concerns must be properly addressed, with thorough and meaningful community consultation throughout the planning process
- Barangaroo caters to a gap in our international standing for “high-end” gambling.

**Response**

The issues raised are considered to be outside the scope of the Chatswood to Sydenham project.

## 8.4 Stakeholder and community engagement

### 8.4.1 Consultation prior to exhibition

Thirty-one submissions raised issues regarding consultation prior to exhibition of the Environmental Impact Statement.

**Stakeholder identification numbers**

10, 15, 28, 31, 32, 33, 67, 82, 104, 106, 110, 115, 116, 117, 119, 121, 122, 123, 124, 135, 143, 144, 160, 162, 163, 177, 239, 241, 249, 266, 269

**Issue raised**

In summary, the submissions raised the following issues:

- Not enough information has been provided to the community and the community has not been involved in the planning process
- Government is encouraged to listen to residents about their needs and concerns. The current government has a poor track record in managing both environmental impacts and community consultation in respect of projects such as WestConnex and the CBD and South East Light Rail

- There has been inadequate consultation with residents around Alexandria, St Peters and Erskineville regarding additional stations and transport needs
- Those to be most impacted by the project at the Chatswood dive site were not properly consulted with at the outset
- The options leading to the decision for the current Chatswood dive structure option 3 was not brought to the attention of the public until at the first public meetings. As a consequence the bulk of the public to be impacted by the dive structure options were not in attendance at that meeting. The feedback from the public at those meeting led to the decision of the dive structure location being moved away from St Leonards
- Concern regarding the lack of information regarding noise issues at the Chatswood dive site provided during previous contact with Sydney Metro
- Residents and tenants around Crows Nest Station have not been consulted
- Concern as to whether the community has been consulted regarding the proposed changes at Unwin's Bridge Road (new right turn from May Street), and the removal of parking on Edinburgh Road around the Marrickville dive site
- There has been inadequate notification of landowners above the tunnels. As a result there has not been sufficient time to make a submission
- Concern regarding lack of consultation with residents in Lord Street, Newtown about property damage, values, and acquisition
- There has been inadequate notification of tunnelling activities associated with the project
- Concern regarding the level of publicity and consultation held for Victoria Cross Station.

### Response

As outlined in Chapter 5 of the Environmental Impact Statement, community engagement around the extension to the Sydney Metro network, including Chatswood to Sydenham, commenced in June 2014.

Almost two years of engagement around an extension to the Sydney Metro network occurred, prior to the statutory required consultation. The aim of this consultation was to gather feedback during the development of the project and feed into the preparation of the environmental impact assessment.

Information has been provided to the community via stakeholder meetings, three media releases, 41 advertisements, seven fact sheets, two newsletters delivered to 220,000 properties within one kilometre of the proposed route, five project booklets (Environmental Impact Statement Summary, brochures, project overviews, project updates), two online forums, updates across three website, and information provided at two community information centres. The community was also invited to attend eight community information sessions in June 2015, and six sessions and two information stalls in May and June 2016.

Properties immediately adjacent to future construction sites or identified as being potentially affected by the project were either doorknocked by Transport for NSW Place Managers or meetings requested with major landowners and tenants to ensure they were aware of the project, the extent of the works and were provided with information to help them make a submission on the project.

Project scope consultation and engagement with the community and stakeholders occurred in June 2015. During this project scope engagement period, the online forum sought public feedback on the proposed station options under consideration (Artarmon Industrial Area, Crows Nest or St Leonards, Barangaroo, Waterloo or The University of Sydney). Further consultation was undertaken in November 2015 which confirmed stations at Crows Nest and Barangaroo and advised of the ongoing investigations into a proposed metro station at either Waterloo or The University of Sydney. This was followed by the announcement of Waterloo Station in February 2016. Consultation in June 2015 also sought feedback on the potential locations of the northern dive structure. The majority of feedback at this time supported the project being in tunnel from the Chatswood area rather than from St Leonards.

Transport for NSW will continue to engage closely with stakeholders and affected properties owners and occupiers through all stages of design, planning, and construction. Further information regarding consultation during construction is provided in Chapter 4 of this report.

### 8.4.2 Consultation during exhibition

Twenty-three submissions raised issues regarding consultation during exhibition.

**Stakeholder identification numbers**

43, 46, 47, 76, 77, 85, 87, 88, 94, 104, 121, 143, 151, 173, 204, 248, 255, 262, 263, 264, 267, 273, 301

**Issue raised**

In summary, the submissions raised the following issues:

- Concern regarding the process available to objectors which impacts on the nature and detail of submissions
- The time period allowed for exhibition of six weeks is simply not feasible for objectors to consider the implications of the proposal, obtain legal and expert advice, and subsequently time to call meetings to consider that advice and the impacts of the proposal
- The exhibition period should be extended to allow more time for community engagement
- Request for the exhibition period to be extended
- The community information sessions for the Chatswood dive site were useful
- Appreciation for the opportunity to attend the drop in session at McMahons Point in May 2016 to meet with industry providers
- Support for the opportunity to contribute feedback to the community engagement process
- There was inadequate time between the public meeting regarding Central Station and the close of Environmental Impact Statement exhibition to construct a submission

**Response**

The minimum public exhibition period for State significant infrastructure is 30 days, as per clause 194 of the *Environmental Planning and Assessment Regulation 2000*. The Sydney Metro City & Southwest Chatswood to Sydenham Environmental Impact Statement was placed on public exhibition for a period of 48 days.

Six community information sessions and two community information stalls were held across the project alignment during the exhibition period and available for all stakeholders and the community to attend. Attendance at an information sessions was not essential. All information available at the sessions and stalls was also available on the project website and the project team was available and continues to be available to answer any questions or requests for information by phone and email.

### 8.4.3 Future consultation

Eleven submissions raised issues regarding future consultation.

**Stakeholder identification numbers**

104, 110, 121, 142, 143, 155, 206, 228, 236, 266, 297

**Issue raised**

In summary, the submissions raised the following issues:

- A local community consultative committee should be formed for the Chatswood dive site
- Request for staff with cross-cultural communication skills be appointed to the Chatswood dive site. This person should be available in person, by phone or by email
- Request for a community meeting with a metro representative for Chatswood West Ward Progress Association
- Request that an Engineers Report be provided to receivers around Crows Nest on the regular basis during construction
- Request for consultation in writing of any release of future information for commercial properties at 7-39 Mandible Street and 27-41 Hiles Street, Alexandria
- Suggestion that additional public meetings be held closer to the Victoria Cross site
- Suggestion to undertake regular meetings with an Owners Group around Victoria Cross Station and Martin Place Station to inform affected parties about imminent works, road closures, pedestrian impacts and general updates on the progress of the project
- Detailed stakeholder consultation with the Ethnic Communities Council (ECC) and land owners must be carried out prior to construction works at Waterloo, including:
  - Involvement in preparing mitigation measures
  - Ongoing consultation with the website updated on a regular basis, including details for construction timeframes, work zones, road closures and complaint handling procedures
  - Bus stop location and bus service changes to be sent to ECC, residents and landowners to allow time to adjust travel arrangements
  - Involvement in any future consultation regarding the metro project in Waterloo
- Request more meaningful consultation with residents of Alexandria, St Peters and Erskineville

**Response**

Transport for NSW would continue to engage closely with stakeholders and affected properties owners and occupiers through all stages of design, planning, and construction.

The Construction Environmental Management Framework (Appendix B of this report) provides the communication and consultation strategy for the project. A range of communication methods would be used including construction notifications, doorknocks, emails, newsletters, advertising, meetings and briefings to communicate the progress of works, impacts and mitigation measures to affected stakeholders. Further information on consultation during construction is provided in Chapter 4 of this report.

Transport for NSW uses the Australian Government Translating and Interpreting Services. Any member of the community requiring interpreting services to understand project information can contact the project team via the interpreting service on 131 450.

# 8.5 Project description – operation

## 8.5.1 Characteristics of the metro product

Sixty submissions raised issues regarding characteristics of the metro product.

### Stakeholder identification numbers

9, 13, 43, 46, 47, 76, 77, 81, 85, 87, 88, 96, 114, 118, 122, 125, 131, 146, 149, 151, 160, 171, 172, 180, 204, 216, 218, 221, 229, 236, 240, 248, 250, 251, 257, 258, 261, 263, 264, 267, 271, 272, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 296

### Issue raised

In summary, the submissions raised the following issues:

- Support for straight platforms with secure passenger barriers
- Support for single deck trains with short dwell time and good ingress / egress from stations
- At least half of the train carriages should be quiet zones
- Concern regarding safe train access arrangements for people with special needs
- The proposal indicates that the metro tracks and wheels will be constructed from steel even though rubber tracks and wheels are best modern practice (examples in Paris, Montreal, Kobe and Mexico City)
- The current Environmental Impact Statement does not include a seating plan or carriage dimensions
- Suggestion of car style seats in at least some carriages and seat displays showing arrival time at destinations
- Concern regarding the comfort and safety of seating and standing arrangements on metro trains with a higher proportion of customers standing, particularly for customers with limited mobility, customers with prams, customers with children and women
- Concern regarding the small number of seats in the metro product and the height of the standing support 'hangers' provided
- Single deck trains should be fitted with traverse seating to increase the seating capacity by at least 50 per cent
- Concerns that the metro line is only being designed to cater for single deck trains. Suggestion that tunnels be designed to cater for double deck trains
- Suggestion that more capacity can be achieved with double deck trains compared with the single deck metro product
- Suggestion that double deck trains can run at the same or similar frequency to the metro product
- Concern that the metro product will downgrade the existing double deck train system and result in a deterioration of comfort and capacity by requiring passengers to stand
- Concern regarding driverless trains and reduction of staff at stations, particularly regarding efficiency of emergency procedures and assistance for customers in medical, violent or otherwise dangerous situations. Suggestion that a staff member in on board metro trains for 'incident control'
- The metro product does not effectively integrate with Sydney's existing train network
- Safe entry, exit and storage of bicycles should be accounted for in train design
- Suggestion to integrate the metro product with the Opal ticketing system

### Response

The metro product characteristics are described in Section 6.2.2 of the Environmental Impact Statement.

The metro product would provide level access between the platform and the train, reduced gaps between the platform and the train and three double doors per side per carriage. These features allow efficient and safe boarding and alighting for customers with special needs. The Operations Control Centre is responsible for monitoring railway operations, including activities on platforms and trains. If customers with special needs require additional time to board and alight trains, they may contact Customer Service Attendants or the Operations Control Centre, and the Operations Control Centre will extend the time the train is held at the platform. Station staff would also be available to provide assistance. The metro trains would provide a comfortable, reliable and safe service for customers. Other features of the metro would include:

- Air conditioned trains
- A mixture seating and standing room to maximise personal space
- Plenty of grab handles for standing customers
- Space on trains for the mobility impaired, the elderly and parents with prams
- Customer service assistants at every station and moving through the network
- Communication-based train control and advanced technology to safely run driverless trains
- Platform screen doors to keep people and objects away from the edge
- Designing for bicycles on trains
- Integration with the opal ticketing system.

The metro network would include interchange capability with the existing Sydney Trains network at strategic locations. This includes Martin Place and Central stations. Interchange would also be available at Epping, Chatswood and Sydenham stations as part of other stages of Sydney Metro.

The metro trains would be able to carry more customers per hour than the current trains on the Sydney Trains network. Chapter 3 of the Environmental Impact Statement identifies that the reliable capacity of an existing Sydney Trains double deck train is about 1,200 passengers. With the Sydney Trains network generally being limited to 20 trains per line per hour, this equates to a reliable capacity of around 24,000 passengers per line per hour. In contrast, a Sydney Metro single deck train would have an ultimate capacity of 1,500 passengers. At the ultimate capacity of 30 trains per hour, this equates to around 45,000 passengers per hour.

Some other metro authorities specify rubber wheeled vehicles for a range of considerations. Strict operational noise levels have been specified for Sydney Metro. Potential operational noise and vibration impacts are assessed in Chapter 11 of the Environmental Impact Statement and conclude that the project would comply with the operational ground-borne noise and vibration design objectives at all receivers. The project has also been designed to minimise potential airborne noise impacts.

### 8.5.2 Tunnel design

Thirty-three submissions raised issues regarding tunnel design.

**Stakeholder identification numbers**

50, 51, 53, 82, 96, 114, 122, 143, 172, 218, 249, 251, 257, 258, 272, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 296

**Issue raised**

In summary, the submissions raised the following issues:

- Concern regarding the location of any proposed fire escapes from the metro tunnels
- Safety concerns regarding the evacuation procedures within the tunnel as it does not cater for customers with limited mobility
- Suggestion that the tunnel depth under buildings is overstated
- Concern regarding the tunnel alignment passing directly under properties
- Concern regarding the size and setbacks of the tunnels
- Request for the depth of Crows Nest Station to be increased
- Suggestion that tunnels should be a vertical pair rather than horizontal between stations in the Sydney CBD.

**Response**

The proposed tunnel alignment is shown on Figure 6-2 in Section 6.3.1 of the Environmental Impact Statement. This figure also provides the depth of the tunnel to the existing ground surface. It is recognised that in some locations building basements and footing would extend beyond the existing ground surface.

Wherever possible, the tunnels have been aligned along other transport infrastructure such as under road alignments rather than under residential properties. However, passing under residential properties is unavoidable in some circumstances. The operational noise and vibration assessment, presented in Chapter 11 of the Environmental Impact Statement predicts that noise levels from trains would comply with the relevant guidelines (in particular the *Rail Infrastructure Noise Guideline*). The alignment through the Sydney CBD, with the tunnels being arranged horizontally, allows each tunnel to be aligned beneath a road reserve (to avoid building basements) and keeps the stations at acceptable depths. Potential issues associated with the presence of unknown basements are addressed in Sections 8.3.5 and 8.10.5 of this report.

The depth of the tunnels has been influenced by the vertical grade requirements of the running track, the need to avoid existing underground structures and the desire to keep stations as shallow as possible to facilitate easy access to the stations.

Section 6.3.2 of the Environmental Impact Statement details the anticipated emergency access and exit arrangements from the tunnels. A raised walkway would be provided throughout the tunnels to provide emergency access and exit. These walkways would be the same height as the train floor so customers could evacuate in an emergency. Cross-passages would also be provided between the two tunnels at interval of around 240 metres.

### 8.5.3 Surface track

Six submissions raised issues regarding the surface track.

**Stakeholder identification numbers**

15, 110, 206, 228, 236, 241

**Issue raised**

In summary, the submissions raised the following issues:

- Concern regarding construction of the Chatswood dive site on two sides of the rail corridor – the dive site to the south and surface track to the east
- Suggestion to replace the existing steel bridge with a low-noise concrete bridge to span Brand Street, Artarmon, which has the benefit of allowing Sydney Trains better graded and curved tracks at Brand Street
- Recommendation to separate metro and existing heavy rail tracks near Chatswood
- Do not build the rail cross-over at Nelson Street / Gordon Avenue to avoid removal of Nelson Street bridge
- Concern regarding the removal of an existing maintenance point south of Chatswood Station and the staircase from Nelson Street bridge which is used for police, rail maintenance teams, graffiti removalists and the digital radio tower maintenance teams. The removal of this access point will reduce the level of safety for these workers.

**Response**

The surface tracks at Chatswood are required to integrate the metro tracks with the existing Sydney Trains tracks between Chatswood Station and the dive structure. To provide efficient operation this would require the relocation of the Sydney Trains tracks to provide space for the metro tracks and grade separation between the two tracks. This work is described and assessed in the Environmental Impact Statement.

The grade separation needs to occur to the south of Chatswood Station to allow trains to get back to the required grade at Chatswood Station. This grade separation results in the need to demolish Nelson Street bridge. Impacts of the demolition of Nelson Street bridge are assessed in the relevant chapters of the Environmental Impact Statement, particularly Chapter 8 (Construction traffic and transport) and Chapter 9 (Operational traffic and transport).

The relocation of the Sydney Trains tracks also requires the removal of the existing Hopetoun Avenue maintenance access point. Consultation has been carried out with Sydney Trains to ensure that alternative maintenance access points are available and that maintenance works can be carried out safely.

The replacement of the existing rail bridge over Brand Street is outside the scope of the Sydney Metro City & Southwest Chatswood to Sydenham project.

### 8.5.4 Station design

Fourteen submissions raised issues regarding station design.

**Stakeholder identification numbers**

1, 9, 13, 30, 69, 71, 96, 137, 159, 179, 216, 221, 240, 250

**Issue raised**

***General station design***

In summary, the submissions raised the following issues:

- Request to ensure that escalators and station entry / exit gates to have copious spare capacity to enable speedy entry and exit of passengers
- Concern regarding the provision of accessible toilets, or identification of nearby accessible toilets outside the station
- The metro system lacks a siding at stations for express services to pass. Inner city stations should have two levels – one for northbound and one for southbound
- There should be three platforms to allow passenger to exit or enter on both side of the train
- Concern regarding the design of the city stations to accommodate large crowds during events like Vivid and New Year's Eve
- The current Environmental Impact Statement does not show how passengers will be able to enter and exit the metro stations
- The station design does not integrate with current rail networks or future metro lines. No time-saving cross platform interchanges have been suggested to improve passenger transits
- Access locations should be designed for convenience and to minimise walking distances and overall travel time for passengers
- The project description does not show or describe where services to "assist customers achieve their daily tasks" are in the interchange or precinct
- More detail is needed on each station to understand the operational stage of the project and, hence, the impact of the project.

***Design of Crows Nest Station***

In summary, the submissions raised the following issues:

- Underground access between the services building and development sites should be seriously considered at Crows Nest Station as there is much traffic along Hume Street. Close cooperation with Roads and Maritime Services will be required to improve the crossing with the Pacific Highway
- The Environmental Impact Statement does not say what the Crows Nest Station buildings will have at street level. Suggestion for retail or similar uses facing the street for passive surveillance and interest on Pacific Highway and Hume Street.

### *Design of Victoria Cross Station*

In summary, the submissions raised the following issues:

- The Environmental Impact Statement does not give adequate consideration to the extension of the existing underground pedestrian links to provide for a more efficient and weather-protected link to the existing North Sydney Station via Greenwood Plaza
- The Environmental Impact Statement does not provide any contingency measures in the event that Denison Street, North Sydney, cannot be fully pedestrianised due to the existing loading arrangements
- Concern regarding the design and scale of the future services building at Victoria Cross.

### *Design of Martin Place Station*

In summary, the submissions raised the following issues:

- Concern regarding the underground Martin Place Station platforms
- Suggestion to retain some form of underground access between Martin Place at Castlereagh Street and the existing Martin Place Station concourse
- Support for an additional station entry / exit at Bligh Street and O'Connell Street for the Martin Place Station
- Entry point to Martin Place Station and bus layover area suggested at O'Connell Street
- The Tom Bass Sculpture should be re-installed where it is now or on the Martin Place Station façade by Transport for NSW.

### *Design of Pitt Street Station*

In summary, the submissions raised the following issues:

- Location of the Park Street entry to Pitt Street Station loses proximity to the future public square between Pitt Street and George Street. Integration of Pitt Street Station with an underground retail arcade connection should be pursued

### *Design of Central Station*

In summary, the submissions raised the following issues:

- The northern entry plaza at Central Station should be enlarged as it is already crowded during peak hours. This could be achieved by removing the eastern commercial shops
- A southern entry plaza at Central Station should also be considered off Railway Square and Devonshire Street tunnel to increase links to the bus interchange at Railway Square
- The Central metro platforms need improved access at the southern end of Railway Square because this is where there is more public transport patronage from universities and future developments
- Suggestion to number metro platforms at Central Station 14 and 15 and re-number existing heavy rail platforms appropriately
- Concern regarding the increase in passenger numbers at Central Station. The metro design does not appear to increase the capacity of the station or passenger movements
- Clarification is sought as to whether a pedestrian connection at Central Station from the southern end of the new metro concourse into the existing pedestrian network would be constructed
- Suggestion that dual-sided entry / exit from metro trains at Central be provided to increase efficiency of passenger movements.

### *Design of Waterloo Station*

In summary, the submissions raised the following issues:

- The entry plaza at Waterloo should be enlarged to connect Cope Street and Botany Road to the bus stops on Botany Road and make access easier and more visible to Australian Technology Park and residents
- Waterloo Station should have an entrance to connect directly with Botany Road bus stops
- Suggestion to incorporate a pedestrian underpass under Botany Road at Waterloo.

**Response**

### *General station design*

The proposed station features and designs are described in Section 6.6 of the Environmental Impact Statement. Further details and guiding principles for ongoing design development of each station is provided in the Chatswood to Sydenham Design Guidelines (Appendix A of this report).

In general, interchange arrangements at stations have been designed following the station access hierarchy which prioritises walking and cycling, followed by public transport.

The details of how customers would enter and exit each stations are subject to detailed design, however indicative arrangements have been provided in Section 6.6 of the Environmental Impact Statement. Some key design features and principles of the stations include:

- All stations have been designed with sufficient vertical transport and internal space for anticipated customer demand in 2056
- Relevant stations have been designed to cater for special events (for example, Barangaroo Station)
- Efficient interchange has been provided at relevant stations (for example, Martin Place Station provides a platform to platform connection to the existing Sydney Trains platforms)
- All stations would provide accessible toilet facilities behind the gateline
- Convenient interchange with existing Sydney Trains services is provided at strategic points including Martin Place and Central Station. Although cross platform interchange is not feasible at these locations, cross platform interchange is provided at Chatswood Station as part of Sydney Metro Northwest.

### *Design of Crows Nest Station*

Transport for NSW is conducting further work to determine the feasibility of safeguarding a link from Crows Nest Station to the western side of Pacific Highway. There are a number of constraints which are being investigated including:

- The link would be into the paid side of station and would require an extra gateline
- The shallow station depth constrains potential opportunities for an underground pedestrian link
- Unknown services underneath Pacific Highway
- Potential conflict with existing underground car parks
- Customer catchment on the western side of the Pacific Highway is limited due to steep grades and relatively easier access to Wollstonecraft Station.

Street level building use at Crows Nest Station would be determined during detailed design in consultation with relevant stakeholder. This would follow the place-making principles described in the Chatswood to Sydenham Design Guidelines (Appendix A of this report).

### *Design of Victoria Cross Station*

Victoria Cross Station is not proposed to provide a significant interchange function with the Sydney Trains network. This capability is provided at other stations on the Sydney Metro network including Central, Martin Place and Chatswood. As such, there are no plans to provide an underground connection between the metro station and the existing North Sydney Station. Notwithstanding, customers who wish to interchange in this location would be able to walk between the stations using the existing footpath network.

Transport for NSW is working with North Sydney Council and other relevant stakeholders regarding potential upgrades to Denison Street to provide an optimum outcome for pedestrian movements and access arrangements to existing buildings.

The design of the services building at Victoria Cross Station would be guided by the Chatswood to Sydenham Design Guidelines (Appendix A of this report). These guidelines provide specific requirements in relation to services, as well as requirements regarding land use and heritage integration.

### *Design of Martin Place Station*

Transport for NSW is proposing to reinstate areas of Martin Place affected by construction consistent with the City of Sydney's masterplan. This includes the relocation of the station entries within Martin Place to improve the public domain. The addition of a new metro entrance, with a direct connection to the existing Martin Place Station would provide the opportunity to fulfil this desire while maintaining suitable station entries.

Transport for NSW is safeguarding an additional station entry from O'Connell Street. Further details regarding this future pedestrian link and safeguarded entry are provided in Section 3.3 of this report.

Street level activation at Martin Place Station would be determined during detailed design in consultation with relevant stakeholders. This would follow the place-making principles described in the Chatswood to Sydenham Design Guidelines (Appendix A of this report).

Mitigation measure LV15 in the Environmental Impact Statement identifies that the P&O Fountain at 55 Hunter Street (the Tom Bass sculpture) would be reinstated at a location determined in consultation with City of Sydney Council. Additionally, consultation has commenced with the Tom Bass Studio and access to his archives relating to this piece has been provided. Further notification would occur regarding moral rights.

### *Design of Pitt Street Station*

The design of the station entry locations at Pitt Street would be subject to detailed design. This would consider the anticipated passenger distribution around the station and efficiency of interchange with other transport modes. The design of Pitt Street Station would safeguard a potential future underground connection to the future Town Hall Square.

The design of the above ground station buildings would be guided by the Chatswood to Sydenham Design Guidelines (Appendix A of this report). This includes consideration of adjacent heritage items.

### *Design of Central Station*

The enlargement of the Eddie Avenue plaza entry, eastern entry and western entry are outside the scope of the Sydney Metro project. Transport for NSW is currently investigating options to improve pedestrian movements within Central Station.

The metro stations and trains would facilitate efficient boarding and alighting by providing platform screen doors and three doors per carriage per side. There is no need to provide dual sided entry and exit platforms to cater for the boarding and alighting at Central Station.

### *Design of Waterloo Station*

The urban design of Waterloo Station is being carried out in consultation with UrbanGrowth NSW and other stakeholders to provide a good amenity for customers. The station entry design would facilitate easy transfers between Sydney Metro and buses along Botany Road.

## 8.5.5 Design of ancillary facilities

Seven submissions raised issues regarding the design of ancillary facilities.

**Stakeholder identification numbers**

50, 74, 173, 206, 228, 236, 273

**Issue raised**

In summary, the submissions raised the following issues:

- Suggestion for the Artarmon substation to be built in the Artarmon Industrial Area to limit impacts on future residents
- Concern regarding the presence of mobile phone transmitters in the tunnels and request for them not be located below Blues Point
- Concern regarding the construction of any permanent above-ground structures proposed in McMahons Point in connection with the metro tunnels, including any proposed air vents
- Physical details of Sydney Yard Access Bridge construction are unclear.

**Response**

In response to the issues raised by Council and local residents surrounding the site at Barton Road / Butchers Lane, Artarmon, Transport for NSW has commenced investigations into an alternative site for the Artarmon substation within the Artarmon Industrial Area. Confirmation of an alternative site would be dependent on meeting criteria for siting. These criteria include:

- being directly located above the track running tunnels
- be accessible by a public road
- be located such that compliance with relevant NSW noise policy guidance may be achieved.

It is anticipated the site location and property requirements would be identified following determination of the project and a supplementary environmental review / assessment would be carried out and, if necessary, the appropriate approvals obtained.

Confirmation of a suitable alternative site would result in the requirement for the land at Barton Road / Butchers Lane being removed from the project.

The location of any mobile phone transmitters within the tunnels would be determined during detailed design. This provision of this infrastructure would not have any impact on people above the tunnels. The Environmental Impact Statement commits to meeting the exposure standards of the *Draft Radiation Standard – Exposure Limits for Magnetic Fields* (Draft Radiation Standard) (Australian Radiation Protection and Nuclear Safety Agency, 2006).

There are no plans for any permanent infrastructure at the Blues Point temporary site. This site would be used to support construction only and would be reinstated following construction activities.

Section 6.9.2 of the Environmental Impact Statement provides an indicative plan and long section of the Sydney Yard Access Bridge, along with preliminary design principles. Section 2.5 of this report provides a more detailed set of design principles and guidelines in recognition of the sensitive visual and heritage setting in which the bridge would be placed.

### 8.5.6 Design guidelines

Seven submissions raised issues regarding the Chatswood to Sydenham Design Guidelines.

**Stakeholder identification numbers**

25, 75, 131, 159, 271, 297

**Issue raised**

In summary, the submissions raised the following issues:

- New stations should incorporate Aboriginal heritage and identity (both traditional and contemporary) of the area. Relevant stakeholders should be included such as the Metropolitan Local Aboriginal Land Council, NSW Aboriginal Education Consultative Group and Aboriginal Heritage Office
- Concern regarding power use from partitioned off platforms, video surveillance and other technology
- The preferred project should include sufficient detail on the design intent of the new underground CBD stations. Any above-station commercial activation should be a secondary consideration which supports, rather than competes with, the achievement of public accessibility goals
- Concern regarding adequate seating at stations for waiting passengers
- Suggestion that an education program could be developed around the project construction similar to Barangaroo
- Pitt Street Station should be renamed Park Street Station to better reflect its location
- Crime Prevention Through Environmental Design (CPTED) principles must be considered and implemented as part of the design of Waterloo Station

**Response**

The Chatswood to Sydenham Design Guidelines (Appendix A of this report) would guide the ongoing design development of the project. These guidelines have been updated in response to submissions to the Environmental Impact Statement (refer to Appendix A of this report). The following responses are provided to specific issues raised:

- The design guidelines include consideration of Aboriginal and non-Aboriginal interpretation into the design. This is also reflected in mitigation measures NAH8 and AH4
- The design guidelines provide for consideration of minimising energy use. Further mitigation measure SUS10 identifies that 100 per cent of greenhouse gas emissions associated with consumption of electricity during operation would be offset
- The design intent of each proposed station is provided in the design guidelines. Over station development would be subject to a separate planning approval process. It is intended that the Sydney Metro Design Review Panel would also apply to the over station development, particularly to ensure its integration with the station elements
- The provision of seating at stations would be subject to detailed design. This would be carried out in accordance with the design guidelines
- Wayfinding and signage would be carried out in accordance with the design guidelines. The design guidelines specific that information displayed in wayfinding and signage would include destinations in the local precinct
- The potential for education programs would be considered by construction contractors

- The proposed name of the metro stations would be subject to consultation with the Geographical Names Board of NSW
- The dive sites would be located within the existing rail corridor and therefore would not be available for development as public open space
- All aspects of the project would be subject to Crime Prevention Through Environmental Design principles.

### 8.5.7 Metro operations

Seven submissions raised issues regarding metro operations.

**Stakeholder identification numbers**

13, 179, 216, 230, 239, 253, 271

**Issue raised**

In summary, the submissions raised the following issues:

- Concern regarding the performance and interruption of driverless trains during heavy rain and flooding
- Suggestion to operate the metro network for 24 hours per day
- The Environmental Impact Statement does not adequately provide information on the depot, stabling or maintenance facilities
- Concern regarding lengthy shutdown, start-up and maintenance procedures without a metro stabling facility close to the southern terminus
- Concern regarding the adequacy of maintenance and stabling facilities associated with the project and related impacts including time and maintenance efficiencies
- Concern regarding the integration of ticketing with the existing public transport system and whether there will there be two tiers of ticket prices for the two rail systems
- The metro network would be operated from a new centralised operations control centre at Rouse Hill, while the government is spending $276 million on developing a new Sydney Trains Rail Operations Centre at Green Square. The operation of the metro network should be integrated with the Sydney Trains network to ensure safety and cost efficiencies are maximised.

**Response**

The following responses are provided to specific issues raised:

- The risk of flooding affecting operations of the project is very small, as the tunnels would be designed to avoid water ingress. The aboveground track between the Marrickville dive site and Sydenham Station are part of the Sydenham to Bankstown upgrade project. The Sydenham to Bankstown upgrade project will be subject to a separate environmental assessment process which will consider flooding impacts and mitigation
- Section 6.11.4 of the Environmental Impact Statement provides information regarding the expected operational hours of the metro network. The operating hours would be determined as part of the development of the services schedules for the project taking into account customer and maintenance access requirements

- Information on stabling and maintenance is provided in Section 6.11.7 of the Environmental Impact Statement. This section identifies that stabling and maintenance would occur at the Sydney Metro Trains Facility in Rouse Hill which has sufficient capacity to serve the Chatswood to Sydenham project. Any additional stabling requirements to serve the expanded Sydney Metro network would be delivered and assessed as part of the Sydenham to Bankstown upgrade project
- The project would be integrated with the existing Opal electronic ticketing system. Ticket pricing for all transport is determined by Independent Pricing and Regulatory Tribunal of New South Wales (IPART), and by NSW Government policy. The NSW Government reviews this pricing annually and may consider a change to the Opal policy at any time. Any Sydney Metro service pricing would be in line with pricing review in the same way as other trains, buses, light rail and ferry services are considered
- The Sydney Metro network would operate within a fully integrated transport network. In the event of service disruptions on the metro network, segregated operations would allow other heavy rail services to be maintained. The Transport Management Centre will remain central to the coordination of all modes of transport, whether normal daily running or when problems occur. The Transport Management Centre has multi-modal coverage extending beyond the Sydney Trains rail network, and covers multiple bus operators, light rail and other road traffic, as well as emergency services. There will be interface agreements in place between the Metro operator and Sydney Trains to ensure coordinated operations at key locations such as Martin Place, much like the interface arrangements in place between Sydney Trains and ARTC, whose operations are controlled remotely from Junee near the NSW border.

## 8.6 Project description – construction

### 8.6.1 Construction program

Nine submissions raised issues regarding the construction program.

**Stakeholder identification numbers**

82, 84, 94, 98, 105, 142, 239, 249, 297

**Issue raised**

In summary, the submissions raised the following issues:

- The seven year construction program at the Chatswood dive site will impact on day to day living
- Request the construction timeframe be clearly defined and reduced at Crows Nest Station
- Concern regarding 24 hour per day construction for four years at Crows Nest Station
- Concern regarding the length of the rehabilitation period for the reserve land at Blues Point after work is completed
- A detailed construction timetable for Waterloo Station should be prepared in close liaison with Roads and Maritime Services, City of Sydney Council, Urban Growth NSW and the Department of Family and Community Services.

**Response**

The construction program provided in the Environmental Impact Statement represents a realistic timeframe to complete construction of the project. The construction program aims to provide a balance between the efficient completion of construction and minimising impacts to adjacent receivers. Issues regarding the construction program are commonly related to the duration of amenity impacts. Specific amenity impact issues raised in the context of the program are addressed in the other sections of this report, including:

- Construction traffic and transport in Section 8.7
- Construction noise and vibration in Section 8.9
- Construction visual amenity impacts in Section 8.15
- Air quality impact in Section 8.21.

Blues Point temporary site would be rehabilitated in consultation with North Sydney Council. The duration of these works would be refined as part of this process.

Further, detailed construction programs would be developed during construction planning. This would take into account the issues raised, including conditions of approval from the Minister for Planning.

Consultation with the community regarding the construction program would continue prior to and during the construction of the project. Further information regarding consultation during construction is provided in Chapter 4 of this report.

### 8.6.2 Tunnel construction

One submission raised issues regarding tunnel construction.

**Stakeholder identification numbers**

96

**Issue raised**

In summary, the submission raised the following issues:

- Request for further detail on the method of tunnel construction
- Concern regarding the tunnelling approach under Sydney Harbour and the belief that it is likely sediment will liquefy on disturbance – it is unlikely that grout injection will suffice

**Response**

Section 7.6 of the Environmental Impact Statement provides a description of the tunnel construction methodology. This section describes the proposed tunnelling methods, equipment types, launch and support sites, fit-out and ancillary tunnelling construction methods. Further construction information would be developed as part of detailed construction planning.

The proposed method of tunnelling under Sydney Harbour and the preferred approach for ground improvement has been determined based on geotechnical investigations and the current understanding of the ground conditions. The options assessment for different ground improvement methods is provided in Section 4.6.3 of the Environmental Impact Statement.

### 8.6.3 Station construction

Two submissions raised issues regarding station construction.

**Stakeholder identification numbers**

14, 142

**Issue raised**

In summary, the submissions raised the following issues:

- Request for a different construction method to be used at Crows Nest other than cut-and-cover
- Concern regarding the demolition of buildings around Martin Place to provide access to the metro stations. Suggestion that these buildings should remain and the entrance to the station should be built within the buildings or relocated elsewhere

**Response**

The decision regarding the construction method at each station considers a range of factors including the depth of the station and existing land use constraints above the station. To provide optimal customer outcomes, a design objective has been to keep stations as shallow as possible to minimise vertical transport travel times. The optimal station depth is around 20-25 metres. This depth cannot be constructed using a mined technique.

At Crows Nest Station, there are few underground constraints meaning an optimal station depth of around 25 metres can be provided by cut-and-cover technique.

In relation to Martin Place, the retention of buildings above the station would not provide the necessary space to support construction works. This would likely result in a substantial increase in the construction program due to inefficient excavation rates and methodology.

### 8.6.4 Location and layout of construction sites

Twenty-four submissions raised issues regarding the location and layout of construction sites.

**Stakeholder identification numbers**

48, 50, 58, 66, 70, 74, 84, 91, 92, 95, 112, 166, 173, 178, 190, 200, 212, 213, 215, 228, 239, 242, 247, 273

**Issue raised**

In summary, the submissions raised the following issues:

- Concern regarding the proximity of the Chatswood dive site to residential properties and the impact of associated construction activities
- Concern regarding the water treatment plant, dangerous goods storage and workshop and impacts on residents located close to the Artarmon substation
- Objection to the location of the Crows Nest Station construction site
- Opposition to the use of Blues Point as a construction site
- The government must explore other options for the establishment of a construction site at Blues Point
- The Blues Point site appears to be unnecessary and will impact local residents

- Further investigation should be carried out into alternatives to the use of Blues Point as a construction site such as:
  - Victoria Cross Station
  - Barangaroo Station
  - The disused rail line along Sawmillers Reserve
  - Dismantle the tunnel boring machine equipment underground (within the tunnel) and retrieve via the tunnel back to Victoria Cross and Barangaroo
  - Bury the equipment after use
  - Use barges instead of trucks to transport equipment
- Request for email notification as to where the sites are planned to bring rock waste to the surface in Blues Point and North Sydney
- Request for information on what other options were considered for the retrieval site other than Blues Point and why were they dismissed
- Request for the shaft at Blues Point to be located as far away from neighbouring residential properties as possible
- Concern regarding amenity impacts to the 54 Regent Street apartment building due to the location of the Sydney Yard Access Bridge construction site

### Response

Construction sites have generally been co-located with the operational infrastructure such as stations and dive structures to minimise property acquisition requirements. The options assessment process for these elements is provided in Section 3.4.4 and 4.7 of the Environmental Impact Statement.

The location of infrastructure within the Artarmon substation site would consider the potential impacts to nearby receivers. For example, plant and equipment would be located and orientated to minimise noise impacts to adjacent receivers. Storage of dangerous goods would be located to meet State environmental policy requirements – namely *State Environmental Planning Policy No. 33 – Hazardous and Offensive Development*. Additionally, Transport for NSW is continuing to investigate an alternative site for the Artarmon substation within the Artarmon Industrial Area.

The Blues Point temporary site is required due to the tunnelling methodology and anticipated ground conditions under Sydney Harbour which requires a specialised tunnel boring machine. This requires sites on either side of the harbour for the launch and retrieval of the machine, with the majority of work required at the launch site. As the tunnelling process involves the erection of tunnel lining as tunnelling progresses, it is not feasible to retrieve the cutter head and shield of the tunnel boring machine at the launch site. Barangaroo Station was chosen for the launch site due to its proximity to the harbour, its inclusion as part of the project as a station site and as it provides the necessary space to support the tunnelling activity.

A smaller site would be required on the other side of the Sydney Harbour to retrieve the tunnel boring machine components. Blues Point was chosen as it is located directly above the tunnels, thereby minimising the generation of spoil, and would not require the acquisition of private property.

Further responses to the specific issues raised in relation to Blues Point temporary site are as follows:

- The use of Barangaroo Station for the retrieval works was not feasible as the retrieval site needs to be located at the end of the tunnel drive. Barangaroo Station is proposed to be used as the launch site (ie the beginning of the drive)

- The use of Victoria Cross Station would result in the specialised tunnel boring machine operating through rock for a longer distance. This would result in a longer duration of impacts to residents surrounding the Barangaroo and Victoria Cross stations
- The disused rail line along Sawmillers Reserve is not located directly above the tunnels and would result in the generation of more spoil. Additionally, road access to this site would require the use of a number of local roads (rail access is not feasible as train paths are not available on the T1 North Shore Line)
- Burying the equipment underground is not a feasible solution as the tunnel boring machine would need to pass underneath Sydney Harbour twice to bore the two separate tunnels
- The use of barges to transport equipment has been investigated. Further details are provided in Section 3.2 of this report.
- The shaft at Blues Point would be positioned considering a range of factors, including minimising impacts to the community and providing an optimal construction outcome.

Potential amenity impacts associated with the Sydney Yard Access Bridge have been considered in the Environmental Impact Statement. Further responses to amenity issues in this location are provided in the relevant sections of this report.

### 8.6.5 Power supply routes

One submission raised issues regarding power supply routes.

**Stakeholder identification number**

236

**Issue raised**

The submission raised concern regarding the new power cables on the Pacific Highway near the Chatswood dive site.

**Response**

The proposed power supply route to the Chatswood dive site is shown in Figure 7-23 of the Environmental Impact Statement. The proposed route is from the Chatswood substation on the corner of Mowbray Road and Hampden Road directly across Mowbray Road to the site. There are no plans to run new power cables along the Pacific Highway in this location.

### 8.6.6 Construction hours

Four submissions raised issues regarding construction hours.

**Stakeholder identification numbers**

112, 130, 235, 236

**Issue raised**

In summary, the submissions raised the following issues:

- Concern regarding noise associated with demolition and excavation work undertaken outside of standard construction hours at the Chatswood dive site
- Suggestion to stop noise generating construction activities between 6-7 pm on Fridays and 8.30 am-12.30 pm on Saturdays at Pitt Street Station
- Concern regarding tunnelling works occurring 24/7 in the vicinity of Waterloo Station

### Response

The proposed construction working hours are provided in Section 7.11.3 of the Environmental Impact Statement. Generally, construction works would be restricted to the standard daytime construction hours of:

- 7 am to 6 pm Monday to Friday
- 8 am to 1 pm Saturday
- No work on Sundays and Public Holidays.

However, some activities such as tunnelling, station excavation and their supporting activities are proposed to be carried out up to 24 hours per day and seven days per week.

These proposed hours aim to provide a balance between minimising the intensity of impacts to the community, the duration of impacts to the community and the efficiency of the construction work. Responses to issues raised regarding the construction duration and program are provided in Section 8.6.1 of this report. Responses to the specific issues raised are provided below:

- Demolition works are generally proposed to be carried out during standard daytime hours. Excavation of stations is proposed to be carried out up to 24 hours per day and seven days per week. Since the development of the Environmental Impact Statement, construction planning has identified that rock breaking for cut-and-cover stations and station shafts (except for Central Station) would not be required outside of standard construction hours. Support station excavation activities would still occur up to 24 hours per day and seven days per week. Further information is provided in Section 9.6 of this report
- Tunnelling works are proposed to be carried out up to 24 hours per day and seven days per week. Section 10.4 of the Environmental Impact Statement provides an assessment of the potential ground-borne noise impacts. In the vicinity of Waterloo Station, there are predicted to be exceedances of the ground-borne noise management levels of up to 10 dB. These exceedances would be expected to occur for a few days for each tunnel boring machine. These impacts would be managed in accordance with the Construction Noise and Vibration Strategy (Appendix C of this report).

Responses to specific issues raised regarding construction noise issues and the duration of construction noise issues are provided in Section 8.9 of this report

## 8.6.7 Other construction issues

Three submissions raised other construction issues.

### Stakeholder identification numbers

50, 74, 231

### Issue raised

In summary, the submissions raised the following issues:

- Concern regarding impacts on residents from tunnelling and station construction and fitout in Chatswood and Naremburn. Mitigation measures to minimise duration and severity of impacts should be implemented
- Concern regarding any blasting proposed in the vicinity of the Blues Point site
- Concern regarding strong winds at Blues Point blowing fencing and equipment onto the road

- Confirmation sought regarding the location of the proposed on-shore site facility for the treatment of slurry from the Sydney Harbour ground improvement works
- Concern regarding construction at Pitt Street Station, including:
  - Potential presence of hazardous substances
  - Protection of adjoining buildings (safe work, access, structural integrity, vibration, concussion, weather proofing, air quality controls, noise mitigation and maintenance of common / public services)

**Response**

The potential impacts of construction work for the project are described and assessed in the Environmental Impact Statement. Potential impacts would be managed through the implementation of the mitigation measures in Chapter 27 of the Environmental Impact Statement and the Construction Environmental Management Framework (Appendix B of this report).

Responses to other specific issues raised are provided below:

- Section 10.4 provides an assessment of the potential ground-borne noise impacts. In the area between Chatswood and Artarmon, there are predicted to be exceedances of the ground-borne noise management levels of up to 10 dB. These exceedances would be expected to occur for a few days for each tunnel boring machine. These impacts would be managed in accordance with the Construction Noise and Vibration Strategy (Appendix C of this report)
- In the event that blasting is required for the Blues Point site, blasts would be designed to meet the applicable noise and vibration criteria
- All construction sites and equipment would be kept secure to avoid issues such as winds blowing fencing onto surrounding roadways
- The location of the on-shore facility to support the ground improvement works has not been determined at this stage. Section 7.6.1 of the Environmental Impact Statement provides criteria which would be met when determining the location for this facility should it be needed.
- Any works to utilities would be managed to eliminate or minimise the duration of any interruption of supply to users. Where interruption would be required, potentially affected users would be notified in advance
- All hazardous substances would be located to meet the requirements of *State Environmental Planning Policy No. 33 – Hazardous and Offensive Development*
- Property condition surveys would be offered to the owners of all buildings with potential to be affected by construction works. The process for property condition surveys is described in the Construction Environmental Management Framework (Appendix B of this report).

# 8.7 Construction traffic and transport

## 8.7.1 Assessment method

Five submissions raised issues regarding the assessment method.

### Stakeholder identification numbers

67, 104, 112, 121, 141

### Issue raised

In summary, the submissions raised the following issues:

- The traffic and transport assessment is inadequate as it does not consider the relationship between metro and WestConnex and the ability for metro to offset the impact of WestConnex traffic
- Concerns with the construction traffic methodology around Blues Point including:
  - There are no specifications for construction vehicles
  - The Environmental Impact Statement is silent on the impact of fully laden trucks travelling up the steep, narrow Blues Point Road
- The Environmental Impact Statement does not address the combined impact of trucks from multiple sites using the same roads, beyond the closest arterial road, for the Blues Point site.

### Response

The potential cumulative impacts of construction traffic from the project and WestConnex are considered in Section 26.3.12 of the Environmental Impact Statement. At this stage of the project, it is not possible to determine the exact volume of traffic each of these projects would generate at the same time as this is subject to construction staging by the relevant contractors. As detailed construction planning develops, Transport for NSW would manage and co-ordinate the interface with projects under construction at the same time. This would include:

- Provision of regular updates to the detailed construction program, construction sites and haul routes
- Identification of key potential conflict points with other construction projects
- Developing mitigation strategies in order to manage conflicts. Depending on the nature of the conflict, this could involve:
  - Adjustments to the Sydney Metro construction program, work activities or haul routes; or adjustments to the program, activities or haul routes of other construction projects
  - Co-ordination of traffic management arrangements between projects.

The potential for Sydney Metro to improve conditions for road users is described in Section 3.4.1 of the Environmental Impact Statement. This section identifies that there could be a reduction of up to 20 million car trips in 2026 as a result of the project. Any offset by the project of the traffic impacts of WestConnex would be a benefit.

The anticipated truck types at each site are provided in Section 3.1.1 of Technical Paper 1 of the Environmental Impact Statement. For Blues Point, the anticipated truck type is single unit trucks with a capacity of 10 cubic metres. In relation to trucks using Blues Point Road, the Environmental Impact Statement provides a traffic assessment in Section 8.4.10 and a noise assessment in Section 10.4.5. The assessments found that:

- Construction traffic impacts on Blues Point Road would be negligible
- Construction traffic noise levels on Blues Point Road would exceed the baseline criteria by one decibel.

The traffic assessment for the Environmental Impact Statement considered the potential impact to intersections along the proposed construction routes between the construction sites and the arterial road network. This is consistent with the approach taken on other major infrastructure projects. Traffic routes have generally been designed to avoid overlap as far as feasible and reasonable. Where vehicles from multiple construction sites use the same arterial road, the combined impact is anticipated to be minor. The potential combined impact of trucks from multiple construction sites would be further considered during the development of Construction Traffic Management Plans.

### 8.7.2 Alternative spoil transport options

Forty-one submissions raised issues regarding alternative spoil transport options.

**Stakeholder identification numbers**

43, 46, 47, 48, 50, 61, 63, 65, 66, 70, 74, 76, 77, 81, 85, 87, 88, 93, 95, 102, 110, 112, 151, 190, 200, 204, 213, 215, 236, 240, 242, 245, 254, 261, 263, 264, 265, 267, 268, 275, 294

**Issue raised**

In summary, the submissions raised the following issues:

- Objection to the upgrade of the existing T1 North Shore Line near the Chatswood dive site to freight capability for spoil removal due to increased noise and impact on visual amenity
- Suggestion that spoil should not be brought back to Chatswood for disposal
- Suggestion to undertake analysis of use of the T1 North Shore Line for removal of construction waste from Chatswood dive site
- Suggestion that spoil and equipment should be delivered and removed by barge or train from Blues Point and that a temporary wharf and conveyor be constructed to assist
- Suggestion that spoil and equipment from Blues Point be delivered and removed at either Victoria Cross Station or Barangaroo Station
- Waste should be removed by barge from Blues Point as was done for work at HMAS Penguin
- Question as to whether barge transport will be adopted at Blues Point if public safety issues arise from trucks
- Concern regarding how the cost to residents at Blues Point has been accounted for in the consideration of spoil transport options
- If spoil is to be removed by barge from Barangaroo, it should happen from the harbour side of Central Barangaroo to avoid double handling.

**Response**

Consideration of alternative spoil transport options was provided in Section 8.2.3 of the Environmental Impact Statement. This concluded that:

- For spoil transport by rail from the Chatswood dive site, space would need to be found in the rail corridor for spoil loading activities for the construction of new rail sidings and related infrastructure during scheduled track possessions. The use of the spoil loading facility and spoil transport would need to work around regular night-time maintenance on the T1 North Shore line and may impact passenger rail operations, reducing the flexibility of spoil removal. The Chatswood dive site is in close proximity to residential dwellings and there would be potentially substantial noise impacts on local residents. While none of the above reasons fully preclude the use of rail for spoil transport at this site, when they are viewed in combination and with the capacity of existing road network for spoil haulage, it is not the preferred solution

- Spoil transport by barge from the Blues Point site may be feasible subject to further investigations. This would need to consider aspects such as the infrastructure necessary to load spoil onto barges and the proposed destination of spoil
- Spoil transport by barge from the Barangaroo site may be feasible subject to further investigations and consultation with Barangaroo Delivery Authority. Further work has been carried out on the potential to barge spoil from Barangaroo Station site (refer to Section 3.2 of this report).

### 8.7.3 Haul routes

Two submissions raised issues regarding haul routes.

**Stakeholder identification numbers**

168, 271

**Issue raised**

In summary, the submissions raised the following issues:

- Concern regarding the display of a haul route for the Chatswood dive site when no contractor had been appointed to move the spoil and no direction to the dump site is known
- Concern regarding noise and parking impacts from the haul route for Victoria Cross site at McLaren Street, North Sydney
- Concern regarding heavy traffic management at Victoria Cross
- Concern regarding the suitability of the northern construction site at Victoria Cross and significant consistent adverse impacts that are exacerbated by truck movements. Limiting heavy construction access at the intersection of Berry Street would assist and should be investigated.

**Response**

The haul routes identified in Section 8.4 the Environmental Impact Statement are based on current construction planning carried out for the project and consider factors such as providing the most efficient route to the arterial road network and minimising the overlap of haul routes between construction sites. More detailed construction planning will be carried out by the appointed contractor and any changes to proposed haul routes would be reviewed with regard to the impacts identified in the Environmental Impact Statement.

An assessment of the potential impact from trucks using haul routes is provided in the relevant chapters of the Environmental Impact Statement, in particular Chapter 8 (Construction traffic and transport), Chapter 10 (Construction noise and vibration) and Chapter 21 (Air quality). This includes a range of mitigation measures to minimise and manage the potential impacts from heavy vehicle use.

Responses to the specific issues raised regarding Victoria Cross Station are provided below:

- Around two to four on street car parking spaces would be removed on Miller Street. This would mainly be associated with construction site access and egress points
- Noise from heavy vehicles is considered in Section 10.4 of the Environmental Impact Statement. For McLaren Street, this assessment found that the increase in traffic noise would comply with the relevant criteria
- The introduction of construction vehicles would not result in a deterioration of intersection performance around Victoria Cross Station.

### 8.7.4 Pedestrian, cyclist and motorist safety

Twenty-six submissions raised issues regarding pedestrian, cyclist and motorist safety.

**Stakeholder identification numbers**

15, 48, 50, 61, 65, 66, 70, 82, 84, 91, 95, 98, 102, 105, 110, 112, 142, 166, 178, 190, 200, 242, 245, 249, 254, 268

**Issue raised**

In summary, the submissions raised the following issues:

- The impact to the safety of disabled people, pedestrians, skateboard users, cyclists, motorists and rail workers at the Chatswood dive site is understated in the Environmental Impact Statement. The real impact to public safety is largely ignored
- The alternative routes when Frank Channon Walk is closed near the Chatswood dive site are not suitable for disabled people, pedestrians, skateboard users and cyclists. The paths and roads are extremely narrow in comparison to Frank Channon Walk, resulting in a dangerous environment for pedestrians (including those with disabilities and limited mobility), cyclists and nearby motorists
- Clarke Lane, Crows Nest is very narrow and trucks using this lane will make entering and exiting the adjacent residential building driveway dangerous
- Concern regarding safety of people around Crows Nest, particularly the elderly, and families with young children, due to trucks around Crows Nest Station
- Concern regarding conflicts and safety risks from the location of major construction activities at Victoria Cross Station and on Miller Street, North Sydney, due to the highly pedestrianised environment
- Concern regarding potential pedestrian hazards while travelling north of McLaren Street in North Sydney near the Victoria Cross Station site
- Concern regarding reduction in width of the Miller Street footpath and pedestrian safety implications
- Given the volume of movements in and out of the northern construction site at Victoria Cross, the proposed strategy to mitigate risks to Monte Sant' Angelo Mercy College and the broader community is inadequate. No measures or commitments are proposed to manage safety and security.
- Concern regarding increased risk of pedestrian accidents in McMahons Point and North Sydney
- Concern regarding public safety due to trucks at Blues Point and around the Blues Point site, particularly to road users and motorists on Blues Point Road and to pedestrians (especially the elderly and children). Suggest trucks be required to travel at slow speed to avoid incidents
- Concern regarding traffic snarls around Blues Point and the potential to cause casualties
- Concern regarding traffic safety of trucks turning right out of Henry Lawson Drive at Blues Point

**Response**

Pedestrian, cyclist and motorist safety is assessed in Section 8.4.1 of the Environmental Impact Statement. This section identifies general safety impacts for all construction sites mainly associated with the interface of construction access and egress points with pedestrians and cyclists. This section also identifies that access and egress arrangements have been developed with consideration of pedestrian, cyclist and motorist safety.

In addition to the requirements for management of chain of responsibility (heavy haulage) requirements, the Contractor would be required to adopt applicable vulnerable road user initiatives to enhance pedestrian, cyclist and motorist safety in the vicinity of construction sites. These may include measures such as deployment of speed awareness signs in conjunction with variable message signs, enhanced blind spot visibility and other construction vehicle safety features / devices (including side under-run guards and telematics systems to monitor driver behaviour), Sydney Metro City & Southwest specific heavy vehicle driver training and community educational events and initiatives. Where construction sites would have an impact on footpaths, consideration would be given to the requirements of all pedestrians and especially vulnerable users (school children, elderly and mobility impaired). *Disability Discrimination Act* requirements would be adopted with kerb ramps or other measures provided at road crossings. Footpath widths are required to allow for two way pedestrian traffic allowing for prams / strollers and wheelchairs.

Where high numbers of vulnerable users are using a footpath, special provision and design consideration may be required to mitigate any impacts.

Mitigation measure T7 has been revised to the following:

*Additional enhancements for pedestrian, cyclist and motorist safety in the vicinity of the construction sites would be implemented during construction. This would include measures such as:*

- *Use of speed awareness signs in conjunction with variable message signs near construction sites to provide alerts to drivers*
- *Community educational events that allow pedestrians, cyclists or motorists to sit in trucks and understand the visibility restrictions of truck drivers, and for truck drivers to understand the visibility from a bicycle; and a campaign to engage with local schools to educate children about road safety and to encourage visual contact with drivers to ensure they are aware of the presence of children*
- *Specific construction driver training to understand route constraints, expectations, safety issues, human error and its relationship with fitness for work and chain of responsibility duties, and to limit the use of compression braking*
- *Use of IVMS (telematics) to monitor vehicle location and driver behaviour*
- *Safety devices on construction vehicles that warn drivers of the presence of a vulnerable road user located in the vehicles' blind spots and warn the vulnerable road user that a vehicle is about to turn.*

Additional mitigation measures which have been specifically developed to manage potential pedestrian, cyclist and motorist safety issues include:

- Mitigation measure T2 – Road Safety Audits would be carried out at each construction site. Audits would address vehicular access and egress, and pedestrian, cyclist and public transport safety.
- Mitigation measure T3 – Directional signage and line marking would be used to direct and guide drivers and pedestrians past construction sites and on the surrounding network. This would be supplemented by Variable Message Signs to advise drivers of potential delays, traffic diversions, speed restrictions, or alternate routes.
- Mitigation measure T6 – Vehicle access to and from construction sites would be managed to ensure pedestrian, cyclist and motorist safety. Depending on the location, this may require manual supervision, physical barriers, temporary traffic signals and modifications to existing signals or, on occasions, police presence.

The safety of pedestrians, cyclists and motorists would be a key consideration during detailed construction planning and in the development of Construction Traffic Management Plans

In relation to reduction in footpath widths, the project would generally maintain a minimum 2.4 metre wide footpath around the construction sites in accordance with Austroads guidelines.

### 8.7.5 Emergency services

One submission raised issues regarding emergency services.

**Stakeholder identification numbers**

65

**Issue raised**

In summary, the submission raised concerns regarding access for emergency vehicles along Blues Point Road.

**Response**

Potential disruption to emergency services access is considered in Section 8.4.2 of the Environmental Impact Statement. This section identifies that:

- There is not anticipated to be a substantial change to emergency vehicle access during construction
- Construction sites would be arranged to ensure emergency access to nearby buildings and precincts is maintained (including access to emergency firefighting infrastructure)
- There would be ongoing consultation with emergency service providers in relation to changed traffic conditions around construction sites.

### 8.7.6 Special events

One submission raised issues regarding special events.

**Stakeholder identification numbers**

66

**Issue raised**

In summary, the submission raised an objection to the timing of the rehabilitation of Blues Point site and the impact of the site on New Years Eve celebrations.

**Response**

A process for managing construction works during special events is described in Section 8.4.3 of the Environmental Impact Statement. This section identifies that liaison would occur with the organisers of class 1 and 2 events and (as relevant) the CBD Coordination Office and Roads and Maritime Services to provide appropriate management of construction vehicles to manage potential impacts to event goers, the general public and the construction works.

The construction program for Blues Point is indicative at this stage. Options would be investigated to minimise the footprint of the works during key harbour viewing activities such as New Year's Eve. As identified in Section 7.10.5 of the Environmental Impact Statement, public access to the foreshore would be maintained during works at this site.

### 8.7.7 Construction worker parking

Five submissions raised issues regarding construction worker parking.

**Stakeholder identification numbers**

66, 206, 215, 228, 236

**Issue raised**

In summary, the submissions raised the following issues:

- Concern regarding the impacts of additional trades vehicles on resident parking in Chatswood
- Request for all construction worker parking to be accommodated within the boundary of the Chatswood dive site
- Suggestion that all construction workers be encouraged to use public transport to address concerns regarding impacts on parking in Chatswood during construction
- Suggestion for a 'park and shuttle' service for construction workers to avoid impacts on residential parking in Chatswood
- Suggestion that workers at Blues Point use parking contained within the site, use public transport or a shuttle service from an alternative parking area
- Suggestion to acquire an adjoining property to the Blues Point site at 1 Henry Lawson Avenue for site parking, and then rezone as public space when the project is completed.

**Response**

Section 8.4.4 of the Environmental Impact Statement identifies that construction worker parking would generally not be provided at the majority of the sites, although around 300 car parking spaces may be provided at each of the dive sites to facilitate a park and shuttle service, and a small number of spaces would be provided at all sites.

Further, the use of private vehicles by construction workers would be discouraged by Transport for NSW. As such, options such as acquiring additional property for construction worker parking was not considered.

Mitigation measure T12 commits to managing construction sites to minimise construction staff parking on surrounding streets. The following measures would be implemented:

- Encouraging staff to use public or active transport (through the use of incentive systems)
- Encouraging ride sharing
- Provision of alternative parking locations and shuttle bus transfers where feasible and reasonable.

### 8.7.8 Active transport impacts

Five submissions raised issues regarding active transport impacts.

**Stakeholder identification numbers**

69, 71, 82, 249, 270

**Issue raised**

In summary, the submissions raised the following issues:

- Concern that Clarke Lane, Crows Nest, is very narrow and trucks using this lane will make entering and exiting the building driveway difficult for pedestrians

- Concern that the six month closure of the existing Martin Place Station entrance to the south of Elizabeth Street will place additional pressure on remaining entrances, reduce their level of performance, inconvenience commuters and present a potential safety issue in an emergency situation
- Suggestion that the temporary pedestrian bridge at Central Station be a permanent structure with lifts
- The temporary pedestrian bridge at Central Station appears to be overkill. A smaller bridge could simply connect platform 12 and 16/17 with customers then using the existing underground connections.

**Response**

The potential for impacts to active transport is considered and assessed in Section 8.4 of the Environmental Impact Statement. Responses to the specific issues raised are provided below:

- Construction sites would be arranged to maintain safe access to surrounding properties. This would include maintaining emergency access and exit arrangements to adjacent buildings.
- Transport for NSW is reviewing and further developing construction staging and methodology for Martin Place Station. The revised methodology will be the subject of further pedestrian analysis to ensure that pedestrian movements are maintained at an acceptable level of service throughout construction.
- The temporary pedestrian bridge at Central Station is no longer proposed to be provided. Pedestrian movements during construction at Central Station would be managed by maintaining underground pedestrian connectivity and staging of the construction works. Further details are provided in Section 2.5 of this report.

### 8.7.9 Public transport impacts

Five submissions raised issues regarding public transport impacts.

**Stakeholder identification numbers**

1, 50, 135, 213, 270

**Issue raised**

In summary, the submissions raised the following issues:

- Concern regarding the replacement bus services during track possessions around Chatswood. Roads in the area are already congested and adding rail replacement buses will make the problem worse
- Concern regarding the proposed relocation of the bus shelter on 194 Miller Street – information is required on the new location
- Concern regarding conflict with pedestrian, cycle, bus and taxi access to the ferry wharf at McMahons Point
- Concern regarding the relocation of the Henry Lawson Drive bus stop near Blues Point, and the impact this will have on residents
- Concern regarding the removal of platforms 13, 14 and 15 at Central Station.

### Response

The potential for impacts to public transport is considered and assessed in Section 8.4 of the Environmental Impact Statement. Responses to the specific issues raised are provided below:

- Where possible, track possessions required for the project would be coordinated with possessions required by Sydney Trains and the Epping to Chatswood Conversion project. Rail replacement buses would be managed in the same manner as during regular Sydney Trains track possession works. During these periods, the additional buses on the network may result in additional traffic congestion and longer travel times for public transport users
- There would be no restrictions on access to the McMahons Point Ferry Wharf
- The bus stop on Henry Lawson Drive would need to be relocated to facilitate construction works. The relocation of the bus stop would be carried out in consultation with bus operators, Roads and Maritime Services and North Sydney Council. Any decision regarding an alternative location would consider the primary users of the bus stop and the location of other nearby bus stops
- Planning for the removal of platforms 13, 14 and 15 at Central Station is being carried out with Sydney Trains and NSW Trains to enable existing rail services to be maintained.

## 8.7.10 Parking and taxi impacts

Thirty-five submissions raised issues regarding parking and taxi impacts.

### Stakeholder identification numbers

50, 66, 91, 95, 110, 112, 135, 140, 141, 166, 173, 178, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 200, 213, 238, 242, 254, 273, 297

### Issue raised

In summary, the submissions raised the following issues:

- Suggestion that a resident-only parking scheme be implemented for Nelson Street and Gordon Avenue, Chatswood
- Suggestion for planning and on-going monitoring at Crows Nest to limit impacts on local roads and parking
- Concern regarding loss of parking at Blues Point considering many residents do not have on-site parking. Residents would need to travel further to find parking
- Concern regarding parking loss impacting businesses and tourists on Blues Point Road
- Concern that there has been no assessment of parking impacts for the Sydney Yard Access Bridge construction site
- Concern regarding the loss of parking around Waterloo during construction
- A Construction Traffic Management Plan should be prepared and distributed publicly to make sure community at Waterloo is aware of car parking restrictions associated with construction. The loss of on-street car parking should be considered at the City of Sydney Council's Local Pedestrian Cycling and Traffic Calming Committee with an opportunity for input from the local community
- To minimise excessive disruption to the local community in Waterloo, a logical, staged construction timetable with inter-Government Agency coordination should be prepared to minimise impacts and prevent car parking congestion in the area

### Response

The potential removal of existing car parking is considered and assessed in Section 8.4 of the Environmental Impact Statement. The loss of parking in the vicinity of most construction sites would be minor (generally around two to four spaces would be removed). Where feasible and reasonable, and in accordance with mitigation measures T19, alternative parking facilities would be provided where existing parking is removed to facilitate construction activities.

Construction worker parking would be managed through the implementation of mitigation measure T12 which commits to managing construction sites to minimise construction staff parking on surrounding streets. The following measures would be implemented:

- Encouraging staff to use public or active transport (through the use of incentive systems)
- Encouraging ride sharing
- Provision of alternative parking locations and shuttle bus transfers where feasible and reasonable.

Transport for NSW would work with local councils to minimise adverse impacts of construction on parking and other kerbside use in local streets.

Mitigation measure T5 commits to community notification in advance of proposed road and pedestrian network changes. In addition, the communication and consultation strategy outlined in the Construction Environmental Management Framework (Appendix B of this report) commits to notification of works that may affect transport such as road closures, changes to pedestrian routes and changes to bus stops.

The process for the development of Construction Traffic Management Plans is also outlined in the Construction Environmental Management Framework.

## 8.7.11 Road network performance

Sixty submissions raised issues regarding road network performance.

### Stakeholder identification numbers

13, 18, 65, 70, 74, 82, 84, 91, 95, 97, 98, 102, 105, 110, 112, 135, 139, 140, 141, 142, 145, 153, 173, 182,, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 206, 207, 208, 209, 213, 220, 228, 236, 238, 242, 245, 249, 254, 266, 271, 273, 275, 297, 298

### Issue raised

#### *General*

In summary, the submissions raised the following issues:

- General concern regarding impacts to local residents from construction traffic
- Concern regarding the need to widen roads for the metro line. This need may be addressed instead by blocking off roads, or widening the road and inserting bus lanes
- Concern regarding traffic performance from the overlap in haul routes between the Blues Point, Victoria Cross and Crows Nest sites.

#### *Chatswood dive site – demolition of Nelson Street bridge and alterations to Pacific Highway / Mowbray Road intersection*

In summary, the submissions raised the following issues:

- Traffic information for the Chatswood dive site is missing and no solution provided. No survey of traffic appears to have been made of traffic turning off Pacific Highway, left into Nelson Street, in order to travel west on Mowbray Road. There is only a proposed solution which is subject to Roads and Maritime Services action and may have related property acquisition impacts

- Nelson Street Bridge near the Chatswood dive site should not be closed as this will limit entry of residents to their property and increase traffic congestion on the Pacific Highway and in Chatswood. Suggestion that this closure will add 15 to 30 minutes of travel time for local residents
- Suggestions to minimise impacts of the removal of Nelson Street bridge near the Chatswood dive site:
  - Build a new bridge
  - Provide traffic lights at the Nelson Street / Pacific Highway / Moriarty Road intersection and allow all movements
  - Provide 'keep clear' signs on Pacific Highway at Nelson Street
  - Provide a one-way road from Nelson Street to Mowbray Road
  - Provide a left-in / left-out access at the western Ausgrid entrance on Mowbray Road
  - Provide a right-in / left out access at the western Ausgrid entrance on Nelson Street with two-phase traffic lights at Nelson Street / Pacific Highway intersection
  - Provide a left-in / left-out access for light vehicles at Bryson Street
- Objection to the reconfiguration of the Mowbray Road / Pacific Highway intersection at Chatswood
- Request for a dedicated left turn lane from the Pacific Highway to Mowbray Road at Chatswood without traffic control at the beginning of the project.

***Chatswood dive site – other traffic impacts***

In summary, the submissions raised the following issues:

- Support for proposed site access at Brand Street for the Chatswood dive site
- The intersections of Pacific Highway and Gore Hill Freeway ramps, Pacific Highway and Victoria Avenue (AM period) and Pacific Highway and Fullers Road (AM period) are graded F and no solutions have been offered
- Concern regarding vision obstruction by the abutments of the old bridge at the Chatswood dive site
- Concern regarding traffic congestion near Chatswood including at the intersection of Pacific Highway / Mowbray Road, especially cumulative impacts during shutdown of the Epping to Chatswood Rail Link
- Metro should present a traffic control plan to the Willoughby Traffic Committee
- Metro should provide a traffic control plan for the Chatswood dive site to alleviate local traffic congestion
- The Nelson Street / Pacific Highway intersection should be signalised during construction at Chatswood
- Metro construction vehicles should not enter Nelson Street, Chatswood and an alternative slip lane off the Pacific Highway should be provided
- The intersection of Gordon Avenue and Pacific Highway at Chatswood should be marked with 'Do not block this intersection'
- Request for more information regarding traffic management during the support works to the western abutment of Mowbray Road Bridge near the Chatswood dive site
- Suggestion to facilitate access to the Chatswood dive site via Brand Street and Hampden Road rather than Elizabeth Street.

### *Crows Nest Station*

In summary, the submissions raised the following issues:

- An alternative route is required when Hume Street is closed for residents and businesses on Nicholson Street who currently turn left off the Pacific Highway southbound into Oxley Street, then turn right into Clarke Street and then turn right into Hume Street to cross the highway. The alternative route should be detailed in a traffic management plan and signposted
- Concern regarding significant construction traffic impacts at Crows Nest
- Request that Clarke Lane, Crows Nest, be retained as a one way thoroughfare. Clarke Lane is very narrow and trucks using this lane, particularly as a two way road, will make entering and exiting the building driveway difficult for vehicles and for rubbish removal trucks
- Request that a turning circle is built at the Hume Street end of Clarke Lane, Crows Nest, during construction to make the road two-way
- Concern regarding the blocking of driveways on Clarke Lane, Crows Nest due to 200 trucks per day
- Concern regarding temporary closure of Hume Street, Crows Nest, and whether it will prevent access to Lawson House carparks on Clarke Lane and restricted access to Nicholson Place
- Request for information on traffic control measures to be implemented during the closure period of Hume Street, Crows Nest
- Concern regarding traffic impacts on Kelly's Place child care centre caused by haulage trucks and light vehicles on Clarke Street, Crows Nest
- Suggestion for planning and ongoing monitoring to limit impacts on local roads and parking around Crows Nest Station.

### *Victoria Cross Station*

In summary, the submissions raised the following issues:

- Concern regarding truck/pedestrian conflicts at the end of the school day near Victoria Cross Station
- Concern regarding traffic management around Victoria Cross Station due to existing traffic congestion

### *Blues Point temporary site*

In summary, the submissions raised the following issues:

- Traffic congestion on Blues Point Road due to the use of trucks, especially considering the narrow width of the road, the potential for oversize loads to create traffic congestion, and the inconvenience of a truck every few minutes
- Blocking parked cars and property access on Blues Point Road by queuing trucks
- Traffic impact of idling trucks on Blues Point Road. This has not been addressed in the Environmental Impact Statement.

### *Martin Place Station*

In summary, the submissions raised the following issues:

- Concern regarding impacts of vehicular movements on access and road network performance at Martin Place Station. Particular concern has been expressed about the transportation of spoil.

### *Central Station*

Concerns were raised regarding traffic around Regent Street during construction of the proposed Sydney Yard Access Bridge.

### *Waterloo Station*

In summary, the submissions raised the following issues:

- Concern regarding traffic impacts during construction of Waterloo Station, specifically the intersection of Cope and Raglan streets
- A detailed Construction Traffic Management Plan to be prepared and distributed publicly to the surrounding properties around the Waterloo Station site. Any road closures should be considered at the City of Sydney Council's Local Pedestrian Cycling and Traffic Calming Committee for consideration and determination with an opportunity for input from the local community
- To minimise excessive disruption to the local community, a logical, staged construction timetable with inter-Government Agency coordination is requested to minimise impacts and prevent traffic congestion in the Waterloo area.

### *Marrickville dive site*

In summary, the submissions raised the following issues:

- The haul route for trucks at the Marrickville dive site will have major traffic impacts
- Do not make the entry to the Marrickville dive site in Murray Street – instead use an entry at Sydney Steel Road, Marrickville

## Response

### *General*

Changes to roads in the vicinity of the metro stations or other metro infrastructure are generally not proposed. Where changes are required, such as Nelson Street at Chatswood, this is described in Sections 6.9.1 and 7.10.1 of the Environmental Impact Statement and the potential traffic and transport impacts are assessed in Sections 8.4.6 and 9.4.3 of the Environmental Impact Statement.

Haul routes for construction sites have generally been designed to limit the potential to overlap where feasible and reasonable. This issue would be further investigated during detailed construction planning. Where routes do overlap, this would be confined to the arterial road network which is intended to handle the majority of traffic movements. The construction traffic impact assessment shows that the potential impacts on the surrounding road network from construction vehicles would be negligible. In the event there is some overlap of construction vehicles from multiple sites on the arterial road network, this impact is also anticipated to be negligible.

### *Chatswood dive site – demolition of Nelson Street bridge and alterations to Pacific Highway / Mowbray Road intersection*

Nelson Street bridge is required to be demolished due to the Chatswood dive site and the realigned T1 North Shore Line. It is not feasible to replace this bridge due to the grades which would be required to raise the road over the realigned T1 North Shore Line. To cater for the main vehicle movement using Nelson Street (the G-turn from Pacific Highway southbound to Mowbray Road westbound using Nelson and Orchard streets), it was proposed in the Environmental Impact Statement to provide an all vehicle right turn provision at the Pacific Highway / Mowbray Road intersection.

Since development of the Environmental Impact Statement, concerns have been raised by stakeholders (including Roads and Maritime Services) regarding the provision of the right hand turn lanes in isolation from other long term changes required at this intersection. It has also been identified that it would be desirable for all work at the intersection to be carried out at the same time to avoid traffic disruption on multiple occasions.

As a result, Transport for NSW is currently working with Roads and Maritime Services and other stakeholders to carry out a broader review of the traffic and transport needs in the precinct, the implications of the closure of the Nelson Street bridge and to identify a preferred approach to any future upgrade of the Pacific Highway / Mowbray Road intersection. The identification of the proposed solution at the Pacific Highway / Mowbray Road intersection and the carrying out of such work may not be implemented prior to the construction work that would require closure of the Nelson Street bridge. Section 9.2 of this report provides a revised traffic impact assessment for the area around Chatswood in the event that the solution cannot be implemented prior to the demolition of Nelson Street bridge.

Responses to other specific issues raised are provided below:

- Background traffic data was obtained for the areas around Chatswood dive site. This included a combination of data provided by Roads and Maritime Services from the Sydney Coordinated Adaptive Traffic System (SCATS) and surveyed traffic counts
- The role of Nelson Street, and Nelson Street bridge, providing local access to properties is considered in the operational traffic and transport assessment (Section 9.4.3 of the Environmental Impact Statement). Following closure, residents would need to use alternative roads (such as Mowbray Road or Albert Avenue) to cross the rail line and access properties. This is expected to result in marginal increases to travel times.

### *Chatswood dive site – other traffic impacts*

An assessment of potential construction traffic and transport impacts is provided in Section 8.4.6 of the Environmental Impact Statement. Around Chatswood, the assessment identified that construction vehicles would have a negligible impact on the surrounding road network. Responses to specific issues raised are provided below:

- The Pacific Highway / Gore Hill Freeway ramps, Pacific Highway / Victoria Avenue and Pacific Highway / Fullers Road intersections are predicted to operate at a level of service F both with and without the project. The introduction of construction vehicles would not result in a substantial change in performance of these intersections
- In relation to the potential for the removal of the bridge reducing sight lines, all metro works would be carried out to meet the relevant road design specifications
- The potential for cumulative traffic impacts with the Epping to Chatswood Rail Line conversion is considered in Chapter 26 of the Environmental Impact Statement. Transport for NSW would manage this interface to minimise potential road network performance impacts where feasible and reasonable
- The process for developing construction traffic management plans and traffic control plans is provided in the Construction Environmental Management Framework (Appendix B of this report). This would include consultation with the relevant stakeholders
- The potential impacts of trucks using Nelson Street during construction would be effectively managed without the need for new traffic signals or removing this access point from the project

- The design of the project has minimised the works required to Mowbray Road bridge. Specific traffic management requirements would be developed during detailed construction planning as part of traffic management plans and traffic control plans
- Access to carry out the northern surface track works would be required from a number of streets, including Brand Street and Drake Street. As such, there would be a requirement for some vehicles to use Elizabeth Street (anticipated to be around six vehicles per hour). This would not result in impacts to the performance of the surrounding road network.

### *Crows Nest Station*

An assessment of potential construction traffic and transport impacts around Crows Nest is provided in Section 8.4.8 of the Environmental Impact Statement.

The assessment identified that the introduction of construction vehicles would have a negligible impact on the surrounding road network. Responses to specific issues raised are provided below:

- During the period when Hume Street is closed, motorists would be able to use a number of alternative routes to access the western side of the Pacific Highway. For example, this could include left at Albany Street, right at Oxley Street then straight across the Pacific Highway
- A temporary closure of Clarke Lane is proposed near the intersection with Hume Street. During this period, Clarke Lane would be made two-way to facilities continued access to buildings
- During construction, access would be maintained to properties around the site. This would include periods when Clarke Lane and Hume Street are partially closed
- The exact nature of traffic control measures during road closures would be developed as part of traffic management plans and traffic control plans in consultation with the relevant road authority.

### *Victoria Cross Station*

An assessment of potential construction traffic and transport impacts around Victoria Cross is provided in Section 8.4.9 of the Environmental Impact Statement.

The assessment identified that the introduction of construction vehicles would have a negligible impact on the surrounding road network. Construction traffic would be managed to provide a safe pedestrian environment around the sites.

### *Blues Point temporary site*

An assessment of potential construction traffic and transport impacts around Blues Point from construction vehicles along Blues Point Road is provided in Section 8.4.10 of the Environmental Impact Statement. The assessment found that the potential to impact intersection performance would be negligible.

The potential impacts from oversized vehicles to remove the tunnel boring machine components were also considered. This would involve the temporary short-term closure of the road (most likely overnight) and the temporary removal of street furniture along Blues Point Road. Since the development of the Environmental Impact Statement, further investigations have been carried out into the potential to use barges to transport the tunnel boring machine components. Further information is provided in Section 2.2 of this report.

### *Martin Place Station*

An assessment of potential construction traffic and transport impacts around Martin Place is provided in Section 8.4.14 of the Environmental Impact Statement.

In the vicinity of the Martin Place Station, the assessment identified that construction vehicles would have a negligible impact on the surrounding road network. Responses to specific issues raised are provided below:

- The exact details and location of the site exit from the Martin Place Station construction sites would be determined during detailed construction planning. Access to neighbouring properties would be maintained
- There are no proposed access restrictions on Castlereagh Street during construction. In the event that temporary night-time partial road closures are required, these would be managed in consultation with the relevant road authority. In this event, notification would be provided to neighbouring properties and alternative arrangements provided where feasible and reasonable.

### *Central Station*

An assessment of potential construction traffic and transport impacts around Central and Sydney Yard Access Bridge is provided in Section 8.4.16 of the Environmental Impact Statement.

The assessment identified that construction vehicles would have a negligible impact on the surrounding road network.

### *Waterloo Station*

An assessment of potential construction traffic and transport impacts around Waterloo is provided in Section 8.4.17 of the Environmental Impact Statement.

In the vicinity of Waterloo Station, the assessment identified that construction vehicles would have a negligible impact on the surrounding road network. Responses to specific issues raised are provided below:

- The process for developing construction traffic management plans and traffic control plans is provided in the Construction Environmental Management Framework (Appendix B of this report). This would include consultation with the relevant stakeholders. Management plan required by the conditions of approval would be made available on the project website
- The potential cumulative impacts of construction traffic from the project and other projects in the vicinity of Waterloo are considered in Chapter 26 of the Environmental Impact Statement. Transport for NSW would manage and co-ordinate the interface with projects under construction at the same time.

### *Marrickville dive site*

An assessment of potential construction traffic and transport impacts around Marrickville is provided in Section 8.4.18 of the Environmental Impact Statement.

The assessment identified that construction vehicles would have a negligible impact on the surrounding road network. Responses to specific issues raised are provided below:

- Consultation would continue with all relevant stakeholders regarding potential traffic impacts and changed traffic conditions associated with the project
- Access to neighbouring properties would be maintained during construction. This may involve the provision of alternative access arrangements
- The Marrickville dive site is proposed to provide two functions during construction – to support the tunnel boring machine and use as a temporary concrete pre-cast facility. Two access points are proposed for the Marrickville dive site to provide separation of vehicles accessing different parts of the site and manage potential traffic impacts.

# 8.8 Operational traffic and transport

## 8.8.1 Assessment method

Fourteen submissions raised issues regarding the assessment method.

### Stakeholder identification numbers

10, 31, 32, 33, 106, 115, 116, 117, 123, 124, 144, 147, 177, 250

### Issue raised

In summary, the submissions raised the following issues:

- Operational transport impacts including interchanges, opportunities to improve public transport, impacts to pedestrian access in and around stations and connecting streets, capacity of streets, and the provision of infrastructure to support sustainable transport options has not been adequately addressed in the Environmental Impact Statement
- There is not sufficient information on how metro interacts with buses, cycling and pedestrians at each location and the opportunities to improve public transport. The Environmental Impact Statement fails to state whether integration and state of the art technology will be at ground level so that bus users and pedestrians can get travel information
- The Environmental Impact Statement does not adequately model how additional metro stations could reduce traffic associated with the WestConnex project

### Response

The project has been designed to provide efficient interchange between Sydney Metro and other forms of transport. The station access hierarchy has been adopted during the development of the design. This hierarchy prioritises walking, cycling and interchange with other public transport modes over kiss-and-ride infrastructure.

Section 9.4 of the Environmental Impact Statement provides information on how each metro station would interact with buses, cycling and pedestrians at each location. The design of each station and the interchange facilities would continue to be developed during detailed design in consultation with key planning agencies, including the Department of Planning and Environment and local councils, to identify opportunities to integrate existing and future land uses within and around the stations.

Changes to traffic volumes and patterns associated with WestConnex New M5 are a matter for assessment as part of that project. There is no requirement for the project to consider the potential for additional stations to reduce the traffic impacts associated with WestConnex. However, as identified in Section 3.4.1 of the Environmental Impact Statement, the Chatswood to Sydenham project is anticipated to reduce the number of car trips which would have otherwise been on the network (by up to 20 million annually in 2026) and would result in a reduction in traffic on the road network.

### 8.8.2 Strategic traffic and transport impacts

Ten submissions raised issues regarding strategic traffic and transport impacts.

**Stakeholder identification numbers**

100, 114, 122, 159, 162, 163, 205, 216, 221, 298

**Issue raised**

In summary, the submissions raised the following issues:

- Concern regarding changes to the frequency of existing heavy rail services to St Peters and Erskineville stations. All of the stations currently on the Bankstown line will be serviced by the Metro, other than Erskineville Station and St Peters Station. The future of train services to those stations has still not been confirmed. Residents have been told that Erskineville Station and St Peters Station will be incorporated into a different existing line, however no further details have been given. Buses are not a viable alternative
- Concern regarding future heavy rail services to St Peters and Erskineville and the rumours of service reduction on the T3 Bankstown Line due to the metro line
- Query as to which heavy rail line will run through Wynyard once the T3 Bankstown Line is removed

**Response**

After opening of the project, trains on the T3 Bankstown Line would be moved to other lines such as the T2 Inner West and South Line.

Erskineville and St Peters stations would continue to be served by Sydney Trains services. Customer demand levels at these stations would be taken into account when new train timetables are being designed over the coming years.

Similarly, a decision on which train line would use the City Circle (and Wynyard Station) would be made when new train timetables are being designed over the coming years.

Changes to the T3 Bankstown Line are part of the Sydenham to Bankstown project, which is subject to a separate assessment and approval process.

### 8.8.3 Pedestrian integration

Nineteen submissions raised issues regarding pedestrian integration.

**Stakeholder identification numbers**

18, 19, 37, 69, 113, 138, 206, 215, 221, 228, 229, 236, 238, 240, 250, 266, 270, 294, 297

**Issue raised**

***General issues***

In summary, the submissions raised the following issues:

- The Environmental Impact Statement does not adequately assess impacts on future pedestrian movements and densities
- It is important that the project provides adequate all weather pedestrian access and limits jaywalking
- Suggestion to establish a Local Active Transport Plan at each station to integrate with pedestrian and cycle links. A radius of 15 to 20 minutes' walking or cycling should be used.

### *Chatswood dive site*

In summary, the submissions raised the following issues:

- Support for the extension of Frank Channon Walk from Nelson Street / Mowbray Road near the Chatswood dive site
- Concern regarding maintenance of footpaths in Chatswood
- Suggestion that a single-span footbridge be installed to replace Nelson Street bridge or that a new bridge be built at Gordon Avenue to allow existing utilities to be left in place and to retain pedestrian access. This would save time and money and connect the eastern end of Nelson Street to Frank Channon Walk.

### *Crows Nest Station*

In summary, the submissions raised the following issues:

- Support for pedestrian integration at Crows Nest Station
- Suggestion that an underground pedestrian connection should be provided at Crows Nest Station to the other side of the Pacific Highway near Hume Street. This would avoid lots of metro customers crowding the narrow footpath to cross at the intersection and reduce pedestrian safety risks
- Suggestion for pedestrian integration of Crows Nest Station with Hume Street Park
- Request for new pedestrian crossing on the Pacific Highway at Oxley Street, Crows Nest, with traffic lights
- Support for new pedestrian crossings on the Pacific Highway / Oxley Street, Clarke Street, Hume Street and Oxley Street. Suggestion for further investigation into pedestrian integration at the station in consultation with Roads and Maritime Services and North Sydney Council

### *Victoria Cross Station*

In summary, the submissions raised the following issues:

- Further consideration should be given to a Greenwood Plaza to Victoria Cross Station underground pedestrian link to improve pedestrian safety and relieve pressure at the Pacific Highway / Miller Street intersection and Dennison Street, North Sydney
- Concern regarding pedestrian volumes increasing on the Dennison Street laneway system outside Victoria Cross Station

### *Blues Point temporary site*

In summary, the submissions raised the following issues:

- In collaboration with North Sydney Council, the intersection of Henry Lawson Avenue and Blues Point Road should be improved to provide safe pedestrian crossing at the completion of works.

### *Martin Place Station*

In summary, the submissions raised the following issues:

- Concern regarding the proposed main customer discharge point of Martin Place Station onto Castlereagh Street. Concern regarding safety and inefficiency ('bottle necks') of pedestrians travelling along a narrow foot path and then turning north to reach the pedestrian crossing. Suggestion to extend the pedestrian crossing further south, and or discharge customers onto the expanse of Martin Place

- Following additions are suggested at Martin Place Station:
  - A north-east tunnel from Martin Place Station to Chifley Square for pedestrians crossing Hunter Street
  - Retention of the underground connection from Martin Place to MLC Centre as it forms part of a cross town path.

### *Pitt Street Station*

In summary, the submissions raised the following issues:

- The Environmental Impact Statement does not describe the impacts on people using major bus interchange areas at Park and Druitt streets near Pitt Street Station. Design responses need to manage pedestrian traffic from metro stations and bus interchanges. The Environmental Impact Statement does not demonstrate how interchange between transport networks will occur as claimed. Environmental Impact Statement does not define what "appropriate" footpath widths are and how this will be determined
- Following additions are suggested at Pitt Street Station:
  - An underground connection from Pitt Street Station to Town Hall Station through Galleries Victoria
  - A connection to the Foodbase Food court to provide connection to Museum Station
  - A station entrance and exit in the block between Park, Castlereagh, Bathurst and Pitt streets.

### *Waterloo Station*

In summary, the submissions raised the following issues:

- Consideration should be given to additional pedestrian access points on the southern side of Waterloo Station to enhance connectivity with the residential area in the south of Waterloo.

## Response

### *General issues*

The pedestrian modelling approach is outlined in Section 9.2 and Section 4.3 of Technical Paper 1 of the Environmental Impact Statement. The pedestrian modelling provides an assessment of the performance of footpaths around the metro stations from the redistribution of pedestrians by the new stations.

The Chatswood to Sydenham Design Guidelines (Appendix A of this report) will be used to guide the ongoing design of the project. This includes the provision for adequate pedestrian weather protection, safe crossing and ensures effective interchange between different modes of transport.

### *Chatswood dive site*

Once the project is operational, the ongoing maintenance of footpaths would be the responsibility of the relevant road authority.

Section 9.4.3 of the Environmental Impact Statement provides an assessment of impact to pedestrians and cyclists from the removal of Nelson Street bridge. With the proposed extension of Frank Channon Walk to Mowbray Road, the additional travel distance would be around 50 to 100 metres. This is not considered to result in a significant impact to pedestrians and cyclists. As such, the provision of a footbridge to replace the Nelson Street bridge is not considered to be justified.

### *Crows Nest Station*

Transport for NSW would implement the project in an integrated manner and in direct collaboration with key planning agencies, including the Department of Planning and Environment and local councils, to identify opportunities to integrate existing and future land uses within and around the stations.

It is proposed to introduce a signalised pedestrian crossing on the northern side of the Pacific Highway / Oxley Street intersection to facilitate improved pedestrian access from the western side of the Pacific Highway to Crows Nest Station.

Transport for NSW is conducting further work to determine the feasibility of safeguarding a link to the western side of Pacific Highway. There are a number of constraints which are being investigated including:

- Link would be into the paid side of station and would require an extra gateline
- The shallow station depth constrains opportunities for an underground link
- Unknown services underneath Pacific Highway
- Potential conflict with underground car parks
- Customer catchment on the western side of the Pacific Highway is limited by steep grades and easy access to Wollstonecraft Station.

### *Victoria Cross Station*

Victoria Cross Station is not proposed to fulfil a major interchange role with Sydney Trains services at North Sydney Station. This interchange function is provided at other stations along the metro line including Chatswood, Martin Place and Central stations. Notwithstanding, customers wishing to interchange between North Sydney and Victoria Cross stations would be able to use the existing footpath network. As such, there are no plans for an underground connection between the proposed Victoria Cross Station and the existing North Sydney Station.

Section 9.4.5 of the Environmental Impact Statement identifies that pedestrian volumes are predicted to increase on Dennison Street. Transport for NSW is currently working with North Sydney Council to investigate opportunities to improve the pedestrian environment on Dennison Street while maintaining servicing and delivery access the buildings.

### *Blues Point temporary site*

The project would not have any ongoing effect at the Henry Lawson Avenue / Blues Point Road intersection. Any improvements to pedestrian facilities at this intersection are a matter for the relevant road authority.

### *Martin Place Station*

Transport for NSW would implement the project in an integrated manner and in direct collaboration with key planning agencies, including the Department of Planning and Environment and local councils, to identify opportunities to integrate existing and future land uses within and around the stations. This process would include further consideration of improvement to the pedestrian network around Martin Place Station and the interface of the station with Martin Place.

### *Pitt Street Station*

Section 9.4.8 of the Environmental Impact Statement provides information on the interchange arrangements at Pitt Street Station with nearby bus services. In relation to bus stops on Park and Druitt streets, the station would provide efficient interchange potential with customers using existing footpaths to interchange between the two modes.

The two station entries would provide efficient entry and exit points to surrounding land uses. A third station entry is not considered to be warranted. The station design does, however, safeguard a potential future underground connection to the future Town Hall Square.

### *Waterloo Station*

There are no plans for additional station entries at Waterloo Station. The station access on the corner of Cope and Raglan streets is strategically located adjacent to future civic, retail and commercial spaces. It is also within three minutes walk to the Australian Technology Park via Henderson Road to the west. This entry point serves wider urban and civic outcomes and includes surface treatments to facilitate access in all directions.

The single entry aligns with connectivity to transport links. Interchange with the bus network is adjacent to the station entry on Botany Road. Suburban rail interchange is within 10 minutes walk to Redfern Station to the north via Wyndham Street. To the east of the station entry, a shared zone (proposed as part of future urban renewal) on Cope Street would allow for safe and convenient access to the south for pedestrians and cyclists. The single entry also provides an opportunity to activate the surrounding streets and frontage along Botany Road as customers are walking past.

The station has been designed to safeguard future entries to either the east or western side of the station via subways connecting into the concourse level. Future entries are also possible within any adjacent development should they be justified in the future.

Given the ability for customers to move within sheltered public spaces at street level along Cope Street and through a new permeable local street network associated with the future urban renewal, the addition of a second metro entry at Waterloo is not warranted. On balance, an urban design response combined with the ability to safeguard future subway connections is considered adequate.

The details of the Waterloo Station layout and transport integration arrangements are subject to detailed design. Consultation would continue with Land and Housing Corporation, UrbanGrowth NSW and other relevant stakeholders to enable the station arrangements to consider the broader strategic planning for the area and other relevant projects.

## 8.8.4 Cyclist integration

Seven submissions raised issues regarding cyclist integration.

**Stakeholder identification numbers**

7, 19, 37, 129, 229, 236, 238

**Issue raised**

In summary, the submissions raised the following issues:

- Sydney Metro must include provision for bicycle integration. Metro stations need to be connected to and by a separated bike path network with the ability to take bikes on the train
- Encourage as much secure enclosed bicycle parking as can be accommodated with flexibility to expand to cater for increased future demand
- Suggestion to establish a Local Active Transport Plan at each station to integrate with pedestrian and cycle links. A radius of 15 to 20 minutes walking or cycling should be used
- Suggestion that a single-span footbridge be installed to replace Nelson Street bridge or a new bridge be built at Gordon Avenue, Chatswood, to retain cyclist access
- Support for cyclist integration at Crows Nest via Hume, Oxley, Clarke and Nicholson streets

**Response**

The facilities providing integration with the cycle network are described in Section 9.4 of the Environmental Impact Statement. This would include:

- Cycle parking at all metro stations
- New on road cycle facilities at Crows Nest and Waterloo stations, connecting existing cycle routes to the station entries.

Section 6.2.2 of the Environmental Impact Statement also identifies that the system would be designed to provide the ability to take bicycles on trains.

The Chatswood to Sydenham Design Guidelines (Appendix A of this report) will be used to guide the ongoing design of the project. This includes the provision for convenient, safe, secure bicycle storage facilities and connections to existing cycle ways.

Section 9.4.3 of the Environmental Impact Statement provides an assessment of impact to pedestrians and cyclists from the removal of Nelson Street bridge. With the proposed extension of Frank Channon Walk to Mowbray Road, the additional travel distance would be around 50 to 100 metres. This is not considered to result in a significant impact to pedestrians and cyclists. As such, the provision of a footbridge to replace the Nelson Street bridge is not considered to be justified.

### 8.8.5 Public transport integration

Nine submissions raised issues regarding public transport integration.

**Stakeholder identification numbers**

7, 13, 131, 159, 236, 238, 250, 266, 270

**Issue raised**

In summary, the submissions raised the following issues:

- The chapter on Operational Transport does not on address physical interchanges at each metro entrance or the experience of people transferring between metro and bus or metro and active transport
- Concerns that the new metro will not connect with the existing rail system. The transport system needs to be properly integrated
- Interchanges should be convenient and involve minimum time
- Concern regarding access to buses from bus stops and buses becoming 'bunched up' as a result of Sydney Metro development
- Query regarding the transport connection between Crows Nest Station and St Leonards
- Suggestion to maintain existing bus stops on the Pacific Highway close to Crows Nest Station to facilitate integration
- A zebra crossing should be provided across Hickson Road near Barangaroo Station to access bus services 311, 324 and 325 near the entrance to Cutaway Park and Barangaroo Reserve. Query as to whether bus stop facilities will be relocated
- The existing northern CBD buses hub on Clarence, York and Carrington streets should be retained and connected to Sydney Metro infrastructure.

### Response

The project has been designed to provide efficient interchange between each Sydney Metro station and other forms of transport. Section 9.4 of the Environmental Impact Statement provides information regarding the proposed public transport interchange arrangements at each station. The station access hierarchy, adopted during the development of the design, prioritises walking, cycling and interchange with other public transport modes over kiss-and-ride infrastructure.

Responses to specific issues raised are provided below:

- The metro system would provide interchange potential with the existing rail network at strategic points, including Martin Place and Central stations. Further interchange would be provided at Epping, Chatswood, Central and Sydenham stations as part of other stages of Sydney Metro
- Interchange with the bus network is described for each station in Chapter 9 of the Environmental Impact Statement. Section 3.4.1 of the Environmental Impact Statement identifies that the project would deliver improved reliability and reduced travel times for bus customers associated with improved road traffic conditions
- There would be no change to the existing transport network between Crows Nest and St Leonards. It is anticipated that connections would be primarily made by walking using the existing footpath network. The proposed northern station entry at Crows Nest Station would provide efficient pedestrian connectivity to the St Leonards' commercial centre
- As described in Section 9.4.4 of the Environmental Impact Statement, the existing bus stops on the Pacific Highway near Crows Nest Station would be retained to provide for efficient interchange with the station
- The proposed interchange facilities at Barangaroo Station are described in Section 9.4.6 of the Environmental Impact Statement. Subject to further consultation with the Barangaroo Delivery Authority, this would include pedestrian crossings on Hickson Road to facilitate interchange with bus services. It is also proposed to relocate bus stops on Hickson Road closer to the proposed northern station entry
- There are no plans to change the existing bus interchange at Clarence, York and Carrington streets near Wynyard Station. Potential interchange from this bus facility to metro stations would involve pedestrians using the existing footpath network and other pedestrian facilities such as Wynyard Walk through the Sydney CBD.

## 8.8.6 Road network performance

Thirty-five submissions raised issues regarding road network performance.

### Stakeholder identification numbers

3, 15, 37, 44, 54, 55, 80, 82, 90, 110, 139, 142, 145, 170, 173, 175, 198, 199, 201, 206, 207, 208, 209, 211, 212, 228, 236, 238, 241, 249, 250, 271, 273, 274, 297

### Issue raised

In summary, the submissions raised the following issues:

- Suggestion to undertake traffic flow analysis for improved service at the Pacific Highway / Mowbray Road intersection

- The provision of the right turn from Pacific Highway to Mowbray Road, Chatswood, appears to be unviable. Without these right turn lanes, there would be a severe impact to traffic congestion on the Pacific Highway that would reverse the improvements in safety made over a number of years by Roads and Maritime Services
- Suggestion to improve access to Chatswood from the Pacific Highway and Mowbray Road due to the permanent closure of Nelson Street
- Proposal for a right turn lane following closure of Nelson Street bridge ignores residents from Chatswood West / Lane Cove travelling to the Pacific Highway from Mowbray Road. Suggestion to provide new traffic lights at Eddy Road with right turn onto Pacific Highway
- The removal of Nelson Street bridge will have considerable impact on Orchard Road and access to and from Nelson Street (eastern side of the rail line) and Gordon Avenue at Chatswood. Suggested solution to construct a road linking Nelson Street and Mowbray Road opposite Hampden Road
- The removal of Nelson Street bridge will have considerable impact on congestion around Chatswood
- Suggestion to construct a new road post construction over the Chatswood dive site in a similar location to the existing private road within the Ausgrid site
- Suggestion to construct a new two way local road parallel to the proposed Frank Channon Walk with a signalised intersection at Mowbray Road. This will enable light vehicles travelling on Nelson Street to access Chatswood East via Mowbray Road rather than the Pacific Highway
- Suggestion for a traffic bridge linking Gordon Street and Orchard Road
- Suggestion for a 'Do not queue across intersection' sign at the intersection of Nelson Street and the Pacific Highway at Chatswood
- Suggestion for a 'hook turn' on Albert Avenue, Chatswood
- A resident parking scheme should be provided on Nelson Street and Gordon Avenue, Chatswood, while maintaining on street parking provision. Suggestion to give out resident parking permits
- Support for kiss-and-ride and taxi bays on Clarke Street, Crows Nest
- Concern regarding traffic impacts from reduced on street parking, kiss-and-ride and taxi bays on Clarke Street, Crows Nest
- Request for the taxi rank and park-and-ride at Crows Nest be moved to another location
- The artists' impression of Crows Nest Station appears to show Hume Street closed to traffic. Residents rely on Hume Street to travel between the shops in Crows Nest to Nicholson Street and the western part of Hume Street. There is no other way into this area
- Concern regarding traffic increases and reduced car parking due to people accessing Waterloo Station

### Response

Nelson Street bridge is required to be demolished due to the Chatswood dive site and the realigned T1 North Shore Line. It is not feasible to replace this bridge due to the grades which would be required to raise the road over the realigned T1 North Shore Line. To cater for the main vehicle movement using Nelson Street (the G-turn from Pacific Highway southbound to Mowbray Road westbound using Nelson Street and Orchard Road), it was proposed in the Environmental Impact Statement to provide an all vehicle right turn provision at the Pacific Highway / Mowbray Road intersection.

Since development of the Environmental Impact Statement, concerns have been raised by stakeholders (including Roads and Maritime Services) regarding the provision of the right hand turn lanes in isolation from other required changes at this intersection. It has also been identified that it would be desirable for all work at the intersection to be carried out at the same time to avoid traffic disruption on multiple occasions.

As a result, Transport for NSW is currently working with Roads and Maritime Services and other stakeholders to carry out a broader review of the traffic and transport needs in the precinct, the implications of the closure of the Nelson Street bridge and to identify a preferred approach to any future upgrade of the Pacific Highway / Mowbray Road intersection. The identification of the proposed solution at the Pacific Highway / Mowbray Road intersection and the carrying out of such work may not occur prior to the closure of the Nelson Street bridge. Section 9.2 of this report provides a revised traffic impact assessment for the area around Chatswood in the event that the solution cannot be implemented prior to the demolition of Nelson Street bridge.

Management of parking on local streets, including implementation of resident parking schemes, is a matter for the relevant local council. Transport for NSW would work with local councils to minimise adverse impacts of metro operation on parking and other kerbside use in local streets.

The location of the proposed taxi and kiss-and-ride bays near Crows Nest Station has been determined through the station access hierarchy principles discussed above. The proposed location provides efficient access to the station, while prioritising more sustainable modes of transport such as walking and cycling.

The artists' impressions provided in Section 6.6 of the Environmental Impact Statement are indicative only. There are no plans to close Hume Street to vehicular traffic.

The provision of a station at Waterloo is anticipated to reduce the reliance on car use in this area and provide an overall improvement in traffic congestion and car parking. The provision of kiss-and-ride bays at this station would have negligible impact on the performance of the road network.

### 8.8.7 Maintenance access

One submission raised issues regarding maintenance access.

**Stakeholder identification number**

110

**Issue raised**

The submission suggested that residents be informed about work in relation to the track maintenance access points at Chatswood.

**Response**

Track maintenance access points at Chatswood would be used by Sydney Trains maintenance workers. Sydney Trains would continue to follow their usual processes in relation to notification to residents regarding the use of maintenance access.

### 8.8.8 Impacts to the broader rail network

One submission raised issues regarding impacts to the broader rail network.

**Stakeholder identification number**

15

**Issue raised**

The submission raised concerns that the rail corridor at the location of the Chatswood dive is of prime importance to Sydney Trains as trains park there every day. Should this provision be removed, this will impact on public safety.

**Response**

Consultation has and would continue with Sydney Trains to ensure its existing operations can continue safely and efficiently in the vicinity of the Chatswood dive.

## 8.9 Construction noise and vibration

### 8.9.1 Assessment method

Six submissions raised issues regarding the assessment method.

**Stakeholder identification numbers**

12, 161, 173, 220, 241, 273

**Issue raised**

In summary, the submissions raised the following issues:

- The noise assessment incorrectly identifies 402-420 Pacific Highway Crows Nest as commercial. This is a residential property
- Query as to whether the residential area around Crows Nest Station was assessed to determine acceptable levels of noise and vibration during construction
- Concern regarding the noise assessment and classification of noise sensitive receivers at Lawson House, Crows Nest. Request for additional assessments to be undertaken and request for 'special sensitive' mitigation measures to be applied to Lawson House on account of the sound recording business and other commercial activities undertaken outside standard business hours. Request for additional information on assessments and proposed mitigation measures for forecasted ground-borne noise and its impact on commercial sensitive receivers which are particularly sensitive (recording studios) or operate outside standard business hours
- The Environmental Impact Statement fails to identify that 31-33 McLaren Road, North Sydney, is a residential premise and incorrectly classifies this property as a commercial receiver. This building will be uninhabitable during night works and alternative accommodation would be required
- It is not clear where receivers were placed for the airborne noise assessment around Sydney Yard Access Bridge.

**Response**

The construction noise and vibration assessment in Section 10.4 of the Environmental Impact Statement and Section 3 of Technical Paper 2 has been carried out in accordance with the Secretary's environmental assessment requirements and the relevant guidelines. Since the development of the Environmental Impact Statement, additional information regarding the nature of some receivers around the site has become available. Section 2.6 of this report provides a clarification of these receiver types and the potential construction noise impacts.

As part of the assessment, noise monitoring was carried out at representative receivers around each of the sites to determine background noise levels. Noise predictions from construction activities were made at the facades of all surrounding buildings.

### 8.9.2 Airborne noise

Twenty-nine submissions raised issues regarding airborne noise.

**Stakeholder identification numbers**

44, 50, 54, 55, 58, 61, 74, 80, 82, 90, 91, 94, 141, 142, 173, 198, 199, 207, 208, 209, 212, 213, 215, 241, 242, 245, 249, 273, 293

**Issue raised**

In summary, the submissions raised the following issues:

- Concern regarding noise during construction and adequacy of mitigation measures for residents on Nelson Street, Gordon Avenue, Orchard Road and Gilham Street, Chatswood
- Request for the following construction noise mitigation at Chatswood:
  - A five metre high noise barrier and landscaping be provided from the top of the cutting on the eastern side of the rail line from Mowbray Road to Nelson Street
  - An acoustic shed over the dive site
  - Double-glazing on west-ward facing windows and glass doors
  - All efforts made to contain noise where there are no acoustic covers, especially vehicle noise
- Concern regarding the level and duration of noise impacts at Crows Nest Station.
- Noise impacts are discussed in the Environmental Impact Statement for Clarke Street but not for Clarke Lane which is closer to the construction site
- Request for a sound proof wall to be built on the western side of Crows Nest construction site prior to excavation commencing
- Concern regarding noise from Blues Point site. Noise barriers will be ineffective due to apartments around the site
- The noise impacts from the extraction of the tunnel boring machines at Blues Point has not been assessed
- Concern that the predominate wind direction during construction hours is towards the residential apartments at Blues Point and will accentuate noise levels
- Request for acoustic attenuation or shed over the excavation site at Blues Point to manage noise impacts
- Request to have construction equipment orientate noise away from residents at Blues Point
- The Environmental Impact Statement states there would be significant exceedances of more than 20 db in first two periods of construction at Central Station.

**Response**

The assessment of potential construction noise impacts in the Environmental Impact Statement presents a worst-case 15-minute assessment in accordance with the approach required by the *Interim Construction Noise Guideline*. This approach assumes that all construction equipment for a particular construction scenario is operating at the same time and at the closest point on the site to any receiver. In reality, construction equipment would move around the site and would rarely all be in use at the one time. As such, the actual noise levels experienced by individual receivers would vary throughout the construction works.

The Construction Noise and Vibration Strategy (Appendix C of this report) provides the process for carrying out more detailed construction noise and vibration impact statements prior to each construction activity based on further understanding of the construction equipment and construction processes. This process would provide further detail regarding the actual noise levels which would be experienced by individual receivers.

The Construction Noise and Vibration Strategy also provides a list of standard noise mitigation measures which would be implemented at all construction sites for the project. Further, the Strategy provides additional mitigation measures which would be implemented when defined exceedances of the noise management levels are predicted to occur. These mitigation measures would meet the outcomes of the mitigation proposed in submissions.

Construction noise modelling provides predictions at the facades of all properties around the construction site. At Crows Nest this includes the buildings with facades backing onto Clarke Lane (with physical addresses on Clarke Street).

The noise impacts from the extraction of tunnel boring machine components at Blues Point are assessed as part of the broader earthworks scenario.

### 8.9.3 Ground-borne noise

One submission raised issues regarding ground-borne noise.

**Stakeholder identification number**

220

**Issue raised**

In summary, the submission raised concerns regarding impacts of ground-borne noise from tunnel excavations on commercial and residential receivers around Crows Nest Station, including Lawson House. Suggestion to implement appropriate mitigation measures. Request for advanced notice of tunnelling works to enable businesses within Lawson House to schedule work around this period of worst disruption

**Response**

The potential ground-borne noise impacts are assessed in Section 10.4 of the Environmental Impact Statement.

In relation to tunnelling works, some exceedances of the night-time noise management levels are predicted in certain locations, including around Crows Nest Station. This would only occur when the tunnel boring machines are directly below each receiver and would be likely to occur for a few days for each tunnel boring machine. Notification would be provided to receivers in advance of each tunnel boring machine passing beneath their property.

### 8.9.4 Vibration

Twenty-three submissions raised issue regarding vibration.

**Stakeholder identification numbers**

42, 50, 63, 66, 82, 112, 134, 162, 163, 173, 190, 198, 199, 200, 207, 208, 209, 220, 231, 238, 241, 249, 273

**Issue raised**

In summary, the submissions raised the following issues:

- Concern regarding vibration causing damage to properties around the tunnels
- Concern regarding construction vibration at the Chatswood dive site

- Concern regarding impacts of vibration from tunnelling, blasting and demolition on the Federation-style cottages on the southwest corner of Naremburn Heritage Conservation Area
- Concern regarding construction vibration levels at Crows Nest. Suggestion for mitigation measures to monitor and manage the severity and duration of impacts
- Vibration impacts for Crows Nest Station are predicted in the Environmental Impact Statement for Clarke Street but not for Clarke Lane
- Concern regarding cosmetic damage of Lawson House caused by ground-borne vibrations from construction activities at Crows Nest Station. Request for provision of advanced of impact schedule to Lawson House owners. Request for information regarding the construction vibration management plan and assessment methods for vibration damage of structural elements of Lawson House. Suggestion for a vibration damage assessment and ongoing monitoring
- Concern regarding perceptible vibration and cosmetic damage to buildings around the northern access shaft at Victoria Cross Station
- Concern regarding vibration and property damage from tunnelling and truck movements at Blues Point. The old buildings on Blues Point Road are particularly sensitive to vibration
- Request that residents of the Stamford on Kent and the Stamford Marque not be able to feel vibrations during construction
- Vibration will significantly and adversely affect the amenity of 54 Regent Street, Chippendale.

### Response

The assessment of construction vibration in Section 10.4 of the Environmental Impact Statement has adopted cosmetic damage screening levels based on guidance from British Standard *BS 7385 Evaluation and Measurement for Vibration in Buildings*. These screening criteria are set at 50 percent of the level when cosmetic damage would typically start to occur, and are:

- 25 mm/s for reinforced or framed structures
- 7.5 mm/s for unreinforced or light framed structures.

Although heritage items are not assumed to be more susceptible to vibration, a conservative approach has been taken in applying the screening criteria of 7.5 mm/s to all heritage items.

The assessment shows that a number of buildings adjacent to the construction sites are predicted to have vibration levels above these screening criteria. In this case, and in accordance with mitigation measure NV4, a more detailed site specific assessment of the structure would be carried out to ensure vibration levels remain below appropriate limits for that structure. For heritage items this would also take into consideration the heritage value of the structure. For all tunnelling works, the vibration levels are predicted to be below 7.5 mm/s.

Human comfort vibration is assessed using ground-borne noise as a proxy as people would typically hear vibration well before they feel vibration. As such, where the ground-borne noise management levels are exceeded, the human comfort vibration levels may also be exceeded. These exceedances are predicted to occur at all construction sites primarily associated with rock breaking activities. Due to these predicted impacts, blasting has been proposed as a primary excavation technique for stations to minimise these impacts, although some rock breaking would still be required prior to reaching safe blasting depths. The Environmental Impact Statement shows that the use of blasting would substantially reduce the overall duration of ground-borne noise impacts.

Additionally, since the development of the Environmental Impact Statement, construction planning has identified that rock breaking for cut-and-cover stations and station shafts (except for Central Station) would not be required outside of standard construction hours. This would reduce the potential vibration impacts in the more sensitive night-time period Support station excavation activities would still occur up to 24 hours per day and seven days per week. Further information is provided in Section 9.6 of this report.

The Construction Noise and Vibration Strategy has been updated to provide vibration and noise monitoring requirements for the construction phase of the project. The revised Construction Noise and Vibration Strategy is provided as Appendix C of this report.

### 8.9.5 Traffic noise

Fifty-seven submissions raised issues regarding traffic noise.

**Stakeholder identification numbers**

44, 48, 49, 50, 54, 55, 62, 63, 65, 74, 80, 82, 84, 89, 90, 91, 95, 102, 112, 139, 141, 142, 145, 166, 168, 173, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 207, 208, 209, 212, 220, 241, 242, 249, 268, 270, 273, 275

**Issue raised**

In summary, the submissions raised the following issues:

- Concern regarding traffic noise from spoil removal
- Concern regarding noise from trucks left with engines idling
- The use of exhaust brakes should be banned for construction vehicles, with 24/7 noise and video monitoring to enable policing
- Concern regarding construction traffic noise around Chatswood
- Concern regarding noise from truck movements during construction in Nelson Street and the Ausgrid site. Suggestion that construction vehicles should not be allowed to use Nelson Street, but should access only from Mowbray Road
- Concern regarding traffic noise from trucks at Crows Nest, especially from trucks trying to turn around in narrow Clarke Lane
- Concern regarding potential changes to haul routes on Hume Street (between Clarke Street and Clarke Lane) and associated impacts on Lawson House, Crows Nest
- Noise and vibration traffic concerns at McLaren Street, North Sydney
- Concern regarding road traffic noise and vibration from the Blues Point site
- Request to find an alternative to the haul route at Blues Point due to noise impacts
- Concern regarding construction traffic noise from Barangaroo Station, especially around Towns Place and Dalgety Road
- Concern that the noise impacts from the trucks around Central Station will be unbearable. Night-time truck noise is expected to exceed sleep disturbance screening levels by up to 10 dB during excavation, with no practical options to address this.

**Response**

A construction traffic noise assessment for each site is included in Section 10.4 of the Environmental Impact Statement. Additional assessment of traffic noise impacts for Cope Street at Waterloo, O'Connell Street construction site at Martin Place, the proposed Gordon Avenue access at Chatswood and the alternative routes associated with the demolition of Nelson Street bridge are provided in Sections 3.4, 3.3, 9.1 and 9.2 of this report.

In the majority of cases, the traffic noise levels would comply with the relevant criteria. As such, no mitigation measures are required in these cases. Where traffic noise is predicted to exceed the relevant criteria, mitigation measure NV2 commits to restricting the use of these access points at night unless compliance can be achieved.

Additionally, mitigation measure T7 commits to driver training to limit the use of compression braking.

### 8.9.6 Noise impacts during out of hours work

Thirty-six submissions raised issues regarding noise impacts during out of hours work.

**Stakeholder identification numbers**

18, 66, 82, 98, 105, 112, 139, 141, 142, 145, 173, 182, 183, 184, 185, 186, 187, 188, 189, 191, 192, 193, 194, 195, 196, 197, 198, 199, 207, 208, 209, 249, 266, 270, 273, 294

**Issue raised**

In summary, the submissions raised the following issues:

- Suggestion to limit rock breaking to the hours of 7 am to 6 pm to avoid sleep disturbance impacts
- Suggestion to provide sound proof cladding and roofing to limit noise impacts
- Concern regarding construction noise impacts out of hours around Chatswood
- Concern regarding noise from Crows Nest Station at night. The Environmental Impact Statement suggested that noise levels will be 90 dB throughout the night which is above the acceptable level of 30 dB. The acoustic shed will not help as:
  - It will be built after the initial excavation
  - The impact of blasting will not be mitigated by the shed
  - There will be openings at either end of the shed
- Suggestion to limit spoil truck movements to the hours of 7 am to 10 pm to avoid sleep disturbance impacts at Crows Nest
- Suggestion that noise and vibration measurements and monitoring should be taken at Crows Nest prior to and during construction and tunnel boring machine works to ensure residents are not kept up all night
- Concern regarding night time traffic noise during construction at McLaren Street near Victoria Cross Station. The well-being of all residents will be compromised if overnight truck noise goes on for the many years that it appears this project will take to complete. The many schools in the area will have concerns when the students need to take important exams and truck noise disturbs their concentration
- Concern regarding sleep disturbance during the night-time activity at the Blues Point site. A sleep disturbance assessment of trucks on Blues Point Road at night has not been included in the Environmental Impact Statement
- Noise concerns at 54 Regent Street, Chippendale, regarding sleep impacts due to construction noise and traffic noise at Sydney Yard Access Bridge construction site.

### Response

Section 10.4 of the Environmental Impact Statement provides an assessment of potential noise impacts at night from tunnelling and station excavation works and associated supporting activities. In some cases, exceedances of the relevant night-time noise management level were predicted to occur.

Since the development of the Environmental Impact Statement, construction planning has identified that rock breaking for cut-and-cover stations and station shafts (except for Central Station) would not be required outside of standard construction hours. This would reduce the potential noise impacts during out of hours work. Support station excavation activities would still occur up to 24 hours per day and seven days per week. Further information is provided in Section 9.6 of this report.

The Construction Noise and Vibration Strategy (Appendix C of this report) provides the approach for managing noise, including noise from out of hours work. This includes additional mitigation measures which would be implemented when defined exceedances of the noise management levels are predicted to occur.

Responses to potential night-time traffic noise impacts are provided in Section 8.9.5.

## 8.9.7 General noise and vibration issues

Forty-three submissions raised general noise and vibration issues.

### Stakeholder identification numbers

15, 74, 76, 77, 82, 84, 85, 87, 88, 89, 94, 97, 98, 105, 110, 112, 128, 130, 134, 135, 139, 142, 143, 145, 154, 157, 158, 167, 169, 198, 199, 207, 208, 209, 212, 220, 235, 236, 238, 249, 255, 297, 298

### Issue raised

#### *General*

In summary, the submissions raised the following issues:

- Concern regarding noise and vibration above the tunnels during construction
- Concern regarding noise levels during construction. Shift workers need to be able to sleep during the daytime.

#### *Chatswood dive site*

In summary, the submissions raised the following issues:

- Concern regarding noise and vibration impacts around Chatswood from the dive site and surface works
- Concern regarding the maximum permissible noise levels being exceeded at the Chatswood dive site and that the remedy proposed is unlikely to occur
- No remedy is offered to Chatswood residents for noise level exceedances
- Mitigation measures for dealing with construction noise at the Chatswood dive site seem to have clauses to permit breaches on the grounds of 'unavoidable events or work' and 'impractical to mitigate or avoid'
- Objection to the proposed noise management at Chatswood dive site. Suggestion that an acoustic shed and sound barrier be installed
- Concern regarding construction noise and vibration impacting a home business around Chatswood
- Request that 2 Gordon Avenue / 9 Nelson Street, Chatswood, be considered for at-property treatment to mitigate noise. This building has an existing rail noise issue
- Concern regarding noise, vibration and the health and well-being of residents near the Chatswood dive site.

### *Crows Nest Station*

In summary, the submissions raised the following issues:

- Concern regarding construction noise at Crows Nest Station, with levels above 90dB when humans sleep with levels of 30dB
- Objection to the metro line and station at Crows Nest due to construction noise impacts to adjacent residents on Clarke Street. These apartment buildings have bedrooms overlooking the construction site
- Request for a residential building at Crows Nest be insulated to reduce noise and vibration impacts prior to construction. Request for ongoing noise and vibration monitoring during construction
- The Environmental Impact Statement does not adequately assess the impacts of blasting on businesses at Lawson House, Crows Nest (particularly sensitive businesses such as recording studios). Request for blasting schedule and mitigation measures to minimise impacts
- Preference expressed by Lawson House, Crows Nest management for a higher number of days above noise management levels if it means the construction schedule is reduced. Particular concern expressed for noise impacts of blasting
- Request for double glazing of windows of apartments on Clarke Street
- Suggestion for mitigation measures at Crows Nest to monitor and manage the severity and duration of impacts

### *Blues Point temporary site*

In summary, the submissions raised the following issues:

- Preference for blasting to be used at Blues Point over rock hammers.

### *Barangaroo Station*

In summary, the submissions raised the following issues:

- Concern regarding construction noise impacts at Millers Point. Request that all construction should be kept to the Barangaroo Central area where there are no residents

### *Martin Place Station*

In summary, the submissions raised the following issues:

- Request to assess alternative excavation methods, measures to reduce the construction programs and provision of respite periods to reduce impact on surrounding activities at Martin Place Station

### *Pitt Street Station*

In summary, the submissions raised the following issues:

- Concern regarding Pitt Street Station construction noise on Sabbath at the Great Synagogue.

### *Waterloo Station*

In summary, the submissions raised the following issues:

- Concern regarding construction noise and vibration around Waterloo
- High to very high noise attenuation measures must be considered for the eastern metro track at Waterloo to ensure the amenity of future residential accommodation on the Ethnic Communities Centre site is reasonable

### *Marrickville dive site*

The submissions raised concerns regarding construction noise around the Marrickville dive site

### Response

The construction noise and vibration assessment has been carried out in accordance with the requirements of the Secretary's environmental assessment requirements and applicable guidelines, particularly the *Interim Construction Noise Guideline*. Details of the methodology of the assessment are provided in Technical Paper 2: Noise and Vibration of the Environmental Impact Statement.

Since the development of the Environmental Impact Statement, additional information regarding the use of some receivers around the site has become available. Section 2.6 of this report provides a clarification of these receiver types and the potential construction noise impacts.

The assessment in Section 10.4 of the Environmental Impact Statement found that there would be exceedances of the applicable airborne noise, ground-borne noise and vibration levels during construction of the project. Responses relating to these potential impacts are provided below.

#### *Airborne and ground-borne noise*

The project has inherently included a number of measures to minimise airborne noise impacts. This includes provision for noise barriers around all construction sites and acoustic sheds where ongoing night-time works are proposed. Despite these measures, there are predicted to be exceedances of the airborne noise management levels. In this event, all feasible and reasonable mitigation measures would be implemented. Details on noise and vibration mitigation and management are provided below.

The ground-borne noise assessment found that there would be exceedances of the ground-borne noise management levels, particularly associated with rock breaking for stations and station shaft excavation.

Due to these predicted impacts, blasting has been proposed as a primary excavation technique to minimise these impacts, although some rock breaking would still be required prior to reaching safe blasting depths. The Environmental Impact Statement shows that the use of blasting would substantially reduce the overall duration of ground-borne noise impacts. All blasting for the project would be design to achieve the applicable air blast overpressure and vibration criteria.

Since the development of the Environmental Impact Statement, construction planning has identified that rock breaking for cut-and-cover stations and station shafts (except for Central Station) would not be required outside of standard construction hours. This would reduce the potential airborne and ground-borne noise impacts in the more sensitive night-time period. Support station excavation activities would still occur up to 24 hours per day and seven days per week. Further information is provided in Section 9.6 of this report.

In relation to potential ground-borne noise from tunnelling works, some exceedances of the night-time noise management levels are predicted in certain locations. This would only occur when the tunnel boring machines are directly below each receiver and would be likely to occur for a few days for each tunnel boring machine.

#### *Vibration*

The assessment of construction vibration in Chapter 10 of the Environmental Impact Statement has adopted cosmetic damage screening levels based on guidance from British Standard *BS 7385 Evaluation of Measurement for Vibration in Buildings*. These screening criteria are set at 50 percent of the level when cosmetic damage would typically start to occur, and are:

- 25 mm/s for reinforced or framed structures
- 7.5 mm/s for unreinforced or light framed structures.

Although heritage items are not assumed to be more susceptible to vibration, a conservative approach has been taken in applying the screening criteria of 7.5 mm/s to all heritage items.

The assessment shows that a number of buildings adjacent to the construction sites are predicted to have vibration levels above these screening criteria. In this case, and in accordance with mitigation measure NV4, a more detailed site specific assessment of the structure would be carried out to ensure vibration levels remain below appropriate limits for that structure. For heritage items this would also take into consideration the heritage value of the structure. For all tunnelling works, the vibration levels are predicted to be below 7.5 mm/s.

As described above, since the development of the Environmental Impact Statement, construction planning has identified that rock breaking for cut-and-cover stations and station shafts (except for Central Station) would not be required outside of standard construction hours. This would reduce the potential vibration impacts in the more sensitive night-time period. Support station excavation activities would still occur up to 24 hours per day and seven days per week. Further information is provided in Section 9.6 of this report.

Potential vibration levels from tunnelling activities would remain below the cosmetic damage screening criterion of 7.5 mm/s in all cases.

***Noise and vibration mitigation and management***

Proposed noise and vibration mitigation measures are identified in Chapter 10 of the Environmental Impact Statement.

The Construction Noise and Vibration Strategy (Appendix C of this report) provides the process to carrying out more detailed construction noise and vibration impact statements prior to each construction activity based on further understanding of the construction equipment and construction processes. This process would provide further detail regarding the actual noise levels which would be experienced by individual receivers.

The Construction Noise and Vibration Strategy also provides a list of standard noise mitigation measures which would be implemented at all construction sites for the project. Further, the strategy provides additional mitigation measures which would be implemented when defined exceedances of the noise management levels are predicted to occur. These mitigation measures would meet the outcomes of the mitigation proposed in submissions.

It is acknowledged that some receivers are particularly sensitive to noise and vibration at different periods of the day. This would be considered as part of the Construction Noise Impact Statement process (described in the Construction Noise and Vibration Strategy (Appendix C of this report)). As part of this process, consultation would be carried out with these receivers (in accordance with mitigation measures BI1 and SO2 – refer to Chapter 11 of this report) to identify and develop mitigation measures to manage the specific construction impacts to the receiver.

The Construction Noise and Vibration Strategy has been updated to provide vibration and noise monitoring requirements for the construction phase of the project. The revised Construction Noise and Vibration Strategy is provided as Appendix C of this report.

# 8.10 Operational noise and vibration

## 8.10.1 Assessment method

Eight submissions raised issues regarding the assessment method.

### Stakeholder identification numbers

139, 161, 173, 199, 207, 208, 209, 273

### Issue raised

***Chatswood dive site***

In summary, the submissions raised the following issues:

- Concern that the operational noise performance and criteria is a voluntary guideline, not mandatory.

***Crows Nest Station***

In summary, the submissions raised the following issues:

- The Environmental Impact Statement noise and vibration assessment predictions are based on a mid-floor multi-storey building. Much of the surrounding residential area at Crows Nest is single storey – query as to whether this was considered and whether this information is available.

***Victoria Cross Station***

In summary, the submissions raised the following issues:

- Noise objectives for the operation of services plant associated with Victoria Cross Station should be revised to reflect representative noise levels of the area
- Operational noise criteria at Victoria Cross Station would result in plant noise at nearby receivers that is at least 10 dBA higher than acceptable levels

***Central Station***

In summary, the submissions raised the following issues:

- The noise assessment in the Environmental Impact Statement is inadequate for 54 Regent Street, Chippendale, including the omission of ongoing use of Sydney Yard Access Bridge following construction.

### Response

***Chatswood dive site***

The *Rail Infrastructure Noise Guideline* (EPA, 2013) has been applied to the design and assessment of the project.

This guideline specifies that the noise trigger levels apply both immediately after operations commence and for projected train numbers at an indicative period into the future to represent the expected typical maximum level of train use. To support the noise modelling predictions, estimated train numbers were assessed for the at-opening and 10-years after opening scenarios. If the guidelines are exceeded, there is a requirement to consider feasible and reasonable mitigation measures.

### *Crows Nest Station*

The behaviour of vibration as it passes through a building is complex. Depending on various factors such as construction type and material of the building, this can include a reduction in vibration or an increase in vibration levels. The noise and vibration assessment has considered the potential for the reduction in vibration levels through a building as well as the potential for propagation of vibration through a building. At this stage, the assessment has been carried out on a conservative basis using the maximum mid floor vibration levels.

Additional noise and vibration modelling would be carried out during detailed design to refine the findings of the assessment and to enable the appropriate mitigation measures to be applied.

### *Victoria Cross Station*

The noise objectives for the services plant at Victoria Cross has been determined through background noise monitoring and then deriving the project specific noise criteria from the *Industrial Noise Policy* (EPA, 2000).

Since the development of the Environmental Impact Statement, additional information regarding the type of receivers around the site has become available. Section 2.6 of this report provides a clarification of these receiver types and the potential operational noise impacts.

### *Central Station*

Following construction, the use of Sydney Yard Access Bridge would be for infrequent maintenance requirements for Sydney Trains and Sydney Metro. Due to the infrequent use of this bridge, potential noise impacts would be negligible.

## 8.10.2 Ground-borne noise and vibration

Twenty-seven submissions raised issues regarding ground-borne noise and vibration.

**Stakeholder identification numbers**

49, 57, 59, 60, 62, 64, 68, 73, 74, 82, 84, 97, 98, 99, 105, 142, 162, 163, 173, 198, 199, 207, 208, 209, 236, 249, 273

**Issue raised**

In summary, the submissions raised the following issues:

- Concern regarding operational ground-borne noise and vibration in the vicinity of metro tunnels and potential for disturbance, health impacts and structural damage
- High-attenuation track should be provided to reduce noise
- Concern regarding operational vibration at the Chatswood dive site, particularly at 1-3 Gordon Avenue, Chatswood. Suggestion to install dampers under metro tracks and north shore tracks between Albert Avenue and the Ausgrid dive site to reduce vibration impacts
- Request for track attenuation in the vicinity of Crows Nest Station to mitigate ground-borne noise and vibration
- Concern regarding the depth of Crows Nest Station and operational noise and vibration impacts
- Objection to the proposed route of the tunnels through McMahons Point and Blues Point due to operational ground-borne noise and vibration impacts
- Request to use the best available noise abatement measures to minimise ground-borne noise near Towns Place, Millers Point

### Response

Ground-borne noise and vibration impacts from operational rail lines in tunnels are generally mitigated by a resilient rubber layer between the rail and the tunnel foundation. This can take the form of resilient rail fasteners, booted sleepers, floating slab track or a combination of measures.

Initial ground-borne noise and vibration modelling was carried out to determine the indicative track form along the tunnel alignment to meet the design objectives (from the *Rail Infrastructure Noise Guideline*) at receivers above the tunnels. This modelling determined that the following three track forms would be required:

- Standard attenuation track – incorporating a hard resilient baseplates. This track form would be used for around 93 per cent of the tunnels. This is the standard specification for Sydney Metro and would be used in areas with low sensitivity to ground-borne noise and vibration, or at locations where there is sufficient tunnel depth to the receivers
- High attenuation track – incorporating medium resilient baseplates. This track form would be used for around seven per cent of the tunnels, in sensitive areas where the standard attenuation track is not sufficient to meet the design objectives
- Very high attenuation track – incorporating soft resilient baseplates. This track form would be required for less than one per cent of the tunnels, in very sensitive areas where the depth of the tunnel is particularly shallow.

The indicative track form for the current design of the tunnels, trains and operations is shown in Section 11.4.1 of the Environmental Impact Statement. The proposed track form provides one option to meet the ground-borne noise and vibration objectives. As identified in Section 6.3.1 of the Environmental Impact Statement, the tunnel alignment is indicative at this stage, and has been used for the purposes of the environmental impact assessment including all specialist investigations. During detailed design, the alignment may change (horizontally and / or vertically). Any changes to the alignment would be reviewed for consistency with the assessment contained in this Environmental Impact Statement including relevant mitigation measures, performance outcomes and any future conditions of approval. The final track form would be confirmed as part of detailed design.

Since the development of the Environmental Impact Statement, additional information regarding the use of some receivers around the site has become available. Section 2.6 of this report provides a clarification of these receiver types and the potential operational noise impacts.

## 8.10.3 Airborne noise

Twenty-one submissions raised issues regarding airborne noise.

### Stakeholder identification numbers

44, 54, 55, 80, 90, 94, 110, 135, 142, 154, 158, 173, 198, 199, 207, 208, 209, 212, 236, 241, 273

### Issue raised

In summary, the submissions raised the following issues:

- Request dampers be used where metro tracks are on concrete slab for the surface works
- Concern regarding noise during operation for residents on Nelson Street and Gordon Avenue, Chatswood, considering metro tracks will be on concrete slabs between Albert Avenue and the Ausgrid site, there will be two additional tracks between Albert Avenue and the Ausgrid site and existing tracks will be moved west by three metres at Gordon Avenue and Nelson Street. Suggestion to use dampers instead of concrete slabs under tracks

- Relocation of T1 North Shore Line and construction at Chatswood dive site and removal of vegetation will increase residential noise levels
- Request for the following operational airborne noise mitigation measures at Chatswood:
  - Noise barriers around the metro and T1 North Shore lines along the dive site and tunnel entrance and over the T1 North Shore Line bridge
  - Best practice quiet rail wheels and rail lines
  - Dampers instead of concrete slab for the T1 North Shore and metro lines instead of increasing the height of the noise barrier
  - Landscaping to reduce operational noise
- Request for double glazing, treatment and / or soundproofing of windows of impacted properties at Chatswood
- Request that the noise walls at Chatswood not be increased as they create an echoing effect and reduce sunlight and cooling breezes
- Concern regarding long-term use noise impacts of the Sydney Yard Access Bridge.

**Response**

The project has been designed with the aim of achieving the noise and vibration objectives from the *Rail Infrastructure Noise Guideline*.

To mitigate potential airborne noise impacts at the northern end of the project, the design has incorporated the following measures:

- An increase in the height (to four metres) of the noise barrier between Chapman Avenue and Nelson Street on the eastern side of the rail line
- An increase in the height (to four metres) of the noise barrier between the Frank Channon Walk pedestrian underpass and Albert Avenue on the western side the rail line
- An increase in the height (to four metres) of the noise barrier between Nelson Street and Gordon Avenue on the western side the rail line
- A two metre high noise barrier to the south of Mowbray Road on the western side of the rail line
- Rail dampers and deck absorption within the Chatswood dive structure.

The exact height and extent of the noise barriers in these locations would be further refined during detailed design.

The results of the noise assessment indicate that there remains a predicted exceedance of the noise trigger levels at one residential receiver building (at 1-3 Gordon Avenue, Chatswood) on the western side of the rail line. This receiver is a multi-storey apartment building with several dwellings. The upper floors of this receiver would have an unobstructed view of the rail tracks over the noise barrier, even with the proposed increase in barrier height. To break the line of sight at the triggered receivers on the upper floor of this building, a noise barrier in excess of six metres high would be required. Noise barriers of this height are unlikely to be considered reasonable and may not be feasible, particularly since the barrier would need to be located in close proximity to the building facade. Based on the outcomes of noise modelling during detailed design, this property would be considered for at property treatment.

Following construction, the use of Sydney Yard Access Bridge would be used for infrequent maintenance requirements for Sydney Trains and Sydney Metro. Due to the infrequent use of this bridge, potential noise impacts would be negligible.

### 8.10.4 Noise from stations and ancillary facilities

Five submissions raised issues regarding noise from stations and ancillary facilities.

**Stakeholder identification numbers**

82, 84, 130, 228, 249

**Issue raised**

In summary, the submissions raised the following issues:

- Concern regarding noise issues associated with operations of the Artarmon substation
- Concern regarding increased noise from pedestrians and commuter traffic accessing Crows Nest Station
- There has been no assessment of the noise impact of ancillary equipment (substations and ventilation systems) at Waterloo.

**Response**

The approach to assessment of noise from station and ancillary infrastructure is to calculate the maximum acceptable sound power level at each location based on the location of the proposed facility and the location of the nearest receivers. These maximum acceptable sound power levels would be used to guide the detailed design to ensure compliance with the applicable criteria from the *Industrial Noise Policy* (EPA, 2000).

The nearest receiver type and relevant external noise criteria for each station and ancillary services facility are presented in Section 11.4.3 of the Environmental Impact Statement. Based on experience with existing projects such as Epping to Chatswood Rail Line, it is expected that these levels can be achieved through the use of appropriate noise attenuation measures such as equipment selection, positioning of plant and ventilation discharges, in-duct attenuators, and acoustic enclosures.

Potential noise impacts from customers and vehicles accessing Crows Nest Station are anticipated to be negligible when compared to existing background noise levels.

### 8.10.5 General noise and vibration issues

Thirty-six submissions raised general noise and vibration issues.

**Stakeholder identification numbers**

43, 46, 47, 51, 53, 76, 77, 81, 82, 84, 85, 87, 88, 89, 93, 98, 105, 134, 139, 140, 143, 145, 151, 204, 236, 248, 249, 255, 261, 262, 263, 264, 265, 267, 269, 297

**Issue raised**

In summary, the submissions raised the following issues:

- Concern regarding noise and vibration impacts to residents (including shift workers) and businesses in the vicinity of metro tunnels
- Concern regarding operational noise and vibration impacts around Chatswood from the dive site and surface works
- Concerns that the existing excessive noise levels at Chatswood provide an excuse for not providing mitigation. The statement that a noise barrier is not practical is unacceptable. Concerns that the at-property treatment may not be provided or will be provided after operations commence

- Concern regarding compliance with industrial noise standards at Chatswood dive site during operations
- Objection to and concern regarding the metro line and station at Crows Nest due to operational noise impacts to adjacent residents on Clarke Street. Request for track attenuation and window glazing in the vicinity of Crows Nest Station
- Concern regarding operational noise and vibration impacts around Dalgety Road and Towns Place, Millers Point. Request for track attenuation
- Suggestion that noise and vibration from the tunnels will be significantly worse than the Environmental Impact Statement suggests due to existence of underground car park, tunnel depth will be much closer to ground level, and absence of noise attenuation between the harbour and Barangaroo Station. The operational noise and vibration has not been properly attenuated
- Concern regarding noise from train operations around Waterloo where the tunnels are only 25 metres deep. Suggestion that the track through the Waterloo area should be very high attenuation track
- High to very high noise attenuation measures must be considered for the eastern metro track to preserve the amenity of any future residential accommodation on the Ethnic Communities Council site.

**Response**

The project has been designed with the aim of achieving the noise and vibration objectives from the *Rail Infrastructure Noise Guideline*. Further, the assessment has been carried out to meet the requirements of the Secretary's environmental assessment requirements and in accordance with the *Rail Infrastructure Noise Guideline*.

Noise and vibration impacts from operational rail lines in tunnels are generally mitigated by a resilient rubber layer between the rail and the tunnel foundation. This may take the form of resilient rail fasteners, booted sleepers, floating slab track or a combination of measures.

Initial ground-borne noise and vibration modelling determined that the following three track forms would be required:

- Standard attenuation track
- High attenuation track
- Very high attenuation track.

The indicative track form for the current design of the tunnels, trains and operations (which has been determined to meet the noise and vibration trigger levels from the *Rail Infrastructure Noise Guideline*) is shown in Section 11.4.1 of the Environmental Impact Statement.

As identified in Section 6.3.1 of the Environmental Impact Statement, the tunnel alignment is indicative at this stage, and has been used for the purposes of the environmental impact assessment including all specialist investigations. During detailed design the alignment may change (horizontally and / or vertically). Any changes to the alignment would be reviewed for consistency with the assessment contained in this Environmental Impact Statement including relevant mitigation measures, performance outcomes and any future conditions of approval. The final track form would be confirmed as part of detailed design.

For the northern surface works, the results indicate that noise levels at residential receivers without the project are generally already close to, or exceeding, the overall noise criteria levels. Mitigation measures proposed within the design of the project for the northern surface works includes:

- An increase in the height (to four metres) of the noise barrier between Chapman Avenue and Nelson Street on the eastern side of the rail line
- An increase in the height (to four metres) of the noise barrier between the Frank Channon Walk pedestrian underpass and Albert Avenue on the western side the rail line
- An increase in the height (to four metres) of the noise barrier between Nelson Street and Gordon Avenue on the western side the rail line
- A two metre high noise barrier to the south of Mowbray Road on the western side of the rail line
- Rail dampers and deck absorption within the Chatswood dive structure.

The outcomes of the assessment indicate that there remains a predicted exceedance of the noise trigger levels and increase in train passby vibration levels at one residential receiver building (at 1-3 Gordon Avenue, Chatswood) on the western side of the rail line. This residential receiver is a multi-storey apartment building with several dwellings. The upper floors of this receiver would have an unobstructed view of the rail tracks over the noise barrier, even with the proposed increase in barrier height. To break line of sight at the triggered receivers on the upper floor of this building would require a noise barrier in excess of six metres high. Noise barriers of this height are unlikely to be considered reasonable and may not be feasible, particularly since the barrier would need to be located in close proximity to the building facade. Based on the outcomes of noise modelling during detailed design, this property would be considered for at property treatment.

## 8.11 Land use and property

### 8.11.1 Property acquisition

Eleven submissions raised issues regarding property acquisition.

**Stakeholder identification numbers**

119, 140, 162, 163, 173, 198, 207, 208, 209, 273, 298

**Issue raised**

In summary, the submissions raised the following issues:

- Request that 1-3 Gordon Avenue, Chatswood, be acquired due to impacts of the construction and operation of the project
- Request that 54 Regent Street, Chippendale, be acquired or leased for the duration of construction
- Concern regarding the acquisition and demolition of buildings for Waterloo Station. Comment that not all buildings are required for station construction and the loss of the buildings will degrade the character of the area
- Concern that houses on Lawrence Street and Belmont Street in Alexandria will be compulsory acquired with the tunnel depth at 45 metres
- Concern regarding property buy outs in Lord Street, Newtown
- Concern regarding the methods used to determine compensation for properties compulsorily acquired.

**Response**

Transport for NSW will only acquire properties necessary to facilitate construction or operation of the project. The Environmental Impact Statement has shown that the potential impacts of the project can be managed to within acceptable levels at nearby receivers.

The property acquisition requirements for the project are summarised in Section 12.4.1 of the Environmental Impact Statement. The owners of all properties subject to acquisition have been contacted by the Sydney Metro project team.

All property acquisition would be managed in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991*. This Act sets out the steps to be followed including how compensation is calculated. Every effort would be made to acquire the affected properties through negotiated purchase. This requires appropriate compensation to be paid including associated legal costs, valuation fees, relocation and removal expenses, and mortgage costs.

### 8.11.2 Substratum acquisition

One submission raised issues regarding substratum acquisition.

**Stakeholder identification number**

143

**Issue raised**

The submission raised concerns regarding substratum acquisition for the tunnels and the restriction of the future development of land

**Response**

It would be necessary to acquire stratum below the surface of properties for the construction of the project. This subsurface stratum would be a stratum acquisition envelope around the tunnel, including any tunnel anchors required. The project alignment is generally shallowest at stations and at tunnel portals (at stations tunnel depths are typically greater than 20 metres). Between stations tunnel depth increases to typically between 25 and greater than 40 metres.

The introduction of the subsurface stratum, and the tunnel itself, has the potential to limit development above the alignment. Based on proposed tunnel depths there would be a minor impact with respect to limiting future development potential above project infrastructure. Development applications within the project corridor would be referred to Transport for NSW for concurrence and to ensure that project infrastructure is not impacted by proposed developments.

### 8.11.3 Direct impacts on land use

One submission raised issues regarding direct impacts on land use.

**Stakeholder identification number**

228

**Issue raised**

The submission raised concern regarding the location of the Artarmon substation. This site is currently leased by the Department of Education with an option to extend to 2020.

**Response**

The potential for overlap in the use of the site with the school is acknowledged. In response to the issues raised by Council and local residents surrounding the site at Barton Road / Butchers Lane, Artarmon, Transport for NSW has commenced investigations into an alternative site for the Artarmon substation within the Artarmon Industrial Area. Confirmation of an alternative site would be dependent on meeting criteria for siting. These criteria include:

- being directly located above the track running tunnels
- be accessible by a public road
- be located such that compliance with relevant NSW noise policy guidance may be achieved.

It is anticipated the site location and property requirements would be identified following determination of the project and a supplementary environmental review / assessment would be carried out and, if necessary, the appropriate approvals obtained.

Confirmation of a suitable alternative site would result in the requirement for the land at Barton Road / Butchers Lane being removed from the project.

### 8.11.4 Land use integration

One submission raised issues regarding land use integration.

**Stakeholder identification numbers**

238

**Issue raised**

In summary, the submission suggested consultation with North Sydney Council with regards to land use planning around Crows Nest Station

**Response**

***Crows Nest Station***

A metro station at Crows Nest would support State and local strategic priorities and planning controls by providing an incentive for investment along the Pacific Highway. This would enhance urban design and amenity, and improve connectivity in Crows Nest.

Transport for NSW would implement the Chatswood to Sydenham project in an integrated manner in direct collaboration with key planning agencies, including the Department of Planning and Environment and local councils, to identify opportunities to integrate existing and future land uses within and around the stations.

### 8.11.5 Future development opportunities

Sixteen submissions raised issues regarding future development opportunities.

**Stakeholder identification numbers**

13, 122, 126, 127, 131, 149, 171, 179, 236, 240, 246, 250, 252, 266, 270, 297

**Issue raised**

In summary, the submissions raised the following issues:

- Concern that developers will be the big winners from the metro and that metro is an excuse for overdevelopment
- Concern regarding provision of open space proportional to density of future development

- Concern regarding over station development at the Chatswood dive site. Suggestion to limit over station development to low rise
- Request that high rise towers are not built in Crows Nest and that development around the Crows Nest Station needs to retain the character of Crows Nest and differentiate this area from North Sydney and St Leonards.
- Over station development at Crows Nest should be coordinated to occur as soon as possible so that the areas are not left derelict
- Query as to the plans to increase the density of buildings on the Lane Cove side of St Leonards
- Concern regarding future above station development at Victoria Cross. Question as to whether North Sydney Council will be involved in the development process
- The Environmental Impact Statement should provide information on the building which would be built above Victoria Cross Station, how these buildings could mitigate the loss of the social and aesthetic amenity of the area, and how they would visually impact on the neighbouring heritage items (MLC Centre and Rag and Famish Hotel)
- Concern regarding the metro construction and operation leading to overdevelopment of Waterloo and Sydenham
- The Over Station Development will enable substantial uplift of the development density in and around Waterloo

**Response**

The need for the project, detailed in Chapter 3 of the Environmental Impact Statement, is clearly established based on public transport capacity requirements for Sydney. Section 3.4.1 of the Environmental Impact Statement identifies the additional rail capacity which would be provided by the introduction of Sydney Metro. This section identifies that Sydney Metro, together with signalling and infrastructure upgrades across the existing network, would increase the capacity of the rail network through the Sydney CBD from about 120 services per hour during peak periods today, to up to 200 services per hour beyond 2024, including capacity for up to 60 metro trains per hour during peak periods (or 30 trains per hour in each direction). This would equate to an increase of up to 60 per cent capacity across the network.

Along with the transport benefits (associated with rail network capacity, resilience and congestion) and road network improvements, Sydney Metro would also provide city building opportunities in relation to a higher intensity of land uses around new and converted stations.

Over station development will be subject to a separate approval processes. This process would consider the potential impacts of the over station development.

### 8.11.6 Property values

Eight submissions raised issues regarding property values.

**Stakeholder identification numbers**

82, 100, 135, 142, 162, 163, 212, 249

**Issue raised**

In summary, the submissions raised the following issues:

- Concern regarding impact on property values

- The removal of the Nelson Street bridge was never noted in searches for properties in Chatswood purchased over the last few years. Suggestion that the values of properties will be reduced by the removal of the Nelson Street bridge and the ability of residents to sell their properties reduced
- Concern regarding impact on property values and the ability to rent or sell apartments in Crows Nest
- Concern regarding property value loss in Lord Street, Newtown

**Response**

Property values are based a number of complex factors including demand at a certain point in time, general location, accessibility, traffic and traffic noise on the street and proximity to transport infrastructure. Properties located above the rail tunnels are not anticipated to experience a reduction in value as a result of the project. A decline in property values above the tunnels has not been evident along the Epping to Chatswood Rail Line or other underground rail lines in Sydney. Based on experience around other rail stations within Sydney and elsewhere, the proximity to a rail station would be anticipated to have a positive impact on property prices over the long term.

### 8.11.7 Property condition surveys

Fourteen submissions raised issues regarding property condition surveys.

**Stakeholder identification numbers**

42, 50, 94, 152, 153, 162, 163, 190, 200, 231, 236, 254, 297, 298

**Issue raised**

In summary, the submissions raised the following issues:

- Concern regarding structural impacts on old houses, heritage items and infrastructure during tunnelling. Request for property condition surveys pre and post-construction and compensation if any damage occurs
- Improvements to roads and bridges would alleviate concerns of being left with damaged road infrastructure following construction
- Concern regarding property damage at Chatswood and that it will not be fixed by Sydney Metro
- Concern regarding damage to the Chatswood Bowling Club and Croquet fields
- Suggestion to undertake pre-construction and post-construction condition reports on the Federation-style cottages on the southwest corner of Naremburn Heritage Conservation Area
- Condition surveys of properties along Blues Point should be carried out by a specialist heritage engineer prior to the start of construction
- Request that the Stamford on Kent and the Stamford Marque be assessed prior to construction and then afterwards to ensure any damage is made good. Presumption that the NSW Government will cover any consequential damage to the building
- Request for a dilapidation report for Ethic Communities Council site before and after construction. Any rectification works and / or compensation are to be paid by Sydney Metro/NSW Government
- Request for structural assessment of houses on Lord Street, Newtown, and at residential properties in Newtown more generally, at the start of operation and at six and 12 months after the start of operation. Query that if there is damage to houses whether there is a mitigation plan that will fix any issues with houses and infrastructure
- The bridge over the railway line included in the Marrickville haul route is old and needs work. Roads in the local area are pot-holed and subsiding during to the existing traffic volumes.

**Response**

Mitigation measure GWG2 (refer to Chapter 11) and the Construction Environmental Management Framework (Appendix B of this report) provide the process for carrying out condition surveys. These would be offered to the owners of buildings and structures in the vicinity of the tunnel and excavations prior to the commencement of excavation at each site. This process would also apply to all local public roads proposed to be used by construction heavy vehicles. In the unlikely event that building damage does occur as a result of the project, this would be rectified by the project at no cost to the building owner.

### 8.11.8 Restrictions on future development

Two submissions raised issues regarding restrictions on future development.

**Stakeholder identification numbers**

143, 297

**Issue raised**

In summary, the submissions raised the following issues:

- Any construction works at Waterloo should consider the potential impacts on residential dwellings on the Ethnic Communities Centre site and adjoining sites where shop top housing and other residential accommodation is permitted under the planning framework
- Further information is requested regarding any restrictions on future basement excavation on the Ethnic Communities Centre site due to the proximity to rail tunnels and associated metro infrastructure
- Concern regarding impacts of underground tunnelling on the development potential of Green Square

**Response**

The project would require a substratum acquisition envelope around the tunnel, including any tunnel anchors required. The introduction of the subsurface stratum, and the tunnel itself, has the potential to limit development above the alignment. The project alignment is generally shallowest at stations and at tunnel portals (at stations tunnel depths are typically greater than 20 metres). Between stations tunnel depth increases to typically between 25 and greater than 40 metres. Based on proposed tunnel depths there would be a minor impact with respect to limiting future development potential above project infrastructure.

Development applications within the project corridor would be referred to Transport for NSW for concurrence and to ensure that project infrastructure is not impacted by proposed developments.

### 8.11.9 Requests for compensation

Nine submissions raised issued regarding requests for compensation.

**Stakeholder identification numbers**

50, 62, 82, 84, 110, 142, 173, 249, 273

**Issue raised**

In summary, the submissions raised the following issues:

- Concern regarding structural issues to buildings and question as to who will pay for repairs
- There has been no effort to compensate residents near the Crows Nest Station site
- Request for double glazing of windows around Crows Nest

- Request for Sydney Metro to pay for regular cleaning of residential windows and exterior of buildings, and repair damage from construction 'as new' at Crows Nest
- Query as to whether any damage to properties in the vicinity of the Blues Point site will be repaired immediately and as a priority
- Request for compensation for 54 Regent Street, Chippendale, owners and tenants.

**Response**

The Environmental Impact Statement has shown that the potential impacts of the project can be managed, with the implementation of feasible and reasonable mitigation measures, to within acceptable levels at nearby receivers.

In the unlikely event that damage to any adjacent buildings or structure is caused by construction activities associated with the project, this would be rectified at no cost to the owner.

## 8.12 Business impacts

### 8.12.1 Direct acquisition

Three submissions raised issues regarding direct acquisition.

**Stakeholder identification numbers**

130, 140, 259

**Issue raised**

In summary, the submissions raised the following issues:

- Concern regarding the demolition of the existing shops within the proposed metro station areas
- Concern regarding the acquisition, loss or relocation of businesses at Waterloo.

**Response**

As part of the design process, construction footprints were aligned as closely as possible with the operational footprint to minimise the need for property acquisition. However, property acquisition affecting businesses would still be required at metro stations and dive sites, including an estimated 18 properties at Waterloo (resulting in acquisition or relocation of occupying businesses, or other negotiated arrangements).

All property acquisition would be managed in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991*. Transport for NSW has made direct contact with directly affected businesses and has provided details of the proposed property acquisition process. Every effort would be made to acquire the affected properties through negotiated purchase.

While subject to a separate assessment and approval process, it is expected that once operational, metro stations would provide new retail, commercial and mixed use opportunities.

### 8.12.2 Servicing and delivery access during construction

Two submissions raised issues regarding servicing and delivery access during construction.

**Stakeholder identification numbers**

130, 297

**Issue raised**

The submissions raised concerns about business servicing and delivery access on Botany Road, Raglan Street and Buckland Street, and in general around Waterloo.

**Response**

The Environmental Impact Statement commits to maintain access to existing properties and buildings in consultation with property owners (refer to mitigation measure T8). Specific consultation would occur to identify and develop measures to manage the specific construction impacts for individual businesses, including access and servicing (refer to mitigation measure BI1).

### 8.12.3 Customer access during construction

Seven submissions raised issues regarding customer access during construction.

**Stakeholder identification numbers**

130, 141, 153, 190, 200, 242, 245

**Issue raised**

In summary, the submissions raised the following issues:

- Concern regarding customer access to businesses on Blues Point Road during construction due to loss of parking, increased traffic and the presence of trucks
- Concern regarding reduction in customer access and passing trade for businesses around Waterloo
- Marrickville Metro shopping centre will lose customers during construction of the Marrickville dive site.

**Response**

The potential impacts to businesses in the vicinity of the sites are assessed in Section 13.4 of the Environmental Impact Statement. Further details regarding potential traffic related impacts to businesses are provided in Section 8.4 of the Environmental Impact Statement.

The Blues Point temporary site would be used intermittently – firstly for site establishment and excavation of the shaft, and then on occasions for the retrieval of the cutter heads from the tunnel boring machines. Site establishment and shaft excavation works would occur over a period of about 12 months and then the site would remain inactive until retrieval is required. Each retrieval would take about four weeks.

The peak heavy vehicle movements at Blues Point would be six heavy vehicles per hour during the shaft excavation phase (and four heavy vehicles per hour during the AM peak period (7 am to 10 am)). The peak for light vehicles would be 10 vehicles per hour. These construction traffic volumes would not affect amenity for and access to businesses located in the northern section of Blues Point Road.

Around four on street car parking spaces on Blues Point Road near the temporary site would be removed during the site establishment and shaft excavation stage. During each tunnel boring machine retrieval, all on street car parking spaces (around 23 spaces in total) on the eastern side of Blues Point Road adjacent to the site would also need to be removed. This loss of parking would be for a period of around four weeks and occur on four occasions. It is recognised that this temporary loss of parking would impact the ability for some visitors to access this area, but is less likely to affect businesses which are located on the northern section of Blues Point Road. Alternative on-street parking (around eight spaces) is available on the opposite side of Blues Point Road and about 50 metres further north.

Options to retain some car parking at the end of Blues Point Road, including a disabled parking space, would be investigated during detailed design. It may also be feasible to remove the tunnel boring machines via barge using the wharf at the end of Blues Point Road and this would likely reduce the need to remove parking. Further details of this opportunity are provided in Section 2.2 of this report.

Section 13.4.1 of the Environmental Impact Statement acknowledges the potential for moderately negative impacts on businesses during construction of Pitt Street Station, Waterloo Station and Marrickville dive site in terms of services / delivery access, customer access / passing trade, changed consumer behaviour and impacts on amenity (noise, vibration and dust). Further consultation would be carried out with business owners with the aim of developing measures to manage the specific construction impacts (including access and servicing) for individual businesses and to ensure visibility to customers is maintained (refer to mitigation measures BI1 to BI3).

### 8.12.4 Amenity issues during construction

Eleven submissions raised issues regarding amenity issues during construction.

**Stakeholder identification numbers**

48, 50, 61, 66, 74, 112, 198, 199, 207, 208, 209

**Issue raised**

In summary, the submissions raised the following issues:

- Concern regarding impacts to residences and a home business at 1-3 Gordon Street, Chatswood
- Loss of amenity during construction works at the Chatswood dive site will force a home business to relocate at great personal expense
- Concern regarding amenity impacts to cafes and businesses on Blues Point Road due to the presence of the worksite and trucks. This has not been adequately assessed in the Environmental Impact Statement and mitigation plans have not been adequately developed

**Response**

The potential impacts to businesses in the vicinity of the sites are assessed in Section 13.4.1 of the Environmental Impact Statement. Further details regarding potential noise related impacts to businesses are provided in Section 10.4 of the Environmental Impact Statement.

For the Chatswood dive site, Section 10.4.1 of the Environmental Impact Statement identifies exceedences of construction noise management levels (for airborne and ground-borne noise). These exceedences are a direct result of the relative close proximity of receivers to the construction activities and the absence of any appreciable shielding between sites and receivers. Mitigation measures provided in the Environmental Impact Statement and the Construction Noise and Vibration Strategy (Appendix C of this report) would be implemented to address these impacts.

The Blues Point temporary site is located within Blues Point reserve and some distance from the businesses on the northern section of Blues Point Road. This separation would minimise potential amenity impacts for these businesses as would the implementation of measures to address noise, air quality and visual impacts at the site through a range of measures, including the installation of hoarding and site fencing.

Section 8.4.10 of the Environmental Impact Statement notes that at Blues Point peak heavy vehicle movements would be six heavy vehicles per hour during the shaft excavation phase (and four heavy vehicles per hour during the AM peak period (7 am to 10 am)). The peak for light vehicles would be 10 vehicles per hour. These construction traffic volumes are not expected to significantly affect amenity for businesses located in the northern section of Blues Point Road.

Further consultation with the aim of developing measures to manage the specific construction impacts (including access and servicing) would be carried out with individual businesses and to ensure visibility to customers is maintained (refer to mitigation measures BI1 to BI3). Measures to address noise / vibration and air quality impacts during construction are detailed in Sections 10.5 and 22.6 of the Environmental Impact Statement respectively.

Section 13.4.1 of the Environmental Impact Statement acknowledges that for businesses near Martin Place and Pitt Street stations there is some potential for changed consumer behaviour to persist following completion of construction. There would however also be important benefits including improved access for customers and staff.

### 8.12.5 Customer access during operation

One submission raised issues regarding customer access during operation.

**Stakeholder identification number**

1

**Issue raised**

The submission raised concern about the removal of the Nelson Street bridge near the Chatswood dive site, as it will impact access to businesses on the Pacific Highway between Gordon Avenue and Nelson Street.

**Response**

As described in Section 6.9.1 of the Environmental Impact Statement, the project would require the permanent demolition of the Nelson Street bridge over the T1 North Shore Rail Line. This would affect convenience of access to the Dulux premises on the corner of Nelson Street and the Pacific Highway, which has its access directly from Nelson Street. With the proposed Nelson Street bridge closure, access to this business would be achieved as follows:

- From the north – left-turn into Nelson Street from the Pacific Highway (as is currently the case)
- From the east – access via Albert Street and the Pacific Highway
- From the south – right-turn at Mowbray Road, left-turn at Orchard Road then via Albert Avenue and the Pacific Highway
- From the west – cross the Pacific Highway at Mowbray Road, right-turn at Orchard Road then via Albert Avenue and the Pacific Highway.

While these alternative routes would involve some minor additional travel time, it is not expected that this would significantly affect a business of this type, which is a destination for customers who are seeking a specific product or service (in contrast to a passing trade business).

The other businesses on the eastern side of the Pacific Highway between Gordon Avenue and Nelson Street are currently accessed either directly from the Pacific Highway or from Gordon Avenue. The project would not affect these access arrangements.

### 8.12.6 Compensation to businesses

Seven submissions raised issues regarding compensation to businesses.

**Stakeholder identification numbers**

50, 139, 145, 198, 207, 208, 209

**Issue raised**

In summary, the submissions raised the following issues:

- Request for compensation for a business operating from home near the Chatswood dive site due to noise and vibration impacts during construction
- Request for temporary or permanent relocation of a home business at 1-3 Gordon Street, Chatswood, due to noise impacts
- Request for compensation for businesses along Blues Point Road

**Response**

Section 13.4.1 of the Environmental Impact Statement acknowledges the potential for impacts on businesses during construction and commits to carrying out further consultation with the aim of developing measures to manage the specific construction impacts for individual businesses. A business impact risk register would also be developed to identify, rate and manage the specific construction impacts for individual businesses (refer to mitigation measures BI1 and BI2). Additionally, mitigation measures relating to noise and vibration (in Section 10.5 of the Environmental Impact Statement) would assist in managing potential impacts to businesses. Potential business impacts can be effectively managed through the implementation of these mitigation measures.

## 8.13 Non-Aboriginal heritage

### 8.13.1 Assessment method

One submission raised issues regarding the assessment method.

**Stakeholder identification number**

127

**Issue raised**

The submission suggested that Tower Square should be addressed in the heritage assessment for Victoria Cross Station. The report should include places of potential heritage value not just listed items.

**Response**

Assessing heritage impacts based on listed items is a standard approach to environmental impact assessment. The local listings (such as those listed under the *North Sydney Local Environmental Plan 2013*) are compiled by councils as part of a systematic evaluation of heritage values across a local government area. They represent a sound basis on which heritage impacts can be assessed. The heritage assessment in the Environmental Impact Statement has been carried out in accordance with the relevant Secretary's environmental assessment requirements.

### 8.13.2 Demolition of heritage items

Seven submissions raised issues regarding the demolition of heritage items.

**Stakeholder identification numbers**

13, 127, 159, 164, 215, 217, 259

**Issue raised**

In summary, the submissions raised the following issues:

- Suggestion to relocate heritage buildings rather than demolish them
- Concern regarding the demolition of local heritage items. Archival recording is a poor substitute for the preservation of heritage items
- The following shop fronts (facades) should be preserved around Crows Nest Station: 501 (Proud Furniture), 465 (Oz Design), 465A, 459-467 – 469A – 471 – 473 – 475
- It is unclear if options to place Victoria Cross Station on the opposite side of Miller Street were explored in order to avoid demolition of heritage items
- Support for the retention of the heritage listed shop at 187 Miller Street, North Sydney, and the sculpture outside 189 Miller Street
- The heritage bus shelter art work at Blues Point should be reinstated in collaboration with North Sydney Council at the completion of the project
- Concern about whether former car ferry docks at Blues Point will be maintained
- Objection to the demolition of 7 Elizabeth Street for Martin Place Station due to its design by prominent architect Emil Sodersten and interior design by Marion Hall Best
- Objection to the construction methodology for Central Station, specifically the removal of platforms 13-15 and the historic canopies. It is unacceptable to impact rare heritage items for a temporary footbridge structure
- Protection for built heritage values at Central Station is required
- Loss of historic buildings along Regent Street, Chippendale, is unnecessary.

**Response**

The potential to avoid direct impact to heritage items was considered as part of the station locations options assessment, and during the refinements of station design. In some locations, avoidance of heritage items was not a feasible solution to provide optimum station planning (including customer experience outcomes) and constructible configurations (minimising risk and safety issues).

Mitigation measure NAH1 commits to archival recording of all heritage items to be demolished in accordance with the NSW Heritage Office's *How to Prepare Archival Records of Heritage Items* (1998), and *Photographic Recording of Heritage Items Using Film or Digital Capture* (2006).

Responses to specific issues raised are provided below:

- The shop fronts around Crows Nest Station, the sculpture at 189 Miller Street, North Sydney and 56 to 64 Regent Street, Chippendale are not listed heritage items and, as such their removal is not considered in terms of heritage impacts
- The sculpture outside 189 Miller Street, North Sydney would be removed by North Sydney Council prior to construction activities at the site. North Sydney Council will take responsibility for works relating to its relocation, including any notification or negotiations required relating to moral rights
- The bus shelter at Blues Point would be temporarily removed. Opportunities to salvage this shelter and reinstate it at the completion of construction would be investigated in consultation with North Sydney Council
- There would be no impact on the former car ferry wharf at Blues Point
- The retention of 7 Elizabeth Street would have resulted in increased risk and safety issues and a more complex construction methodology, and a significantly compromised station design outcome for customer experience. The reduced excavation area required by the retention of this building would also result in restricted below ground station areas and therefore reduced pedestrian circulation areas in the paid and unpaid concourse creating potential congestion issues. Notification would be carried out as required by moral rights legislation.

  Emil Sodersten is considered to be one of Australia's most influential architects (Emil Sodersten) from the 1930s and numerous building designed by Sodersten remain in Sydney. Sodersten's most highly regarding commercial office building are the CML Building at 60-66 Hunter Street and Bryant House at 80-82 Pitt Street. In relation to residential buildings, Sodersten's most important building is considered to be Birtley Towers, Elizabeth Bay. Although 7 Elizabeth Street is considered to be significant as an important work, it is not considered to be at the forefront of Sodersten's work, and its relatively modest scale has been overwhelmed by more recent and lesser quality adjacent development.

  It is understood that Marion Hall Best's input to 7 Elizabeth Street was limited to the decoration of the apartment interiors. It cannot be confirmed whether any evidence remains of Best's original decorative scheme, however it is considered unlikely. Any surviving fragments, if present, would not substantially contribute to the significance of the building.
- Transport for NSW is working with the Heritage Council of NSW and other relevant stakeholders in relation to the design outcomes for Central Station. In addition, the Sydney Metro Design Review Panel would include a heritage architect to provide independent review throughout detailed design. Further construction planning has identified that the temporary station footbridge at Central Station would not represent the optimum outcome. As such, it is now proposed to manage pedestrian movements at Central Station during construction through the staged retention of underground connections. This would reduce potential heritage impact at Central Station, particularly associated with impacts to platform canopies. Further details are provided in Section 9.4 of this report.

### 8.13.3 Indirect impacts to heritage items

Twenty-six submissions raised issues regarding indirect impacts to heritage items.

**Stakeholder identification numbers**

37, 94, 127, 164, 173, 182, 183, 184, 185, 186, 187, 188, 189, 191, 192, 193, 194, 195, 196, 197, 206, 228, 236, 238, 250, 273

**Issue raised**

In summary, the submissions raised the following issues:

- Suggestion to protect and enhance the Mowbray Road heritage precinct including Mowbray House School, Chatswood South Uniting Church, the Cemetery, Chatswood Reservoirs 1 and 2, and 2 Orchard Road
- Concern raised regarding impacts of truck movements and spoil haulage on the 10 metre curtilage of Mowbray House and heritage palm tree garden
- This historical significance of the area around Chatswood dive site is important with some of the earliest uses of gas (including Mowbray House). The significance to historical pre railway Chatswood is enormous
- Mowbray House should be retained as a public access building due to its historical cultural and political significance
- Request for heritage urban design treatment for the Mowbray House and garden precinct post completion
- Concern regarding other heritage properties on the northern side of Mowbray Road, Chatswood, and four on the southern side in a 430 metre strip between Bowen Street and Orchard Road / Elizabeth Street. Suggestion to undertake dilapidation reports on heritage items and residential buildings pre and post construction to assess construction impacts and share these reports with Willoughby / Lower North Shore Council and the Willoughby District Historical Society
- Concern regarding impacts on heritage listed buildings around Crows Nest Station (particularly 28-34 Clarke Street / St Leonards Centre). Mitigation measures to prevent structural or amenity impacts should be implemented
- The heritage chapter does not assess the relationship of Crows Nest Station or the services buildings to the scale of the heritage buildings on the Pacific Highway. The form of any future building above the station needs to consider the visual impact and relationship to these heritage buildings which contribute to the village character of Crows Nest
- Given the sensitive interfaces and the Victoria Cross precinct generally (being surrounded by heritage items), a far more substantive level of design detail is required to properly assess the impacts of the proposed works
- Objection to the Sydney Yard Access Bridge which would impact views to Mortuary Station. The footprint on the Sydney Yard Access Bridge is excessive and too close to Mortuary Station heritage item. Request to consider other potential access locations such as site near existing driveway between 26 Lee Street and bus depot or existing maintenance access driveway from Chalmers Street adjacent to the Central Station south eastern entry. Access to Sydney Yard should be by tunnel rather than an elevated bridge
- Concern regarding the adverse impact on the heritage context of 54 Regent Street.

### Response

Section 14.5 of the Environmental Impact Statement provides an assessment of the potential indirect impacts to non-Aboriginal heritage items. These indirect impacts are mainly associated with views and vistas, or the potential for impacts from vibration causing construction activities.

In relation to vibration, a conservative cosmetic damage screening criterion of 7.5 mm/s has been applied to all heritage items. Where levels are predicted to be above this screening criterion, a more detailed assessment of the structure would be carried out to ensure vibration levels remain below a specific cosmetic damage level for that structure. This would consider the heritage values of the item.

Responses to specific issues raised are provided below:

- Mowbray House would be retained and protected within the Chatswood dive site, although there would be some impacts to non-original outbuildings. The future use of this item would be determined in consultation with Willoughby Council
- Existing condition surveys would be offered to the owners of all properties with the potential to be affected by construction works. The process for condition surveys is provided in the Construction Environmental Management Framework (Appendix B of this report)
- Mitigation measure NAH8 identifies that appropriate heritage interpretation would be incorporated into the design for the project in accordance with the NSW Heritage Manual, the NSW Heritage Office's *Interpreting Heritage Places and Items: Guidelines* (August 2005), and the NSW Heritage Council's *Heritage Interpretation Policy*. Consideration of heritage values is also required by the Design Guidelines for the project (Appendix A of this report)
- The potential heritage impacts to Mortuary Station from the Sydney Yard Access Bridge are considered in the heritage assessment in the Environmental Impact Statement.

Since development of the Environmental Impact Statement, further work has been carried out regarding the design principles for the Sydney Yard Access Bridge including consideration of the visual impacts of the bridge to Mortuary Station. These updated design principles are provided in Section 2.5 of this report. Further, Transport for NSW is working with the Heritage Council of NSW and other relevant stakeholders in relation to the design outcomes for Central Station (including the design of the Sydney Yard Access Bridge). The Sydney Metro Design Review Panel would include a heritage architect to provide independent review throughout detailed design.

Options for access to Sydney Yard are considered in Section 4.8.2 of the Environmental Impact Statement. In summary, a tunnel solution was not feasible as the horizontal geometry and vertical grades could not be achieved, it would have resulted additional disruption to the rail network, it would have constrained future infrastructure provision at Central Station, and it would have resulted in substantial impacts to infrastructure around Central Station (such as Prince Alfred Park or the bus layover).

## 8.13.4 Impacts to heritage conservation areas

One submission raised issues regarding impacts to heritage conservation areas.

### Stakeholder identification number

134

### Issue raised

The submission raised concerns regarding vibration causing damage to properties in heritage conservation areas around the tunnels.

### Response

The assessment of vibration impacts to buildings has considered the cosmetic damage values from British Standard BS7385 and then applied a 50 per cent reduction as a screening criterion.

As identified in the Environmental Impact Statement, heritage buildings or conservation areas have not been assumed to be more susceptible to vibration. Notwithstanding, the screening criterion applied to all heritage items has been set at a lower value of 7.5 mm/s (typically applied to light framed, unreinforced buildings) rather than the higher 25 mm/s value (typically applied to reinforced or framed buildings).

Section 10.4.13 of the Environmental Impact Statement provides a vibration assessment of properties above the tunnel alignment. Ground-borne vibration levels from main tunnelling works are predicted to be lower than the 7.5 mm/s cosmetic damage screening criteria at all locations.

Mitigation measure NV3 ensures that where vibration levels (from other construction activities) are predicted to exceed the screening criteria, a more detailed assessment of the structure and attended vibration monitoring would be carried out to ensure vibration levels remain below appropriate limits for that structure. For heritage items, the more detailed assessment would specifically consider the heritage values of the structure.

## 8.13.5 Potential archaeological items

Six submissions raised issues regarding potential archaeological items.

### Stakeholder identification numbers

50, 130, 166, 200, 213, 254

### Issue raised

In summary, the submissions raised the following issues:

- A full historic research and analysis should be a condition of any approval as should a full historical archaeological assessment prior to any intervention being considered at Blues Point Reserve where the tunnel boring machine retrieval site has been proposed
- Concern regarding the high likelihood of archaeological deposits in the Waterloo area which would be of significance. In particular this relates to the proposed tunnel between Marrickville dive site and Waterloo Station runs beneath Sheas Creek, a now concrete canal which forms the north-eastern extent of Alexandra Canal.

### Response

Section 14.5 of the Environmental Impact Statement identifies the potential for archaeological items to be present at a number of sites including the Blues Point temporary site and Waterloo Station. Mitigation measure NAH2 identifies that an archaeological research design would be prepared for these sites. This has subsequently been prepared and is provided as Appendix H to this report.

The archaeological research design identified that:

- There is moderate potential for State significant archaeology to be present in one location on the Blues Point temporary site, low potential for State significant archaeology in two other locations, and a moderate to high potential for local significant archaeology at various location on the site
- There is low to moderate potential for local significant archaeology to be present at the Waterloo Station site.

The archaeological research design also sets out the proposed archaeological management for construction works at these sites.

# 8.14 Aboriginal heritage

## 8.14.1 Potential archaeological items

Two submissions raised issues regarding potential archaeological items.

### Stakeholder identification numbers

50, 200

### Issue raised

The submissions suggest that the potential heritage significance of Blues Point Reserve is exceptionally high due potentially earlier Cammerragal occupation. A more thorough investigation should be undertaken into the significance of Blues Point Reserve in accordance with the NSW Heritage Council's guidelines. A full historic research and analysis should be a condition of any approval as should a full historical archaeological assessment prior to any intervention being considered at Blues Point Reserve.

### Response

As stated in Section 15.3.4 of the Environmental Impact Statement, there is a moderate or greater potential for previously unrecorded items of Aboriginal heritage significance to be present in sub-surface contexts in the northwest corner of the Blues Point temporary site where there is evidence of natural landform. As a result, mitigation measure AH2 commits to the preparation of an Aboriginal cultural heritage assessment report. This has subsequently been prepared and is provided as Appendix I to this report. The Aboriginal cultural heritage assessment report identified that the northwest corner of the site has a moderate potential for Aboriginal archaeology. The report also sets out the excavation methodology for this site considering the potential for archaeology.

The overall guiding principle for cultural heritage management for the project would be to conserve Aboriginal sites in situ, where possible. In situations where the conservation of an Aboriginal heritage site is not practical, mitigation measures would be developed (in consultation with the Metropolitan Local Aboriginal Land Council) and implemented to reduce the project's Aboriginal heritage impact. These measures would include:

- Consultation with the Metropolitan Local Aboriginal Land Council in accordance with the NSW Office of Environment and Heritage's *Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation 2005* (Department of Environment and Conservation, 2005a)
- Archaeological test excavation and salvage (when required).

Archaeological test excavation (and salvage when required) would be carried out where intact natural soil profiles with the potential to contain significant archaeological deposits are encountered at the Blues Point temporary site.

# 8.15 Landscape character and visual amenity

## 8.15.1 Construction visual impacts

Eleven submissions raised issues regarding constriction visual impacts.

**Stakeholder identification numbers**

50, 66, 94, 97, 112, 178, 198, 200, 207, 208, 238

**Issue raised**

***Chatswood dive site***

In summary, the submissions raised the following issues:

- Concern regarding visual impacts from the works around Chatswood
- The Environmental Impact Statement assessment of visual impacts being minor at 1-3 Gordon Avenue, Chatswood is not acceptable.

***Crows Nest Station***

In summary, the submissions raised the following issues:

- Concern regarding impacts on visual amenity (particularly from the perspective of 22-26 Clarke Street) caused by construction activities at Crows Nest Station. Suggestion for mitigation measures to monitor and manage the severity and duration impacts
- Concern regarding privacy of residents around Crows Nest.

***Blues Point temporary site***

In summary, the submissions raised the following issues:

- Concern regarding general visual impacts at Blues Point
- Concern regarding views associated with the Blues Point site including the curtilage of the world heritage listed Opera House and views from Dawes Point, Walsh Bay and Barangaroo
- The Environmental Impact Statement should rate the views to the Opera House from Blues Point as of national importance, not regional importance.

**Response**

***Chatswood dive site***

The potential visual impacts around the Chatswood dive site are assessed in Section 16.4.1 of the Environmental Impact Statement. The assessment was carried out in accordance with the Secretary's environmental assessment requirements.

The daytime visual impact assessment considered visual amenity as experienced by the users of the site and surrounds. The assessment included consideration of views from residential areas, offices and streets. To identify the potential impacts, the assessment involved identifying the existing visual conditions, views that are representative of these conditions, the sensitivity of the views, and the magnitude of change expected as a result of the project (Table 16-7 of the Environmental Impact Statement shows the relationship between these factors). An overall assessment was then made of the level of impact expected.

During construction at the Chatswood dive site there would be:

- Minor and moderate adverse visual impacts on viewpoints from Nelson Street, Gilham Street, Mowbray Road and residential properties to the east of the existing rail corridor. These impacts would primarily be due to the scale and extent of the proposed work, including removal of vegetation along the rail corridor (between Nelson Street and Mowbray Road) and construction activities at the Chatswood dive site (for example, spoil removal and tunnel support works)
- Minor adverse visual impacts on viewpoints from elevated residences to the west of the Frank Channon Walk. This impact would be due to the removal of vegetation within the rail corridor, which would open up views to both existing rail infrastructure and metro infrastructure under construction. The minor impact in this location is derived from a combination of a considerable reduction in visual amenity, associated with a viewpoint of a *neighbourhood* level of visual sensitivity.

Where feasible and reasonable, the elements within construction sites would be located to minimise visual impacts, for example materials and machinery would be stored behind fencing. Visual mitigation would be implemented as soon as feasible and reasonable after the commencement of construction, and remain for the duration of the construction period. The design and maintenance of construction site hoardings would aim to minimise impacts on visual amenity and landscape character, including the prompt removal of graffiti. Public art opportunities would be considered. The selection of materials and colours for acoustic sheds would aim to minimise their visual prominence.

### *Crows Nest Station*

During construction, there would be minor and moderate visual impacts at Crows Nest due to the extent of demolition and the scale of the proposed acoustic enclosures and construction sites. The range of impact levels at this location reflects the scale and proximity of the works to the viewing location. Generally, impacts would be more substantial in the vicinity of Hume Street where the construction site works would be more complex and have a larger footprint.

Where feasible and reasonable, the elements within construction sites would be located to minimise visual impacts, for example materials and machinery would be stored behind fencing. Visual mitigation would be implemented as soon as feasible and reasonable after the commencement of construction, and remain for the duration of the construction period. The design and maintenance of construction site hoardings would aim to minimise impact on visual amenity and landscape character, including the prompt removal of graffiti. Public art opportunities would be considered. The selection of materials and colours for acoustic sheds would aim to minimise their visual prominence.

### *Blues Point temporary site*

During construction, there would be:

- Moderate to high adverse visual impacts on viewpoints from Blues Point and McMahons Point. These impacts would be due to the obstruction of views to the open water of the harbour and the incongruous character of the construction work with these views
- A moderate adverse visual impact on viewpoints from the Harbour Bridge and St Ives stairs due to the disruption of the green foreshore edge, which is currently visible from across the harbour
- Negligible visual impacts from the Sydney Opera House and forecourt. Although the project site would be clearly visible from these locations, the distance and ability of the surrounding urban environment to absorb visual impacts would result in no perceived change in the amenity of views. Similarly, negligible visual impacts would be experienced from Barangaroo Reserve, where distance and intervening elements would limit the visibility of the site.

Where feasible and reasonable, the elements within construction sites would be located to minimise visual impacts (for example, materials and machinery would be stored behind fencing). Visual mitigation would be implemented as soon as feasible and reasonable after the commencement of construction, and remain for the duration of the construction period. The design and maintenance of construction site hoardings would aim to minimise impact on visual amenity and landscape character, including the prompt removal of graffiti. Public art opportunities would be considered. The selection of materials and colours for acoustic sheds would aim to minimise their visual prominence.

Tunnel boring machine retrieval works at the Blues Point temporary site would be timed to avoid key harbour viewing events and benching would be used where feasible and reasonable to minimise visual amenity impacts.

Defining views of the harbour (which include views of the Opera House) from Blues Point as regional is consistent with the allocation of visual sensitivity throughout the visual impact assessment in the Environmental Impact Statement. An important factor in determining visual sensitivity is how heavily a viewpoint is experienced. In this context, views from the Opera House are experienced by far more people than those from Blues Point. While views from Blues Point are unquestionably important (regionally sensitive), they do not have the same level of importance as the national sensitive views from the Opera House.

### 8.15.2 Operation visual impacts

Twenty-eight submissions raised issues regarding operational visual impacts.

**Stakeholder identification numbers**

44, 54, 55, 80, 90, 110, 135, 173, 182, 183, 184, 185, 186, 187, 188, 189, 191, 192, 193, 194, 195, 196, 197, 206, 212, 228, 241, 273

**Issue raised**

In summary, the submissions raised the following issues:

***Chatswood dive site***

In summary, the submissions raised the following issues:

- Concern regarding visual impacts around the Chatswood dive site as trains will be visible above the noise wall
- There will be visual amenity impacts to residents west of Frank Channon Walk due to removal of vegetation within the rail corridor, noise barriers, overshadowing, and the rail bridge
- Concern regarding loss of sunlight and views as a result of installations of noise barriers at Chatswood. Suggestion to consult with affected residents in choice of material and barrier height
- Suggestion that the rail bridge should not be built over Nelson Street and Nelson Street bridge should not be permanently closed
- Both metro tracks at Chatswood should be located together from Albert Avenue rather than in between the two T1 North Shore Line tracks
- Suggestion that an artist's impression showing a cross-section of the two major structures at Chatswood dive site within the rail corridor showing the dive structure and the rail bridge be developed
- Suggestion that the development of the Ausgrid site near Chatswood should exclude high rise

- Suggestion for extra tree plantings at the south and north of Nelson Street and east of Nelson Street bridge before construction starts
- Suggestion that vines growing on the noise barriers along Frank Channon Walk should be retained and the height of the current barriers should be retained.

***Central Station***

In summary, the submissions raised the following issues:

- Concern regarding visual impacts from Sydney Yard Access Bridge at 54 Regent Street.

**Response**

***Chatswood dive site***

During the operation at the Chatswood dive site, there would be minor to moderate adverse daytime visual impacts on viewpoints from the following locations:

- Residential properties to the west of the Frank Channon Walk
- Residential properties and streets between Nelson Street and Mowbray Road
- Residential properties and streets between Mowbray Road and Hawkins Street.

These impacts would be due to the proposed removal of vegetation from within the rail corridor and scale of metro infrastructure, which would result in unfiltered views of the rail corridor, noise barriers and dive structure. There would also be minor adverse landscape impacts on the Frank Channon Walk during operations due to the proposed removal of trees, the scale of the adjacent retaining structure and noise barriers, and associated overshadowing.

Mitigation measures (LV12 and LV13) have committed that, where feasible and reasonable, vegetation would be provided to screen and visually integrate sites with the surrounding area. In addition appropriate landscape treatments for Frank Channon Walk are to be identified and implemented.

Sydney Metro would consult with Willoughby Council to identify in opportunities to mitigate the impacts to Frank Channon Walk, Gordon and Nelson Avenue, through landscape and public domain treatments for areas affected by construction.

Noise barriers would be transparent where they are augmenting existing transparent noise barriers.

The Nelson Street bridge is required to be demolished to enable the construction of the metro dive structure and the realignment of the T1 North Shore Line.

The future development of the residual land at Chatswood dive site would be subject to a separate planning approval process.

***Central Station***

The visual impact of the Sydney Yard Access Bridge is considered and assessed in Section 16.4.10 of the Environmental Impact Statement. Moderate adverse visual impacts are anticipated to be experienced at Regent Street where the Sydney Yard Access Bridge would remain and continue to be used for access to the Yard.

Since exhibition of the Environmental Impact Statement, more detailed design principles for the Sydney Yard Access Bridge have been developed with a focus on minimising the visual and heritage impacts associated with the bridge, These refined design principles are provided in Section 2.5 of this report and are also included in the updated Chatswood to Sydenham Design Guidelines (Appendix A of this report).

### 8.15.3 Construction and operation landscape character impacts

Nine submissions raised issues regarding construction and operational landscape character impacts.

**Stakeholder identification numbers**

15, 50, 94, 110, 127, 137, 215, 236, 250

**Issue raised**

***Chatswood dive site***

In summary, the submissions raised the following issues:

- Suggestion for landscape master planning and a maintenance program post-construction at Chatswood dive site
- Request for a landscape plan for Nelson Street and the rail corridor to Chatswood Station
- Concern regarding the potential removal of vines on Frank Channon Walk wall adjacent to the rail corridor. This is great for the environment and also provide a barrier against graffiti
- Concern regarding tree removal on Nelson Street, Chatswood. Suggestion for a 2 for 1 tree replacement program.

***Crows Nest Station***

In summary, the submissions raised the following issues:

- The Crows Nest Station design does not keep with the appearance of Crows Nest. The Environmental Impact Statement does not address the change to pedestrian areas or footpath spaces and the removal of small scale retail.

***Victoria Cross Station***

In summary, the submissions raised the following issues:

- Objection to the demolition of the Jewellers Shop and Tower Square for Victoria Cross Station. These buildings make an important contribution to the social and visual character of the Miller Street area
- All trees on Miller Street and Berry Street, North Sydney should be retained and included in the rebuilt streetscape.

***Blues Point temporary site***

In summary, the submissions raised the following issues:

- Concern regarding the considerable landscape impact to Blues Point, including harbour viewing events and unique photo opportunities of the Opera House and Harbour Bridge

***Martin Place Station***

In summary, the submissions raised the following issues:

- Concern regarding the size and design of Martin Place Station as it appears to take up a lot of open space in Martin Place. The building does not appear to be in keeping with the architecture of other buildings in Martin Place.

**Response**

The potential landscape character impacts are assessed in Section 16.4 of the Environmental Impact Statement. Responses to specific issues raised at each relevant site are provided below.

### *Chatswood dive site*

The assessment at Chatswood includes the potential landscape impact associated with the removal of vegetation and changes to Frank Channon Walk.

Mitigation measures (LV12 and LV13) have committed that, where feasible and reasonable, vegetation would be provided to screen and visually integrate sites with the surrounding area. In addition appropriate landscape treatments for Frank Channon Walk are to be identified and implemented.

Sydney Metro would consult with Willoughby Council to identify in opportunities to mitigate the impacts to Frank Channon Walk, Gordon and Nelson Avenue, through landscape and public domain treatments for areas affected by construction.

In addition, mitigation measure LV5 commits identifying opportunities for the retention and protection of existing trees during detailed construction planning.

### *Crows Nest Station*

The location and form of Crows Nest Station has been specifically developed to be in keeping with the existing character of Crows Nest. Of particular importance is the location of the station outside the main village centre. This is discussed in the Chatswood to Sydenham Design Guidelines, which were included as Appendix B to the Environmental Impact Statement. An updated version of the Design Guidelines (Appendix A of this report) provides more context to the station design at Crows Nest and its relationship to the surrounding urban character.

During operation, there would be minor beneficial landscape impacts on these areas due to the improved accessibility of public transport and the provision of additional pedestrian crossings, which would improve overall accessibility around the entire precinct. In addition, there would be a negligible visual impact on surrounding viewpoints. In addition, the proposed station entry and streetscape upgrades would likely improve the overall quality of views from the corner of Hume and Clarke streets.

### *Victoria Cross Station*

The project provides a major opportunity to improve the overall quality of the area. Further information is provided in the updated Chatswood to Sydenham Design Guidelines (Appendix A of this report).

During construction there would be a minor adverse landscape impact on Berry and Miller streets. This impact would be primarily due to direct impacts on pedestrian movement and the removal of mature street trees at these locations.

While the contribution of the jewellers shop and Tower Square to the character of Miller Street is acknowledged, there are substantial opportunities for improved landscape outcomes provided through the design of an integrated station precinct. Beneficial landscape impacts are identified in the Environmental Impact Statement through the uncluttering of views to the site, and the introduction of a broad open plaza, street trees, and a prominent, architectural station entry and plaza. Following construction, and where feasible and reasonable, vegetation would be provided to screen and visually integrate sites with the surrounding area.

### *Blues Point temporary site*

During construction, there would be a high adverse landscape impact on Blues Point Reserve. This impact would be a consequence of the direct loss of harbour foreshore open space. It is noted, however, that pedestrian access would be maintained around the foreshore edge, and existing mature trees would be retained.

Where feasible and reasonable, the elements within construction sites would be located to minimise visual impacts (for example, materials and machinery would be stored behind fencing). Visual mitigation would be implemented as soon as feasible and reasonable after the commencement of construction, and remain for the duration of the construction period. The design and maintenance of construction site hoardings would aim to minimise impact on visual amenity and landscape character, including the prompt removal of graffiti. Public art opportunities would be considered. The selection of materials and colours for acoustic sheds would aim to minimise their visual prominence.

In addition, tunnel boring machine retrieval works at the Blues Point temporary site would be timed to avoid key harbour viewing events., and Benching would be used where feasible and reasonable to minimise visual amenity impacts.

During operation, there would be negligible landscape impacts as the reserve would be reinstated after construction.

### *Martin Place Station*

The architectural form of the building associated with the southern Martin Place entry will be identified as part of the approvals process for over station development. The southern station entry would be built to the existing property line and not resume any part of Martin Place. It is acknowledged however that the existing building at this site is set back from Martin Place with some open plaza space on the Martin Place and Castlereagh Street frontages.

During operation, there would be a minor beneficial landscape impact on Hunter, Castlereagh and Elizabeth streets, as well as a high beneficial landscape impact on Martin Place due to the integration of the station and plaza, and improvements to legibility and accessibility. There would also be high beneficial impacts on views in the vicinity of Martin Place, as the design outcome would improve views in this area.

## 8.16 Groundwater and geology

### 8.16.1 Ground movement and settlement

Thirteen submissions raised issues regarding ground movement and settlement.

**Stakeholder identification numbers**

50, 82, 84, 98, 105, 114, 130, 140, 142, 162, 163, 249, 298

**Issue raised**

In summary, the submissions raised the following issues:

- Concern regarding the impact of blasting on the stability of the buildings across Clarke Lane, Crows Nest
- Concern that excavation at Blues Point will exacerbate subsidence issues at Blues Point Tower
- Concern that tunnelling will impact foundations of buildings in Waterloo and that not enough information has been provided

- Concern regarding ground movement near Waterloo Station
- Concern regarding potential tunnel collapse and subsidence around Newtown
- Concern regarding damage to residential properties in Lord Street, Newtown especially those close to the dive site. Specific concerns raised include:
  - Houses are over 100 years old
  - Soil is reactive clay with substantial existing movement during dry and wet weather
  - Tunnels will be in an aquifer with a high water table. Disturbance during construction may create subsidence problems
  - Water and sewer pipes are over 100 years old. Investigations are needed on this infrastructure
  - There have been no geotechnical investigations
  - Request for more detail on contingency funds to repair any damage.

### Response

Section 10.4 of the Environmental Impact Statement considers the potential impacts of project construction associated with blasting and ground-borne vibration. Section 17.4.2 considers the potential for ground movement (or settlement) related to construction.

The use of blasting is proposed at most excavation locations (including at Crows Nest) because it is expected to reduce the overall duration of excavation, and the associated impacts of rock hammering. Upper limits for vibration and overpressure from blasting were adopted for the project in line with other recent project approvals to target the protection of building structures from cosmetic damage. An additional conservative criterion for heritage buildings was also adopted to screen potential vibration impacts from blasting at heritage buildings. All of the blasting scenarios considered in the Environmental Impact Statement were designed (based on preliminary information) to comply with these criteria.

Consistent with the guidance from British Standard *BS 7385 Evaluation an Measurement for Vibration in Buildings*, conservative vibration damage screening levels were adopted for reinforced or framed structures and unreinforced or light framed structures. Chapter 10 of the Environmental Impact Statement identifies that during main tunnelling works ground-borne vibration would be lower than the threshold at which cosmetic damage may occur at all locations. However, exceedences of the screening criteria are expected as a result of excavation for some buildings and structures at Crows Nest Station, Victoria Cross Station, Barangaroo Station, Martin Place Station, Pitt Street Station and Central Station. A more detailed assessment of potentially affected structures and attended vibration monitoring would therefore be carried out at these locations to ensure vibration levels remain below appropriate limits for those structures (refer to mitigation measure NV3).

Ground movement typically results from either the release or redistribution of stress in rock formations during tunnelling and excavation, or from ground consolidation following the drawdown of groundwater (during construction and / or operation). While the specific risk to buildings and structures due to ground movement depends on geotechnical conditions, distance from construction activities and building characteristics, preliminary ground movement contours indicate that for most of the project alignment there would be a negligible ground movement risk, with superficial damage to buildings unlikely. Some buildings and structures close to station and dive sites excavations may be at risk of superficial damage and therefore may require future building strain and structural assessment to address settlement related risks.

Mitigation measure GWG1 commits to the development of a detailed geotechnical model that would allow more specific assessment of the potential for damage to structures, services, basements and other sub-surface elements through settlement or strain. Where building damage risk is rated as moderate or higher (as per adopted risk based criteria), a structural assessment of the affected buildings and structures would be carried out and specific measures implemented to address the risk of damage. Pre-excavation condition surveys of buildings and structures in the vicinity of the tunnel and excavations are also proposed (refer to mitigation measure GWG2).

Geotechnical investigations have occurred along the project alignment to inform the design development process and further investigations would be conducted as required during detailed design.

### 8.16.2 Groundwater inflow

Three submissions raised issues regarding groundwater inflow.

**Stakeholder identification numbers**

130, 162, 163

**Issue raised**

In summary, the submissions raised the following issues:

- Concern regarding groundwater impacts and impacts at Waterloo
- Concern regarding the lack of survey of the Lord Street, Newtown area for suitability for a train line and possibility of interference with underground water.

**Response**

Potential groundwater impacts are considered in Sections 17.4.1, 17.4.3 and 17.4.4 of the Environmental Impact Statement.

During construction, the assessment estimates the maximum dewatering (after initial works) would be 2.86 litres per second for Waterloo Station. This maximum inflow rate, should it occur, would not be expected to result in changes to groundwater levels at the nearest groundwater extraction site. Further, actual inflows during operation would be much lower than this estimated maximum because Waterloo Station would be tanked. This means it would be designed to inhibit the inflow of groundwater, typically using concrete lining and waterproofing membrane.

The geological long-section included in Appendix F of the Environmental Impact Statement shows that a number of geotechnical investigations were conducted near Lord Street at Newtown and that beneath Lord Street the tunnels would be located within Ashfield Shale. As the tunnels would be tanked to inhibit groundwater inflows, groundwater drawdown at this location is expected to be limited. Additionally, the permeability of shale is generally low, with the majority of groundwater flow transmitted through joints and fractures rather than via the porous nature of the material.

Section 17.4.1 of the Environmental Impact Statement sets target changes to groundwater levels which vary depending on geology and the presence of buildings. These targets would be reviewed following the development of a detailed geotechnical model for the project and a groundwater monitoring program would be implemented if significant exceedances of target changes to groundwater levels are predicted at surrounding land uses and nearby water supply works. Any groundwater monitoring program would aim to confirm no adverse impacts on groundwater levels or to identify impacts so they can be appropriately managed (refer to mitigation measure GWG1).

# 8.17 Soils, contamination and water quality

## 8.17.1 Soil erosion

One submission raised issues regarding soil erosion.

### Stakeholder identification number

130

### Issue raised

The submissions raised concerns regarding erosion from the Waterloo Station site.

### Response

Potential soil erosion and sedimentation impacts of the project are considered in Section 18.4.2 of the Environmental Impact Statement.

Construction of the project would temporarily expose the natural ground surface and sub-surface at the Waterloo Station site through the removal of overlying structures (such as buildings and footpaths) and excavation of the construction footprint for the station, structures and foundations. The exposure of these disturbed areas to water runoff and wind could increase soil erosion potential.

Given the relatively small areas of surface disturbance anticipated during construction and the flat topography at the Waterloo Station site, it is expected that soil erosion would be adequately managed by implementing measures in accordance with *Managing Urban Stormwater: Soils and Construction Volume 1* (Landcom, 2004) and *Managing Urban Stormwater: Soils and Construction Volume 2* (Department of Environment and Climate Change, 2008a).

## 8.17.2 Acid sulfate soils

One submission raised issues regarding acid sulfate soils.

### Stakeholder identification number

130

### Issue raised

The submission raised concerns regarding disturbance of acid sulfate soils at Waterloo Station.

### Response

The likelihood of the project exposing potential acid sulfate soil is considered in Section 18.4.2 of the Environmental Impact Statement.

The Office of Environment and Heritage acid sulfate soil rock maps do not identify the Waterloo Station site as having a probability of acid sulfate soils. The site is also classified as Class 5 on the acid sulfate soils map included in *Sydney Local Environmental Plan 2012*, which is the lowest risk category. It is, however, still possible that construction at the Waterloo Station site could expose alluvial soils with acid sulfate soil potential.

Further geotechnical testing of underlying sub-soil and rock stratum would be undertaken to determine the composition of rock and soil types likely to be present within excavation areas. If acid sulfate soils are encountered, they would be effectively managed in accordance with the *Acid Sulfate Soil Manual* (Acid Sulfate Soil Management Advisory Committee, 1998). The manual includes procedures for the investigation, handling, treatment and management of such soils (refer to mitigation measure SCW2).

### 8.17.3 Contamination

Two submissions raised issues regarding contamination.

**Stakeholder identification numbers**

112, 130

**Issue raised**

In summary, the submissions raised the following issues:

- Concern regarding the risk to workers, residents and visitors from contamination at Blues Point from previous industrial activities
- Concern regarding disturbance of contamination at Waterloo Station.

**Response**

The potential for the project to disturb contaminated areas is considered in Section 18.4.2 of the Environmental Impact Statement and Section 3 of Technical Paper 8: Phase 1 Contamination Investigation.

The Blues Point temporary site has a moderate contamination risk with a history of commercial / industrial use including potential ship yard activities undertaken on and / or adjacent to the site which could have resulted in contaminated soils, water and vapour.

The historical and current commercial and industrial use of the Waterloo Station site (including present day activities such as dry cleaners, automotive use and a sub-station) represents a moderate risk and is a potential source of contamination associated with the chemicals used in the dry cleaning process (ie chlorinated hydrocarbons, and volatile organic compounds), the automotive industry (hydrocarbons), substation (hydrocarbons and PCB) and miscellaneous chemicals associated with historical commercial / industrial operations.

Updated desktop contamination assessments would be carried out for the Chatswood dive site, Blues Point temporary site, Barangaroo Station, Central Station and Waterloo Station. If necessary to determine the remediation requirements and identify risks to site workers, visitors, the general public and surrounding environments, detailed contamination assessments, including collection and analysis of soil and groundwater samples would be carried out (refer to mitigation measure SCW1).

### 8.17.4 Marine water quality

One submission raised issues regarding marine water quality.

**Stakeholder identification number**

159

**Issue raised**

The submissions requested protection for estuarine environments of Sydney Harbour.

**Response**

The Environmental Impact Statement commits to mitigation measures including the use of silt curtains, a water quality monitoring program to inform responses to any potential impacts and procedures to avoid the spread of marine pests (refer to mitigation measures SCW5, SCW6 and B4). With the implementation of suitable mitigation measures, impacts on Sydney Harbour environments would be managed.

# 8.18 Social impacts and community infrastructure

## 8.18.1 Community cohesion

One submission raised issues regarding community cohesion.

**Stakeholder identification number**

250

**Issue raised**

The submission raised concerns that if large scale buildings are built over the stations, Crows Nest village will be broken up and the community will be less cohesive.

**Response**

Over station development would be subject to a separate planning approval process.

## 8.18.2 Community health and safety

Seven submissions raised issues regarding community health and safety.

**Stakeholder identification numbers**

8, 130, 153, 154, 158, 167, 268

**Issue raised**

In summary, the submissions raised the following issues:

- Health and safety of local residents is the number one priority
- The health and wellbeing of people in the neighbouring properties at the Chatswood dive site is worth significant consideration
- Concern regarding the impact of construction dust on health at the Chatswood dive site
- Concern regarding the location of the Artarmon substation near a school and potential impacts to children's health. Suggestion to move the substation to the Artarmon Industrial Area
- Request to find an alternative to the haul route at Blues Point due to impacts on health of elderly people
- Concern regarding the health impacts of the substation at Waterloo Station. There has been no community consultation on this issue.

**Response**

Section 19.4.3 of the Environmental Impact Statement provides consideration of the potential health and safety impacts to the surrounding community from construction and operation of the project.

Responses to specific issues raised are provided below:

- The potential impacts associated with the generation of dust are assessed in Section 22.4.1 of the Environmental Impact Statement. These impacts are anticipated to be minor and would be managed through the implementation of standard mitigation measures provided in Section 22.6 of the Environmental Impact Statement
- Transport for NSW is continuing to investigate sites for the Artarmon substation within the Artarmon Industrial Area. This location would represent better land use compatibility and remove the potential for overlap with the use of the site by the school

- In relation to potential health impacts from substations, the Environmental Impact Statement commits to meeting the exposure standards of the *Draft Radiation Standard – Exposure Limits for Magnetic Fields* (Draft Radiation Standard) (Australian Radiation Protection and Nuclear Safety Agency, 2006)
- Details of community consultation are provided in Chapter 4 of this report. Prior to exhibition of the Environmental Impact Statement, this included specific consultation following the announcement of Waterloo Station in February 2016. Consultation during exhibition of the Environmental Impact Statement included six community information sessions and two information stalls. Place Managers were also available to contact via the community information line and the project email address.

### 8.18.3 Impacts to community infrastructure

Fifteen submissions raised issues regarding impacts to community infrastructure.

**Stakeholder identification numbers**

18, 37, 74, 91, 112, 166, 190, 200, 213, 215, 240, 242, 250, 254, 301

**Issue raised**

In summary, the submissions raised the following issues:

- Suggestion that if a road link between Nelson Street and Mowbray Road was provided as part of the Chatswood dive site, the area between the road and the metro could become open space and incorporate Frank Channon Walk. If the Ausgrid site is totally dedicated to high rise development it would exacerbate a need for open space in the immediate area. In the event the link from Nelson Street to Mowbray Road is not provided, this area should still be retained as open space after construction
- Residual land at the dive site should be used as 'green / recreational' spaces
- The loss of the Crows Nest post office is not included in the business impacts chapter. Private mailboxes at this post office are vital to businesses in Crows Nest and would have a significant impact. It is important that there is a permanent post office at Crows Nest during and following construction
- Objection to the use of Blues Point Reserve due to impacts on public open space and community infrastructure
- Concern regarding permanent impacts to Blues Point Reserve
- Blues Point Reserve should be reinstated in collaboration with North Sydney Council at the completion of the project

**Response**

Responses to the specific issues raised are provided below:

- The use of the residual land at the Chatswood dive site would be subject to a separate planning approval process
- The replacement of the Australia Post in Crows Nest is a matter for Australia Post Corporation. Alternative postal facilities are available nearby at St Leonards
- The site at Blues Point Reserve is a temporary facility. This site would be reinstated as soon as possible after the completion of activities at the site in consultation with North Sydney Council.

# 8.19 Biodiversity

## 8.19.1 Vegetation clearing

Three submissions raised issues regarding vegetation clearing.

### Stakeholder identification numbers

15, 130, 270

### Issue raised

In summary, the submissions raised the following issues:

- The construction of Chatswood dive site will remove an old and large tree inside the rail corridor near the Nelson Street bridge
- Concern regarding tree removal in Miller Street, North Sydney, due to shade provision and pollution reduction
- Concern regarding the clearing of native fig trees at Waterloo which provide habitat for Rainbow Lorikeet and Sulphur-crested Cockatoo.

### Response

The biodiversity assessment in Chapter 20 of the Environmental Impact Statement conservatively assumed that all vegetation within the construction footprint would be cleared. Mitigation measure LV5 identifies that vegetation would be retained where feasible and reasonable.

All vegetation identified within the study area is mapped as Urban – Exotic / Native in Native Vegetation of the Sydney Metropolitan Catchment Management Authority Area (Department of Environment, Climate Change and Water, 2009a) and field assessment has confirmed that most vegetation is planted or exotic regrowth.

There is minimal native vegetation in the area to be impacted. Native vegetation is limited to planted trees and shrubs and occasional scattered regeneration of common native plant species within previously disturbed areas.

The clearing of planted trees and landscaped vegetation could impact foraging habitat and shelter for fauna species. However, impacts would be to a very small amount of vegetation and would therefore be minor and generally restricted to common fauna species that inhabit urban environments.

## 8.19.2 Impacts to threatened species

One submission raised issues regarding impacts to threatened species.

### Stakeholder identification number

130

### Issue raised

The submission raised concerns regarding impacts to bat roosting at Waterloo Station.

### Response

As identified in Section 20.4 of the Environmental Impact Statement, the removal of buildings at the Waterloo Station site has the potential to impact roosting and nesting fauna including microbat habitat. During targeted surveys carried out as part of the assessment, no microbats were observed at this site. The assessment concluded that there would be a moderate likelihood of microbats occurring at the Waterloo Station site.

Potential bat roosting locations at the Waterloo Station site would be checked by a qualified ecologist or wildlife handler prior to demolition. The local WIRES group and / or a veterinarian would be contacted if any fauna are injured on site or require capture and / or relocation.

# 8.20 Flooding and hydrology

## 8.20.1 Construction stage flooding, hydrology and drainage infrastructure

One submission raised issues regarding construction stage flooding, hydrology and drainage infrastructure.

### Stakeholder identification numbers

297

### Issue raised

In summary, the submission requested the flooding implications for Waterloo be addressed in the short term and longer term via a detailed flood impact assessment undertaken prior to finalising the detailed design of the Waterloo Station.

### Response

As identified in Section 21.4.2 of the Environmental Impact Statement, the Waterloo Station site would be at risk of flooding during construction. Construction of the project also has the potential to alter local flood behaviour due to the obstruction of overland flow paths, loss of floodplain storage (for example, due to stockpiling construction materials and spoil) and the alteration to stormwater drainage infrastructure. Detailed construction planning would consider flood risk at the Waterloo Station construction site. This would include identification of measures to avoid, where reasonable and feasible, construction phase flooding impacts on the community and on other property and infrastructure.

## 8.20.2 Operational flooding, hydrology and drainage infrastructure

Two submissions raised issues regarding operational stage flooding, hydrology and drainage infrastructure.

### Stakeholder identification numbers

134, 297

### Issue raised

In summary, the submissions raised the following issues:

- Concern regarding increased local flooding from the project around the metro rail tunnels
- Concern regarding flooding impacts during the operation of Waterloo Station.

### Response

To avoid inundation, the tunnel dive structures would be designed at or above the Probable Maximum Flood level for mainstream flooding. Drainage at the dive structures would be designed to manage flows for the 100-year average recurrence interval event.

As identified in the Environmental Impact Statement, the Waterloo Station site would be at risk of flooding during operation. To avoid flooding impacts on project infrastructure, station entries and aboveground rail system facilities would be located (where feasible and reasonable) above the Probable Maximum Flood level and at least 0.5 metres above the 100-year average recurrence interval flood level. Where it is not feasible and reasonable to meet these design criteria, the design would consider the need for sumps and pumps to manage any potential inflows into project infrastructure.

The aboveground station infrastructure would be located within the footprint of existing development and would have a negligible impact on the existing surface hydrology. The runoff volumes and flow rates would be similar to the existing conditions and there would be no impact to the capacity of the existing downstream stormwater infrastructure. All surface water from aboveground facilities and tunnel dive structures would also be collected by new drainage infrastructure and connected to existing stormwater systems.

Mitigation measure FH9 (refer to Chapter 11 of this report) has been revised to identify that the design of the project would, where feasible and reasonable, not worsen existing flooding characteristics up to and including the 100 year average recurrence interval event in the vicinity of the project.

# 8.21 Air quality

## 8.21.1 Construction dust emissions

Thirty-seven submissions raised issues regarding construction dust emissions.

**Stakeholder identification numbers**

49, 58, 61, 63, 74, 91, 95, 112, 128, 130, 154, 158, 166, 167, 173, 182, 183, 184, 185, 186, 187, 188, 189, 191, 192, 193, 194, 195, 196, 197, 200, 215, 220, 238, 242, 245, 273

**Issue raised**

In summary, the submissions raised the following issues:

- Concern regarding dust from spoil removal
- Concern regarding air pollution and air quality impacts from the Chatswood dive site during construction. Request for high dust barriers to mitigate impacts
- Objection to the proposed air quality management at Chatswood dive site
- Concern regarding dust impacts caused by construction activities at Crows Nest Station. Suggestion for mitigation measures to monitor and manage the severity and duration of impacts
- Concern regarding impacts of dust from demolition, construction and heavy vehicle movements on Hume Street, Crows Nest, and how dust will effect ground and first floor businesses of Lawson House
- Concern regarding dust impact on Kelly's Place child care centre caused by haulage trucks and light vehicles on Clarke Street, Crows Nest
- Concern regarding dust emissions from the Blues Point site and reduced quality of life, especially due to winds from the harbour blowing towards residences
- Concern regarding dust from trucks on Blues Point Road
- Suggestion to contain dust by erecting an acoustic shed at the Blue Point temporary site
- The suggested 'hoardings' at Blues Point will be of minimal value in attenuating the dust because the site is surrounded by apartment towers
- Dust and amenity impacts from Sydney Yard Access Bridge construction likely at properties on Regent Street, Chippendale
- Concern regarding construction dust emissions and general construction pollution around Waterloo
- Concern regarding construction pollution around the Marrickville dive site.

**Response**

Section 22.4 of the Environmental Impact Statement provides an assessment of potential air quality impacts of the project. Dust emissions from the project would be readily manageable to appropriate standards through standard mitigation measures (as identified in Section 22.6 of the Environmental Impact Statement).

It is acknowledged that some receivers are particularly sensitive dust emissions. Specific consultation (as per mitigation measure SO2) would be carried out with sensitive community receivers potentially impacted during construction. This consultation would aim to identify and develop specific measures to manage construction impacts for individual sensitive community receivers.

### 8.21.2 Construction exhaust emissions

Twenty-eight submissions raised construction exhaust emissions.

**Stakeholder identification numbers**

65, 74, 91, 95, 112, 141, 166, 173, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 242, 245, 273, 275

**Issue raised**

In summary, the submissions raised the following issues:

- Concern regarding exhaust emissions from trucks on Blues Point Road and exhaust emissions from the Blues Point site, particularly the impact on this inner city residential area
- Request for machinery vents and exhausts to be faced away from residential buildings at Blues Point
- Concern regarding fumes from Sydney Yard Access Bridge during construction.

**Response**

Exhaust emissions during construction would generally be restricted to minor localised emissions of carbon monoxide, oxides of nitrogen, sulfur dioxide and volatile organic compounds, due to the combustion of fuel in construction plant, machinery and equipment and emissions from plant and equipment.

These pollutants would not significantly affect local air quality at the nearest sensitive receivers and would be adequately managed during construction with standard mitigation measures as outlined in Section 22.6 of the Environmental Impact Statement.

### 8.21.3 Operational impacts

Six submissions raised issues regarding operational impacts.

**Stakeholder identification numbers**

134, 139, 142, 145, 158, 182

**Issue raised**

In summary, the submissions raised the following issues:

- Concern regarding degradation to air quality around exhaust stacks from the tunnels
- Request for air pollution control at the Chatswood dive site
- Concern regarding increased pollution around Chatswood due to the removal of Nelson Street bridge
- Relocation of T1 North Shore Line and construction at Chatswood dive site and removal of vegetation will increase air pollution
- Concern regarding air quality impacts in Crows Nest and an increase in dust and grime on the outside of buildings
- Concern regarding fumes and dust from Sydney Yard Access Bridge during operation

**Response**

Section 22.5 of the Environmental Impact Statement provides a detailed assessment of potential air quality impacts of the project. This assessment identifies that emissions vented through the fresh air ventilation system would be in very low concentrations.

During operation, the Sydney Yard Access Bridge would be used for maintenance access requirements for Sydney Trains and Sydney Metro. Access would be infrequent, with traffic volumes less than on a local residential street.

# 8.22 Hazard and risk

## 8.22.1 Dangerous goods and hazardous substances

Three submissions raised issues regarding dangerous goods and hazardous substances.

**Stakeholder identification numbers**

82, 142, 249

**Issue raised**

The submissions raised concerns regarding the storage of dangerous goods at Crows Nest Station

**Response**

Typically, low volumes of potentially hazardous materials would be stored on site. The likely materials and storage volumes at each site are provided in Section 23.3.1 of the Environmental Impact Statement. Storage of dangerous goods would be located to meet State environmental policy requirements – namely *State Environmental Planning Policy No. 33- Hazardous and Offensive Development*.

# 8.23 Waste management

## 8.23.1 Spoil generation and management

Sixteen submissions raised issues regarding spoil generation and management.

**Stakeholder identification numbers**

43, 46, 47, 76, 77, 81, 85, 87, 88, 93, 151, 204, 261, 263, 264, 267

**Issue raised**

In summary, the submissions raised the following issues:

- The indicative timing of construction (and removal) at Barangaroo Station is on a 24/7 basis, which is superfluous and unreasonable
- The spoil from Barangaroo Station should be removed from the area directly to its final destination, and this should not occur at night
- The temporary spoil stockpile on Hickson Road for Barangaroo Station is unnecessary and will result in double handling. Spoil should be removed directly to its final destination
- The Environmental Impact Statement indicated that spoil from Barangaroo may be removed from the area by barge. If that was to happen, it must only do so from the harbour side of the central Barangaroo site. To do so from any other local harbour location would involve double handling, unwarranted and unreasonable noise and increase the number of truck movements in the area

**Response**

Tunnelling and underground excavations and supporting activities are proposed to be carried out up to 24 hours per day and seven days per week. The proposed hours aim to provide a balance between minimising the intensity and duration impacts on the community and construction efficiency.

Since the preparation of the Environmental Impact Statement, construction planning has identified that rock breaking for cut-and-cover stations and station shafts (except for Central Station) would no longer be required outside of standard construction hours. Support station excavation activities would still occur up to 24 hours per day and seven days per week. Further information is provided in Section 9.6 of this report.

The spoil generated at Barangaroo Station, including from tunnelling activities, would be stored at the site and removed as efficiently as possible. Double handling is an additional cost to the contractor and would be avoided where feasible and reasonable.

Section 8.2.3 of the Environmental Impact Statement identifies alternative spoil transport options, including the potential use of barges at Barangaroo. Further investigations regarding the potential for use of barges at Barangaroo have been carried out (refer to Section 3.2 of this report).

### 8.23.2 Other construction waste

One submission raised issues regarding other construction waste.

**Stakeholder identification number**

220

**Issue raised**

The submission raised concerns regarding emissions of asbestos from demolition activities (particularly the Post Office) at Crows Nest Station and requested information on mitigation measure designed to reduce risk to owners and tenants of nearby properties.

**Response**

Mitigation measure HR3 identifies that a hazardous material survey would be completed for those buildings and structures suspected of containing hazardous materials (particularly asbestos) prior to their demolition. If asbestos is encountered, it would be handled and managed in accordance with relevant legislation, codes of practice and Australian standards.

## 8.24 Sustainability

### 8.24.1 Environment and sustainability policy and strategy

One submission raised issues regarding environment and sustainability policy and strategy.

**Stakeholder identification number**

153

**Issue raised**

The submission suggested that staff and contractors for the project should be sourced from NSW.

**Response**

Transport for NSW would implement a Workforce Development and Industry Participation Strategy for the Sydney Metro project.

The project offers the potential to increase workforce capability and capacity, mitigate skills shortages and gaps that would reduce cost, improve productivity and provide local sustainable employment. Sydney Metro's skills legacy would improve the competitiveness of industry, provide individual career pathways and provide major socio-economic benefits to individuals and communities.

Sustainability objectives and supporting targets and initiatives identified for the project (provided in Section 25.3 of the Environmental Impact Statement) include: workforce development and community benefit, the provision of employment opportunities for local people and the creation of opportunities for local business involvement during construction and operation.

### 8.24.2 Construction resource use

Two submissions raised issues regarding construction resource use.

**Stakeholder identification numbers**

5, 153

**Issue raised**

The submissions suggested that rail materials and goods for the project should be provided from Australian suppliers.

**Response**

Sustainability objectives and supporting targets and initiatives have been identified for the project and are provided in Section 25.3 of the Environmental Impact Statement. This includes local sourcing of high impact material such as steel and concrete used in the project. In some cases, such as for uncommon resources, to provide the optimum product outcome and to ensure value for money some resources may need to be supplied from suppliers outside Australia.

### 8.24.3 Construction greenhouse gas emissions

One submission raised issues regarding construction greenhouse gas emissions.

**Stakeholder identification number**

112

**Issue raised**

The submission raised concerns regarding the greenhouse gas implication of trucks to and from the Blues Point site.

**Response**

Section 25.6 of the Environmental Impact Statement provides an assessment of the potential greenhouse gas emissions from the project. Overall, emissions from the construction of the project are anticipated to be relatively minor. In the long term, the project would provide a net benefit in greenhouse gas emissions associated with the anticipated shift from road to rail.

Additionally, sustainability objectives and supporting targets and initiatives for the project (provided in Section 25.3 of the Environmental Impact Statement) include the reduction of emissions through design requirements and construction practices, use of biodiesel and ethanol fuel, and the implementation of green travel plans. The project has also committed to offsetting 25 per cent of the greenhouse gas emissions associated with construction.

# 8.25 Cumulative impacts

## 8.25.1 Cumulative impacts with other projects

Five submissions raised issues regarding cumulative impacts with other projects.

### Stakeholder identification numbers

16, 94, 153, 160, 205

### Issue raised

In summary, the submissions raised the following issues:

- Concern regarding the impact of multiple major transport projects around Chatswood
- The Environmental Impact Statement should model the relationship between metro and the WestConnex traffic impacts
- Development of large projects like WestConnex and Central to Eveleigh need to be planned together, with consultation of the local community considered

### Response

Section 26.3 of the Environmental Impact Statement identifies the potential for cumulative impacts with a range of other projects during the construction of Sydney Metro City & Southwest Chatswood to Sydenham. This included consideration of WestConnex and the Central to Eveleigh Transformation and Transport Program.

Transport for NSW would manage and co-ordinate the interface with projects under construction at the same time to minimise the potential cumulative impacts. Co-ordination and consultation with relevant stakeholders would include:

- Provision of regular updates to the detailed construction program, construction sites and haul routes
- Identification of key potential conflict points with other construction projects
- Developing mitigation strategies in order to manage conflicts. Depending on the nature of the conflict, this could involve:
  - Adjustments to the Sydney Metro construction program, work activities or haul routes; or adjustments to the program, activities or haul routes of other construction projects
  - Co-ordination of traffic management arrangements between projects.

# 8.26 Environmental management framework

## 8.26.1 Construction environmental management framework

One submission raised issues regarding the construction environmental management framework.

### Stakeholder identification numbers

155

### Issue raised

In summary, the submission requested that staff at the Chatswood dive site and Artarmon site be briefed on the residential nature of the local area and behave accordingly.

### Response

The Construction Environmental Management Framework (Appendix B of this report) provides information on the training, awareness and competence requirements for Principal Contractors on Sydney Metro.

As a minimum this would include site induction, regular toolbox talks and topic specific environmental training, including informing workers of the environment surrounding the construction sites and appropriate measures to minimise impacts to nearby residential areas.

## 8.26.2 Construction noise and vibration strategy

Four submissions raised issues regarding the construction noise and vibration strategy.

### Stakeholder identification numbers

50, 66, 74, 112

### Issue raised

In summary, the submissions raised the following issues:

- Concern regarding clarity on the management of noise impacts from Victoria Cross Station apart from offering relocation for residents. Much of the strategy is aimed at assessment, prediction, notification and monitoring alone will do nothing to reduce noise and vibration impacts.
- Concern regarding the need for Blues Point residents to vacate their properties when tunnelling is occurring in the vicinity
- In the event Blues Point residents need to vacate their homes, question as to whether equivalent accommodation, removalist and lost employment costs will be provided
- Mitigation for night time noise at Blues Point must include temporary alternative accommodation for all residents to close proximity and should a minimum 4-star quality hotel and include parking

### Response

The Construction Noise and Vibration Strategy (Appendix C of this report) provides the overall noise and vibration management approach during construction of the project.

This includes the process specific Construction Noise and Vibration Impact Statements based on a more detailed understanding of the construction methods, plant and equipment. This would also include the identification of specific mitigation measures. Depending on the nature of the works, the Construction Noise and Vibration Impact Statements may be activity specific or location specific.

The Construction Noise and Vibration Strategy also identifies standard noise and vibration mitigation measures which would be implemented at all construction sites. Additional mitigation measures are also identified and would be implemented for certain works based on defined levels of noise exceedance.

Based on the anticipated ground-borne noise levels from tunnelling in the vicinity of Blues Point (refer Section 10.4.13 of the Environmental Impact Statement), it is unlikely that residents would be required to vacate their properties. In the event this is required, it is anticipated this would be a few days only for each tunnel boring machine. The project team would work with affected residents to find suitable alternative accommodation in the event it is required

## 8.27 Endorsement of other submissions

One submission provided an endorsement of another submission.

**Stakeholder identification number**

255

**Issue raised**

The submission supports the submission by the Owners Corporation of the residential complex at Towns Place, Millers Point.

**Response**

The support for the submission is noted.

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# PREFERRED INFRASTRUCTURE REPORT

CHAPTER NINE

# 9 Preferred infrastructure report

This chapter provides a description and assessment of following proposed changes to the project:

- Changes to the construction methodology for the northern surface track works
- Changes to the timing for alterations to the Pacific Highway and Mowbray Road intersection
- Changes to Martin Place Station to accommodate the platform-to-platform connection to the Martin Place metro station
- Changes to Central Station, including removal of the temporary pedestrian bridge
- Removal of the stub tunnels from the project
- Removal of rock breaking outside of standard construction hours for cut-and-cover stations and station shafts (except at Central Station).

## 9.1 Northern surface track works – changes to construction methodology

Section 7.8 of the Environmental Impact Statement outlines the construction activities for the northern surface track works between Chatswood Station and the Chatswood dive structure. This would involve adjustments to the T1 North Shore Line between the southern end of Chatswood Station and Brand Street, Artarmon.

Section 7.11.7 of the Environmental Impact Statement identifies that there would be impacts on pedestrian and cyclist facilities to enable construction of this section of the project. The impacts include the temporary closure of the Frank Channon Walk (a shared path that provides a link between Chatswood Station and Nelson Street, Chatswood). It also identifies that construction access would be from Hopetoun Avenue, Drake Street and Brand Street from the eastern side of the rail corridor.

Since the exhibition of the Environmental Impact Statement, ongoing construction planning for this section has identified the need for a longer, staged closure of the Frank Channon Walk between Albert Street and Nelson Street, Chatswood. It has also identified a need for access to the western side of the rail corridor from Gordon Avenue. This has led to a need to change the construction methodology for this section of track.

### 9.1.1 Change in retaining wall construction method

A review of construction methodology indicated that there would be a need to construct the retaining wall from the Frank Channon Walk. The location of the northern surface track works in relation to the Frank Channon Walk is shown in Figure 9-1. Construction would include:

- Vegetation clearance
- Site establishment works, including, protecting and / or relocating utilities, establishing site hoardings, noise barriers and / or site fencing around the site perimeter, establishing work areas and establishing access and egress points.
- Construction of the retaining wall, including earthworks and piling
- Reinstatement of the Frank Channon Walk (including pavement) and installing permanent noise barriers.

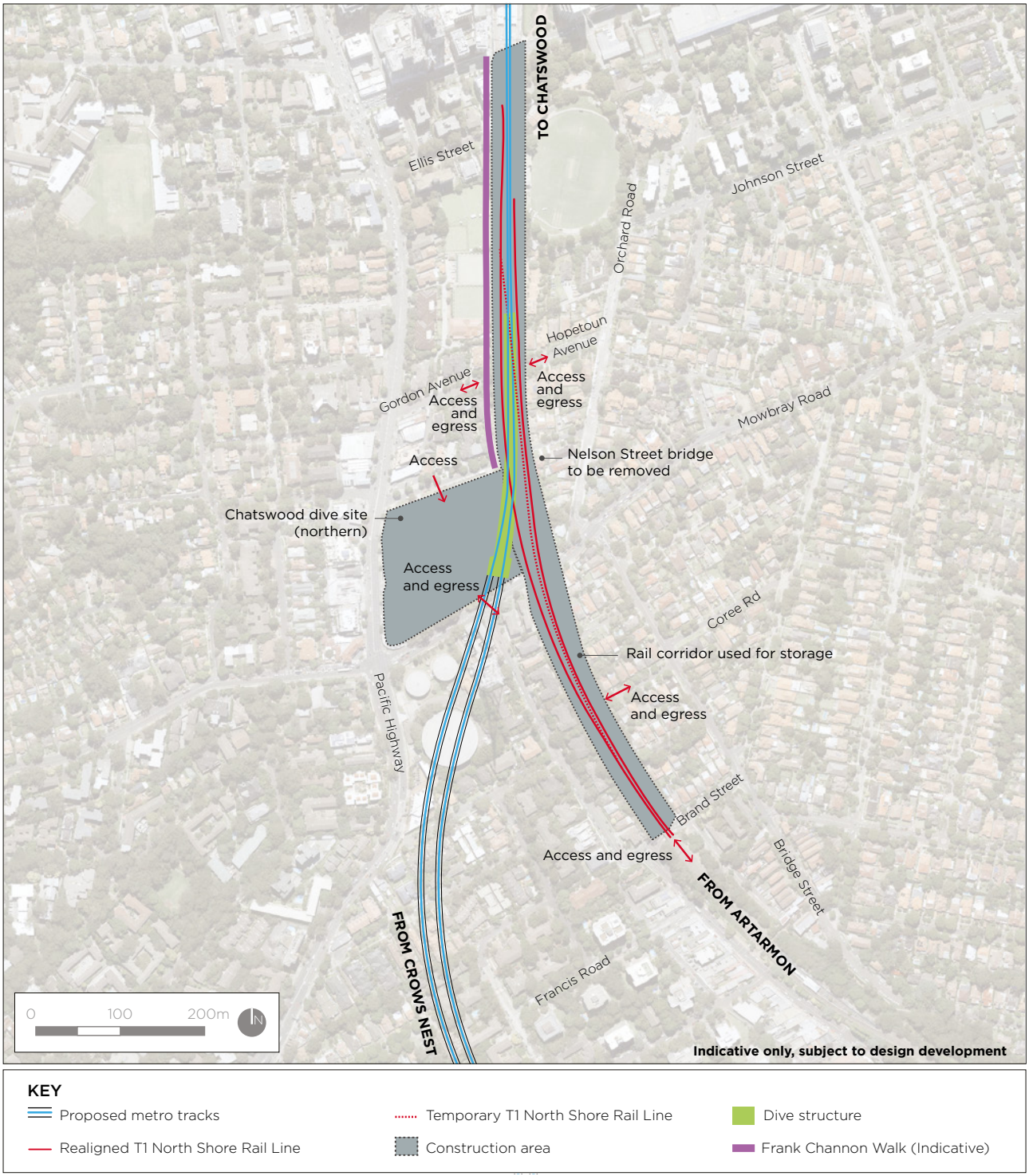



**Figure 9-1 Northern surface track works in relation to the Frank Channon Walk**

This work (with the exception of site establishment and closure), would not involve construction activities additional to those described in the Environmental Impact Statement.

The adjustments to the T1 North Shore Line, as identified in the Environmental Impact Statement, would involve piling and heavy earthworks, the operation of plant and equipment, and installation of noise barriers and retaining walls. Further construction planning has identified the need for this work to be carried out directly from the Frank Channon Walk given the complexity of construction and the narrowness of the rail corridor at this location.

Occasional construction vehicles as well as the delivery of plant and machinery would be required to access sections of the Frank Channon Walk, primarily during site establishment and closure. This would occur via Ellis Street, Gordon Avenue and / or Nelson Street as the work progresses.

Construction activities would occur during standard construction hours, but would also occur outside these hours coinciding with rail possessions.

Based on current construction planning, the Frank Channon Walk would be closed for around nine months in two stages as shown in Figure 9-2 and Figure 9-3, and as described below:

- Stage 1: The Frank Channon Walk would be closed between Albert Street, Chatswood to the Chatswood Oval pedestrian underpass for a period of about three months. Where feasible and reasonable:
  - this would occur prior to the removal of Nelson Street bridge in late 2018
  - the section of shared path between Ellis Street and the pedestrian underpass, and the pedestrian underpass itself, would be re-opened as early as possible, to reinstate the link between the Pacific Highway and Orchard Road
- Stage 2: The Frank Channon Walk would be closed between the Chatswood Oval pedestrian underpass to Nelson Street, Chatswood for a period of about six months. Where feasible and reasonable, this would occur once Nelson Street bridge is removed.

At the completion of work in this area, the Frank Channon Walk would be reinstated in consultation with Willoughby City Council.

The Frank Channon Walk would also be extended as part of the project from Nelson Street to Mowbray Road on the western side of the railway line. This would benefit pedestrians and cyclists as it would provide continued access between Chatswood Station and residential areas to the south. Further detail on this change is provided in Section 2.1 of this report.

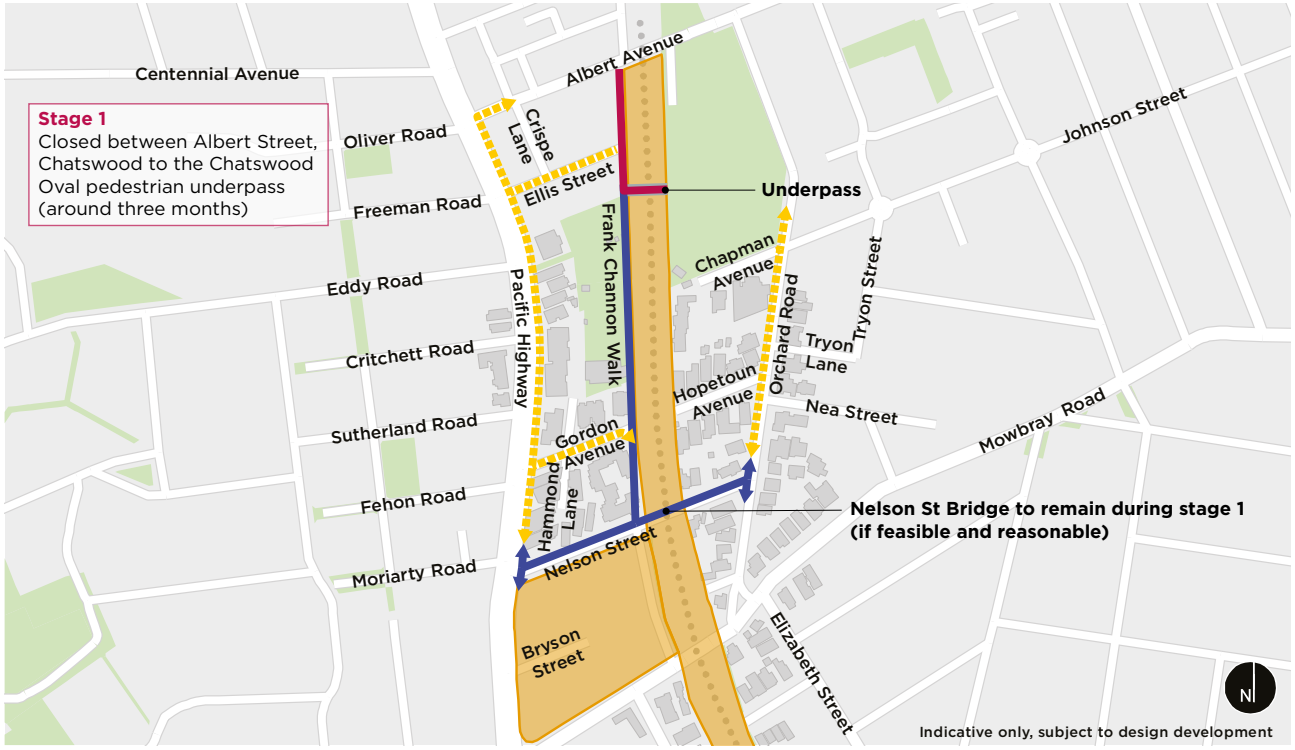



**Figure 9-2 Staging strategy for the Frank Channon Walk – Stage 1**

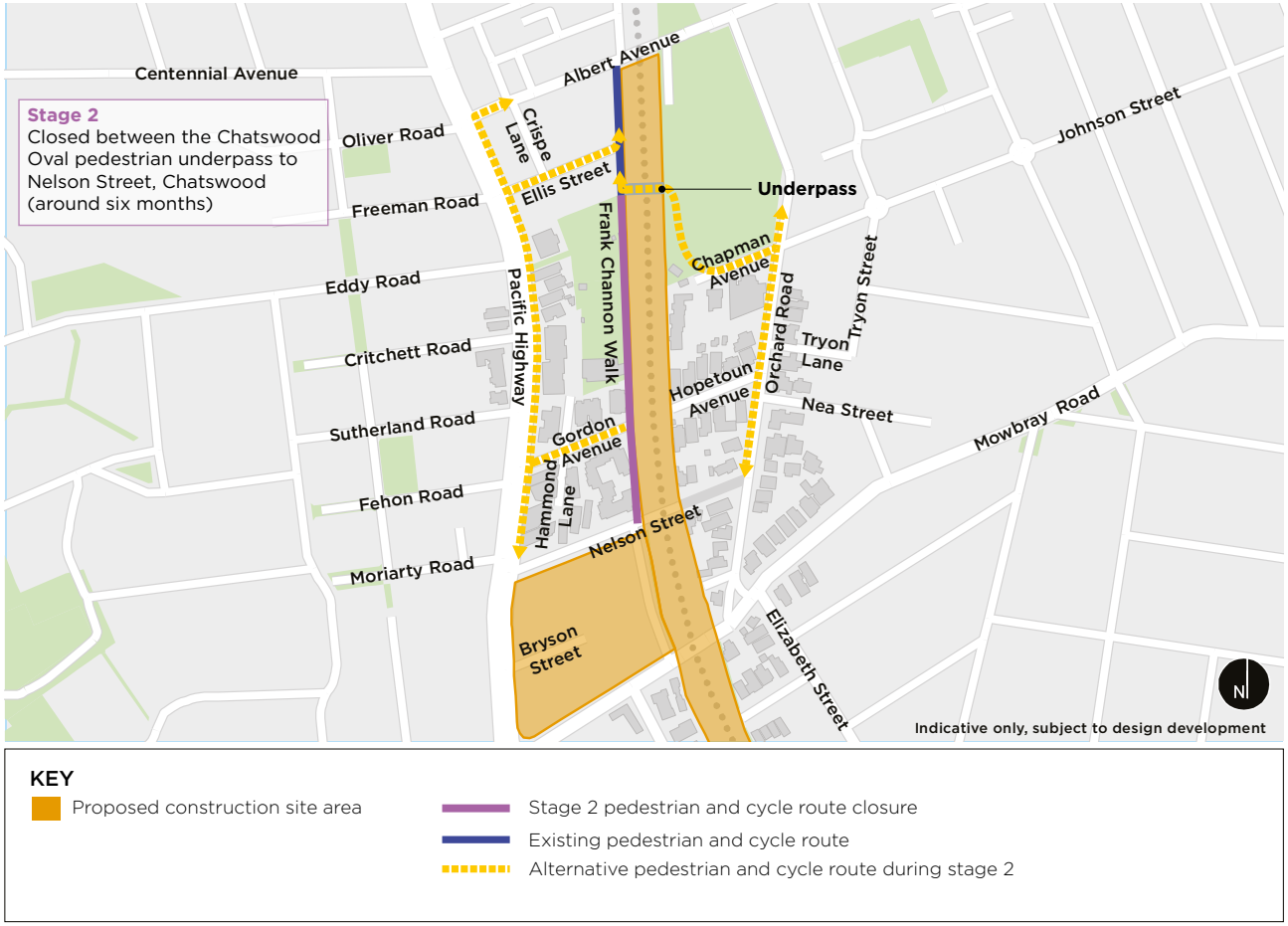



**Figure 9-3 Staging strategy for the Frank Channon Walk – Stage 2**

## 9.1.2 Gordon Avenue temporary construction site access

A temporary ramp is now required to construct the northern surface track works to allow vehicles to access from Gordon Avenue to the western side of the rail corridor. The location of the proposed Gordon Avenue access is shown on Figure 9-4. Site establishment work for the access would involve:

- Clearing landscaped vegetation, where required
- Protecting and / or relocating utilities, including street lighting
- Establishing the new access / egress point and ramp, and constructing the temporary diversion of the Frank Channon Walk, a new heavy vehicle footpath crossing and relocated kerb line
- Establishing site hoardings around the perimeter of the site.

Construction work for the northern surface track works between Chatswood and Brand Street, Artarmon would occur from mid-2017 to mid-2022 (refer to Section 7.8 of the Environmental Impact Statement). Based on current planning, the Gordon Avenue access would take about four months to construct and would be used for around three years (estimated at this stage from mid-2017 to mid-2020).

During this period, it is anticipated there would be around 39 heavy vehicle round trips (that is, 78 movements) and 37 light vehicle round trips (that is, 74 movements) to and from the Gordon Avenue access every day, with a maximum construction peak of eight vehicle trips per hour.

The use of the Gordon Avenue access would generally be restricted to the standard daytime construction hours. However, vehicles would also use this access to support work during track possessions.

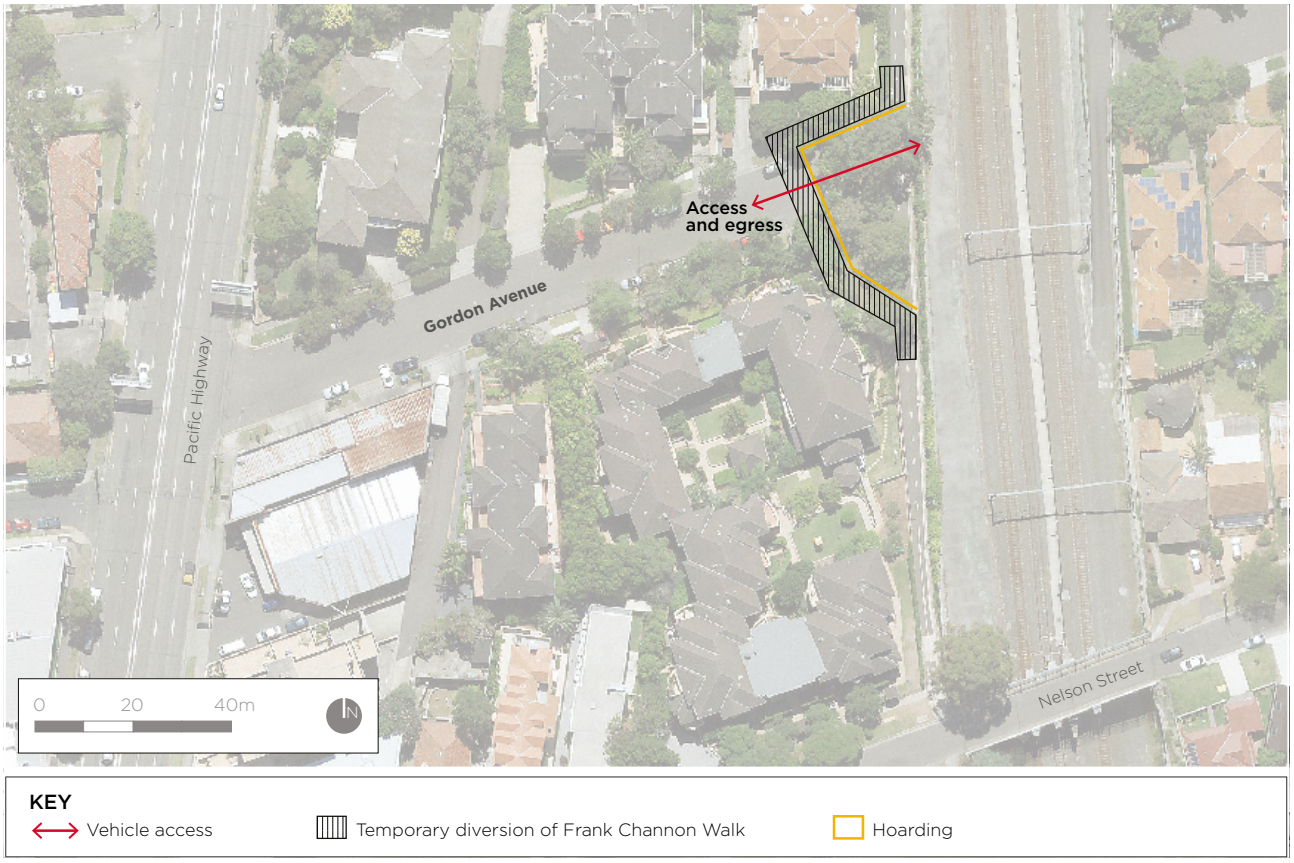



**Figure 9-4 Gordon Avenue temporary construction site access**

The Frank Channon Walk would be diverted and relocated to the west around the perimeter of the access point. The diversion at Gordon Avenue would enable the walk to remain open while the construction site access is being used. However, sections of the Frank Channon Walk would be closed (including sections of the shared path near Gordon Avenue) to support the construction of the northern surface works.

A small park at the eastern end of Gordon Avenue would be occupied for the full three-year period. The use of the park would require the removal of vegetation at the eastern end of Gordon Avenue, primarily within the park (around 12 to 15 trees), and some street trees (around four trees). This would be in addition to the vegetation that would be removed to construct the northern surface track works. The park would be reinstated and landscaped in consultation with Willoughby City Council once the temporary construction access is no longer required.

### 9.1.3 Environmental screening assessment

To understand the potential change in environmental impacts, a screening level assessment was conducted and is presented in Table 9-1. This assessment considers potential environmental aspects that may require further impact assessment to understand likely environmental impacts, and identify any relevant mitigation measures that may be required. An assessment of these potential changes in impacts compared to the assessment in the Environmental Impact Statement is provided after the table.

Table 9-1 Chatswood dive site (northern) and northern surface track works – environmental screening assessment

| Aspect | Potential change in impacts | Description |
|---|---|---|
| **Construction traffic and transport** | Yes | **Construction vehicles and road network impacts**<br>The change in construction methodology may require vehicular access to the Frank Channon Walk from Ellis Street and/or Nelson Street as work progresses. However, this would be occasional and largely associated with site establishment. No further assessment is required.<br>However, the construction access at Gordon Avenue would introduce construction traffic movements to a new location. Further assessment is provided in Section 9.1.4.<br>**Active transport (walking and cycling)**<br>The potential for disruption and alternative routes for pedestrians and cyclists is identified in the Environmental Impact Statement. However, the impacts would now be for a longer duration. Further, alternative routes identified in the Environmental Impact Statement to mitigate the removal of Nelson Street bridge would now be occasionally unavailable.<br>Further assessment is provided in Section 9.1.4 |
| **Operational traffic and transport** | No | The change in construction methodology would not result in any changes to the operation of the project as assessed in the Environmental Impact Statement.<br>The Frank Channon Walk would be reinstated following completion of the work. Further, the project would also provide a permanent connection between Albert Street and Mowbray Road, which would enhance connectivity for pedestrians and cyclists.<br>No further assessment is required. |
| **Construction noise and vibration** | Yes | The construction site access at Gordon Avenue would introduce construction traffic noise impacts.<br>Construction activities that were to be undertaken from within the rail corridor, such as piling, would now occur from the Frank Channon Walk, immediately adjacent to sensitive receivers.<br>Further assessment is provided in Section 9.1.5. |
| **Operational noise and vibration** | No | The change in construction methodology would not result in any changes to the operation of the project as assessed in the Environmental Impact Statement.<br>No further assessment is considered necessary. |
| **Land use and property** | No | The changes in construction methodology would require the temporary occupation of the Frank Channon Walk for a longer duration than originally identified in the Environmental Impact Statement. However, once the construction activities within the shared path have been completed, the Frank Channon Walk would be reinstated to a similar standard, and in consultation with the local council. Further, following the completion of construction in the area, the shared path would be extended to Mowbray Road, which would benefit pedestrians and cyclists.<br>For the Gordon Avenue construction site access, a small portion of land currently used as open space would be required for the construction period, and a temporary diversion for the shared path provided. This would be reinstated after completion of construction.<br>The changes in impact are considered to be minor and the mitigation measures in the Environmental Impact Statement would manage any increase in impacts.<br>No further assessment is considered necessary. |

| Aspect | Potential change in impacts | Description |
|---|---|---|
| **Business impacts** | No | There would be no additional direct impacts on business as a result of the changes in construction methodology. Pedestrians and cyclists would continue to have access to the Chatswood central business district and businesses located alongside the rail corridor via alternative routes.<br>Changes in noise impacts may further reduce amenity at the closest business; however, noise impacts would be mitigated where feasible and reasonable in accordance with the mitigation measures in Chapter 11 (Revised environmental mitigation measures and environmental performance outcomes) and the Sydney Metro Construction Noise and Vibration Strategy. The change in impact is considered to be minor and the mitigation measures in the Environmental Impact Statement would manage any increase in impacts.<br>No further assessment is considered necessary. |
| **Non-Aboriginal heritage** | No | No heritage items or conservation areas would be directly impacted by the changes in construction methodology. Further, the footprint of earthworks and more extensive construction activities would not differ from those assessed in the Environmental Impact Statement.<br>No further assessment is considered necessary. |
| **Aboriginal heritage** | No | The northern surface track works area has a low probability for Aboriginal heritage. Further, the footprint of earthworks and more extensive construction activities would not differ from those assessed in the Environmental Impact Statement.<br>No further assessment is considered necessary. |
| **Landscape character and visual amenity** | Yes | The changes in construction methodology would result in construction areas being closer to sensitive receivers, as well as impacts on users of the Frank Channon Walk. The construction site access at Gordon Avenue would also result in the clearing of vegetation from the end of Gordon Avenue. This would result in a change to the landscape character and introduce additional visual impacts.<br>Further assessment is provided in Section 9.1.6. |
| **Groundwater and geology** | No | The change in construction methodology would not result in any additional groundwater and geology impacts as the extent of excavation has not changed from that assessed in the Environmental Impact Statement.<br>No further assessment is considered necessary. |
| **Soils, contamination and water quality** | No | The changes in construction methodology would not significantly change the potential impacts on soils, contamination or water quality as assessed in the Environmental Impact Statement. The mitigation measures in the Environmental Impact Statement would be implemented to manage this construction area.<br>No further assessment is considered necessary. |
| **Social impacts and community infrastructure** | Yes | The temporary, but staged, closure of the Frank Channon Walk would have impacts on pedestrians and cyclists that use this facility. The construction site access at Gordon Avenue would also require the temporary use of a small portion of land currently used as open space, and require the temporary diversion of the Frank Channon Walk.<br>Further assessment is provided in Section 9.1.7. |

| Aspect | Potential change in impacts | Description |
|---|---|---|
| **Biodiversity** | Yes | The changes in construction methodology would require clearing of vegetation from the end of Gordon Avenue. Vegetation to be cleared elsewhere along the Frank Channon Walk is assessed in the Environmental Impact Statement.<br>Further assessment is provided in Section 9.1.8. |
| **Flooding and hydrology** | No | The work would not be located in flood-prone land and would not alter existing stormwater systems.<br>No further assessment is considered necessary. |
| **Air quality** | No | The changes in construction methodology would not result in any additional air quality impacts. However, some plant and equipment may be closer to sensitive receivers. The change in impact would be minor and the mitigation measures in the Environmental Impact Statement would manage any increase in impacts.<br>No further assessment is considered necessary. |
| **Hazard and risk** | No | The changes in construction methodology would not involve the storage and use of any hazardous substances and dangerous goods in areas closer.<br>No further assessment is considered necessary. |
| **Waste management** | No | The changes in construction methodology would not result in the generation of any different and increased volumes of waste materials.<br>No further assessment is considered necessary. |
| **Sustainability** | No | The changes in construction methodology would not change the climate risk profile of the project, and would not result in a substantial change to the generation of greenhouse gases or the use of resources.<br>No further assessment is considered necessary. |
| **Cumulative impacts** | No | The changes in construction methodology would not result in any additional cumulative impacts.<br>No further assessment is considered necessary. |

### 9.1.4 Traffic and transport

The Frank Channon Walk is a shared pedestrian and cyclist path on the western side of the rail corridor between Nelson Street and Albert Avenue, Chatswood. An underpass is located adjacent to Chatswood Oval, which provides a connection to the Frank Channon Walk for pedestrians and cyclists travelling to / from areas east of the rail corridor.

Gordon Avenue is a local, no through road with low traffic volumes. It has a connection to Hammond Lane, which provides access to residential, commercial and recreational properties, such as the Chatswood Bowling Club and rear lane access for businesses along the Pacific Highway. Footpaths are located on both sides of Gordon Avenue, and connect to the Frank Channon Walk.

The intersection of Gordon Avenue with the Pacific Highway does not have traffic signals, and is restricted to left-in, left-out movements. Unrestricted, on-street parking is allowed within signposted areas.

### Vehicle trip forecasts and routes

The proposed haul routes are shown in Figure 9-5. Access to and egress from the site would be left-in from Gordon Avenue and left-out via Gordon Avenue. Construction access would occur during standard daytime construction hours (7am to 6pm Monday to Friday, and 8am to 1pm Saturday). However, vehicles would also use this access on occasion to support work carried out during track possessions.

The anticipated vehicle numbers (heavy and light vehicles) using the Gordon Avenue site access over a typical day is provided in Figure 9-6. This graph shows that the peak for heavy vehicle trips would be the AM peak period (7am to 10am), with four heavy vehicle trips and four light vehicle trips per hour (a total of 16 movements, with every vehicle entering the site departing within the same hour).

The haul routes presented in the Environmental Impact Statement would not directly impact Gordon Avenue. However, the haul routes described above would be in addition to those presented in the Environmental Impact Statement, with Gordon Avenue becoming the primary access/egress point for work within the rail corridor between mid-2017 and mid-2020.

The use of Gordon Avenue access would not result in an increase in total construction vehicles associated with the northern corridor and Chatswood dive (northern) construction site compared with that discussed in the Environmental Impact Statement. However, it would result in additional vehicles on the road network in any one hour.

### Active transport network

The Frank Channon Walk is a shared path that provides pedestrian and cyclist access along the western side of the rail corridor between Nelson Street, Chatswood and Albert Avenue, Chatswood. As identified in the Environmental Impact Statement, it would be temporarily closed to safely carry out construction work along the northern corridor.

### Change in retaining wall construction method

While the potential for disruption and alternative routes for pedestrians and cyclists is identified in the Environmental Impact Statement, these impacts would now be for a longer duration. Further, alternative routes identified in the Environmental Impact Statement (Chapter 8 – Construction traffic and transport) to mitigate the removal of Nelson Street bridge would now be occasionally unavailable.

The staged closure of the Frank Channon Walk would aim to minimise these impacts, and maintain, where feasible and reasonable, key alternative east-west routes, being the Nelson Street bridge or the rial underpass. If these alternative east-west routes are not available, pedestrians and cyclists travelling between Albert Avenue and Nelson Street would need to travel an additional 250 to 300 metres via Pacific Highway or via Orchard Road.

The proposed staged closure of the Frank Channon Walk would result in a longer disruption to pedestrians and cyclists that use this shared path than assessed in the Environmental Impact Statement. However, alternative routes would remain available and the option of reopening the section between Ellis Street and the underpass during Stage 1 would be explored further during detailed construction planning to minimise disruption to east–west connectivity, and travel distances for pedestrians and cyclists. Mitigation measures in the Environmental Impact Statement (T2, T3, T6 and T7) would provide further mitigation, including advanced notification, road safety audits and directional signage.

The proposed change in construction methodology for the northern surface track works would result in additional impacts on the Frank Channon Walk. While the nature and scale of the impacts would be similar to those assessed in the Environmental Impact Statement, the impacts would occur for a longer duration. Given the availability of temporary alternatives and the proposed staging of closures of certain sections, the impact would be generally consistent with the impacts assessed in the Environmental Impact Statement. The mitigation measures in the Environmental Impact Statement would effectively manage any increased impact.

### Gordon Avenue temporary construction site access

A temporary diversion of the Frank Channnon Walk in the immediate vicinity of the proposed access/egress point at Gordon Avenue would be provided where there are direct impacts on the path. The path would be closed while the temporary diversion is established, which would be in addition to closure of the path as required to facilitate the construction of the retaining wall (as detailed above).

The closure of the shared path at this location would occur during Stage 1 of the broader staged closure of the Frank Channon Walk and would result in additional impacts on access and connectivity for users of the path. However, access to and from Chatswood Station for pedestrians and cyclists from the south would be maintained via the Pacific Highway, or Orchard Road. This would create an additional travel distance of up to around 300 metres while the underpass is closed.

Overall, the proposed changes to impacts on the Frank Channon Walk compared to those assessed in the Environmental Impact Statement would be minor.

### Public transport services

There would be no additional impacts on public transport services as a result of the additional construction site access on Gordon Avenue.

### Parking and taxis

There is potential for about four on-street parking spaces to be removed to cater for the additional site access at Gordon Avenue. This is unlikely to significantly impact the surrounding community given that the nearby residential, recreational and commercial properties have available off-street parking. Opportunities to limit the number of on-street parking spaces impacted would be explored during detailed design.

### Road network performance

Chapter 10 (Construction traffic and transport) of the Environmental Impact Statement presents the impacts on pedestrians, cyclists and motorists as a result of construction activities in the vicinity of the Chatswood dive site (northern). The assessment found that a number of intersections currently experience long delays and a poor level of service due to the high through traffic volumes and conflicting right-turn movements. The Environmental Impact Statement concludes that:

- The construction traffic from the project would cause minor increases in the degree of saturation and the average delay at some intersections, but generally no change to the level of service in the peak periods
- The construction traffic would not have a major impact on the surrounding road network.

The Gordon Avenue site access would generate a maximum of eight additional construction vehicle trips per hour during the peak construction period (10am to 3pm), reducing to five trips per hour during the AM and PM peak. Given this low volume relative to existing traffic flows on key construction haulage routes and the volume of total construction traffic generated by the project at this location, the impacts on the road network as a result of this additional access would be negligible.

The Pacific Highway / Gordon Avenue intersection is a priority controlled intersection. During use of this site access, a maximum of four light vehicles and four heavy vehicles per hour are anticipated to turn into and out of Gordon Avenue to access the site during the peak construction period. These low volumes would have a minimal impact on the performance of the intersection. Breaks in traffic flow on the Pacific Highway may also occur due to heavy vehicles requiring a large turning circle and longer lead times to enter traffic. However, since the maximum construction vehicle volumes are expected outside of the network peak period, these breaks in traffic flow are likely to be short in duration and have minor impacts to southbound vehicles on the Pacific Highway immediately upstream of the intersection.

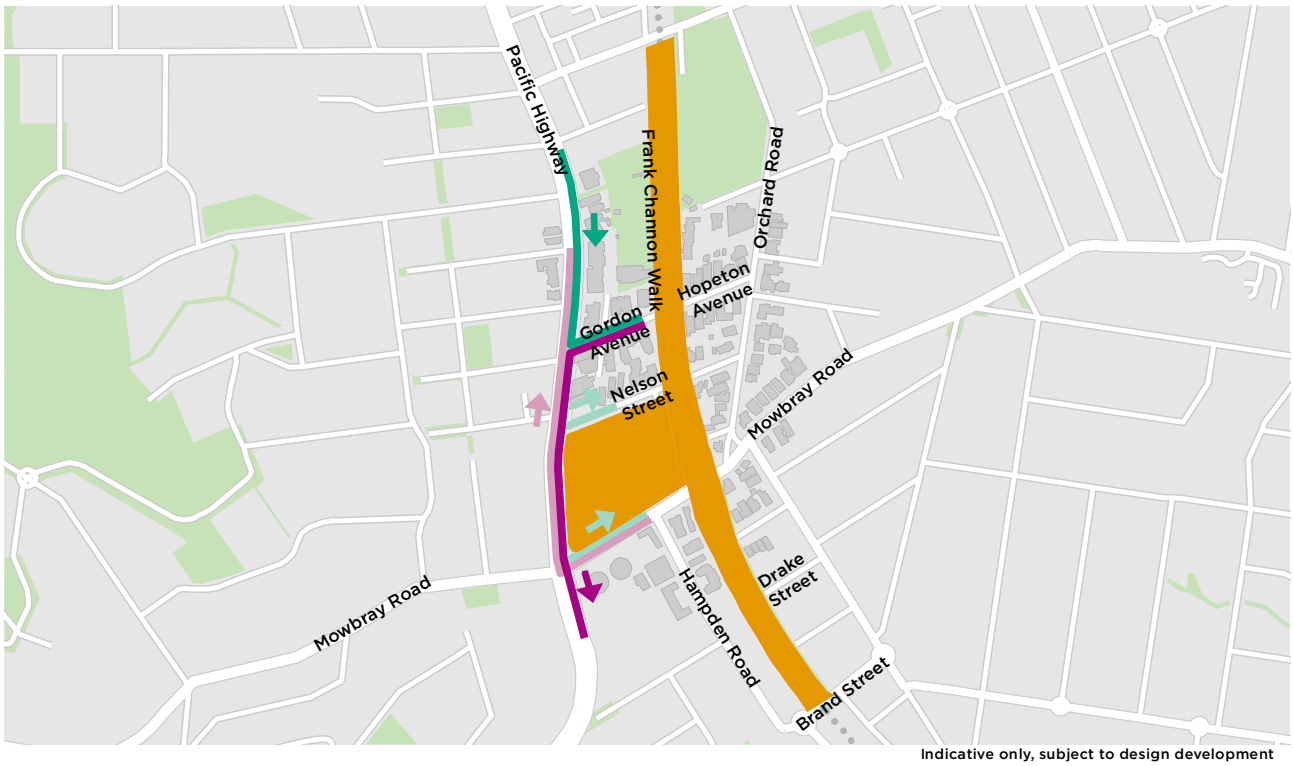
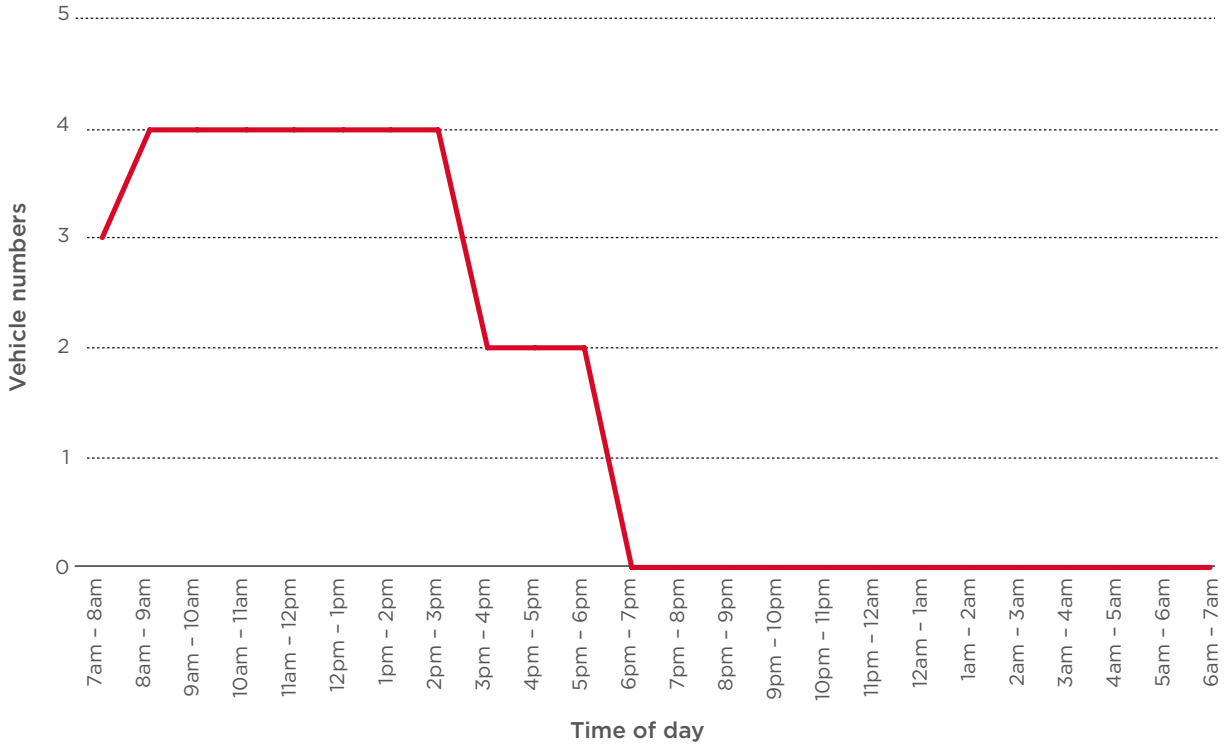



**Figure 9-5 Proposed Gordon Avenue temporary construction site access route**

Light vehicles




Heavy vehicles

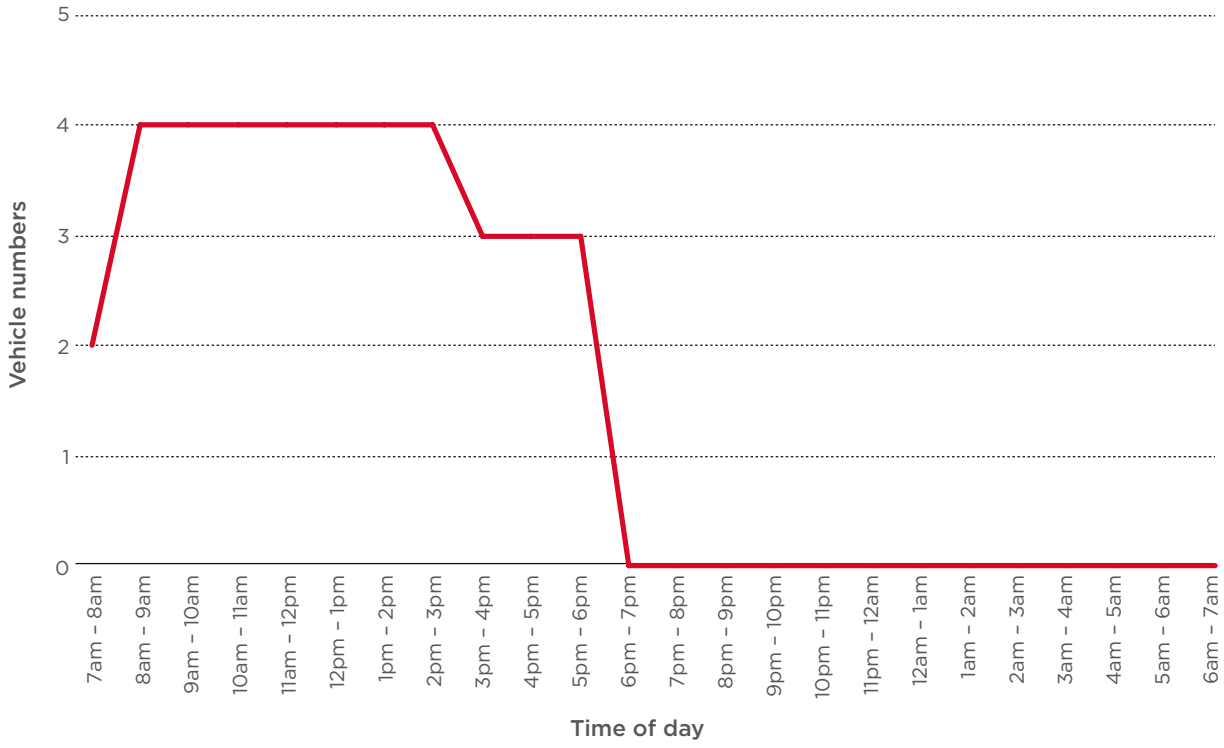



**Figure 9-6 Gordon Avenue temporary construction site access – construction traffic numbers (arrival only)**

### 9.1.5 Noise and vibration

Land uses in the vicinity of the Frank Channon Walk are predominately residential and commercial, with an educational receiver south of Ellis Street. There are active recreational receivers to the northwest and northeast of the railway line.

Gordon Avenue is a local, no through road with low daytime traffic flows. Land uses along Gordon Avenue are predominately medium density residential. Limited commercial and light industrial uses (auto mechanics) have frontage to the Pacific Highway, south of the intersection of Gordon Avenue.

#### Construction airborne noise

Section 10.4.1 of the Environmental Impact Statement provides an assessment of the potential construction noise impacts on nearby sensitive receivers during construction of the northern surface works. Appendix E of the Technical Noise Paper 2 Noise and Vibration presents the predicted construction noise levels at the most affected façade for each receiver, including the sensitive receivers along Gordon Avenue and in the vicinity of the Frank Channon Walk.

#### Change in retaining wall construction method

Activities that were to be undertaken from within the rail corridor, such as piling, would now occur from the Frank Channon Walk. As a result, construction activities would now occur immediately adjacent to sensitive receivers that adjoin the Frank Channon Walk. This could result in additional airborne noise and vibration. Sensitive receivers adjacent to the Frank Channon Walk include residential, commercial, educational and active recreation.

To assess the change in impact, the additional activities have been incorporated into the earthwork scenario as presented in the Environmental Impact Statement. As a consequence of this change, exceedances of noise management levels at the nearest receiver during this scenario have increased, and would now be similar or greater than the exceedances predicted for the surface track works scenario in the Environmental Impact Statement.

Specifically, the assessment found that receivers to the west of the Frank Channon Walk (Area C) would experience an increase in noise levels, as follows:

- Commercial and active recreational receivers in Area C: The Environmental Impact Statement predicts exceedances of the noise management levels between 10 dB and 20 dB during surface track works. These receivers would now experience exceedances of greater than 20 dB
- Residential and educational receivers in Area C: The Environmental Impact Statement predicts exceedances of noise management levels of over 20 dB during surface track works. The reduction in setback distances to the active construction area would further increase these noise levels.

Consistent with the commitments in the Environmental Impact Statement, any exceedance would be managed in accordance with the mitigation measures in Chapter 11 (Revised environmental mitigation measures and environmental performance outcomes) and the Sydney Metro Construction Noise and Vibration Strategy as provided in Appendix C of this report.

Construction equipment that is now proposed to be placed within the Frank Channon Walk would be at an elevation that would provide a direct line of sight for some receivers located to the east of the rail corridor (in Area D). Where this occurs, receivers could experience an increase in noise levels. The Environmental Impact Statement predicts that these receivers would experience an increase of over 20 dB (for residential receivers) and between 10 to 20 dB (for active recreational receivers).

Consistent with the commitments in the Environmental Impact Statement, any additional exceedance would be managed in accordance with the mitigation measures in Chapter 11 (Revised environmental mitigation measures and environmental performance outcomes) and the Sydney Metro Construction Noise and Vibration Strategy as provided in Appendix C of this report. The applicable mitigation measures are detailed further in Section 9.1.9 of this report.

#### Gordon Avenue temporary construction site access

The Gordon Avenue site access would reduce the setback distances to the two apartment buildings immediately adjacent to the rail corridor. Noise levels at the most impacted façade are unlikely to increase as a result of this access, but the number of facades impacted would be expected to increase, For example, noise levels would increase on the northern or southern façades of the residential apartment buildings that front onto Gordon Avenue. However, the level of exceedance would be similar to that predicted in the Environmental Impact Statement and the mitigation measures as presented in Chapter 11 (Revised environmental mitigation measures and environmental performance outcomes) and the Sydney Metro Construction Noise and Vibration Strategy would continue to apply.

At receivers further along Gordon Avenue, there would be minor increases of about 2 dB to 3 dB in the predicted maximum noise levels. Mitigation measures would be implemented in accordance with Chapter 11 (Revised environmental mitigation measures and environmental performance outcomes) and the Sydney Metro Construction Noise and Vibration Strategy. The applicable mitigation measures are detailed further in Section 9.1.9 of this report.

#### Construction traffic noise

##### *Gordon Avenue temporary construction site access*

Construction vehicles would use the proposed site access on Gordon Avenue during standard daytime construction hours (7am to 6pm Monday to Friday, and 8am to 1pm Saturday).

Construction vehicles would also use this access to support work carried out during track possessions, but out-of-hours work would be short term and subject to approval under an Environment Protection Licence for the project. As such, this assessment only considers the potential impacts against the Environment Protection Authority's NSW *Road Noise Policy* (DECCW, 2011) baseline criteria for the daytime period.

The assessment presented in Table 9-2 shows that construction traffic noise levels from the additional access on Gordon Avenue would comply with the baseline criteria at all residences.

**Table 9-2 Gordon Avenue construction site access – predicted traffic noise**

| Access road | Base criteria daytime $L_{Aeq(1hr)}$ | Predicted daytime road traffic noise $L_{Aeq(1hr)}$ |
|---|---|---|
| Gordon Avenue | 55 | 52 |

*Note 1: Existing traffic flows are not available for Gordon Avenue.*

### 9.1.6 Landscape character and visual amenity

Currently, trees within the park and vegetation along the western embankment of the rail corridor filter views of the transparent noise barriers along the rail corridor from elevated windows and balconies in residential areas to the west of the Frank Channon Walk.

Gordon Avenue is a local residential street consisting of medium density residential apartment buildings around three to six storeys high, and is lined by an avenue of mature street trees. Commercial and light industrial uses (mechanics and retail outlets) are located at the corner of Gordon Avenue and the Pacific Highway, and associated vehicles use Gordon Avenue for rear lane access.

The eastern end of Gordon Avenue terminates at a small pocket park, which includes mature trees and a lawn area. This park provides a small area of neighbourhood open space and pedestrian access to the local footpath network via the Frank Channon Walk.

Views to the Pacific Highway are more urban in character to the western end of Gordon Avenue. The highway also creates a barrier to pedestrian movement, with no east–west crossings located nearby.

An assessment of the landscape character and visual impacts has been completed consistent with the methodology and rating systems in Chapter 16 (Landscape character and visual amenity) of the Environmental Impact Statement.

### Landscape character impacts

#### *Change in retaining wall construction method*

Landscape impacts anticipated during construction and operation are summarised in Table 9-3.

During construction, there would be a considerable reduction in landscape quality as a result of the change in construction methodology, primarily due to the direct impact and temporary closure of the Frank Channon Walk. This would result in a moderate adverse landscape impact.

The change in construction methodology would further contribute to a considerable reduction in landscape quality. However, the impact rating would not differ from that presented in the Environmental Impact Statement, as construction activities were already proposed to be undertaken along the interface of the shared path and the rail corridor.

As the Frank Channon Walk would be reinstated following the completion of construction, there is no change in the operational impact presented in the Environmental Impact Statement.

A new mitigation measure has been included in Chapter 11 (Revised environmental mitigation measures and environmental performance outcomes) concerning the reinstatement of the Frank Channon Walk in consultation with the Willoughby City Council. This includes consultation with Willoughby City Council concerning the identification of opportunities to mitigate impacts to Frank Channon Walk (along with impacts to Gordon Avenue and Nelson Street), through landscape and public domain treatments for areas affected by construction.

Further, mitigation measures (LV12 and LV13) have committed that, where feasible and reasonable, vegetation would be provided to screen and visually integrate sites with the surrounding area. In addition, appropriate landscape treatments for Frank Channon Walk are to be identified and implemented

#### *Gordon Avenue temporary construction site access*

Landscape impacts anticipated during construction and operation are summarised in Table 9-3.

During construction, there would be:

- A further but minor contribution to the reduction in landscape quality as a result of the impact on the Frank Channon Walk, primarily due to the direct impact on the path and temporary closure
- A further but minor adverse landscape impact on Gordon Avenue due to the removal of mature trees and temporary removal of local open space, which would temporarily alter the character of the street.

During operation, there would be:

- A further but minor contribution to the reduction in landscape quality due to the removal of mature trees, until new plantings mature. The overall impact, however, would remain unchanged from the impact identified in the Environmental Impact Statement
- A negligible landscape impact on Gordon Avenue. Reinstatement of the park would provide an opportunity for new planting, lawn and footpaths, though this may take a number of years to provide the same level of shade and general amenity.

A new mitigation measure has been included in Chapter 11 (Revised environmental mitigation measures and environmental performance outcomes) concerning the reinstatement of the small park and the Frank Channon Walk in consultation with Willoughby City Council.

**Table 9-3 Chatswood dive site (northern) and northern surface track works – landscape impacts**

| Location | Sensitivity rating | Construction | | Operation | |
|---|---|---|---|---|---|
| | | Modification rating | Impact rating | Modification rating | Impact rating |
| **Gordon Avenue and park** | Neighbourhood | Considerable reduction | Minor adverse | Noticeable reduction | Negligible |
| **Frank Channon Walk** | Local | Considerable reduction | Moderate adverse | Noticeable reduction | Minor adverse |

### Daytime visual amenity impacts

The anticipated daytime visual impacts from representative viewpoints during construction and operation are shown in Figure 9-7 and summarised in Table 9-4.

For all assessed viewpoints, a level of impact would occur irrespective of the changes in construction methodology given work would occur along the rail corridor, and would involve the removal of vegetation along the Frank Channon Walk.

#### *Change in retaining wall construction method*

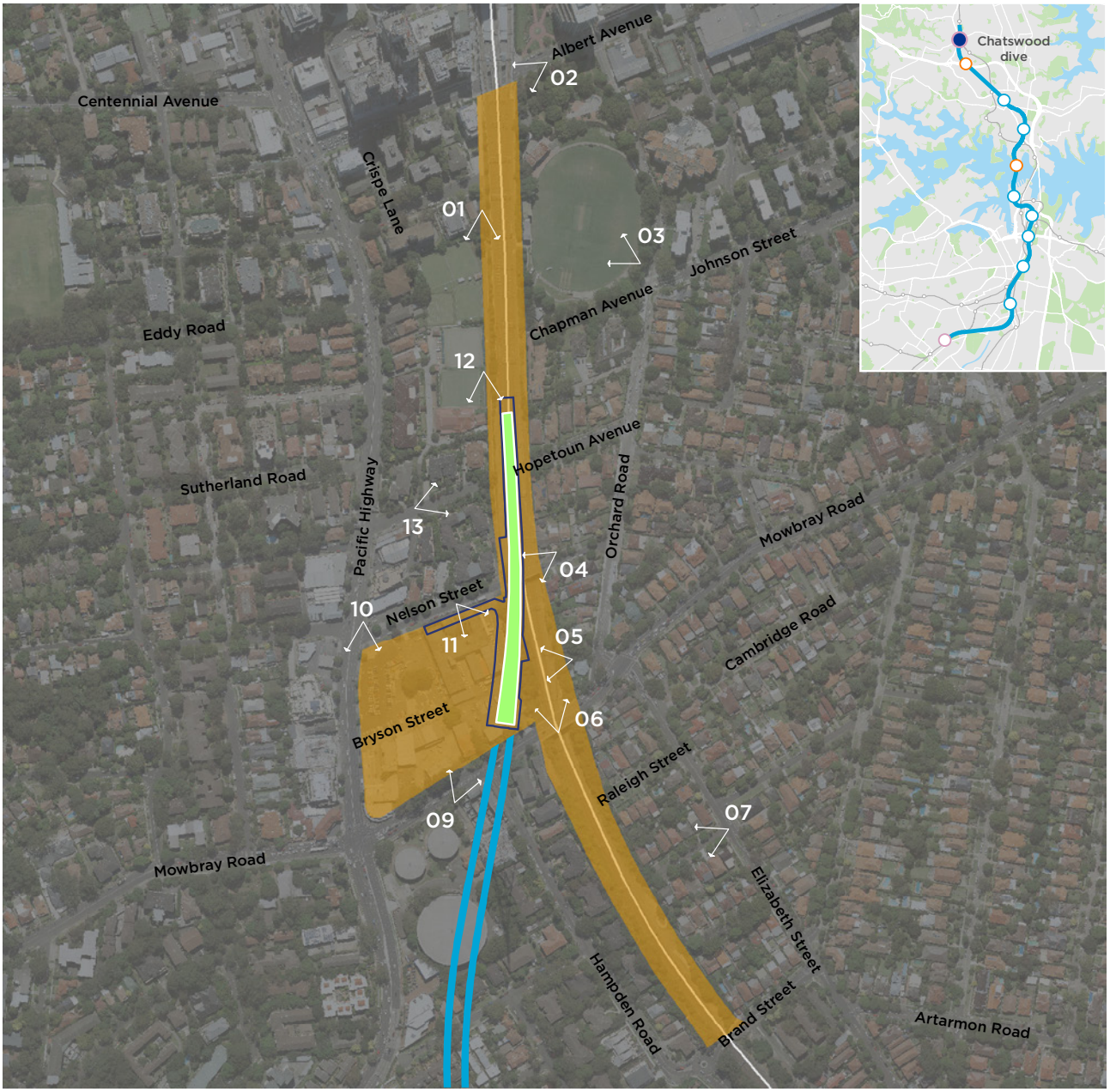
For the change in construction method for the retaining wall, the following viewpoints were assessed:

- Viewpoint 1: View south along the Frank Channon Walk
- Views from residential areas to the west of the Frank Channon Walk

The change in construction method would result in additional localised visual impacts during construction over and above those identified in the Environmental Impact Statement due to the temporary closure and occupation of the Frank Channon Walk. Construction equipment would be operated within the path, and noise barriers and / or fencing provided around the perimeter of the construction site.

For viewpoint 1, this would result in a moderate adverse visual impact during construction. However, this level of impact remains unchanged from that assessed in the Environmental Impact Statement. For views from residential areas to the west of the Frank Channon Walk, construction work areas would now be closer to residential areas and adjacent to recreational areas, such as the Chatswood Bowling Club. This would considerably impact views from these areas.

Therefore, the project, with the proposed change in methodology, would result in a minor adverse impact during construction. However, this level of impact would remain unchanged from that assessed in the Environmental Impact Statement.




KEY

- Chatswood to Sydenham
- Proposed dive structure
- Proposed operational area at surface
- Proposed construction site area
- Existing suburban rail
- 03 Viewpoint location

Indicative only, subject to design development

0 200 m

N

**Figure 9-7 Chatswood dive site (northern) and northern surface track works – representative viewpoints**

During operation, this work would have a minor adverse impact on views. This impact remains unchanged from the Environmental Impact Statement as there are no proposed changes to the project at this site.

### *Gordon Avenue temporary construction site access*

The following viewpoints were assessed for the provision of a temporary construction site access from Gordon Avenue:

- Views from residential areas to the west of the Frank Channon Walk
- Viewpoint 12: View south along the Frank Channon Walk
- Viewpoint 13: View east along Gordon Avenue, which is an additional viewpoint to that assessed in the Environmental Impact Statement.

For all assessed viewpoints, the Gordon Avenue access would have additional localised visual impacts over and above those identified in the Environmental Impact Statement during construction and operation due to:

- The removal of mature vegetation within the park and along a short section of road, which currently filters views of the rail corridor
- The temporary occupation of the small park
- The introduction of additional construction elements within the landscape (such as hoarding and construction vehicles).

During construction, the Gordon Avenue access would have minor to moderate adverse impacts. In the case of impacts to views from residential areas to the west of the Frank Channon Walk, the introduction of the Gordon Avenue access would not differ from that presented in the Environmental Impact Statement. This is because the impacts of other construction activities in the area contribute to a considerable reduction in visual amenity.

During operation, the Gordon Avenue access would have negligible to minor adverse impacts on views. Following the reinstatement of the park and landscaping, views to the rail corridor and metro infrastructure would be filtered, with this effect increasing as the vegetation matures. However, there would be a noticeable reduction in amenity until the vegetation matures.

**Table 9-4 Chatswood dive site (northern) and northern surface track works – daytime visual impacts**

| Location | Sensitivity rating | Construction impact | | Operation impact | |
|---|---|---|---|---|---|
| | | Modification rating | Impact rating | Modification rating | Impact rating |
| **Viewpoint 1: View south along Frank Channon Walk** | Local | Considerable reduction | Moderate adverse | Noticeable reduction | Minor adverse |
| **Residential areas to the west of Frank Channon Walk** | Neighbourhood | Considerable reduction | Minor adverse | Considerable reduction | Minor adverse |
| **Viewpoint 12 View south along Frank Channon Walk, adjacent to the Chatswood Bowling Club** | Local | Considerable reduction | Moderate adverse | Noticeable reduction | Minor adverse |
| **Viewpoint 13 View northeast along Gordon Avenue** | Neighbourhood | Considerable reduction | Minor adverse | Noticeable reduction | Negligible |

### Night-time visual amenity impacts

#### *Change in retaining wall construction method*

The northern surface track works would require night-time work during rail possessions. During construction, it is expected that the project would result in a high adverse visual impact during evening hours due to the effect of light spill. The magnitude of change be greater than that assessed in the Environmental Impact Statement due to the expansion of the construction site towards residential areas to the west of the Frank Channon Walk. There is also potential for some direct light spill onto the adjacent property. The lighting would create a considerable reduction in amenity of views from surrounding streets and adjacent residential properties. To mitigate this impact, lighting of the construction area would be orientated to minimise glare and light spill on adjacent receivers (mitigation measure LV3).

During operation, lighting would be consistent with existing lighting on the Frank Channon Walk. As such, the impact remains unchanged from that presented in the Environmental Impact Statement.

#### *Gordon Avenue temporary construction site access*

The Chatswood dive site (northern) and northern surface works would require night-time work during rail possessions. This would involve traffic movements at night to and from the Gordon Avenue site access. This would cause a minor additional adverse impact during construction and a negligible visual impact during operation. The magnitude of light levels from the site would be the same as that assessed in the Environmental Impact Statement.

Although there would generally be no out-of-hours vehicle access along Gordon Avenue, it may be used during rail possessions, which would occur over a weekend, including at night. Overall, the site would be more brightly lit than the existing setting; however, it is expected that there would be no direct light intrusion onto adjacent private properties.

During operation, lighting would be consistent with the adjacent railway and the Frank Channon Walk. As such, the impact would be the same as that assessed in the Environmental Impact Statement.

## 9.1.7 Social impacts and community infrastructure

The Frank Channon Walk would be subject to a temporary staged closure to enable construction associated with the northern surface track works. A temporary diversion would be in place where direct impacts to the path would occur at Gordon Avenue.

#### *Change in retaining wall construction method*

The temporary closure of the Frank Channon Walk would have impacts to access and connectivity for users of the path. However, as detailed in the Environmental Impact Statement (Chapter 19 – Social impacts and community infrastructure), access to and from Chatswood Station for pedestrians and cyclists would be maintained via the Pacific Highway or Orchard Road. Nearby community infrastructure (such as Chatswood Oval) would remain accessible for pedestrians via local streets. The closure of the Frank Channon Walk would be staged to minimise the duration of disruption to users and to maintain connections where possible. This includes, if feasible and reasonable, maintaining Nelson Street bridge during Stage 1 of the planned closure to minimise the degree of disruption.

To further manage impacts on pedestrians and cyclists, the mitigation measures in Section 9.1.4 would also be implemented and the affected community would be consulted and informed about the project and construction activities (including timing, likely impacts and mitigation measures) (refer to mitigation measure S02 in the Environmental Impact Statement). Transport for NSW would consult with Willoughby City Council to identify in opportunities to mitigate the impacts to Frank Channon Walk through landscape and public domain treatments for areas affected by construction.

### *Gordon Avenue temporary construction site access*

The Gordon Avenue construction site access would require the temporary closure of the Frank Channon Walk while the temporary diversion is being constructed. If this were to occur during Stage 1 of the staged closure of the Frank Channon Walk, there would be a short term cumulative impact to users of the shared path. However, if feasible and reasonable, the Nelson Street bridge would remain and would maintain an east–west connection across the corridor during Stage 1.

The increase in the construction footprint at Gordon Avenue would have a direct temporary impact on a small area of open space, which currently serves the surrounding residential community. The loss of open space would result in a temporary reduction in amenity for these residents as well as users of the Frank Channon Walk. For residences immediately adjacent to the site access, the impacts would include loss of green outlook, reduction in privacy and increased proximity to the construction site (with the associated potential visual, noise and dust related impacts).

The use of Gordon Avenue by a small number of construction vehicles is also expected to have temporary impacts on amenity for nearby residents due to minor increases in noise, dust and traffic. However, construction vehicles would only use the road during standard construction hours (excluding rail possessions) and only for a small proportion of the full period of construction. Therefore, this impact would be low.

The use of this local road may also impact on community perceptions of road safety due to the introduction of construction vehicles, or may impact on perceptions of safety due to changes to the shared path through reduced sight lines and changes in levels of activity. Mitigation measures to manage potential safety risks associated with construction traffic and pedestrian / cyclist safety are provided in the Environmental Impact Statement and would continue to apply. This would include the application of Crime Prevention through Environmental Design principles, which take into account the relationship between the physical environment and users of that environment, promoting maximum usability and safety.

In addition, the affected community would be consulted and informed about the project and construction activities (including timing, likely impacts and mitigation measures) (refer to mitigation measure S02 in Chapter 11).

## 9.1.8 Biodiversity

To allow for the construction of the Gordon Avenue site access, a number of trees and shrubs would be removed, including some street trees. The vegetation has not been mapped by the Office of Environment and Heritage (2013).

Based on an inspection of the site, the trees and shrubs appear to be landscape plantings, and consist of a mix of native and exotic species (such as *Casuarina cunninghamiana* (River Oak), *Acacia implexa* (Hickory Wattle), *Pittosporum undulatum* (Sweet Pittosporum), *Jacaranda mimosifolia* (Jacaranda), *Harpullia pendula* (Tulipwood) and *Callistemon* spp). The groundcover is also managed, and dominated by exotic grasses and/or woodchips. No endangered ecological communities, threatened species or their habitat listed under the *Threatened Species Conservation Act 1995* (TSC Act) or *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) were identified. Some trees may provide foraging resources for native birds or bats. However, none of the species recorded are identified as feed trees for the Grey-headed Flying Fox (*Pteropus poliocephalus*) (Eby and Law, 2008), a listed vulnerable species under the TSC Act and EPBC Act.

Construction of the Gordon Avenue access would not generate significant impacts on biodiversity, with impacts limited to a very small area of planted and landscaped vegetation within a previously disturbed area. Any potential impacts on fauna would be minor and generally restricted to common fauna species that inhabit urban environments. Risk of fauna injury or death would be similar to the risks identified in the Environmental Impact Statement, and would be limited to the construction phase of the project and managed through mitigation measure B3 in Chapter 11.

As no endangered ecological communities, threatened species or their habitat were identified in the site inspection, and the impacts would be limited to planted or highly modified native vegetation, an update to the assessment of significance under the EPBC Act, and the assessment according to the Framework for Biodiversity Assessment (including any consideration of offsets) as presented in the Environmental Impact Statement is not required.

### 9.1.9 Mitigation measures

As discussed in Section 9.1.6, a new mitigation measure (LV10) is proposed to require the rehabilitation of the Frank Channon Walk and the small park at Gordon Avenue in consultation with Willoughby City Council following the completion of construction work in those spaces.

Additional mitigation measures as identified in the Environmental Impact Statement and detailed in Chapter 11 (Revised environmental management measures and environmental performance outcomes) would also address the potential impacts of the proposed changes. These measures include:

- Mitigation measure T2 – Road Safety Audits would be carried out at each construction site. Audits would address vehicular access and egress, and pedestrian, cyclist and public transport safety
- Mitigation measure T3 – Directional signage and line marking would be used to direct and guide drivers and pedestrians past construction sites and on the surrounding network. This would be supplemented by Variable Message Signs to advise drivers of potential delays, traffic diversions, speed restrictions, or alternate routes
- Mitigation measure T5 – The community would be notified in advance of proposed road and pedestrian network changes through media channels and other appropriate forms of community liaison
- Mitigation measure T6 – Vehicle access to and from construction sites would be managed to ensure pedestrian, cyclist and motorist safety. Depending on the location, this may require manual supervision, physical barriers, temporary traffic signals and modifications to existing signals or, on occasions, police presence
- Mitigation measure T7 – Additional enhancements for pedestrian, cyclist and motorist safety in the vicinity of the construction sites would be implemented during construction. This would include measures such as:
  - Use of speed awareness signs in conjunction with variable message signs near construction sites to provide alerts to drivers
  - Community educational events that allow pedestrians, cyclists or motorists to sit in trucks and understand the visibility restrictions of truck drivers, and for truck drivers to understand the visibility from a bicycle; and a campaign to engage with local schools to educate children about road safety and to encourage visual contact with drivers to ensure they are aware of the presence of children

- Specific construction driver training to understand route constraints, expectations, safety issues, human error and its relationship with fitness for work and chain of responsibility duties, and to limit the use of compression braking
- Use of IVMS (telematics) to monitor vehicle location and driver behaviour
- Safety devices on construction vehicles that warn drivers of the presence of a vulnerable road user located in the vehicles' blind spots and warn the vulnerable road user that a vehicle is about to turn

- Mitigation measure T13 – Construction site traffic would be managed to minimise movements in the AM and PM peak periods
- Mitigation measure NV1 – The Construction Noise and Vibration Strategy would be implemented with the aim of achieving the noise management levels where feasible and reasonable. This would include the following example mitigation measures where feasible and reasonable:
  - Provision of noise barriers around each construction site
  - The coincidence of noisy plant working simultaneously close together would be avoided
  - Offset distances between noisy plant and sensitive receivers would be increased
  - Residential grade mufflers would be fitted to all mobile plant
  - Dampened rock hammers would be used
  - Non-tonal reversing alarms would be fitted to all permanent mobile plant
  - High noise generating activities would be scheduled for less sensitive period considering the nearby receivers
  - The layout of construction sites would consider opportunities to shield receivers from noise
- Mitigation measure LV3 – Lighting of construction sites would be oriented to minimise glare and light spill impact on adjacent receivers
- Mitigation measure LV5 – Opportunities for the retention and protection of existing street trees would be identified during detailed construction planning
- Mitigation measure LV6 – The design and maintenance of construction site hoardings would aim to minimise visual amenity and landscape character impacts, including the prompt removal of graffiti. Public art opportunities would be considered
- Mitigation measure LV12 – Where feasible and reasonable, vegetation would be provided to screen and visually integrate sites with the surrounding area.
- Mitigation measure LV13 – Identify and implement appropriate landscape treatments for Frank Channon Walk.
- Mitigation measure S02 – Specific consultation would be carried out with sensitive community facilities (including aged care, childcare centres, educational institutions and places of worship) potentially impacted during construction. Consultation would aim to identify and develop measures to manage the specific construction impacts for individual sensitive community facilities
- Mitigation measure B3 – The local WIRES group and / or veterinarian would be contacted if any fauna are injured on site or require capture and / or relocation.

In accordance with the Construction Noise and Vibration Strategy (Appendix C of this report), Construction Noise Impact Statements would be developed for construction activities associated with the northern corridor works. This would be informed by more detailed construction planning and would include typical standard mitigation strategies (such as at source mitigation, temporary noise barriers and works scheduling).

If the Construction Noise Impact Statement identifies significant exceedances of noise management levels and impacts on receivers for a significant period of time, despite the implementation of standard mitigation measures, additional reasonable and feasible mitigation measures would be considered if practical to reduce noise levels and impacts on sensitive receivers. These at primarily aimed at pro-active engagement with affected sensitive receivers, but includes site specific respite periods. Further detail can be found in the Construction Noise and Vibration Strategy (refer to Appendix C of this report).

Place Managers would also continue to play a vital role in maintaining close and ongoing contact with local communities and stakeholders during the design and delivery of Sydney Metro. Place Managers would provide a direct point of contact between affected members of the community and the project team.

## 9.2 Chatswood dive site (northern) – Pacific Highway and Mowbray Road intersection

As detailed in Chapter 7 (Project description – construction) of the Environmental Impact Statement, track and associated rail corridor work would require the permanent removal of the Nelson Street bridge. The bridge serves local traffic movements to and from Nelson Street and regional traffic, particularly vehicles completing the following G-turn:

- Traffic travelling on Pacific Highway southbound to Mowbray Road westbound (regional route A)
- Traffic travelling on Mowbray Road eastbound to Pacific Highway southbound (regional route B).

To maintain this movement, an all vehicle right-turn movement from the Pacific Highway (southbound) to Mowbray Road westbound is proposed in the Environmental Impact Statement. Additional details are provided in Section 9.4.3 of the Environmental Impact Statement.

Since the exhibition of the Environmental Impact Statement, concerns have been raised by stakeholders (including Roads and Maritime Services) regarding the proposed changes to the intersection of the Pacific Highway and Mowbray Road with respect to the provision of right-turn lanes. Roads and Maritime would prefer a solution taking into account broader road network requirements. It has also been identified that it would be more desirable for upgrades of this intersection to be carried out at the one time to avoid multiple traffic disruptions.

As a result, Transport for NSW is currently working with Roads and Maritime Services and other stakeholders to carry out a broader review of the traffic and transport needs in this precinct. This may include alternative solutions for improving the intersection of the Pacific Highway and Mowbray Road to the addition of right-turn lanes as proposed as part of this project. A decision on the preferred solution for this intersection may not occur prior to the proposed closure of the Nelson Street bridge.

This section provides an assessment of the closure of the Nelson Street bridge without a proposed solution for the Pacific Highway / Mowbray Road intersection. It also includes an assessment of the proposed Gordon Avenue site access as described in Section 9.1 of this report.

### 9.2.1 Description

The removal of the Nelson Street bridge, without the provision of right-turn lanes, would result in a re-distribution of local and regional traffic on the surrounding road network. As shown on Figure 9-8, traffic that currently uses regional route A would likely use the following alternative route:

- Southbound on Pacific Highway
- Left turn into Albert Avenue
- Right turn into Orchard Road
- Right turn at Mowbray Road
- Continue westbound on Mowbray Road.

For traffic that currently uses regional route B, there would be two alternatives (as shown in Figure 9-9). Alternative route 1 would be:

- Eastbound on Mowbray Road
- Right turn into Hampden Road
- Right turn at the roundabout located at the intersection of Hampden Road and Brand Street
- Southbound on Hampden Road
- Right turn into Broughton Road
- Right turn into Rimmington Street
- Left turn into Pacific Highway.

Alternative route 2 would be:

- Eastbound on Mowbray Road
- Right turn into Hampden Road
- U-turn at the roundabout located at the intersection of Hampden Road and Brand Street
- Northbound on Hampden Road
- Left turn into Mowbray Road
- Left turn at Pacific Highway
- Continue southbound on Pacific Highway.

The removal of the right-turn lanes would not result in changes to construction haulage routes to and from the Chatswood dive site (northern), nor the volumes of construction vehicles generated by the project as presented in the Environmental Impact Statement, other than the Gordon Avenue site access (as described in Section 9.1 of this report).


**Figure 9-8 Pacific Highway southbound to Mowbray Road westbound – alternative route for regional route A**


**Figure 9-9 Mowbray Road eastbound to Pacific Highway southbound – alternative routes for regional route B**

### 9.2.2 Environmental screening assessment

To understand the potential change in environmental impacts compared to those assessed in the Environmental Impact Statement, a screening assessment was conducted and is presented in Table 9-5. This assessment considers potential environmental aspects that may require further impact assessment to understand likely environmental impacts, and identify any relevant mitigation measures that may be required.

**Table 9-5 Chatswood dive site (northern) – Pacific Highway and Mowbray Road intersection – environmental screening assessment**

| Aspect | Potential change in impacts | Description |
|---|---|---|
| **Construction traffic and transport** | Yes | The changed traffic conditions would alter the distribution of local and regional traffic on the surrounding road network. It would not alter the volume or distribution of construction vehicles.<br>An assessment is provided in Section 9.2.3. |
| **Operational traffic and transport** | Yes | A final solution for the Pacific Highway / Mowbray Road intersection would be determined in consultation with Roads and Maritime Services and other stakeholders. It is expected to be implemented before completion of construction.<br>No further assessment is considered necessary. |
| **Construction noise and vibration** | Yes | The changed traffic conditions may introduce changes to road traffic noise on the alternative routes due to re-distributed traffic.<br>An assessment is provided in Section 9.2.4. |
| **Operational noise and vibration** | Yes | A final solution for the Pacific Highway / Mowbray Road intersection would be determined in consultation with Roads and Maritime Services and other stakeholders. It is expected to be implemented before the completion of construction.<br>No further assessment is considered necessary. |
| **Land use and property** | No | There would be no additional impacts on land use and property as a result of the changed traffic conditions.<br>An assessment is not considered necessary. |
| **Business impacts** | No | Before a solution is implemented at the Pacific Highway / Mowbray Road intersection, customers accessing businesses along the Pacific Highway would experience minor increases in travel times due to the alternative routes. However, this would not result in significant additional business impacts.<br>An assessment is not considered necessary. |
| **Non-Aboriginal heritage** | No | The changed traffic conditions would not alter the impact on non-Aboriginal heritage.<br>An assessment is not considered necessary. |
| **Aboriginal heritage** | No | The changed traffic conditions would not alter the impact on Aboriginal heritage.<br>An assessment is not considered necessary. |

| Aspect | Potential change in impacts | Description |
|---|---|---|
| **Landscape character and visual amenity** | No | The changed traffic conditions would not increase the impact on landscape character and visual amenity.<br>An assessment is not considered necessary. |
| **Groundwater and geology** | No | The changed traffic conditions would not result in any additional groundwater and geology impacts, as excavation is not proposed.<br>An assessment is not considered necessary. |
| **Soils, contamination and water quality** | No | The changed traffic conditions would not change the potential soils, contamination or water quality impacts.<br>An assessment is not considered necessary. |
| **Social impacts and community infrastructure** | No | The re-distribution of traffic would not have a noticeable impact on social or community infrastructure located along the alternative routes.<br>An assessment is not considered necessary. |
| **Biodiversity** | No | The changed traffic conditions would not result in any additional biodiversity impacts.<br>An assessment is not considered necessary. |
| **Flooding and hydrology** | No | The changed traffic conditions would not occur on flood-prone land and would not alter existing stormwater systems.<br>An assessment is not considered necessary. |
| **Air quality** | No | The changed traffic conditions would not result in any additional air quality impacts.<br>An assessment is not considered necessary. |
| **Hazard and risk** | No | The changed traffic conditions would not involve the storage and use of any hazardous substances and dangerous goods, or be located within a bushfire prone area.<br>An assessment is not considered necessary. |
| **Waste management** | No | The changed traffic conditions would not result in the generation of any different and increased volumes of waste materials.<br>An assessment is not considered necessary. |
| **Sustainability** | No | The changed traffic conditions would not change the climate risk profile of the project, and would not result in a substantial change to the generation of greenhouse gases or the use of resources.<br>An assessment is not considered necessary. |
| **Cumulative impacts** | No | The changed traffic conditions would not result in any additional cumulative impacts.<br>An assessment is not considered necessary. |

### 9.2.3 Construction traffic and transport

#### Approach

Nelson Street bridge serves local traffic movements to and from Nelson Street as well as regional traffic, in particular vehicles completing the following G-turn:

- Traffic travelling on Pacific Highway southbound to Mowbray Road westbound (regional route A)
- Traffic travelling on Mowbray Road eastbound to Pacific Highway southbound (regional route B).

Intersection counts and origin-destination surveys have been undertaken to determine the proportion of local and regional traffic movements on Nelson Street. The following peak hour volumes were recorded using Nelson Street as a G-turn facility:

- AM peak hour:
  - Regional route A – 41 vehicles
  - Regional route B – 12 vehicles
- PM peak hour:
  - Regional route A – 56 vehicles
  - Regional route B – 18 vehicles.

As identified in Section 9.2.1, this assessment considers the impact on intersections along alternative routes with construction underway, with site access points at Gordon Avenue, Nelson Street and Mowbray Road, but with no changes to the Pacific Highway / Mowbray Road intersection. The introduction of traffic signals ('signalisation') of Mowbray Road / Hampden Road and the construction access point at the northern leg of this intersection are included in the analysis.

The assessment considers each southbound alternative route (regional route B) with the westbound alternative route (regional route A). Alternative route 1 and 2 for regional route B has been assessed separately, with all vehicles assumed to undertake one route for each assessment.

This approach provides a worst case scenario, as it assesses the additional vehicles on the road network during the AM and PM peak hours due to construction activity alongside traffic using the alternative routes.

Figure 9-10 provides an overview of intersection locations included in the assessment.

### Results

Table 9-6 summarises the average delay per vehicle, level of service and degree of saturation at each intersection comparing the existing network layout (without the signalisation of Mowbray Road / Hampden Road), and with the project (with the signalisation of the Mowbray Road / Hampden Road intersection).

The signalisation of Mowbray Road / Hampden Road during construction would improve the performance of the intersection from level of service F to level of service C during the AM peak hour. During the PM peak hour the intersection would still operate with spare capacity at LoS A or B. The operational performance of the intersection would remain the same irrespective of the alternative route undertaken for regional route B. However, the level of service would reduce when compared to the results presented in the Environmental Impact Statement, reducing from level of service B to level of service C in the AM peak. This is attributed to the additional vehicles now using this intersection in the absence of the right-turn lanes.

The performance of the Hampden Road / Brand Street roundabout would deteriorate from level of service A to level of service B during the AM peak hour, with increases in peak period delays at the roundabout. This is primarily due to the additional vehicles that would now use the roundabout in order to travel southbound on the Pacific Highway. However, the intersection would continue to operate with spare capacity.

Impacts on all other intersections would be minimal, with similar average delays except at the Pacific Highway / Mowbray Road intersection where the average delay increases by eight seconds during the AM peak hour. However, the level of service would remain the same.

Each alternative route for regional route B would adequately accommodate the additional traffic generated due to the closure of Nelson Street bridge. However, alternative route 2, which involves vehicles performing a U-turn at the Hampden Road / Brand Street roundabout, would be preferred as it does not require the use of local roads and the shopping precinct around Artarmon Station, unlike alternative route 1.

The assessment identifies an improvement in the performance of the Mowbray Road / Orchard Street / Elizabeth Street intersection during the AM peak hour due to the lower number of vehicles using this intersection. This lower volume is attributable to vehicles travelling via the alternative regional routes. Improvements observed at all other intersections are a result of the marginal change in approach volumes and the reallocation of green time (that is, the length of time the traffic light stays on green) within the model.

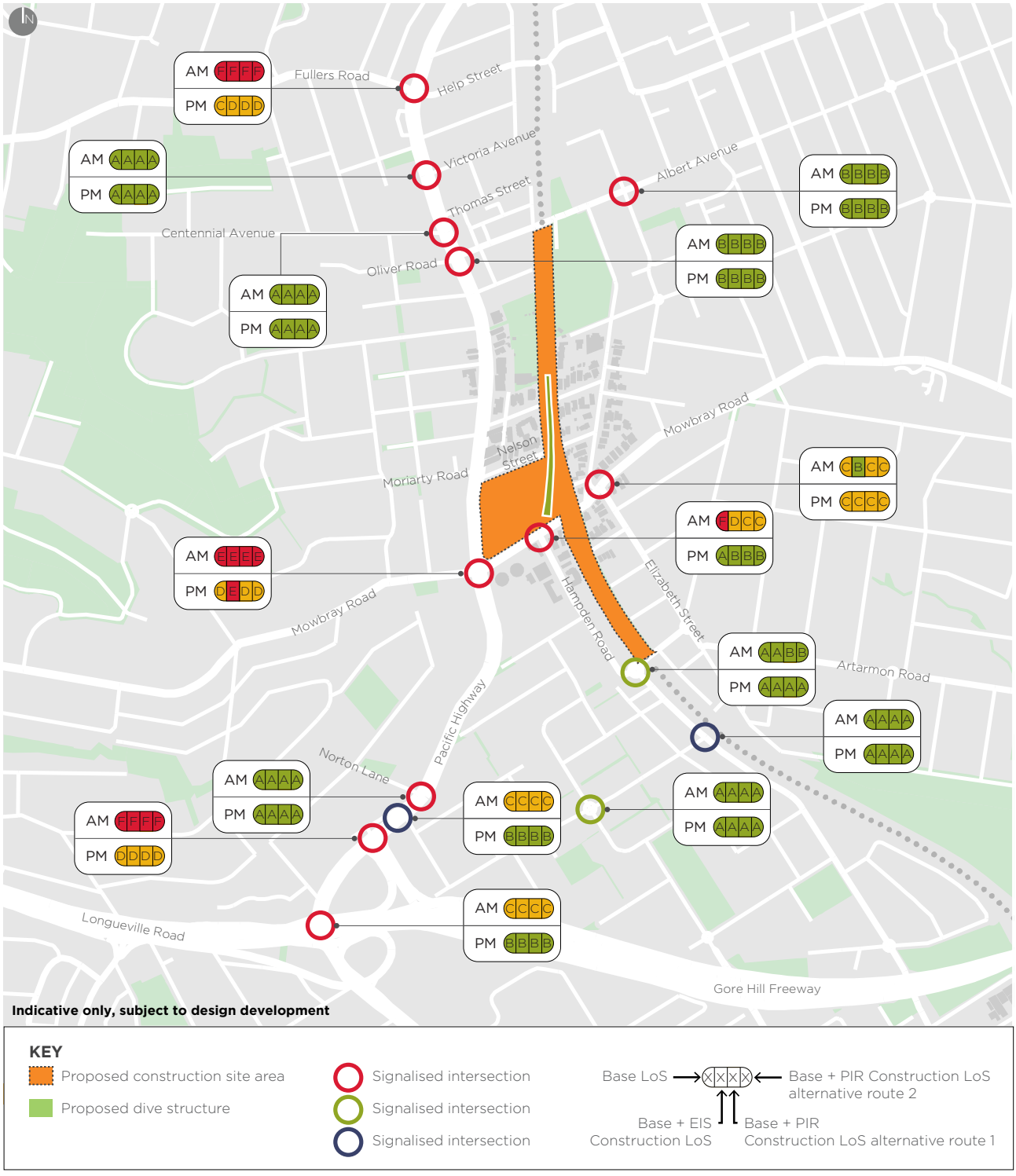



**Figure 9-10 Chatswood dive site (northern) and northern surface track works – assessed intersection locations**

**Note: Mowbray Road / Hampden Road is a priority controlled intersection in the existing network layout.*

Table 9-6 Chatswood dive site (northern) and northern surface track works – assessment of intersection performance (AM and PM peak hour)

| Intersection / peak period | Existing | | With project (EIS) (without Gordon Avenue access) | | With project (Preferred Infrastructure Report) – southbound alternative route 1 | | With project (Preferred Infrastructure Report) – southbound alternative route 2 | |
|---|---|---|---|---|---|---|---|---|
| | Level of service | Degree of saturation | Level of service | Degree of saturation | Level of service | Degree of saturation | Level of service | Degree of saturation |
| **Pacific Highway / Fullers Road / Help Street (signalised)** | | | | | | | | |
| AM peak | F | 1.28 | F | 1.16 | F | 1.28 | F | 1.28 |
| PM peak | C | 0.92 | D | 0.94 | D | 0.94 | D | 0.94 |
| **Pacific Highway / Victoria Avenue (signalised)** | | | | | | | | |
| AM peak | A | 0.82 | A | 0.85 | A | 0.85 | A | 0.85 |
| PM peak | A | 0.73 | A | 0.73 | A | 0.73 | A | 0.73 |
| **Pacific Highway / Centennial Avenue (signalised)** | | | | | | | | |
| AM peak | A | 0.67 | A | 0.69 | A | 0.70 | A | 0.70 |
| PM peak | A | 0.72 | A | 0.72 | A | 0.73 | A | 0.73 |
| **Pacific Highway / Albert Avenue / Oliver Road (signalised)** | | | | | | | | |
| AM peak | B | 0.77 | B | 0.95 | B | 0.77 | B | 0.77 |
| PM peak | B | 0.96 | B | 0.96 | B | 0.96 | B | 0.96 |
| **Pacific Highway / Mowbray Road (signalised)** | | | | | | | | |
| AM peak | E | 1.05 | E | 1.03 | E | 1.10 | E | 1.10 |
| PM peak | D | 0.97 | E | 1.01 | D | 0.97 | D | 0.97 |
| **Pacific Highway / Howarth Road / Norton Lane (signalised)** | | | | | | | | |
| AM peak | A | 0.61 | A | 0.60 | A | 0.62 | A | 0.62 |
| PM peak | A | 0.75 | A | 0.75 | A | 0.75 | A | 0.75 |
| **Pacific Highway / Gore Hill Freeway ramps (signalised)** | | | | | | | | |
| AM peak | F | 1.07 | F | 1.12 | F | 1.04 | F | 1.04 |
| PM peak | D | 1.04 | D | 1.04 | D | 1.04 | D | 1.04 |
| **Pacific Highway / Longueville Road (signalised)** | | | | | | | | |
| AM peak | C | 0.83 | B | 0.83 | B | 0.79 | B | 0.78 |
| PM peak | B | 0.79 | B | 0.79 | B | 0.77 | B | 0.79 |
| **Mowbray Road / Orchard Road / Elizabeth Street (signalised)** | | | | | | | | |
| AM peak | C | 0.71 | B | 0.72 | C | 0.68 | C | 0.68 |
| PM peak | C | 0.74 | C | 0.68 | C | 0.74 | C | 0.74 |

| Intersection / peak period | Existing | | With project (EIS) (without Gordon Avenue access) | | With project (Preferred Infrastructure Report) – southbound alternative route 1 | | With project (Preferred Infrastructure Report) – southbound alternative route 2 | |
|---|---|---|---|---|---|---|---|---|
| | Level of service | Degree of saturation | Level of service | Degree of saturation | Level of service | Degree of saturation | Level of service | Degree of saturation |
| **Mowbray Road / Hampden Road (existing – priority controlled, with project – signalised)** | | | | | | | | |
| AM peak | F | 1.04 | D | 0.97 | C | 0.89 | C | 0.89 |
| PM peak | A | 0.38 | B | 0.69 | B | 0.65 | B | 0.64 |
| **Orchard Road / Albert Avenue (signalised)** | | | | | | | | |
| AM peak | B | 0.39 | B | 0.38 | B | 0.44 | B | 0.40 |
| PM peak | B | 0.37 | B | 0.45 | B | 0.51 | B | 0.51 |
| **Hampden Road / Brand Street (roundabout)** | | | | | | | | |
| AM peak | A | 0.82 | A | 0.82 | B | 0.83 | B | 0.83 |
| PM peak | A | 0.60 | A | 0.60 | A | 0.60 | A | 0.60 |
| **Hampden Road / Broughton Road (priority controlled)** | | | | | | | | |
| AM peak | A | 0.38 | A | 0.38 | A | 0.40 | A | 0.38 |
| PM peak | A | 0.38 | A | 0.38 | A | 0.38 | A | 0.38 |
| **Broughton Road / Buller Road (roundabout)** | | | | | | | | |
| AM peak | A | 0.18 | A | 0.18 | A | 0.18 | A | 0.18 |
| PM peak | A | 0.22 | A | 0.22 | A | 0.22 | A | 0.22 |
| **Pacific Highway / Rimmington Street (priority controlled)** | | | | | | | | |
| AM peak | C | 0.57 | C | 0.61 | C | 0.62 | C | 0.58 |
| PM peak | B | 0.44 | B | 0.43 | B | 0.49 | B | 0.44 |

*Note: Level of Service reported for signalised intersections is for the overall intersection, and for roundabouts and priority controlled intersections is the worst performing approach.*

*Note: Existing and 'with project' results are based on 2016 traffic counts*

*Note: Outputs from LinSig Version 3.2*

### 9.2.4 Road traffic noise

The re-distribution of traffic that would occur prior to the implementation of a solution for the Pacific Highway / Mowbray Road intersection could result in a change in road traffic noise compared to that assessed in the Environmental Impact Statement.

To assess the potential impacts on sensitive receivers located along these routes, an assessment of road traffic noise has been completed with consideration to the applicable criteria specified in the Environment Protection Authority's NSW *Road Noise Policy*. While there are two possible alternative routes for southbound traffic, the assessment has assumed all traffic uses one route (ie does not split) to represent a worst case scenario.

The results of the assessment are presented in Table 9-7. Where an exceedance of the criterion has been identified, the predicted increase in noise as a result of the diverted traffic has been identified.

**Table 9-7 Chatswood dive site (northern) and northern surface track works – Road traffic noise on local roads**

| Road | Road Noise Policy criteria (dB) | | Predicted road traffic noise (dB), including diverted traffic | | Predicted increase (dB), where criteria is exceeded | |
|---|---|---|---|---|---|---|
| | Day | Night | Day | Night | Day | Night |
| Albert Avenue, Chatswood[1] | 60 | 55 | 69 | 62 | 0.3 | 0.4 |
| Orchard Road, Chatswood[1] | 60 | 55 | 62 | 55 | 0.9 | 1.3 |
| Mowbray Road. Chatswood[1] | 60 | 55 | 69 | 61 | 0.1 | 0.1 |
| Hampden Road, Artarmon[1] | 60 | 55 | 63 | 55 | 0.9 | N/A |
| Broughton Road, Artarmon[2] | 55 | 50 | 56 | 43 | 0.9 | N/A |
| Rimmington Street, Artarmon[2] | 55 | 50 | 52 | 43 | N/A | N/A |

*Notes:*

*1 – The Road Noise Policy criteria for arterial and sub-arterial roads is daytime LAeq(15hr) and night-time LAeq(9hr)*

*2 – The Road Noise Policy criteria for local roads is daytime LAeq(1hr) and night-time LAeq(1hr). For local roads, the most impacted year is presented.*

Table 9-7 indicates that the increase in road traffic noise as a result of the diverted traffic would be within the applicable criterion or would represent an increase of less than 2dB. An increase of 2dB represents a minor impact that is considered to be barely perceptible

# 9.3 Changes at Martin Place Station to facilitate platform-to-platform pedestrian connections

Section 6.6.4 of the Environmental Impact Statement described a new underground pedestrian link between the existing Suburban and Intercity Martin Place Station platforms and the metro station platforms. Ongoing design work has identified the need for additional work within the heritage listed Martin Place Station to construct and operate the new connection. Martin Place Station is a State heritage item. These changes are assessed below.

## 9.3.1 Description

As assessed in the Environmental Impact Statement, the underground pedestrian link to the Martin Place metro station would have a direct impact to the western end of the Suburban and Intercity platforms at Martin Place Station. Ongoing design work has identified the need for additional construction works within the existing Martin Place Station to provide the pedestrian link, including:

- Removal of three banks of station seating on the platform to provide adequate customer circulation to and from the metro station
- Relocation of utilities located at the western end of the platform to accommodate the new connection, including provision of new storage units for fire-fighting equipment.
- Works within the ceiling space in proximity to the underground connection, including temporary removal of the false ceiling. This would be reinstated, subject to fire rating requirements.
- Strengthening works to Martin Place Station structures that would be directly adjacent to the new connection, including platform walls and the Eastern Suburbs Line tunnel. These would typically be undertaken from within the excavated void created for the underground connection.
- An area in the immediate vicinity of the new connection would be temporarily occupied during construction to support the works.

The key adverse impact of the change would be on non-Aboriginal heritage, as it would have a direct impact on original fabric that contributes to the significance of the heritage listing. This is discussed further in Section 9.3.2.

Clarifications on the curtilage of the item and other construction impacts of the project are also provided in Section 9.3.2.

Other issues would be very similar to those assessed in the Environmental Impact Statement and do not require additional assessment.

## 9.3.2 Non-Aboriginal heritage

Martin Place Railway Station is of State heritage significance, and is listed on the State Heritage Register, the Sydney Trains Section 170 Heritage and Conservation Register and *Sydney Local Environment Plan 2012*.

The curtilage of the heritage item, as described on the State Heritage Register, is as follows:

*The listing boundary is the whole of the underground station area from the main public and pedestrian concourse where ticket vending machines and ticket windows are located (to the entrance of the western pedestrian subway as defined by the line of the newsagent and shops). Within the paid concourse the boundary extends up to the open ceiling above the concourse, while in the station area the boundary should be considered to be a 5 metre radius from the tunnel ceiling and platform ends. (Does not include modern retail areas).*

Direct impacts to the curtilage would be associated with the construction of the underground connection at the western end of the platform. As discussed in Section 14.5.7 of the Environmental Impact Statement, this would result in a direct physical impact on the aesthetic significance of the heritage item due to the removal of original fabric (including red ceramic tiling). Overall, the heritage impact assessment within the Environmental Impact Statement concluded that the project would have moderate impact on the heritage item.

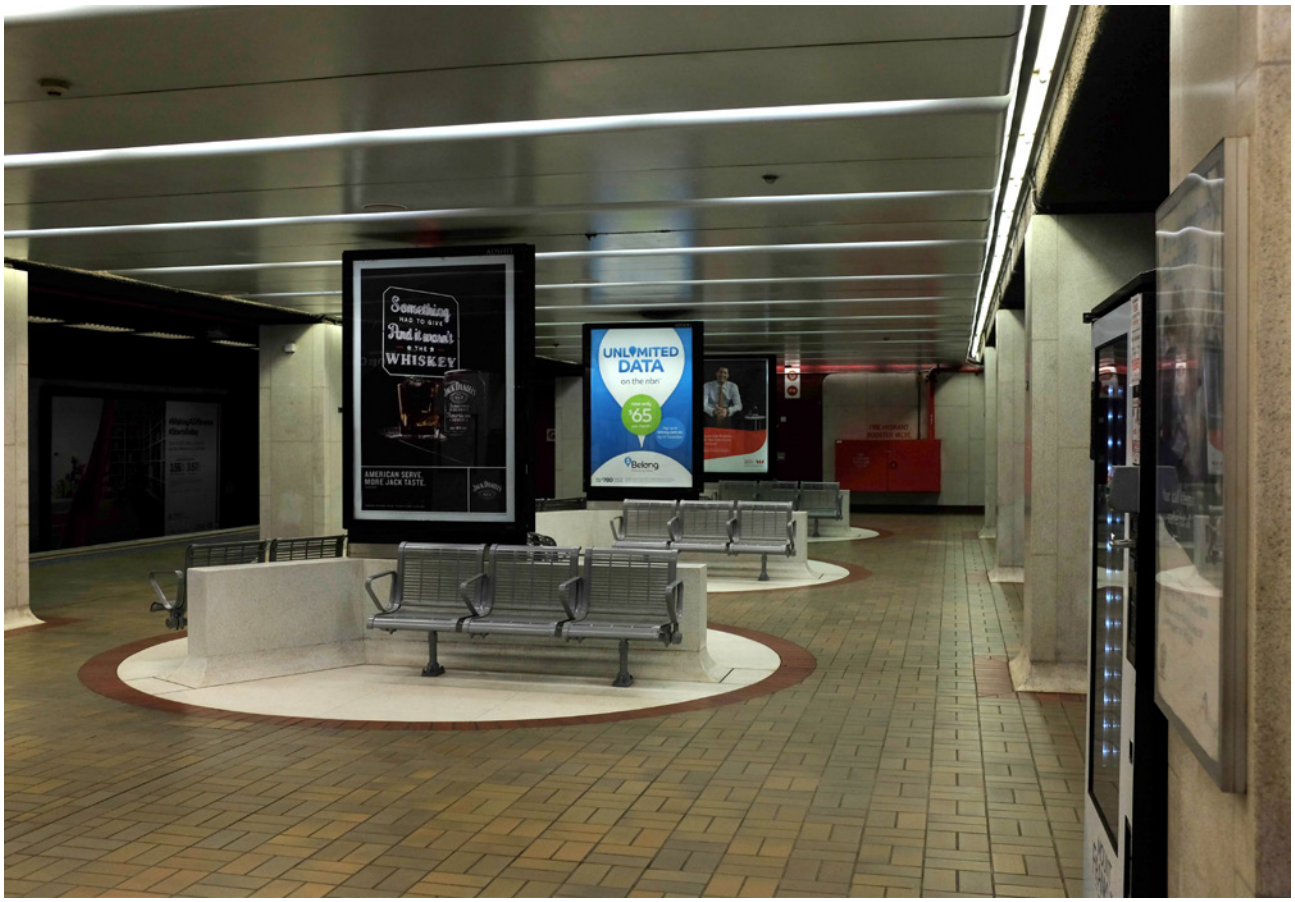
The curtilage for the heritage item (MP10) has been updated and provided on Figure 9-11.


**Figure 9-11 Martin Place Station – impacts to heritage items – updated curtilage**

The additional works identified in Section 9.3.1 would have the following additional impacts to the heritage item:

- The platform seating frames and the associated floor tiles are original significant fabric (the seats are a modern addition). The removal of the seating frames and impacts to the floor tiling would have a major direct impact on the element, and a moderate direct impact on the heritage significance of Martin Place Railway Station.
- The removal of the existing utilities space and relocation of utilities elsewhere on the platform would have a minor direct impact to original fabric (including the terrazzo panel tiling). It would also have a negligible to minor indirect impact (views and vistas) due to the location of utilities (including fire fighting equipment) on the platform, depending on the design and size of the storage units.
- The removal of a small portion and possible reinstatement of roofing would have a minor impact on the heritage significance of Martin Place Station.
- Other works would have a neutral heritage impact as it would not impact original fabric.

Figure 9-12 provides an example of the circular seating and tiling on the station platforms.




*Source: Artefact 2016*

**Figure 9-12 An example of circular seating, red tiles and terrazzo panel tiles at Martin Place Station**

Since the exhibition of the Environmental Impact Statement, other impacts to the heritage item, including works within the curtilage have been clarified:

- Impacts to the curtilage as a result of the permanent closure of underground connections and staircases in Martin Place.
- Indirect impacts due to construction vibration associated with tunnelling.

The curtilage of the heritage item extends to the end of the pedestrian concourse and ticketing area to the entrance of the existing underground connection which connects to the surface at Martin Place. Sections of the existing underground connection would be closed as part of the project, including the stairs to / from Martin Place, to the west of Elizabeth Street (refer to Figure 8-36 of the Environmental Impact Statement). The stairs to the underground connection are outside the State heritage curtilage. Parts of the underground connection are within the heritage curtilage but would not be physically impacted.

The metro tunnels would be excavated under the Eastern Suburbs Line in the vicinity of the heritage curtilage. Tunnelling activities would result in vibration below the 7.5 m/s screening level for cosmetic damage. Other construction activities would be below the 7.5 m/s screening level for cosmetic damage.

The above impacts would be in addition to the impacts as assessed in the Environmental Impact Statement, and are assessed as having a moderate impact on the heritage values of Martin Place. However, this would not impact the heritage significance of the item and Martin Place Railway Station would retain its State significance under all criteria.

### Mitigation measures

The Environmental Impact Statement included a number of mitigation measures that would still be applicable. These are:

- Archival recording of the item prior to works commencing (NAH1)
- Fabric salvage, including consideration of reuse opportunities for salvaged fabric considered (NAH5). This would include the salvage and reuse of any significant red tiles and terrazzo panels impacted during works.
- The project design would be sympathetic to heritage items and, where reasonable and feasible, minimise impacts to the setting of heritage items. The detailed design for Martin Place Station would be developed with input from a heritage architect (NAH7).
- Appropriate heritage interpretation would be incorporated into the design for the project in accordance with the NSW Heritage Manual, the NSW Heritage Office's *Interpreting Heritage Places and Items: Guidelines* (August 2005), and the NSW *Heritage Council's Heritage Interpretation Policy* (NAH8)

While these mitigation measures provide for minimising heritage impacts, including the salvage and reuse of removed heritage fabric, additional mitigation measures have been identified to address impacts on any significant fabric of the heritage item:

- The final design and location of the new connection and opening at Martin Place Railway Station would minimise removal of the significant red ceramic tiling where feasible and reasonable (NAH14).
- Opportunities for the reuse of any tiles at Martin Place Railway Station that are removed would be investigated (NAH15).
- Opportunities for the reuse of the circular seating within Martin Place Station would be investigated (NAH16).

## 9.4 Changes at Central Station

Ongoing design work and construction planning have identified a need for the following changes at Central Station:

- The removal of the Central Station temporary pedestrian bridge
- An additional temporary construction site to support the construction of the Sydney Yard Access Bridge.
- Changes to the northern concourse and Intercity platforms, including the relocation of the northern services building from Eddy Avenue forecourt to the northern concourse.

These changes are described in Section 9.4.1.

### 9.4.1 Description

#### Removal of the temporary pedestrian bridge

Ongoing construction planning has identified that the proposed temporary pedestrian bridge at Central Station (described in Chapter 7 of the Environmental Impact Statement) is no longer required.

It is now proposed to manage pedestrian movements during the construction of the metro platforms at Central Station using existing and new underground connections. As shown on Figure 9-13 this would include:

- Construction of the new underground pedestrian connection at the southern end between platforms 12 and 16. During this work, the existing underground pedestrian connections would remain open, except for a potential two week full closure of the existing pedestrian connections. This two-week period would be timed to avoid periods of peak pedestrian demand (ie any major events) and would not be concurrent with the temporary two week full closure of the Devonshire Street tunnel
- Construction of new temporary stairs to platform 20 to 23
- Opening of the new permanent underground pedestrian connection
- Closure of existing underground pedestrian connections.

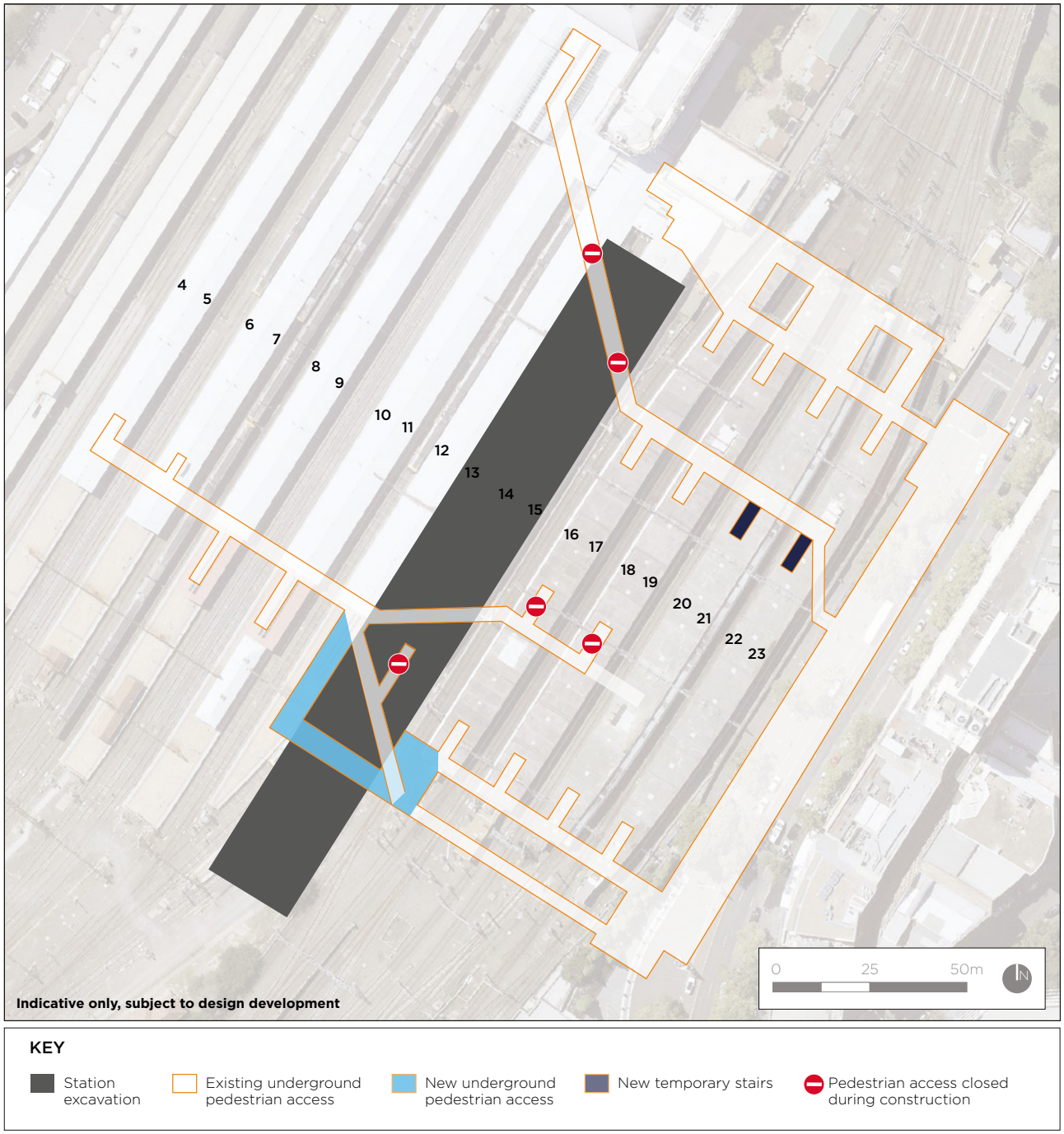



**Figure 9-13 Central Station – staged closure of the existing and realigned southern pedestrian connection, and additional suburban platform stairs**

### Northern concourse and Intercity platform changes

Ongoing design development has identified the following changes at the northern concourse and the Intercity platforms:

- The need for additional space at the northern concourse to accommodate the vertical transport from the metro platforms. This would require the shortening of platforms 9 to 14 at the northern end, and a corresponding lengthening at the southern end.
- Demolition and reinstatement of platform 12. The Environmental Impact Statement had proposed partial demolition of platform 12/13, with platform 12 remaining.

  Due to structural stability, platform 12 would be demolished and re-built/re-constructed. Operational adjustments may be made elsewhere within Central Station to ensure the operational functionality of the station during construction.
- Platforms 13 to 15 would be demolished to accommodate the construction of the metro station. The Environmental Impact Statement identified that platform 15 could reinstated and converted to a suburban platform following construction of the new Sydney Metro platforms at Central Station. It is now proposed that platform 15 would not be reinstated. This was based on further investigation and consultation with Sydney Trains and NSW Trains that determined that existing and planned services at Central Station can be accommodated without the need for platform 15.
- Relocation of the northern services building from the Eddy Avenue Forecourt onto the northern end of platform 14 (refer to Figure 9-14). This building contains the emergency egress stairs for the metro platforms below the concourse. The building would be a similar height to the northern concourse canopy, and would be designed in accordance with the Chatswood to Sydenham Design Guidelines for the project (refer to Appendix A). There would be no change to the southern services building. Following completion of construction, areas of the Eddy Avenue forecourt that were previously permanently impacted by the northern services building, would now be reinstated as part of the existing forecourt.

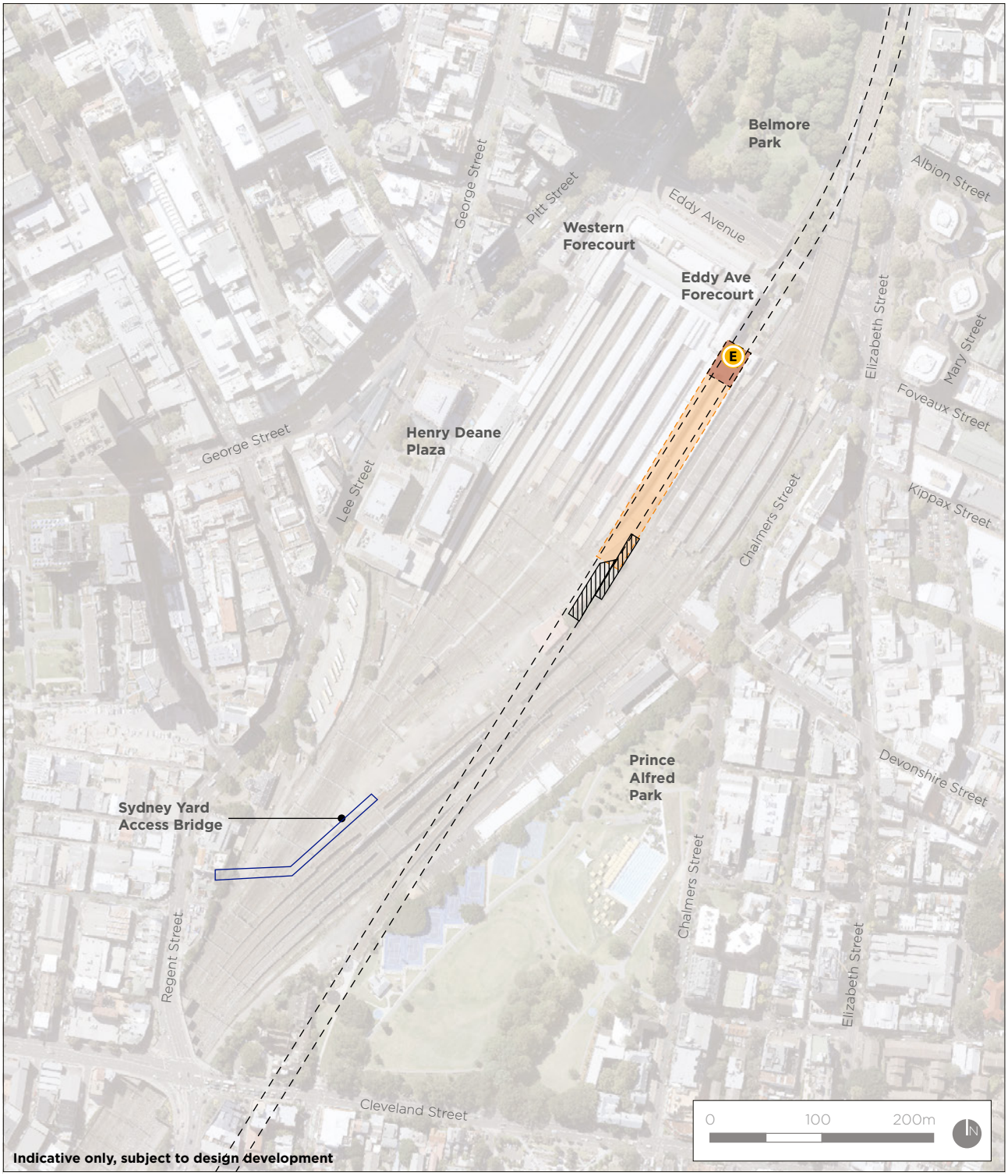



**Figure 9-14 Central Station – indicative layout**

### Sydney Yard Access Bridge temporary construction site

Ongoing construction planning and design development has identified the need for an additional site to support the construction of the Sydney Yard Access Bridge. Activities at the temporary construction site would include:

- Construction of a large hardstand area, including crane pads, to support the activities
- Delivery and storage of pre-cast bridge segments on hardstand
- Assembly of pre-cast bridge segments. This would be supported by two cranes and other equipment.
- Positioning of the assembled segments into place, using a large crane (750 tonnes) to lift assembled segments into place.

Access to the site would be via Lee Street using an existing Sydney Trains maintenance access way provided through the Sydney Buses depot. An additional temporary access track across the rail tracks would be constructed to connect the temporary site with the Central Station construction site.

The temporary construction site would be used for around seven months, commencing in the first quarter of 2017.

The site would generally be restricted to the standard daytime construction hours. However, the site would support bridge construction works which would only be undertaken during track possessions (refer to Section 7.10.9 of the Environmental Impact Statement). Any out of hours works associated with work carried out during rail possessions would be short term and subject to approval under an Environment Protection Licence for the project.

The location of the Sydney Yard Access Bridge construction site, including vehicle access and egress, are illustrated in Figure 9-15.

The area is currently used as a maintenance area by Sydney Trains. Site preparation works would be required and would involve:

- Establishing site hoardings around the perimeter of the site.
- Levelling of the construction site and formation of hardstand
- Construction of the crane pads, including minor excavation.

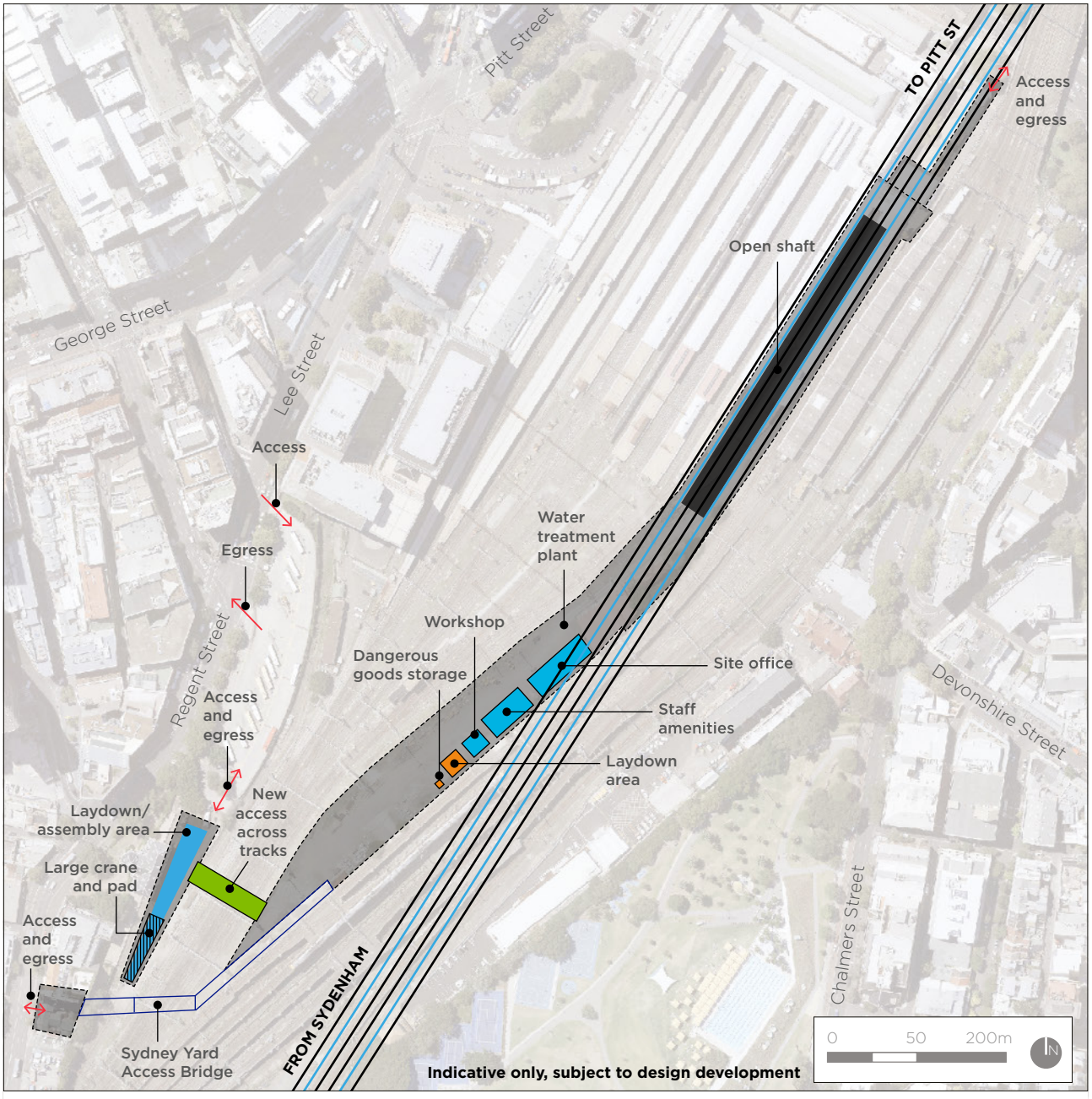



Figure 9-15 Sydney Yard Access Bridge and Central Station construction sites

### 9.4.2 Environmental screening assessment

To understand the potential change in environmental impacts, a screening level assessment was conducted and is presented in Table 9-1. This assessment considers potential environmental aspects that may require further impact assessment to understand likely environmental impacts, and identify any relevant mitigation measures that may be required. An assessment of these potential changes in impacts compared to the assessment in the Environmental Impact Statement is provided after the table.

**Table 9-8 Central Station – environmental screening assessment**

| Aspect | Potential change in impacts | Description |
|---|---|---|
| **Construction traffic and transport** | Yes | **Construction vehicles and road network impacts**<br>The additional construction site would result in an additional site access / egress point onto Lee Street. This is an existing maintenance access for Sydney Trains and passes through the Sydney Buses depot. The construction vehicles that would use this access point once the site is established would be redistributed from the access point provided off Regent Street. However, there would be additional construction vehicles generated during the establishment of the construction site and the delivery of the cranes.<br>**Impacts to customers**<br>The proposed alternative to the temporary pedestrian bridge would alter customer circulation while construction is underway. Works associated with the northern concourse and Intercity platforms would have impacts consistent with those described and assessed in the Environmental Impact Statement.<br>Further assessment is provided in Section 9.4.3. |
| **Operational traffic and transport** | No | The changes at Central Station would not result in changes to the operation of the project as assessed in the Environmental Impact Statement, noting that some changes are proposed to improve circulation in the northern concourse.<br>No further assessment is required. |
| **Construction noise and vibration** | Yes | The additional construction site and works within Central Station would introduce additional works.<br>Further assessment is provided in Section 9.4.4. |
| **Operational noise and vibration** | No | The change in construction methodology would not result in any changes to the operation of the project as assessed in the Environmental Impact Statement.<br>No further assessment is considered necessary. |
| **Land use and property** | No | The changes at Central Station would be contained within operational areas of Central Station and would not have direct impacts to private property.<br>No further assessment is considered necessary. |
| **Business impacts** | No | There would be no additional direct impacts on business as a result of the changes at Central Station.<br>Changes in noise impacts may further reduce amenity at the closest business; however, noise impacts would be mitigated where feasible and reasonable in accordance with the mitigation measures in Chapter 11 (Revised environmental mitigation measures and environmental performance outcomes) and the Sydney Metro Construction Noise and Vibration Strategy. The change in impact is considered to be minor and the mitigation measures in the Environmental Impact Statement would manage any increase in impacts.<br>No further assessment is considered necessary. |

| Aspect | Potential change in impacts | Description |
|---|---|---|
| **Non-Aboriginal heritage** | Yes | The changes at Central Station would be located directly adjacent to Mortuary Station and within the curtilage of Central Station. Both are State heritage listed items.<br>Further assessment is provided in Section 9.4.5. |
| **Aboriginal heritage** | No | No identified Aboriginal sites would be impacted by the changes at Central Station. Across the Central Station site there is potential for Aboriginal objects to occur in sub-surface contexts where natural soil contexts remain. The mitigation measures in the Environmental Impact Statement would be implemented to manage activities associated with the changes at Central Station and near Mortuary Station.<br>No further assessment is considered necessary. |
| **Landscape character and visual amenity** | Yes | The changes at Central Station would alter the landscape character and visual impacts.<br>Further assessment is provided in Section 9.4.6. |
| **Groundwater and geology** | No | The changes at Central Station would not result in any additional groundwater and geology impacts. Minor excavation works are required at the temporary construction site however this is expected to comprise of residual soils. The change in impact is considered to be minor and the mitigation measures in the Environmental Impact Statement would manage any increase in impacts.<br>No further assessment is considered necessary. |
| **Soils, contamination and water quality** | No | The changes at Central Station would not significantly change the potential impacts on soils, contamination or water quality as assessed in the Environmental Impact Statement. The mitigation measures in the Environmental Impact Statement would be implemented to manage these changes.<br>No further assessment is considered necessary. |
| **Social impacts and community infrastructure** | No | There would be no additional direct impacts on community infrastructure as a result of the changes at Central Station.<br>Changes in noise impacts may further reduce amenity at the closest residences and businesses; however, noise impacts would be mitigated where feasible and reasonable in accordance with the mitigation measures in Chapter 11 (Revised environmental mitigation measures and environmental performance outcomes) and the Sydney Metro Construction Noise and Vibration Strategy. The change in impact is considered to be minor and the mitigation measures in the Environmental Impact Statement would manage any increase in impacts.<br>No further assessment is considered necessary. |
| **Biodiversity** | No | The changes at Central Station would not impact landscaped areas.<br>No further assessment is considered necessary. |
| **Flooding and hydrology** | No | There would be minor changes to hydrology and drainage as a result of the changes at Central Station. The area is not identified as being flood prone.<br>No further assessment is considered necessary. |

| Aspect | Potential change in impacts | Description |
|---|---|---|
| **Air quality** | No | The changes at Central Station would not result in any additional air quality impacts. However, some activities, plant and equipment may be closer to sensitive receivers. The change in impact would be minor and the mitigation measures in the Environmental Impact Statement would manage any increase in impacts.<br>No further assessment is considered necessary. |
| **Hazard and risk** | No | The changes would not involve the storage and use of any hazardous substances and dangerous goods in areas closer.<br>No further assessment is considered necessary. |
| **Waste management** | No | The changes would not result in the generation of any different and increased volumes of waste materials.<br>No further assessment is considered necessary. |
| **Sustainability** | No | The changes at Central Station would not change the climate risk profile of the project, and would not result in a substantial change to the generation of greenhouse gases or the use of resources.<br>No further assessment is considered necessary. |
| **Cumulative impacts** | No | The changes in construction methodology would not result in any additional cumulative impacts.<br>No further assessment is considered necessary. |

### 9.4.3 Traffic and transport

#### Removal of the temporary pedestrian bridge

The southern underground pedestrian connections under platforms 12, 13, 14 and 15 currently enable customer interchange from platforms 4 through to 23 and the Eastern Suburbs Line.

Beneath platforms 12 and 13, the connection splits at a Y-junction. As shown on Figure 9-13, the southern arm provides connections through to all platforms from 14 to 23 and the Eastern Suburbs Line, and the northern arm provides connections through to platforms 16 to19 only. The northern arm is used less frequently than the southern arm given it only provides connections to platforms 16 to 19 through to the InterCity platforms. There is an additional pedestrian connection to suburban platforms only, which runs parallel to the southern arm of the Y-junction. This is also accessed via the southern end of these platforms through an additional set of stairs.

The southern pedestrian connection between the InterCity and Suburban platform are busiest during the AM peak period. This is associated with the arrival of InterCity trains with customers interchanging to Suburban trains or exiting the station to Chalmers Street. However, the frequency of InterCity train arrivals during the AM peak (around 12 per hour) are relatively low. Observations of the underground connection indicate that the sections impacted by this change generally operate at a level of service B or C.

The southern pedestrian connections that would be impacted by this change (located beneath platforms 12 to 15) would already be affected by the metro platform work. (That is, the Environmental Impact Statement identifies that the sections that provide links between the InterCity and Suburban platforms would be directly impacted during construction of the station).

The removal of the temporary construction bridge without the provision of replacement connections to the subterranean pedestrian links during construction would significantly impact pedestrian flows around the station to the extent that the station would cease to operate effectively. The provision of temporary underground connections is essential to maintaining acceptable levels of service for pedestrians. As such, a new permanent underground pedestrian connection would be constructed prior to removal of the existing southern arm. The proposed connection would be built with similar dimensions to the existing connection and would therefore operate at a similar level of service. It would also allow for the two southernmost stairs to directly connect to the InterCity platform pedestrian link. Stairs would also be constructed on platforms 20 to 23. These elements would allow for a more even distribution of demand and to help reduce congestion during construction.

There would be no impacts on the connectivity between suburban platforms, where the majority of interchange at Central Station occurs, as the functionality would remain. The exception would be prior to the opening of the new underground connection, which would require a two week temporary closure of the underground connections, and works on platforms 20 to 23. The two-week closure would be timed to avoid periods of peak pedestrian demand and would not be concurrent with the temporary two week full closure of the Devonshire Street tunnel. The construction of the additional stairs on platforms 20 to 23 would be undertaken during rail possessions.

### Northern concourse and Intercity platform changes

As identified in Section 9.4.16 of the Environmental Impact Statement, works at Central Station are likely to result in limited alterations to the Sydney Trains and NSW Trains timetable due to the closure of platforms 13, 14 and 15. Transport for NSW would liaise with Sydney Trains and NSW Trains in relation to the necessary timetable alterations. Customers would be advised of any timetable changes. The demolition and reinstatement of platform 12, and minor adjustments to platforms 9 to 11 (which would be of shorter duration) would be considered in any required timetable alterations. However, the works would be undertaken during rail possessions and wherever possible, within the scheduled Sydney Trains track possessions. Alternative bus services would be provided during possession works.

### Sydney Yard Access Bridge temporary construction site

The construction site would be accessed via the Sydney Buses depot, which has direct access onto Lee Street and an egress at the intersection of Regent Street and Lee Street. This access is currently used by Sydney Trains maintenance vehicles.

The addition of the Sydney Yard Access Bridge construction site would not increase the volume of construction traffic as presented in the Environmental Impact Statement. However, until the construction of the Sydney Yard Access Bridge is completed, construction traffic that would have used the Regent Street access / egress point would use the additional access / egress points on Lee Street. As the egress point does not allow left turn movements, it would also require outbound vehicles to use Lee Street and George Street. George Street was identified as a secondary outbound route in the Environmental Impact Statement.

As identified in the Environmental Impact Statement, the initial stages of construction activity would generate around six heavy vehicle trips per hour and a maximum of 10 light vehicle trips per hour in the AM and PM peak. The assessment presented in the Environmental Impact Statement identified that:

- The Lee Street and Regent Street intersection, which also serves the egress point for the Sydney Buses depot, operates at a level of service B with and without the project
- The George Street, Lee Street, Pitt Street and Quay Street intersection operates at a level of service F during the AM peak, and a level of service C during the PM peak, with and without the project.

The temporary change in distribution of construction traffic as a result of this change would not change the level of service for the intersections as presented in the Environmental Impact Statement. Furthermore, the volume of traffic generated by the project during the peak periods would be low, and would occur for a short duration (ie seven months).

Transport for NSW would liaise with Sydney Buses to minimise disruption to depot operations, particularly during peak periods of construction activity, including the delivery of the cranes and oversized equipment. Mitigation measures T1, T2 and T3, which relate to consultation and road safety audits, would effectively manage the additional access / egress points, and potential conflicts with Sydney Buses, as well as motorists, cyclists and pedestrians along Regent Street and Lee Street.

### 9.4.4 Construction noise and vibration

This section provides an assessment of the Sydney Yard Access Bridge construction site, incorporating adjustments to some receiver type classification in the vicinity of the station.

#### Receiver type classifications

Near the Central Station construction site, receivers in Areas B and D were identified in the Environmental Impact Statement as commercial receivers. These have since been confirmed as residential receivers. The receiver classification changes do not require further assessment as these receivers would not be the closest residential receivers to the construction sites.

In addition, in Area E, the Environmental Impact Statement (Figure 10-10) identified:

- One receiver as a residential receiver, but this was correctly categorised and assessed as a commercial receiver with the results presented in Table 10-30 of the Environmental Impact Statement (that is, it was only an error within the figure). Therefore, no further assessment for this receiver is required
- One receiver as a commercial receiver, but this has since been confirmed as a residential receiver. Further assessment has been undertaken for this receiver.
- Mortuary Station, which was correctly assessed as a commercial receiver but the results were not presented in the summary table.

The correct receiver types in Area E are shown in Figure 9-16.

#### Construction airborne noise

The Sydney Yard Access Bridge construction site would be located adjacent to residential and commercial receivers located along Regent Street, and would introduce additional construction activities closer to the rear façade of these buildings.

The findings of the revised construction noise impact assessment, including clarified receiver types, are presented in Table 9-9 and discussed below. Noise level exceedances are shown on brackets where they have changed from those presented in the Environmental Impact Statement.

The approximate period for each phase of construction at Central Station would be:

- Enabling work (18 months)
- Earthworks (two months)
- Excavation (three and a half years)
- Station construction (12 months).

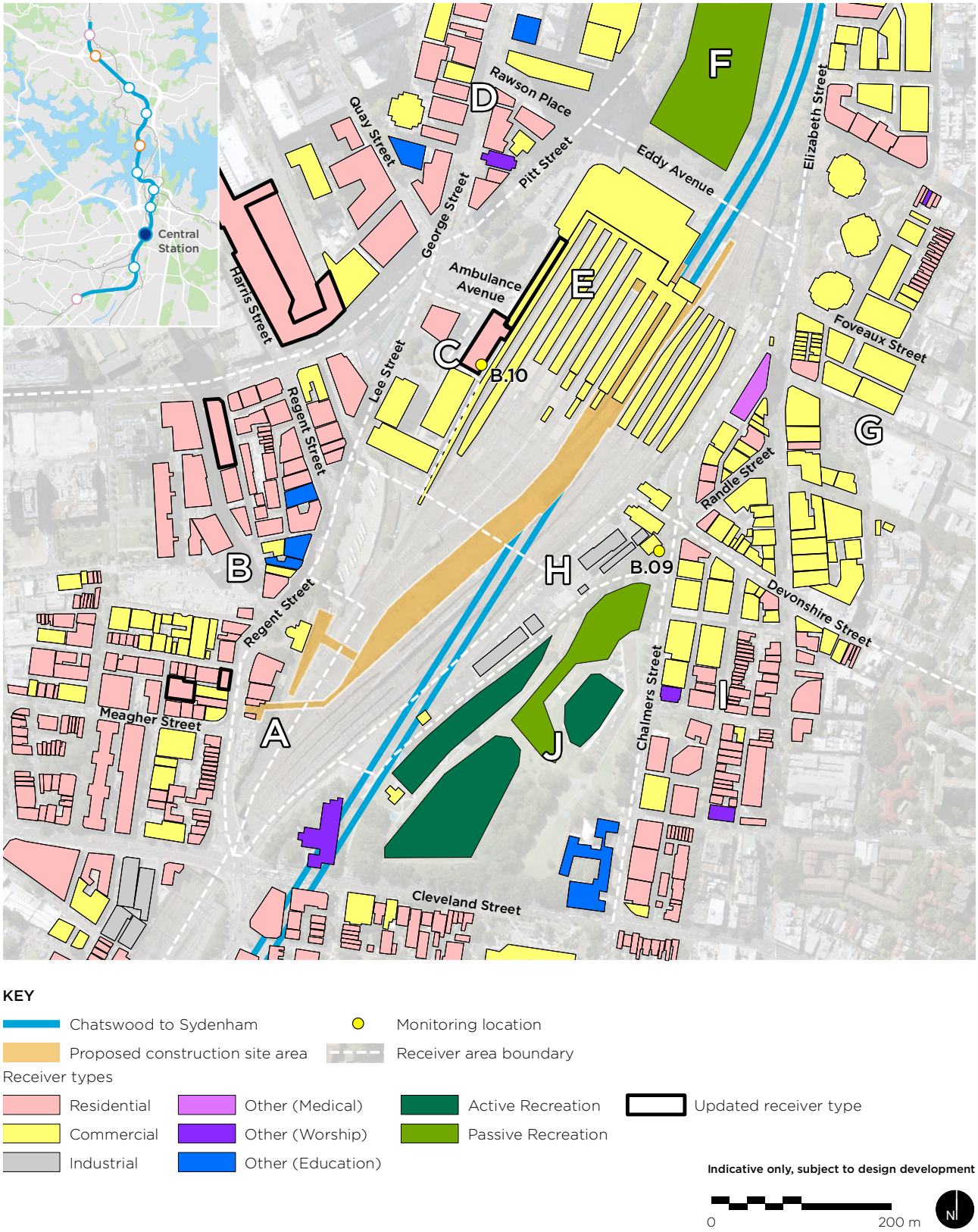



**Figure 9-16 Revised classification of noise receivers at Central Station**

For activities associated with the Sydney Yard Access Bridge construction site, the additional activities have been considered under the enabling works and earthworks scenarios. The addition of the construction site would not change the level of exceedance of the noise management levels at the closest affected residential receiver, as this receiver was already predicted to exceed noise management levels by more than 20 dB during other enabling works and earthwork activities (for example, the demolition of adjoining buildings, and piling activities associated with the construction of the Sydney Yard Access Bridge). However, the residential receiver located adjacent to Mortuary Station would also now experience an increase in noise when compared to the Environmental Impact Statement as the construction site is now closer.

For Mortuary Station, it would now exceed noise management levels by up to 10 dB during enabling works and earthwork activities as a result of the additional construction activities. As identified in the Environmental Impact Statement, feasible and reasonable noise mitigation measures would be implemented in accordance with Chapter 11 (Revised environmental mitigation measures and environmental performance outcomes) and the Sydney Metro Construction Noise and Vibration Strategy (refer to Appendix C of this report) to minimise airborne construction noise where exceedances are predicted. Examples of standard mitigation measures that could be implemented, where feasible and reasonable, include avoiding the coincidence of noisy plant operating simultaneously close together, use of dampened rock hammers, scheduling of noisy activities during less sensitive periods, and considering opportunities in site layouts to provide shielding from noise for receivers.

Construction noise impacts for the residential receiver in Area E (east of Lee Street and west of Central Station) would:

- Comply with the noise management levels during enabling, earthworks and station construction phases
- Exceed the noise management levels by up to 10 dB for night-time work during the excavation phase, but would comply with the noise management levels for the excavation phase during the day, daytime out of hours (DOOH) and evening periods. Again, these exceedances would be managed through the mitigation measures in Chapter 11 (Revised environmental mitigation measures and environmental performance outcomes) and the Sydney Metro Construction Noise and Vibration Strategy.

### Construction ground-borne noise and human comfort vibration

The addition of the Sydney Yard Access Bridge construction site would not alter the ground-borne noise or vibration impacts as presented at the closest residential receivers.

### Operational ground-borne noise

The ground-borne noise levels would comply with the relevant criterion at the receiver during operation of the project.

**Table 9-9 Central Station – revised assessment**

| Receiver area | Scenario | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Enabling works | Earthworks | Excavation | Construction | | | | |
| | Day | Day | Day | DOOH | Evening | Night | Sleep | Day |
| **A** Residential receivers to the west, east of Regent Street | 🔴 | 🔴 | 🟢 | 🟢 | 🟢 | 🔵 | 🟢 | 🟢 |
| **A** *Commercial receiver to the west, east of Regent Street* | 🔵 | 🔵 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 |
| **B** Residential receivers to the east, west of Regent Street | 🟡 | 🔵 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 |
| **B** Commercial receivers to the west, east of Lee Street | 🟡 | 🔵 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 |
| **C** Residential receivers to the west, east of Regent Street | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟡 | 🟢 | 🟢 |
| **C** Commercial receivers to the west, east of Regent Street | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 |
| **D** Residential receivers to the west, west of Pitt Street | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 |
| **D** Church to the west, west of Pitt Street | 🟡 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 |
| **E** *Residential receivers to the west, east of Lee Street* | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟡 | 🟢 | 🟢 |
| **E** Commercial receivers surrounding at Central Station | 🔴 | 🟢 | 🟡 | 🟡 | 🟢 | 🟢 | 🟢 | 🔴 |
| **F** Belmore Park to the north | 🟡 | 🔵 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 |
| **G** Residential receivers to the east, east of Chalmers Street | 🔵 | 🔵 | 🟢 | 🔵 | 🔵 | 🟡 | 🔵 | 🟢 |
| **G** Sydney Dental Hospital to the east, east of Chalmers Street | 🟡 | 🟡 | 🔵 | 🔵 | 🟢 | 🟢 | 🟢 | 🔵 |
| **H** Commercial receivers to the east, west of Prince Alfred Park | 🔵 | 🔵 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 |
| **I** Residential receivers to the east, south of Devonshire Street | 🔵 | 🟢 | 🟢 | 🟢 | 🔵 | 🟡 | 🔵 | 🟢 |
| I Commercial receivers to the east, south of Devonshire Street | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 |
| **J** Prince Alfred Park | 🔵 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 |

**Legend**

🟢 NML compliance

🔵 NML exceedance of less than 10 dB

🟡 NML exceedance between 10 dB and 20 dB

🔴 NML exceedance of more than 20 dB

*Note 1: The results presented in the Environmental Impact Statement are shown in brackets ( )*

*Note 2: DOOH = Daytime out of hours (i.e Saturdays 1pm to 6pm and Sundays 7am to 6pm)*

*Note 3: Additional or clarified receiver types are shown in italics.*

### 9.4.5 Non-Aboriginal heritage

Central Station (Sydney Terminal and Central Railway Station Group) and Mortuary Station are State heritage items, and the changes to the project at Central Station would have additional impacts on these items. The changes to the project would also have additional impacts on three local heritage items and one heritage conservation area.

#### Central Station

The changes to Central Station would have the following heritage impacts to the Sydney Terminal and Central Railway Station Group:

- The removal of the temporary pedestrian bridge would result in a reduction in impact at this location, which was previously expected to have a major visual impact and direct impact to significant fabric.
- The southern underground pedestrian connection would be impacted by the construction of the metro station box, and additional minor excavation works would not have a greater impact to the heritage values of this item.
- The suburban platforms (referred to as the Central Electric Station) are of high significance as a heritage group. The construction of additional stairs on platforms 20 to 23 would have a localised major direct impact on the fabric of the platforms (paving and asphalt), which are elements of moderate significance. However, the impacts would be minor in the context of the Central Electric Station group, and the heritage values of the item as a whole.
- The relocation of the northern services building from Eddy Avenue Forecourt to platform 15 would have a minor indirect impact (visual) to the heritage item. As it would be built within the footprint of the new platform, it would not have an additional impact on the existing heritage fabric. It would also be located in a similar location to an existing services building, which is a modern addition and an intrusive element. The design of the northern services building would be an element of high quality design consistent with the Chatswood to Sydenham Design Guidelines (Appendix A) and would be viewed as part of the visual context of the new metro infrastructure. The replacement of the existing structure with the northern services building would be a positive heritage outcome.
- The changes to platform 15 would result in minor impacts on the significance of the InterCity platforms as a heritage group as the symmetry would be effected along with the historical use of the platform, change in platform structure and change in views. However, the impacts would be minor in the context of the heritage values of the item as a whole
- The demolition and reinstatement of platform 12 would have a major direct impact on the original fabric, but the impacts to the item as a whole would be consistent with that as assessed for platforms 13 to 15.
- The shortening and lengthening of the Intercity platforms at platforms 9 to 12 would have a negligible direct and indirect impacts to the heritage value of these item. The platforms would be visually similar on completion of the works, and would not impact significant view corridors within or towards the station. Furthermore platforms 9 to 15 were extended southwards in preparation of the Sydney Olympics, and the proposed extensions to platform 9 to 11 would not be fixed to heritage fabric.

- The temporary Sydney Yard Access Bridge construction site would have a temporary minor visual impact to the heritage item, as the cranes would be visually distant from the main station site. The setting of Sydney Yard would not be visually compromised as it is a working rail corridor and a work site would be in keeping with its use. The additional access track would have negligible impacts on the heritage item as it would not impact original fabric and requires minimal construction works.
- There are no overhead wiring structures within the portion of the Sydney Yard that would be used for the Sydney Yard Access Bridge construction site. All overhead wiring structures within the southern portion of Sydney Yard constructed after the mid twentieth century.

Overall the level of heritage impacts to the Sydney Terminal and Central Railway Station Group would be the same as assessed in the Environmental Impact Statement, which concluded that the project would have:

- A moderate to major direct physical impact on the heritage item due to the works associated with the construction of the metro station, adjustments elsewhere within the item to accommodate the metro platforms as well as temporary structures and sites.
- A minor direct impact to the item due to construction vibration.
- A moderate to major indirect impact to the item due to visual impacts associated with temporary infrastructure, with negligible to minor visual impacts upon completion of the works.

The project, as amended, would not impact the State significance of the item against all assessment criteria.

The Environmental Impact Statement included a number of mitigation measures that would still be applicable, including (but not limited to):

- Archival recording of the item prior to works commencing (NAH1)
- The design and detailed construction planning of work at Central Station would consider the requirements of the *Central Station Conservation Management Plan* (Rappoport and Government Architects Office, 2013) and include consideration of opportunities for the retention, conservation and / or reuse of original and significant heritage fabric. Consultation would be carried out with Sydney Trains and the Heritage Council of NSW during design development (NAH13).
- Inclusion of an appropriately qualified and experienced heritage architect in the Sydney Metro Design Review Panel, who would provide independent review periodically throughout detailed design (NAH6)
- The project design would be sympathetic to heritage items and, where reasonable and feasible, minimise impacts to the setting of heritage items. The detailed design for Central Station would be developed with input from a heritage architect (NAH7).
- A Central Station heritage interpretation plan would be developed and implemented. It would be consistent with the *Central Station Conservation Management Plan* (Rappoport and Government Architects Office, 2013) and in accordance with the guidelines identified in NAH8 (being NSW Heritage Manual, the NSW Heritage Office's *Interpreting Heritage Places and Items: Guidelines* (August 2005), and the NSW *Heritage Council's Heritage Interpretation Policy*).

An additional mitigation measure has also been incorporated into Chapter 11 (Revised environmental mitigation measures and environmental performance outcomes), which requires works at Central Station to be carried out with the oversight of heritage specialists (NAH18). No further mitigation measures are considered necessary.

### Mortuary Station

The temporary Sydney Yard Access Bridge construction site would not be located within the curtilage of Mortuary Station, but would be directly adjacent to the heritage item. Site establishment and general construction activities would have the following additional temporary heritage impacts:

- The site activities, including large cranes would limit views to the east and south east. While this is in keeping with the character of a working rail corridor, it would result in a moderate to major temporary visual impact.
- The construction of an access route across the rail tracks to the Central Station construction site would have negligible direct heritage impacts as significant fabric would not be affected.
- Minor direct impacts due to construction vibration.
- Subsurface impacts as a result of the excavation works required for the construction site (including crane pads) are unlikely to impact archaeological remains. The evidence of previous structural remains in this location consists of a number of mid-19th century wooden structures associated with the first railway station. Archaeological remains associated with these structures are likely to have been impacted or removed by later construction works.

Overall, the project, as amended, would not significantly change the impact to the item (as assessed in the Environmental Impact Statement), nor would it impact the State significance of the item against all assessment criteria.

The Environmental Impact Statement included a number of mitigation measures that would still be applicable, including (but not limited to):

- Archival recording of the item prior to works commencing (NAH1)
- A Central Station heritage interpretation plan would be developed and implemented. It would be consistent with the *Central Station Conservation Management Plan* (Rappoport and Government Architects Office, 2013) and in accordance with the guidelines identified in NAH8 (NAH9).
- Where vibration levels are predicted to exceed the screening criteria, a more detailed assessment of the structure and attended vibration monitoring would be carried out to ensure vibration levels remain below appropriate limits for that structure. This would include specific consideration of the heritage values of the structure in consultation with a heritage specialist to ensure sensitive heritage fabric is adequately monitored and managed (NV3).

No further mitigation measures are considered required, noting that the Archaeological Research Design (provided in Appendix H) (revised mitigation measure NAH2) would apply to this additional construction site.

### Other items

The following local heritage items or conservation areas (listed in the *Sydney Local Environmental Plan 2012*) are located within the vicinity of the Sydney Yard Access Bridge temporary construction site:

- Terrace group including interior (99-105 Regent Street). The Environmental Impact Statement identified that the project would have a moderate visual impact on the item.
- Former Crown Hotel including interior. The Environmental Impact Statement identified that the project would have a moderate visual impact on the item.
- Co-Masonic Temple including interior. The Environmental Impact Statement identified that the project would have a moderate visual impact on the item.
- The Chippendale conservation area. The Environmental Impact Statement identified that the project would have a moderate visual impact on the item.

The additional construction activity, including the presence of large cranes, would have additional temporary visual impacts on the items or conservation area. However, the change in impact as a result of the additional construction site would not increase from that as presented in the Environmental Impact Statement.

## 9.4.6 Landscape character and visual impacts

An assessment of the landscape character and visual impacts has been completed consistent with the methodology and rating systems in Chapter 16 (Landscape character and visual amenity) of the Environmental Impact Statement.

### Landscape character impacts

The Environmental Impact Statement identified the northern concourse as representative of the landscape character of Central Station. The proposed changes to Central Station would not alter the impacts to the northern concourse.

### Daytime visual amenity impacts

The anticipated daytime visual impacts from representative viewpoints during construction and operation are shown in Figure 9-17 and summarised in Table 9-10.

For the Central Station changes, the following viewpoints were assessed:

- Viewpoint 1: View south from Eddy Avenue to the northern concourse
- Viewpoint 2: View south from platform 16
- Viewpoint 3: View west from Chalmers and Devonshire Streets
- Views from the rail corridor
- Viewpoint 6: View northeast from Meagher Street
- Viewpoint 7: View southeast from Regent Street
- Viewpoint 8: View east from Regent Street to Mortuary Station

Three additional viewpoints have also been considered to assess the proposed changes at Central Station:

- Viewpoint 9: View north from platform 16
- Views from residential properties on Regent Street
- Viewpoint 10: View south from platforms 20/21

During construction, the changes to Central Station would have the following key additional impacts to visual amenity:

- The removal of the temporary pedestrian bridge would reduce visual impacts during construction as assessed in the Environmental Impact Statement
- Additional construction activities, storage of equipment and hoarding on platforms within Central Station would be visible from approaching trains and/or while at platforms.
- Construction activities on the Intercity platforms, including the construction of the metro box, would have a moderate adverse impact during construction, due to temporary obstruction of views from within the station.
- Additional construction activities at the Sydney Yard Access Bridge construction site would be visually prominent from viewed from passing trains. However the additional activities would be seen within the context of existing infrastructure (including bridges)
- Views of the temporary cranes would be possible from viewpoints on surrounding roads in the vicinity of the construction site. Along with other construction activity, this would have a considerable though temporary reduction in the amenity of the views when considered in conjunction with other construction activity. For views east from Regent Street to Mortuary Station, this would result in an increase the visual impact from moderate to high. Similarly these impacts would be temporary.
- Residential properties on Regent Street would have views of the temporary construction sites within Sydney Yard. The construction site and large cranes are located in close proximity to these properties, which would have obstructed views of the cranes.This would have a considerable though temporary reduction in the amenity of these views.

Overall the level of impact would remain unchanged from that assessed in the Environmental Impact Statement.


**KEY**

- Chatswood to Sydenham
- Existing suburban rail
- Proposed operational area at surface
- Proposed construction site area
- 03 Viewpoint location
- 08 Artists impression

**Indicative only, subject to design development**

0 200 m

N

**Figure 9-17 Central Station – representative viewpoints**

Table 9-10 Central Station – daytime visual impacts

| Location | Sensitivity rating | Construction impact | | Operation impact | |
|---|---|---|---|---|---|
| | | Modification rating | Impact rating | Modification rating | Impact rating |
| View 1: View southwest from Eddy Avenue to the northern concourse | Local | Noticeable reduction | Minor adverse | No perceived change | Negligible |
| View 2: View north from platform 16 | Regional | Noticeable reduction | Moderate adverse | No perceived change | Negligible |
| View 3: View northwest from the corner of Devonshire and Chalmers Streets | Local | No perceived reduction (Noticeable reduction) | Negligible (Minor adverse) | No perceived change | Negligible |
| Views from the rail corridor | Regional | Noticeable reduction | Moderate adverse | Noticeable reduction | Moderate adverse |
| View 5: View west from Prince Alfred Park | Regional | No perceived change | Negligible | No perceived change | Negligible |
| View 6: View southeast along Regent Street | Local | Considerable reduction | Moderate adverse | Considerable reduction | Moderate adverse |
| View 7: View northeast from Meagher Street | Local | Considerable reduction | Moderate adverse | Considerable reduction | Moderate adverse |
| View 8: View east across Regent Street to Mortuary Station | Regional | Considerable reduction (Noticeable reduction) | High adverse (Moderate adverse) | Noticeable reduction | Moderate adverse |
| New – View 9: View north from platform 16 | Regional | Noticeable reduction | Moderate adverse | No perceived change | Negligible |
| New – Views from residential properties on Regent Street | Neighbourhood | Considerable reduction | Minor adverse | Considerable reduction | Minor adverse |
| New – View 10: View north from platform 20/21 | Regional | Noticeable reduction | Moderate adverse | No perceived change | Negligible |

*Note: The ratings as presented in the Environmental Impact Statement are shown in brackets where different*

During operation, there would be negligible visual impacts on the majority of the assessed viewpoints within Central Station as much of the site would be reinstated. While there would be additional permanent features, these would not significantly obstruct views of station buildings and/or the skyline, or change the character of the existing views. It is noted expected that the northern services building would further obstruct views to station buildings (being generally in the same location as an existing modern structure), and that visibility through to the adjacent platforms would be relatively unchanged. As such, the changes within Central Station would not alter the level of impact as concluded in the Environmental Impact Statement. As the proposed changes at Central Station do not include permanent infrastructure in Sydney Yards, the assessment as presented in the Environmental Impact Statement has not changed.

### Night-time visual amenity impacts

The Sydney Yard Access Bridge temporary construction site, in conjunction with other construction activities in the Sydney Yard, would have a minor adverse visual impact during evening hours. This is an increase in predicted impact, as presented in the Environmental Impact Statement, due to proximity of the additional construction activities to residential properties along Regent Street. During all other times, and from most locations, there would be no change in impact as presented in the Environmental Impact Statement.

During operation, the impact would be the same as that assessed in the Environmental Impact Statement.

## 9.5 Removal of stub tunnels

Chapter 6 of the Environmental Impact Statement identifies the need to provide stub tunnels to the north of Victoria Cross Station and between Waterloo Station and the Marrickville dive structure.

Stub tunnels were proposed as one method to provide for potential extensions to the network should this be decided in the future. However, given the complexity of designing for this long term potential, stub tunnels are no longer proposed.

An alternative approach is to establish a more flexible tunnel design and track alignment with the ability to build extensions in the future. In future, the Sydney Metro network could be extended by:

- Direct connections to the tunnels proposed as part of this project. This approach could result in disruption to the metro network during construction, and would need to be considered at the time of any proposed extension. This approach would, however, provide flexibility in determining how and where the network should be extended
- Separate independent metro alignments that provide connectivity through strategic interchange points.

The removal of the stub tunnels from the project would:

- Reduce the potential impacts described in the Environmental Impact Statement. In particular, there would be a reduction in construction ground-borne noise impacts associated with the roadheader excavation of the stub tunnels, and a reduction in the volume of spoil generated by the project
- Reduce construction complexity and provide a more efficient construction methodology, and therefore reduce the potential for construction delays.

# 9.6 Removal of rock breaking at night

Since the exhibition of the Environmental Impact Statement, and in response to issues raised by the community and the Environment Protection Authority, construction planning has identified that rock breaking is no longer essential for construction of cut-and-cover stations and station shafts (with the exception of Central Station) outside of standard construction hours. Other station excavation activities would still occur up to 24 hours per day and seven days per week.

This change would substantially reduce the potential impacts associated with airborne and ground-borne noise in periods outside standard daytime construction hours. Ongoing construction planning and further geotechnical investigations has also identified efficiencies in excavation methods, which has reduced the duration of time when rock breakers would be in use.

A revised assessment of the potential noise impacts is provided in this section for the following sites:

- Crows Nest Station
- Victoria Cross Station
- Pitt Street Station
- Waterloo Station.

As outlined in Section 2.6 of this report, some receiver type classifications in proximity to these sites have also been clarified since the exhibition of the Environmental Impact Statement and have been incorporated in the revised assessment.

Revised assessments for Barangaroo Station (refer to Section 3.2) and Martin Place Station (refer Section 3.3) have been considered elsewhere in this report.

The removal of rock breaking outside of standard daytime construction hours would not change the potential impacts for any other environmental aspect.

## 9.6.1 Crows Nest Station

This section provides an assessment of the elimination of rock breaking outside of standard construction hours, incorporating adjustments to some receiver type classification in the vicinity of the station.

### Receiver type classifications

In the vicinity of the Crows Nest Station construction site, the Environmental Impact Statement identified:

- Receivers in Area A, B and D as commercial, but have since been confirmed as being residential.
- One receiver was identified as a commercial receiver, and has since been confirmed as being a theatre (video production and duplication)
- One receiver was identified as a commercial receiver, and has since been confirmed as a medical centre.

These receivers are shown in Figure 9-18.

These receiver types have more stringent criteria (and therefore stricter noise management levels) for construction noise and vibration compared with the criteria assessed in the Environmental Impact Statement. While the level of predicted noise and vibration has not changed, the level of potential exceedances may have increased.

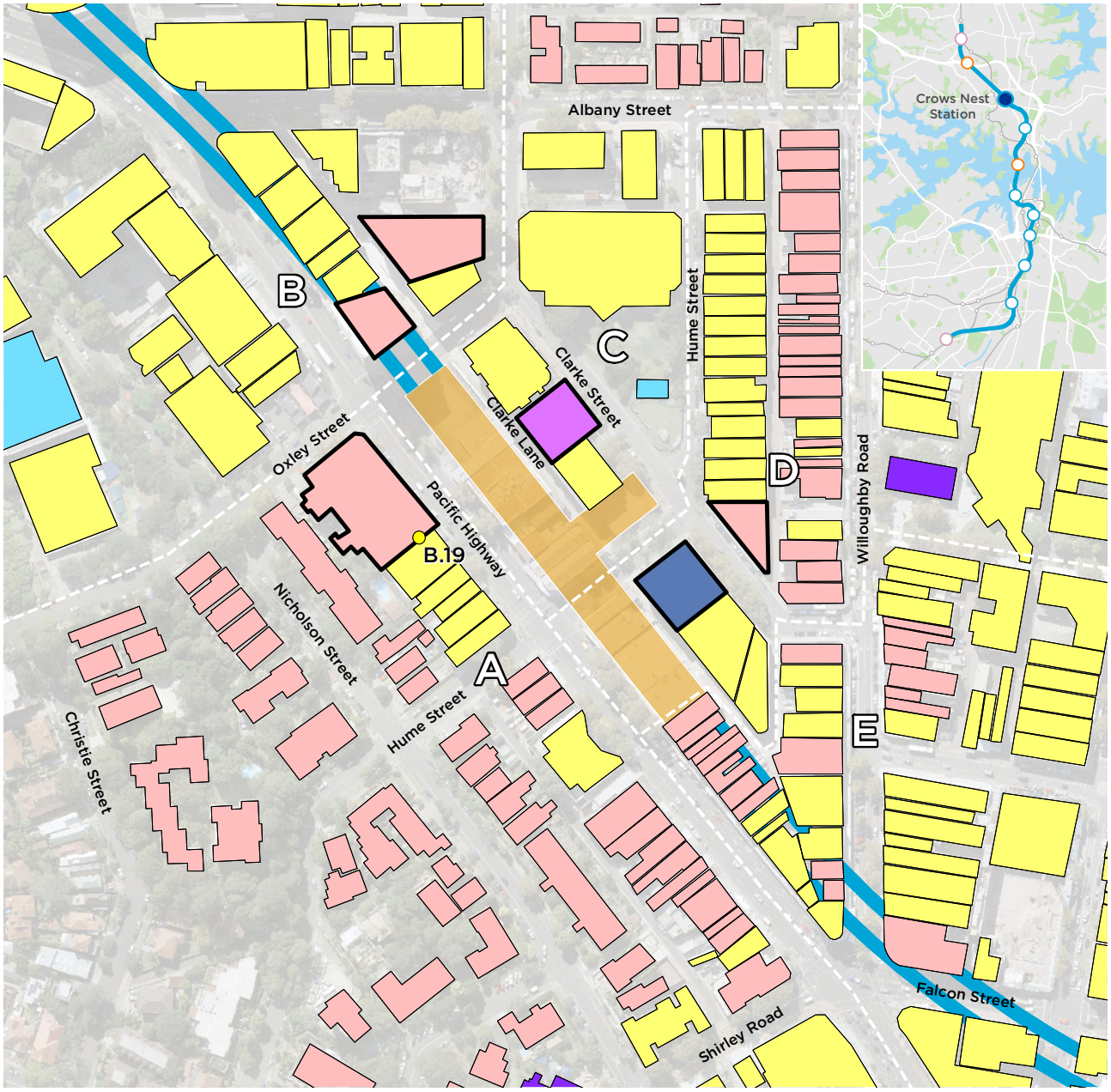



**Figure 9-18 Revised classification of noise receivers at Crows Nest Station**

## Construction airborne noise

The findings of the revised construction noise impact assessment, including clarified receiver types, are presented in Table 9-11 and discussed below. Noise level exceedances are shown on brackets where they have changed from those presented in the Environmental Impact Statement.

**Table 9-11 Predicted airborne noise level exceedances at Crows Nest Station – revised assessment**

| Receiver area | Scenario | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Enabling Works | Earthworks | Acoustic shed construction | Excavation with shed | | | | | Construction |
| | Day | Day | Day | Day | DOOH | Evening | Night | Sleep | Day |
| A *Residential receivers to the west on the Pacific Highway* | ● | ● | ● | ● | ● | ● | ● | ● (●) | ● |
| A Commercial receivers to the west on the Pacific Highway | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| B Commercial receivers to the north of Oxley Street | ● | ● (●) | ● | ● | ● | ● | ● | ● | ● |
| B North Side Community Church to the north on Oxley Street | ● | ● | ● | ● | ● (●) | ● | ● | ● | ● |
| B *Residential north of Oxley Street* | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| C Residential receivers to the north east on Clarke Street | ● | ● | ● | ● | ● (●) | ● (●) | ● (●) | ● (●) | ● |
| C *Medical identified in the ground floor of the residential identified in the row above* | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| C Commercial receivers to the north, between Pitt Street and Castlereagh Street | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| C Active recreation receiver to north on Hume Street | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| D *Residential receivers to the south east on Clarke Street* | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| D Commercial receivers to the north east on Clarke Street | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| D *Commercial (video production and duplication)* | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| E Residential receivers to the south on the Pacific Highway | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| E Commercial receivers to the south on the Pacific Highway | ● | ● | ● | ● | ● | ● | ● | ● | ● |

**Legend**

- ● NML compliance
- ● NML exceedance of less than 10 dB
- ● NML exceedance between 10 dB and 20 dB
- ● NML exceedance of more than 20 dB

*Note 1: The results presented in the Environmental Impact Statement are shown in brackets ( )*

*Note 2: DOOH = Daytime out of hours (i.e Saturdays 1pm to 6pm and Sundays 7am to 6pm)*

*Note 3: Additional or clarified receiver types are shown in italics.*

The approximate period for each phase of construction at the Crows Nest Station site would be as follows:

- Enabling works including mobilisation and demolition activities (12 months)
- Earthworks (two months), noting that rock breaking during excavation would now only occur during standard construction hours
- Acoustic shed construction (one month)
- Excavation with acoustic shed (three years)
- Station construction (18 months).

The findings of the construction noise impact assessment indicate:

- The restriction of rock breaking activities to standard construction hours during the excavation scenario has lowered, or in some instances removed the predicted exceedances of noise management levels at some receivers in Areas A, B and C during the daytime (outside standard hours), evening and/or night time periods.
- For clarified residential receiver types in Area A and B, moderate exceedance of the noise management levels of between 10 dB and 20 dB are predicted during enabling works and minor exceedances of up to 10 dB during construction works. At the residential receiver in Area A, this would be an increase in the level of exceedance as presented in the Environmental Impact Statement for earthworks only, as the receiver is closer to the construction site.
- For clarified residential receiver type in Area D, minor exceedances of up to 10 dB are predicted during enabling works and earthworks.
- For the medical centre in Area C, exceedances of greater than 20 dB of the noise management levels are predicted during enabling works, earthworks, acoustic shed construction works and construction works. Moderate exceedance of the noise management levels of between 10 dB and 20 dB are predicted during excavation works (standard construction hours), and minor exceedances of up to 10 dB during excavation works (daytime out of hours, evening and night time).
- For the theatre (video production and duplication) in Area D, exceedances of greater than 20 dB of the noise management levels are predicted during enabling works, earthworks, acoustic shed construction works and construction works. Moderate exceedance of the noise management levels of between 10 dB and 20 dB are predicted during excavation (standard construction hours) and minor exceedances of up to 10 dB during excavation works (daytime out of hours).
- As result of clarified receiver types in Area B, the closest commercial receiver is now further away from the construction site, which has reduced the predicted noise levels at these receivers. For the earthworks scenarios, this has lowered the category of the predicted exceedance at the receiver.

As identified in the Environmental Impact Statement, feasible and reasonable noise mitigation measures would be implemented in accordance with Chapter 11 (Revised environmental mitigation measures and environmental performance outcomes) and the Sydney Metro Construction Noise and Vibration Strategy (refer to Appendix C of this report) to minimise airborne construction noise where exceedances are predicted. Examples of standard mitigation measures that could be implemented, where feasible and reasonable, include avoiding the coincidence of noisy plant operating simultaneously close together, use of dampened rock hammers, scheduling of noisy activities during less sensitive periods, and considering opportunities in site layouts to provide shielding from noise for receivers.

### Construction ground-borne noise and human comfort vibration

Changes to the potential ground-borne noise impacts due to vibration intensive construction activities (rock breaking) have been re-assessed, alongside the updated receiver types.

The Environmental Impact Statement (Section 10.2.3), indicates that ground-borne noise does not usually create a significant disturbance to building occupants during the day due to high ambient levels which mask the audibility of ground-borne noise emissions. The Environmental Impact Statement also identifies that where ground-borne noise exceedances are identified, then exceedances of human comfort vibration levels may also occur.

The restriction of rock breaking during standard construction hours during excavation works has eliminated ground-borne noise exceedances of the noise management levels at residential receivers during the daytime (outside standard construction hours) evening and night time.

The revised receiver classifications would not result in changes in assessed ground-borne noise impacts at the commercial (video production and duplication) receiver where the ground-borne noise levels are potentially higher than 75dBA.

The medical receiver in area C has been classified as a residential receiver for the purposes of night time work as this would be the most sensitive use within this building with respect to ground-borne noise and human comfort. The night time ground-borne noise levels would be below the ground-borne noise management level. This medical receiver has been classified as a commercial receiver for the purposes of daytime ground-borne noise assessment. Daytime ground-borne noise levels would be potentially higher than 75 dBA.

Where exceedances of ground-borne noise levels are predicted, mitigation measures would be implemented in accordance with the mitigation measures in Chapter 11 (Revised environmental mitigation measures and environmental performance outcomes) and the Sydney Metro Construction Noise and Vibration Strategy (refer to Appendix C of this report). This would include a more detailed site specific ground-borne noise investigation being carried out where day-time internal noise levels are predicted to be greater than 75 dBA. This would include consideration of the acoustic properties and the structural response of the building.

### Blasting

Consistent with the approach taken in the Environmental Impact Statement, blasting has been considered due to the level and duration of ground-borne noise exceedances associated with rock breaking. As rock breaking would now only be undertaken during standard construction hours, only the daytime period has been further considered.

Table 9-12 compares the number of daytime periods times when the noise management levels would be exceeded with and without blasting. The table shows that the adoption of blasting as an excavation technique would reduce impacts to receivers, with around a 60 per cent reduction in the number of periods in which noise management levels would be exceeded during the daytime period.

**Table 9-12 Crows Nest blasting scenarios**

| | Number of daytime periods above Noise Management Levels | | | |
|---|---|---|---|---|
| | Residential | | Commercial | |
| Scenario | No blasting | Blasting plus large rock breaker | No blasting | Blasting plus large rock breaker |
| Crows Nest | 25 | 10 | 21 | 8 |

Further detailed construction planning, through the development of Construction Noise Impact Statements (as required by the Sydney Metro Construction Noise and Vibration Strategy in Appendix C of this report) would determine detailed construction activities with the aim of reducing ground-borne noise impacts to receivers. With careful planning and positioning of equipment it may be possible to avoid consecutive periods of noise management levels exceedances to any one receiver, effectively providing respite periods. For any residual exceedances of the noise management levels, additional mitigation measures would be implemented in accordance with Chapter 11 (Revised environmental mitigation measures and environmental performance outcomes) and the Sydney Metro Construction Noise and Vibration Strategy (refer to Appendix C of this report).

#### Operational ground-borne noise

The ground-borne noise levels would comply with the relevant criterion at the receiver during operation of the project.

### 9.6.2 Victoria Cross Station

This section provides an assessment of the elimination of rock breaking outside of standard construction hours, incorporating adjustments to some receiver type classification in the vicinity of the station.

#### Receiver type classifications

In the vicinity of the Victoria Cross Station construction site, the Environmental Impact Statement identified the Monte Sant' Angelo Mercy College as an educational receiver. However, it has been confirmed since the exhibition of the Environmental Impact Statement that:

- The building immediately to the south of the services building with the school grounds contains a theatre
- The building immediate to the west of the services building within the school grounds contains residential premises.

These receivers are shown in Figure 9-19.

The residential building within the school grounds had been assessed in the Environmental Impact Statement as a residential receiver with the results presented in Table 10-15 of the Environmental Impact Statement (as *B – Residential to the west on McLaren Street*). However, it had been depicted incorrectly within the corresponding Figure 10-4 of the Environmental Impact Statement as an educational receiver.

For the theatre within the school grounds, this receiver type would have more stringent criteria (and therefore noise management levels) for construction noise and vibration compared with that assessed in the Environmental Impact Statement. While the level of predicted noise and vibration has not changed, the level of potential exceedances may have increased.

In addition to this clarification, a receiver to the east on Walker Street was identified and assessed in the Environmental Impact Statement as a child care centre. However this receiver was not identified in the summary table for airborne noise as being the nearest receiver of that type. This has now been included in the summary table for completeness.


**Figure 9-19 Revised classification of noise receivers at Victoria Cross Station**

## Construction airborne noise

The findings of the revised construction noise impact assessment, including clarified receiver types, are presented in Table 9-13 and discussed below. Noise level exceedances are shown on brackets where they have changed from those presented in the Environmental Impact Statement.

**Table 9-13 Predicted airborne noise level exceedances at Victoria Cross Station – revised assessment**

| Receiver area | Scenario | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Enabling Works | Earthworks | Acoustic shed construction | Excavation with shed | | | | | Construction |
| | Day | Day | Day | Day | DOOH | Evening | Night | Sleep | Day |
| A Commercial receivers to the west on Miller Street | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| A Educational receivers to the west on the Pacific Highway | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| B Commercial receivers to the west on Miller Street | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| B Residential receivers to the west on McLaren Street | ● | ● | ● | ● | ● | ● (●) | ● (●) | ● (●) | ● |
| B Educational receivers to the west on Miller Street | ● | ● | ● (●) | ● (●) | ● (●) | ● | ● | ● | ● (●) |
| B *Theatre (school theatre)* | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| C Residential receivers to the north on McLaren Street | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| C Commercial receivers to the north on McLaren Street | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| D Residential receivers to the east on Miller Street | ● | ● | ● | ● | ● | ● | ● (●) | ● | ● |
| D Commercial receivers to the east on Miller Street | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| E Residential receivers to the east on Miller Street | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| E Commercial receivers to the east on Miller Street | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| E *Childcare receiver to the east on Walker Street* | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| F Commercial receivers adjacent to the south | ● | ● | ● | ● | ● | ● | ● | ● | ● |

**Legend**

- ● NML compliance
- ● NML exceedance of less than 10 dB
- ● NML exceedance between 10 dB and 20 dB
- ● NML exceedance of more than 20 dB

*Note 1: The results presented in the Environmental Impact Statement are shown in brackets ( )*

*Note 2: DOOH = Daytime out of hours (i.e Saturdays 1pm to 6pm and Sundays 7am to 6pm)*

*Note 3: Additional or clarified receiver types are shown in italics.*

The approximate period for each phase of construction at the Victoria Cross Station site as follows:

- Enabling works including mobilisation and demolition activities (12 months)
- Earthworks (two months), noting that rock breaking during excavation would now only occur during standard construction hours
- Acoustic shed construction (one month)
- Excavation with acoustic shed (three years)
- Station and services building construction (18 months).

The findings of the construction noise impact assessment indicate:

- The restriction of rock breaking activities to standard construction hours during the excavation scenario has lowered, or in some instances removed, the predicted exceedances of noise management levels at some receivers in Areas B and D during the evening and night time periods. This includes the residential premises within the grounds of the Monte Sant' Angelo Mercy College.
- For the theatre within Monte Sant' Angelo Mercy College, exceedances of greater than 20 dB of the noise management levels are predicted during the daytime for enabling works, earthworks, acoustic shed construction works, excavation works and construction works. There would be no exceedance of noise management levels for excavation works undertaken during daytime (outside standard hours), evening and night time.
- The re-classification of the theatre has increased the setback of the closest education building from the services building construction site. As a consequence of this change, the level of exceedance has reduced from some activities.
- For the child care receiver, moderate exceedance of the noise management levels of between 10 dB and 20 dB are predicted during enabling works and earthworks, and minor exceedances of up to 10 dB during construction works.

As identified in the Environmental Impact Statement, feasible and reasonable noise mitigation measures would be implemented in accordance with the Chapter 11 (Revised environmental mitigation measures and environmental performance outcomes) and the Sydney Metro Construction Noise and Vibration Strategy (refer to Appendix C of this report) to minimise airborne construction noise where exceedances are predicted. Examples of standard mitigation measures that could be implemented, where feasible and reasonable, include avoiding the coincidence of noisy plant operating simultaneously close together, use of dampened rock hammers, scheduling of noisy activities during less sensitive periods, and considering opportunities in site layouts to provide shielding from noise for receivers.

### Construction ground-borne noise and human comfort vibration

Changes to the potential ground-borne noise impacts due to vibration intensive construction activities (rock breaking) have been re-assessed, alongside the updated receiver types.

The Environmental Impact Statement (Section 10.2.3), indicates that ground-borne noise would not usually create a significant disturbance to building occupants during the day due to high ambient levels which mask the audibility of ground-borne noise emissions. The Environmental Impact Statement also identified that where there are likely to be exceedances of ground-borne noise criteria then exceedances of human comfort vibration levels may also occur.

The elimination of rock breaking outside of standard construction hours has eliminated ground-borne noise exceedances of the noise management levels at residential receivers outside of standard construction hours.

At the theatre within Monte Sant' Angelo Mercy College, internal ground-borne noise levels would be potentially greater than 75dBA during the day-time. During the evening and night time period, noise levels would typically be 35 dBA to 50 dBA, depending on the location of the excavation activity relative to the theatre.

Where exceedances of ground-borne noise levels are predicted, mitigation measures would be implemented in accordance with Chapter 11 (Revised environmental mitigation measures and environmental performance outcomes) and the Sydney Metro Construction Noise and Vibration Strategy (refer to Appendix C of this report). This would include a more detailed site specific ground-borne noise investigation, which would include consideration of the acoustic properties and the structure response of the building.

### Blasting

Consistent with the approach taken in the Environmental Impact Statement, blasting has been considered due to the level and duration of ground-borne noise exceedances associated with rock breaking. As rock breaking would now only be undertaken during standard construction hours, only the daytime period has been further considered.

Table 9-14 compares the number of daytime periods times when the noise management levels would be exceeded with and without blasting. The table shows that the adoption of blasting as an excavation technique would reduce impacts to receivers, with up to a 55 per cent reduction in the number of periods in which noise management levels would be exceeded during the daytime period.

**Table 9-14 Victoria Cross Station blasting scenarios**

| Scenario | Number of daytime periods above Noise Management Levels | | | |
|---|---|---|---|---|
| | Residential | | Commercial | |
| | No blasting | Blasting plus large rock breaker | No blasting | Blasting plus large rock breaker |
| Victoria Cross North | 57 | 29 | 260 | 120 |
| Victoria Cross South | 0 | 0 | 21 | 13 |

Further detailed construction planning, through the development of Construction Noise Impact Statements (as required by the Sydney Metro Construction Noise and Vibration Strategy in Appendix C of this report) would determine detailed construction activities with the aim of reducing ground-borne noise impacts to receivers. With careful planning and positioning of equipment it may be possible to avoid consecutive periods of noise management levels exceedances to any one receiver, effectively providing respite periods. For any residual exceedances of the noise management levels, additional mitigation measures would be implemented in accordance with Chapter 11 (Revised environmental mitigation measures and environmental performance outcomes) and the Sydney Metro Construction Noise and Vibration Strategy (refer to Appendix C of this report).

#### Operational ground-borne noise

The ground-borne noise levels would comply with the relevant criterion at the theatre during operation of the project, with ground-borne noise levels predicted to be 24 dBA, which is below the criterion for drama theatres. During the night time period, ground borne vibration levels would be below the residential criterion. As the child care receiver is not in proximity to the rail tunnels, it has not been re-assessed.

### 9.6.3 Pitt Street Station

This section provides an assessment of the elimination of rock breaking outside of standard construction hours, incorporating adjustments to some receiver type classification in the vicinity of the station.

#### Receiver type classifications

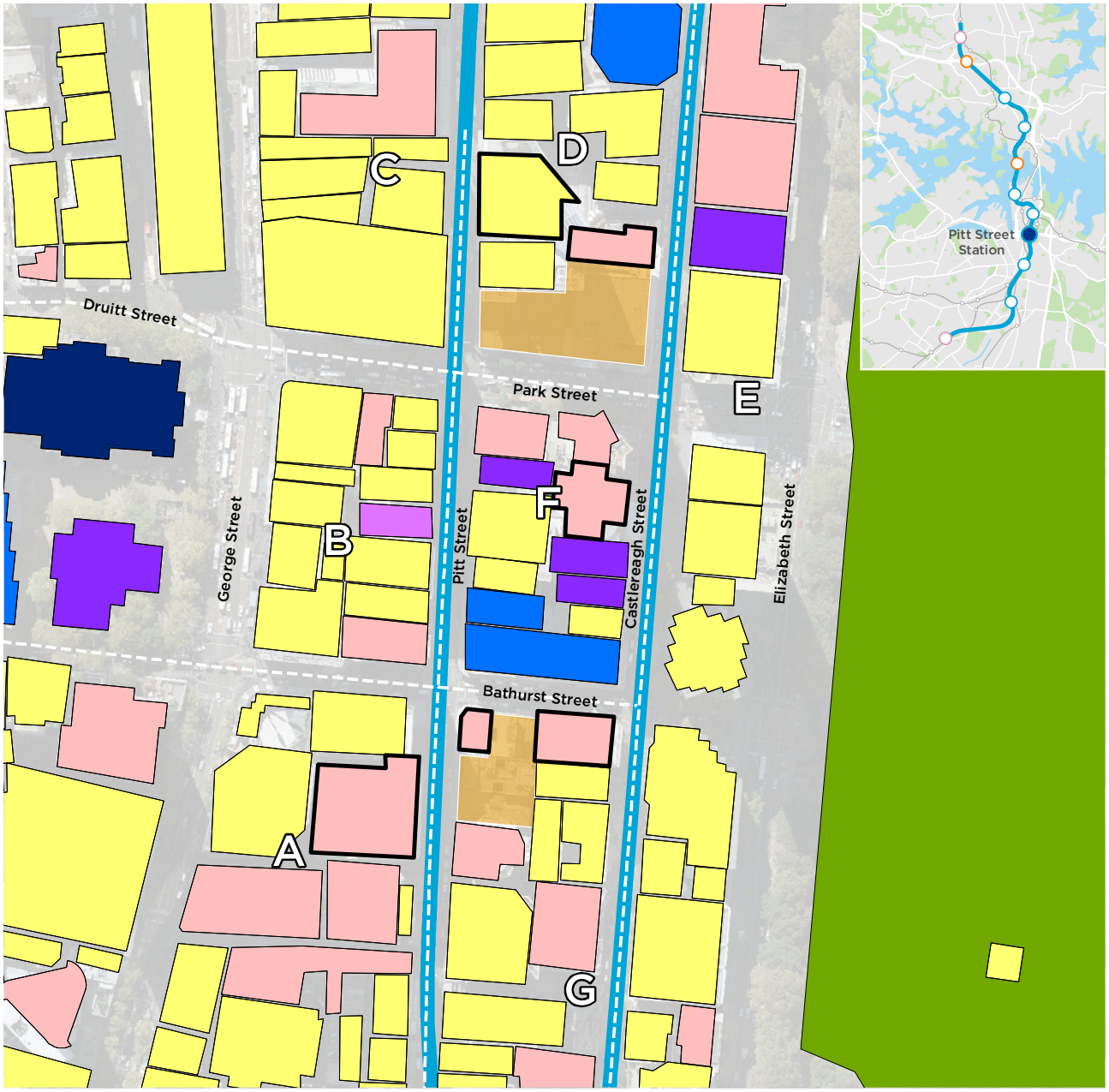
In the vicinity of the Pitt Street Station construction site, the Environmental Impact Statement identified:

- Receivers in Areas A, F and G as commercial, but have since been confirmed as being residential receivers
- One receiver in Area D immediately adjacent to the Pitt Street Station (north) construction site was identified as a commercial receiver, and has since been confirmed as being a hotel. This receiver has now been now classified as a residential receiver
- One receiver in Area D was identified as a residential, and has since been confirmed as being a commercial receiver

These receivers are shown in Figure 9-20.

As a result of these clarifications, the closest residential receivers in Area A and D have changed and an assessment of the potential impacts for these receivers in presented in Table 9-15 along with the revised assessment for rock breaking.

The clarifications in receiver types elsewhere have not resulted in changes to the closest receiver type, and therefore do not require further assessment.




KEY

Chatswood to Sydenham
Monitoring location
Proposed construction site area
Receiver area boundary

Receiver types

Residential
Other (Medical)
Other (Education)
Updated receiver type
Commercial
Other (Worship)
Other (Theatre)
Passive Recreation

Indicative only, subject to design development

0 100 m

N

**Figure 9-20 Revised classification of noise receivers at Pitt Street Station**

### Construction airborne noise

The findings of the revised construction noise impact assessment, including reclassified receiver types, are presented in Table 9-15 and discussed below. Noise level exceedances are shown on brackets where they have changed from those presented in the Environmental Impact Statement.

The approximate period for each phase of construction at the Pitt Street Station site would be as follows:

- Enabling works including mobilisation and demolition activities (12 months)
- Earthworks (two months), noting that rock breaking during excavation would now only occur during standard construction hours
- Acoustic shed construction (one month)
- Excavation with acoustic shed (three years)
- Station and services building construction (18 months).

The findings of the construction noise impact assessment indicate:

- The restriction of rock breaking activities to standard construction hours during the excavation of the shafts has removed the predicted exceedances of noise management levels at residential receiver in Area G during the night time period.
- For the residential receiver in Area A, minor exceedances of up to 10 dB are predicted during enabling works, earthworks and construction works.
- For the hotel in Area D, moderate exceedance of the noise management levels of between 10 dB and 20 dB are predicted during enabling works and earthworks, and minor exceedances of up to 10 dB during construction works.

As identified in the Environmental Impact Statement, feasible and reasonable noise mitigation measures would be implemented in accordance with Chapter 11 (Revised environmental mitigation measures and environmental performance outcomes) and the Sydney Metro Construction Noise and Vibration Strategy (refer to Appendix C of this report) to minimise airborne construction noise where exceedances are predicted. Examples of standard mitigation measures that could be implemented, where feasible and reasonable, include avoiding the coincidence of noisy plant operating simultaneously close together, use of dampened rock hammers, scheduling of noisy activities during less sensitive periods, and considering opportunities in site layouts to provide shielding from noise for receivers.

Table 9-15 Predicted airborne noise level exceedances for re-classified receivers at Pitt Street Station

| Receiver area | Scenario: Enabling Works – Day | Earthworks – Day | Acoustic shed construction – Day | Excavation with shed – Day | Excavation with shed – DOOH | Excavation with shed – Evening | Excavation with shed – Night | Excavation with shed – Sleep | Construction – Day |
|---|---|---|---|---|---|---|---|---|---|
| A *Residential receivers to the west, west of Pitt Street and south of Bathurst Street* | 🔵 | 🔵 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🔵 |
| A Commercial receivers to the west, west of Pitt Street and south of Bathurst Street | 🟡 | 🟡 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🔵 |
| B Residential receivers to the west, west of Pitt Street and north of Bathurst Street | 🔵 | 🔵 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 |
| B Commercial receivers to the west, west of Pitt Street and north of Bathurst Street | 🔵 | 🔵 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🔵 |
| C Residential receivers to the west, west of Pitt Street and north of Park Street | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 |
| C Commercial receivers to the west, west of Pitt Street and north of Park Street | 🟡 | 🟡 | 🔵 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🔵 |
| D *Hotel receiver to the north on Castlereagh Street* | 🟡 | 🟡 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🔵 |
| D *Commercial receivers to the north, between Pitt Street and Castlereagh Street* | 🔴 | 🟡 | 🔵 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟡 |
| E Residential receivers to the east | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 |
| E Commercial receivers to the east | 🟡 | 🟡 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🔵 |
| F *Residential receivers betweenPark Street and Bathurst Street* | 🔵 | 🔵 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🔵 |
| F *Commercial receivers between Park Street and Bathurst Street* | 🔵 | 🔵 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 |
| F *Educational receivers between Park Street and Bathurst Street* | 🔴 | 🔴 | 🟡 | 🔵 | 🟢 | 🟢 | 🟢 | 🟢 | 🔴 |
| G *Residential receivers to the south, between Pitt Street and Castlereagh Street* | 🔴 | 🟡 | 🔵 | 🟢 | 🟢 | 🟢 | 🟢 (🔵) | 🟢 | 🔴 |
| G *Commercial receivers to the south, between Pitt Street and Castlereagh Street* | 🔴 | 🔴 | 🔵 | 🟢 | 🟢 | 🟢 | 🟢 | 🟢 | 🔴 |

**Legend**

- 🟢 NML compliance
- 🔵 NML exceedance of less than 10 dB
- 🟡 NML exceedance between 10 dB and 20 dB
- 🔴 NML exceedance of more than 20 dB

*Note 1: The results presented in the Environmental Impact Statement are shown in brackets ( )*

*Note 2: DOOH = Daytime out of hours (i.e Saturdays 1pm to 6pm and Sundays 7am to 6pm)*

*Note 3: Additional or clarified receiver types are shown in italics.*

### Construction ground-borne noise and human comfort vibration

Changes to the potential ground-borne noise impacts due to vibration intensive construction activities (rock breaking) have been re-assessed, alongside the reclassified receiver types.

The Environmental Impact Statement (Section 10.2.3), indicates that ground-borne noise would not usually create a significant disturbance to building occupants during the day due to high ambient levels which mask the audibility of ground-borne noise emissions. The Environmental Impact Statement also identified that where there are likely to be ground-borne noise exceedances, then exceedances of human comfort vibration levels may also occur.

The elimination of rock breaking outside of standard construction hours has eliminated ground-borne noise exceedances of the noise management levels at residential receivers outside of standard construction hours. However, internal ground-borne noise levels would be potentially greater than 75dBA during the daytime on several floors of the re-classified residential building in Area A and at the hotel in Area D.

Where exceedances of ground-borne noise levels are predicted, mitigation measures would be implemented in accordance with Chapter 11 (Revised environmental mitigation measures and environmental performance outcomes) and the Sydney Metro Construction Noise and Vibration Strategy (refer to Appendix C of this report). This would include a more detailed site specific ground-borne noise investigation, which would include consideration of the acoustic properties and the structure response of the building.

### Blasting

Consistent with the approach taken in the Environmental Impact Statement, blasting has been considered due to the level and duration of ground-borne noise exceedances associated with rock breaking. As rock breaking would now only be undertaken during standard construction hours, only the daytime period has been further considered.

Table 9-16 compares the number of daytime periods times when the noise management levels would be exceeded with and without blasting. The table shows that the adoption of blasting as an excavation technique would reduce impacts to receivers, with around a 50 per cent reduction in the number of periods in which noise management levels would be exceeded during the daytime period.

Table 9-16 Pitt Street Station blasting scenarios

| Scenario | Number of daytime periods above Noise Management Levels | | | |
|---|---|---|---|---|
| | Residential | | Commercial | |
| | No blasting | Blasting plus large rock breaker | No blasting | Blasting plus large rock breaker |
| Pitt Street North | 24 | 13 | 20 | 11 |
| Pitt Street South | 41 | 18 | 63 | 32 |

Further detailed construction planning, through the development of Construction Noise Impact Statements (as required by the Sydney Metro Construction Noise and Vibration Strategy in Appendix C of this report) would determine detailed construction activities with the aim of reducing ground-borne noise impacts to receivers. For example, this could involve the consideration of different sized rock breakers at different periods, and the positioning of rock breakers within the site during different periods.

With careful planning and positioning of the rock breakers it may be possible to avoid consecutive periods of noise management levels exceedances to any one receiver, effectively providing respite periods. For any residual exceedances of the noise management levels, additional mitigation measures would be implemented in accordance with Chapter 11 (Revised environmental mitigation measures and environmental performance outcomes) and the Sydney Metro Construction Noise and Vibration Strategy (refer to Appendix C of this report).

#### Operational ground-borne noise

The ground-borne noise levels would comply with the relevant criterion at the clarified receiver types during operation of the project.

### 9.6.4 Waterloo Station

At the Waterloo Station construction site, earthworks would occur for around two months. Rock breaking during excavation would now only occur during standard construction hours. As there are no changes to the receiver classifications within the vicinity of the construction site, this section only presents the change in impacts resulting from the change in construction methodology.

The findings of the revised construction noise impact assessment during excavation are presented in Table 9-17 and discussed below. Noise level exceedances are shown in brackets where they have changed from those presented in the Environmental Impact Statement.

**Table 9-17 Predicted airborne noise level exceedances at Waterloo Station construction site – revised assessment (restriction of rock breaking)**

| Receiver area | Scenario: Excavation with shed – Day | DOOH | Evening | Night | Sleep |
|---|---|---|---|---|---|
| **A** Residential receivers north of Raglan Street | ● | ● (●) | ● (●) | ● (●) | ● (●) |
| **B** Residential receivers east of Cope Street | ● | ● (●) | ● (●) | ● (●) | ● (●) |
| **C** Residential receivers south of Buckland Street | ● | ● | ● (●) | ● (●) | ● (●) |
| **C** Commercial receivers south of Buckland Street | ● | ● | ● | ● | ● |
| **D** Residential receivers west of Botany Road | ● | ● (●) | ● | ● (●) | ● |
| **D** Place of worship receivers east of Botany Road | ● | ● (●) | ● | ● | ● |
| **C** Commercial receivers east of Botany Road | ● | ● | ● | ● | ● |

**Legend**

- ● NML compliance
- ● NML exceedance of less than 10 dB
- ● NML exceedance between 10 dB and 20 dB
- ● NML exceedance of more than 20 dB

*Note 1: The results presented in the Environmental Impact Statement are shown in brackets ( )*
*Note 2: DOOH = Daytime out of hours (i.e Saturdays 1pm to 6pm and Sundays 7am to 6pm)*
*Note 3: Additional or clarified receiver types are shown in italics.*

The restriction of rock breaking activities to standard construction hours during the excavation scenario has lowered, or in some instances removed, the predicted exceedances of noise management levels at all receivers in Areas A, B, C and D during the evening and night time periods.

As identified in the Environmental Impact Statement, feasible and reasonable noise mitigation measures would be implemented in accordance with Chapter 11 (Revised environmental mitigation measures and environmental performance outcomes) and the Sydney Metro Construction Noise and Vibration Strategy (refer to Appendix C of this report) to minimise airborne construction noise where exceedances are predicted. Examples of standard mitigation measures that could be implemented, where feasible and reasonable, include avoiding the coincidence of noisy plant operating simultaneously close together, use of dampened rock hammers, scheduling of noisy activities during less sensitive periods, and considering opportunities in site layouts to provide shielding from noise for receivers.

### Construction ground-borne noise and human comfort vibration

Changes to the potential ground-borne noise impacts due to vibration intensive construction activities (rock breaking) have been re-assessed, alongside the updated receiver types.

The Environmental Impact Statement (Section 10.2.3), indicates that ground-borne noise would not usually create a significant disturbance to building occupants during the day due to high ambient levels which mask the audibility of ground-borne noise emissions. The Environmental Impact Statement also identified that where there are likely to be exceedances of ground-borne noise levels, then exceedances of human comfort vibration levels may also occur.

The restriction of rock breaking during standard construction hours during excavation works has eliminated ground-borne noise exceedances of the noise management levels at residential receivers outsideof standard construction hours.

### Blasting

Consistent with the approach taken in the Environmental Impact Statement, blasting has been considered due to the level and duration of ground-borne noise exceedances associated with rock breaking. As rock breaking would now only be undertaken during standard construction hours, only the daytime period has been further considered.

Table 9-18 shows the number of daytime periods times when the noise management levels would be exceeded while excavation works are underway. The table shows that the adoption of blasting as an excavation technique would reduce impacts to receivers, with around a 50 per cent reduction in the number of periods in which noise management levels are exceeded during the daytime period.

**Table 9-18 Waterloo Station blasting scenarios**

| | Number of daytime periods above Noise Management Levels | | | |
|---|---|---|---|---|
| | Residential | | Commercial | |
| Scenario | No blasting | Blasting plus large rock breaker | No blasting | Blasting plus large rock breaker |
| Waterloo Station | 76 | 42 | 4 | 2 |

Further detailed construction planning, through the development of Construction Noise Impact Statements (as required by the Sydney Metro Construction Noise and Vibration Strategy in Appendix C of this report) would determine detailed construction activities with the aim of reducing ground-borne noise impacts to receivers. For example, this could involve the consideration of different sized rock breakers at different periods, and the positioning of rock breakers within the site during different periods.

With careful planning and positioning of the rock breakers it may be possible to avoid consecutive periods of noise management levels exceedances to any one receiver, effectively providing respite periods. For any residual exceedances of the noise management levels, additional mitigation measures would be implemented in accordance with Chapter 11 (Revised environmental mitigation measures and environmental performance outcomes) and the Sydney Metro Construction Noise and Vibration Strategy (refer to Appendix C of this report).

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# PREFERRED INFRASTRUCTURE ENGAGEMENT

CHAPTER TEN

# 10 Preferred infrastructure engagement

During the preparation of this report, Transport for NSW engaged with those stakeholders and community members who would be directly impacted by additional items or a revised project scope. These additional items are:

- Northern surface track work – changes in construction methodology
- O'Connell Street – future underground pedestrian link
- Waterloo Station – revised footprint.

The aim of this engagement was to provide clear, factual and timely information about the timing and impacts associated with the work, including proposed mitigation measures, and provide the opportunity for the community to provide feedback on the proposed changes and additional assessment to be considered as part of the assessment of the application.

## 10.1 Northern surface track works – changes in construction methodology

The stakeholder and community engagement activities included:

- Phone calls to directly impacted property owners at 1–3 Gordon Avenue (where contact details were available)
- Development of a project update brochure including details of the assessment, map and project contact details
- Letterbox drop with project update brochure to 323 properties on Hammond Lane, Ellis Street, Gordon Avenue, Nelson Street and Hopetoun Avenue
- 140 doorknocks to directly impacted properties on Gordon Avenue Ellis Street and Nelson Street. If residents were home, they were provided with information about the changes including a project update brochure. If residents were not home, the project update and a calling card was left behind
- Information via email (including project update brochure) to strata managers, with details of changes to the project scope, for distribution to tenants and owners (Gordon Avenue and Nelson Street)
- Briefings with directly affected property owners and occupiers, if requested or required
- Briefings with Willoughby electorate office and Willoughby Council
- Updated website content including project update brochure and chapter exert from the preferred infrastructure report
- Letterbox drop on 30 August with an invitation to attend a community information session (also sent by email to known stakeholders)
- Community information session held on 6 September at the Chatswood Bowling Club (attended by 40 people including a representative from the Chatswood West Ward Progress Association and three representatives from Willoughby Council).

A summary of the issues raised during the above stakeholder and community engagement activities is provided in Table 10-1, along with responses.

Table 10-1 Summary of issues and responses – Northern surface track works stakeholder and community engagement

| Issue | Response |
|---|---|
| **Stakeholder and community engagement** | |
| • Opposition to the Preferred Infrastructure Report consultation process<br>• The consultation process should have been extended to allow more time for consideration of the changes and for more people to be consulted<br>• Inadequate communication to local properties about the changes<br>• The Environmental Impact Statement should be exhibited again | Information has been provided to the community via a two letter box drops, a project update brochure, updates across the website, doorknocks and a community information session as outlined above.<br>Where properties would be directly impacted, phone calls were made to property owners (where contact details were available) and information distributed by email to strata managers. Briefings with directly affected property owners and occupiers were also made available.<br>Transport for NSW will continue to engage closely with stakeholders and affected properties owners and occupiers through all stages of design, planning, and construction. Further information regarding consultation during construction is provided in Section 4.5.4.<br>The Secretary of the Department of Planning and Environment may require the exhibition of the preferred infrastructure report if the Secretary considers that significant changes are proposed to the nature of the project. The proposed changes are not considered to be significant. The preferred infrastructure report will be made available to the public. |
| **Project description – construction** | |
| • Uncertainty around the use of the new Gordon Avenue access for piling and retaining wall construction<br>• Piling and retaining wall construction should occur from the new ramp once it is constructed as there is enough room in the rail corridor<br>• The Ausgrid site should be used for corridor access and storage of plant and equipment. The Gordon Avenue park should not be used for construction storage<br>• Concern regarding impacts to underground cables under Frank Channon Walk and uncertainty as to whether they will be moved for construction | Further construction planning outlined in Section 9.1.1 has identified the need for this work to be carried out directly from the Frank Channon Walk given the complexity of construction and the narrowness of the rail corridor at this location. Occasional vehicular access would occur via Ellis Street, Gordon Avenue and / or Nelson Street as the work progresses.<br>The use of the small park at the eastern end of Gordon Avenue would be required to allow vehicles to access from Gordon Avenue to the western side of the rail corridor. As outlined in Section 9.1.2, the park would be reinstated and landscaped in consultation with Willoughby City Council once the temporary construction access is no longer required.<br>Utilities located under Frank Channon Walk would be protected or relocated as required during site establishment works in accordance with Section 7.11.6 of the Environmental Impact Statement. A program of ongoing consultation has been established with service providers to further assess requirements for utilities. |

| Issue | Response |
|---|---|
| **Construction traffic and transport** | |
| **Vehicle movements and traffic flow**<br>• Opposition to 160 heavy vehicle movements per day<br>• Impacts to traffic flow caused by large trucks turning into Gordon Avenue from the Pacific Highway<br>• Concern regarding truck impacts to road surfaces | As discussed in Section 9.1.4, during use of the Gordon Avenue site access there are anticipated to be around 78 heavy vehicle movements per day. A maximum of four light vehicles and four heavy vehicles per hour are anticipated to turn into and out of Gordon Avenue during the peak construction period. These low volumes would have a minimal impact on the intersection performance. Breaks in traffic flow on the Pacific Highway may also occur due to heavy vehicles requiring a large turning circle and longer lead times to enter traffic. However, since the maximum construction vehicle volumes are expected outside of the network peak period, these breaks in traffic flow are likely to be short in duration and have minor impacts to southbound vehicles on the Pacific Highway.<br>Mitigation measure GWG2 (refer to Chapter 11) and the Construction Environmental Management Framework (Appendix B of this report) provide the process for carrying out condition surveys. This process would also apply to all local public roads proposed to be used by construction heavy vehicles. In the event that damage is caused to local public roads by construction vehicles, this would be rectified by the project. |
| **Vehicular construction site access**<br>• Query as to whether there are secondary site access points for construction vehicles other than Gordon Avenue, and whether access could be shared across multiple roads<br>• Concern that Gordon Avenue will be used as a turning circle for trucks<br>• Uncertainty around the use of Hawkins Street and Brand Street for construction site access<br>• Construction site access should be provided via Ellis Street | Gordon Avenue would become the primary access and egress point for work on the western side of the rail corridor to the north of the Chatswood dive site between mid-2017 and mid-2020. Occasional vehicular access to this section of work would occur via Ellis Street, Gordon Avenue and / or Nelson Street as the work progresses.<br>As outlined in Section 9.4.6 of the Environmental Impact Statement, the main access point for works in the Chatswood area would remain through the Chatswood dive site using Nelson Street and Mowbray Road.<br>In addition, access to the northern surface track works site (metro tracks and the adjustments to the T1 North Shore Line) would be provided by existing access points on Hopetoun Avenue, Chatswood and Drake Street, Artarmon as well as a proposed new access point at Brand Street, Artarmon.<br>Construction traffic movements for site access would be managed in accordance with the mitigation measures specified in Chapter 11 of this report. |
| **Parking**<br>• Construction traffic and construction worker parking around the new access point would impact parking on Gordon Avenue for residents and local retail customers<br>• Sydney Metro should organise for parking on Gordon Avenue and Nelson Street to be restricted to residents and their visitors during construction | There is potential for about four on-street parking spaces to be removed to cater for the additional site access at Gordon Avenue. As assessed in Section 9.1.4, this is unlikely to substantially impact the surrounding community given that the nearby residential, recreational and commercial properties have available off-street parking. Opportunities to limit the number of on-street parking spaces impacted would be explored during detailed design. |

| Issue | Response |
|---|---|
| **Pedestrian and bicycle movements**<br>• Frank Channon Walk will be closed for too long. The second stage of the closure should be completed in two stages to lessen the impacts<br>• Closure of Frank Channon Walk impact pedestrian safety by diverting pedestrians to narrower paths along major arterial roads<br>• Query as to how pedestrians and cyclists using Frank Channon Walk will be separated from construction traffic when crossing Gordon Avenue<br>• Walking an extra 10 minutes to Chatswood is too far<br>• Cyclists cannot use the Pacific Highway between Nelson Street and Albert Avenue or along Orchard Road between Nelson Street and Albert Avenue | The proposed staged closure of the Frank Channon Walk would result in a longer disruption to pedestrians and cyclists that use this shared path than assessed in the Environmental Impact Statement. Further construction planning outlined in Section 9.1.1 has identified the need for this longer closure to enable work to be carried out directly from the Frank Channon Walk due to the complexity of construction and the narrowness of the rail corridor at this location.<br>Alternative routes would remain available as identified in Section 9.1.4. Mitigation measures in the Environmental Impact Statement (T2, T3, T6 and T7) would provide further mitigation, including advanced notification, road safety audits, safety enhancements and directional signage. |
| **Construction noise and vibration** | |
| **Proximity of construction to residential properties**<br>• Concern regarding the proximity of construction to residential properties (1-3 Gordon Avenue and 9 -11 Nelson Street)<br>• Query as to whether construction in close proximity to residents will be 24 hours per day | Activities that were to be carried out from within the rail corridor, such as piling, would now occur from the Frank Channon Walk. As a result, construction activities would now occur immediately adjacent to sensitive receivers that adjoin the Frank Channon Walk. This could result in additional airborne noise and vibration impacts, as discussed in Section 9.1.5. Consistent with the commitments in the Environmental Impact Statement, construction hours and any noise and vibration level exceedance would be managed in accordance with the mitigation measures in Chapter 11 of this report and the Sydney Metro Construction Noise and Vibration Strategy as provided in Appendix C of this report. |
| **Property noise treatments**<br>• Request for at property noise treatments for the entire block at 1-3 Gordon Avenue prior to construction<br>• Property noise treatments should be offered at 2-8 Gordon Avenue and 9-11 Nelson Street<br>• Query as to whether residents will be relocated due to predicted noise criteria exceedances. | Where properties are eligible for noise treatment for operational impacts, opportunities to install the treatments early would be investigated.<br>As described in the Sydney Metro Construction Noise and Vibration Strategy (Appendix C of this report), alternative accommodation options may be provided for residents living in close proximity to construction works that are likely to incur unreasonably high impacts over an extended period of time. Alternative accommodation will be determined on a case-by-case basis. |

| Issue | Response |
|---|---|
| **Noise barrier**<br>• The existing noise barrier is not effective for current rail noise<br>• The proposed construction noise barrier height and materials (marine ply) are not sufficient<br>• Query as to whether the existing noise barrier will be demolished and the time period between demolition and construction of the new noise barrier<br>• Clear panels should be used in the new noise barrier to allow for natural light | The existing noise barriers would need to be removed to facilitate construction works. During this period, temporary construction barriers would be provided. This is accounted for in the construction noise modelling carried out for the project.<br>As specified in Section 10.4 of the Environmental Impact Statement, noise barrier heights and the specific height of construction noise barriers would be identified during detailed construction planning through the implementation of the Sydney Metro Construction Noise and Vibration Strategy.<br>Operational noise barriers would be transparent where they are augmenting existing transparent noise barriers, in accordance with mitigation measure LV17 in the Environmental Impact Statement. |
| **Vibration impacts**<br>• Piling will create vibration impacts | Activities that were to be carried out from within the rail corridor, such as piling, would now occur from the Frank Channon Walk. As a result, construction activities would now occur immediately adjacent to sensitive receivers that adjoin the Frank Channon Walk. This could result in additional airborne noise and vibration impacts.<br>Consistent with the commitments in the Environmental Impact Statement, noise and vibration impacts would be managed in accordance with the mitigation measures in Chapter 11 of this report and the Sydney Metro Construction Noise and Vibration Strategy as provided in Appendix C of this report. |
| **Mitigation measures**<br>• Construction impacts have increased but the relevant mitigation measures have not been revised<br>• Permanent noise and vibration monitors should be installed<br>• Noisy work should be limited to standard construction hours | To assess the change in impact, the additional activities have been incorporated into the earthwork scenario as presented in the Environmental Impact Statement. As a consequence of this change, exceedances of noise management levels at the nearest receiver during this scenario have increased, and would now be similar or greater than the exceedances predicted for the surface track works scenario in the Environmental Impact Statement.<br>The revised noise assessment for these works, provided in Section 9.1, identified that no additional mitigation measures would be required. These works would be managed in accordance with the mitigation measures in Chapter 11 of this report and Sydney Metro Construction Noise and Vibration Strategy as provided in Appendix C of this report. |
| **Land use and property** | |
| • Concern regarding impact on property values and the ability to rent or sell properties<br>• Uncertainty of land ownership to be used for the diversion of Frank Channon Walk at Gordon Avenue | Property values are based a number of complex factors including demand at a certain point in time, general location, accessibility, traffic and traffic noise on the street and proximity to transport infrastructure. In the long-term, and based on experience around other rail stations within Sydney and elsewhere, the proximity to a rail station would be anticipated to have a positive impact on property prices.<br>The diversion of Frank Channon Walk would be contained to the road reserve or land owned by Willoughby Council. |

| Issue | Response |
|---|---|
| **Landscape character and visual amenity** | |
| • More control of light spill impacts from night works at adjacent properties is required<br>• Concerns regarding the removal of vines growing over the existing noise wall which prevent graffiti | As per mitigation measure LV3 in the Environmental Impact Statement, lighting of construction sites would be oriented to minimise glare and light spill impact on adjacent receivers.<br>The landscape character and visual impact assessment contained in the Environmental Impact Statement includes the potential impacts associated with the removal of vegetation and changes to Frank Channon Walk.<br>Mitigation measures, identified in Chapter 11 of this report, would be implemented to minimise potential impacts of this vegetation removal. |
| **Biodiversity** | |
| • Resumption of the parkland, removal of mature vegetation in the reserve and street trees is not necessary<br>• Concern that the park will be paved rather than reinstated following construction<br>• Trees alongside 9-11 Nelson were planted as part of a local development application. Query as to whether the trees can they be removed and not replaced, and whether Council approval is required<br>• Concern for the brush turkey family present in the reserve | The use of the small park at the eastern end of Gordon Avenue, including vegetation clearance, would be required to allow vehicles to access from Gordon Avenue to the western side of the rail corridor. As outlined in Section 9.1.2, the park would be reinstated and landscaped in consultation with Willoughby City Council once the temporary construction access is no longer required.<br>The project is seeking approval for the removal of these trees under Part 5.1 of the *Environmental Planning and Assessment Act 1979*. Approval from local council is not required.<br>As per mitigation measure B3 in the Environmental Impact Statement, the local WIRES group and / or veterinarian would be contacted if any fauna are injured on site or require capture and / or relocation. |
| **Air quality** | |
| • Concern regarding the management of dust during construction | As per the mitigation measures outlined in Chapter 22 of the Environmental Impact Statement, dust would be managed to minimise impacts.<br>Stockpiles and demolition would be managed to minimise dust generation. All vehicles carrying loose or potentially dusty material to or from the site would be fully covered.<br>Hard surfaces would be installed on long term haul routes and regularly cleaned, while unsurfaced haul routes and work area would be regularly damped down in dry and windy conditions to minimise dust impacts. |

## 10.2 O'Connell Street – future underground pedestrian link

The stakeholder and community engagement activities included:

- Phone calls to directly impacted building owners
- Doorknocks of directly impacted tenants
- Information via email to building managers, with details of changes to the project scope, for distribution to tenants and owners
- Briefings with directly affected stakeholders, if requested or required
- Updated website content
- A notification letter outlining details of the assessment, a map and project contact details.

A summary of the issues raised during the above stakeholder and community engagement activities is provided in Table 10-2, along with responses.

**Table 10-2 Summary of issues and responses – O'Connell Street future underground pedestrian link stakeholder and community engagement**

| Issue | Response |
|---|---|
| **Strategic need and justification** | |
| • Expression of support for this element of the project from five submissions | Support for this element of the project is noted. |
| **Stakeholder and community engagement** | |
| • Inadequate notification of the proposal to stakeholders<br>• Inadequate time and information provided to enable meaningful feedback. Request for extension to properly review all information | As outlined above, phone calls were made to building owners and doorknocks / notification letters were made to tenants of buildings that would be directly impacted by the project. Information was provided via email to building managers for distribution to tenants and owners. Briefings with directly affected property owners and occupiers were also made available.<br>Transport for NSW would continue to engage with stakeholders and affected properties owners and occupiers through all stages of design, planning, and construction. Further information regarding consultation during construction is provided in Chapter 4. |

| Issue | Response |
|---|---|
| **Spoil removal** | |
| • The transport of 229,000 cubic metres of spoil (comprising the 175,000 cubic metres identified in the Environmental Impact Statement and the additional 54,000 cubic metres for the O'Connell Street pedestrian link) from 33 Bligh Street by truck will have significant impacts on adjoining properties and impact on their ability to be leased during the period of construction | The assessment provided in Section 3.3 of this report identifies an additional 54,000 cubic metres of spoil associated with the construction of the O'Connell Street pedestrian link. This brings to total spoil for Martin Place, as assessed in the Environmental Impact Statement and this report to 229,000 cubic metres. This spoil would be transported from the three identified Martin Place construction sites. The final quantity of spoil to be removed specifically from the O'Connell Street construction site would be subject to more detailed construction planning.<br>The Environmental Impact Statement and the revised assessment in Section 3.3 of this report has shown that the potential impacts of the project can be managed, with the implementation of feasible and reasonable mitigation measures, to within acceptable levels at nearby receivers.<br>Transport for NSW would continue to engage closely with stakeholders and affected properties owners and occupiers through all stages of design, planning, and construction. The project team can be contact via the community information line (1800 171 386) or project email (sydneymetro@transport.nsw.gov.au).<br>Further information regarding consultation during construction is provided in Chapter 4. |
| **Construction traffic and transport** | |
| • Truck movements should be restricted to off-peak times outside of business hours<br>• Higher traffic volumes and heavy vehicle movements on O'Connell and Bligh streets will reduce pedestrian safety<br>• Concern regarding the interface between buses and heavy vehicle movements<br>• More information requested regarding potential full or partial temporary road closures during construction | The assessment of traffic movements provided in Section 3.3.4 shows there would be no change to the predicted level of service (compared with the assessment in the Environmental Impact Statement) at all key intersections during construction as a result of the additional construction vehicles for the O'Connell Street site.<br>Construction traffic movements, road closures and road safety would be managed in accordance with the mitigation measures specified in Chapter 11 of this report. |
| **Construction noise and vibration** | |
| **Noise receivers**<br>• There are no residential receivers at 17 Castlereagh Street (residential receivers are located behind 17 Castlereagh Street)<br>• Through discussions at a meeting, advice received that part of the 31 Bligh Street property is used for special events and conference type activities, which in some instances involve filming and recording. | This change has been noted and relevant mapping and assessments updated accordingly.<br>The particular uses at 31 Bligh Street would be considered as part of the Construction Noise Impact Statement process (described in the Sydney Metro Construction Noise and Vibration Strategy (Appendix C of this report)). As part of this process, consultation would be carried out with 31 Bligh Street (in accordance with mitigation measure BI1 – refer to Chapter 11 of this report) to identify and develop mitigation measures to manage the specific construction impacts to 31 Bligh Street. |

| Issue | Response |
|---|---|
| **Noise and vibration impacts**<br>More information requested regarding specific impacts to neighbouring buildings | The assessment of potential construction noise impacts in the Environmental Impact Statement presents a worst-case 15-minute assessment in accordance with the approach required by the Interim Construction Noise Guideline. This approach assumes that all construction equipment for a particular construction scenario is operating at the same time and at the closest point on the site to any receiver. In reality, construction equipment would operate at varying locations around the site and would rarely all be in use at the same time. As such, the actual noise levels experienced by individual receivers would vary throughout the construction works.<br>Predicted noise level exceedances at receivers surrounding the O'Connell Street site are detailed in Section 3.3.5 and Table 3-11.<br>As identified in the Environmental Impact Statement, noise and vibration mitigation measures would be implemented, where feasible and reasonable, in accordance with the measures in Chapter 11 of this report and the Sydney Metro Construction Noise and Vibration Strategy (refer to Appendix C of this report) to minimise construction noise and vibration impacts where exceedances are predicted.<br>The Sydney Metro Construction Noise and Vibration Strategy also provides the process for carrying out more detailed construction noise and vibration impact statements prior to each construction activity based on further understanding of the construction equipment and construction processes, which would be confirmed during detailed construction planning. This process would provide further detail regarding the actual noise levels which would be experienced by individual receivers. |
| **Construction hours**<br>• Concern regarding noise impacts from proposed 24 hour construction on adjacent hotel<br>• Works exceeding 75 dB should be completed on weekends and outside of business hours | The assessment of potential construction noise impacts in the Environmental Impact Statement presents a worst-case 15-minute assessment in accordance with the approach required by the Interim Construction Noise Guideline. This approach assumes that all construction equipment for a particular construction scenario is operating at the same time and at the closest point on the site to any receiver. In reality, construction equipment would operate at varying locations around the site and would rarely all be in use at the same time. As such, the actual noise levels experienced by individual receivers would vary throughout the construction works.<br>The Sydney Metro Construction Noise and Vibration Strategy (Appendix C of this report) provides the process for carrying out more detailed construction noise and vibration impact statements prior to each construction activity based on further understanding of the construction equipment and construction processes, which would be confirmed during detailed construction planning. This process would provide further detail regarding the actual noise levels which would be experienced by individual receivers.<br>Noise and vibration mitigation measures, including construction hours and staging of works, would be implemented in accordance with the measures in Chapter 11 of this report and the Sydney Metro Construction Noise and Vibration Strategy. |

| Issue | Response |
|---|---|
| **Mitigation measures**<br>• Inadequate information provided around mitigation measures to reduce impacts on adjacent properties<br>• Request for weekly noise monitoring to ensure work stays within approved limits<br>• Request for ground-borne noise mitigation measures | Noise monitoring and noise and vibration mitigation measures would be implemented in accordance with the measures in Chapter 11 of this report and the Sydney Metro Construction Noise and Vibration Strategy (refer to Appendix C of this report). Standard mitigation measures that could be implemented include avoiding the coincidence of noisy plant operating simultaneously close together, use of dampened rock hammers, scheduling of noisy activities during less sensitive periods, and considering opportunities in site layouts to provide shielding from noise for receivers. |
| **Land use and property** | |
| **Property access during construction**<br>• Concern regarding impacts to property access for tenants, visitors and restaurant patrons<br>• Concern regarding impacts to underground parking access from O'Connell Street. | The O'Connell Street site is currently an active construction site. While there would be an increase in vehicles accessing or departing the site, and associated additional construction activity, there would be no changes to pedestrian access or visibility of surrounding businesses as a result of this activity. Mitigation measure T8 (refer to Chapter 11 of this report) commits to maintaining access to existing buildings and properties. |
| **Structural concerns**<br>• Request for property dilapidation reports to be issued<br>• Concerns regarding structure and cosmetic damage to buildings | During construction of the shafts, vibration levels are anticipated to remain well below the vibration screening levels associated with minor cosmetic building damage for all the surrounding buildings except at one commercial building located immediately to the south of the southern shaft (at Martin Place Station construction site), and the adjacent building to the north of the shaft at the O'Connell Street site.<br>Where exceedances of the cosmetic damage screening levels are predicted, a more detailed assessment of the structure and attended vibration monitoring would be carried out to ensure vibration levels remain below appropriate limits for this structure. This would include consideration of the heritage values of the structure.<br>The process for carrying out condition surveys of adjacent properties is provided in the Construction Environmental Management Framework (Appendix B of this report). These would be offered to the owners of buildings and structures in the vicinity of the tunnel and excavations prior to the commencement of excavation at each site. In the unlikely event that building damage does occur as a result of the project, this would be rectified by the project at no cost to the building owner. |
| **Impacts on land use at neighbouring properties**<br>• Concern regarding impacts on ability of property owners to attract and retain tenants adjacent to a major construction site leading to loss of rental income<br>• The site is currently undeveloped. Development for the project may impact the viability of neighbouring properties | The Environmental Impact Statement and the revised assessment in Section 3.3 of this report has shown that the potential impacts of the project can be managed, with the implementation of feasible and reasonable mitigation measures, to within acceptable levels at nearby receivers. Transport for NSW would continue to engage with stakeholders and property owners during the design and delivery of Sydney Metro to manage the potential impacts. The project team can be contact via the community information line (1800 171 386) or project email (sydneymetro@transport.nsw.gov.au).<br>In the long-term the development of the site and the potential future entry to Martin Place Station would be expected to increase the attractiveness of neighbouring properties. |

| Issue | Response |
|---|---|
| **Business impacts** | |
| • Amenity impacts to nearby hotel and restaurant due to construction noise and vibration may contribute to loss of income | Section 3.3.7 of this report concluded that activities at the proposed site would have amenity impacts that are generally consistent with those assessed in the Environmental Impact Statement. Consequently, impacts to businesses in the vicinity of the O'Connell Street site would be mitigated in accordance with the measures described in Chapter 11 of this report. This would include specific consultation with businesses potentially impacted during construction and the development of business impact registers and mitigation measures for individual businesses. |
| **Hazard and risk** | |
| • Concerns regarding dangerous goods storage on-site | As per Section 23.3 of the Environmental Impact Statement, typically, low volumes of potentially hazardous materials would be stored on site. Environmental hazards and risks associated with the on-site storage would be managed through standard mitigation measures to be developed as part of the construction environmental management documentation.<br>Construction site planning would ensure hazardous materials are stored appropriately and at an appropriate distance from sensitive receivers, in accordance with the thresholds established under Applying SEPP 33. Should the minimum buffers be unable to be maintained, either due to space constraints, the close proximity of sensitive receivers, or a requirement to store volumes of hazardous materials in excess of storage thresholds, a risk management strategy would be developed on a case by-case basis. |

## 10.3 Waterloo Station – revised footprint

The community engagement activities for Waterloo Station included targeted engagement with the Congregational Church (the only directly affected property owner). This was supported by a letter that included details of the proposed change in project scope and project contact details.

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# REVISED ENVIRONMENTAL MITIGATION MEASURES AND ENVIRONMENTAL PERFORMANCE OUTCOMES

CHAPTER ELEVEN

# 11 Revised environmental mitigation measures and environmental performance outcomes

## 11.1 Approach to environmental mitigation and management

The project approach to environmental mitigation and management was described in Chapter 27 of the Environmental Impact Statement. This is shown on Figure 11-1 and includes:

- Project design – measures which are inherent in the design of the project to avoid and minimise impacts. Further detail on these aspects of the project are provided in Chapters 6 and 7 of the Environmental Impact Statement, and as amended in Chapters 2, 3 and 9 of this report.
- Mitigation measures – additional to the project design which are identified through the environment impact assessment. These revised measures are consolidated in Table 11-1
- Construction environmental management framework – details the management processes and documentation for the project. Further details are provided in Section 11.1.1
- Construction noise and vibration strategy – identifies how Sydney Metro proposes to manage construction noise and vibration. Further details are provided in Section 11.1.2
- Design guidelines – provides an assurance of end-state design quality. Further details are provided in Section 11.1.3
- Environmental performance outcomes – which establish the intended outcomes which would be achieved by the project. The revised environmental performance outcomes are identified in Table 11-2.

The construction environmental management framework, construction noise and vibration strategy and design guidelines would be reviewed and updated periodically throughout delivery of the project.

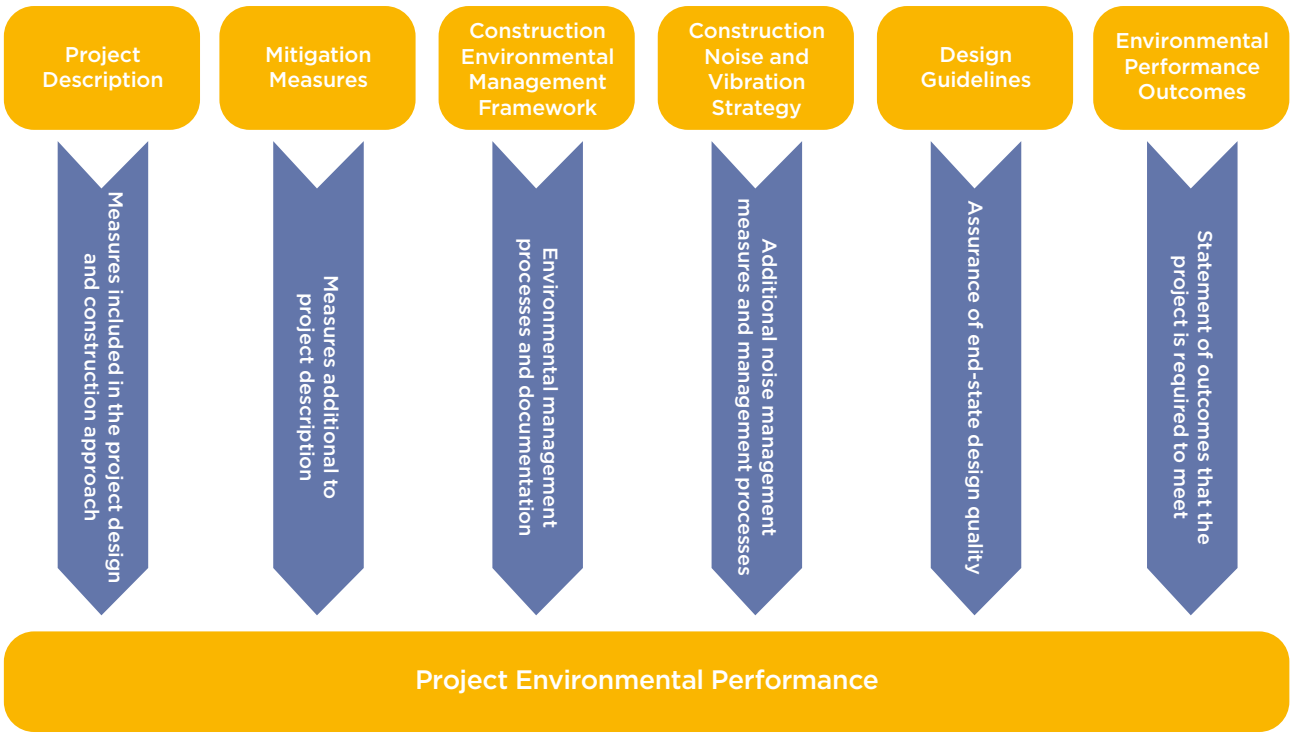


**Figure 11-1 Project approach to environmental mitigation and management**

### 11.1.1 Construction environmental management framework

A construction environmental management framework was developed and successfully implemented as part of the Sydney Metro Northwest project. This document was reviewed and amended for application on this project and was provided in Appendix D to the Environmental Impact Statement.

The practical application of the construction environmental management framework is as a linking document between planning approval documentation and construction environmental management documentation, which would be developed by the construction contractors.

The construction environmental management framework details the environmental, stakeholder and community management systems and processes for the construction of the project. Specifically, it details the requirements in relation to the Construction Environmental Management Plan, sub-plans and other supporting documentation for each specific environmental aspect.

Minor amendments have been made to the construction environmental management framework. The updated version is provided in Appendix B of this report.

### 11.1.2 Construction noise and vibration strategy

The construction noise and vibration strategy was developed to identify how Transport for NSW proposes to manage construction noise and vibration for Sydney Metro City & Southwest. This document was provided in Appendix E to the Environmental Impact Statement.

It is anticipated that construction of City & Southwest would be developed under a number of separate construction contracts. The construction noise and vibration strategy defines the strategies by which construction noise and vibration impacts are to be minimised on Sydney Metro projects and aims to provide a consistent approach to management and mitigation across the Sydney Metro projects.

The construction noise and vibration strategy has been revised to include project specific noise and vibration monitoring requirements. The updated version is provided in Appendix C of this report.

### 11.1.3 Design guidelines

Transport for NSW has developed design guidelines in order to guide the design development process, and establish the aesthetic standards for the project. This document was provided in Appendix B to the Environmental Impact Statement. These guide the design of:

- The interface between stations and their surrounding locality including:
  - Station entries
  - Transport interchange facilities (bicycle facilities, bus stops, kiss-and-ride, taxi ranks and connections to existing rail, ferry and light rail transport)
  - Landscaping and other public domain elements
- Rail corridor works including the tunnel dive structures, rail cuttings and embankments
- Station and service buildings, including underground stations.

The design guidelines have been updated to provide more contextual information for each station. Amendments to specific guidelines have been made in response to submissions and discussions with local councils and specific design principles for Sydney Yard Access Bridge have been added. The updated version is provided in Appendix A of this report.

## 11.2 Revised environmental mitigation measures

The list of mitigation measures and performance outcomes presented in Chapter 27 of the Environmental Impact Statement has been revised on the basis of submissions received, the additional assessment work carried out and the preferred infrastructure report. In some cases new measures have been added, while in others, the wording of existing measures has been adjusted.

Table 11-1 provides the revised consolidated environmental mitigation measures. This table supersedes the mitigation measures presented in the Environmental Impact Statement. New mitigation measures or additions to existing mitigation measures are shown in **bold** text, with deletions shown with a ~~strikethrough~~.

**Table 11-1 Revised environmental mitigation measures**

| ID | Mitigation measure | Applicable location(s)[1] |
|---|---|---|
| **Construction traffic and transport** | | |
| T1 | Ongoing consultation would be carried out with (as relevant to the location) the CBD Coordination Office, Roads and Maritime Services, Sydney Trains, NSW Trains, **the Port Authority of NSW, Barangaroo Delivery Authority**, local councils, emergency services and bus operators in order to minimise traffic and transport impacts during construction. | All except metro rail tunnels |
| T2 | Road Safety Audits would be carried out at each construction site. Audits would address vehicular access and egress, and pedestrian, cyclist and public transport safety. | All except metro rail tunnels |
| T3 | Directional signage and line marking would be used to direct and guide drivers and pedestrians past construction sites and on the surrounding network. This would be supplemented by Variable Message Signs to advise drivers of potential delays, traffic diversions, speed restrictions, or alternate routes. | All except metro rail tunnels |
| T4 | In the event of a traffic related incident, co-ordination would be carried out with the CBD Coordination Office and / or the Transport Management Centre's Operations Manager. | All except metro rail tunnels |
| T5 | The community would be notified in advance of proposed road and pedestrian network changes through media channels and other appropriate forms of community liaison. | All except metro rail tunnels |
| T6 | Vehicle access to and from construction sites would be managed to ensure pedestrian, cyclist and motorist safety. Depending on the location, this may require manual supervision, physical barriers, temporary traffic signals and modifications to existing signals or, on occasions, police presence. | All except metro rail tunnels |

| ID | Mitigation measure | Applicable location(s)[1] |
|---|---|---|
| T7 | Additional enhancements for pedestrian, cyclist and motorist safety in the vicinity of the construction sites would be implemented during construction. This would include measures such as:<br>• Use of speed awareness signs in conjunction with variable message signs near construction sites to provide alerts to drivers<br>• ~~Shared experience~~ **Community** educational events that allow pedestrians, cyclists or motorists to sit in trucks and understand the visibility restrictions of truck drivers, and for truck drivers to understand the visibility from a bicycle; **and a campaign to engage with local schools to educate children about road safety and to encourage visual contact with drivers to ensure they are aware of the presence of children**<br>• Specific construction driver training to understand route constraints, expectations, safety issues, **human error and its relationship with fitness for work and chain of responsibility duties**, and to limit the use of compression braking<br>• **Use of In Vehicle Monitoring Systems (telematics) to monitor vehicle location and driver behaviour**<br>• Safety devices on construction vehicles that warn drivers of the presence of a vulnerable road user located in the vehicles' blind spots and warn the vulnerable road user that a vehicle is about to turn. | All except metro rail tunnels |
| T8 | Access to existing properties and buildings would be maintained in consultation with property owners. | All except metro rail tunnels |
| T9 | All trucks would enter and exit construction sites in a forward gear, where feasible and reasonable. | All except metro rail tunnels |
| T10 | Any relocation of bus stops would be carried out by Transport for NSW in consultation with Roads and Maritime Services, the CBD Coordination Office (for relevant locations), the relevant local council and bus operators. Wayfinding and customer information would be provided to notify customers of relocated bus stops. | All except metro rail tunnels |
| T11 | For special events that require specific traffic measures, those measures would be developed in consultation the CBD Coordination Office (for relevant locations), Roads and Maritime Services, **Barangaroo Delivery Authority (for relevant locations)** and the organisers of the event. | BN, MP, PS, CS |
| T12 | Construction sites would be managed to minimise construction staff parking on surrounding streets. The following measures would be implemented:<br>• Encouraging staff to use public or active transport<br>• Encouraging ride sharing<br>• Provision of alternative parking locations and shuttle bus transfers where feasible and reasonable.<br>**Transport for NSW would work with local councils to minimise adverse impacts of construction on parking and other kerbside use in local streets, such as loading zones, bus zones, taxi zones and coach zones.** | All except metro rail tunnels |
| T13 | Construction site traffic would be managed to minimise movements in the AM and PM peak periods. | All except metro rail tunnels |
| T14 | Construction site traffic immediately around construction sites would be managed to minimise movements through school zones during pick up and drop off times. | All except metro rail tunnels |

| ID | Mitigation measure | Applicable location(s)[1] |
|---|---|---|
| T15 | Pedestrian and cyclist access would be maintained at Crows Nest during the temporary closure of Hume Street, and at Martin Place during the temporary partial closure of Martin Place. Wayfinding and customer information would be provided to guide pedestrians and cyclists to alternative routes. | CN, MP |
| T16 | Timing for the temporary closure of the Devonshire Street tunnel would avoid periods of peak pedestrian demand. Wayfinding and customer information would be provided to guide pedestrians to alternative routes. | CS |
| T17 | Consultation would occur with the Harbour Master, Roads and Maritime Services and Sydney Ferries' to ensure shipping channels are maintained during the Sydney Harbour ground improvement works. | GI |
| T18 | During the closure of existing entrances to Martin Place Station, marshalls would be provided during the AM and PM peak periods to direct customers to available access and egress points. | MP |
| T19 | Where existing parking is removed to facilitate construction activities, alternative parking facilities would be provided where feasible and reasonable. | All except metro rail tunnels |
| T20 | Alternative pedestrian routes and property access would be provided where these are affected during the construction of the power supply routes. | PSR |
| T21 | **The potential combined impact of trucks from multiple construction sites would be further considered during the development of Construction Traffic Management Plans.** | **All except metro rail tunnels** |
| T22 | **Where existing footpath routes used by pedestrians and / or cyclists are affected by construction, a condition survey would be carried out to confirm they are suitable for use (eg suitably paved and lit), with any necessary modifications to be carried out in consultation with the relevant local council.** | **All except metro rail tunnels** |
| **Operational traffic and transport** | | |
| OpT1 | Enhancement of pedestrian infrastructure in the vicinity of Victoria Cross and Martin Place stations would be investigated further in consultation with (as relevant to the location) the CBD Coordination Office, Roads and Maritime Services and the relevant local council. | VC, MP |
| OpT2 | Access would be maintained to neighbouring properties. | All except metro rail tunnels |
| OpT3 | **The design of the interface between the Frank Channon Walk extension and the signalised intersection at Mowbray Road / Hampden Road (including any shared zone proposal) would be developed in consultation with Roads and Maritime Services and Willoughby Council.** | **CDS** |
| OpT4 | **Transport for NSW would work with local councils to minimise adverse impacts of operation on parking and other kerbside use in local streets, such as loading zones, bus zones, taxi zones and coach zones.** | **All except metro rail tunnels** |
| OpT5 | **During detailed design, Transport for NSW would consult with Inner West Council, Roads and Maritime Services and other stakeholder on strategies to reduce the number of staged pedestrian marked foot crossings at the Edinburgh Road / Edgeware Road intersection.** | **MDS** |

| ID | Mitigation measure | Applicable location(s)[1] |
|---|---|---|
| **Construction noise and vibration** | | |
| **NV1** | The Construction Noise and Vibration Strategy would be implemented with the aim of achieving the noise management levels where feasible and reasonable.<br>This would include the following example standard mitigation measures where feasible and reasonable:<br>• Provision of noise barriers around each construction site<br>• Provision of acoustic sheds at Chatswood dive site, Crows Nest, Victoria Cross, Barangaroo, Martin Place, Pitt Street, Waterloo and Marrickville dive site<br>• The coincidence of noisy plant working simultaneously close together would be avoided<br>• Offset distances between noisy plant and sensitive receivers would be increased<br>• Residential grade mufflers would be fitted to all mobile plant<br>• Dampened rock hammers would be used<br>• Non-tonal reversing alarms would be fitted to all permanent mobile plant<br>• High noise generating activities would be scheduled for less sensitive period considering the nearby receivers<br>• The layout of construction sites would consider opportunities to shield receivers from noise.<br>**This would also include carrying out the requirements in relation to construction noise and vibration monitoring.** | All |
| **NV2** | Unless compliance with the relevant traffic noise criteria can be achieved, night time heavy vehicle movements at the Chatswood dive site, Crows Nest Station, ~~and~~ Victoria Cross Station **and Waterloo Station** sites would be restricted to:<br>• The Pacific Highway and Mowbray Road at the Chatswood dive site<br>• The Pacific Highway, Hume Street and Oxley Street at the Crows Nest Station construction site<br>• McLaren Street, Miller Street and Berry Street at the Victoria Cross Station construction site<br>• **Botany Road and Raglan Street at the Waterloo Station construction site**. | CDS, CN, VC**, WS** |
| **NV3** | Where vibration levels are predicted to exceed the screening criteria, a more detailed assessment of the structure and attended vibration monitoring would be carried out to ensure vibration levels remain below appropriate limits for that structure.<br>For heritage items, the more detailed assessment would specifically consider the heritage values of the structure in consultation with a heritage specialist to ensure sensitive heritage fabric is adequately monitored and managed. | All except metro rail tunnels |
| **NV4** | Feasible and reasonable measures would be implemented to minimise ground borne noise where exceedences are predicted. | All |

| ID | Mitigation measure | Applicable location(s)[1] |
|---|---|---|
| NV5 | Feasible and reasonable mitigation measures would be implemented where power supply works would result in elevated noise levels at receivers. This would include:<br>• Carrying out works during the daytime period when in the vicinity of residential receivers<br>• Where out of hours works are required, scheduling the noisiest activities to occur in the evening period (up to 10 pm)<br>• Use of portable noise barriers around particularly noisy equipment such as concrete saws. | PSR |
| NV6 | **Transport for NSW would engage an Independent Acoustic Advisor to act independently of the design and construction teams and provide oversight of construction methods, construction noise and vibration planning, management and mitigation, and construction noise and vibration monitoring and reporting. The key responsibilities of the Independent Acoustic Advisor would include :**<br>• **Assurance of contractor noise and vibration planning, modelling, management and monitoring practices**<br>• **Verification of compliance with relevant guidelines and approval requirements**<br>• **Audit noise and vibration management practices.** | **All** |
| NV7 | **Alternative demolition techniques that minimise noise and vibration levels would be investigated and implemented where feasible and reasonable. This would include consideration of:**<br>• **The use of hydraulic concrete shears in lieu of hammers/rock breakers**<br>• **Sequencing works to shield noise sensitive receivers by retaining building wall elements**<br>• **Locating demolition load out areas away from the nearby noise sensitive receivers**<br>• **Providing respite periods for noise intensive works**<br>• **Methods to minimise structural-borne noise to adjacent buildings including separating the structural connection prior to demolition through saw-cutting and propping, using hand held splitters and pulverisers or hand demolition**<br>• **Installing sound barrier screening to scaffolding facing noise sensitive neighbours**<br>• **Modifying demolition works sequencing / hours to minimise impacts during peak pedestrian times and / or adjoining neighbour outdoor activity periods.** | **All except metro rail tunnels** |
| Operational noise and vibration | | |
| OpNV1 | The height and extent of noise barriers adjacent to the northern surface track works would be confirmed during detailed design with the aim of not exceeding trigger levels from the *Rail Infrastructure Noise Guidelines* (Environment Protection Authority, 2013).<br>At property treatments would be offered where there are residual exceedances of the trigger levels. | STW |
| OpNV2 | Track form would be confirmed during the detailed design process in order to meet the relevant ground-borne noise and vibration criteria from the *Rail Infrastructure Noise Guidelines* (EPA, 2013) and the *Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects* (DECC, 2007a). | Metro rail tunnels |

| ID | Mitigation measure | Applicable location(s)[1] |
|---|---|---|
| OpNV3 | Stations and ancillary facilities including train breakout noise from draught relief shafts would be designed to meet the applicable noise criteria derived from the *Industrial Noise Policy* (EPA, 2000). | All except metro rail tunnels |
| **Business impacts** | | |
| BI1 | Specific consultation would be carried out with businesses potentially impacted during construction. Consultation would aim to identify and develop measures to manage the specific construction impacts for individual businesses. | All |
| BI2 | A business impact risk register would be developed to identify, rate and manage the specific construction impacts for individual businesses. | All |
| BI3 | Appropriate signage would be provided around construction sites to provide visibility to retained businesses. | All except metro rail tunnels |
| **Non-Aboriginal heritage** | | |
| NAH1 | Archival recording and reporting of the following heritage items would be carried out in accordance with the NSW Heritage Office's *How to Prepare Archival Records of Heritage Items* (1998a), and *Photographic Recording of Heritage Items Using Film or Digital Capture* (2006):<br>• The internal heritage fabric and any non-original elements removed from within the curtilage of Mowbray House, Chatswood<br>• The interior, exterior and setting of the shop at 187 Miller Street, North Sydney<br>• The fabric and setting of the North Sydney bus shelters requiring removal and temporary relocation at Victoria Cross Station and Blues Point temporary site<br>• Any component of the Blues Point Waterfront Group and the McMahons Point South heritage conservation area to be directly affected or altered, including vegetation and significant landscape features<br>• Hickson Road wall in the vicinity of proposed ventilation risers and skylights for Barangaroo Station<br>• The interior, exterior and setting of the 'Flat Building' at 7 Elizabeth Street, Sydney<br>• Martin Place, between Elizabeth and Castlereagh streets, Sydney<br>• The heritage fabric of areas of the existing Martin Place Station affected by the project<br>• The Rolling Stock Officers Garden, Rolling Stock Officers Building and Cleaners Amenities Building in Sydney Yard and any other component of the Sydney Terminal and Central Railway Stations group to be removed or altered<br>• **Directly impacted parts of the Congregational Church at Waterloo.** | CDS, VC, BP, MP, CS, **WS** |

| ID | Mitigation measure | Applicable location(s)[1] |
|---|---|---|
| NAH2 | ~~An archaeological research designs would be prepared and implemented to identify the need for archaeological testing or monitoring. Archaeological mitigation measures recommended in the archaeological research design would be carried out in accordance with Heritage Council guidelines, and where identified in the archaeological research design, would be supervised by a suitably qualified Excavation Director with experience in managing State significant archaeology.~~<br>**The archaeological research design would be implemented.**<br>**Significant archaeological findings would be considered for inclusion in heritage interpretation (as per NAH8) for the project and be developed in consultation with the relevant local council.** | CDS, CN, VC, BP, BN, MP, PS, CS, WS, PSR |
| NAH3 | An Exhumation Policy and Guideline would be prepared and implemented. It would be developed in accordance with the *Guidelines for Management of Human Skeletal Remains* (NSW Heritage Office, 1998b) **and NSW Health Policy Directive – Exhumation of human remains (December, 2013). It would be prepared in consultation with NSW Heritage Office and NSW Health.** | All except metro rail tunnels |
| NAH4 | The method for the demolition of existing buildings and / or structures at Chatswood dive site, Victoria Cross Station, Martin Place Station, Pitt Street Station, Central Station and Waterloo Station would be developed to minimise direct and indirect impacts to adjacent and / or adjoining heritage items. | CDS, VC, MP, PS, CS, WS |
| NAH5 | Prior to total or partial demolition of heritage items at Victoria Cross and Martin Place stations, heritage fabric for salvage would be identified and reuse opportunities for salvaged fabric considered. This would include salvage and reuse of heritage tiles to be impacted at Martin Place Station. | VC, MP |
| NAH6 | An appropriately qualified and experienced heritage architect would form part of the Sydney Metro Design Review Panel and would provide independent review periodically throughout detailed design. | All |
| NAH7 | The project design would be sympathetic to heritage items and, where reasonable and feasible, minimise impacts to the setting of heritage items. The detailed design for Martin Place Station and Central Station would be developed with input from a heritage architect. | STW, CDS, CN, VC, BN, MP, PS, CS, WS, MDS |
| NAH8 | Appropriate heritage interpretation would be incorporated into the design for the project in accordance with the NSW Heritage Manual, the NSW Heritage Office's *Interpreting Heritage Places and Items: Guidelines* (August 2005), and the NSW Heritage Council's *Heritage Interpretation Policy*. | CDS, CN, VC, BP, BN, MP, PS, WS |
| NAH9 | A Central Station heritage interpretation plan would be developed and implemented. It would be consistent with the *Central Station Conservation Management Plan* (Rappoport and Government Architects Office, 2013) and in accordance with the guidelines identified in NAH8. | CS |

| ID | Mitigation measure | Applicable location(s)[1] |
|---|---|---|
| NAH10 | ~~The design of the Sydney Yard Access Bridge would be sympathetic to surrounding heritage items and minimise impacts to sight lines, views and setting of surrounding heritage items, including to Mortuary Station and the Sydney Terminal and Central Railway Stations group. As a minimum the design would:~~<br>• ~~Incorporate materials and finishes sympathetic to the heritage context of the railway station~~<br>• ~~Minimise height and bulk of the structure.~~<br>**The detailed design of the Sydney Yard Access Bridge would be carried out in accordance with the relevant specific element principles in the Design Guidelines.** | CS |
| NAH11 | Except for heritage significant elements affected by the project, direct impact on other heritage significant elements forming part of the following items would be avoided:<br>• The Blues Point Waterfront Group (including the former tram turning circle, stone retaining wall, bollards and steps)<br>• The Millers Point and Dawes Point Village Precinct<br>• The existing Martin Place Station<br>• Sydney Terminal and Central Railway Stations group<br>• Sydney Yard (including the Shunters Hut and Prince Alfred Sewer). | BP, BN, MP, CS |
| NAH12 | Power supply works would be designed and constructed to avoid impacts to the Tank Stream and Bennelong Stormwater Channel. | PSR |
| NAH13 | The design and detailed construction planning of work at Central Station would consider the requirements of the *Central Station Conservation Management Plan* (Rappoport and Government Architects Office, 2013) and include consideration of opportunities for the retention, conservation and / or reuse of original and significant heritage fabric **and movable heritage items.**<br>Consultation would be carried out with Sydney Trains and the Heritage Council of NSW during design development. | CS |
| NAH14 | **The final design and location of the new connection and opening at Martin Place Railway Station would minimise removal of the significant red ceramic tiling where feasible and reasonable.** | MP |
| NAH15 | **Opportunities for the reuse of any tiles at Martin Place Railway Station that are removed would be investigated.** | MP |
| NAH16 | **Opportunities for the reuse of the circular seating within Martin Place Station would be investigated.** | MP |
| NAH17 | **Opportunities for the salvage and reuse of the bus shelters temporarily removed at Victoria Cross and Blues Point would be investigated in consultation with North Sydney Council.** | VC, BP |
| NAH18 | **Works at Central Station would be carried out with the oversight of heritage specialists.** | CS |
| NAH19 | **Subject to outcomes of consultation with the church, temporary and permanent works at the Congregational Church would:**<br>• **Minimise impacts to heritage fabric**<br>• **Be sympathetic to the heritage values and architectural form of the building.** | WS |

| ID | Mitigation measure | Applicable location(s)[1] |
|---|---|---|
| **Aboriginal heritage** | | |
| **AH1** | Aboriginal stakeholder consultation would be carried out in accordance with the NSW Office of Environment and Heritage's Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010. | All |
| **AH2** | ~~An Aboriginal cultural heritage assessment report would be prepared in accordance with the OEH Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW. The Aboriginal cultural heritage assessment report would include:~~<br>• ~~Details of Aboriginal stakeholder consultation conducted in accordance with AH1~~<br>• ~~An assessment of cultural significance for the project area and identification of any specific areas of cultural significance based on consultation with Aboriginal stakeholders~~<br>• ~~A methodology for archaeological management including test excavation and salvage (refer to AH3).~~<br>**The cultural heritage assessment report would be implemented.** | All |
| **AH3** | Archaeological test excavation (and salvage when required) would be carried out where intact natural soil profiles with the potential to contain significant archaeological deposits are encountered at the Blues Point temporary site, Barangaroo Station, Martin Place Station, Pitt Street Station, Central Station, Waterloo Station and Marrickville dive site. Excavations would be conducted in accordance with the methodology outlined in the Aboriginal cultural heritage assessment report | BP, BN, MP, PS, CS, WS, MDS |
| **AH4** | Appropriate Aboriginal heritage interpretation would be incorporated into the design for the project in consultation with Aboriginal stakeholders. | All |
| **AH5** | Feasible and reasonable mitigation at the ground improvement locations would be identified in consultation with the Office of Environment and Heritage. | GI |
| **AH6** | The Aboriginal cultural heritage assessment report would address areas of archaeological potential associated with the power supply routes. | PSR |
| **Landscape character and visual amenity** | | |
| **Construction** | | |
| **LV1** | Where feasible and reasonable, the elements within construction sites would be located to minimise visual impacts, for example materials and machinery would be stored behind fencing. | All except metro rail tunnels |
| **LV2** | Existing trees to be retained would be protected prior to the commencement of construction in accordance with *Australian Standard AS4970 the Australian Standard for Protection of Trees on Development Sites and Adjoining Properties*. | All except metro rail tunnels |
| **LV3** | Lighting of construction sites would be oriented to minimise glare and light spill impact on adjacent receivers. | All except metro rail tunnels |
| **LV4** | Visual mitigation would be implemented as soon as feasible and reasonable after the commencement of construction, and remain for the duration of the construction period. | All except metro rail tunnels |
| **LV5** | Opportunities for the retention and protection of existing ~~street~~ trees would be identified during detailed construction planning. | All except metro rail tunnels |

| ID | Mitigation measure | Applicable location(s)[1] |
|---|---|---|
| LV6 | The design and maintenance of construction site hoardings would aim to minimise visual amenity and landscape character impacts, including the prompt removal of graffiti. Public art opportunities would be considered. | All except metro rail tunnels |
| LV7 | The selection of materials and colours for acoustic sheds would aim to minimise their visual prominence. | CDS, CN, VC, BN, MP, PS, WS, MDS |
| LV8 | Tunnel boring machine retrieval works at the Blues Point temporary site would be timed to avoid key harbour viewing events. | BP |
| LV9 | Benching would be used where feasible and reasonable at Blues Point temporary site to minimise visual amenity impacts. | BP |
| LV10 | **Temporary impacts to public open space would be rehabilitated in consultation with the relevant local council and / or landowner.** | **All except metro rail tunnels** |
| Operation | | |
| LV11 | Cut off and direct light fittings (or similar technologies) would be used to minimise glare and light spill onto private property. | CDS, AS, MDS |
| LV12 | Where feasible and reasonable, vegetation would be provided to screen and visually integrate sites with the surrounding area. | STW, CDS, AS, MDS |
| LV13 | Identify and implement appropriate landscape treatments for Frank Channon Walk. | STW, CDS |
| LV14 | The architectural treatment of Artarmon substation would minimise visual amenity and landscape character impacts. | AS |
| LV15 | The Harbour cycles sculpture at North Sydney would be reinstated at a location determined in consultation with North Sydney Council. | VC |
| LV16 | The P&O Fountain, **the mid-20th century bas relief sculpture and the Douglas Annand glass screen** at 55 Hunter Street would be reinstated at a location determined in consultation with City of Sydney Council. | MP |
| LV17 | Opportunities would be investigated to provide a permanent wall for street art at Marrickville dive site in consultation with Marrickville Council. | MDS |
| LV18 | Noise barriers would be transparent where they are augmenting existing transparent noise barriers. | STW |
| LV19 | **Notification processes in relation to moral rights for public art and architecture under Commonwealth *Copyright Act 1968* would be carried out.** | All except metro rail tunnels |

| ID | Mitigation measure | Applicable location(s)[1] |
|---|---|---|
| **Groundwater and geology** | | |
| **GWG1** | A detailed geotechnical model for the project would be developed and progressively updated during design and construction. The detailed geotechnical model would include:<br>• Assessment of the potential for damage to structures, services, basements and other sub-surface elements through settlement or strain<br>• Predicted changes to groundwater levels, including at nearby water supply works.<br>Where building damage risk is rated as moderate or higher (as per the CIRIA 1996 risk-based criteria), a structural assessment of the affected buildings / structures would be carried out and specific measures implemented to address the risk of damage.<br>With each progressive update of the geotechnical model the potential for exceedance of the following target changes to groundwater levels would be reviewed:<br>• Less than 2.0 metres – general target<br>• Less than 4.0 metres – where deep building foundations present<br>• Less than 1.0 metre – residual soils<br>• Less than 0.5 metre – residual soils (Blues Point) (fill / Aeolian sand).<br>Where a significant exceedance of target changes to groundwater levels are predicted at surrounding land uses and nearby water supply works, an appropriate groundwater monitoring program would be developed and implemented. The program would aim to confirm no adverse impacts on groundwater levels or to appropriately manage any impacts. Monitoring at any specific location would be subject to the status of the water supply work and agreement with the landowner.<br>**The geotechnical model and groundwater monitoring program would be developed in consultation with the Department of Primary Industries (Water).** | All |
| **GWG2** | Condition surveys of buildings and structures in the vicinity of the tunnel and excavations would be carried out prior to the commencement of excavation at each site. | All |
| **Soils, contamination and water quality** | | |
| **Construction** | | |
| **SCW1** | Updated desktop contamination assessments would be carried out for Chatswood dive site, Blues Point temporary site, Barangaroo Station, Central Station and Waterloo Station. If sufficient information is not available to determine the remediation requirements and the impact on potential receivers, then detailed contamination assessments, including collection and analysis of soil and groundwater samples would be carried out.<br>Detailed contamination assessment would also be carried out for the Barangaroo power supply route within Hickson Road and the Marrickville power supply route adjacent to Sydney Park and Camdenville Oval.<br>In the event a Remediation Action Plan is required, these would be developed in accordance with *Managing Land Contamination: Planning Guidelines SEPP 55 – Remediation of Land* (Department of Urban Affairs and Planning and Environment Protection Authority, 1998) and a site auditor would be engaged. | CDS, BP, BN, CS, WS, PSR |

| ID | Mitigation measure | Applicable location(s)[1] |
|---|---|---|
| SCW2 | Prior to ground disturbance in high probability acid sulfate areas at Barangaroo Station, Waterloo Station and Marrickville dive site, testing would be carried out to determine the presence of acid sulfate soils.<br>If acid sulfate soils are encountered, they would be managed in accordance with the *Acid Sulfate Soil Manual* (Acid Sulfate Soil Management Advisory Committee, 1998). | BN, WS, MDS |
| SCW3 | Erosion and sediment control measures would be implemented in accordance with *Managing Urban Stormwater: Soils and Construction Volume 1* (Landcom, 2004) and *Managing Urban Stormwater: Soils and Construction Volume 2* (Department of Environment and Climate Change, 2008a). Measures would be designed as a minimum for the 80th percentile; 5-day rainfall event. | All except metro rail tunnels |
| SCW4 | Discharges from the construction water treatment plants would be monitored to ensure compliance with the discharge criteria in an environment protection licence issued to the project. | All except metro rail tunnels |
| SCW5 | A silt curtain would be used around the Sydney Harbour ground improvement work barges. | GI |
| SCW6 | A water quality monitoring program would be implemented to monitor water quality within Sydney Harbour during ground improvement work.<br>The water quality monitoring program would be carried out to detect any potential impacts on the water quality of Sydney Harbour from the ground improvement work and inform management responses in the event any impacts are identified.<br>Specific monitoring locations and frequencies would be determined during the development of the program in consultation with the Environment Protection Authority. | GI |
| **Operation** | | |
| SCW7 | Discharges from the tunnel water treatment plant would be monitored to ensure compliance with the discharge criteria determined in consultation with the NSW Environment Protection Authority. | MDS |
| **Social impacts and community infrastructure** | | |
| SO1 | Direct impacts to public open space at the Blues Point temporary site would be minimised. | BP |
| SO2 | Specific consultation would be carried out with sensitive community facilities (including aged care, child care centres, educational institutions and places of worship) potentially impacted during construction. Consultation would aim to identify and develop measures to manage the specific construction impacts for individual sensitive community facilities. | All except metro rail tunnels |
| **Biodiversity** | | |
| B1 | An ecologist would be present during the removal of any hollow-bearing trees. | CDS |
| B2 | Potential bat roosting locations at Central Station, Waterloo Station and Marrickville dive sites would be checked by a qualified ecologist or wildlife handler prior to demolition. Any bats found would be relocated, **unless in torpor, in which case the relocation would be delayed until the end of the torpor period.** | CS, WS, MDS |

| ID | Mitigation measure | Applicable location(s)[1] |
|---|---|---|
| B3 | The local WIRES group and / or veterinarian would be contacted if any fauna are injured on site or require capture and / or relocation. | All except metro rail tunnels |
| B4 | Procedures would be developed and implemented, in accordance with the National System for the Prevention and Management of Marine Pest Incursions, during Sydney Harbour ground improvement works to avoid transportation of marine pests from other locations, particularly the marine alga Caulerpa taxifoli. | GI |
| **Flooding and hydrology** | | |
| **Construction** | | |
| FH1 | Detailed construction planning would consider flood risk at Barangaroo Station, Martin Place Station and the Waterloo Station construction sites. This would include identification of measures to avoid, where feasible and reasonable, ~~construction phase flooding impacts on the community and on other property and infrastructure~~ **not worsen existing flooding characteristics up to and including the 100 year annual recurrence interval event in the vicinity of the project.**<br>**Not worsen is defined as:**<br>• **A maximum increase flood levels of 50mm in a 100 year Average Recurrence Interval flood event**<br>• **A maximum increase in time of inundation of one hour in a 100 year Average Recurrence Interval flood event**<br>• **No increase in the potential for soil erosion and scouring from any increase in flow velocity in a 100 year Average Recurrence Interval flood event.** | BN, MP, WS |
| FH2 | The site layout and staging of construction activities at Marrickville dive site would avoid or minimise obstruction of overland flow paths and limit the extent of flow diversion required. | MDS |

| ID | Mitigation measure | Applicable location(s)[1] |
|---|---|---|
| **FH3** | Overland flow diversions during construction at the Marrickville dive site would meet the following criteria, **where feasible and reasonable:**<br>• **Not worsen existing flooding characteristics up to and including the 100 year annual recurrence interval event in the vicinity of the project**<br>• ~~Increases in flood levels during events up to and including the 100-year average recurrence interval would be minimised particularly within private properties~~<br>• ~~Any increase in flow velocity for events up to and including a 100-year average recurrence interval event would not increase the potential for soil erosion and scouring~~<br>• Dedicated evacuation routes would not be adversely impacted in flood events up to and including the probable maximum flood. **This may include the requirement for changes to existing arrangements for flood warning systems and signage.**<br>Construction planning for the Marrickville dive site would be carried out in consultation with the State Emergency Services and Marrickville Inner West Council.<br>**Not worsen is defined as:**<br>• **A maximum increase flood levels of 50mm in a 100 year Average Recurrence Interval flood event**<br>• **A maximum increase in time of inundation of one hour in a 100 year Average Recurrence Interval flood event**<br>• **No increase in the potential for soil erosion and scouring from any increase in flow velocity in a 100 year Average Recurrence Interval flood event.** | MDS |
| **Operation** | | |
| **FH4** | Where feasible and reasonable, detailed design would result in no net increase in stormwater runoff rates in all storm events unless it can be demonstrated that increased runoff rates as a result of the project would not increase downstream flood risk. | STW, AS, MDS |
| **FH5** | Where space permits, on-site detention of stormwater would be introduced where stormwater runoff rates are increased. Where there is insufficient space for the provision of on-site detention, the upgrade of downstream infrastructure would be implemented where feasible and reasonable. | STW, AS, MDS |
| **FH6** | Detailed design would occur in consultation with ~~Marrickville~~ **Inner West** Council to ensure future drainage improvement works around the Marrickville dive site would not be precluded. | MDS |
| **FH7** | Consultation would be carried out with **Marrickville Inner West** Council to ensure flood-related outcomes of the project are consistent with any future floodplain risk management study and / or plan developed for the Marrickville Valley Catchment. | MDS |
| **FH8** | The frequency of Sydney Trains rail service disruptions due to flooding would not be increased in the vicinity of the Marrickville dive structure. | MDS |

| ID | Mitigation measure | Applicable location(s)[1] |
|---|---|---|
| FH9 | Design of the ~~Marrickville dive structure~~ **project** would be reviewed to, where feasible and reasonable, **not worsen existing flooding characteristics up to and including the 100 year annual recurrence interval event in the vicinity of the project. Detailed flood modelling would consider:**<br>• **Potential changes to flood prone land and flood levels**<br>• **Potential changes to overland flow paths**<br>• **Redistribution of surface runoff as a result of project infrastructure**<br>• **Behaviour of existing stormwater runoff**<br>• **Potential changes required to flood evacuation routes, flood warning systems and signage.**<br>~~further reduce flood levels for events up to and including the 100-year annual recurrence interval, including at private properties, within the road reserve at Bolton Street and around Sydenham Station.~~<br>Flood modelling to support detailed design would be carried out in accordance with the following guidelines:<br>• *Floodplain Development Manual* (NSW Government, 2005b)<br>• *Floodplain Risk Management Guideline: Practical Consideration of Climate Change* (DECC, 2007b)<br>• *Floodplain Risk Management Guide: Incorporating Sea Level Rise Benchmarks in Flood Risk Assessments* (DECCW, 2010c)<br>• *New guideline and changes to section 117 direction and EP&A Regulation on flood prone land, Planning Circular PS 07-003* (NSW Department of Planning, 2007).<br>**Flood modelling and consideration of mitigation measures would be carried out in consultation with the relevant local councils, the Office of Environment and Heritage and the State Emergency Services.**<br>**Not worsen is defined as:**<br>• **A maximum increase flood levels of 50mm in a 100 year Average Recurrence Interval flood event**<br>• **A maximum increase in time of inundation of one hour in a 100 year Average Recurrence Interval flood event**<br>• **No increase in the potential for soil erosion and scouring from any increase in flow velocity in a 100 year Average Recurrence Interval flood event.** | ~~MDS~~ **All except metro rail tunnels** |
| FH10 | **During detailed design, project infrastructure would be designed to meet the following criteria, where feasible and reasonable:**<br>• **Locate station and service entrances to underground stations above the greater of the 100 year annual recurrence interval flood level plus 500mm or the probable maximum flood level**<br>• **Provide site surface grading and drainage collection systems at the Chatswood and Marrickville dive structures to manage the risk of local catchment and overland flooding for events up to and including the probable maximum flood event**<br>• **Locate aboveground rail system facilities (such as traction power supply sub stations) at least above the 100 year annual recurrence interval flood level plus 500mm**<br>• **Protect facilities that are identified as being critical to emergency response operations from the probable maximum flood level.** | **All except metro rail tunnels** |

| ID | Mitigation measure | Applicable location(s)[1] |
|---|---|---|
| **Air quality** | | |
| **AQ1** | The engines of all on-site vehicles and plant would be switched off when not in use for an extended period. | All |
| **AQ2** | Plant would be well maintained and serviced to minimise emissions. Emissions from plant would be considered as part of pre-acceptance checks. | All |
| **AQ3** | Construction site layout and placement of plant would consider air quality impacts to nearby receivers. | All except metro rail tunnels |
| **AQ4** | Hard surfaces would be installed on long term haul routes and regularly cleaned. | All except metro rail tunnels |
| **AQ5** | Unsurfaced haul routes and work area would be regularly damped down in dry and windy conditions. | All except metro rail tunnels |
| **AQ6** | All vehicles carrying loose or potentially dusty material to or from the site would be fully covered. | All except metro rail tunnels |
| **AQ7** | Stockpiles would be managed to minimise dust generation. | All except metro rail tunnels |
| **AQ8** | Demolition would be managed to minimise dust generation. | All except metro rail tunnels |
| **AQ9** | Ventilation from acoustic sheds would be filtered. | CDS, CN, VC, BN, MP, PS, WS, MDS |
| **Hazard and risk** | | |
| **Construction** | | |
| **HR1** | All hazardous substances that may be required for construction would be stored and managed in accordance with the *Storage and Handling of Dangerous Goods Code of Practice* (WorkCover NSW, 2005) and *Hazardous and Offensive Development Application Guidelines: Applying SEPP 33* (Department of Planning, 2011). | All |
| **HR2** | Dial before you dig searches and non-destructive digging would be carried out to identify the presence of underground utilities. | All |
| **HR3** | A hazardous material survey would be completed for those buildings and structures suspected of containing hazardous materials (particularly asbestos) prior to their demolition. If asbestos is encountered, it would be handled and managed in accordance with relevant legislation, codes of practice and Australian standards. | CDS, CN, VC, MP, PS, CS, WS, MDS |
| **HR4** | The method for delivery of explosives would developed prior to the commencement of blasting in consultation with the Department of Planning and Environment and be timed to avoid the need for on-site storage. | CN, VC, BN, MP, PS, WS |
| **Operation** | | |
| **HR5** | All hazardous substances that may be required for operation would be stored and managed in accordance with the *Storage and Handling of Dangerous Goods Code of Practice* (WorkCover NSW, 2005) and *Hazardous and Offensive Development Application Guidelines: Applying SEPP 33* (Department of Planning, 2011). | All |

| ID | Mitigation measure | Applicable location(s)[1] |
|---|---|---|
| **Waste management** | | |
| **Construction** | | |
| **WM1** | All waste would be assessed, classified, managed and disposed of in accordance with the *NSW Waste Classification Guidelines*. | All |
| **WM2** | 100 per cent of spoil that can be reused would be beneficially reused in accordance with the project spoil reuse hierarchy. | All |
| **WM3** | A recycling target of at least 90 per cent would be adopted for the project. | All |
| **WM4** | Construction waste would be minimised by accurately calculating materials brought to the site and limiting materials packaging. | All |
| **Operation** | | |
| **WM5** | Generation of operation phase waste would be minimised. | All |
| **Sustainability** | | |
| **Construction** | | |
| **SUS1** | Sustainability initiatives would be incorporated into the detailed design and construction of the project to support the achievement of the project sustainability objectives. | All |
| **SUS2** | A best practice level of performance would be achieved using market leading sustainability rating tools during design and construction. | All |
| **SUS3** | A workforce development and industry participation strategy would be developed and implemented during construction. | All |
| **SUS4** | Climate change risk treatments would be incorporated into the detailed design of the project including:<br>• Ensuring that adequate flood modelling is carried out and integrated with design<br>• Testing the sensitivity of air-conditioning systems to increased temperatures, and identify potential additional capacity of air-conditioning systems that may be required within the life of the project, with a view to safeguarding space if required<br>• Testing the sensitivity of ventilation systems to increased temperatures and provide adequate capacity. | All |
| **SUS5** | An iterative process of greenhouse gas assessments and design refinements would be carried out during detailed design and construction to identify opportunities to minimise greenhouse gas emissions.<br>Performance would be measured in terms of a percentage reduction in greenhouse gas emissions from a defined reference footprint. | All |
| **SUS6** | 25 per cent of the greenhouse gas emissions associated with consumption of electricity during construction would be offset. | All |

| ID | Mitigation measure | Applicable location(s)[1] |
|---|---|---|
| **Operation** | | |
| **SUS7** | Sustainability initiatives would be incorporated into the operation of the project to support the achievement of the project sustainability objectives. | All |
| **SUS8** | Periodic review of climate change risks would be carried out to ensure ongoing resilience to the impacts of climate change. | All |
| **SUS9** | A workforce development and industry participation strategy would be developed and implemented during operation. | All |
| **SUS10** | 100 per cent of the greenhouse gas emissions associated with consumption of electricity during operation would be offset. | All |
| **Cumulative impacts** | | |
| **CU1** | Transport for NSW would manage and co-ordinate the interface with projects under construction at the same time. Co-ordination and consultation with the following stakeholders would occur, where required:<br>• CBD Coordination Office<br>• Department of Planning and Environment<br>• Roads and Maritime Services<br>• Sydney Trains<br>• NSW Trains<br>• Sydney Buses<br>• Sydney Water<br>• Port Authority of NSW<br>• Willoughby Council<br>• North Sydney Council<br>• City of Sydney Council<br>• Marrickville Council<br>• Sydney Motorways Corporation<br>• Barangaroo Delivery Authority<br>• Emergency service providers<br>• Utility providers<br>• Construction contractors.<br>Co-ordination and consultation with these stakeholders would include:<br>• Provision of regular updates to the detailed construction program, construction sites and haul routes<br>• Identification of key potential conflict points with other construction projects<br>• Developing mitigation strategies in order to manage conflicts. Depending on the nature of the conflict, this could involve:<br>  ◆ Adjustments to the Sydney Metro construction program, work activities or haul routes; or adjustments to the program, activities or haul routes of other construction projects<br>  ◆ Co-ordination of traffic management arrangements between projects. | All |

1 *STW: Surface track works; CDS: Chatswood dive site; AS: Artarmon substation; CN: Crows Nest Station; VC: Victoria Cross Station; BP: Blues Point temporary site; GI: Ground improvement works; BN: Barangaroo Station; MP: Martin Place Station; PS: Pitt Street Station; CS: Central Station; WS: Waterloo Station; MDS: Marrickville dive site; Metro rail tunnels: Metro rail tunnels not related to other sites (eg TBM works); PSR: Power supply routes.*

## 11.3 Revised environmental performance outcomes

The environmental performance outcomes presented in Chapter 27 of the Environmental Impact Statement have been revised on the basis of submissions received, the additional assessment work carried out and the preferred infrastructure report.

Table 11-2 provides the revised environmental performance outcomes. This table supersedes the environmental performance outcomes presented in the Environmental Impact Statement. New environmental performance outcomes or additions to existing environmental performance outcomes are shown in **bold** text, with deletions shown with a ~~strikethrough~~.

**Table 11-2 Revised environmental performance outcomes**

| Relevant Secretary's environmental assessment requirements desired performance outcomes | Environmental performance outcome |
|---|---|
| **Construction traffic and transport** | |
| **Transport and traffic**<br>Network connectivity, safety and efficiency of the transport system in the vicinity of the project are managed to minimise impacts.<br>The safety of transport system customers is maintained.<br>Impacts on network capacity and the level of service are effectively managed.<br>Works are compatible with existing infrastructure and future transport corridors. | • The project would minimise impacts to the road network<br>• Pedestrian and cyclist safety would be maintained<br>• Effective coordination would be carried out to minimise cumulative network impacts<br>• Access to properties would be maintained. |
| **Operational traffic and transport** | |
| **Transport and traffic**<br>Network connectivity, safety and efficiency of the transport system in the vicinity of the project are managed to minimise impacts.<br>The safety of transport system customers is maintained.<br>Impacts on network capacity and the level of service are effectively managed.<br>Works are compatible with existing infrastructure and future transport corridors. | • The project would appropriately integrate with existing and planned future transport infrastructure including active transport<br>• Access to properties would be maintained<br>• Metro customers would be provided with a safe and secure service<br>• The project would reduce station crowding, increase rail network reach and use, improve network resilience, and improve travel times within the global economic corridor. |
| **Construction noise and vibration** | |
| **Noise and vibration – amenity**<br>Construction noise and vibration (including airborne noise, ground-borne noise and blasting) are effectively managed to minimize adverse impacts on acoustic amenity.<br>**Noise and vibration – structural**<br>Construction noise and vibration (including airborne noise, ground-borne noise and blasting) are effectively managed to minimize adverse impacts on the structural integrity of buildings and items including Aboriginal places and environmental heritage. | • Noise levels would be minimised with the aim of achieving the noise management levels where feasible and reasonable<br>• The project would avoid any damage to buildings from vibration. |

| Relevant Secretary's environmental assessment requirements desired performance outcomes | Environmental performance outcome |
|---|---|
| **Operational noise and vibration** | |
| **Noise and vibration – amenity**<br>Increases in noise emissions and vibration affecting nearby properties and other sensitive receivers during operation of the project are effectively managed to protect the amenity and well-being of the community.<br>**Noise and vibration – structural**<br>Increases in noise emissions and vibration affecting environmental heritage as defined in the *Heritage Act 1977* during operation of the project are effectively managed. | • Noise levels would comply with the Rail Infrastructure Noise Guidelines (Environment Protection Authority, 2013).<br>• The project would avoid any damage to buildings from vibration. |
| **Landuse and property** | |
| **Socio-economic, land use and property**<br>The project minimises impacts to property and business and achieves appropriate integration with adjoining land uses, including maintenance of appropriate access to properties and community facilities, and minimisation of displacement of existing land use activities, dwellings and infrastructure. | • The project would be appropriately integrated into local landuse planning strategies<br>• The surface footprint of the project would be minimised<br>• The project would provide substantial future development opportunities. |
| **Business impacts** | |
| **Socio-economic, land use and property**<br>The project minimises adverse social and economic impacts and capitalises on opportunities potentially available to affected communities.<br>The project minimises impacts to property and business and achieves appropriate integration with adjoining land uses, including maintenance of appropriate access to properties and community facilities, and minimisation of displacement of existing land use activities, dwellings and infrastructure. | • The project would minimise impacts on businesses during construction<br>• During operation, the project would improve access to businesses for employees and customers, and connectivity between businesses within the global economic corridor. |
| **Non-Aboriginal heritage** | |
| **Heritage**<br>The design, construction and operation of the project facilitates, to the greatest extent possible, the long term protection, conservation and management of the heritage significance of items of environmental heritage and Aboriginal objects and places.<br>The design, construction and operation of the project avoids or minimises impacts, to the greatest extent possible, on the heritage significance of environmental heritage and Aboriginal objects and places. | • The project would be sympathetic to heritage items and, where feasible and reasonable, avoid and minimise impacts to non-Aboriginal heritage items and archaeology<br>• The design of the project would reflect the input of an independent heritage architect, relevant stakeholders and the design review panel. |

| Relevant Secretary's environmental assessment requirements desired performance outcomes | Environmental performance outcome |
|---|---|
| **Aboriginal heritage** | |
| **Heritage**<br>The design, construction and operation of the project facilitates, to the greatest extent possible, the long term protection, conservation and management of the heritage significance of items of environmental heritage and Aboriginal objects and places.<br>The design, construction and operation of the project avoids or minimises impacts, to the greatest extent possible, on the heritage significance of environmental heritage and Aboriginal objects and places. | The project would be sympathetic to heritage items and, where feasible and reasonable, avoid and minimise impacts to Aboriginal heritage items and archaeology<br>The design of the project would reflect the input of an independent heritage architect, relevant stakeholders and the design review panel. |
| **Landscape character and visual amenity** | |
| **Urban design**<br>The project design complements the visual amenity, character and quality of the surrounding environment.<br>The project contributes to the accessibility and connectivity of communities.<br>**Visual amenity**<br>The project minimises adverse impacts on the visual amenity of the built and natural environment (including public open space) and capitalises on opportunities to improve visual amenity. | During operation, the project would make a positive contribution to the quality of the urban environment at each station site<br>During operation, the project would minimise change to landscape character in the vicinity of the dive structures and Artarmon substation<br>The project would be visually integrated with its surroundings. |
| **Groundwater and geology** | |
| **Water – hydrology**<br>Long term impacts on surface water and groundwater hydrology (including drawdown, flow rates and volumes) are minimised. The environmental values of nearby, connected and affected water sources, groundwater and dependent ecological systems including estuarine and marine water (if applicable) are maintained (where values are achieved) or improved and maintained (where values are not achieved).<br>Sustainable use of water resources. | • The project would make good any impacts on groundwater users<br>• The project would avoid any damage to buildings from settlement. |

| Relevant Secretary's environmental assessment requirements desired performance outcomes | Environmental performance outcome |
|---|---|
| **Soils, contamination and water quality** | |
| **Soils**<br>The environmental values of land, including soils, subsoils and landforms, are protected.<br>Risks arising from the disturbance and excavation of land and disposal of soil are minimised, including disturbance to acid sulfate soils and site contamination.<br>**Water – quality**<br>The project is designed, constructed and operated to protect the NSW Water Quality Objectives where they are currently being achieved, and contribute towards achievement of the Water Quality Objectives over time where they are currently not being achieved, including downstream of the project to the extent of the project impact including estuarine and marine waters (if applicable). | • Erosion and sediment controls during construction would be implemented in accordance with *Managing Urban Stormwater: Soils and Construction Volume 1* (Landcom, 2004) and *Managing Urban Stormwater: Soils and Construction Volume 2* (Department of Environment and Climate Change, 2008a)<br>• There would be no impacts on aquatic environments associated with the disturbance of acid sulfate soils during construction<br>• Any contamination on project sites would be remediated to suit future land use<br>• The project would protect or contribute to achieving the Water Quality Objectives, during construction and operation<br>• Construction water quality discharge would comply with the requirements of an environment protection licence issued to the project<br>• Operation water quality discharge would comply with a discharge criteria determined in consultation with the NSW Environment Protection Authority. |
| **Social impacts and community facilities** | |
| **Socio-economic, land use and property**<br>The project minimises adverse social and economic impacts and capitalises on opportunities potentially available to affected communities.<br>The project minimises impacts to property and business and achieves appropriate integration with adjoining land uses, including maintenance of appropriate access to properties and community facilities, and minimisation of displacement of existing land use activities, dwellings and infrastructure. | • The project would avoid long term impacts (during operation) on the availability and quality of public open space and community facilities<br>• The project, during operation, would help to improve access to local facilities, services and destinations, supporting opportunities for community interaction. |
| **Biodiversity** | |
| **Biodiversity**<br>The project design considers all feasible measures to avoid and minimise impacts on terrestrial and aquatic biodiversity.<br>Offsets and/or supplementary measures are assured which are equivalent to any remaining impacts of project construction and operation. | • The biodiversity outcome would be consistent with the Framework for Biodiversity Assessment<br>• The project would minimise impacts to biodiversity. |

| Relevant Secretary's environmental assessment requirements desired performance outcomes | Environmental performance outcome |
|---|---|
| **Flooding and hydrology** | |
| **Flooding**<br>The project minimises adverse impacts on existing flooding characteristics. Construction and operation of the project avoids or minimises the risk of, and adverse impacts from, infrastructure flooding, flooding hazards, or dam failure.<br>**Water – hydrology**<br>Long term impacts on surface water and groundwater hydrology (including drawdown, flow rates and volumes) are minimised. The environmental values of nearby, connected and affected water sources, groundwater and dependent ecological systems including estuarine and marine water (if applicable) are maintained (where values are achieved) or improved and maintained (where values are not achieved).<br>Sustainable use of water resources. | ○ Changes to overland flow diversions during construction would meet the following criteria:<br>♦ **Not worsen existing flooding characteristics up to and including the 100 year annual recurrence interval event in the vicinity of the project (not worsen is defined as a maximum increase flood levels of 50mm in a 100 year Average Recurrence Interval flood event, a maximum increase in time of inundation of one hour in a 100 year Average Recurrence Interval flood event, and no increase in the potential for soil erosion and scouring from any increase in flow velocity in a 100 year Average Recurrence Interval flood event).**<br>♦ ~~Increases in flood levels during events up to and including the 100-year average recurrence interval would be minimised particularly within private properties~~<br>♦ ~~Any increase in flow velocity for events up to and including a 100-year average recurrence interval event would not increase the potential for soil erosion and scouring~~<br>♦ Dedicated evacuation routes would not be adversely impacted in flood events up to and including the probable maximum flood.<br>○ There would be no additional private properties affected by flooding up to and including the 100 year average recurrence interval event during operation<br>○ Flood levels would be increased by a maximum of 470 mm during the 100-year average recurrence interval event in the vicinity of the Marrickville dive structure during operation<br>○ The performance of the downstream drainage network would be maintained during operation. |
| **Air quality** | |
| There are no Secretary's environmental assessment requirements relevant to air quality. | ○ Dust and exhaust emissions during construction would be minimised. |
| **Hazard and risk** | |
| There are no Secretary's environmental assessment requirements relevant to hazard and risk. | ○ The storage, use and transport of dangerous goods and hazardous substances would comply with *Hazardous and Offensive Development Application Guidelines: Applying SEPP 33* (Department of Planning, 2011)<br>○ There would be no unplanned or unexpected disturbance of utilities. |

| Relevant Secretary's environmental assessment requirements desired performance outcomes | Environmental performance outcome |
|---|---|
| **Waste Management** | |
| **Waste**<br>All wastes generated during the construction and operation of the project are effectively stored, handled, treated, reused, recycled and/or disposed of lawfully and in a manner that protects environmental values. | • All waste would be assessed, classified, managed and disposed of in accordance with the NSW Waste Classification Guidelines<br>• 100 per cent of spoil that can be reused would be beneficially reused in accordance with the project spoil reuse hierarchy.<br>• A recycling target of at least 90 per cent would be adopted for the construction of the project. |
| **Sustainability** | |
| **Sustainability**<br>The project reduces the NSW Government's operating costs and ensures the effective and efficient use of resources.<br>Conservation of natural resources is maximised. | • The project would be carried out in accordance with the Sydney Metro City & Southwest Environment and Sustainability Policy<br>• 25 per cent of the greenhouse gas emissions associated with consumption of electricity during construction would be offset<br>• 100 per cent of the greenhouse gas emissions associated with consumption of electricity during operation would be offset. |

# WHERE TO FIND RESPONSES TO INDIVIDUAL SUBMISSIONS

# Where to find responses to individual submissions

The following table identifies where individual Community and Other submissions in Chapter 8 have been responded to.

| Submission ID | Relevant report sections |
|---|---|
| 1 | 8.2.2, 8.3.2, 8.3.7, 8.3.8, 8.3.9, 8.5.4, 8.7.9, 8.12.5 |
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| 3 | 8.3.3, 8.8.6 |
| 4 | 8.2.2, 8.3.9 |
| 5 | 8.24.2 |
| 6 | 8.3.3 |
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| 8 | 8.3.2, 8.18.2 |
| 9 | 8.2.1, 8.5.1, 8.5.4 |
| 10 | 8.3.3, 8.4.1, 8.8.1 |
| 11 | 8.2.3, 8.3.3 |
| 12 | 8.9.1 |
| 13 | 8.3.3, 8.3.7, 8.3.8, 8.3.9, 8.5.1, 8.5.4, 8.5.7, 8.7.11, 8.8.5, 8.11.5, 8.13.2 |
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| 15 | 8.1.2, 8.3.6, 8.4.1, 8.5.3, 8.7.4, 8.8.6, 8.8.8, 8.9.7, 8.15.3, 8.19.1 |
| 16 | 8.3.3, 8.25.1 |
| 17 | 8.2.1, 8.3.3 |
| 18 | 8.7.11, 8.8.3, 8.9.6, 8.18.3 |
| 19 | 8.3.6, 8.8.3, 8.8.4 |
| 20 | 8.1.1, 8.2.1, 8.2.5, 8.3.7 |
| 21 | 8.3.5 |
| 22 | 8.3.2, 8.3.7 |
| 23 | 8.3.2 |
| 24 | 8.3.4 |
| 25 | 8.2.2, 8.3.2, 8.5.6 |
| 26 | 8.3.3 |
| 27 | 8.3.3 |
| 28 | 8.2.4, 8.3.3, 8.4.1 |
| 29 | 8.3.3 |
| 30 | 8.3.8, 8.5.4 |
| 31 | 8.3.3, 8.4.1, 8.8.1 |
| 32 | 8.3.3, 8.4.1, 8.8.1 |
| 33 | 8.3.3, 8.4.1, 8.8.1 |
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| 35 | 8.3.2, 8.3.3 |
| 36 | 8.3.3 |
| 37 | 8.8.3, 8.8.4, 8.8.6, 8.13.3, 8.18.3 |

| Submission ID | Relevant report sections |
|---|---|
| 38 | 8.3.7, 8.3.9 |
| 39 | 8.3.3 |
| 40 | 8.3.7, 8.3.9 |
| 41 | 8.3.3 |
| 42 | 8.3.5, 8.9.4, 8.11.7 |
| 43 | 8.1.2, 8.3.5, 8.4.2, 8.5.1, 8.7.2, 8.10.5, 8.23.1 |
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| 47 | 8.1.2, 8.3.5, 8.4.2, 8.5.1, 8.7.2, 8.10.5, 8.23.1 |
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| 53 | 8.5.2, 8.10.5 |
| 54 | 8.8.6, 8.9.2, 8.9.5, 8.10.3, 8.15.2 |
| 55 | 8.8.6, 8.9.2, 8.9.5, 8.10.3, 8.15.2 |
| 56 | 8.3.9 |
| 57 | 8.10.2 |
| 58 | 8.6.4, 8.9.2, 8.21.1 |
| 59 | 8.3.5, 8.10.2 |
| 60 | 8.3.5, 8.10.2 |
| 61 | 8.7.2, 8.7.4, 8.9.2, 8.12.4, 8.21.1 |
| 62 | 8.1.1, 8.3.5, 8.9.5, 8.10.2, 8.11.9 |
| 63 | 8.7.2, 8.9.4, 8.9.5, 8.21.1 |
| 64 | 8.3.5, 8.10.2 |
| 65 | 8.7.2, 8.7.4, 8.7.5, 8.7.11, 8.9.5, 8.21.2 |
| 66 | 8.6.4, 8.7.2, 8.7.4, 8.7.6, 8.7.7, 8.7.10, 8.9.4, 8.9.6, 8.12.4, 8.15.1, 8.26.2 |
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| 68 | 8.3.5, 8.10.2 |
| 69 | 8.2.1, 8.3.2, 8.5.4, 8.7.8, 8.8.3 |
| 70 | 8.6.4, 8.7.2, 8.7.4, 8.7.11 |
| 71 | 8.2.1, 8.5.4, 8.7.8 |
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| 291 | 8.2.3, 8.2.5, 8.3.9, 8.5.1, 8.5.2 |
| 292 | 8.2.3, 8.2.5, 8.3.9, 8.5.1, 8.5.2 |
| 293 | 8.9.2 |
| 294 | 8.3.9, 8.7.2, 8.8.3, 8.9.6 |
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| 297 | 8.2.1, 8.3.9, 8.4.3, 8.5.6, 8.6.1, 8.7.10, 8.7.11, 8.8.3, 8.8.6, 8.9.7, 8.10.5, 8.11.5, 8.11.7, 8.11.8, 8.12.2, 8.20.1, 8.20.2 |
| 298 | 8.2.5, 8.3.9, 8.7.11, 8.8.2, 8.9.7, 8.11.1, 8.11.7, 8.16.1 |
| 301 | 8.1.1, 8.2.1, 8.2.2, 8.2.3, 8.3.7, 8.3.9, 8.4.2, 8.18.3 |

# GLOSSARY AND REFERENCES

# Glossary and references

## Glossary

| Acronym | Definition |
|---|---|
| ACHAR | Aboriginal Cultural Heritage Assessment Report |
| AFG | Aboriginal Focus Group |
| AHAA | Aboriginal Heritage Archaeological Assessment |
| AHD | Australian Height Datum |
| AHIMS | Aboriginal Heritage Information Management System |
| ARD | Archaeological Research Design |
| ARI | Average Recurrence Interval |
| ARTC | Australian Rail Track Corporation |
| AS | Australian Standard |
| BCA | Building Code of Australia |
| BDA | Barangaroo Delivery Authority |
| C2E | Central to Eveleigh Urban Transformation and Transport Program |
| CBA | Commonwealth Bank of Australia |
| CBD | Central business district |
| CCTV | Closed-circuit television |
| CIRIA | Construction Industry Research and Information Association |
| CMP | Construction Management Plan |
| CNVS | Construction Noise and Vibration Strategy |
| COAG | Council of Australian Governments |
| CPTED | Crime Prevention Through Environmental Design |
| CRC | Cooperative Research Centre |
| CTMP | Construction Traffic Management Plan |
| dB | Decibels |
| dBA | A-weighted decibels |
| DEC | Department of Education |
| DOOH | Daytime out of hours |
| ECC | Ethnic Communities Council |
| EIS | Environmental Impact Statement |
| EMR | Electromagnetic Radiation |
| EPA | Environment Protection Authority |
| EP&A Act | *Environmental Planning and Assessment Act 1979* |
| EPBC Act | *Environment Protection and Biodiversity Act 1999* |
| EURO | European emissions standards |
| FBA | Framework for Biodiversity Assessment |
| ETCM | Enhanced Train Crowding Model |
| GLALC | Gadangarra Local Aboriginal Land Council |
| GTO | Group Training Organisation |

| Acronym | Definition |
|---|---|
| HCA | Heritage Conservation Area |
| HIA | Heritage Impact Assessment |
| HMAS | Her Majesty's Australian Ship |
| ISCA | Infrastructure Sustainability Council of Australia |
| LAHC | Land and Housing Corporation |
| LEP | Local environmental plan |
| LGA | Local government area |
| LOS | Level of Service |
| LPCTCC | Local Pedestrian, Cycling and Traffic Calming Committee |
| MLALC | Metropolitan Local Aboriginal Land Council |
| mm/s | Millimetres per second |
| NABERS | National Australian Built Environment Rating System |
| NSW | New South Wales |
| NTSCORP | Native Title Services Corporations Limited |
| NZS | New Zealand Standard |
| OEH | Office of Environment and Heritage |
| OLS | Obstacle Limitation Surface |
| OPT | Overseas Passenger Terminal |
| OSD | Over station development |
| PANS-OPS | Procedures for Air Navigation Services – Aircraft Operations |
| PAPI | Precision Approach Path Indicator |
| PCB | Polychlorinated biphenyls |
| PIR | Preferred Infrastructure Report |
| PMF | Probable Maximum Flood |
| PTPM | Public Transport Project Model |
| PV | Photovoltaic |
| RAPs | Registered Aboriginal Parties |
| RERU | Rail Emergency Response Unit |
| S170 | Listing under Section 170 of the *Heritage Act 1977* |
| SEARs | Secretary's Environmental Assessment Requirements |
| SHR | State Heritage Register |
| SDCP 2012 | *Sydney Development Control Plan 2012* |
| SLEP 2012 | *Sydney Local Environmental Plan 2012* |
| SMC | Sydney Motorway Corporation |
| TBM | Tunnel boring machine |
| TIA | Australian Government Translating and Interpreting Services |
| TSC Act | *Threatened Species Conservation Act 1995* |
| USB | Universal Serial Bus, a portable data storage device |
| WIRES | NSW Wildlife Information, Rescue and Education Service |

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