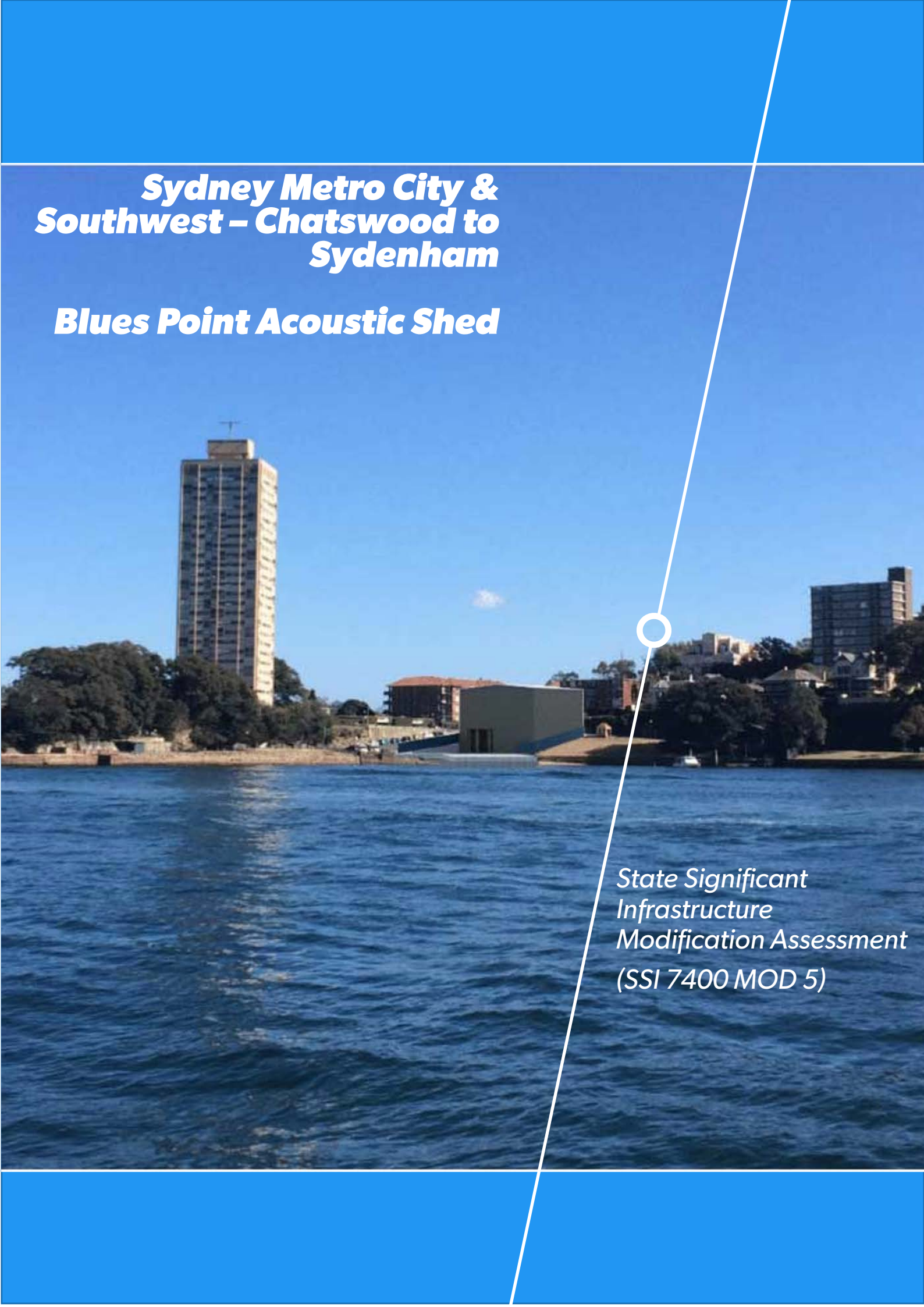


Sydney Metro City & Southwest – Chatswood to Sydenham

Blues Point Acoustic Shed



*State Significant
Infrastructure
Modification Assessment
(SSI 7400 MOD 5)*

November 2018

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Cover photo

Artist impression of acoustic shed viewed from Sydney Harbour (Blues Point Acoustic Shed Modification Report, August 2018)

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Glossary

| Abbreviation | Definition |
|-----------------|--|
| Approval | Infrastructure Approval |
| CoA | Condition of Approval |
| Council | North Sydney Council |
| Department | Department of Planning and Environment |
| EPA | Environment Protection Authority |
| EP&A Act | <i>Environmental Planning and Assessment Act 1979</i> |
| EP&A Regulation | <i>Environmental Planning and Assessment Regulation 2000</i> |
| ICNG | Interim Construction Noise Guideline |
| Minister | Minister for Planning |
| NML | Noise Management Level |
| RMS | Roads and Maritime Services |
| RtS | Response to Submissions |
| Secretary | Secretary of the Department of Planning and Environment |
| SSI | State Significant Infrastructure |
| TBM | Tunnel Boring Machine |



Executive Summary

The Proposal

The Minister for Planning approved the Sydney Metro City and Southwest – Chatswood to Sydenham project on 9 January 2017. The Chatswood to Sydenham project is primarily an underground metro rail line, approximately 16.5 kilometres long (of which approximately 15.5 kilometres is located in underground rail tunnels), from west of Chatswood Station and under Sydney Harbour to north of Sydenham Station and includes five new stations and new underground platforms at Martin Place and Central. The approved project includes a 2,100 square metre temporary construction site at Henry Lawson Reserve, Blues Point to retrieve the cutter heads and shields of the tunnel boring machines (TBMs) arriving from the Chatswood dive site and from Barangaroo.

Transport for NSW has submitted a request to modify the project approval for additional works at Blues Point temporary site. Modification 5 “Blues Point Acoustic Shed” requests the following changes:

- installation of a temporary acoustic shed
- retrieval of all components of the TBMs driven from the Chatswood dive site and Barangaroo through the shaft at Blues Point temporary site.

The Department publicly exhibited the proposal from 5 September 2018 to 19 September 2018 (14 days). Two submissions were received during the exhibition period, consisting of one community submission and one government agency submission from NSW Environment Protection Authority. North Sydney Council made a late submission. No objections were received.

Following the exhibition period, the Proponent requested an administrative change to condition of approval E54 to increase the blasting screening criteria for heritage structures, in particularly for the Victoria Cross north site, from 7.5mm/s to 25mm/s provided an investigation is undertaken by a suitably qualified structural engineer with experience assessing heritage structures and the increase is determined acceptable.

Department’s Consideration

The modification has been requested to minimise fire and life safety implications for construction personnel and avoid delays to the tunnel works, which would otherwise involve the removal and reinstatement of tunnel services if the TBMs were pulled back through the tunnel and retrieved from their respective launch sites as originally approved.

The proposed acoustic shed is intended to improve security, noise, dust, water, soil and sediment control issues at the site. Additional noise impacts would result from work outside of standard construction hours. The existing *Sydney Metro City and Southwest Construction Noise and Vibration Strategy* implemented under condition of approval (CoA) E32 and Out of Hours Work Protocol under CoA E47 would apply, as well as Conditions E37 and E38 that relate to respite for receivers. Additional recommended conditions would restrict shaft excavation, and the installation and decommissioning of the acoustic shed to standard construction hours (except where compliance with CoA E44 is achieved), as well as ensuring the Proponent uses best endeavours to schedule annoying activities, including steel hammering and movement of the self-propelled modular trailer, at the Blues Point temporary site between 7am and 8pm. Existing condition of approval E42 would also manage noise impacts through the provision of additional mitigation to residential receivers likely to experience an internal noise level of Leq(15 minute) 45 dB(A) or greater between 8pm and 7am. The acoustic shed is justified on the basis that the structure and associated impacts would be temporary. Furthermore, implementing the modification would reduce

construction worker safety risks and avoid delays to the Blues Point temporary site construction program as well as the overall Sydney Metro – Chatswood to Sydenham project.

In the assessment to amend the blasting criteria, it was accepted that a building of historical value should not (unless it is structurally unsound) be assumed to be more sensitive for the purpose of controlled blasting. This is consistent with the British Standard BS 7385-2:1993 *Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration*. Amending Condition E54 to adopt a higher blasting criteria for heritage structures was considered appropriate provided that an investigation is undertaken by a suitably qualified structural engineer with experience assessing heritage structures and that any decision to adopt the higher criterion must be supported by evidence to demonstrate that the higher criterion is appropriate.

The key issues considered in the Department's assessment include construction related noise, visual impacts and blasting.

The Department supports the proposed modification and considers that residual impacts can be managed to acceptable levels subject to amended conditions of approval and additional project commitments that include:

- the provision of an acoustic shed at Blues Point within the Construction Noise and Vibration Strategy;
- ventilation from the acoustic shed would be filtered;
- colours for the acoustic shed to minimise its visual prominence;
- timing the erection of the acoustic shed to minimise impact on key harbour viewing events such as the New Year's period;
- identifying noise sensitive receivers for respite;
- restricting installation and decommissioning of the acoustic, as well as shaft excavation generally to standard construction hours;
- scheduling high noise activities (steel hammering and movement of self-propelled modular trailer) to less noise sensitive hours; and
- adopting a risk management approach to blasting in relation to heritage structures.

The Department acknowledges the broader objective of Sydney Metro City and Southwest – Chatswood to Sydenham project to facilitate and respond to Sydney's forecast population, economic growth and the present and emerging constraints on the existing rail network. This modification will in turn contribute and support the delivery of the overall project.

It is determined that the benefits of the modification outweigh the associated impacts. As such, the modification is considered approvable.



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1. Introduction

This report assesses a request to modify the State significant infrastructure (SSI) approval for the Sydney Metro City and Southwest – Chatswood to Sydenham project (SSI 7400).

The modification request seeks approval for installation of a temporary acoustic shed at Blues Point over the tunnel boring machine (TBM) retrieval shaft, and retrieval of all components of tunnel boring machines arriving at Blues Point from Chatswood and Barangaroo, which would require works to be undertaken outside standard construction hours.

The modification request also seeks to amend condition of approval (CoA) E54 to increase the blasting screening criterion for heritage structures from 7.5mm/s to 25mm/s provided an investigation is undertaken by a suitably qualified structural engineer with experience assessing heritage structures and the increase is determined acceptable.

The request was lodged by Sydney Metro (the Proponent) on 28 August 2018 pursuant to section 5.25 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

1.1 Background

Sydney Metro City and Southwest – Chatswood to Sydenham forms part of a future modern high capacity rail network which includes Sydney Metro Northwest (currently under construction) and the proposed Sydenham to Bankstown upgrade project (currently under assessment). The Chatswood to Sydenham project is primarily an underground metro rail line, approximately 16.5 kilometres long (of which approximately 15.5 kilometres is located in underground rail tunnels), commencing west of Chatswood Station and under Sydney Harbour to north of Sydenham Station, with new metro stations provided at Crows Nest, Victoria Cross, Barangaroo, Pitt Street and Waterloo, and new underground platforms at Martin Place and Central. Construction commenced in late 2017 with services expected to commence in 2024.

The approved project includes a temporary construction site at Blues Point (see **Figure 1**) to retrieve the cutter heads and shields of the tunnel boring machines (TBMs) arriving from launch sites at Chatswood and Barangaroo. The Blues Point temporary site covers an area of about 2,100 square metres in Henry Lawson Reserve, at the end of Blues Point Road.

Since the project was approved, detailed construction planning for the Blues Point temporary site has identified the need for all components of the tunnel boring machines arriving at Blues Point from the Chatswood dive site and from Barangaroo to be retrieved from this site for construction programming (and associated impacts) and construction worker safety reasons.

The Proponent seeks to modify the approval to erect a temporary acoustic shed at Blues Point, retrieve all components of the TBMs arriving at this site and transfer these components to barges for return to Barangaroo or transfer to onward transportation sites. This would be largely undertaken out of hours.



Figure 1 | Blues Point Site Location

Additionally, the Proponent has identified through detailed design that controlled blasting at the Victoria Cross north site would be more effective than rock hammering. However, the blast screening criterion for heritage structures of 7.5mm/s would be exceeded at an adjacent, locally listed heritage item. The Proponent subsequently requested a modification to condition E54 to increase the blast screening criteria for heritage structures from 7.5mm/s to 25mm/s, provided a suitably qualified structural engineer with experience assessing heritage structures determines that the increase is acceptable.

Justification

The Proponent is seeking the modification as the existing approval 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 at the Chatswood dive site
- necessitate the removal and reinstatement of tunnel services
- cause delays to the work at the new metro stations north of Sydney Harbour
- delay the construction and installation of the concrete lining within the crossover cavern at Barangaroo.

To avoid delays to the tunnelling and the inefficient removal and reinstatement of tunnel services (which would otherwise be required if the remainder of the tunnel boring machines were pulled back to their respective launch sites), the timing of work to retrieve the tunnel boring machines and to transport by barge would involve works outside standard daytime hours.

To minimise impacts of these works, the Proponent proposes to install a temporary acoustic shed at Blues Point to enclose the gantry crane used to raise excavated material and tunnel boring machine components from the shaft and enable 24/7 operation of the site during TBM disassembly and retrieval activities.

The modification for the proposed installation of an acoustic shed would provide the following key benefits:

- reduce noise impacts on surrounding sensitive receivers during excavation of the shaft;
- reduce noise impacts on surrounding sensitive receivers during the TBM retrieval works, particularly during works outside standard daytime hours;
- reduce dust impacts on surrounding sensitive receivers; and
- improved security at the shaft site.

In addition, the inability to carry out the TBM retrieval works outside the standard working hours would extend the overall construction program at Blues Point by about eight months, increasing the duration of construction impacts on surrounding receivers and the community.

1.2 Approval History

Project approval was granted on 9 January 2017 by the then Minister under Section 115ZB of the then EP&A Act for the Sydney Metro City and Southwest – Chatswood to Sydenham project SSI 7400. The project approval permits the following works at the Blues Point temporary site:

- excavation of a shaft to the tunnels below and removal of about 8,000 cubic metres of spoil during daytime hours;
- retrieval of cutter heads and shields of tunnel boring machines launched from the Chatswood dive site and from Barangaroo through the shaft;
- transporting the cutter heads and shields by either road or by barge;
- access to the site from Blues Point Road (left-in) and Henry Lawson Drive (left-out);
- works undertaken outside standard daytime construction hours provided appropriate noise mitigation is in place.

The project approval has been modified on four (4) previous occasions (see **Table 1**).

Table 1 | Summary of Modifications

| Mod No. | Summary of Modifications | Approval Authority | Type | Approval Date |
|---------|--|--------------------|-----------|------------------|
| MOD 1 | Services relocations | Department | 115ZI | 18 October 2017 |
| MOD 2 | Central Walk | Department | 115ZI | 21 December 2017 |
| MOD 3 | Martin Place Metro Station | Minister | 115ZI (2) | 22 March 2018 |
| MOD 4 | Sydenham Station and Metro Trains Facility | Department | 115ZI | 13 December 2017 |



2. Proposed Modification

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

- installation of a temporary acoustic shed at the Blues Point temporary site;
- disassembly and retrieval of all components of tunnel boring machines arriving at the Blues Point temporary site through the shaft; and
- amendment of Condition E54 to increase the blasting screening criteria for heritage structures from 7.5mm/s to 25mm/s provided a suitably qualified structural engineer with experience assessing heritage structures demonstrates the higher criterion is appropriate.

2.1 Modification Description

Installation of Acoustic Shed

An acoustic shed would be installed temporarily over the excavated shaft location to minimise noise impacts associated with TBM retrieval outside of standard working hours. The shed would be approximately 29 metres long, 26.8 metres wide and 19 metres high (to the top of the roof) (Refer to **Figure 2** and **Figure 3**). Due to site gradient, the shed would sit about 17 metres above ground level on the northern facade, and about 21 metres above ground level on the southern facade (waterfront side).

Shed installation would follow site establishment (anticipated in early 2019) and is expected to take approximately three months. Following completion of the tunnel boring machine retrieval, approximately an 18 month period anticipated for mid 2020, the shed would then be decommissioned and dismantled prior to the New Year's period of 2020/2021. An indicative construction program is presented in **Figure 4**.

The shed would include a roller door on the southern side, facing the harbour and louvres on the eastern side covering approximately 40 per cent of the facade. The roller door allows access between the shaft and the barge with the louvres assisting with shed ventilation.

Colours would be sympathetic to the surrounding environment to reduce visual dominance and contribute to the acoustic shed receding within the background.

Tunnel Boring Machine Retrieval

All components of the TBMs are now proposed to be retrieved from the Blues Point temporary site, through the excavated shaft. This would involve removal of the two hard-ground TBMs arriving from the Chatswood dive site and the removal of the under-harbour TBM arriving 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.

A gantry crane inside the acoustic shed will be used to lift the TBM components from the shaft and place them onto a trailer for movement onto the barge for transport. Depending on their size, several components would be loaded onto each trailer for transport, however the total loading and safety requirements will dictate the overall number of movements.

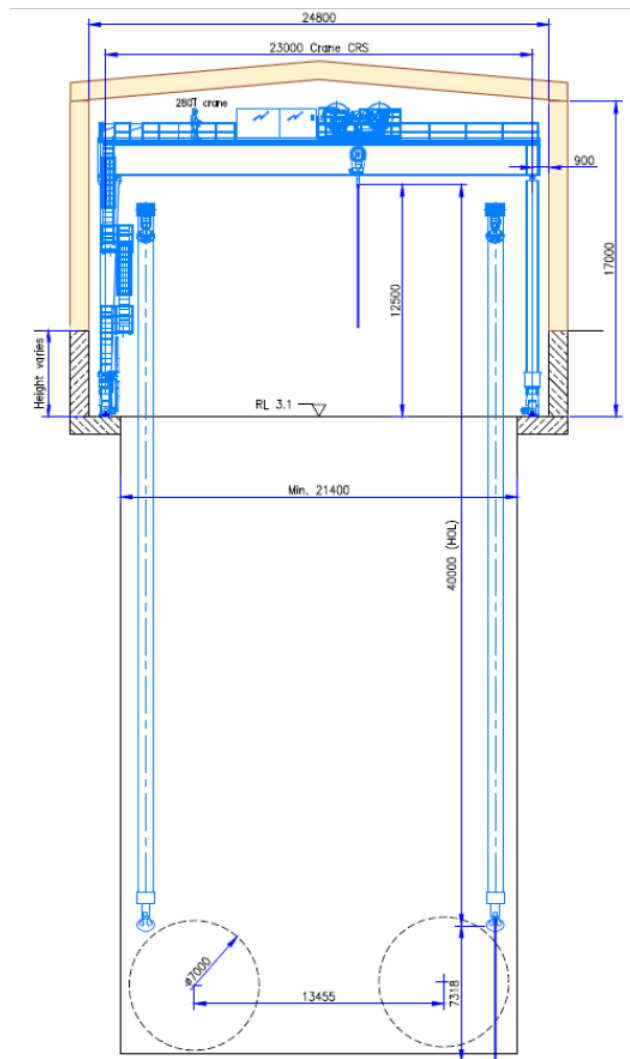


Figure 2 | Section details of acoustic shed



Figure 3 | Artist impression of acoustic shed

Three TBMs are required to be retrieved in quick succession but will not occur simultaneously. These are the two TBMs being driven from Chatswood and one from Barangaroo (slurry TBM specifically designed to tunnel across Sydney Harbour), which would be initially barged back to Barangaroo and relaunched for a second tunnel drive across the harbour. Retrieval of TBM components would require up to 16 weeks of out of hours works, and approximately 20 barge movements. An indicative construction program is presented in **Figure 4**.

The components of the three TBMs retrieved from the Blues Point temporary site (two from Chatswood and the slurry TBM following a second drive from Barangaroo) would be transported by barge to either Clyde or White Bay as their final destination. Barge transport would be dependent on tides, weather conditions and the requirements of the Harbour Master and therefore may involve works outside standard daytime hours.

| Construction Activity | 2018 | | | | 2019 | | | | 2020 | | | | 2021 | | | |
|---------------------------------------|------|----|----|----|------|----|----|----|------|----|----|----|------|----|----|----|
| | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 |
| Enabling works and site establishment | | | | | | | | | | | | | | | | |
| Acoustic shed installation | | | | | | | | | | | | | | | | |
| Shaft excavation | | | | | | | | | | | | | | | | |
| TBM retrieval (Barangaroo drive 1) | | | | | | | | | | | | | | | | |
| TBM retrieval (northern drives) | | | | | | | | | | | | | | | | |
| TBM retrieval (Barangaroo drive 2) | | | | | | | | | | | | | | | | |
| Acoustic shed decommissioning | | | | | | | | | | | | | | | | |
| Rehabilitation | | | | | | | | | | | | | | | | |

Figure 4 | Blues Point temporary site indicative construction program

Blasting

Following exhibition, Sydney Metro has advised that detailed design has identified controlled blasting as the preferred method for bulk excavation, as a means for economical and efficient excavation, of the vertical shaft at the Victoria Cross North site. However, the vibration criterion for heritage structures in Condition E54 would be exceeded for an adjacent local heritage building. As such, the Proponent has requested modification to condition E54 to increase the blasting screening criteria for heritage structures from 7.5mm/s to 25mm/s.

2.2 Proponent's Justification

Acoustic Shed

The Proponent has requested the modification to:

- implement noise mitigation measures (install the acoustic shed) so TBM disassembly and retrieval works could be undertaken outside standard working hours;
- avoid delays to construction works and extension to the construction program;
- decrease potential fire and life safety risks associated with the removal of the tunnel boring machines through the Chatswood dive site;
- improve security at the shaft site; and
- reduce noise and dust impacts to sensitive receivers and the general public.

The proposed modification would temporarily increase the visual impacts associated with the project at Blues Point, however noise and dust impacts would decrease. The Proponent has identified that the shed would be installed for an 18 month duration to enable the TBM retrieval works. This construction program has been

developed to minimise the duration of the visual impacts and disruption to only the New Year's period of 2020/2021.

Blasting

Sydney Metro considers that the proposed modification:

- would bring Condition E54 in line with the *British Standard (BS 7385-2:1993 Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration)*, as the Standard recognises that the 7.5mm/s criteria should be applied to structurally unsound buildings of historical values. However, where heritage buildings are deemed to be structurally sound, then the 25mm/s criteria should be applied;
- provides a conservative criterion when compared to the cosmetic damage levels in both the British and Australian Standards; and
- would be consistent with the approach adopted for Martin Place through Condition E28.1 in the case of 50 Martin Place, a State heritage listed building.



3. Strategic Context

A temporary construction site was identified at Blues Point to support the construction of the tunnels as part of the approved project. The site was to be used for:

- excavation of a shaft to the tunnels below resulting in about 8,000 cubic metres of spoil being removed through the site, during daytime hours only;
- retrieval of the cutter heads and shields of the TBMs from the Chatswood dive site and from Barangaroo through the shaft; and
- transporting the tunnel boring machine components by either road or by barge.

The site is now required for the complete retrieval of the TBMs being driven from the Chatswood dive site as these machines cannot work under Sydney Harbour, and the retrieval of the specialised tunnel boring machine being driven from Barangaroo which has been designed specifically to tunnel under Sydney Harbour.

The modification would not reduce the construction program at Blues Point but would avoid delays to the overall project construction program. Not undertaking the TBM disassembly and retrieval works outside standard construction hours would delay the construction program at Blues Point by approximately eight months, which would decrease the duration of construction impacts on surrounding receivers.

The alternative to using the Blues Point temporary site is to retrieve the tunnel boring machines at the Chatswood dive site and at Barangaroo. The proponent considers these original options would result in delays to the work at the new metro stations north of Sydney Harbour, delays to the commencement of tunnel activities such as cross passage and crossover caverns works, an extension to the construction program and potential fire and life safety risks for the Chatswood dive site.

With regard to blasting, the Secretary's assessment report and the project approval recognised that there may be alternative methods to rock hammering to excavate station boxes, including the use of blasting, which would have less impact on the affected community. The proposal to change the relevant screening criterion for heritage structures would ensure that the applied criterion is based on the structural integrity of a heritage building rather than the fact it has heritage value alone.



4. Statutory Context

4.1 Scope of Modifications

In accordance with Section 5.25 of the EP&A Act, a proponent may request the Minister to modify an approval for State significant infrastructure. The Minister's approval for a modification is not required if the infrastructure as modified will be consistent with the existing approval.

The installation of a temporary acoustic shed at Blues Point over the TBM retrieval shaft, disassembly of all TBMs (in their entirety) arriving at Blues Point, undertaking TBM disassembly and retrieval activities 24 hours per day and 7 days per week, as well as amending the blasting criterion for heritage structures is not considered consistent with the existing approval. Consequently, modification of the Minister's approval under Section 5.25 of the EP&A Act is required.

4.2 Delegated Authority

The Minister will be the approval authority under s. 5.25 of the Act unless the Minister has delegated his determination functions to the Department.

Minister's delegate as determining authority

Under the Instrument of Delegation dated 11 October 2017, the functions and powers of the Minister for Planning under section 5.25 of the Act to determine a modification of the Minister's approval may be delegated to the Director, Transport Assessments, whereby:

- the relevant local council has not made an objection;
- a political disclosure statement has not been made; and
- there are less than 25 public submissions in the nature of objections.

The proposed modification meets the terms of this delegation.



5. Engagement

5.1 Department's Engagement

Under Section 5.28(1)(g) of the EP&A Act, the Planning Secretary is required to make requests for modification of approvals determined by the Minister publicly available. Accordingly, the Department made the modification request publicly available and exhibited the modification from Wednesday 5 September 2018 on its website and at:

- Service NSW centres;
- North Sydney Council; and
- The Nature Conservation Council.

The modification request was also referred to North Sydney Council and the Environment Protection Authority, which are the relevant authorities regarding the proposed modification. The Department accepted submissions until Wednesday 19 September 2018, a period of 14 days.

A site visit was conducted on 13 September 2018, as well as an additional site visit (7 September 2018) to The Rocks to observe a similar acoustic shed installed as part of work at Barangaroo.

5.2 Summary of Submissions

During the exhibition period, two (2) submissions were received, including one (1) from a government agency and one (1) from the community. None of the submissions received objected to the proposal. North Sydney Council made a late submission commenting on the modification after the close of the exhibition period.

5.3 Key Issues – Government Agencies

The NSW Environment Protection Authority (EPA) was consulted. It advised that incorporating the proposed acoustic shed would allow noise impacts to be introduced to the Blues Point area outside of standard hours within the shed (shaft excavation) which would have otherwise had to occur during standard hours under the existing approval. The advice also included the following:

- construction of the acoustic shed should be limited to standard construction hours;
- the need and justification for 24 hours per day, 7 days per week excavation should be considered as out of standard hours excavation will have noise impacts;
- the EPA's position is that the ICNG should be used to determine potential impacts from the proposal and not those derived from CSSI CoA E42; and
- potential for noise impacts associated with out of standard hours TBM retrieval operations with no comparison of project timeframes with and without both the modification and out of standard hours work.

The issues raised by the EPA were addressed in the Proponent's response to submissions (RtS). The main concern being that, in accordance with condition E48, the installation of an acoustic shed would allow excavation at the Blues Point temporary site to be undertaken 24 hours per day, 7 days per week. The Proponent has confirmed that shaft excavation outside of standard working hours is not proposed.

5.4 Key Issues – Council/Community

5.4.1 Community Issues

One submission was received from a community member at McMahons Point. The submitter supported the construction of the acoustic shed, however queried the reasoning for the location of the ventilation louvres and associated noise impacts to Henry Lawson Avenue residents.

5.4.2 Council key issues

North Sydney Council advised that it did not have the technical expertise to recommend alternate designs for the acoustic shed or TBM retrieval methodologies and therefore did not comment further. It is noted that Council supports the substantial long-term community benefit arising from the project and recognised the importance of Sydney Metro and the TSE Contractor to continue the standard of community consultation undertaken to date.

5.5 Response to Submissions

The Proponent responded to submissions in a letter dated 2 October 2018. This document is available on the Department's website and was forwarded to the EPA on 5 October 2018.



6. Assessment

6.1 Noise

Installation of a temporary acoustic shed at Blues Point would reduce noise impacts from tunnel support activities during the construction hours approved for that site. However, it is acknowledged that even with the acoustic shed in place, residents in Blues Point would still experience noise impacts associated with the disassembly and retrieval of the TBMs occurring outside standard construction hours and for a longer duration due to the requirement to disassemble and retrieve each TBM entirely and not just the cutter head and shield as is currently approved.

Orientation and Installation of Acoustic Shed

Installation of the shed is expected to take approximately three months but would be generally limited to standard construction hours as required by Condition of Approval (CoA) E36 and recommended amendments to CoA E48.

The proposal as exhibited in the Modification Report included ventilation louvres (with acoustic baffling or similar noise attenuation) on the northern façade to draw air into the shed and shaft, which directly faces residents on Henry Lawson Avenue. The Proponent has committed to relocate the louvres to the eastern side of the shed in response to a comment made in the community submission. This design change orientates the louvres and direct line of noise transmission away from residents. The main door of the shed faces south (the harbour) to facilitate movement of TBM components from the shaft to the barge on the harbour. This would direct noise away from residents at Blues Point.

Under the existing approval, the cutter heads and shields are the only components of the TBMs which can be retrieved from the Blues Point temporary site. The TBMs (minus cutter heads and shields) were then to be pulled back through the driven tunnels and retrieved from their respective launch sites. The Proponent has advised that it is necessary to retrieve the TBMs in their entirety from the Blues Point site as pulling them back through the driven tunnels could have fire and safety implications for construction personnel working in the tunnel during this process, particularly where the location of the TBM in the tunnel isolates workers by preventing access and egress. In addition, it would require removal of the support services installed behind the operating TBM which would then have to be replaced resulting in construction inefficiencies and delays to the overall project construction schedule.

The requested modification proposes retrieving all TBM components from the Blues Point temporary site. Installing the acoustic shed would reduce the noise impacts of TBM disassembly outside of standard construction hours and mitigate the longer period required to disassemble the whole TBM.

The Department is satisfied that the revised orientation of the shed openings will optimise noise attenuation for nearby residents and that limiting activities to erect the shed generally to standard construction hours will minimise noise impacts.

Excavation of the Shaft

The approved project allows for shaft excavation during the standard construction hours. If the request to erect an acoustic shed is approved, it would allow the Proponent to excavate 24 hours per day, seven days per week as outlined in Condition E48(b) if that condition is not amended. The Proponent has stated that excavation is only proposed during daytime hours. Further, the impacts of excavation in this location outside of daytime hours has not been assessed. Therefore, the Department recommends amending Condition E48 to clearly exclude excavation outside daytime construction periods (except where compliance with Condition E44 is achieved),

even with an acoustic shed in place. Any request to excavate outside this period would need to be assessed and the appropriate approval sought. Notwithstanding this proposed amendment, the acoustic shed would be in place ahead of bulk excavation and would have the benefit of reducing the daytime noise experienced by affected receivers by up to 15 dB(A) compared to the approved project.

TBM Disassembly

Removal of the TBM cutter head and shield as proposed in the EIS is considered a tunnel support activity and therefore can occur 24 hours per day, seven days per week under the existing approval. Further disassembly of the TBM will extend the length of each period of activity at the Blues Point temporary site and the noise generated.

The duration of TBM disassembly works for all TBMs is anticipated to be 16 weeks (i.e. four weeks per TBM) across a 12-month period. Three TBMs are likely to require disassembly and retrieval in quick succession, but not simultaneously. The fourth TBM would be disassembled and retrieved following the second tunnel drive beneath the harbour from Barangaroo. 24/7 work would reduce the disassembly time for each TBM from approximately 12-14 weeks to less than 3-4 weeks.

Noise levels during TBM disassembly are expected to meet relevant noise management levels (NMLs), except at Blues Point Tower during daytime out of hours work (i.e. 1pm-6pm Saturdays and 8am to 6pm Sundays and public holidays), when an imperceptible exceedance (by 1 to 3 dB(A)) of the noise management levels may occur. If these same activities occurred without an acoustic shed in place, an increase in noise levels of between 15-20 dB(A) during daytime out of hours would be expected.

The Proponent has advised that the noisiest activity required for TBM disassembly is steel hammering which is expected to occur for about 1-2 minutes across a 15-minute period and would be required sporadically. The Proponent has committed to avoiding this activity during the evening and night time periods wherever possible. The Department agrees with this approach and recommends including a new condition that the Proponent must use best endeavours to schedule this activity during daytime hours.

Furthermore, the Department recommends amending condition of approval E37 to include Blues Point so that receivers likely to experience internal noise levels greater than $Leq_{(15 \text{ minute})}$ 60 dB(A) must be consulted to ensure broader community requirements inform the development of respite periods.

Existing Condition E42 would also apply to ensure that additional noise mitigation is offered to residential receivers in residential zones likely to experience an internal noise level of $Leq_{(15 \text{ minute})}$ 45 dB(A) or greater between 8pm and 7am. It is therefore considered that the noise impacts identified are reasonably acceptable over a relatively short duration. The Department is satisfied that noise impacts resulting from TBM disassembly can be appropriately managed with existing conditions of approval, as well as the proposed amendments to the condition discussed.

The Department is satisfied that the impacts of this activity would:

- likely meet the relevant noise management levels and, while perceptible during daytime out of hours periods, not significant;
- meet the night time NMLs as derived from the existing approval;
- occur for relatively short periods of time across a 12-month period, the sequencing of which will provide respite over and above that which is required during the active periods by the approval; and
- be managed appropriately by existing conditions requiring respite and mitigation would apply where necessary.

TBM Retrieval

TBM retrieval operations would require lifting and placement of the components onto a self-propelled modular trailer for transfer to a barge with the doors open. This activity would need to occur largely at night to meet tidal restrictions for barge movements. Maximum noise levels could exceed the internal NML derived from Condition E42 by up to 17 dB(A) which would trigger consideration for additional mitigation, in accordance with the *Sydney Metro City and Southwest Construction Noise and Vibration Strategy*, as well as any necessary respite determined under CoA E37 (amended as recommended above).

The trailer would be used for a maximum total of 16 nights (four nights per each TBM). Approximately 15 trailer movements, each of 30 to 60 minutes duration would be required for each TBM. It is expected that the four nights would occur close together but may not be consecutive or within the same week and would ultimately depend on how quickly the TBM segments are lifted out of the shaft and placed on the trailer. It is noted that any interval between the nights would afford respite for receivers.

The Proponent has advised that all efforts would be made to restrict the movements to day time hours where possible. Consideration was given to restricting trailer movements to day time hours, however the Department acknowledged that only a small window exists during which barge docking can occur (due to tides and weather) and therefore is not a workable solution. Although operating outside of standard working hours may exceed noise management levels (even with the acoustic shed), the proposal would avoid delays to the Blues Point construction program and reinstatement of Henry Lawson Reserve (by approximately eight months) and reduce the associated impacts that receivers would otherwise be exposed to if retrieval was limited to daytime operations without an acoustic shed. In this instance the Department recommends that a condition be included stating the Proponent must use best endeavours to schedule the movement of the trailer between 7 am and 8 pm.

Sleep Disturbance

The OOHW protocol has identified potential sleep disturbance criterion as the Rating Background Level (RBL) + 15 dB(A). The *NSW Road Noise Policy* (DECCW, 2011) whilst not directly applicable states that:

- maximum internal noise levels below 50–55 dB(A) are unlikely to awaken people from sleep; and
- one or two noise events per night, with maximum internal noise levels of 65–70 dB(A), are not likely to affect health and wellbeing significantly.

The Proponent has adopted an external sleep disturbance screening criterion of RBL + 15 dB(A) and sleep disturbance NML of L_{Amax} 55 dB(A) (internal). The latter equates to an external NML of 65 dB(A) and is consistent with construction scenarios used in the *Construction Noise and Vibration Guideline* (RMS, 2016).

TBM disassembly activities could result in exceedances of the sleep disturbance screening criteria to the nearest properties on Blues Point Road, Warung Street and directly opposite the site on Henry Lawson Avenue of up to 7 dB(A).

The Proponent has advised that a worst-case scenario has been assessed, using the noisiest activity (steel hammering) across a 24-hour period. As considered above, the Proponent has committed to, and the Department has recommended that this activity be avoided at night to minimise sleep disturbance.

The Department acknowledges that the TBM retrieval could exceed the sleep disturbance and recommends that a condition be included which reiterates the Proponent's commitment to use best endeavours to schedule annoying activities between 7am and 8pm.

Conclusion

Installation and use of an acoustic shed at the Blues Point temporary site would have multiple benefits to the surrounding community and construction programming, including substantially reducing noise impacts on

sensitive receivers during standard construction hours, minimising potential fire and safety risks to construction workers and avoiding delays to the overall approved project. The Department supports the Proponent's commitments to minimise noise impacts, including installation of the acoustic shed, undertaking shaft excavation during standard working hours and restricting certain works (movements of the self-propelled modular trailer and steel hammering required for TBM disassembly) to daytime hours where possible.

Despite these measures, residents nearest the project that could experience noise impacts up to 27 dB(A) above the project NMLs. The suite of conditions to manage noise in the project approval adopt best practice to construction noise management which requires the Proponent to provide an appropriate level of amenity for and informed by the community while balancing the needs of construction.

Necessary amendments to ensure these conditions are applicable to the Blues Point temporary site include amendment to CoA E37, which in combination with E38 establishes parameters to develop respite periods informed by the affected community and CoA E48 to restrict acoustic shed installation, decommissioning and shaft excavation generally to standard construction hours. Furthermore, an additional condition (CoA 48.1) is recommended requiring that the Proponent use best endeavours to schedule annoying activities, including steel hammering and movement of the self-propelled modular trailer, at the Blues Point temporary site between 7am and 8pm.

6.2 Visual Impacts

Henry Lawson Reserve consists of an open lawn with seating, a bus stop, mature fig tree and a sandstone sea wall incorporating steps into the harbour. The site has important views towards Sydney Harbour, including a view of the Opera House framed by the Sydney Harbour Bridge. The area is currently subject to preparation for shaft excavation in to receive the TBMs and is secured from the public by fencing/hoardings.

The site is within the buffer zone of the World Heritage-listed Sydney Opera House; the views and vistas of the locally listed Blues Point Waterfront Group and Blues Point Tower; and the McMahons Point South heritage conservation area. However, the indirect impacts (views and vistas) to the buffer zone of the Sydney Opera House and local heritage items near the Blues Point construction site would be short term and reversible (i.e. removed once the worksite is decommissioned and rehabilitated).

The purpose of the proposed acoustic shed is to cover the excavated shaft at the construction site and to enclose the approved gantry crane that would be used to retrieve the TBM components through the excavated shaft. The Proponent has advised that the height and size of the acoustic shed has been minimised as far as practicable to enable installation and operation of the crane. Furthermore, the colour palette would be sympathetic to the surrounding environment to reduce visual dominance and contribute to the acoustic shed receding within the background.

The Environmental Impact Statement for the approved project identified a high adverse visual impact and landscape impact from construction activity, including the gantry crane, at Blues Point. The temporary installation of a 29-metre-long, 26.8-metre-wide and 19-metre-high (to the top of the roof) acoustic shed to enclose the site and gantry crane would introduce a new visual element and increased visual impacts over and above those assessed for the approved project. The Proponent has identified that the proposed acoustic shed does not alter the overall visual impact rating identified for each assessed viewpoint. Furthermore, it is acknowledged that the acoustic shed would screen the gantry crane during shaft excavation and TBM retrieval. However, compared to the approved project, the shed would disrupt and increase the impacts to the views of more residential receivers due to its bulk and scale, as well as the solid materials, of the shed.

Although the modification will increase visual impacts, the nature of the impacts would be finite and reversible (i.e. removed once TBM retrieval is completed and the site decommissioned and rehabilitated after 18 months of use).

Furthermore, the construction program has been developed to ensure it is in place for only one summer, when the harbour is most active. This commitment has been identified as a mitigation measure where *“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”*. It is recommended that a condition of approval be included to this effect.

Overall, it is accepted that the visual impact of the shed in such a prominent location would be substantial, albeit temporary and outweighed by the benefits, including noise management. Given that the acoustic shed would be temporary and the visual landscape reinstated, the visual impacts are considered acceptable. Furthermore, the Department is also satisfied that the proposed mitigation measures are appropriate and proportionate in relation to the visual impacts of the proposal.

6.3 Blasting at Victoria Cross North

Sydney Metro has advised that detailed design for the project has identified controlled blasting as the preferred method for bulk excavation (as a means for economical and efficient excavation) of the vertical shaft at the Victoria Cross North site. The proposal is consistent with Condition E35 stating that *“the Proponent must review alternative methods to rock hammering and blasting for excavation as part of the detailed construction planning with a view to adopting methods that minimise impacts on sensitive receivers.”*

Condition E54 sets blasting overpressure and vibration limits at the most affected residence of other sensitive receivers however blasting at Victoria Cross North is likely to exceed the 7.5mm/s vibration criterion for an adjacent local heritage item, a ‘shop’ listed in the North Sydney Local Environmental Plan 2013. The building is a two-storey brick house with upper storey roughcast rendered and hipped and gabled terracotta roof, constructed in the late nineteenth century.

It is acknowledged that traditional excavation methods using large rock hammers commonly result in significant noise and vibration impacts to nearby sensitive receivers. In comparison, the magnitude and duration of exposure to these impacts are reduced by controlled blasting. The overall blasting program is expected to take between 10 and 14 weeks (3.5 months), compared to the approximate 34 weeks (8.5 months) for traditional excavation techniques. As such, nearby receivers would otherwise experience approximately five months more of rock hammering associated with the shaft excavation under the existing excavation program compared with the proposed blasting program for the Victoria Cross North site. This is not considered to be in the public interest.

This matter was assessed in relation to 50 Martin Place, Sydney, the State Heritage-listed Commonwealth Bank of Australia (SSI 7400 MOD 3). The criteria identified in Condition E54 are consistent with the British Standard BS 7385-2:1993 *Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration*. The standard recognises that *“Important buildings which are difficult to repair may require special consideration on a case-by-case basis. A building of historical value should not (unless it is structurally unsound) be assumed to be more sensitive.”*

It was accepted on this basis that a risk management approach could be taken which considers the structural integrity of a heritage building before applying a non-discriminating, more conservative vibration limit and in that instance, accept that, the limit of 25 mm/s could be applied if the building were found to be structurally sound or no less sensitive to vibration than any other similar non-heritage building.

It is considered that a similar approach is appropriate for other heritage structures potentially affected by blasting for the project. The Department recommends that Condition E54 be amended to reflect Condition E28.1 adopted for 50 Martin Place.



7. *Evaluation*

It is concluded that the proposed modification would result in supplementary and differing impacts when compared to the approved project. These include the visual impacts of the shed, noise impacts and works undertaken outside of standard construction hours, which were not previously envisaged in this location. However, these impacts would be temporary and short term. The proposed modification would also provide a variety of benefits, such as reducing potential fire and life safety risks to construction workers, avoiding delays to the overall project construction program, as well as improving security, dust, water, soil and sediment control issues at the site. The Department is satisfied that the identified impacts can be managed by the implementation of the Proponent's commitments and with existing, amended and new conditions of approval.

In addition, the request to modify the blasting criteria was also considered. It was accepted that a building of historical value should not (unless it is structurally unsound) be assumed to be more sensitive for the purpose of controlled blasting and as such a risk management approach is deemed acceptable, consistent with relevant standards. The Department recommends an amendment that accepts a higher criterion for heritage buildings where the structural integrity of the building can be demonstrated.

Overall the merits of the modification have been evaluated and it is concluded that the benefits of the proposed modification outweigh the potential impacts, and that residual impacts can be managed and would not, subject to conditions, result in any long term adverse or irreversible effects.



8. Recommendation

This section provides a formal recommendation to the decision maker to approve or refuse the modification.

The following text should be included:

It is recommended that the Director Transport Assessments, as delegate of the Minister for Planning:

- **considers** the findings and recommendations of this report; and
- **Determines** that the request SSI 7400 MOD 5 falls within the scope of section 5.25 of the EP&A Act
- **accepts and adopts** all of the findings and recommendations in this report as the reasons for making the decision to grant approval to the request;
- **agrees** with the key reasons for approval listed in the draft notice of decision;
- **modify** the approval SSI 7400 MOD 5
- **signs** the attached Notice of Modification (Appendix G).

Recommended by:

Luke Kennington

Planning Officer

Transport Assessments

31/10/2018

Recommended by:

Lisa Mitchell

Team Leader


Transport Assessments

31/10/18



9. Determination

The recommendation is: **Adopted by:**


Glenn Snow
Director
Transport Assessments

2/11/18



Appendices

Appendix A – List of Documents

- Sydney Metro City & Southwest – Chatswood to Sydenham: Blues Point acoustic shed modification report (August 2018)
- Response to submissions: Sydney Metro City & Southwest – Chatswood to Sydenham: Mod 5 – Blues Point acoustic shed (SSI 7400) (2 October 2018)

Appendix B – Environmental Assessment

See the Department's website at:

http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=9568

Appendix C – Submissions

See the Department's website at:

http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=9568

Appendix D – Submissions Report

See the Department's website at:

http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=9568

Appendix E – Community views for Notice of Decision

| Issue | Consideration |
|--|---|
| | Assessment |
| Issue 1 | <ul style="list-style-type: none">The Proponent committed, within the RtS, to relocate and orientate the louvres and direct line of noise transmission away from residents. |
| <ul style="list-style-type: none">Location of ventilation louvres and associated noise impacts | <i>Recommended Conditions/Response</i> <ul style="list-style-type: none">No conditions specific to this issue required. |

Appendix F – Consolidated Approval

See the Department's website at:

http://www.majorprojects.planning.nsw.gov.au/page/development-categories/transport--communications--energy---water/rail---related-facilities/?action=view_job&job_id=7400

Appendix G – Notice of Modification

See the Department's website at:

http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=9568