City & Southwest

Chatswood to Sydenham

Blues Point tunnel fit out access modification report

July 2020

Contents

1 Introduction

1.1 Overview

Planning approval for Sydney Metro City & Southwest Chatswood to Sydenham (the approved project) was granted by the Minister for Planning (now the Minister for Planning and Public Spaces) under section 5.19 of the *Environmental Planning and Assessment Act 1979 (*EP&A Act) on 9 January 2017.

The approved project includes the construction and operation of a 16.5 kilometre metro line from Chatswood, under Sydney Harbour and through Sydney's CBD onto Sydenham. It also includes seven new metro stations at Crows Nest, Victoria Cross, Barangaroo, Martin Place, Pitt Street and Waterloo, as well as new underground metro platforms at Central Station.

This forms part of the larger Sydney Metro City & Southwest project which also includes the upgrade of the 125-year-old T3 Bankstown Line to metro standards between Sydenham and Bankstown. This component received separate planning approval on 19 December 2018. In 2024 when both part of the project are completed, Sydney will have 31 metro railway stations and a 66 kilometre standalone metro railway system.

Since its determination, seven modifications have been approved to modify various aspects of the approved project. These approved modifications relate to Victoria Cross Station and Artarmon Substation, Central Walk, Martin Place Station, Sydenham Station and Sydney Metro Trains Facility South, Blues Point Acoustic Shed, and other administrative changes.

The approved project includes a temporary construction site at Blues Point including an acoustic shed to enable the retrieval of all elements of the tunnel boring machines launched from the Chatswood dive site and from Barangaroo. The Blues Point temporary site covers an area of about 2,100 square metres within Henry Lawson Reserve, at the end of Blues Point Road.

Since the project and modifications were approved and now that the tunnel excavation works have been completed, detailed construction planning has sought to identify the preferred access points to enable the completion of tunnel fit out works across the alignment, including in the under-harbour tunnels between Victoria Cross and Barangaroo.

The proposed modification would involve the following changes to the approved project at the Blues Point temporary site:

- Use of the site as the primary access point to fit out the under-harbour section of the rail tunnels between Victoria Cross and Barangaroo
- Continued use of the existing acoustic shed for up to an additional 12 months, with the shed to be removed prior to the Christmas/New Year's period in 2021/2022.

The approved site rehabilitation activities at Blues Point site would commence after the completion of the tunnel fit out works from early 2022.

The tunnel fit out works to be undertaken from the Blues Point temporary site involve:

- Concrete pours to form the track slab and rail fastening
- Rail installation and fixing
- Cable and equipment installation
- Overhead traction power installation
- Other equipment installation including lighting (including emergency lighting), drainage, and fire and life safety systems (including walkways connecting to emergency egress and fire hydrant systems).

The tunnel fit out works would be undertaken by Sydney Metro's Line-Wide Contractor, Systems Connect (joint venture between CPB Contractors and UGL).

The proposed modification is described further in Chapter 6 (Modification description).

1.2 Purpose and structure of this report

Pursuant to section 5.25 of the EP&A Act, Sydney Metro is seeking to modify the State significant infrastructure approval to address these changes to the approved project at Blues Point. This modification report includes:

- A description of the proposed modification to the approved project
- A justification for the proposed modification
- An assessment of the environmental and community impacts and benefits of the proposed modification.

The structure and content of this report is as follows:

- Section 1 – provides an introduction to the approved project and the proposed modification
- Section 2 – provides the strategic need, alternatives and justification for the proposed modification
- Section 3– outlines the consultation process and outcomes
- Section 4 – provides a description of the proposed modification
- Section 5 – provides an environmental screening and additional environmental assessment of changes in potential impacts of the proposed modification
- Section 6 – provides the approach to environmental management and revised mitigation measures resulting from changes in potential impacts of the proposed modification
- Section 7 – provides the justification for the proposed modification and conclusion of the environmental assessment. This section also provides supporting information including references and definitions.

2 Strategic justification, need and alternatives

This chapter outlines the strategic justification, need for the proposed modification and identifies the alternatives considered for the proposed modification.

2.1 Need for Sydney Metro Chatswood to Sydenham (approved project)

The approved project was developed within the framework of the transport and planning strategies identified in State government policies. At the time of the approval this included the *12 NSW Premier priorities* (established to grow the economy, deliver infrastructure, and improve health, education and other services across NSW), *Sydney's Rail Future: Modernising Sydney's Trains*, and the *Future Transport 2056* strategy.

These polices indicate a strategic need to:

- Significantly increase public transport capacity in key parts of the network, especially to the Sydney CBD and the Global Economic Corridor
- Drive productivity through integrated transport and land use planning to realise the productivity benefits of having businesses close together enabling increased interaction, knowledge sharing and collaboration
- Effectively develop infrastructure to cement Sydney's position among the world's most liveable cities and Australia's only global city.

The approved project will deliver a step-change in the capacity of Sydney's rail network by providing a fully automated rail system with a high capacity, turn-up-and-go service. Sydney Metro, together with signalling and infrastructure upgrades across the existing network, will increase the capacity of train services entering the Sydney CBD – from about 120 an hour currently, to up to 200 services an hour beyond 2024. That's an increase of up to 60 per cent capacity across the network to meet demand. There will be ultimate capacity for a metro train every two minutes in each direction under the Sydney city centre.

Other key benefits of the approved project include:

- Doubling the number of train paths available from the north
- Strengthening connections and access across Sydney, particularly within the Global Economic Corridor
- Providing new connections to the rail network – including connections to the T4 Eastern Suburbs Line, and direct connections between the Sydney CBD and the north west
- Improving the capacity, reliability and efficiency of the existing transport system, by relieving the pressure on existing rail lines, Sydney CBD train stations, the Sydney CBD, North Sydney and Sydney South bus routes, and the Sydney CBD road network
- Providing a catalyst for urban renewal opportunities particularly around the new stations at Crows Nest, Victoria Cross, Barangaroo and Waterloo
- Providing opportunities for the renewal of the ageing Waterloo social housing estate including a mix of private, affordable and social housing
- Improving network resilience through the Sydney CBD and across Sydney Harbour by providing an additional rail route.

2.1.1 Need for the approved works at Blues Point

A temporary site was identified at Blues Point to support the construction of the twin tunnels as part of the approved project. A site at Blues Point was required to:

- Retrieve all components of the tunnel boring machines launched from the Chatswood dive site as these machines cannot work under Sydney Harbour
- Retrieve all components of the specialised tunnel boring machine launched from Barangaroo which has been designed specifically to tunnel under Sydney Harbour.

A temporary acoustic shed is in place over the retrieval shaft to minimise the construction impacts associated with the approved works at Blues Point.

2.2 Need, alternatives and justification for the proposed modification

2.2.1 Tunnel fit out access

The Environmental Impact Statement assumed the main tunnel fit out would occur from the Chatswood and Marrickville dive sites. The Environmental Impact Statement identified that secondary access via underground stations would be possible, however this access would diminish as the station fit out progresses.

During original construction planning, Barangaroo was proposed as the main access point for under-harbour tunnel fit out works between Victoria Cross and Barangaroo. Due to unforeseen circumstances including engineering and design challenges during excavation works, a significant heritage find in 2018 of a 180-year old timber boat, and the ongoing construction work required within Barangaroo Station, the use of Barangaroo as the main access point for these works is no longer viable. Due to the development within the surrounding area at Barangaroo there are no other opportunities to access the tunnels via an alternative shaft.

Subsequently, detailed construction planning has sought to identify access points to enable the timely completion of under-harbour tunnel fit out works between Victoria Cross and Barangaroo. All potential access points were reviewed for their suitability to enable these works.

Victoria Cross Station has a small and enclosed access to the station cavern which means that this site is not viable for the tunnel fit out activities. In addition, the construction works to be undertaken at Victoria Cross Station from early 2021 would block access to north of this section of tunnel, including from the Chatswood dive site.

The Blues Point temporary site was reviewed for its suitability and it was identified as the only remaining access point for the majority of the tunnel fit out works between Victoria Cross and Barangaroo. Blues Point temporary site includes an access shaft to the tunnels below which would enable the efficient delivery of the materials to complete these works within the required construction timeframe. By temporarily utilising the Blues Point site it would remove the construction interfaces with and potential delays to the completion of the station construction works at Barangaroo and Victoria Cross, as well as minimising potential delays to the overall project program.

Once the rail is placed within the tunnels between Victoria Cross and Barangaroo, rail installation and fixing works and the remaining tunnel fit out works would be undertaken from the Blues Point temporary site.

As such, the use of Blues Point temporary site is the only viable option to complete tunnel fit out works between Victoria Cross and Barangaroo to ensure the overall construction timeframe of the project is maintained.

2.2.2 Road or marine material transport

As identified in the Environmental Impact Statement, a main component of tunnel fit out work includes concrete pours to form the track slab. Tunnel fit out works would also require the delivery of materials to complete rail installation and fixing work and the complete installation of cable and equipment, overhead traction power, lighting, drainage and fire and life safety systems. Therefore, completion of the tunnel fit out works is reliant on the efficient transport of materials (particularly concrete) to site.

Transport of the tunnel fit out materials would not be possible by barge to the Blues Point temporary site due to the:

- Inability to guarantee transport times for material delivery as required throughout the day given the dependence on safety procedures, tides, weather conditions and the requirements of the Harbour Master. In particular, guaranteed transport times are critical for concrete deliveries due to setting and curing times.
- Safety and environmental risks posed by transporting fully loaded concrete trucks on a barge through Sydney Harbour.

As such, access to the site for delivery of all tunnel fit out materials is proposed by road only.

During the proposed works, truck movements would predominantly occur during standard construction hours. As tunnel fit out works are approved to be undertaken 24 hours per day seven days a week, a minimal number of deliveries of materials (excluding concrete) to the site are proposed out of standard hours. Concrete deliveries would predominately occur during standard construction hours, however in the event a concrete pour is required to be finalised, concrete truck movements may continue to ensure the concrete pour is completed.

As the jetty and barging facility is not required, they were removed by the Tunnel and Station Excavation (TSE) contractor in June 2020 in accordance with the approved project.

2.2.3 Acoustic shed

To minimise construction impacts of these proposed works, the tunnel fit out contractor proposes to continue to use the existing acoustic shed at the site for up to an additional 12 months.

The existing shed would continue to cover the excavated shaft site and reduce noise impacts to surrounding residents as a result of the proposed works. The existing acoustic shed would be maintained, in the same size and position. The overall site footprint would be similar with the front section of the site proposed to be set back slightly which would provide access to the beach on Sydney Harbour (see Figure 5-4).

The current gantry crane within the shed is too large and slow to support the tunnel fit out works and is subsequently being removed from late June 2020 over a period of approximately four weeks. To enable this, the front wall of the acoustic shed (i.e. the wall near the harbour with roller door) and the first bay of the roof has been removed.

Should the proposed modification be approved, the tunnel fit out contractor would then install a smaller crane (more suited to the frequent, rapid lifts required for the tunnel fit out works) within the shed and reinstate the removed acoustic shed wall and roof panel.

A smaller acoustic shed was considered however the time and cost to remove the existing acoustic shed and reinstall a slightly smaller acoustic shed to fit the smaller crane was not considered value for money and would contribute additional noise impacts during the demobilisation and reinstallation of the shed.

The proposed continued use of the acoustic shed would provide the following key benefits:

- Reduced noise impacts on surrounding sensitive receivers, particularly during deliveries and works outside standard daytime hours
- Continued security at the shaft site.

An alternative option of removing the acoustic shed for the duration of the proposed works was not considered due to the nature of the proposed works and the subsequent noise impacts to surrounding residents, which would be largely mitigated by the acoustic shed.

The acoustic shed is therefore proposed to be in place for up to an additional 12 months and would be removed prior to the Christmas/New Year's period in 2021/2022. After which the Blues Point temporary site would be demobilised, rehabilitated and returned to the community in accordance with the approved project in early 2022.

3 Stakeholder and community engagement

This chapter provides an outline of the consultation carried out for the proposed modification. It identifies who has been consulted, how the consultation was carried out, the issues raised and how those issues have been addressed.

3.1 Overview

Engagement with the community and stakeholders about the Blues Point temporary site began in February 2016 and continued through the preparation of the Chatswood to Sydenham Environmental Impact Statement and again in August 2018 as part of the modification application to install the acoustic shed. Prior to, and on a continuing basis outside of the Environment Impact Statement process, Sydney Metro continues to proactively engage with the community and stakeholders.

Key stakeholders relevant to the Blues Point temporary site include (but are not necessarily limited to):

- NSW Government agencies
- North Sydney Council
- Public utilities, business and industry groups near the project
- Directly impacted communities
- The broader community.

This chapter provides an overview of the consultation activities carried out to date, specific to the proposed modification. Consultation activities during construction would be consistent with approach for the approved project.

3.2 Consultation to date

3.2.1 Government agencies

Key government agencies have been consulted on the proposed modification, including:

- Department of Planning, Industry and Environment
- North Sydney Council.

3.2.2 Community – special interest groups

Local community groups consulted on the proposed modification included:

- Union Precinct Committee
- North Sydney Sunrise Rotary Club.

3.2.3 Community – residents, businesses and other stakeholders

Early consultation in relation to the proposed modification was undertaken with the community and stakeholders throughout June 2020. The consultation activities undertaken included distribution of a letter to targeted stakeholders, a project update to the local area outlining the proposed modification, an electronic version of the project updated emailed to the Blues Point stakeholder distribution list, two interactive online information sessions, responses to individual email enquiries and phone calls to key stakeholders.

Due to the Covid-19 social distancing restrictions, briefings and information sessions were held via online platforms. At these sessions, senior Sydney Metro project team members provided details about the proposed modification and answered questions from the community and stakeholders. The sessions included an open Q&A where attendees could directly address questions and provide their feedback to the project team.

A summary of the feedback received is provided in Section 3.3.

3.3 Feedback

The feedback received during the consultation activities has been considered during the preparation of this modification report has been summarised in Table 3-1.

Table 3-1 Summary of feedback considered

Feedback / Comments	Response
Concern around the number of truck movements and impacts such as noise.	Refer to Sections 5.1.2, 5.1.3 and 5.2.2 of this report for further information on construction traffic and construction noise and vibration.
Concern around truck speed on Blues Point Road	Refer to Sections 5.1.2 and 5.1.3 of this report for further information on construction traffic.
Concern around pedestrian safety near site gate	Refer to Sections 5.1.2 and 5.1.3 of this report for further information on construction traffic.
Request that barging be used instead of local roads	Due to constraints with barging the materials required for this scope of work, access to the site for delivery of all tunnel fit out materials is proposed by road only. Refer to Section 2.2.2 of this report.
Concern around the visual amenity impacts for adjacent residents	Refer to Sections 5.3.1, 5.3.2 and 5.3.3 of this report for further information on landscape character and visual amenity.
Concern around the limited access to Henry Lawson Reserve for the public and local residents, including during New Year's Eve celebrations	Refer to Sections 5.4.1, 5.4.2 and 5.4.3 of this report for further information on social impacts.
Interest in the involvement of Sydney Metro in the park reinstatement	Sydney Metro is responsible for the reinstatement of Henry Lawson Reserve and will work with North Sydney Council and local stakeholders as part of a masterplan for this area.
Concern around financial impacts on owners due to the impacts of construction and the acoustic shed	While we appreciate the temporary impacts on property owners and tenants, financial compensation is not offered as a result of project works performed in accordance with planning approvals provided by the Department of Planning, Industry and Environment.
Interest in the type of work that the Line-Wide contractor will be undertaking	Refer to Section 4 of this report which outlines the description of work.

Feedback / Comments	Response
Concern around light spill from the site	Refer to Section 5.3.2 of this report for further information on landscape character and visual amenity.
Question about why the shed size cannot be reduced if Line-wide work is less impactful	Refer to Section 2.2.3 of this report regards to alternatives considered for the acoustic shed.
Request for more information about why alternative access points cannot be used	Refer to Section 2.2.1 of this report which considers the suitability and availability of all alternative access points.
Comment that community trust has been broken by this proposal	We acknowledge the disappointment of the local community that the area will not returned in the original planned timeframe. Sydney Metro will continue to provide regular information and communications to the community during construction.
Request to use Barangaroo or other access point if they become available	If alternative access points become available they will be utilised to reduce impact at Blues Point.
Comment that the tunnelling contractor's place manager has provided excellent communications	Noted. Sydney Metro will continue to provide information and updates on the project as work progresses.
Comment that the extension is for 18 months, not 12 months	The Environmental Impact Statement and the 2018 modification had the original timeline for use of the Blues Point site ending in Q1 2021. The acoustic shed was expected to be decommissioned prior to the 2020/2021 Christmas/New Year Period, with rehabilitation work to be completed in early 2021. With this proposal the shed would come down one year later (by the 2021/2022 Christmas/New Year period) with rehabilitation work taking place in early 2022.
Suggestion to delay station construction work at Crows Nest so that the Blues Point community is not impacted	The Crows Nest site will be used for a number of months to bring in and weld rail tracks before station construction commences. Delays to station construction at this site would impact the overall Sydney Metro program. Refer to Section 2.2.1 of this report for further information.
Comment around why the project did not know earlier that this site would be required for Line-Wide access	Refer to Section 2.2.1 of this report regarding the need for the modification.

Feedback / Comments	Response
Comment that early engagement about this proposal is not consultative	The purpose of Sydney Metro's early engagement was to provide the community with a detailed overview of the proposed modification, enabling them to ask questions and provide their feedback. Feedback was gathered through various consultation methods such as phone conversations, emails and online sessions. This feedback was used to inform the preparation of this report. The community will have further opportunities to provide their comments during the public exhibition period run by the Department of Planning, Industry and Environment.
Question around a 'Plan B' if this proposal is rejected	If this modification proposal is not approved by the Department of Planning, Industry and Environment, adjustments to the construction program will be required that could cause delays to the opening of this critical infrastructure project which will keep Sydney moving.
Comment that Sydney Metro might seek to extend this proposal past early 2022 due to unfinished or other works	There is high confidence in the proposed timeframe due to the type of work being undertaken by the Line-Wide contractor. The tunnel fit out work is not subject to the same unknowns as excavation work.
Question around whether delays have been caused by COVID-19 restrictions	Sydney Metro construction sites have been operating under strict NSW Health rules to protect workers during COVID-19 while continuing to deliver essential work for the Sydney Metro City & Southwest project. The physical distancing restrictions have not caused delays to the program.
Suggestion to access the tunnel via an expanded or new shaft at Barangaroo	Due to multiple developments in the Barangaroo area, there is no availability to expand the project footprint to enable an alternative tunnel access point. Refer to Section 2.2.1 of this report.
Question around whether population density at other locations was a factor in the choice of Blues Point	The use of access points for tunnel fit out was determined based on review of the construction program. Refer to Section 2.2.1 of this report.
Question around the use of the site between now and the beginning of 2021 per the existing approval	The tunnelling contractor will be working in the area until late 2020. The community will continue to be informed of upcoming work through regular project communications.
Question around whether there will be acoustic or pollution monitoring given there is a playground nearby	Refer to Section 5.2.1of this report for further information on noise and vibration.
Comment that residents are subject to noise and inconvenience but get no benefit from the project.	Refer to Section 2.1 of this report regarding the need for the approved project.

3.4 Public exhibition of this report

The Department of Planning, Industry and Environment will place this report on public exhibition. During the exhibition period, government agencies, stakeholders and the community will be able to review this report and will have an opportunity to make a written submission to the Department of Planning, Industry and Environment for consideration in its assessment of the proposed modification.

Consultation activities planned to be undertaken by Sydney Metro during the public exhibition of this report will include:

- Contact points (i.e. Community Information Line and email address)
- Project website
- Email notification of the exhibition.

Briefings to key stakeholders and residents in proximity to the site can be undertaken upon request.

3.4.1 Consideration of submissions

At the completion of the public exhibition period for the modification, the Department of Planning, Industry and Environment will collate and provide Sydney Metro with a copy of all submissions received. If required, the Department of Planning, Industry and Environment may request that Sydney Metro respond to the relevant issues raised in the submissions. If responses to submissions are required, the responses will be made publicly available on the Department of Planning, Industry and Environment website. Anyone making a public submission will receive a letter notifying them of the publication of the responses to submissions on the Department of Planning, Industry and Environment website.

3.5 Future consultation and engagement

Should the proposed modification be approved, the project team would continue to consult with the community and key stakeholders during the planning and construction of the project. In general, this consultation would involve:

- Ongoing consultation with key stakeholders, local council and other government agencies
- Provision of regular updates to the nearby community
- Seeking community feedback on the draft park reinstatement design
- Development and implementation of a site-specific Community Communications Strategy.

Further details regarding stakeholder and community involvement requirements during project delivery are outlined in the Construction Environmental Management Framework (provided as part of the Submissions and Preferred Infrastructure Report for the approved project).

4 Modification description

To provide access to complete the under-harbour tunnel fit out works more efficiently, the proposed modification would involve the following changes to the approved project at the Blues Point temporary site:

- Use of the site as the primary access point to fit out the section of the rail tunnels between Victoria Cross and Barangaroo
- Continued use of the existing acoustic shed for up to an additional 12 months, extending across a second Christmas/New Year's period, with the shed to be removed prior to the Christmas/New Year's period in 2021/2022.

The proposed tunnel fit out works to be undertaken from the Blues Point temporary site involve:

- Concrete pours to form the track slab and rail fastening
- Rail installation and fixing
- Cable and equipment installation
- Overhead traction power installation
- Other equipment installation including lighting (including emergency lighting), drainage, and fire and life safety systems (including walkways connecting to emergency egress and fire hydrant systems).

Construction activities on the surface would include:

- Works to install the smaller gantry crane and subsequent reinstatement of the front wall and the first bay of the roof of the acoustic shed
- Concrete deliveries including agitator truck unloading into the pump
- Unloading of trucks with heavy items (e.g. concrete rail sleepers).

The gantry crane inside the acoustic shed would be used to lower the materials from the shaft into the tunnels below. The fit out works would occur at the bottom of the shaft within the tunnels. The temporary acoustic shed would remain over the excavated shaft to minimise noise impacts associated with the tunnel fit out works.

Although activities associate with tunnel fit out works are approved to be undertaken 24 hours per day seven days a week, work to prepare for the tunnel fit out works within the acoustic shed would predominantly take place during standard construction hours:

- 7am to 6pm Monday to Friday
- 8am to 1pm Saturdays
- No works on Sundays or Public Holidays.

Out of hours (including evening and night time) work is expected to consist of delivery of materials (e.g. concrete rail sleepers, steel walkway components, steel pipework, steel cable containment and various sized cables) into the site, with a small logistics crew working in the shed to unload deliveries to be ready for following day shift. Concrete deliveries would occur during standard construction hours, however in the event a concrete pour is required to be finalised, concrete truck movements may continue to ensure the concrete pour is completed.

The proposed works would be completed within 12 months. The acoustic shed would be decommissioned and dismantled following completion of the tunnel fit out works prior to the Christmas/New Year's period 2021/2022. No construction works would take place at the site during New Year's Eve celebrations. The

approved site rehabilitation activities at Blues Point site would commence after the completion of the tunnel fit out works from early 2022.

5 Environmental screening assessment

This chapter provides a consideration of the potential for change to the impacts as assessed for the approved project and whether further assessment of each issue is required.

Consideration of each environmental issue as assessed for the approved project was carried out to determine the potential for change to the impacts and, therefore, whether further assessment of the potential impacts of the proposed modification is required. A screening assessment of the potential change in impacts is provided in Table 6-1.

Table 6-1 Environmental screening assessment

Issue	Potential change in impact?	Description
Construction traffic and transport	Yes	The Environmental Impact Statement assessed the construction traffic impact at Blues Point as 'insignificant' with no change to the level of service for key intersections as a result of the traffic movements. The proposed works require a similar traffic profile in the peak to the works originally assessed in the Environmental Impact Statement with the delivery of materials during standard hours and a limited number of deliveries out of standard hours. The construction traffic impacts are therefore considered to be consistent with the assessment in the Environmental Impact Statement however over a longer duration due to the extended use of Blues Point as the access site for tunnel fit out works. An assessment of potential changes to construction traffic and transport impacts associated with the proposed modification is provided in Section 5.1.
Operational traffic and transport	No	The proposed modification relates only to temporary construction activities and would not change the potential operational traffic and transport impacts of the project. An additional assessment of potential changes to operational traffic and transport impacts associated with the proposed modification is not considered necessary.
Construction noise and vibration	Yes	The installation of the smaller gantry crane and reinstatement of the acoustic shed walls would have localised, short-term construction noise impacts associated with the use of noise generating equipment and plant. The use of the existing acoustic shed would minimise the overall construction noise outcomes of the proposed tunnel fit out works at the Blues Point temporary site including unloading of deliveries of materials. The works on site would be for an additional 12 month period compared to activities previously assessed. The works would be undertaken in accordance with existing mitigation measures and the Construction Noise and Vibration Strategy. An assessment of potential changes to construction noise and vibration impacts associated with the proposed modification is provided in Section 5.2.

Issue	Potential change in impact?	Description
Operational noise and vibration	No	The proposed modification relates only to temporary construction activities and would not change the potential operational noise and vibration impacts of the project. An additional assessment of potential changes to operational noise and vibration impacts associated with the proposed modification is not considered necessary.
Land use and property	No	The proposed modification does not directly affect any additional land or property. The proposed modification relates to the temporary use of the Blues Point site and no permanent changes to land use are required. An additional assessment of potential changes to land use and property associated with the proposed modification is not considered necessary.
Business impacts	No	The proposed modification would not result in any additional direct or indirect impacts on businesses. An additional assessment of potential changes to business impacts associated with the proposed modification is not considered necessary.
Non-Aboriginal heritage	No	The approved temporary acoustic shed is located within the Buffer Zone of the World heritage listed Sydney Opera House and the views and vistas of the locally listed Blues Point Waterfront Group and Blues Point Tower. The acoustic shed is also located within the McMahons Point South heritage conservation area. As the proposed modification would not result in any changes to the location or size of the acoustic shed, no additional direct or indirect impacts on non-Aboriginal heritage are anticipated. An additional assessment of potential changes to non-Aboriginal heritage impacts associated with the proposed modification is not considered necessary. Works would continue to be undertaken in accordance with the approved Heritage Report.
Aboriginal heritage	No	The proposed modification would not involve additional excavation and therefore there would be no change to the potential Aboriginal heritage impacts of the approved project. Works would continue to be undertaken in accordance with the approved Aboriginal Cultural Heritage Assessment Report. An additional assessment of potential changes to Aboriginal heritage impacts associated with the proposed modification is not considered necessary.
Landscape character and visual amenity	Yes	The acoustic shed is proposed to remain for up to an additional 12 month period to reduce noise impacts on surrounding residents. The temporary visual impact of the proposed acoustic shed would remain for up to an additional 12 months. The proposed modification would not result in any changes to the location or size of the acoustic shed for the purpose of the proposal. An assessment of potential changes to visual amenity impacts associated with the proposed modification is provided in Section 5.3.
Groundwater and geology	No	The proposed modification would not involve additional excavation and therefore there would be no change to the potential groundwater or geology impacts of the approved project. An additional assessment of potential changes to groundwater and geology impacts associated with the proposed modification is not considered necessary.

Issue	Potential change in impact?	Description
Soils, contamination and water quality	No	The proposed modification would not involve additional excavation and therefore there would be no change to the potential soil, contamination or water quality impacts of the approved project. An additional assessment of potential changes to soils, contamination or water quality impacts associated with the proposed modification is not considered necessary.
Social impacts and community infrastructure	Yes	The proposed modification does not affect any additional land or property from what was assessed as part of the approved project. The proposed modification would require the use of the reserve at Blues Point for an additional 12 months compared with the approved project. An assessment of potential changes to social impacts associated with the proposed modification is provided in Section 5.4.
Biodiversity	No	The proposed modification would not involve any additional clearing of any additional vegetation or areas of biodiversity value. An additional assessment of potential changes to biodiversity impacts associated with the proposed modification is not considered necessary.
Flooding and hydrology	No	The acoustic shed across the site would continue to prevent rainwater from entering the excavated shaft. Any rainwater collected from the acoustic shed would be diverted to the existing drainage infrastructure (but no increase in volume). This is consistent with the approach identified in the Environmental Impact Statement for the capture and redirection of construction site runoff. Therefore there would be no change to potential flooding and hydrology impacts of the approved project. An additional assessment of potential changes to flooding and hydrology impacts associated with the proposed modification is not considered necessary.
Air quality	No	The proposed modification would not involve additional excavation. The proposed modification would not generate any significant additional exhaust emissions from construction plant and equipment. Therefore there would be no change to the potential air quality impacts of the approved project. An additional assessment of potential changes to air quality impacts associated with the proposed modification is not considered necessary.
Hazard and risk	No	The proposed modification would not change the type, likelihood or consequence of potential hazards and risks at the Blues Point temporary site for the approved project. An additional assessment of potential changes to hazard and risk associated with the proposed modification is not considered necessary.
Waste management	No	The tunnel fit out works for the project have not changed, although the primary access location has changed. An additional assessment of potential changes to waste management associated with the proposed modification is not considered necessary.

Issue	Potential change in impact?	Description
Sustainability	No	The proposed modification would continue to be undertaken in accordance with the Sydney Metro City & Southwest Sustainability Strategy and relevant objectives and initiatives. An additional assessment of potential changes to sustainability associated with the proposed modification is not considered necessary.
Cumulative impacts	No	The proposed modification would not result in any additional cumulative impacts at the Blues Point temporary site from those identified for the approved project. An additional assessment of potential changes to cumulative impacts associated with the proposed modification is not considered necessary.

The need for further detailed assessment of traffic and transport, noise and vibration, landscape character and visual amenity and social impacts was identified. This has been carried out and is summarised in the sections below.

5.1 Construction traffic and transport

5.1.1 Background

The Blues Point temporary site is located at the end of Blues Point Road, near the intersection with Henry Lawson Drive.

The heavy vehicle movements required at the Blues Point temporary site for the approved project, as identified and assessed in the Environmental Impact Statement, are provided in Figure 7-1. This graph shows peak heavy vehicle movements in the AM/PM peak periods would be up to four heavy vehicles per hour during the shaft excavation phase and up to one heavy vehicle per hour out of standard hours for tunnel boring machine (TBM) retrieval. Figure 7-2 illustrates the haulage routes for vehicles accessing the Blues Point temporary site during construction of the approved project.

The Environmental Impact Statement traffic assessment showed that during the peak periods, the level of service observed at each intersection in the base scenario (without construction traffic) is maintained once the construction traffic is included on the network. The level of service (LoS) would remain:

- Blues Point Road / Union Street / Lavender Street intersection – LoS C in AM peak and B at PM peak
- Blues Point Road / Miller Street / Blue Street intersection – LoS B in both AM and PM peaks.

The Environmental Impact Statement therefore assessed the construction traffic impact as ‘insignificant’.

After the project was approved, a Construction Traffic Management Plan (CTMP) for the Tunnel and Station Excavation (TSE) works was prepared. The numbers of trucks required to construct the approved project were reduced due to the availability of the barge for spoil removal and removal of tunnel boring machine components. The differences between the Environmental Impact Statement and the CTMP for TSE works for the shaft excavation works are outlined in Table 7-1.

Table 7-2 Worst case vehicle movement (during shaft excavation scenario)

Time	Environmental Impact Statement assessed Heavy Vehicles (per hour)	TSE Heavy Vehicles (per hour)- within Approved CTMP
7am-10am (AM peak)	4	2
10am- 4pm	6	4
4pm-6pm (PM Peak)	4	2

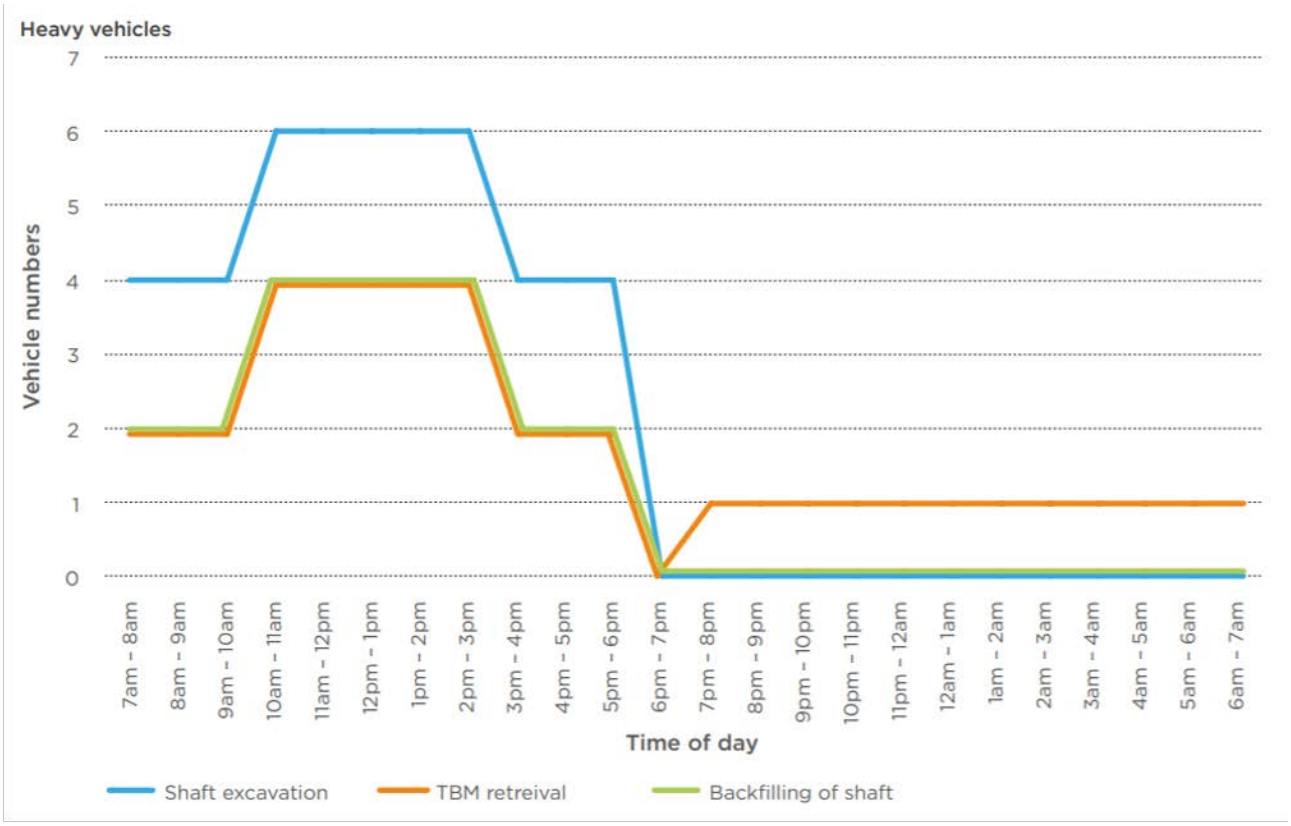

Figure 7-1 Blues Point temporary site heavy vehicle movements (as identified in the Environmental Impact Statement)

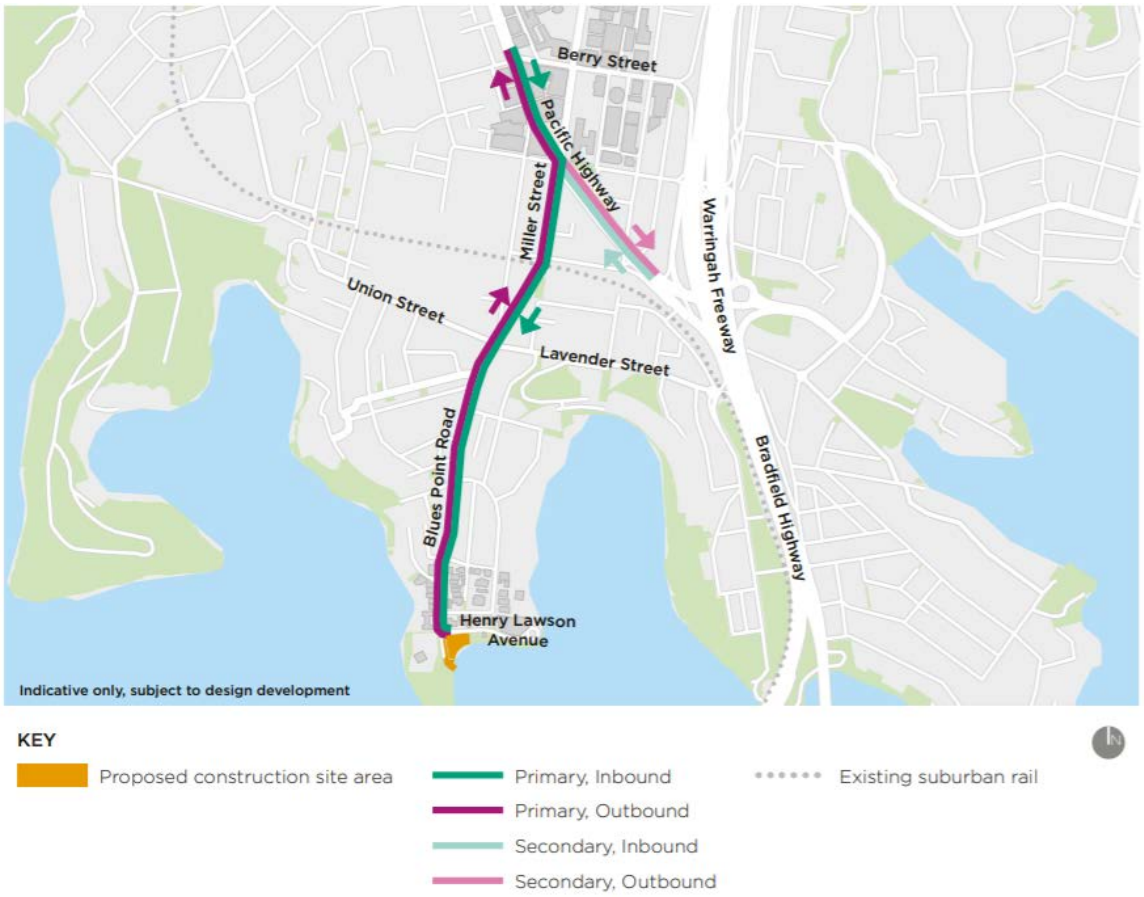

Figure 7-2 Blues Point temporary site haulage routes (as identified in the Environmental Impact Statement)

5.1.2 Impact assessment

As discussed in Section 2.2.2, the delivery of materials for the tunnel fit out works by barge would not be possible. During the proposed works, construction vehicles would predominantly access and egress the site between 7am and 6pm, with the peak construction period occurring between 10am and 4pm. As tunnel fit out works are approved to be undertaken 24 hours per day seven days a week, deliveries to the site are proposed out of standard hours.

The proposed traffic movements to support the delivery of materials for tunnel fit out works would require:

- Deliveries capped at four heavy vehicle movements per hour in the AM peak period (7am to 10am) peak and PM peak (4pm to 6pm) and six heavy vehicle movements per hour out of peak period (10am to 4pm)
- Minimal deliveries out of hours (6pm to 7am) with up to eight heavy vehicle movements per night in total
- Large (oversized) heavy vehicle movement to deliver and remove the gantry crane during set up and demobilisation.

The proposed modification requires the same traffic profile in peak periods as the works assessed in the Environmental Impact Statement for the shaft excavation (see Figure 7-1). The Environmental Impact Statement assessed the peak construction traffic impact at Blues Point as ‘insignificant’ with no change to the level of service for key intersections as a result of the traffic movements. As such, no additional traffic impacts are anticipated during the peak periods as a result of the proposed modification.

One heavy vehicle per hour out of standard hours (6pm to 7am) was assessed in the Environmental Impact Statement for TBM retrieval (see Figure 7-1). The proposed heavy vehicle movements outside of standard hours would be similar to the traffic profile assessed within the Environmental Impact Statement for TBM retrieval with one to two heavy vehicle movements per hour (up to a limit of eight heavy vehicle movements per night in total) required for the proposed modification. A requirement for an increase of one heavy vehicle movement per hour out of standard hours, compared with the Environmental Impact Statement, would be a negligible traffic impact.

The construction traffic impacts during and out of peak periods are considered to be consistent with the assessment in the Environmental Impact Statement however traffic movements would occur over a longer duration due to the extended use of Blues Point temporary site for 12 months as the access for tunnel fit out works. No additional traffic or cumulative traffic impacts are anticipated as a result of the extended duration of the use of the site.

No changes are proposed to the haulage routes as outlined in Figure 7-2. Vehicular access and egress to and from the site would remain from Blues Point Road. No additional changes are proposed to pedestrian footpaths, parking arrangements or public transport services relative to the approved project. As outlined within the Environmental Impact Statement, to ensure safety to pedestrians, cyclists and other motorists, safety audits would be carried out at the construction site and would address vehicular access and egress points and pedestrian, cyclist and motorist safety. Construction vehicle speed would be managed in accordance with mitigation measures as outlined within the Environmental Impact Statement.

The proposed works would utilise the existing site set up as previously assessed with a minor setback of the construction hoarding to allow community access to the beach at the front of the site.

5.1.3 Mitigation measures

The Sydney Metro Construction Environmental Management Framework (CEMF) (provided as part of the Submissions and Preferred Infrastructure Report) sets out the environmental management approach and strategy for the project, and includes commitments regarding the development and implementation of a construction environmental management plan and associated sub-plans.

The relevant project-specific mitigation measures identified in the approval documentation would continue to apply to the project as proposed to be modified. These mitigation measures would adequately address the potential construction traffic and transport impacts.

In addition, the conditions of approval issued for the approved project would also apply to the proposed modification. Of relevance this includes:

- Condition E82 – Construction Traffic Management Plans (CTMPs), consistent with the CEMF and CTMF required in Condition E81, must be prepared for each construction site in consultation with the Traffic and Transport Liaison Groups, and submitted to the Roads and Maritime Services for approval following Sydney Coordination Office endorsement before construction commences at the relevant construction site. A copy of any Construction Traffic Management Plans approved by the Roads and Maritime Services must be submitted to the Secretary for information (note: the CTMPs consider the following conditions of approval as relevant to the scope of works: Condition E81, E88).
- Condition E85 – Heavy vehicle haulage must not use local roads unless no feasible alternatives are available
- Condition 86 – During construction, measures must be implemented to maintain pedestrian and vehicular access to, and parking in the vicinity of, businesses and affected properties.

5.2 Construction noise and vibration

5.2.1 Background

The existing environment at the Blues Point temporary site is primarily residential receivers on the north and west sides of the site as well as areas of passive recreation on the south west and east sides of the site. There is one commercial premise located to the east of the site. Public transport services near the worksite include a ferry terminal and a bus stop.

As presented in the Environmental Impact Statement and Modification Report for Blues Point Acoustic shed (MOD 5), for the purposes of the noise and vibration assessment, four noise catchment areas (NCA) have been identified for the Blues Point temporary site:

- BN_01 – residential buildings north of Argyle Street and Bettington Street (south across the harbour)
- BP_01 – residential apartments east of Blues Point Road
- BP_02 – residential apartments west of Blues Point Road
- OSR – other sensitive receivers such as commercial premises, places of worship, schools etc.

Noise management levels (NMLs) have been determined using the NSW Interim Construction Noise Guideline (ICNG) – DECC 2009, the project conditions of approval and the rating background levels presented in the Environmental Impact Statement.

Table 8-1 summarises the relevant noise levels for the Blues Point site.

Table 8-3 Summary of relevant noise levels for Blues Point

NCA	Rating Background Level (Day/Evening/Night)	Residential Noise Management Levels (based on ICNG) (DS/DO/E/S/N-ICNG)	Residential External Noise Management Levels (based on Condition E41/E42) (N-CoA)	Sleep Disturbance (Screening/ Maximum)
BN_01	50 / 45 / 40	60 / 55 / 50	55-65	55 / 65
BP_01	51 / 49 / 40	61 / 56 / 54	55	55 / 65
BP_02	51 / 49 / 40	61 / 56 / 54	55	55 / 65
OSR	-	60-70 for all periods	-	- / 65

DS = standard construction hours (7am to 6pm Monday to Friday, 8am to 1pm Saturday)
DO = daytime 1pm to 6pm Saturdays, 8am to 6pm Sundays and public holidays
E = evening period 6pm to 10pm
S = shoulder period 10pm to 12am
N-ICNG = 10pm to 7am
N-CoA = 8pm to 7am

5.2.2 Impact assessment

Tunnel fit out works are approved to be undertaken 24 hours per day seven days per week. However tunnel fit out works within the acoustic shed would predominantly take place during standard daytime hours. Overnight work is expected to consist of delivery of materials into the site, with a small logistics crew working in the shed to unload deliveries to be ready for following day shift. Materials which may be delivered out of hours include concrete rail sleepers, rail jewelry, steel walkway components, steel pipework, steel cable containment and various sized cables.

The proposed works would extend the use of the Blues Point temporary site for up to an additional 12 months compared to the approved project. This would have an additional construction noise and vibration impact on the surrounding receivers as a result of both construction works and construction traffic noise.

Airborne construction noise

Some noisy works would be required to undertake the works form the Blues Point temporary site including:

- Works to install the smaller gantry crane and subsequent reinstatement of the front wall and the first bay of the roof of the acoustic shed
- Concrete deliveries including agitator truck unloading into the pump and general use of concrete pump
- Unloading of trucks with heavy items (e.g. rail sleepers).

The front wall and first bay of the acoustic shed faces Sydney Harbour, away from noise sensitive receivers to continue to provide as much acoustic protection as possible during the installation of the new gantry crane. There would be some residual noise impacts to surrounding sensitive receivers during the installation of the new gantry crane and closing back up the acoustic shed as the shed would not be fully in place to provide noise mitigation. This work would be completed during standard hours within about four weeks and would have a similar noise impact to the original installation of the acoustic shed. As such, there are no anticipated changes to the site establishment and demobilisation noise and vibration impacts associated with the proposed modification.

After the front wall and first bay of the acoustic shed is reinstalled, the majority of work would take place inside the shed or down in the tunnels, as such noise impacts would be minimised for the surrounding sensitive receivers. The proposed works would have localised construction noise impacts associated with the use of noise generating equipment and plant (e.g. concrete pump), intermittent noise from on-site truck movements and unloading of heavy materials. Due to the mitigation provided by the acoustic shed, noise impacts are anticipated to be consistent with the noise assessment within the Blues Point acoustic shed Modification Report (MOD 5), however noise impacts would be experienced over an additional 12 month period.

Based on a qualitative assessment comparing the construction activities undertaken to date (with the acoustic shed in place) and the proposed noise generating activities as a result of the proposed modification at Blues Point temporary site, the noise impacts as a result of the proposed modification are anticipated to be less than what has occurred to date for the approved project.

The proposed works would be undertaken in accordance with existing mitigation measures and the Construction Noise and Vibration Strategy.

Construction traffic noise

As outlined in Chapter 7, construction traffic would be similar in nature to the scenarios of heavy vehicle movements assessed in the Environmental Impact Statement. Construction traffic noise was assessed within the Environmental Impact Statement and traffic noise levels from the project complied with the baseline criteria on Henry Lawson Avenue and exceed by 1dB on Blues Point Road during standard hours. In accordance with the NSW Road Noise Policy (RNP) (Department of Environment, Climate Change and Water, 2011) exceedances of up to 2dB is considered to be within acceptable limits for construction traffic noise.

The maximum noise levels associated with deliveries by heavy vehicles, on-site truck movements, and other activities on site can potentially cause awakening reactions (or sleep disturbance) at nearby residential receivers. One to two heavy vehicle movements per hour, out of standard hours (up to eight per night in

total), would be required for the proposed works. As limited night-time vehicle movements are proposed at this site, a sleep disturbance assessment was not deemed necessary.

Heavy vehicle movements (particularly during out of standard hours) would be scheduled to minimise impacts as far as practicable with the aim of achieving noise management levels in accordance with existing mitigation measures and the Construction Noise and Vibration Strategy.

5.2.3 Mitigation measures

The Sydney Metro Construction Environmental Management Framework (provided as part of the Submissions and Preferred Infrastructure Report) sets out the environmental management approach and strategy for the project, and includes commitments regarding the development and implementation of a construction environmental management plan and associated sub-plans.

The relevant project-specific mitigation measures identified in the approval documentation would continue to apply to the project as proposed to be modified. These mitigation measures would adequately address the potential noise and vibration impacts.

In addition, the conditions of approval issued for the approved project would also apply to the proposed modification. Of relevance this includes:

- Condition E33 – Construction Noise and Vibration Impact Statements (CNVISs) must be prepared for each construction site before construction noise and vibration impacts commence and include specific mitigation measures identified through consultation with affected sensitive receivers. (note: the CNVISs consider the following conditions of approval as relevant to the scope of works: Conditions E36, E39, E40, E42, E44 and E48)
- Condition E49 – All acoustic sheds must be erected as soon as site establishment works at the facilities are completed and before undertaking any works or activities which are required to be conducted within the sheds.

It is noted that for Condition E49, the relevant activities to be conducted within the acoustic shed at Blues Point are activities that support tunnel fit out works.

5.3 Landscape character and visual amenity

5.3.1 Background

The existing visual character of the Blues Point temporary site was described in the assessment for the approved project.

The approved project, as modified in 2018, includes an acoustic shed for the duration of tunnel boring machine extraction activities which have been completed (see Figure 9-1).

Landscape character and visual amenity impacts as a result of the temporary acoustic shed were assessed in the Modification Report for the Blues Point acoustic shed (MOD 5).

The temporary acoustic shed was assessed as a dominant element within this landscape character area, with a high adverse impact to the landscape character and high to moderate adverse visual impacts on the majority of surrounding viewpoints. However the acoustic shed also shields the gantry crane infrastructure. The colour palette for the acoustic shed was chosen to reduce its visual impact, as assessed in the approved project.

The views and vistas of the World Heritage listed Sydney Opera House buffer zone and local heritage items in the vicinity of the Blues Point temporary site were identified in the Environmental Impact Statement and

Modification Report for the Blues Point acoustic shed (MOD 5). Indirect impacts were assessed as negligible due to the short term and reversible nature of the use of the site (i.e. acoustic shed to be removed once the worksite is decommissioned and park rehabilitated).

In accordance with mitigation measure LV8, the construction program has been developed to minimise the duration of the visual impacts of the acoustic shed and to minimise impacts during key viewing harbour events where possible.

Figure 5-3 Blues Point temporary acoustic shed

5.3.2 Impact assessment

The temporary acoustic shed would remain a dominant element within this landscape character area. The previously assessed high adverse impact remaining to the landscape character and predominantly high to moderate adverse visual amenity impacts to surrounding viewpoints would remain for an additional 12 months.

The proposed modification would affect one additional Christmas/New Year's period in 2020/2021 and as such would have an additional visual impact on surrounding residents and the wider community.

Any works at night which would require lighting would be undertaken in accordance with existing mitigation measures to avoid light spill or would be undertaken within the acoustic shed.

5.3.3 Mitigation measures

The Sydney Metro Construction Environmental Management Framework (provided as part of the Submissions and Preferred Infrastructure Report) sets out the environmental management approach and strategy for the project, and includes commitments regarding the development and implementation of a construction environmental management plan and associated sub-plans.

The relevant project-specific mitigation measures identified in the approval documentation would continue to apply to the project as proposed to be modified. The visual assessment for the proposed modification

identified that changes to existing mitigation measures and an additional mitigation measure is required in relation to landscape character and visual amenity. The proposed changes to mitigation measures are listed in Table 10-4. New mitigation measures or additions to existing mitigation measures are shown in **bold** text, with deletions shown with a ~~strikethrough~~.

Table 10-4 Mitigation measures

ID	Mitigation measure	Applicable location(s)[1]
LV8	Tunnel boring machine retrieval works **and tunnel fit out works** at the Blues Point temporary site would be timed so that impacts from the acoustic shed would be minimised during key harbour viewing events**,** where possible. The installation of the acoustic shed at the Blues Point temporary site would occur after the New Year's period of 2018/2019 and the shed would be dismantled prior to the New Year's period of ~~2020/2021~~ **2021/2022**.	BP

1 BP: Blues Point temporary site

In addition, the conditions of approval issued for the approved project would also apply to the proposed modification. Of relevance this includes:

- Condition E99 – the project must be constructed in a manner that minimises visual impacts of construction sites, including incorporation of architectural treatment and finishes within key elements of temporary structures that reflect the context within which the construction sites are located.
- Condition E57 – Works at the Blues Point Temporary site must be avoided during key harbour viewing events (with the key harbour viewing events determined in consultation with Events NSW, North Sydney and City of Sydney council(s)).

A proposed change to Condition E57.1 is shown below in **bold** text, with deletions shown with a ~~strikethrough~~:

- Condition E57.1 – Notwithstanding E57, the acoustic shed at Blues Point temporary site must not be in place for more than ~~one~~ **two** Christmas/New Year's period**s**. *Note: Christmas/New Year's period is defined as 18 December to 28 January.*

5.4 Social impacts

5.4.1 Background

About 2,100 square metres of Henry Lawson Reserve is currently utilised by Sydney Metro as a temporary site. This was primarily a grassed area adjacent to Henry Lawson Avenue used for recreational activities such as picnicking, fishing, walking and events such as canoe and board paddling events.

The temporary site has resulted in the loss of access and temporary disruption to the use of this area.

5.4.2 Impact assessment

The proposed modification would require the use of the Henry Lawson Reserve for up to an additional 12 months compared with the approved project. Henry Lawson Reserve would be temporarily unavailable for use by the public and events during this time. The site boundary is proposed to be set back slightly which would provide access to the beach on Sydney Harbour at the front section of the site (see Figure 5-4).

Figure 5-4 Blues Point temporary site access to beach

Consultation with organisers of events at Henry Lawson Reserve would continue to manage potential impacts on these events.

Overall, the impacts to the community would be consistent with the impact as assessed within the Environmental Impact Statement and Modification Report for the Blues Point acoustic shed (MOD 5) however over a longer duration.

As assessed within the EIS, reinstatement of Henry Lawson Reserve would take place in early 2022, about 12 months later than previously anticipated.

5.4.3 Mitigation measures

The Sydney Metro Construction Environmental Management Framework (provided as part of the Submissions and Preferred Infrastructure Report) sets out the environmental management approach and strategy for the project, and includes commitments regarding the development and implementation of a construction environmental management plan and associated sub-plans.

The relevant project-specific mitigation measures identified in the approval documentation would continue to apply to the project as proposed to be modified. These mitigation measures would adequately address the potential noise and vibration impacts.

In addition, the conditions of approval issued for the approved project would also apply to the proposed modification. Condition E57.1 is proposed to be modified as described in Section 5.3.3.

6 Consolidated revised environmental mitigation measures

6.1 Approach to environmental mitigation and management

The project approach to environmental mitigation and management was described in the Environmental Impact Statement and the Submissions and Preferred Infrastructure Report for the approved project. The approach is illustrated in Figure 6-1 and includes:

- Project design – measures which are inherent in the design of the project to avoid and minimise impacts
- Mitigation measures – additional to the project design which are identified through the environment impact assessment in Chapters 7 to 9. These measures are consolidated in Table 6-1
- Construction environmental management framework – details the management processes and documentation for the project. Further details are provided in the Preferred Infrastructure Report
- Construction noise and vibration strategy – identifies how Sydney Metro proposes to manage construction noise and vibration. Further details are provided in the Preferred Infrastructure Report
- Design guidelines – provides an assurance of end-state design quality. Further details are provided in the Preferred Infrastructure Report
- Environmental performance outcomes – which establish the intended outcomes which would be achieved by the project. The performance outcomes are identified in the Preferred Infrastructure Report.

This approach would also be applied to the proposed modification.

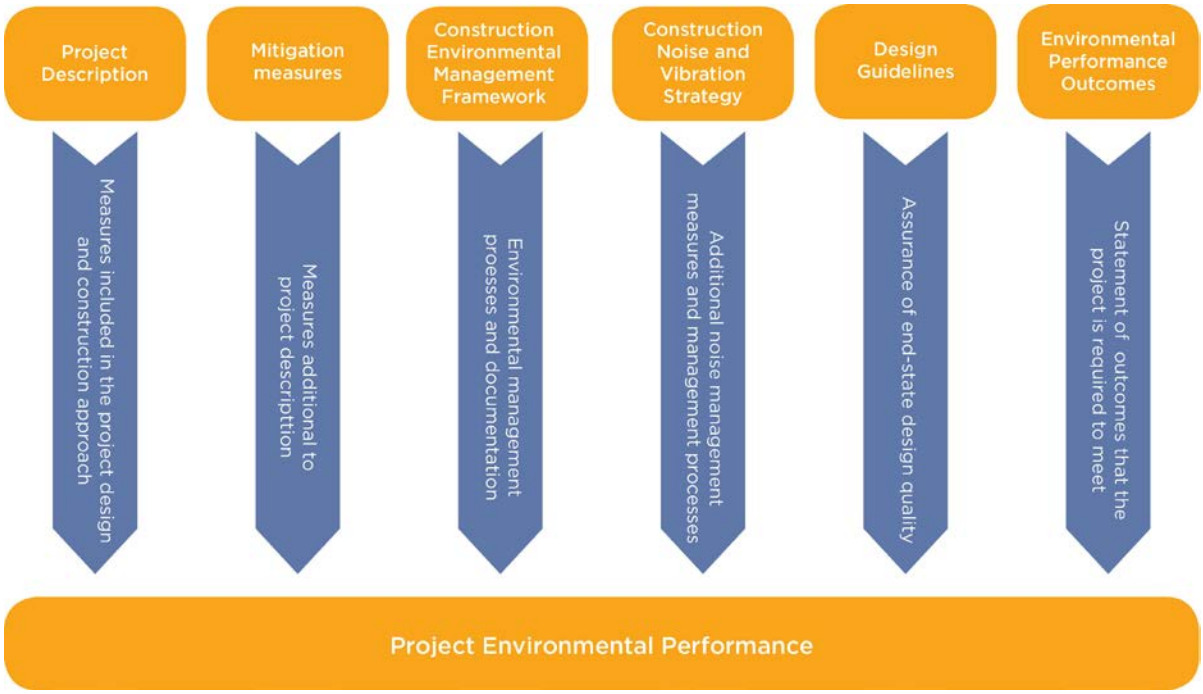

Figure 6-1 Project approach to environmental mitigation and management

6.2 Revised environmental mitigation measures

The list of mitigation measures presented in the Submissions and Preferred Infrastructure Report and subsequent modification reports have been revised based on the assessment carried out for the proposed modification.

Table 6-1 provides the revised consolidated environmental mitigation measures. This table supersedes the mitigation measures presented in the Submissions and Preferred Infrastructure Report and modification reports. New mitigation measures or additions to existing mitigation measures are shown in bold text, with deletions shown with a strikethrough.

Due to recent machinery of government changes in NSW, all references in Table 6-1 should now be read as the following:

- Roads and Maritime Services and CBD Coordination Office - now known as Transport for NSW
- Barangaroo Development Authority- now known as Infrastructure NSW.

As per the approach for the approved project, the location(s) applicable to each mitigation measure are identified by using a unique identifier as follows:

- 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 (this area also includes the necessary mitigation measures for the Sydney Metro Trains Facility South)
- SS – Sydenham Station
- STWS – Surface track works south
- Metro rail tunnels – Metro rail tunnels not related to other sites (eg TBM works)
- PSR – Power supply routes.

Table 6-1 Revised environmental mitigation measures

ID	Mitigation measure	Applicable location(s)
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
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 In Vehicle Monitoring Systems (telematics) to monitor vehicle location and driver behavior ▪ 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

ID	Mitigation measure	Applicable location(s)
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: ▪ Encouraging staff to use public or active transport ▪ 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, 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
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

ID	Mitigation measure	Applicable location(s)
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
T23	Specific station management measures would be implemented during pedestrian movement Phase 2. This would include strategies such as encouraging passengers to exit platforms at the closest stair case or escalator, signage and marshalling of passengers waiting to board to minimise those waiting adjacent to hoarding and to direct passengers so that that there is even distribution along the platform.	CS
T24	The temporary closures of footpaths on Chalmers Street would not occur at the same time as the temporary closure of the Devonshire Street Tunnel.	CS
T25	During the closure of Randle Lane, traffic control would be provided at either end. Reversing movements out of Randle Lane onto Elizabeth Street would not be carried out during the peak periods of 7 am to 10 am and 3 pm to 7 pm.	CS
T26	During the closure of Randle Lane, access to basement car parking would be maintained where feasible and reasonable. If access cannot be maintained, alternative parking would be arranged subject to consultation and agreement of affected owners or residents.	CS
T27	Detailed construction planning would be coordinated with the Sydenham to Bankstown project and the Temporary Transport Strategy arrangements to minimise impacts on the traffic and transport network.	SS
T28	The connectivity provided by the pedestrian route that extends from Elliot Street along the eastern boundary of 52 McLaren Street to McLaren Street would be retained during construction (in conjunction with suitable pedestrian management measures along the McLaren Street frontage).	VC
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

ID	Mitigation measure	Applicable location(s)
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
OpT6	Transport for NSW would work with the Inner West Council to facilitate staged completion of relevant sections of the proposed active transport corridor between Sydenham and Bankstown subject to funding.	SS
OpT7	Transport for NSW would work with the Inner West Council to complete a parking study to manage the long term impacts of parking loss around Sydenham Station.	SS
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. This would include the following example standard mitigation measures where feasible and reasonable: ▪ Provision of noise barriers around each construction site ▪ Provision of acoustic sheds at Chatswood dive site, Crows Nest, Victoria Cross, Blues Point, Barangaroo, Martin Place, Pitt Street, Waterloo and Marrickville dive 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. This would also include carrying out the requirements in relation to construction noise and vibration monitoring.	All

ID	Mitigation measure	Applicable location(s)
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, Victoria Cross Station (southern) and Waterloo Station sites would be restricted to: ▪ The Pacific Highway and Mowbray Road at the Chatswood dive site ▪ The Pacific Highway, Hume Street and Oxley Street at the Crows Nest Station construction site ▪ McLaren Street, Miller Street and Berry Street at the Victoria Cross Station southern construction site ▪ 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. 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 exceedances are predicted.	All
NV5	Feasible and reasonable mitigation measures would be implemented where power supply works would result in elevated noise levels at receivers. This would include: ▪ Carrying out works during the daytime period when in the vicinity of residential receivers ▪ Where out of hours works are required, scheduling the noisiest activities to occur in the evening period (up to 10 pm) ▪ 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 : ▪ Assurance of contractor noise and vibration planning, modelling, management and monitoring practices ▪ Verification of compliance with relevant guidelines and approval requirements ▪ Audit noise and vibration management practices.	All

ID	Mitigation measure	Applicable location(s)
NV7	Alternative demolition techniques that minimise noise and vibration levels would be investigated and implemented where feasible and reasonable. This would include consideration of: ▪ The use of hydraulic concrete shears in lieu of hammers/rock breakers ▪ Sequencing works to shield noise sensitive receivers by retaining building wall elements ▪ Locating demolition load out areas away from the nearby noise sensitive receivers ▪ Providing respite periods for noise intensive works ▪ 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 ▪ Installing sound barrier screening to scaffolding facing noise sensitive neighbours ▪ Modifying demolition works sequencing / hours to minimise impacts during peak pedestrian times and / or adjoining neighbour outdoor activity periods.	All except metro rail tunnels
NV8	Opportunities to minimise heavy vehicles movements on Randle Lane at night would be further investigated during detailed construction planning.	CS
NV9	Measures would be implemented to reduce work health and safety noise exposure for station workers, retail staff and members of the public within Central Station. These would include: ▪ The use of hoarding and / or temporary noise barriers around construction sites ▪ Providing hearing protection to station staff employees where appropriate ▪ Providing specific work health and safety noise training to commercial receiver employers including guidance on managing their employees during highly noisy periods ▪ The use of signage around construction sites to inform the general public of high noise exposure areas.	CS
NV10	Further background monitoring would be conducted at a receiver addressing McLaren Street during the preparation of the Construction Noise and Vibration Impact Statements to confirm the applicable noise management levels for construction.	VC
NV11	Opportunities to minimise heavy vehicle movements from the Victoria Cross Station northern construction site at night would be further investigated during detailed construction planning.	VC
NV12	Ballast tamping and rock breakers would not be undertaken during the night-time period (10pm to 7am) except where circumstances arise that require the use of this plant to ensure the rail corridor is made safe for the operation of trains by the conclusion of a scheduled rail possession.	STWS

ID	Mitigation measure	Applicable location(s)
Operational noise and vibration		
OpNV1	The height and extent of noise barriers adjacent to the northern and southern surface track works would be confirmed during detailed design with the aim of not exceeding trigger levels from the R*ail Infrastructure Noise Guidelines* (Environment Protection Authority, 2013). At property treatments would be offered where there are residual exceedances of the trigger levels.	STW, STWS
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
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
OpNV4	Procedural mitigation measures would be implemented to minimise noise emissions from the Sydney Metro Trains Facility South with the aim of meeting the relevant criteria derived from the *Industrial Noise Policy* (Environment Protection Authority, 2000). This would consider measures such as: ▪ Minimising the number of trains being cleaned simultaneously ▪ Cleaning trains without air conditions systems in use ▪ Limit cleaning and start-up operations during the night-time and early morning periods to the trains stabled furthest from the most affected residences. In the event that procedural measures are not sufficient to achieve compliance with the criteria derived from the Industrial Noise Policy, at-property treatments would be offered to affected receivers.	MDS
OpNV5	Further detailed investigations would be undertaken of the phased operations once the detail of these changes are determined. This investigation would include determination of the likely change in noise levels at receivers and consideration of the need for any feasible and reasonable mitigation measures taking into consideration the likely duration of the phased operations.	STWS
Land use and property		
LP1	Opportunities to integrate the eastern entry with local strategic planning initiatives would be investigated in consultation with City of Sydney Council.	CS
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

ID	Mitigation measure	Applicable location(s)
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): ▪ The internal heritage fabric and any non-original elements removed from within the curtilage of Mowbray House, Chatswood ▪ The interior, exterior and setting of the shop at 187 Miller Street, North Sydney ▪ The fabric and setting of the North Sydney bus shelters requiring removal and temporary relocation at Victoria Cross Station and Blues Point temporary site ▪ 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 ▪ Hickson Road wall in the vicinity of proposed ventilation risers and skylights for Barangaroo Station ▪ The interior, exterior and setting of the 'Flat Building' at 7 Elizabeth Street, Sydney ▪ Martin Place, between Elizabeth and Castlereagh streets, Sydney ▪ The heritage fabric of areas of the existing Martin Place Station affected by the project ▪ 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 ▪ The Bounce Hostel building (former MGM building) ▪ Directly impacted parts of the Congregational Church at Waterloo ▪ Sydenham Pit and Drainage Pumping Station 1 ▪ Sydenham Railway Station Group: Platform 6 building and Platform 1 Parcels Office.	CDS, VC, BP, MP, CS, WS, MDS, SS
NAH2	The archaeological research design would be implemented. 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, Waterloo Station and Sydenham Station would be developed to minimise direct and indirect impacts to adjacent and / or adjoining heritage items.	CDS, VC, MP, PS, CS, WS, SS

ID	Mitigation measure	Applicable location(s)
NAH5	Prior to total or partial demolition of heritage items at Victoria Cross and Martin Place stations, and the Bounce Hostel building (former MGM building at Central Station), 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, CS
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, Central Station, Sydenham Station and the aqueduct over the Sydenham Pit and Drainage Pumping Station would be developed with input from a heritage architect.	STW, CDS, CN, VC, BN, MP, PS, CS, WS, MDS, SS
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
NAH10	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: ▪ The Blues Point Waterfront Group (including the former tram turning circle, stone retaining wall, bollards and steps) ▪ The Millers Point and Dawes Point Village Precinct ▪ The existing Martin Place Station ▪ Sydney Terminal and Central Railway Stations group ▪ Sydney Yard (including the Shunters Hut and Prince Alfred Sewer) ▪ The existing Sydenham Station ▪ Brick retaining walls near Sydenham Station.	BP, BN, MP, CS, SS, STWS
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. Consultation would be carried out with Sydney Trains and the Heritage Council of NSW during design development.	CS

ID	Mitigation measure	Applicable location(s)
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: ▪ Minimise impacts to heritage fabric ▪ Be sympathetic to the heritage values and architectural form of the building.	WS
NAH20	The design and detailed construction planning of works directly impacting the Sydenham Pit and Drainage Pumping Station would consider the requirements of the *Sydenham Pit & Drainage Pumping Station 1 Conservation Management Plan* (Sydney Water, 2004).	MDS
NAH21	The internal and external finishes of the infilled openings between 9-19 Elizabeth Street and the Commonwealth Bank of Australia building would be developed in consultation with a heritage architect.	MP
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	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
AH7	The cultural heritage assessment report would be updated to include the scope of the proposed modification.	CS

ID	Mitigation measure	Applicable location(s)
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 trees would be identified during detailed construction planning.	All except metro rail tunnels
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, BP, BN, MP, PS, WS, MDS
LV8	Tunnel boring machine retrieval works **and tunnel fit out works** at the Blues Point temporary site would be timed so that impacts from the acoustic shed would be minimised during ~~to avoid~~ key harbour viewing events, where possible. The installation of the acoustic shed at the Blues Point temporary site would occur after the New Year's period of 2018/2019 and the shed would be dismantled prior to the New Year's period of **2021/2022**.	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
LV20	The colour palette of the temporary acoustic shed at the Blues Point temporary site should adopt the following recommended colours, or similar: ▪ Acoustic shed roof: Colorbond monument ▪ Acoustic shed walls: Colorbond mangrove.	BP
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, CS, MDS

ID	Mitigation measure	Applicable location(s)
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
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: ▪ Assessment of the potential for damage to structures, services, basements and other sub-surface elements through settlement or strain ▪ Predicted changes to groundwater levels, including at nearby water supply works. 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. With each progressive update of the geotechnical model the potential for exceedance of the following target changes to groundwater levels would be reviewed: ▪ Less than 2.0 metres – general target ▪ Less than 4.0 metres – where deep building foundations present ▪ Less than 1.0 metre – residual soils ▪ Less than 0.5 metre – residual soils (Blues Point) (fill / Aeolian sand). 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. The geotechnical model and groundwater monitoring program would be developed in consultation with the Department of Primary Industries (Water).	All

ID	Mitigation measure	Applicable location(s)
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, Victoria Cross Station, Artarmon substation, Blues Point temporary site, Barangaroo Station, Central Station, Waterloo Station and the Sydenham Maintenance Centre site within surface track works south. 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. 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. 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, AS, VC, BP, BN, CS, WS, STWS, PSR
SCW2	Prior to ground disturbance in high probability acid sulfate areas at Barangaroo Station, Waterloo Station, Marrickville dive site, Sydenham Station and the surface track works south, testing would be carried out to determine the presence of acid sulfate soils. 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, SS, STWS
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. 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. Specific monitoring locations and frequencies would be determined during the development of the program in consultation with the Environment Protection Authority.	GI

ID	Mitigation measure	Applicable location(s)
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 site, Sydenham Station and the surface track works south 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, SS, STWS
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, 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. 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 ▪ 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

ID	Mitigation measure	Applicable location(s)
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
FH3	Overland flow diversions during construction at the Marrickville dive site would meet the following criteria, 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 ▪ 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. Construction planning for the Marrickville dive site would be carried out in consultation with the State Emergency Services and Inner West Council. 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 ▪ 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, SS, STWS
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, SS, STWS
FH6	Detailed design would occur in consultation with Inner West Council to ensure future drainage improvement works around the Marrickville dive site, Sydenham Station and the surface track works south would not be precluded.	MDS, SS, STWS
FH7	Consultation would be carried out with 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, SS, STWS
FH8	The frequency of Sydney Trains rail service disruptions due to flooding would not be increased in the vicinity of the Marrickville dive structure, Sydenham Station and the surface track works south.	MDS, SS, STWS

ID	Mitigation measure	Applicable location(s)
FH9	Design of the 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: ▪ Potential changes to flood prone land and flood levels ▪ Potential changes to overland flow paths ▪ Redistribution of surface runoff as a result of project infrastructure ▪ Behaviour of existing stormwater runoff ▪ Potential changes required to flood evacuation routes, flood warning systems and signage. Flood modelling to support detailed design would be carried out in accordance with the following guidelines: ▪ *Floodplain Development Manual* (NSW Government, 2005b) ▪ *Floodplain Risk Management Guideline: Practical Consideration of Climate Change* (DECC, 2007b) ▪ *Floodplain Risk Management Guide: Incorporating Sea Level Rise Benchmarks in Flood Risk Assessments* (DECCW, 2010c) ▪ *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). 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. Not worsen is defined as: ▪ A maximum increase flood levels of 50mm in a 100 year Average Recurrence lnterval flood event ▪ A maximum increase in time of inundation of one hour in a 100 year Average Recurrence lnterval flood event ▪ No increase in the potential for soil erosion and scouring from any increase in flow velocity in a 100 year Average Recurrence lnterval flood event.	All except metro rail tunnels
FH10	During detailed design, project infrastructure would be designed to meet the following criteria, where feasible and reasonable: ▪ 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 ▪ 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 ▪ 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 ▪ 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)
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, BP, 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, SS
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

ID	Mitigation measure	Applicable location(s)
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
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: ▪ Ensuring that adequate flood modelling is carried out and integrated with design ▪ 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 ▪ 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. 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)
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: ▪ CBD Coordination Office ▪ Department of Planning and Environment ▪ Roads and Maritime Services ▪ Sydney Trains ▪ NSW Trains ▪ Sydney Buses ▪ Sydney Water ▪ Port Authority of NSW ▪ Willoughby Council ▪ North Sydney Council ▪ City of Sydney Council ▪ Marrickville Council ▪ Sydney Motorways Corporation ▪ Barangaroo Delivery Authority ▪ Emergency service providers ▪ Utility providers ▪ Construction contractors. Co-ordination and consultation with these 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.	All

7 Justification and conclusion

This section provides a justification for the proposed modification and concludes the Modification Report.

7.1 Justification

The approved project includes a temporary construction site at Blues Point to enable the retrieval of all components of the tunnel boring machines from the Chatswood dive site and Barangaroo and the installation of an acoustic shed to minimise noise and air quality impacts.

The proposed modification responds to detailed construction planning for the wider Sydney Metro project to consider alternative construction methodologies, identify opportunities to reduce program risks and improve program delivery.

All potential access points were reviewed for their suitability to enable these works. The Blues Point temporary site was identified as the preferred primary access point for these under-harbour tunnel fit out works as it would minimise interfaces with, and interruptions to, the completion of the station construction works, particularly at Barangaroo and Victoria Cross.

To provide access to complete the under-harbour tunnel fit out works more efficiently, the proposed modification would involve the following changes to the approved project at the Blues Point temporary site:

- Use of the site as the primary access point to fit out the section of the rail tunnels between Victoria Cross and Barangaroo
- Continued use of the existing acoustic shed for up to an additional 12 months, extending across a second Christmas/New Year's period

The proposed continued use of the acoustic shed would provide the following key benefits:

- Reduced noise impacts on surrounding sensitive receivers, particularly during deliveries outside standard daytime hours
- Continued security at the shaft site.

The acoustic shed would be in place for up to an additional 12 months and would be removed prior to the Christmas/New Year's period in 2021/2022. After which the Blues Point temporary site would be demobilised, rehabilitated and returned to the community throughout early 2022 in accordance with the approved project.

7.2 Conclusion

The temporary continued use of the Blues Point site as the primary access point for the tunnel fit out works between Victoria Cross and Barangaroo has been assessed. The proposed modification would result in changes to the duration of potential temporary construction traffic, potential temporary construction noise, landscape and visual amenity and potential temporary social impacts of the approved project while maintaining mitigation for adjacent receivers to minimise potential temporary construction impacts, particularly in relation to noise. These impacts would be outweighed by the additional benefits to the public by ensuring the efficient delivery of the approved project.

While the project-specific mitigation measures identified for the approved project are generally sufficient to address the potential temporary impacts of the proposed modification, one existing mitigation measure has been revised to manage specific potential impacts associated with the proposed modification and one revision to a condition of approval.

Amendment of Condition E57.1 is also proposed to enable the acoustic shed to be in place at the Blues Point temporary site for one additional Christmas/New Year's period. The proposed amendment would state the acoustic shed at Blues Point temporary site must not be in place for more than **two** Christmas/New Year's periods. The remaining relevant conditions of approval would continue to apply to the proposed modification.

7.3 References

City & Southwest Metro Chatswood to Sydenham Blues Point Acoustic Shed Modification Report –Mod 5 (Sydney Metro, 2018)

City & Southwest Metro Chatswood to Sydenham Environmental Impact Statement – Technical Paper 6: Traffic and transport impact assessment (SLR, 2016)

Interim Construction Noise Guideline (Department of Environment and Climate Change, 2009)

NSW Road Noise Policy (Department of Environment, Climate Change and Water, 2011)

7.4 Glossary

Acronym/Term	Definition
CBD	Central Business District
Christmas/New Year's period	Christmas/New Year's period is defined in the Conditions of Approval Instrument as 18 December to 28 January.
CEMF	Construction Environmental Management Framework
CTMP	Construction Traffic Management Plan
CNVIS	Construction Noise and Vibration Impact Statement
dB	Decibels
dBA	A-weighted decibels
EPA	NSW Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act 1979*
ICNG	Interim Construction Noise Guideline
Line-Wide	Tunnel fit out Contractor
NMLs	Noise management levels
RBL	Rating background level
TBM	Tunnel boring machine
TSE	Tunnel Station Excavation Contractor