NSW GOVERNMENT | sydney METRO

City & Southwest

Chatswood to Sydenham

Blues Point acoustic shed modification report

August 2018

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Executive summary

Introduction

Sydney Metro City & Southwest has been developed within the framework of the transport and planning strategies identified in State government policies. This includes the 12 NSW Premier priorities (established to grow the economy, deliver infrastructure, and improve health, education and other services across NSW) and the Future Transport Strategy. The project responds to these challenges delivering a step-change in the capacity of Sydney's rail network by providing a fully automated, high demand, high capacity, turn-up-and-go service.

Sydney Metro City & Southwest was declared by Ministerial Order on 10 December 2015 to be State significant infrastructure and critical State significant infrastructure. The assessment and approval process for a critical State significant infrastructure project is established under Division 5.2 (formerly Part 5.1) of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

An Environmental Impact Statement for the Chatswood to Sydenham component of Sydney Metro City & Southwest was prepared and exhibited for 48 days from 11 May to 27 June 2016. A subsequent Submissions and Preferred Infrastructure Report was prepared and submitted to the Department of Planning and Environment in October 2016. Planning approval was granted by the Minister for Planning under Part 5.1 of the EP&A Act on 9 January 2017.

The approved project includes the construction and operation of a 15.5 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.

Since its determination, four modifications have been lodged and approved to modify various aspects of the approved project. These modifications relate to Victoria Cross and Artarmon Substation, Central Walk, Martin Place Station and Sydenham Station and Sydney Metro Trains Facility South.

The approved project includes a temporary construction site at Blues Point to enable the retrieval of the cutter heads and shields of the tunnel boring machines from the Chatswood dive site and from Barangaroo. The Blues Point temporary site covers an area of about 2,100 square metres within Blues Point Reserve, at the end of Blues Point Road.

Since the project was approved, a joint venture John Holland CPB Ghella (JHCPBG) has been contracted to undertake the Tunnel and Station Excavation (TSE) works. During detailed construction planning for the Blues Point temporary site, the TSE contractor has identified the need for every component of the tunnel boring machines from the Chatswood dive site and from Barangaroo to be retrieved from this site.

Transport of the retrieved tunnel boring machine components by barge from the Blues Point temporary site would be dependent on safety procedures, tides, weather conditions and the requirements of the Harbour Master, and therefore may involve works outside standard daytime hours. To minimise construction impacts of these proposed works, the TSE contractor proposes to install an acoustic shed at the site. The acoustic shed would enclose the gantry crane that will be used to lift out the excavated material from the shaft and the tunnel boring machine components.

Pursuant to section 5.25 (formerly section 115ZI) of the EP&A Act, Sydney Metro is therefore 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.

Overview of the proposed modification

The proposed modification would involve the following changes to the approved project:

- Installation of a temporary acoustic shed
- Retrieval of all components of the tunnel boring machines from the Chatswood dive site and from Barangaroo through the shaft.

Need and justification

The retrieval of all components of the tunnel boring machines from the temporary Blues Point site is required to avoid delays to the tunnel works and the inefficient removal and reinstatement of tunnel services that would otherwise be required if the remainder of the tunnel boring machines were to be retrieved from their original launch site.

The proposed temporary acoustic shed is required to minimise the construction impacts associated with the Blues Point temporary site, including the retrieval of all components of the tunnel boring machines.

The timing of work to retrieve the tunnel boring machines and to transport by barge would depend on safety procedures, tides, weather conditions and the requirements of the Harbour Master and therefore may involve works outside standard daytime hours. The proposed temporary acoustic shed would minimise noise impacts.

Community consultation

Engagement with the community and stakeholders on issues relating to the Blues Point temporary site began in February 2016 and have continued throughout the planning approval phase for the approved project.

Consultation has been undertaken in relation to the proposed modification. This has included consultation with key government agencies and the wider community. Feedback received during consultation activities has been considered during the preparation of this modification report.

Consultation will be undertaken during the exhibition period and would continue during construction consistent with the approach for the approved project.

Environmental assessment

The proposed modification would result in some changes to potential visual impacts as assessed for the approved project. These impacts would be temporary and would need to be considered in the context of the benefits of the proposed modification, which includes the reduction in potential noise and dust impacts of the approved project.

The proposed modification would be constructed in accordance with the Sydney Metro Construction Environmental Management Framework provided as part of the Submissions and Preferred Infrastructure Report for the approved project.

While the project-specific mitigation measures identified for the approved project are generally sufficient to address the potential impacts of the proposed modification, one additional and four revised measures have

been identified to manage specific potential impacts associated with the proposed modification. The relevant conditions of approval for the approved project would continue to apply to the proposed modification.

Conclusion

The proposed modification responds to detailed construction planning for the Blues Point temporary site and measures identified to minimise construction impacts. The proposed modification would result in changes to potential visual impacts of the approved project. These impacts would be outweighed by the additional benefits to the public and adjacent receivers from minimised construction impacts, particularly in relation to noise, dust and the duration of the works.

1 Introduction

This chapter provides an overview of the proposed modification, its strategic context and key features, and the structure of this modification report.

1.1 Overview

Planning approval for Sydney Metro City & Southwest Chatswood to Sydenham (the approved project) was granted by the Minister for Planning under Division 5.2 (formerly Part 5.1) 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 15.5-kilometre metro line from Chatswood, under Sydney Harbour and through Sydney's CBD to Sydenham. The approved project will deliver seven new metro stations at Crows Nest, Victoria Cross, Barangaroo, Martin Place, Pitt Street and Waterloo, and new metro platforms at Central Station (underground) and Sydenham Station. The approved project will also deliver the Sydney Metro Trains Facility South.

As part of the approved project, works at the Blues Point temporary site will involve:

- Excavation of a shaft to the tunnels below resulting in about 8,000 cubic metres of spoil being removed through the site
- Retrieval of the cutter heads and shield of the tunnel boring machines from the Chatswood dive site and from Barangaroo through the shaft
- Transporting the tunnel boring machine components by either road or by barge.

Since the project was approved, a joint venture of John Holland CPB Ghella (JHCPBG) has been contracted to undertake the Tunnel and Station Excavation (TSE) works. During detailed construction planning for the Blues Point temporary site, the TSE contractor has identified the need for the entire tunnel boring machines from the Chatswood dive site and from Barangaroo to be retrieved from this site. To minimise the construction impacts of the proposed works at the Blues Point temporary site, the TSE contractor proposes to install an acoustic shed at the site.

Pursuant to section 5.25 (formerly section 115ZI) of the EP&A Act, Sydney Metro is therefore seeking to modify the State significant infrastructure approval to address these changes to the approved project at Blues Point.

The proposed modification would involve the following changes to the approved project:

- Installation of a temporary acoustic shed
- Retrieval of all components of the tunnel boring machines from the Chatswood dive site and from Barangaroo through the shaft.

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

1.2 Purpose of this report

This report provides an assessment of the proposed modification in accordance with section 5.25 of the EP&A Act. This modification report includes:

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

- Revised environmental mitigation measures.

1.3 Structure of this report

The structure and content of this report is outlined in Table 1-1.

Table 1-1 Structure and content of this report

Chapter	Description
Chapter 1	**Introduction (this chapter)** Provides an overview of the proposed modification. Outlines the structure and content of this report.
Chapter 2	**Strategic need and justification** Provides the strategic context and explains the need for the proposed modification.
Chapter 3	**Modification development and alternatives** Describes how the proposed modification was developed and reviews the options that were considered.
Chapter 4	**Planning and assessment process** Provides information on the legislation and environmental planning instruments that would apply to the proposed modification. Outlines the steps involved in the modification assessment and approval process.
Chapter 5	**Stakeholder and community engagement** Provides an overview of the community consultation and stakeholder engagement processes that have been carried out for the proposed modification to date. Identifies issues raised during consultation and how these have been addressed.
Chapter 6	**Modification description** Identifies the physical infrastructure and built form of the proposed modification, including specific design guidelines. Describes the functionality and operation of the proposed modification and its relationship to the approved project.
Chapter 7	**Environmental screening assessment** Considers the potential for change to the impacts described in the Sydney Metro City & Southwest Chatswood to Sydenham planning approval documentation and whether further assessment is required.
Chapter 8	**Construction noise and vibration** Identifies and assesses the potential changes to construction noise and vibration impacts of the proposed modification.
Chapter 9	**Non-Aboriginal heritage** Identifies and assesses the potential changes to non-Aboriginal heritage impacts of the proposed modification.
Chapter 10	**Landscape character and visual amenity** Identifies and assesses the potential changes to landscape character and visual amenity impacts of the proposed modification.
Chapter 11	**Consolidated revised environmental mitigation measures** Provides a consolidated list of the revised mitigation measures identified in Chapters 8 to 10.
Chapter 12	**Justification and conclusion** Confirms the justification for the proposed modification.

Chapter	Description
APPENDICES	
Appendix A	**Secretary's environmental assessment requirements** Provides a checklist of the proposed modification against the Secretary's environmental assessment requirements issues for the approved Sydney Metro City & Southwest Chatswood to Sydenham.

2 Strategic justification and need

This chapter outlines the strategic justification and need for the proposed modification and identifies the benefits of 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. In particular this includes 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 Strategy.*

These polices indicate a strategic need to:

- Significantly increase 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 CBD - from about 120 an hour currently , to up to 200 services beyond 2024. That's an increase of up to 60 per cent capacity across the network to meet demand... There will be ultimate capacity f for a metro train every two minutes in each direction under the Sydney city centre. A door-to-door approach will help customers achieve their daily tasks, whether it's getting to work, meetings, school or education, sport, a day out or running errands – and of course, getting home.

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 development 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 heavy rail route.

It will provide important urban renewal and development opportunities through the application of transit oriented development principles that support government objectives to achieve a more sustainable and efficient use of land to meet Sydney's growth.

2.1.1 Need for the approved works at Blues Point

A temporary construction 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 is required to:

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

2.2 Need and justification for the proposed modification

The retrieval of all components of the hard ground tunnel boring machines from the temporary Blues Point site is required as the use of the Chatswood dive site to retrieve the tunnel boring machine components (excluding the shield and cutter head) would:

- Affect the construction program for the approved cross passage works within the tunnel between Chatswood and Blues Point
- Potentially create fire and life safety risks
- Necessitate the removal and reinstatement of tunnel services.

The retrieval of all components of the under-harbour tunnel boring machine from the temporary Blues Point site is required as the use of the Barangaroo site to retrieve the tunnel boring machine components (excluding the shield and cutter head) would delay the construction and installation of the concrete lining within the crossover cavern at Barangaroo.

The need and justification for the proposed temporary acoustic shed is to minimise the construction impacts associated with the Blues Point temporary site, including the retrieval of all components of the tunnel boring machines.

The timing of work to retrieve the tunnel boring machines and to transport by barge would depend on safety procedures, tides, weather conditions and the requirements of the Harbour Master and therefore may involve works outside standard daytime hours. The installation of the proposed acoustic shed would provide the following key benefits:

- Reduced noise impacts on surrounding sensitive receivers during excavation of the shaft
- Reduced noise impacts on surrounding sensitive receivers during the tunnel boring machine retrieval works, particularly during works outside standard daytime hours
- Reduced dust impacts on surrounding sensitive receivers
- Improved security at the shaft site.

In addition, the proposed modification would allow construction activities to be undertaken in accordance with the construction program. Not being able to carry out the tunnel boring machine retrieval works outside the standard working hours would extend the overall construction program by about eight months, increasing the duration of construction impacts on surrounding receivers and the community.

3 Modification development and alternatives

This chapter describes the options evaluation process for the proposed modification and how the design of the proposed modification has been developed.

3.1 Options evaluation

The options regarding the location of the tunnel boring machine retrieval works include:

- For the hard ground tunnel boring machines, the Chatswood dive site and the Blues Point temporary site
- For the under-harbour tunnel boring machine, the Barangaroo site and the Blues Point temporary site.

Not using the Blues Point temporary site to retrieve all components of the tunnel boring machines would result in:

- Delays to the commencement of tunnel activities such as cross passage and crossover caverns works
- Delays to the work at the new metro stations north of Sydney Harbour as the TBM components are passing through
- An extension to the construction program
- For the Chatswood dive site, potential fire and life safety risks.

As such, it is proposed to use the Blues Point temporary site to retrieve all components of the tunnel boring machines from the Chatswood dive site and Barangaroo.

The tunnel boring machine retrieval works could be undertaken during standard working hours, or outside standard working hours. However, works outside standard working hours would require the implementation of noise mitigation measures.

Not implementing noise mitigation measures would mean that all tunnel boring machine retrieval works would need to occur during standard working hours only. This would delay completion of works at the Blues Point temporary site, and therefore reinstatement of Blues Point Reserve would be delayed by about eight months.

A review of reasonable and feasible noise mitigation measures identified that installation of a temporary acoustic shed as the preferred approach that would achieve the best outcome in terms of minimising noise impacts of works outside standard working hours.

3.2 Design development of the proposed modification

The height and size of the temporary acoustic shed has been minimised as far as practicable. The acoustic shed is required to cover the excavated shaft site and to enclose the approved gantry crane that would be used to retrieve the tunnel boring machine components through the excavated shaft.

The roller door for the acoustic shed would be located on the southern side, facing towards the water. This would assist to minimise noise impacts and break the visual continuity of the acoustic shed when viewed from the south. The northern side (Henry Lawson Avenue) of the shed would have louvers, which cover approximately 40 per cent of that side of the shed and would assist to visually break-up the acoustic shed when viewed from the north.

The recommended colour palette for the temporary acoustic shed (refer to Figure 3-1) has been selected by a qualified urban design consultant (KI Studio) to be sympathetic to the surrounding environment.

Figure 3-1 Recommended colour palette for the proposed acoustic shed

4 Planning and assessment process

This chapter describes the statutory planning process for the proposed modification.

4.1 NSW environmental planning approvals

Sydney Metro City & Southwest was declared by Ministerial Order on 10 December 2015 to be State significant infrastructure and critical State significant infrastructure. The assessment and approval process for a critical State significant infrastructure project is established under Division 5.2 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). An Environmental Impact Statement for the Chatswood to Sydenham component of Sydney Metro City & Southwest was prepared and exhibited for 48 days from 11 May to 27 June 2016. A subsequent Submissions and Preferred Infrastructure Report was prepared and submitted to the Department of Planning and Environment in October 2016. Planning approval was granted by the Minister for Planning under Part 5.1 of the EP&A Act on 9 January 2017.

Sydney Metro is seeking, in accordance with section 5.25 of the EP&A Act, to modify the State significant infrastructure approval with respect to changes to the Blues Point temporary site.

Appendix A provides consideration of the Secretary's environmental assessment requirements issued for the Environmental Impact Statement for Sydney Metro City & Southwest Chatswood to Sydenham, including the relevance of each assessment requirement to the proposed modification and, for the relevant requirements, where they have been addressed in this report.

4.2 NSW legislation that may still be applicable

The assessment for the approved project considered other NSW legislation that may be applicable to the project. Table 4-1 provides further consideration of this legislation in relation to the proposed modification.

Table 4-1 Environmental related legislation of potential relevance to the proposed modification

Legislation	Requirement
Aboriginal Land Rights Act 1983	The NSW *Aboriginal Land Rights Act 1983* applies to Crown lands that are not lawfully needed for an essential public purpose; referred to as claimable Crown land. No additional claimable Crown lands would be affected by the proposed modification.
Contaminated Land Management Act 1997	This Act outlines the circumstances in which notification of the Environment Protection Authority (EPA) is required in relation to the contamination of land. No additional land or excavation is required as part of the proposed modification. Nevertheless, this may become relevant during construction at the Blues Point temporary site.
Crown Lands Act 1989	Ministerial approval is required to grant a 'relevant interest' (ie a lease, licence, permit, easement or right of way) over a Crown Reserve if required. The proposed modification would not be carried out on any additional Crown land.
Heritage Act 1977 (Section 146)	The Heritage Council must be notified of a relic that is uncovered during construction and if it is reasonable to believe that the Heritage Council is unaware of the location of the relic.
Native Title (New South Wales) Act 1994	This Act provides for native title in relation to land or waters. The proposed modification would not affect any additional land subject to native title or to which an Indigenous Land Use Agreement applies.

4.3 Commonwealth legislation

4.3.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) prescribes the Commonwealth's role in environmental assessment, biodiversity conservation and the management of protected areas.

The assessment for the approved project did not identify any impacts to matters of national environmental significance. As such, the approved project was not referred to the Commonwealth Department of the Environment and Energy.

The Environmental Impact Statement identified that project activities associated with the establishment of the temporary site at Blues Point would occur within the buffer zone for the Sydney Opera House, a world heritage listed site. It was noted that the project would not directly impact on the fabric of the Sydney Opera House but the construction activities have the potential to temporarily impact on the 'remarkable waterscape' setting of this World Heritage property. The Environmental Impact Statement assessed a temporary negligible indirect impact on this heritage item.

With respect to matters of national environmental significance, including the World Heritage listed Sydney Opera House, the assessment carried out for the proposed modification did not identify any changes to the impacts as assessed for the approved project. That is, the assessment for the proposed modification did not identify any potential impacts to matters of national environmental significance. Similarly, the proposed modification would not involve any actions on Commonwealth land. As such, a referral to the Commonwealth Department of the Environment for the proposed modification is not required.

4.3.2 Native Title Act

The main objective of the Commonwealth *Native Title Act 1993* is to recognise and protect native title. Section 8 states that the Native Title Act is not intended to affect the operation of any law of a State or a Territory that is capable of operating concurrently with the Act. Searches of the register maintained by the National Native Title Tribunal indicate there are no native title claims registered with respect to land within the area of the proposed modification. The proposed modification would not directly affect any Crown land that is currently the subject of a native title claim.

5 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.

5.1 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. 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):

- State 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.

5.2 Consultation to date

Broad consultation has been undertaken in relation to the proposed modification. This has included consultation with key government agencies and with the wider community.

5.2.1 Government agencies

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

- Department of Planning and Environment
- North Sydney Council
- NSW Environment Protection Authority
- Port Authority of NSW
- Roads and Maritime Services
- Sydney Coordination Office
- Harbour City Ferries, operator of Sydney Ferries on behalf of Transport for NSW
- Emergency services (NSW Police, Ambulance NSW and NSW Fire and Rescue).

A briefing session on the proposed modification and works at the Blues Point temporary retrieval site was held in May 2018 with several of the above agencies in attendance. The discussion was focussed on utility works, heritage investigations, protection of the marine environment, noise and dust mitigation, visual amenity, construction program and construction traffic (road and marine).

In addition, the TSE Contractor is participating in the North Shore New Year's Eve (NYE) Stakeholder meetings (led by Police and attended by councils, Department of Premier and Cabinet, other emergency services, Road and Maritime Services, Sydney Trains and others involved in the planning and crowd management of the NYE event). An on-site meeting was held with a sub-committee focussed on the Blues Point precinct to explain the timing and location of the works at the temporary retrieval site and security measures. Further on-site meetings would be held with the sub-committee as the works progress.

5.2.2 Local business and other stakeholders

A briefing was provided to the Lavender Bay Precinct Committee in June 2018 and regular contact has been ongoing with the Committee.

Targeted communication was also sent to the Harbourside Hotel and Sails Restaurant, which both have access from Henry Lawson Avenue.

5.2.3 Community

Communication on the temporary retrieval site has been ongoing including provision of information via:

- Emails
- Fact sheet
- Individual stakeholder briefings
- Door knocks
- Notifications and newsletter.

An introductory community information session was held in July 2017 to introduce the TSE contractor to the community and the prospect of an acoustic shed was discussed, with visuals of a typical acoustic shed displayed.

Another community drop-in session was held in June 2018 at the Henry Lawson Reserve with approximately 80 community members in attendance. A summary of the feedback received is provided in Section 5.3.

Briefings to Owner's Corporations, Strata Managers and real estate agents of adjacent premises has been ongoing with emails about the temporary retrieval site, possible impacts and an invitation to meet the team at the community drop-in session.

5.3 Feedback

The feedback received during the consultation activities has been considered during the preparation of this modification report. Feedback received by the community and stakeholders in regards to the works at the Blues Point temporary site and the proposed modification is summarised in Table 5-1.

Table 5-1 Summary of feedback considered

Feedback / Comments	Response
Concern around the number of truck movements along Blues Point Road, including the impact on small businesses along Blues Point Road	One of the key reasons for establishing a temporary barge loading facility at this site is to minimise traffic impacts however some trucks for site establishment and also site demobilisation would still be required. Consideration on the size of heavy vehicles and the existing road/ roadside infrastructure has been included in the detailed construction planning.

Feedback / Comments	Response
Support for the use of the barging facility as much as possible.	Noted
Request for consideration of a mural or design to the acoustic shed or the hoarding to minimise the visual impact.	A mural is not proposed on the acoustic shed due to its temporary nature. Heritage interpretation is planned for a portion of the hoarding around the entire site (2.4m high), which would assist to visually break-up the acoustic shed.
Concern about the limited access to Henry Lawson Reserve by the public and local residents.	It is noted that this is a temporary impact for the period that the retrieval site is in place and that access to the remainder of the foreshore and public open space would not be impacted throughout the period. This is as per the assessment of the approved project in the Environmental Impact Statement.
Concern about access to Henry Lawson Reserve during NYE fireworks.	The TSE contractor has programmed the works to construct the acoustic shed as late as possible in the construction program to minimise the impact on NYE celebrations. Two NYE periods would be impacted by the use of the Henry Lawson Reserve for the construction activities however only one NYE period would be impacted by the acoustic shed.
Concern over visual impact to adjacent residents.	Positive feedback on the limiting time the temporary acoustic shed is established on the site. Residents recognised that this was a mitigation to reduce the impact of noise from the construction works. A qualified urban designer has been engaged to recommend measures and a colour palette to minimise the visual impact of the acoustic shed.
Positive impact of placing some of the overhead cables underground adjacent to the Henry Lawson Reserve.	Noted.
Concern about vibration from the shaft excavation work.	Works will be managed in accordance with a Construction Noise and Vibration Impact Statement and Strategy. It is noted that the excavation of the shaft was assessed in the Environmental Impact Statement and already forms part of the approved project. The proposed acoustic shed would mitigate noise impacts from works in the shaft.
Comments on the suitability of Blues Point as a temporary retrieval site.	The Blues Point temporary site forms part of the approved project and was assessed in the Environmental Impact Statement. The removal of the additional components of the tunnel boring machines from the Blues Point temporary site would provide benefits to the local community by minimising construction impacts of the site.
Concerns over loss of on-street parking.	There are some temporary utilities works required for works at the site (as part of the approved project) where some temporary impacts to on-street parking may be experienced. The installation of the gantry crane within the proposed acoustic shed and use of barging would allow for the removal of the tunnel boring machine components without the requirement to set up cranes that would impact parking. Therefore, the proposed works have reduced impacts on parking when compared to the assessment in the Environmental Impact Statement.

Feedback / Comments	Response
Impact on current rental returns on investment properties near the site and claims for financial compensation due to the visual impact from the construction site and acoustic shed.	The Blues Point temporary site forms part of the approved project and was assessed in the Environmental Impact Statement. The proposed modification would change the visual impacts of the site but would also minimise other construction impacts (e.g. noise and dust). Due to the temporary nature of the works and given that there would be no direct impact on other property, compensation would not be provided.

It is noted that, during consultation, there was a general support for the acoustic shed and barging as it minimised noise and dust issues, impacts to parking and enabled the reduced number of heavy vehicles on Blues Point Road.

5.4 Public exhibition of this report

The Department of Planning 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 and Environment for consideration in its assessment of the proposed modification.

Advertisements will be placed in newspapers to advise of the public exhibition period and where this report can be viewed.

Consultation activities during the public exhibition of this report will include:

- Contact points (i.e. Community Information Line and email address)
- Newsletter notification of the exhibition
- Doorknocks with neighbouring properties to ensure they are aware of the exhibition
- Project website
- Email notification of the exhibition.

Briefings to key stakeholders and residents in proximity to the site will be ongoing throughout this period and specific briefings can be undertaken upon request.

Submissions report

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

5.5 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
- 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).

6 Modification description

This chapter describes the proposed modification and its relationship to the approved project.

6.1 Approved Sydney Metro works at Blues Point temporary site

The Sydney Metro City & Southwest Chatswood to Sydenham project was approved by the Minister for Planning on 9 January 2017. At the Blues Point temporary site, the approved works associated with Sydney Metro include:

- Excavation of a shaft to the tunnels below resulting in about 8,000 cubic metres of spoil being removed through the site
- Retrieval of the cutter heads and shield of the tunnel boring machines from the Chatswood dive site and from Barangaroo through the shaft
- Transporting the tunnel boring machine components by either road or barge
- Access to the site would be from Blues Point Road (left-in) and Henry Lawson Drive (left-out)
- Works may be undertaken outside standard daytime construction hours provided appropriate noise mitigation is in place
- Indicative construction plant and equipment including piling rigs, excavators, and mobile cranes.

6.2 Proposed modification

The proposed modification would involve the following changes to the approved project:

- Installation of an acoustic shed
- Retrieval of all components of the tunnel boring machines from the Chatswood dive site and from Barangaroo through the shaft.

6.2.1 Installation of acoustic shed

A temporary acoustic shed would be installed over the excavated shaft to minimise noise impacts associated with undertaking tunnel boring machine retrieval works outside of standard working hours. The acoustic shed would be about 19 metres in height. Due to the gradient of the site, the shed would sit about 17 metres above ground level at the Henry Lawson Avenue side of the site, and about 21 metres above ground level from the waterfront side of the site. The temporary shed would be installed following site establishment works (anticipated to be about early 2019) and would be decommissioned and dismantled following completion of the tunnel boring machine retrieval works (anticipated to be about mid 2020).

The construction of the acoustic shed will take approximately three (3) months to complete and will involve the following key activities:

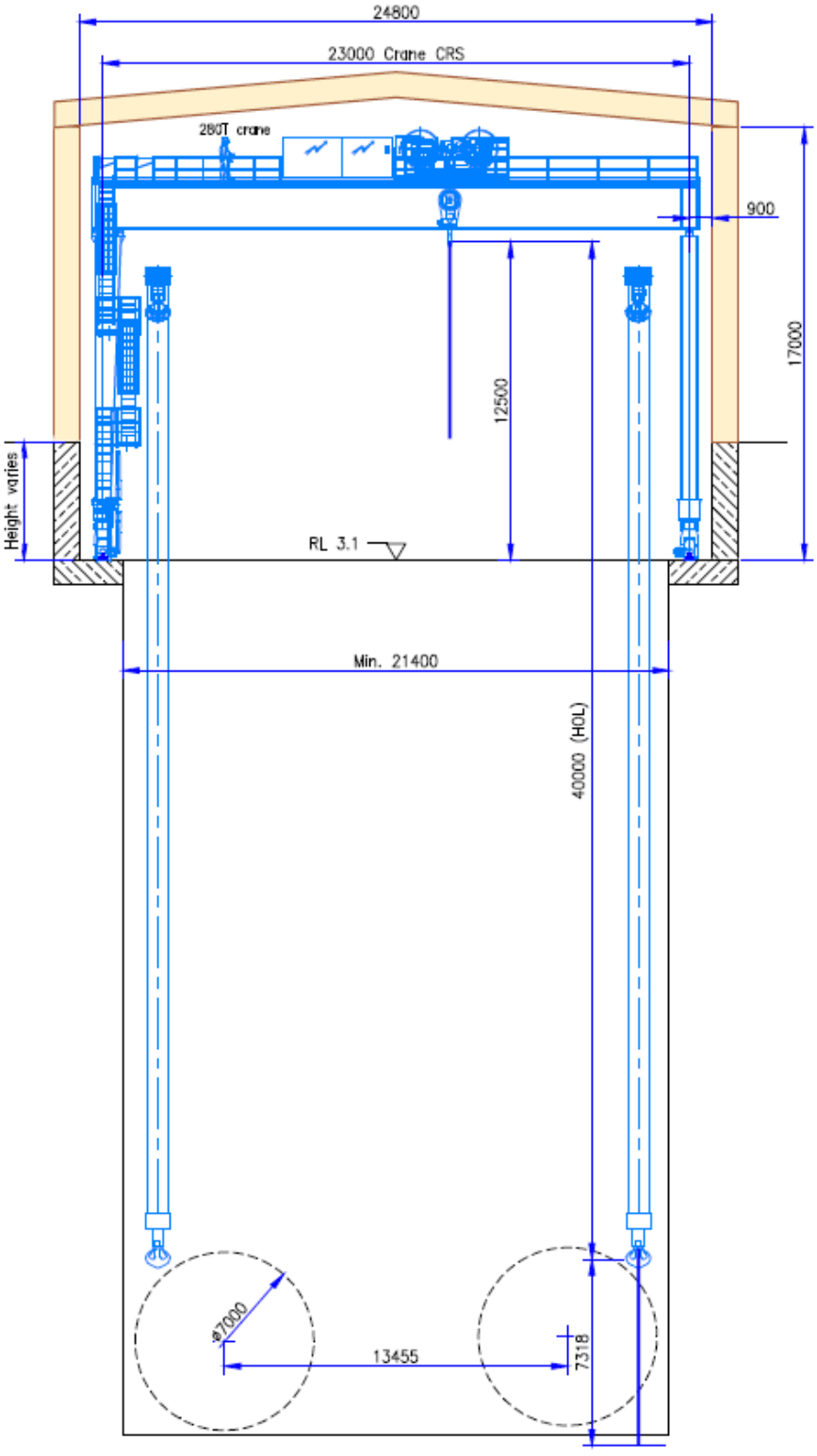
- Delivery of steel and shed components to the worksite
- Installation of shed columns
- Installation of cladding sides and roof
- Installation of bespoke features such as louvres for ventilation, guttering and safety features.

The plant and equipment required to construct the temporary acoustic shed would include cranes, elevated work platforms, forklifts, and hand held tools (e.g. drills).

During the installation of external cladding on the road sides of the shed, there may be some temporary partial closure of the footpath and car parking spaces on Blues Point Road and Henry Lawson Drive to manage the safety requirements for cladding installation. This impact will be short term and will be completed 'bay by bay' for areas where parking is impacted.

A plan of the location of the proposed acoustic shed within the temporary retrieval site is shown in Figure 6-1. The cross section of the proposed acoustic shed (shown in yellow), the approved gantry crane (shown in blue) and the approved excavated shaft (shown in black) are shown in Figure 6-2.

Figure 6-1 Plan of the proposed acoustic shed


24800
23000 Crane CRS
280T crane
900
17000
12500
Height varies
RL 3.1
Min. 21400
40000 (HOL)
ø7000
13455
7318

SECTION A–A

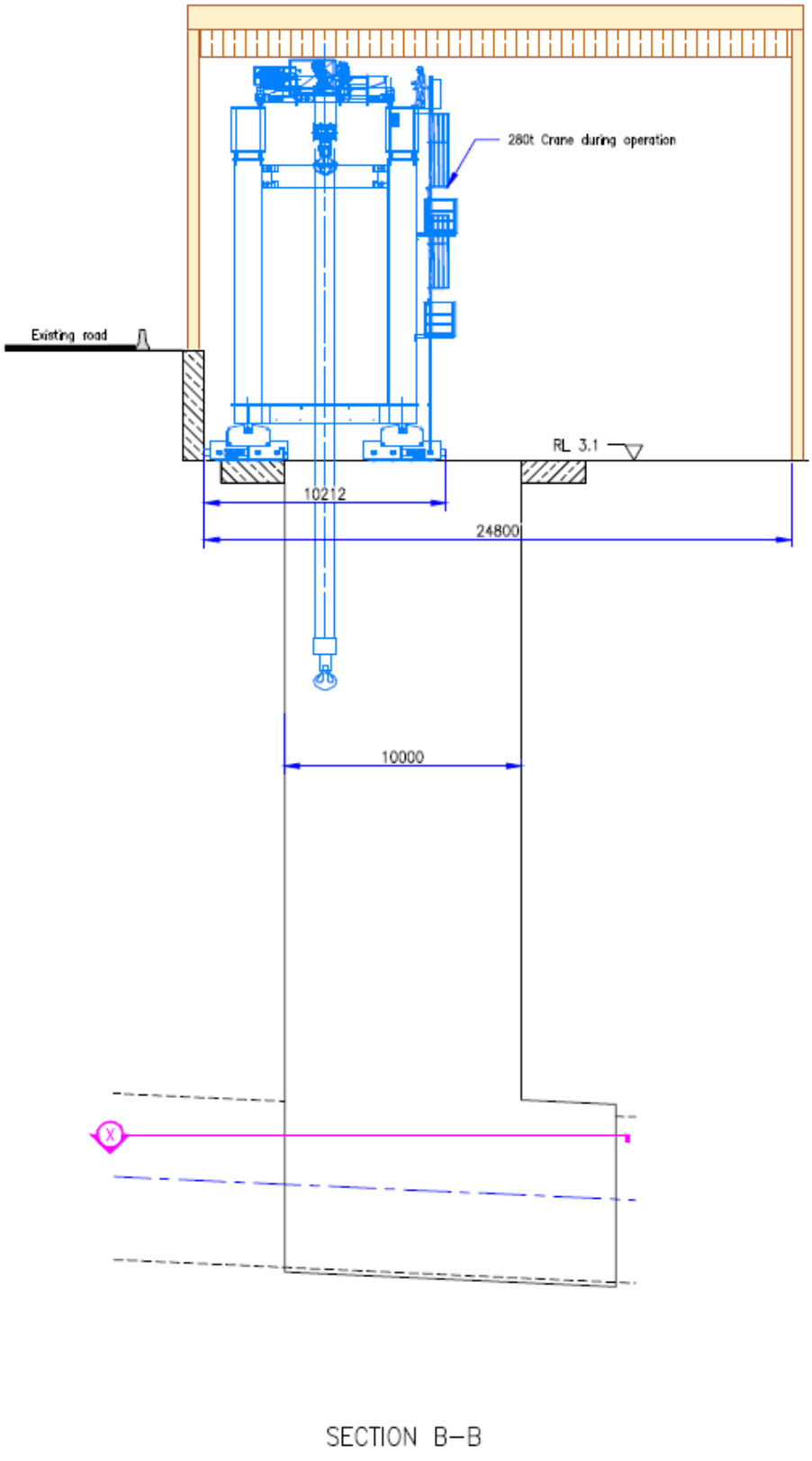


Figure 6-2 Sections of the proposed acoustic shed

6.2.2 Tunnel boring machine retrieval

It is now proposed that all components of the tunnel boring machines are retrieved from the Blues Point temporary site, through the excavated shaft. This would involve the removal of the two hard ground tunnel boring machines from the Chatswood dive site and the removal of the under-harbour tunnel boring machine from Barangaroo. The under-harbour tunnel boring machine would need to be retrieved twice from the Blues Point temporary site, once for each tunnel drive from Barangaroo.

The gantry crane inside the acoustic shed will be used to lift the tunnel boring machine components from the shaft and place them onto trailers for movement onto the barge for transport. Depending on the size of the relevant components, several components will be loaded onto each trailer for transport to minimise the number of movements, however the total loading and safety requirements will dictate the overall number of movements.

Tunnel boring machine components retrieved from the Blues Point temporary site would be transported by barge. The use of the barge would require this work to be undertaken outside standard working hours, in accordance with the requirements of the Harbour Master and during appropriate tides and weather conditions. The retrieval of the tunnel boring machine components would require about three months of out of hours works, and about 15 to 20 barge movements.

7 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 7-1.

Table 7-1 Environmental screening assessment

Issue	Potential change in impact?	Description
Construction traffic and transport	No	The installation of the temporary acoustic shed would require the delivery of shed materials by truck along Blues Point Road, however the volume of truck movements to and from the site have been greatly reduced with the proposed barging of the tunnel boring machine components. The approved project identified the occupation of the on-street parking on Blues Point Road during the tunnel boring machine retrieval works. The proposed site layout with the temporary acoustic shed and associated barging of tunnel boring machine components would avoid the need to impact on this parking during the retrieval works. However, the installation of cladding to the acoustic shed may involve the temporary partial closure of the footpath and car parking spaces on Blues Point Road and Henry Lawson Drive to manage the safety requirements for cladding installation. This impact would be short term and would be completed 'bay by bay' for areas where parking is impacted. Given the minor impacts and benefits associated with the proposed modification, an additional assessment of potential changes to construction traffic and transport impacts associated with the proposed modification is not considered necessary.
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.

Issue	Potential change in impact?	Description
Construction noise and vibration	Yes	The installation of the proposed acoustic shed would improve the overall construction noise outcomes of the works at the Blues Point temporary site. The potential noise impacts associated with the shaft excavation and tunnel boring machine retrieval works is anticipated to reduce by up to 15 to 20 dBA with the installation of the acoustic shed. The proposed installation of the acoustic shed would have localised, short-term construction noise impacts associated with the use of noise generating equipment and plant. 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 Chapter 8.
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	Yes	The proposed temporary acoustic shed would be 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 proposed modification is also located within the McMahons Point South heritage conservation area. The proposed temporary acoustic shed would result in significant but temporary visual impact, but also provides shielding for the gantry crane infrastructure required at the worksite. These impacts are short term and removed once with worksite is demobilised and rehabilitated. An assessment of potential changes to indirect non-Aboriginal impacts associated with the proposed modification is provided in Chapter 9.
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.

Issue	Potential change in impact?	Description
Landscape character and visual amenity	Yes	The Environmental Impact Statement for the approved project identified a high adverse visual impact and landscape impact from the presence of construction activity, including the gantry crane, at Blues Point. The installation of a temporary acoustic shed to enclose the site and gantry crane would create a new visual element, and therefore increased visual impacts, during the construction works at this location. The proposed acoustic shed has been designed to minimise visual impacts as far as practicable. The proposed modification would not significantly change the overall landscape character and function of Blues Point Reserve as assessed in the Environmental Impact Statement. Therefore, the assessment has focused on the potential impact to visual amenity as a result of the proposed modification. An assessment of potential changes to visual amenity impacts associated with the proposed modification is provided in Chapter 10.
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.
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. The provision of the acoustic shed across the site would assist in minimising dust impacts. 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	No	The proposed modification does not affect any additional land or property and there would be no change to the duration of impacts to Blues Point Reserve. Potential temporary amenity impacts experienced by users of Blues Point Reserve due to noise and dust from the excavations and tunnel boring machine retrieval works would be minimised following the installation of the proposed acoustic shed. Although the proposed acoustic shed would temporarily affect the visual amenity of the Reserve. An additional assessment of potential changes to social impacts and community infrastructure associated with the proposed modification is not considered necessary.
Biodiversity	No	The proposed modification would not involve any additional clearing of any additional vegetation or areas of biodiversity value. The large fig tree at the eastern end of Blues Point Reserve would not be affected by the proposed works. Therefore there would be no change to the potential biodiversity impacts of the approved project. An additional assessment of potential changes to biodiversity impacts associated with the proposed modification is not considered necessary.

Issue	Potential change in impact?	Description
Flooding and hydrology	No	The provision of an acoustic shed across the site would 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 and would be undertaken in accordance with the existing mitigation measures identified for the site. 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. The provision of the acoustic shed across the site would assist in minimising dust impacts from the excavated site on adjacent receivers. An additional assessment of potential changes to air quality impacts associated with the proposed modification is not considered necessary. However, mitigation measure AQ9 has been revised to ensure that ventilation from the proposed acoustic shed at Blues Point would also be filtered, consistent with other acoustic sheds for the approved project (refer to Table 11-1).
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	All components of the tunnel boring machines would be retrieved from the Blues Point temporary site rather than the components (excluding the cutter head and shield) being redirected back to the Chatswood dive site and Barangaroo. The need to retrieve all components of the tunnel boring machines for the project has not changed, although their retrieval location has changed. Following completion of the construction activities at the Blues Point temporary site, the acoustic shed would need to be dismantled and considered for re-use. An additional assessment of potential changes to waste management associated with the proposed modification is not considered necessary.
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. The proposed modification would respond to the objective to reduce sources of pollution and optimise control at source to avoid environmental harm, including noise and air quality impacts. An additional assessment of potential changes to sustainability associated with the proposed modification is not considered necessary.

Issue	Potential change in impact?	Description
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.

8 Construction noise and vibration

This chapter assesses the potential change in noise and vibration impacts during the construction of the proposed modification. Any changes to mitigation measures to address the potential impacts are also identified.

8.1 Assessment methodology and assumptions

A noise and vibration assessment of the proposed modification has been undertaken by Renzo Tonin & Associates as part of detailed construction planning. The assessment includes the works associated with establishment of the worksite as well as the construction operations of the worksite. There are no changes to the site establishment and demobilisation noise and vibration impacts associated with the proposed modification. This section discusses the improvements to the acoustic environment from the use of the acoustic shed at the temporary retrieval site. This assessment assumes the acoustic shed is in place for the bulk excavation of the shaft and for all tunnel boring machine retrievals.

Modelling and assessment of airborne noise impacts from activities associated with the construction works was determined by modelling the noise sources, receiver locations, topographical features, and noise mitigation measures using a Cadna-A computer noise model developed for this project. The model calculates the contribution of each noise source at identified sensitive receiver locations and allows for the prediction of the total noise from a site for the various stages of the construction works. The noise prediction models consider:

- Location of noise sources and sensitive receiver locations
- Height of sources and receivers referenced to one metre digital ground contours for the site area and surrounding area
- Sound power levels of plant and equipment likely to be used during the various construction activities
- Separation distances between sources and receivers
- Attenuation from barriers (natural and purpose built).

Key details regarding the construction site layout, the likely plant and equipment (including truck movements), and hours of work were considered in this assessment.

8.2 Existing environment

The existing environment at the Blues Point temporary retrieval 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.

For the purposes of the noise and vibration assessment, four noise catchment areas (NCA) have been identified for the Blues Point temporary retrieval 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 8-1 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

8.3 Potential impacts

During site establishment and demobilisation activities, the proposed acoustic shed would not be in place to provide noise mitigation (and cannot be in place due to the sequencing of the works). As such, there are no anticipated changes to the site establishment and demobilisation noise and vibration impacts associated with the proposed modification.

For receivers at BN_01 and OSR, all bulk shaft excavation and tunnel boring machine retrieval activities are expected to be within the relevant NMLs.

For receivers at BP_01 and BP-02:

- Bulk shaft excavation within the acoustic shed has the potential to exceed the NML by approximately 10dBA. This is a reduction in noise level by approximately 15dBA if these same activities were to be conducted without an acoustic shed in place.
- During tunnel boring machine disassembly within the acoustic shed, noise levels are expected to be within the relevant NMLs except for one noise sensitive receiver. If these same activities were to be conducted without an acoustic shed in place, an increase in noise levels of between 15-20 dB(A) would be expected. These activities would be required to be conducted continuously across 24 hour operations, and exceedance of the sleep disturbance criteria in the order of 7 dB(A) could be expected.
- During tunnel boring machine retrieval operations the assessment indicates maximum noise levels could exceed the NML (based on Condition E41/E42) by up to 17 dB(A) and the ICNG NML by up to 27 dB(A) at the nearest noise sensitive receivers. This work would therefore trigger consideration for alternative accommodation or other suitable respite offers. These activities would involve works both inside and outside of the acoustic shed and would require the roller door on the acoustic shed to be open at times. The noise impacts would be predominantly caused by the operation of the self-propelled

modular trailer to the acoustic shed, which is used to transfer tunnel boring machine components from the shed to the barge.

The tunnel boring machine disassembly and retrieval operations are expected occur between August 2019 and February 2020. It is noted that the high noise levels associated with these works are only expected to occur for a maximum of 16 nights across the entire construction program. This is a significant reduction from the 3-4 months of noise impacts that would occur without the acoustic shed in place.

8.4 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. One revised noise and vibration measure (NV1) is considered necessary as outlined in Table 8-2. The proposed addition to the existing mitigation measure is shown in **bold** text.

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 36, 39, 40, 42, 44 and 48)
- 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 bulk excavation of the shaft and tunnel boring machine retrievals.

Table 8-2 Mitigation measures – Noise and vibration

ID	Mitigation measure	Applicable location(s)[1]
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

1 STW: Surface track works; CDS: Chatswood dive site; AS: Artarmon substation; CN: Crows Nest Station; VC: Victoria Cross Station; BP: Blues Point temporary site; GI: Ground improvement works; BN: Barangaroo Station; MP: Martin Place Station; PS: Pitt Street Station; CS: Central Station; WS: Waterloo Station; MDS: Marrickville dive site (including 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.

9 Non-Aboriginal heritage

This chapter assesses the potential change in indirect non-Aboriginal impacts during the construction of the proposed modification. Any changes to mitigation measures to address the potential impacts are also identified.

9.1 Assessment methodology and assumptions

The Sydney Metro City & Southwest Chatswood to Sydenham Environmental Impact Statement *Technical Paper 4: Non-Aboriginal Heritage Impact Assessment,* prepared by Artefact Heritage (2016), provided the assessment of potential non-Aboriginal heritage impacts associated with the project.

Casey and Lowe undertook a review of the proposed modification in relation to non-Aboriginal heritage impacts identified for the approved project.

9.2 Existing environment

A number of listed heritage items are located in the vicinity of the Blues Point temporary site including:

- Sydney Opera House buffer zone: world heritage list
- Blues Point Waterfront Group: local environmental plan
- Blues Point Tower: local environmental plan
- North Sydney bus shelters: local environmental plan
- House (3 Warung Street) : local environmental plan
- House (5 Warung Street) : local environmental plan
- McMahons Point South heritage conservation area: local environmental plan.

The Blues Point Waterfront Group (I0423) comprises eight individual items:

- Blues Point vehicular ferry dock (I0451)
- World War II Observation Post and stone stairs (I0424)
- Blues Point Foreshore Shelf (I0425)
- Stone retaining wall (I0426)
- Bollard (I0427)
- Bollard with chain (I0428)
- Excavation (archaeological site) (I0429)
- Steps with bollards (I0450).

Refer to Technical Paper 4 for further details on these heritage items.

9.3 Potential impacts

The temporary visual impact of the proposed acoustic shed would be significant, however the acoustic shed would also work to shield the gantry crane infrastructure required for both shaft excavation and the tunnel boring machine retrieval operations. The colour palette for the acoustic shed, outlined in Section 3.2 of this

report, would reduce its visual impact. Indirect impacts (views and vistas) to the Buffer Zone of the Sydney Opera House and local heritage items in the vicinity of the Blues Point temporary site would be short term and reversible (i.e. removed once the worksite is decommissioned and rehabilitated). Impacts to the views and vistas of these items were identified in the Environmental Impact Statement. There would be no direct impacts to these heritage items as a result of the proposed modification.

9.4 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. No changes to existing mitigation measures are required in relation to non-Aboriginal heritage.

The conditions of approval issued for the approved project would continue to apply to the proposed modification. Of relevance this includes:

- Condition E10 – the Proponent must not destroy, modify or otherwise physically affect any Heritage item not identified in the documents referred to in Condition A1.
- Condition E13 - The Proponent must prepare a Heritage Archival Recording Report, including photographic recording of the heritage items identified in documents referred to in Condition A1. Archival recording must include but not be limited to the following heritage items:
  (a) 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; …

10 Landscape character and visual amenity

This chapter assesses the potential change in landscape character and visual amenity impacts during the construction of the proposed modification. Any changes to mitigation measures to address the potential impacts are also identified.

10.1 Assessment methodology and assumptions

An assessment of the proposed modification has been undertaken by KI Studio Pty Ltd on behalf of the TSE contractor, JHCPBG. The potential landscape character and visual impacts of the proposed temporary acoustic shed have been identified, along with strategies to minimise the identified impacts.

The assessment has been carried in accordance with the Roads and Maritime Services (RMS) guidelines – *Guidelines for landscape character and visual impact assessment* (RMS, March 2013) – and includes consideration of the visual sensitivity of the landscape elements and viewpoints and the magnitude of change expected as a result of the proposed modification to provide an overall impact rating. This is consistent with the methodology adopted for the assessment of the approved project.

The assessment in the Environmental Impact Statement for the approved project assessed potential impacts to seven representative viewpoints (refer to Figure 16-5 of the Environmental Impact Statement) and the one landscape character area at Blues Point Reserve. The sensitivity rating for each landscape character area and viewpoint has not changed from the assessment provided in the Environmental Impact Statement. Table 10-1 identifies the seven viewpoint locations assessed as well as their sensitivity rating. The sensitive rating for the landscape character area at Blue Point Reserve was identified as 'regional'.

Table 10-1 Viewpoints and sensitivity rating

Viewpoint	Location	Sensitivity rating
1	View southeast from the corner of Blues Point Road and Henry Lawson Avenue	Regional
2	View northeast from Blues Point	Regional
3	View west from the foreshore park on Henry Lawson Avenue	Regional
4	View west from Sydney Harbour Bridge	Regional
5	View northwest from the Sydney Opera House forecourt plaza	National
6	View northwest from the Ives Stairs	Regional
7	View north from Barangaroo Reserve	Regional

Identification of the potential visual impacts of the proposed acoustic shed has been determined based on the adoption of the recommended colour palette for the acoustic shed as shown in Figure 3-1.

10.2 Existing environment

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

Blues Point Reserve includes sandstone embankments, mature trees, playground equipment and open lawns. The site has important views towards Sydney Harbour, the Sydney Harbour Bridge and Sydney Opera House, including a rare view of the Opera House framed by the Bridge.

Blues Point Tower sits prominently at the end of Blues Point Road and is within Blues Point Reserve. The large expanse of roadway and surface car parking at the end of Blues Point Road detracts somewhat from the character of this parkland.

10.3 Potential impacts

10.3.1 Landscape character

For Blues Point Reserve, the magnitude of change as a result of the proposed acoustic shed is considered to be considerable, although there are areas with effective screening such as the upper level of the reserve. The proposed temporary acoustic shed would be a dominant element within this landscape character area, resulting in a high adverse impact to the landscape character.

10.3.2 Visual amenity

Magnitude of change

For the assessment of viewpoints 1 and 2, the assessment of potential impacts has focused on impacts to residents within the surrounding residential buildings (refer to Table 10-2).

Table 10-2 Potential magnitude of change to surrounding residential buildings

Location	Magnitude of change	Commentary
Blues Point Tower	Considerable reduction to no perceived change	The visual magnitude of the proposed acoustic shed from Blues Point Tower would depend on the height of the viewer. In general, higher viewers would be less impacted. The viewers in the lower third portion of Blues Point Tower would experience a considerable reduction in the view, while viewers in the upper third portion of the Tower would likely look beyond the proposed acoustic shed and would not perceive a change to the view. A number of residences would temporarily lose their current vistas towards the Sydney Harbour Bridge and Sydney Opera House.
30-40 Blues Point Road	Considerable reduction	This property has a direct outlook onto the proposed acoustic shed and there would be a considerable reduction in the view.
42 Blues Point Road	Noticeable reduction	The acoustic shed would be partially screened by other built form elements and the viewers would be located further away from the site but there would still be a noticeable reduction in the view.
46 Blues Point Road	Noticeable reduction	Visual interface with the proposed acoustic shed is limited but there would be a noticeable reduction in the view.

1 Warung Street	Considerable reduction	This property has a direct outlook onto the proposed acoustic shed and there would be a considerable reduction in the view. The acoustic shed would be a dominant feature from this property and the current panoramic vistas would be affected.
3 Warung Street	Considerable reduction	This property has a direct outlook onto the proposed acoustic shed and there would be a considerable reduction in the view.
5 Warung Street	Noticeable reduction	The change to the view would be clearly visible but would not be a substantial change to the view.
7 Warung Street	Noticeable reduction	Visual interface with the proposed acoustic shed is limited but there would be a noticeable reduction in the view.
2 East Crescent Street	No perceived change	The magnitude of change to the view would depend on which floor of the building the viewer is located, although the view is generally unlikely to be perceived by viewers.

The magnitude of change for users of Blues Point Road (within viewpoints 1 and 2) would be limited to the southern end of the road. There would be a noticeable reduction is along part of the road, increasing to a considerable reduction in the views experienced at the southern end of the road.

In addition to impacts on views from residential properties and along Blues Point Road, other viewpoints have been considered. Viewers from Henry Lawson Reserve (viewpoint 3) are likely to experience a considerable reduction in the views but the proposed acoustic shed would only be partially visible due to screening vegetation and the viewscape is of a secondary importance.

Viewers from the Sydney Harbour Bridge (viewpoint 4) would be anticipated to notice the reduction in the views as a result of the proposed acoustic shed but there would not be a substantial change to the panoramic view at this location.

The proposed acoustic shed would result in no perceived change to the views from the Sydney Opera House (viewpoint 5) as the distance to the proposed acoustic shed limits its visual dominance and the proposed colour scheme would contribute to the acoustic shed receding within the background.

The magnitude of change to views at Walsh Bay (viewpoint 6) is expected to be noticeable by viewers but the scale of the proposed acoustic shed in the context of the open panoramic harbour views limits the effects of the proposed shed. The view from Barangaroo Reserve (viewpoint 7) is expected to be partially obstructed by the Blues Point headland and therefore there would be no perceived change to this view as a result of the proposed acoustic shed.

Photomontages of the proposed acoustic shed from a range of key viewpoints are provided in Figure 10-1 to Figure 10-6.

Figure 10-1 Photomontage of proposed temporary acoustic shed from across the harbour on a ferry

Figure 10-2 Photomontage of proposed temporary acoustic shed from Blues Point Tower carpark

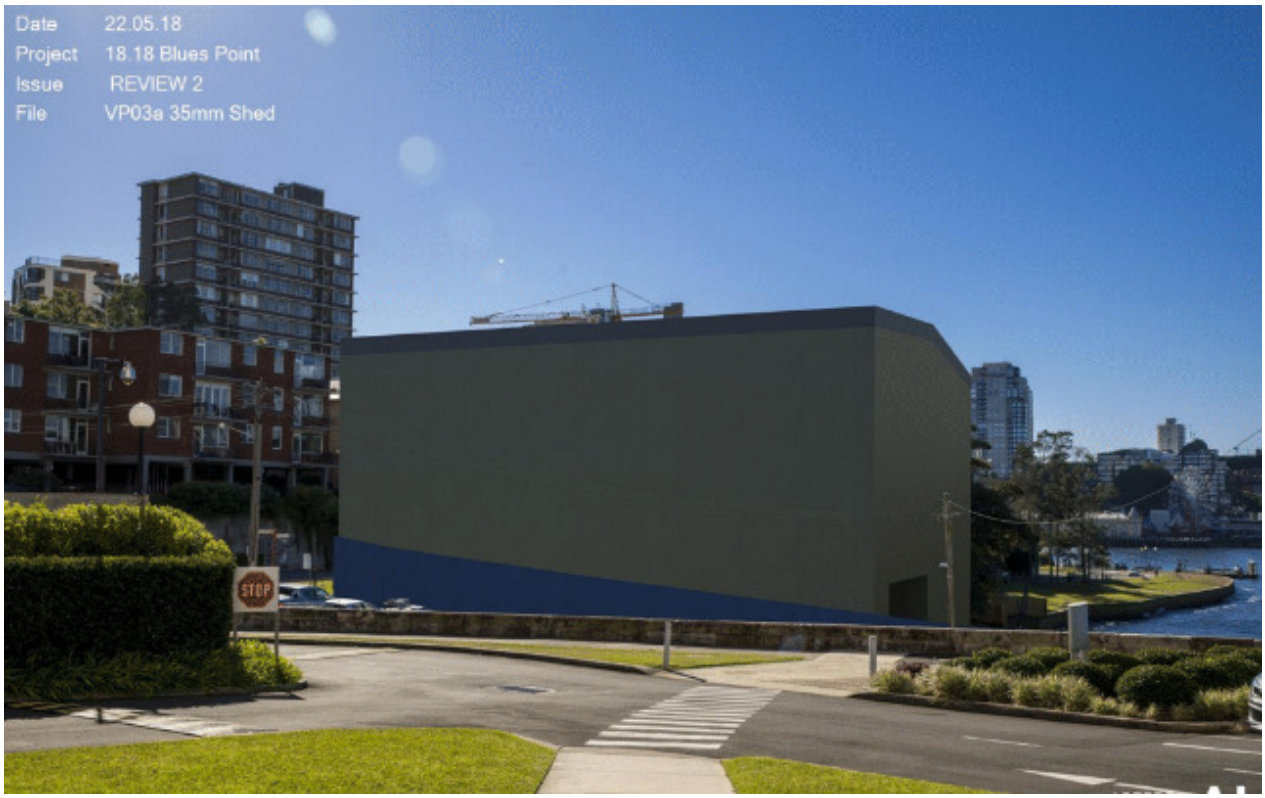


Figure 10-3 Photomontage of proposed temporary acoustic shed from the ground floor of Blues Point Tower

Figure 10-4 Photomontage of proposed temporary acoustic shed from near 30-40 Blues Point Road

Figure 10-5 Photomontage of proposed temporary acoustic shed from Walsh Bay

Figure 10-6 Photomontage of proposed temporary acoustic shed from the forecourt of the Sydney Opera House

Visual impact rating

Based on the above magnitude of change the visual impacts to the viewpoints and associated residential receivers have been identified (refer to Table 10-3). The visual impact rating identified in Table 10-3 as a result of the proposed acoustic shed does not alter the overall visual impact rating identified in the Environmental Impact Statement for each viewpoint. However, the proposed modification would result in a greater number of residential receivers being affected due to the height of the proposed acoustic shed.

Table 10-3 Visual impacts of the proposed modification

Viewpoint	Location	Visual impact rating
1 / 2	Blues Point Tower	Negligible to high adverse
1 / 2	30-40 Blues Point Road	High adverse
1 / 2	42 Blues Point Road	Moderate adverse
1 / 2	46 Blues Point Road	Moderate adverse
1 / 2	1 Warung Street	High adverse
1 / 2	3 Warung Street	High adverse
1 / 2	5 Warung Street	Moderate adverse
1 / 2	7 Warung Street	Moderate adverse
1 / 2	2 East Crescent Street	Negligible
1 / 2	Users of Blues Point Road	Moderate adverse to high adverse
3	Foreshore park on Henry Lawson Avenue	High adverse
4	Sydney Harbour Bridge	Moderate adverse
5	Sydney Opera House forecourt plaza	Negligible
6	Walsh Bay and Ives Stairs	Moderate adverse
7	Barangaroo Reserve	Negligible

The above visual impacts are temporary and would occur over an 18 month period. 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. For example, the proposed acoustic shed would be installed in Q1 2019, so as to not impact on the New Year's period of 2018/2019. The tunnel boring machine retrieval works would be timed to occur over an 18 month period to enable the proposed acoustic shed to be dismantled prior to the New Year's period of 2020/2021. Therefore, the proposed visual impacts would affect only one New Year's period rather than two across its 18 month duration.

10.4 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 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~~.

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.

Table 10-4 Mitigation measures

ID	Mitigation measure	Applicable location(s)[1]
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 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 2020/2021.**	BP
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**

1 STW: Surface track works; CDS: Chatswood dive site; AS: Artarmon substation; CN: Crows Nest Station; VC: Victoria Cross Station; BP: Blues Point temporary site; GI: Ground improvement works; BN: Barangaroo Station; MP: Martin Place Station; PS: Pitt Street Station; CS: Central Station; WS: Waterloo Station; MDS: Marrickville dive site (including 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.

11 Consolidated revised environmental mitigation measures

11.1 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 11-1 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 9 to 13. These measures are consolidated in Table 11-1
- Construction environmental management framework – details the management processes and documentation for the project. Further details are provided in 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.

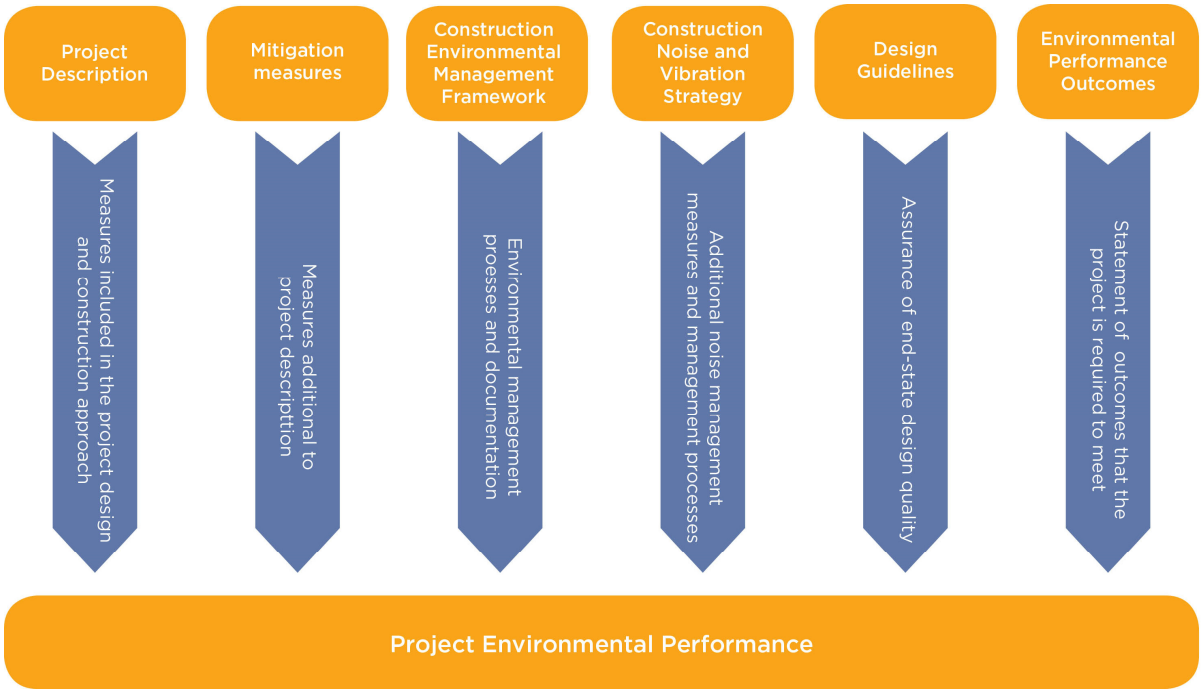


Figure 11-1 Project approach to environmental mitigation and management

11.2 Revised environmental mitigation measures

The list of mitigation measures presented in the Submissions and Preferred Infrastructure Report, the Victoria Cross Station and Artarmon Substation modification, the Central Walk modification, the Martin Place Station modification and the Sydenham Station and Sydney Metro Trains Facility South modification has been revised based on the assessment carried out for the proposed modification.

Table 11-1 provides the revised consolidated environmental mitigation measures. This table supersedes the mitigation measures presented in the Submissions and Preferred Infrastructure Report, the Victoria Cross Station and Artarmon Substation modification, the Central Walk modification, the Martin Place Station modification and the Sydenham Station and Sydney Metro Trains Facility South modification. New mitigation measures or additions to existing mitigation measures are shown in bold text, with deletions shown with a strikethrough.

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 11-1 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 exceedences 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 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 2020/2021.**	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 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.	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

12 Justification and conclusion

The approved project includes a temporary construction site at Blues Point to enable the retrieval of the cutter heads and shields of the tunnel boring machines from the Chatswood dive site and from Barangaroo. Since the project was approved, a joint venture of John Holland CPB Ghella (JHCPBG) has been contracted to undertake the Tunnel and Station Excavation (TSE) works. During detailed construction planning for the Blues Point temporary site, the TSE contractor has identified the need for every component of the tunnel boring machines from the Chatswood dive site and from Barangaroo to be retrieved from this site.

Transport of the retrieved tunnel boring machine components by barge from the Blues Point temporary site would be dependent on tides, weather conditions and the requirements of the Harbour Master and therefore may involve works outside standard daytime hours. To minimise the construction impacts of these proposed works, the TSE contractor proposes to install an acoustic shed over the site. The acoustic shed would enclose the gantry crane that will be used to lift out the excavated material from the shaft and the tunnel boring machine components.

The proposed modification would provide the following benefits:

- Reduced noise impacts on surrounding sensitive receivers during excavation of the shaft and during the tunnel boring machine retrieval works, particularly during works outside standard daytime hours
- Reduced dust impacts on surrounding sensitive receivers
- Improved security at the shaft site.

In addition, the proposed modification would allow construction activities to be undertaken in accordance with the construction program. Not being able to carry out the tunnel boring machine retrieval works outside the standard working hours would extend the overall construction program by about eight months, increasing the duration of construction impacts on surrounding receivers and the community.

The proposed modification would cause a significant visual impact to adjacent residential properties however will be temporary in nature. The duration of the acoustic shed being required at the site has been minimised to the greatest extent possible through detailed construction planning.

While the project-specific mitigation measures identified for the approved project are generally sufficient to address the potential impacts of the proposed modification, one additional measure has been identified and four existing mitigation measures have been revised to manage specific potential l impacts associated with the proposed modification. The relevant conditions of approval would continue to apply to the proposed modification.

References

City & Southwest Metro Chatswood to Sydenham Environmental Impact Statement - Technical Paper 4: Non-Aboriginal heritage impact assessment (Artefact Heritage, May 2016)

City & Southwest Metro Chatswood to Sydenham Environmental Impact Statement - Technical Paper 6: Landscape and visual impact assessment (Iris Visual Planning and Design, April 2016)

Guidelines for landscape character and visual impact assessment (Roads and Maritime Services, March 2013)

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

Glossary

Acronym	Definition
dB	Decibels
dBA	A-weighted decibels
EPA	NSW Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ICNG	Interim Construction Noise Guideline
NMLs	Noise management levels
NYE	New Year's Eve
RBL	Rating background level

Appendix A
Secretary's environmental assessment requirements

Desired Performance Outcome	Requirement	Where addressed
1. Environmental Impact Assessment Process The process for assessment of the proposal is transparent, balanced, well focussed and legal.	1. The Environmental Impact Statement must be prepared in accordance with Part 3 of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* (the Regulation).	Not applicable
	2. It is the Proponent's responsibility to determine whether the project needs to be referred to the Commonwealth Department of the Environment for an approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The Proponent must contact the Commonwealth Department of the Environment immediately if it is determined that an approval is required under the EPBC Act, as supplementary environmental assessment requirements may need to be issued to ensure a streamlined assessment under the Bilateral agreement can be achieved.	Chapter 4
	3. Where the project requires approval under the EPBC Act and is being assessed under the Bilateral Agreement the EIS should address:	
	(a) Consideration of any Protected Matters that may be impacted by the development where the Commonwealth Minister has determined that the proposal is a Controlled Action.	
	(b) Identification and assessment of those Protected Matters that are likely to be significantly impacted.	
	(c) Details of how significant impacts to Protected Matters have been avoided, mitigated and, if necessary, offset.	
	(d) Consideration of, and reference to, any relevant conservation advices, recovery plans and threat abatement plans.	
	4. The onus is on the Proponent to ensure legislative requirements relevant to the project are met.	

Desired Performance Outcome	Requirement	Where addressed
2. Environmental Impact Statement The project is described in sufficient detail to enable clear understanding that the project has been developed through an iterative process of impact identification and assessment and project refinement to avoid, minimise or offset impacts so that the project, on balance, has the least adverse environmental, social and economic impact, including its cumulative impacts.	1. The EIS must include, but not necessarily be limited to, the following:	Not applicable, however the following is noted: ▪ Description of the modification is provided in Chapter 6 ▪ Need and justification for the modification is provided in Chapter 2 ▪ Options analysis for the elements of the modification is provided in Chapter 3
	(a) executive summary;	
	(b) a description of the project, including all components and activities (including ancillary components and activities) required to construct and operate it;	
	(c) a statement of the objective(s) of the project;	
	(d) a summary of the strategic need for the project with regard to its critical State significance and relevant State Government policy;	
	(e) an analysis of any feasible alternatives to the project;	
	(f) a description of feasible options within the project;	
	(g) a description of how alternatives to and options within the project were analysed to inform the selection of the preferred alternative / option. The description must contain sufficient detail to enable an understanding of why the preferred alternative to and options(s) within the project were selected;	
	(h) potential opportunities for further network expansion and consideration of relationship to other Government public transport initiatives; a concise description of the general biophysical and socioeconomic environment that is likely to be impacted by the project (including offsite impacts). Elements of the environment that are not likely to be affected by the project do not need to be described;	
	(i) a demonstration of how the project design has been developed to avoid or minimise likely adverse impacts;	
	(j) the identification and assessment of key issues as provided in the 'Assessment of Key Issues' performance outcome;	
	(k) a statement of the outcome(s) the proponent will achieve for each key issue;	
	(l) measures to avoid, minimise or offset impacts must be linked to the impact(s) they treat, so it is clear which measures will be applied to each impact;	

Desired Performance Outcome	Requirement	Where addressed
	(m) an assessment of the cumulative impacts of the project taking into account other projects that have been approved but where construction has not commenced, projects that have commenced construction, and projects that have recently been completed (for example WestConnex, Barangaroo, any approved construction in the relevant precincts);	
	(n) statutory context of the project as a whole, including:	
	– how the project meets the provisions of the EP&A Act and EP&A Regulation;	
	– a list of any approvals that must be obtained under any other Act or law before the project may lawfully be carried out;	
	(o) a chapter that synthesises the environmental impact assessment and provides:	
	– a succinct but full description of the project for which approval is sought;	
	– a description of any uncertainties that still exist around design, construction methodologies and/or operational methodologies and how these will be resolved in the next stages of the project;	
	– a compilation of the impacts of the project that have not been avoided;	
	– a compilation of the proposed measures associated with each impact to avoid or minimise (through design refinements or ongoing management during construction and operation) or offset these impacts;	
	– a compilation of the outcome(s) the proponent will achieve; and	
	– the reasons justifying carrying out the project as proposed, having regard to the biophysical, economic and social considerations, including ecologically sustainable development and cumulative impacts.	
	(p) relevant project plans, drawings, diagrams in an electronic format that enables integration with mapping and other technical software.	

Desired Performance Outcome	Requirement	Where addressed
	2. The EIS must only include data and analysis that is reasonably needed to make a decision on the proposal. Relevant information must be succinctly summarised in the EIS and included in full in appendices. Irrelevant, conflicting or duplicated information must be avoided.	
3. Assessment of Key Issues* Key issue impacts are assessed objectively and thoroughly to provide confidence that the project will be constructed and operated within acceptable levels of impact. * Key issues are nominated by the Proponent in the CSSI project application and by the Department in the SEARs. Key issues need to be reviewed throughout the preparation of the EIS to ensure any new key issues that emerge are captured. The key issues identified in this document are not exhaustive but are key issues common to most CSSI projects.	1. The level of assessment of likely impacts must be proportionate to the significance of, or degree of impact on, the issue, within the context of the proposal location and the surrounding environment. The level of assessment must be commensurate to the degree of impact and sufficient to ensure that the Department and other government agencies are able to understand and assess impacts.	Chapters 8 to 10
	2. For each key issue the Proponent must:	Chapters 8 to 10
	(a) describe the biophysical and socio-economic environment, as far as it is relevant to that issue;	
	(b) describe the legislative and policy context, as far as it is relevant to the issue;	
	(c) identify, describe and quantify (if possible) the impacts associated with the issue, including the likelihood and consequence (including worst case scenario) of the impact (comprehensive risk assessment), and the cumulative impacts;	
	(d) demonstrate how potential impacts have been avoided (through design, or construction or operation methodologies);	
	(e) detail how likely impacts that have not been avoided through design will be minimised, and the predicted effectiveness of these measures (against performance criteria where relevant).	
	3. Where multiple reasonable and feasible options to avoid or minimise impacts are available, they must be identified and considered and the proposed measure justified taking into account the public interest.	Chapter 3
4. Consultation The project is developed with meaningful and effective engagement during project design and delivery.	1. The project must be informed by consultation, including with relevant government agencies, infrastructure and service providers, special interest groups, affected landowners, businesses and the community. The consultation process must be undertaken in accordance with the current guidelines.	Chapter 5

Desired Performance Outcome	Requirement	Where addressed
	2. The Proponent must document the consultation process, and demonstrate how the project has responded to the inputs received.	
	3. The Proponent must describe the timing and type of community consultation proposed during the design and delivery of the project, the mechanisms for community feedback, the mechanisms for keeping the community informed, and procedures for complaints handling and resolution.	
5. Biodiversity The project design considers all feasible measures to avoid and minimise impacts on terrestrial and aquatic biodiversity. Offsets and/or supplementary measures are assured which are equivalent to any remaining impacts of project construction and operation.	1. The Proponent must assess biodiversity impacts in accordance with the current guidelines including the Framework for Biodiversity Assessment (FBA).	Not applicable
	2. The Proponent must assess any impacts on biodiversity values not covered by the FBA as specified in s2.3.	
	3. The Proponent must assess impacts on the following [EECs, threatened species and/or populations] and provide the information specified in s9.2 of the FBA.	
	4. The Proponent must identify whether the project as a whole, or any component of the project, would be classified as a Key Threatening Process (KTP) in accordance with the listings in the *Threatened Species Conservation Act 1997* (TSC Act), *Fisheries Management Act 1994* (FM Act) and *Environmental Protection and Biodiversity Conservation Act 2000* (EPBC Act).	
6. Flooding The project minimises adverse impacts on existing flooding characteristics. Construction and operation of the project avoids or minimises the risk of, and adverse impacts from, infrastructure flooding, flooding hazards, or dam failure.	1.The Proponent must assess and model (where required), taking into account any relevant Council-adopted flood model or latest flood data available from Councils, the impacts on flood behaviour during construction and operation for a full range of flood events up to the probable maximum flood (taking into account sea level rise and storm intensity due to climate change) including:	Not applicable
	(a) any detrimental increases in the potential flood affectation of other properties, assets and infrastructure;	
	(b) consistency (or inconsistency) with applicable Council floodplain risk management plans;	
	(c) compatibility with the flood hazard of the land;	

Desired Performance Outcome	Requirement	Where addressed
	(d) compatibility with the hydraulic functions of flow conveyance in flood ways and storage areas of the land;	
	(e) downstream velocity and scour potential;	
	(f) impacts the development may have upon existing community emergency management arrangements for flooding. These matters must be discussed with the State Emergency Services and Council; and	
	(g) any impacts the development may have on the social and economic costs to the community as consequence of flooding.	
7.Heritage The design, construction and operation of the project facilitates, to the greatest extent possible, the long term protection, conservation and management of the heritage significance of items of environmental heritage and Aboriginal objects and places. The design, construction and operation of the project avoids or minimises impacts, to the greatest extent possible, on the heritage significance of environmental heritage and Aboriginal objects and places.	1. The Proponent must identify and assess any direct and/or indirect impacts (including cumulative impacts) to the heritage significance of:	
	(a)Aboriginal places and objects, as defined under the *National Parks and Wildlife Act 1974* and in accordance with the principles and methods of assessment identified in the current guidelines;	Not applicable
	(b) Aboriginal places of heritage significance, as defined in the Standard Instrument – Principal Local Environmental Plan;	Not applicable
	(c) environmental heritage, as defined under the *Heritage Act 1977*; and	Chapter 9
	(d) items listed on the National and World Heritage lists.	
	2. Where impacts to State or locally significant heritage items are identified, the assessment must:	
	(a) include a statement of heritage impact for all heritage items (including significance assessment);	
	(b)consider impacts to the item of significance caused by, but not limited to, vibration, demolition, archaeological disturbance, altered historical arrangements and access, visual amenity, landscape and vistas, curtilage, subsidence and architectural noise treatment (as relevant);	
	(c) outline measures to avoid and minimise those impacts in accordance with the current guidelines; and	Chapter 9
	(d) be undertaken by a suitably qualified heritage consultant(s) (note: where archaeological excavations are proposed the relevant consultant must meet the NSW Heritage Council's Excavation Director criteria).	Chapter 9

Desired Performance Outcome	Requirement	Where addressed
	3. Where archaeological investigations of Aboriginal objects are proposed these must be conducted by a suitably qualified archaeologist, in accordance with section 1.6 of the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010).	Not applicable
	4. Where impacts to Aboriginal objects and/or places are proposed, consultation must be undertaken with Aboriginal people in accordance with the current guidelines.	Not applicable
8. Noise and Vibration - Amenity Construction noise and vibration (including airborne noise, ground-borne noise and blasting) are effectively managed to minimise adverse impacts on acoustic amenity. Increases in noise emissions and vibration affecting nearby properties and other sensitive receivers during operation of the project are effectively managed to protect the amenity and well-being of the community.	1. The Proponent must assess construction and operational noise and vibration impacts in accordance with relevant NSW noise and vibration guidelines. The assessment must include consideration of impacts to sensitive receivers including commercial premises, and include consideration of sleep disturbance and, as relevant, the characteristics of noise and vibration (for example, low frequency noise).	Chapter 8
	2. If blasting is required, the relevant requirements of *Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration* (ANZEC 1990) are to be assessed.	Not applicable
9. Noise and Vibration - Structural Construction noise and vibration (including airborne noise, ground-borne noise and blasting) are effectively managed to minimise adverse impacts on the structural integrity of buildings and items including Aboriginal places and environmental heritage. Increases in noise emissions and vibration affecting environmental heritage as defined in the *Heritage Act 1977* during operation of the project are effectively managed.	1. The Proponent must assess construction and operation noise and vibration impacts in accordance with relevant NSW noise and vibration guidelines. The assessment must include consideration of impacts to the structural integrity and heritage significance of items (including Aboriginal places and items of environmental heritage).	Chapter 8
	2. The Proponent must demonstrate that blast impacts are capable of complying with the current guidelines, if blasting is required.	Not applicable

Desired Performance Outcome	Requirement	Where addressed
10. Socio-economic, Land Use and Property The project minimises adverse social and economic impacts and capitalises on opportunities potentially available to affected communities. The project minimises impacts to property and business and achieves appropriate integration with adjoining land uses, including maintenance of appropriate access to properties and community facilities, and minimisation of displacement of existing land use activities, dwellings and infrastructure.	1. The Proponent must assess social and economic impacts in accordance with the current guidelines.	Not applicable
	2. The Proponent must assess impacts from construction and operation on potentially affected properties, approved development applications, businesses, public open space, recreational users and land and water users (for example, recreational and commercial fishers, oyster farmers), including property acquisitions/adjustments, access, amenity and relevant statutory rights.	
	3. Assess the likely risks of the project to public safety, paying particular attention to subsidence risks, bushfire risks and the handling and use of dangerous goods.	
11. Soils The environmental values of land, including soils, subsoils and landforms, are protected. Risks arising from the disturbance and excavation of land and disposal of soil are minimised, including disturbance to acid sulfate soils and site contamination.	1. The Proponent must verify the risk of acid sulfate soils (Class 1, 2, 3 or 4 on the Acid Sulfate Soil Risk Map) within, and in the area likely to be impacted by, the project.	Not applicable
	2. The Proponent must assess the impact of the project on acid sulfate soils (including impacts of acidic runoff offsite) in accordance with the current guidelines.	
	3. The Proponent must assess whether the land is likely to be contaminated and identify if remediation of the land is required, having regard to the ecological and human health risks posed by the contamination in the context of past, existing and future land uses. Where assessment and/or remediation is required, the Proponent must document how the assessment and/or remediation would be undertaken in accordance with current guidelines.	
	4. The Proponent must assess whether salinity is likely to be an issue and if so, determine the presence, extent and severity of soil salinity within the project area.	
	5. The Proponent must assess the impacts of the project on soil salinity and how it may affect groundwater resources and hydrology.	

Desired Performance Outcome	Requirement	Where addressed
	6. The Proponent must assess the impacts on soil and land resources (including erosion risk or hazard). Particular attention must be given to soil erosion and sediment transport consistent with the practices and principles in the current guidelines.	
12. Sustainability The project reduces the NSW Government's operating costs and ensures the effective and efficient use of resources. Conservation of natural resources is maximised.	1. The Proponent must assess the project against the current guidelines including targets and strategies to improve Government efficiency in use of water, energy and transport.	Not applicable
13. Transport and Traffic Network connectivity, safety and efficiency of the transport system in the vicinity of the project are managed to minimise impacts. The safety of transport system customers is maintained. Impacts on network capacity and the level of service are effectively managed. Works are compatible with existing infrastructure and future transport corridors.	1.The Proponent must assess construction transport and traffic (vehicle, pedestrian and cyclists) impacts, including, but not necessarily limited to:	Not applicable
	(a) a considered approach to route identification and scheduling of transport movements;	
	(b) the number, frequency and size of construction related vehicles (passenger, commercial and heavy vehicles, including spoil management movements);	
	(c) the capacity of or need to upgrade roads proposed as construction vehicle routes including Bedwin Road;	
	(d) changes to existing local and regional road networks including access to and around the proposed Chatswood tunnelling site;	
	(e) construction worker parking;	
	(f) the nature of existing traffic (types and number of movements) on construction access routes (including consideration of peak traffic times and sensitive road users and parking arrangements), including access to the Overseas Passenger Terminal for deliveries and passenger coaches;	
	(g) details of how construction and scheduling of works are to be coordinated in regard to public events; cumulative traffic impacts resulting from concurrent work on Westconnex, Barangaroo, Sydney Light Rail and other key construction projects in the Sydney CBD;	
	(h) alternatives to road transport of construction spoil;	
	(i) access constraints and impacts on public transport, pedestrian access and cyclists;	

Desired Performance Outcome	Requirement	Where addressed
	(j) the need to close, divert or otherwise reconfigure elements of the road and cycle network associated with construction of the project;	
	(k) assess the likely risks of the project to public safety, paying particular attention to pedestrian safety and users of Sydney Harbour; and	
	(l) impacts to water based traffic and shipping channels on users of Sydney Harbour with particular reference to the channel between Blues Point and Millers Point for passage to and from White Bay, Glebe Island and Gore Cove.	
	2. The Proponent must assess the operational transport impacts of the project, including:	Not applicable
	(m) forecast travel demand and traffic volumes for the project and the surrounding road, cycle and public transport network;	
	(n) travel time analysis;	
	(o) performance of interchanges and intersections by undertaking a coordinated level of service analysis at locations affected by stations;	
	(p) wider transport interactions (local and regional roads, permanent loss of parking, the need for kiss and ride facilities, cycling, public and freight transport);	
	(q) induced traffic and operational implications for public transport (particularly with respect to strategic bus corridors and bus routes) and consideration of opportunities to improve public transport;	
	(r) impacts to pedestrian access in and around stations and connecting streets, capacity of streets at peak pedestrian times, including phasing of traffic lights, intersection crossing times and connectivity between stations	
	(s) assess the benefits to each station and the general vicinity of walking and cycling catchments and the provision of infrastructure to support sustainable transport options.	
	(t) impacts on cyclists and pedestrian access and safety; and	
	(u) opportunities to integrate cycling and pedestrian elements with surrounding networks and in the project.	
14.Urban design	1. The Proponent must:	Not applicable

Desired Performance Outcome	Requirement	Where addressed
The project design complements the visual amenity, character and quality of the surrounding environment. The project contributes to the accessibility and connectivity of communities.	(a) identify the urban design and landscaping aspects of the project and its components;	
	(b) include consideration of urban design principles adopted by each council or within each station precinct;	
	(c) assess the impact of the project on the urban, rural and natural fabric;	
	(d) explore the use of Crime Prevention Through Environmental Design (CPTED) principles during the design development process, including natural surveillance, lighting, walkways, signage and landscape; and	
	(e) identify urban design strategies and opportunities to enhance healthy, cohesive and inclusive communities.	
15. Visual Amenity The project minimises adverse impacts on the visual amenity of the built and natural environment (including public open space) and capitalises on opportunities to improve visual amenity.	1.The Proponent must assess the visual impact of the project and any ancillary infrastructure on:	Chapter 10
	(a) views and vistas;	
	(b) streetscapes, key sites and buildings;	
	(c) the local community.	
	2. The Proponent must provide artist impressions and perspective drawings of the project to illustrate how the project has responded to the visual impact through urban design and landscaping.	
16. Waste All wastes generated during the construction and operation of the project are effectively stored, handled, treated, reused, recycled and/or disposed of lawfully and in a manner that protects environmental values.	1. The Proponent must assess predicted waste generated from the project during construction and operation, including:	Not applicable
	a) classification of the waste in accordance with the current guidelines;	
	b) estimates / details of the quantity of bulk earthworks and spoil balance to be generated during construction of the project;	
	c) handling of waste including measures to facilitate segregation and prevent cross contamination;	
	d) management of waste including indicative location and volume of stockpiles;	
	e) waste minimisation and reuse;	
	f) lawful disposal or recycling locations for each type of waste using a hierarchy which prioritises higher value end use; and	

Desired Performance Outcome	Requirement	Where addressed
	g) contingencies for the above, including managing unexpected waste volumes.	
	2. The Proponent must assess potential environmental impacts from the excavation, handling, storage on site and transport of the waste particularly with relation to sediment/leachate control, noise and dust.	
17. Water - Hydrology Long term impacts on surface water and groundwater hydrology (including drawdown, flow rates and volumes) are minimised. The environmental values of nearby, connected and affected water sources, groundwater and dependent ecological systems including estuarine and marine water (if applicable) are maintained (where values are achieved) or improved and maintained (where values are not achieved). Sustainable use of water resources.	1. The Proponent must describe (and map) the existing hydrological regime for any surface and groundwater resource (including reliance by users and for ecological purposes) likely to be impacted by the project, including stream orders, as per the FBA.	Not applicable
	2. The Proponent must assess (and model if appropriate) the impact of the construction and operation of the project and any ancillary facilities (both built elements and discharges) on surface and groundwater hydrology in accordance with the current guidelines, including:	Not applicable
	(a) natural processes within rivers, wetlands, estuaries, marine waters and floodplains that affect the health of the fluvial, riparian, estuarine or marine system and landscape health (such as modified discharge volumes, durations and velocities), aquatic connectivity and access to habitat for spawning and refuge;	
	(b) impacts from any permanent and temporary interruption of groundwater flow, including the extent of drawdown, barriers to flows, implications for groundwater dependent surface flows, ecosystems and species, groundwater users and the potential for settlement;	
	(c) changes to environmental water availability and flows, both regulated/licensed and unregulated/rules-based sources;	
	(d) direct or indirect increases in erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses;	
	(e) minimising the effects of proposed stormwater and wastewater management during construction and operation on natural hydrological attributes (such as volumes, flow rates, management methods and re-use options) and on the conveyance capacity of existing stormwater systems where discharges are proposed through such systems; and	

Desired Performance Outcome	Requirement	Where addressed
	(f) water take (direct or passive) from all surface and groundwater sources with estimates of annual volumes during construction and operation.	
	3. The Proponent must identify any requirements for baseline monitoring of hydrological attributes.	Not applicable
18. Water - Quality The project is designed, constructed and operated to protect the NSW Water Quality Objectives where they are currently being achieved, and contribute towards achievement of the Water Quality Objectives over time where they are currently not being achieved, including downstream of the project to the extent of the project impact including estuarine and marine waters (if applicable).	1. The Proponent must:	Not applicable
	(a) state the ambient NSW Water Quality Objectives (NSW WQO) and environmental values for the receiving waters relevant to the project, including the indicators and associated trigger values or criteria for the identified environmental values;	
	(b) identify all pollutants that may be introduced into the water cycle and describe the nature and degree of impact that any discharge(s) may have on the receiving environment, including consideration of all pollutants that pose a risk of non-trivial harm to human health and the environment;	
	(c) identify the rainfall event that the water quality protection measures will be designed to cope with;	
	(d) assess the significance of any identified impacts including consideration of the relevant ambient water quality outcomes;	
	(e) demonstrate how construction and operation of the project will, to the extent that the project can influence, ensure that:	
	– where the NSW WQOs for receiving waters are currently being met they will continue to be protected; and	
	– where the NSW WQOs are not currently being met, activities will work toward their achievement over time;	
	(f) justify, if required, why the WQOs cannot be maintained or achieved over time;	
	(g) demonstrate that all practical measures to avoid or minimise water pollution and protect human health and the environment from harm are investigated and implemented;	
	(h) identify sensitive receiving environments (which may include estuarine and marine waters downstream) and develop a strategy to avoid or minimise impacts on these environments; and	

Desired Performance Outcome	Requirement	Where addressed
	(i) identify proposed monitoring locations, monitoring frequency and indicators of surface and groundwater quality.	
19. Utilities The project is designed, construction and operated to minimise impacts to utilities and provision of such to the public.	1. The Proponent must consider:	Chapter 6
	(a) the impact of the project on the integrity of trunk assets and the need to augment or relocate;	
	(b) opportunities to support initiatives adopted by Councils and utilities providers; and	
	(c) how access to assets will be maintained during construction.	

Chatswood to Sydenham

Blues Point acoustic shed modification report

August 2018