

# SYDNEY METRO WEST EASTERN TUNNELLING PACKAGE

## Detailed Noise and Vibration Impact Statement - Low Impact Works - Project Wide

10 February 2023

John Holland CPB Ghella Joint Venture

Sydney Metro West - ETP - Detailed Noise & Vibration Impact Statement - Low Impact Works (Rev 0).docx

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## Compliance

### Planning Approval (SSI 19238057)

No.	Requirement	
D20	A detailed land use survey must be undertaken to confirm sensitive receivers (including critical working areas such as operating theatres and precision laboratories) potentially exposed to construction noise and vibration and construction ground-borne noise. The survey may be undertaken on a progressive basis but must be undertaken in any one area before the commencement of work which generates construction noise, vibration or ground-borne noise in that area. The results of the survey must be included in the Noise and Vibration CEMP Sub-plan required under Condition C5 of this schedule.	APPENDIX B
D21	Work must only be undertaken during the following hours: (a) 7:00am to 6:00pm Mondays to Fridays, inclusive; (b) 8:00am to 6:00pm Saturdays; and (c) at no time on Sundays or public holidays.	Section 2.2
D22	Except as permitted by an EPL, highly noise intensive work that results in an exceedance of the applicable NML at the same receiver must only be undertaken: (a) between the hours of 8:00 am to 6:00 pm Monday to Friday; (b) between the hours of 8:00 am to 1:00 pm Saturday; and (c) if continuously, then not exceeding three (3) hours, with a minimum cessation of work of not less than one (1) hour. For the purposes of this condition, 'continuously' includes any period during which there is less than one (1) hour between ceasing and recommencing any of the work.	Section 2.2
D23	Notwithstanding Conditions D21 and D22 of this schedule work may be undertaken outside the hours specified in the following circumstances: (a) Safety and Emergencies, including: (i) for the delivery of materials required by the NSW Police Force or other authority for safety reasons; or (ii) where it is required in an emergency to avoid injury or the loss of life, to avoid damage or loss of property or to prevent environmental harm. On becoming aware of the need for emergency work in accordance with (a)(ii) above, the AA, the ER, the Planning Secretary and the EPA must be notified of the reasons for such work. The Proponent must use best endeavours to notify as soon as practicable all noise and/or vibration affected sensitive land user(s) of the likely impact and duration of those work.	Section 2.2
	(b) Low impact, including: (i) construction that causes $L_{Aeq(15\text{ minute})}$ noise levels: • no more than 5 dB(A) above the rating background level at any residence in accordance with the ICNG, and • no more than the 'Noise affected' NMLs specified in Table 3 of the ICNG at other sensitive land user(s); and (ii) construction that causes $L_{AFmax(15\text{ minute})}$ noise levels no more than 15 dB(A) above the rating background level at any residence; or (iii) construction that causes: • continuous or impulsive vibration values, measured at the most affected residence are no more than the preferred values for human exposure to vibration, specified in Table 2.2 of Assessing Vibration: a technical guideline (DEC, 2006), or • intermittent vibration values measured at the most affected residence are no more than the preferred values for human exposure to vibration, specified in Table 2.4 of Assessing Vibration: a technical guideline (DEC, 2006).	Table 2.2 Table 2.2

No.	Requirement	Reference
	<p>(c) By Approval, including:</p> <ul style="list-style-type: none"> <li>(i) where different construction hours are permitted or required under an EPL in force in respect of the CSSI; or</li> <li>(ii) works which are not subject to an EPL that are approved under an Out-of-Hours Work Protocol as required by Condition D24 of this schedule; or</li> <li>(iii) negotiated agreements with directly affected residents and sensitive land user(s).</li> </ul> <p>(d) By Prescribed Activity, including:</p> <ul style="list-style-type: none"> <li>(i) tunnelling by tunnel boring machine (excluding cut and cover tunnelling and surface works) are permitted 24 hours a day, seven days a week; or</li> <li>(ii) delivery of material that is required to be delivered outside of standard construction hours in Condition D21 to directly support tunnelling activities, except between the hours 10:00 pm and 7:00 am to / from the Pymont construction site which could result in a sleep disturbance even for receivers in the proximity of Pymont Street, Edward Street, Union Street, Paternoster Row and Pymont Bridge Road; or</li> <li>(iii) haulage of spoil except between the hours of 10:00 pm and 7:00 am to / from the Pymont construction site; or</li> <li>(iv) work within an acoustic shed where there is no exceedance of noise levels under Low Noise Impact Work circumstances identified in (b) above, unless otherwise agreed by the Planning Secretary.</li> </ul> <p>Note: Tunnelling does not include station box excavation.</p>	Table 2.2
D24	<p>An Out-of-Hours Work Protocol must be prepared before the approval of out-of-hours-work under Condition D23(c)(ii).</p> <p>...</p>	Refer to Sydney Metro West-OOHV-Protocol
D25	<p>All reasonable and feasible mitigation measures must be implemented with the aim of achieving the following construction noise management levels and vibration criteria:</p> <ul style="list-style-type: none"> <li>(a) construction 'Noise affected' noise management levels established using the Interim Construction Noise Guideline (DECC, 2009);</li> <li>(b) vibration criteria established using the Assessing vibration: a technical guideline (DEC, 2006) (for human exposure);</li> <li>(c) Australian Standard AS 2187.2 - 2006 "Explosives - Storage and Use - Use of Explosives" (for human exposure);</li> <li>(d) BS 7385 Part 2-1993 "Evaluation and measurement for vibration in buildings Part 2" as they are "applicable to Australian conditions" (for structural damage); and</li> <li>(e) the vibration limits set out in the German Standard DIN 4150-3: Structural Vibration-effects of vibration on structures (for structural damage for structurally unsound heritage items).</li> </ul> <p>Any work identified as exceeding the noise management levels and / or vibration criteria must be managed in accordance with the Noise and Vibration CEMP Sub-plan.</p> <p>Note: The ICNG identifies 'particularly annoying' activities that require the addition of 5 dB(A) to the predicted level before comparing to the construction Noise Management Level.</p>	Section 4 Table 4.1
D26	<p>All reasonable and feasible mitigation measures must be applied when the following residential ground-borne noise levels are exceeded:</p> <ul style="list-style-type: none"> <li>(a) evening (6:00 pm to 10:00 pm) — internal LAeq(15 minute): 40 dB(A); and</li> <li>(b) night (10:00 pm to 7:00 am) — internal LAeq(15 minute): 35 dB(A).</li> </ul> <p>The mitigation measures must be outlined in the Noise and Vibration CEMP Sub-plan, including in any Out-of-Hours Work Protocol, required by Condition D24.</p>	Section 4 Table 4.1
D27	<p>Noise generating work in the vicinity of potentially-affected community, religious, educational institutions and noise and vibration-sensitive businesses and critical working areas (such as theatres, laboratories and operating theatres) resulting in noise levels above the NMLs must not be timetabled within sensitive periods, unless other reasonable arrangements with the affected institutions are made at no cost to the affected institution.</p>	Section 5.3.2

No.	Requirement	Reference
D28	Industry best practice construction methods must be implemented where reasonably practicable to ensure that noise levels are minimised around sensitive land user(s). Practices must include, but are not limited to: (a) use of regularly serviced low sound power equipment; (b) temporary noise barriers (including the arrangement of plant and equipment) around noisy equipment and activities such as rock hammering and concrete cutting; and (c) use of alternative construction and demolition techniques.	Section 5.3
D29	Detailed Noise and Vibration Impact Statements (DNVIS) must be prepared for any work that may exceed the NMLs, vibration criteria and / or ground-borne noise levels specified in Conditions D25 and D26 at any residence outside construction hours identified in Condition D21, or where receivers will be highly noise affected. The DNVIS must include specific mitigation measures identified through consultation with affected sensitive land user(s) and the mitigation measures must be implemented for the duration of the works. A copy of the DNVIS must be provided to the AA and ER before the commencement of the associated works. The Planning Secretary and the EPA may request a copy (ies) of the DNVIS.	This document Section 1.3
D30	DNVIS 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 land users and updated as required if site conditions or activities change.	This document Section 1.3
D31	Owners and occupiers of properties at risk of exceeding the screening criteria for cosmetic damage must be notified before works that generate vibration commences in the vicinity of those properties. If the potential exceedance is to occur more than once or extend over a period of 24 hours, owners and occupiers are to be provided a schedule of potential exceedances on a monthly basis for the duration of the potential exceedances, unless otherwise agreed by the owner and occupier. These properties must be identified and considered in the Noise and Vibration CEMP Sub-plan.	APPENDIX C Section 6.2
D32	Vibration testing must be conducted during vibration generating activities that have the potential to impact on Heritage items to identify minimum working distances to prevent cosmetic damage. In the event that the vibration testing and attended monitoring shows that the preferred values for vibration are likely to be exceeded, the Proponent must review the construction methodology and, if necessary, implement additional mitigation measures. Such measures must include, but not be limited to, review or modification of excavation techniques.	Section 6.3.4
D33	The Proponent must seek the advice of a heritage specialist on methods and locations for installing equipment used for vibration, movement and noise monitoring at Heritage items. Note: The installation of noise and vibration equipment must not impact on the heritage value of the Heritage items.	Section 6.2.2 and 6.3.4
D34	Before conducting at-property treatment at any Heritage item identified in the documents listed in Condition A1, the advice of a suitably qualified and experienced built heritage expert must be obtained and implemented to ensure any such work does not have an adverse impact on heritage significance of the item.	Not required. See Table 5.5
D35	If a Heritage item is found to be structurally unsound (following inspection) a cosmetic damage criterion of 2.5 mm/s peak component particle velocity (from DIN 4150) must be applied.	Section 4 Table 4.1



No.	Requirement	Reference
D36	<p>All work undertaken for the delivery of the CSSI, including those undertaken by third parties (such as utility relocations), must be coordinated to ensure respite periods are provided. The Proponent must:</p> <ul style="list-style-type: none"> <li>(a) reschedule any work to provide respite to impacted noise sensitive receivers so that the respite is achieved in accordance with Condition D37; or</li> <li>(b) consider the provision of alternative respite or mitigation to impacted noise sensitive receivers; and</li> <li>(c) provide documentary evidence to the AA in support of any decision made by the Proponent in relation to respite or mitigation.</li> </ul> <p>The consideration of respite must also include all other approved Critical SSI, SSI and SSD projects which may cause cumulative and / or consecutive impacts at receivers affected by the delivery of the CSSI.</p>	Not required. See Table 5.5
D37	<p>In order to undertake out-of-hours work outside the work hours specified under Condition D21, appropriate respite periods for the out-of-hours work must be identified in consultation with the community at each affected location on a regular basis. This consultation must include (but not be limited to) providing the community with:</p> <ul style="list-style-type: none"> <li>(a) a progressive schedule for periods no less than three (3) months, of likely out-of-hours work;</li> <li>(b) a description of the potential work, location and duration of the out-of-hours work;</li> <li>(c) the noise characteristics and likely noise levels of the work; and</li> <li>(d) likely mitigation and management measures which aim to achieve the relevant NMLs under Condition D26 (including the circumstances of when respite or relocation offers will be available and details about how the affected community can access these offers).</li> </ul> <p>The outcomes of the community consultation, the identified respite periods and the scheduling of the likely out-of-hour work must be provided to the AA, EPA and the Planning Secretary.</p> <p>Note: Respite periods can be any combination of days or hours where out-of-hours work would not be more than 5 dB(A) above the RBL at any residence.</p>	Not required. See Table 5.5
D38	<p>The Proponent must identify all receivers at Pyrmont and Hunter Street Sydney CBD likely to experience internal noise levels greater than LAeq(15 minute) 60 dB(A) inclusive of a 5 dB penalty, if rock breaking or any other highly noise intensive activity likely to result in regenerated (ground-borne) noise or perceptible level of vibration is planned (including works associated with utility adjustments), between 7am and 8pm.</p> <p>Note: this condition does not override requirements for work hours as outlined in Conditions D21, D22 and D23 above.</p>	No receivers identified, see Section 5.2.1 and 5.2.2
D39	<p>The Proponent must consult with all receivers identified in accordance with Condition D38 with the objective of determining appropriate hours of respite so that construction noise (including ground-borne noise), does not exceed internal noise levels of:</p> <ul style="list-style-type: none"> <li>(a) LAeq(15 minute) 60 dB(A) inclusive of a 5dB penalty if rock breaking or any other highly noise intensive activity likely to result in ground-borne noise or a perceptible level of vibration is planned between 7am - 8pm for more than 50 percent of the time; and</li> <li>(b) LAeq(15 minute) 55 dB(A) inclusive of a 5dB penalty if rock breaking or any other highly noise intensive activity likely to result in ground-borne noise or a perceptible level of vibration is planned between 7am – 8pm for more than 25 percent of the time,</li> </ul> <p>Unless an agreement is reach with those receivers. This condition does not apply to noise associated with the cutting surface of a TBM as it passes under receivers.</p> <p>Note: this condition requires that noise levels be less than LAeq(15 minute) 60 dB(A) for a least 6.5 hours between 7am and 8pm, of which at least 3.25 hours must be below LAeq(15 minute) 55 dB(A). Noise equal to or above LAeq(15 minute) 60 dB(A) is allowed for the remaining 6.5 hours between 7am and 8pm.</p>	Not required, see Section 5.2.1 and 5.3.2.

No.	Requirement	Reference

**Revised Environmental Mitigation Measures**

No.	Requirement	Reference
NV01	<p>Community preference for noise mitigation and management</p> <p>Where justified by the application of the Construction Noise and Vibration Standard, further engagement and consultation would be carried out in accordance with the Sydney Metro Overarching Community Communications Strategy with:</p> <ul style="list-style-type: none"> <li>▪ The affected communities to understand their preferences for mitigation and management measures</li> <li>▪ ‘Other sensitive’ receivers such as schools, medical facilities, theatres, or places of worship to understand periods in which they are more sensitive to impacts.</li> </ul> <p>Based on this consultation, appropriate mitigation and management options would be considered and implemented where feasible and reasonable to minimise the impacts.</p>	<p>Not required, see Section 5.2,5.3.2 and 6.2.</p>

No.	Requirement	Reference
NV02	<p>Alternative construction methodologies</p> <p>Alternative construction methodologies and measures that minimise noise and vibration levels during noise intensive work would be investigated and implemented where feasible and reasonable. This would include consideration of:</p> <ul style="list-style-type: none"> <li>▪ The use of hydraulic concrete shears in lieu of hammers/rock breakers</li> <li>▪ Sequencing work to shield noise sensitive receivers by retaining building wall elements</li> <li>▪ Locating demolition load out areas away from the nearby noise sensitive receivers</li> <li>▪ Providing respite periods to minimise impacts from prolonged periods of noise intensive work</li> <li>▪ Minimising 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</li> <li>▪ Installing sound barrier screening to scaffolding facing noise sensitive neighbours</li> <li>▪ Using portable noise barriers around particularly noisy equipment, such as concrete saws</li> <li>▪ Modifying demolition work sequencing/hours to minimise impacts during peak pedestrian times and/or adjoining neighbour outdoor activity periods.</li> </ul>	See Table 5.5
NV03	<p>Construction noise – respite periods</p> <p>Appropriate respite would be provided to affected receivers in accordance with the Sydney Metro Construction Noise and Vibration Standard. This would include consideration of impacts from utility and power supply work when determining appropriate respite periods for affected receivers.</p> <p>When determining appropriate respite, the need to efficiently undertake construction would be balanced against the communities’ preferred noise and vibration management approach.</p>	See Table 2.2 and Sections 5.3.1 and 5.3.2
NV04	<p>Construction noise – out of hours work</p> <p>The use of noise intensive equipment at construction sites with ‘moderate’ and ‘high’ out of hours noise management level exceedances would be scheduled for standard construction hours, where feasible and reasonable. Where this is not feasible and reasonable, the work would be undertaken as early as possible in each work shift.</p>	Section 2.2 and Section 5.3.1
NV05	<p>Night-time noise impacts</p> <p>Where practicable, air brake silencers would be used on heavy vehicles that access construction sites multiple times per night or over multiple nights.</p>	See Table 5.5
NV06	<p>Night-time noise impacts</p> <p>Perimeter site hoarding would be designed with consideration of on-site heavy vehicle movements with the aim of minimising sleep disturbance impacts.</p>	See Table 5.5
NV07	<p>Noise emissions from equipment</p> <p>Long term construction site support equipment and machinery would be low noise emitting and suitable for use in residential areas, where feasible and reasonable. Examples include:</p> <ul style="list-style-type: none"> <li>▪ Low noise water pumps for use in water treatment facilities</li> <li>▪ Low noise generators and compressors</li> <li>▪ Low noise air conditioner units for use of amenities buildings.</li> </ul>	See Table 5.5 and APPENDIX C (Table C2)
NV08	<p>Acoustic sheds</p> <ul style="list-style-type: none"> <li>▪ Where acoustic sheds are installed, the internal lining and construction materials would be determined during later design stages to ensure appropriate attenuation is provided. This design of sheds would likely include the following considerations: All significant noise producing equipment that would be used during the night-time would be inside the shed, where feasible and reasonable</li> <li>▪ Noise generating ventilation systems such as compressors, scrubbers, etc, would also be inside the shed and external air intake/discharge ports would be appropriately acoustically treated</li> <li>▪ Acoustic shed doors would be kept closed during the night-time period, where feasible and reasonable. Where night-time vehicle access is required, the doors would be designed and constructed to minimise noise breakout.</li> </ul>	See Table 5.5 and APPENDIX C (Table C2)

No.	Requirement	Reference
NV09	<p>Ground-borne noise</p> <p>Feasible and reasonable measures would be implemented to minimise ground-borne noise where exceedances are predicted. This may require implementation of less ground-borne noise and less vibration intensive alternative construction methodologies.</p>	See 2.1.4
NV10	<p>Ground-borne noise – cross passages</p> <p>The proximity of cross passages to nearby receivers and the corresponding construction ground-borne noise and vibration impacts during the excavation work would be considered when determining locations. Relocation of cross passages to be further away from sensitive receivers to mitigate potential construction impacts would be considered, where feasible and reasonable.</p>	N/A (no cross passage excavation under this DNVIS)
NV11	<p>Ground-borne noise – underground rockbreaking</p> <p>Activity specific Detailed and/or General Noise and Vibration Impact Statement (in accordance with the requirements of the Construction Noise and Vibration Standard) would be developed for rockbreaking in the tunnel and at cross passages, specifically addressing the activity where it is required between 22:00 - 07:00.</p>	N/A (no underground rockbreaking in this DNVIS)
NV12	<p>Construction traffic noise</p> <p>Further assessment of construction traffic would be completed during detailed design, including consideration of the potential for exceedances of the NSW Road Noise Policy base criteria (where greater than two dB increases are predicted). The potential impacts would be managed using the following approaches, where feasible and reasonable:</p> <ul style="list-style-type: none"> <li>▪ On-site spoil storage capacity would be maximised to reduce the need for truck movements during sensitive times</li> <li>▪ Vehicle movements would be redirected away from sensitive receiver areas and scheduled during less sensitive times</li> <li>▪ The speed of vehicles would be limited, and the use of engine compression brakes would be avoided</li> <li>▪ Heavy vehicles would not be permitted to idle near sensitive receivers.</li> </ul>	See Section 2.1.3
NV13	<p>Construction vibration</p> <p>Where vibration levels are predicted to exceed the screening criteria, a more detailed assessment of the structure (in consultation with a structural engineer) and vibration monitoring would be carried out to ensure vibration levels remain below appropriate limits for that structure.</p> <p>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.</p>	See Section 6, more specifically Section 6.2
NV14	<p>Building condition surveys – construction vibration</p> <p>Condition surveys of buildings and structures near to the tunnel and excavations would be undertaken prior to the commencement of excavation at each site, where appropriate. For heritage buildings and structures the surveys would consider the heritage values of the structure in consultation with a heritage specialist.</p>	See Table 6.4
NV15	<p>Cumulative construction noise impacts</p> <p>The likelihood of cumulative construction noise impacts would be reviewed during detailed design when detailed construction schedules are available.</p> <p>Co-ordination would occur between potentially interacting projects to minimise concurrent or consecutive work in the same areas, where possible.</p> <p>Specific mitigation strategies would be developed to manage impacts. Depending on the nature of the impact, this could involve adjustments to construction program or activities of Sydney Metro West or of other construction projects.</p>	See Section 5.3.5



# 1 Introduction

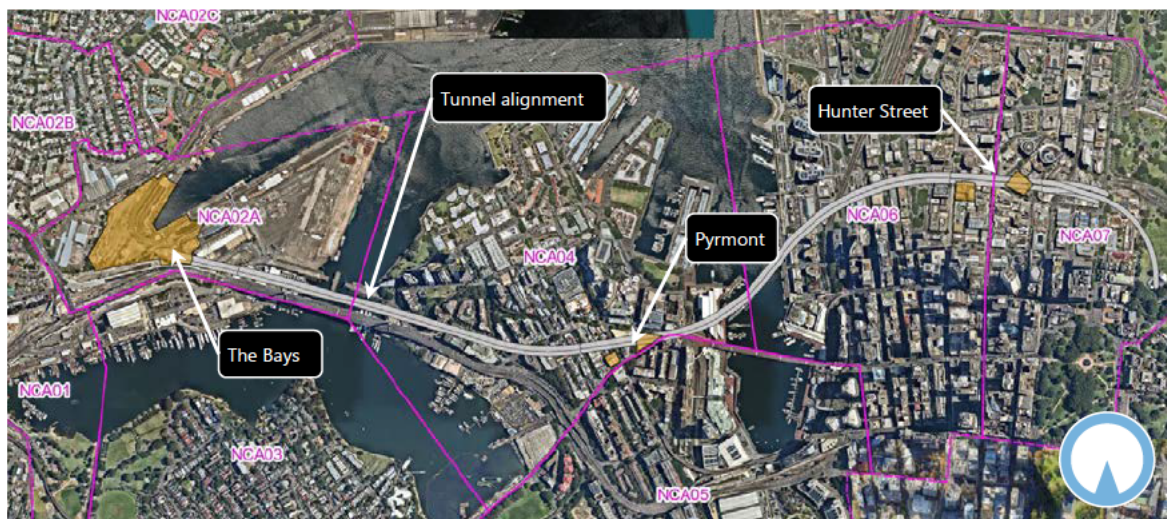
## 1.1 Purpose and application

This Detailed Noise and Vibration Impact Statement (DNVIS) has been prepared on behalf of John Holland CPB Ghella Joint Venture (JCG) in accordance with the Sydney Metro Construction Noise and Vibration Standard (CNVS)[1] for the construction of the Sydney Metro West – Eastern Tunnelling Project (ETP) Works. This DNVIS has been prepared to satisfy Planning Approval (SSI 19238057) Condition D29.

## 1.2 Overview

Sydney Metro West ETP is Stage 2 of the Sydney Metro West a new 24-kilometre metro line that will connect Greater Parramatta with the Sydney CBD via stations at Westmead, Parramatta, Sydney Olympic Park, North Strathfield, Burwood North, Five Dock, The Bays, Pyrmont and Hunter Street (Sydney CBD). The Project includes all major civil construction work including station excavation (at the Pyrmont Station and Hunter Street Station (Sydney CBD) construction sites) and tunnelling between The Bays and Sydney CBD. An overview of the construction work locations for Sydney Metro West ETP is presented in Figure 1-1.

Figure 1-1: Overview of Sydney Metro West ETP construction work between The Bays and Sydney CBD



The aim of this assessment is to minimise the impact of construction noise and vibration on sensitive receivers and demonstrate compliance with relevant Conditions of Approval, the CSSI Stage 2 Environmental Impact Statement (EIS)[4] and the Revised Environmental Mitigation Measures (REMMs) included in the Submissions Report [5].

## 1.3 Detailed Noise and Vibration Impact Statement

DNVIS provide a quantitative noise and vibration assessment of activities and/ or locations where construction work will occur. They clarify details provided in the EIS Noise and Vibration technical Paper

[4], updated to include the more detailed information available at the detailed design and construction planning stage of the Project. This DNVIS is structured to meet the requirements of Condition of Approval D29 and the CNVS, including specific mitigation measures to be implemented for the duration of the assessed works, identified through consultation with affected sensitive land user(s).

This DNVIS provides a noise and vibration assessment of the ETP **Project-wide low impact works** as defined in the SSI 19238057 Conditions of Approval. Note that this DNVIS excludes preliminary works that do not meet the **low impact** definition in the SSI 19238057, which have been assessed in a separate DNVISs (ref: TM372-02-1-06F01 SMW-ETP\_DNVIS-HUN-E Preliminary and TM372-02-1-06F02 SMW-ETP\_DNVIS-PWE Preliminary).

In accordance with the Low Impact Works (LIW) Plan (Section 1.3.2), this DNVIS will accompany a Low Impact Works Approval Form (SM-22-00552597) for each LIW activity. The respective LIW will not commence until the Low Impact Works Approval Form (SM-22-00552597) has been endorsed by the ER (where required by the Planning Approval) and/or approved by Sydney Metro. Following approval of the Preliminary CEMP, LIW that have not commenced will be managed in accordance with the Preliminary CEMP.

## 1.4 Quality assurance

The work documented in this report was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard / NZS ISO 9001. Appendix A contains a glossary of acoustic terms used in this report.

## 2 Construction works and hours

### 2.1 Construction works addressed in this DNVIS

#### 2.1.1 Location of works

The low impact works assessed in this DNVIS includes survey work; investigations; site establishment work; use of ancillary facilities if the ER has determined the operational activities will have minimal impact on the environment and community; minor clearing and relocation of native vegetation; installation of mitigation measures; property acquisition adjustment work; archaeological testing; maintenance of existing buildings and structures; and other activities determined by the ER to have minimal environmental impact, as defined in the Conditions of Approval. The extent of the out of hours works have been limited as much as practicable to ensure that the works satisfy the low impact requirement that *'Any Low Impact Work conducted during night time hours (as defined by the ICNG) that exceeds noise management and vibration levels as identified in Condition D23(b) is not Low Impact Work.* Justification for out of hours work is provided in Section 2.2.1.

Figure 2-1, Figure 2-2 and Figure 2-3 shows the indicative location of low impact work assessed in this DNVIS. The low impact works will be undertaken around The Bays Station, Pyrmont Station and Hunter Street Station. The Bays Station construction site has been previously established as part of the Sydney Metro West Central Tunnelling. The site is located to the east of the former White Bay Power Station and north of Anzac Bridge. The Pyrmont Station includes a western worksite and an eastern worksite. The western worksite is located on the corner of Pyrmont Street and Pyrmont Bridge Road. The eastern worksite is located between Pyrmont Bridge Road, Union Street and Edward Street.

The Hunter Street Station includes a western worksite and an eastern worksite. The western worksite is located on the southern corner of George and Hunter Streets. The eastern worksite is located between Bligh Street, Hunter Street and O'Connell Street.

#### 2.1.2 Construction works

The Project-wide Low impact works are proposed to be undertaken outside standard construction hours, where the out of hours works (OOHW) are justified (see Section 2.2.1). The works are summarised in .

**Table 2.1: Summary of construction works under this DNVIS**

Worksite	Aspect	Construction hours	Indicative timing
The Bays	Use of existing offices, amenities for start-up	Standard hours + OOHW (D/E/N)	6 weeks
	Secure site	Standard hours + OOHW (D/E/N)	6 weeks
	Extension of High voltage construction power supply and water supply from existing CTP substation	Standard hours + OOHW (D/E/N)	3 weeks

Worksite	Aspect	Construction hours	Indicative timing
	Establish pedestrian bridge over site access road	Standard hours + OOHW (D/E/N)	3 weeks
	Installation of environmental controls/ERSED	Standard hours + OOHW (D/E/N)	4 weeks
Pymont West	Utility works, including: - establishment of temporary construction services, - investigation and protection of existing assets, and - decommissioning of redundant assets	Standard hours (D)	6 weeks
	Initial demolition works including: - Hazmat investigation and structural investigation within existing buildings to be demolished - Secure site including establishment of hoardings - Create truck access to facilitate soft strip - Demolition soft strip	Standard hours (D)	6 weeks
	Five archaeological test trenches and if triggered salvage excavations	Standard hours (D)	6 weeks
Pymont East	Utility works, including; - establishment of temporary construction services, - investigation and protection of existing assets, and - decommissioning of redundant assets	Standard hours (D)	4 weeks
	Tree trimming and removal on Pymont Bridge Road, Union Street, and Edward Street	Standard hours (D)	4 weeks
	Initial demolition works including: - Hazmat investigation and structural investigation within existing buildings to be demolished - Secure site including establishment of hoardings - Create truck access to facilitate soft strip - Demolition soft strip	Standard hours (D)	6 weeks
	Detailed site investigation to determine contamination potential	Standard hours (D)	6 weeks
Hunter Street West	Archaeological investigations of DeMestre Place (if access dates allow)	Standard hours + OOHW (D/E/N)	6 weeks
	Utility works and temporary services investigation and installation at DeMestre Place	Standard hours + OOHW (D/E/N)	6 weeks
	Initial demolition works including: - Hazmat investigation and structural investigation <b>within existing buildings</b> to be demolished - Secure site including establishment of hoardings - Create truck access to facilitate soft strip - Demolition soft strip	Standard hours + OOHW (D/E/N)	3 week
	Maintenance of existing temporary WTP	Standard hours + OOHW (D/E/N)	4 weeks

Worksite	Aspect	Construction hours	Indicative timing
Hunter Street East	Internal temporary fitout within existing acoustic shed: - Reticulate HV power supply ready for decline excavation - Site adjustments within the acoustic shed, to facilitate the HV construction power reconfiguration - Establish (including assembly) road header, dust scrubber, shotcrete and bolting equipment on site - Site establishment within existing offices and amenities	Standard hours + OOHW (D/E/N)	6 weeks
	Initial demolition works including: - Hazmat investigation and structural investigation <b>within existing buildings</b> to be demolished - Secure site including establishment of hoardings - Create truck access to facilitate soft strip - Demolition soft strip	Standard hours + OOHW (D/E/N)	3 week

Notes: 'OOHW' means Out of Hours works, or work outside the standard construction hours (see Section 2.2)

'OOHW(D)' is the OOH 'Day' period, 1pm to 6pm Saturday; 8am to 6pm Sunday

'OOHW(E)' is the 'Evening' period, 6pm to 10pm Monday to Sunday

'OOHW(N)' is the OOH 'Night' period, 10pm to 7am Sunday/Monday to Thursday/ Friday; 10pm to 8am Friday/Saturday and Saturday/Sunday

A detailed summary of the construction activities assessed in this report is presented in Section 5.1 and in Table C.1 of APPENDIX C.







Figure 2-2 Low impact works - Pyrmont

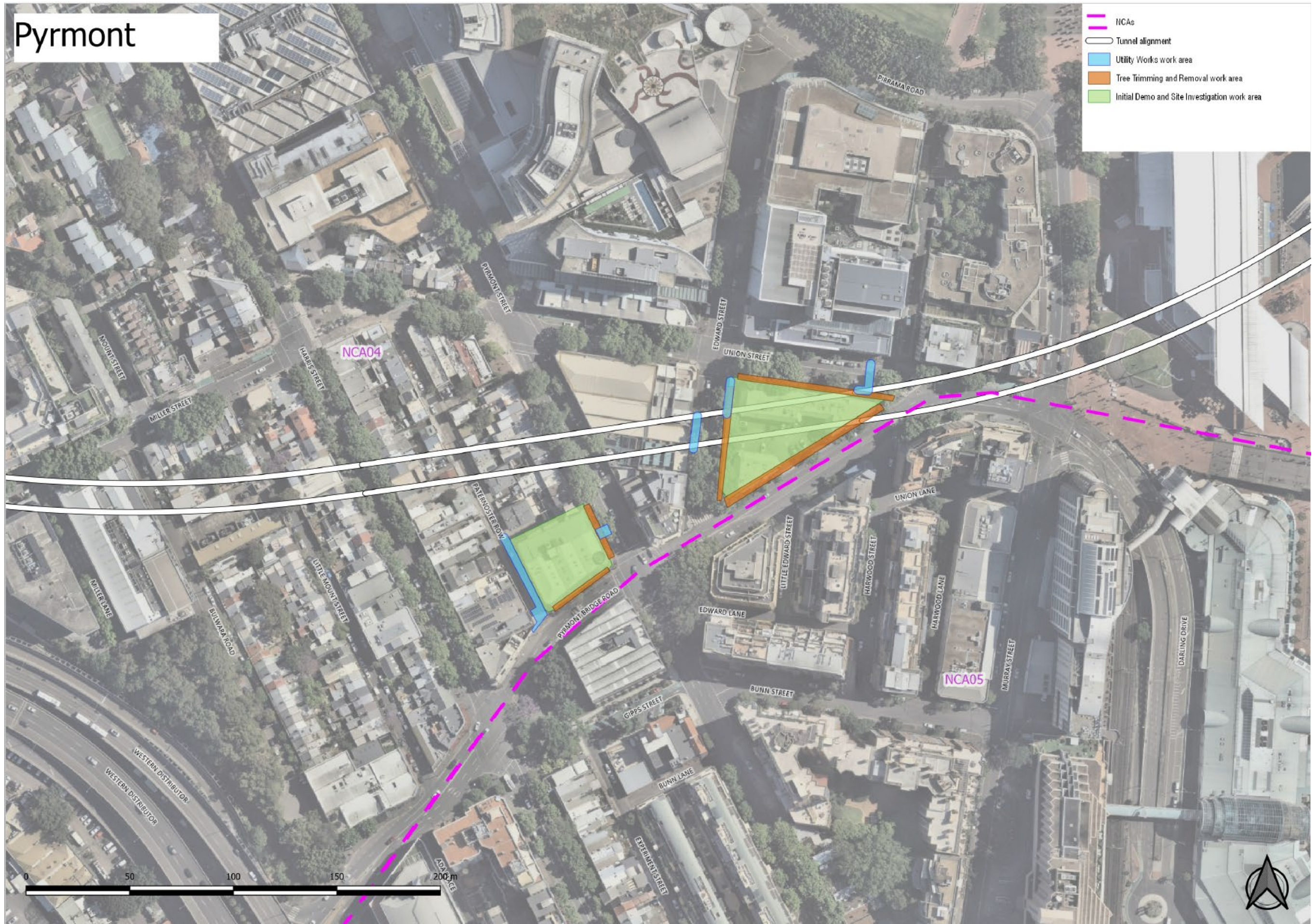
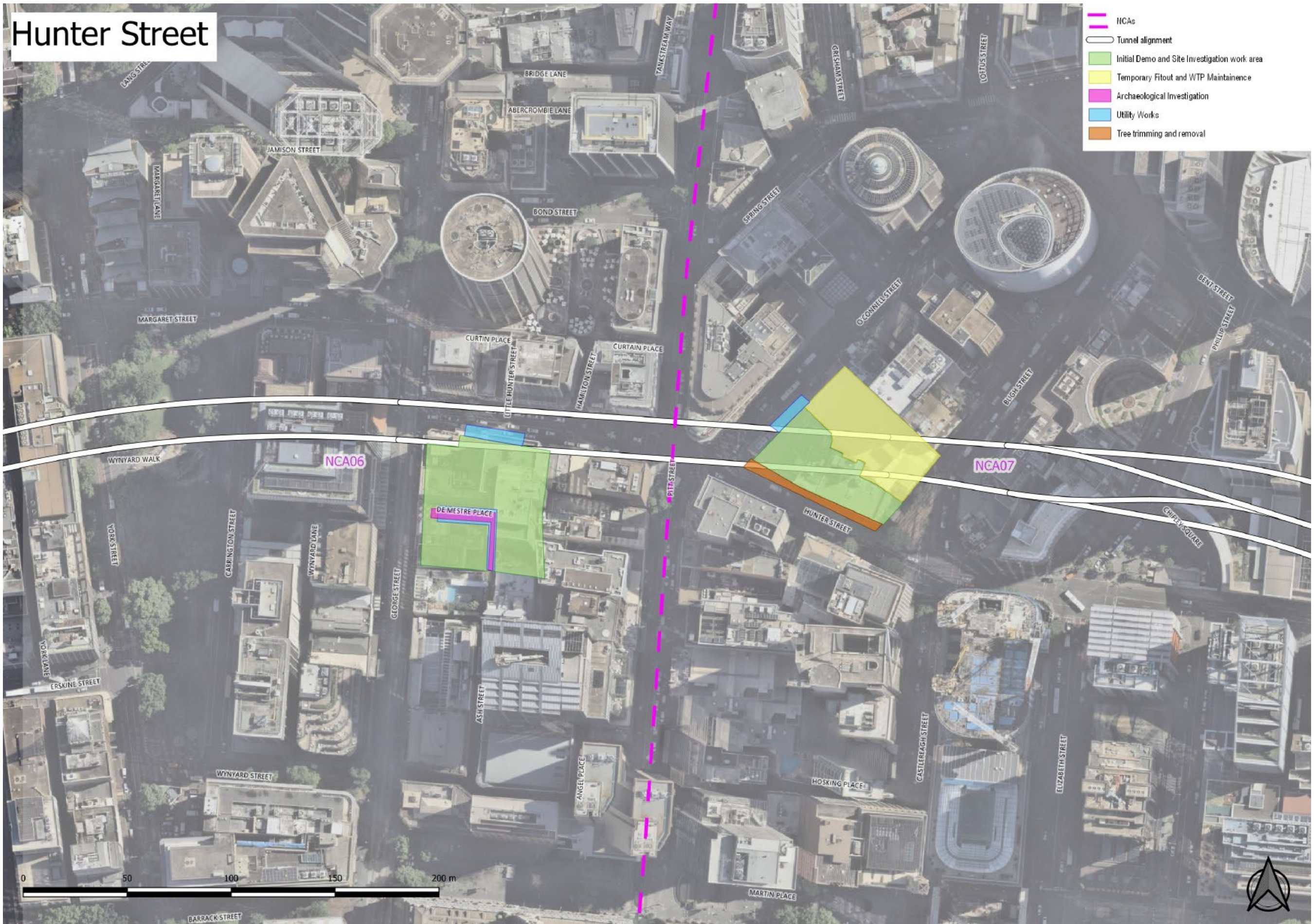




Figure 2-3 Low impact works - Hunter Street





### 2.1.3 Construction traffic

When construction related traffic moves on the public road network, a different noise assessment methodology is appropriate as vehicle movements would be regarded as additional road traffic on public roads rather than as part of the construction site's activities.

Construction traffic associated with the low impact works assessed in this report will be minimal, and mostly during standard construction hours, with some traffic outside standard hours, namely OOH deliveries of plant, equipment or materials. The vehicle movements would be via arterial roads or sub-arterial roads including City West Link, James Craig Road, Pyrmont Bridge Road, Pyrmont Street, Union Street, Cahill Expressway, Bent Street; O'Connell Street; Bridge Street; Loftus Street; Hunter Street and Macquarie Street.

Based on the proposed activities presented in Table C1 in APPENDIX C, the additional vehicle movements would not make a noticeable difference to traffic noise during the day and night periods. At night the total heavy vehicle movements is typically less than four per hour over the night period for any of the proposed OOH activities. The impact is assessed as negligible and has not been considered further in this report.

### 2.1.4 Ground-borne noise

The low impact works will be surface construction works. Due to the nature of surface works, airborne noise is expected to be much higher than ground-borne noise levels at the nearest sensitive receivers. The low impact works inside the acoustic shed at Hunter Street East are not vibration significant works (no excavation). On this basis, the potential impact of ground-borne noise from the low impact construction activities is expected to be negligible. The risk of annoyance due to ground-borne noise is considered low and has not been addressed further in this DNVIS.

## 2.2 Construction Hours

Construction hours for the Project are outlined in Conditions of Approval D21, D22 and D23. Table 2.2 below consolidates the information provided in these Conditions regarding construction working hours for the Project.

**Table 2.2: Working hours for construction worksites**

CoA	Construction Activity <sup>9</sup>	Monday to Friday	Saturday	Sunday / Public holiday
D21	Standard construction	07:00 to 1800	08:00 to 18:00	No work <sup>1</sup>
D22	Highly noise intensive works <sup>2</sup>	08:00 to 18:00 (plus respite <sup>2</sup> )	08:00 to 13:00 (plus respite <sup>2</sup> )	No work <sup>1</sup>
D23(a)	Safety and emergency work <sup>2</sup>	18:00 to 07:00	18:00 to 08:00	08:00 to 0:700
D23(b)	Low noise impact work <sup>3</sup>	18:00 to 07:00	18:00 to 08:00	08:00 to 07:00

CoA	Construction Activity <sup>9</sup>	Monday to Friday	Saturday	Sunday / Public holiday
D23(c)	Works approved under an EPL or Out-of-Hours Work Protocol or through negotiated agreement with directly affected residents and sensitive land user(s)	18:00 to 07:00	18:00 to 08:00	08:00 to 07:00
D23(d)	<b>Prescribed activity:</b> <ul style="list-style-type: none"> <li>▪ Tunnelling and associated surface support works<sup>4</sup></li> <li>▪ Delivery of material to directly support tunnelling activities<sup>5</sup></li> <li>▪ Haulage of spoil<sup>6</sup></li> <li>▪ <b>Work within an acoustic shed or enclosure<sup>7</sup>.</b></li> </ul>	24 hours	24 hours	24 hours
D39	Rock breaking and other particularly highly noise intensive activities for station shaft or cut and cover stations at Hunter Street Sydney CBD <sup>8</sup>	07:00 to 20:00 <sup>8</sup>	07:00 to 20:00 <sup>8</sup>	07:00 to 20:00 <sup>8</sup>
D39 and D40	Rock breaking and other particularly highly noise intensive activities for station shaft or cut and cover stations at Pymont <sup>8</sup>	07:00 to 18:00 <sup>8</sup>	08:00 to 18:00 <sup>8</sup>	No work <sup>1</sup>

## Notes:

1. No work unless permitted and approved.
2. Minimum respite from highly noise intensive works of not less than one (1) hour between each continuous block of works not exceeding three (3) hours.
3. Construction that causes  $L_{Aeq(15\text{ minute})}$  noise levels no more than 5dB(A) above the Rating Background Level (RBL) at any residence; and/or no more than the 'noise affected' NMLs specified in Table 3 of the ICNG at other sensitive land user(s). Construction that causes continuous/impulsive/intermittent vibration values at the most affected residence, no more than the preferred values for human exposure to vibration, specified in Table 2.2 and Table 2.4 of the AVTG.
4. Tunnelling does not include station box excavation.
5. Except between the hours 10:00 pm and 7:00 am to / from the Pymont construction site which could result in a sleep disturbance event for receivers in the proximity of Pymont Street, Edward Street, Union Street, Paternoster Row and Pymont Bridge Road
6. Except between the hours of 10:00 pm and 7:00 am to / from the Pymont construction site
7. Where there is no exceedance of noise levels under Low Noise Impact Work circumstances identified in D23(b), unless otherwise agreed by the Planning Secretary
8. Respite provided by ensuring noise levels are less than  $L_{Aeq(15\text{ minute})}$  60 dB(A) for at least 6.5 hours between 7am and 8pm, of which at least 3.25 hours must be below  $L_{Aeq(15\text{ minute})}$  55 dB(A). Noise equal to or above  $L_{Aeq(15\text{ minute})}$  60 dB(A) is allowed for the remaining 6.5 hours between 7am and 8pm.
9. Greyed out condition not applicable for low impact works.

## 2.2.1 Justification for OOHW

Low impact works included in this DNVIS that will be undertaken outside standard construction hours will meet the low impact requirements of Condition D23(b).

All reasonable and feasible mitigation and management measures will be implemented to reduce noise from the works to within NMLs and these mitigation measures will be detailed in this DNVIS and in the Noise and Vibration Management Procedure.

These works will be undertaken through the Sydney Metro West Out of Hours Works Protocol [3] (OOHW Protocol) prepared for the project in accordance with Condition of Approval D24 or under the Environment Protection Licence (EPL) for works subject to an EPL.

### 2.2.2 Assessment periods

The standard hours and out of hours work (OOHW) periods for construction works are depicted in Table 2.3. The OOHW periods are further defined as OOHW Period 1 and 2, based on the CNVS [1].

Construction traffic is assessed over a fifteen-hour day period, between 7am and 10pm (typically standard hours plus OOHW Period 1) and a nine-hour night period, between 10pm and 7am (typically OOHW Period 2). This is consistent with the NSW Road Noise Policy [8] and the CNVS [1].

**Table 2.3: Assessment periods**

Day/ Time	12am – 1am	1am – 2am	2am – 3am	3am – 4am	4am – 5am	5am – 6am	6am – 7am	7am – 8am	8am – 9am	9am – 10am	10am – 11am	11am – 12pm	12pm – 1pm	1pm – 2pm	2pm – 3pm	3pm – 4pm	4pm – 5pm	5pm – 6pm	6pm – 7pm	7pm – 8pm	8pm – 9pm	9pm – 10pm	10pm – 11pm	11pm – 12am
Monday to Friday																								
Saturday																								
Sunday or Public Holiday																								

## 3 Existing environment

### 3.1 Land use survey

To assess and manage construction noise and vibration impact, a Land Use Survey has been undertaken to satisfy Condition D20. The Land Use Survey identifies existing land use and development along the Project alignment, including a mix of residential, commercial and industrial uses; along with other noise and vibration-sensitive businesses, such as Hotels, medical or dental surgeries and childcare facilities. At Pyrmont Station there are residential receivers surrounding the two worksites. Conversely, at Hunter Street Station the nearest residential receivers are at 16 O'Connell Street (Level 11-12 only) and 1 Hoskings Place, Sydney (approximately 200 metres away).

Heritage receivers have been identified in EIS [4] and in the land use survey.

The Land Use Survey is maintained in a Geographic Information System (GIS) established for the Project and was used in the preparation of this DNVIS. The land use at the time of issue of this DNVIS is identified on an aerial photograph in Figure 3-1 (and in APPENDIX B). The land use revision date is shown in the top left corner of the drawing.

### 3.2 Noise Catchment Areas

Further to the Land Use Survey, residential areas have been divided into Noise Catchment Areas (NCAs) based on those established in the Environmental Impact Statement (EIS) [4] for the project. NCAs group individual sensitive receivers by common traits, such as existing noise environment and location in relation to the ETP works. NCAs relevant to the Hunter Street East worksite are identified in Figure 3-1.

### 3.3 Baseline noise monitoring

As part of the EIS process, baseline noise monitoring was conducted in Sydney CBD in 2015. The ambient noise monitoring locations were selected with reference to the procedures outlined in the NPfl (then the Industrial Noise Policy [10]). Noise monitoring was used to determine appropriate RBLs and ambient noise levels ( $L_{Aeq}$ ) for each NCA. Noise monitoring was used to establish the Rating Background Level (RBL). The RBL represents the average minimum background sound level for each measurement period, averaged over the measurement days. The RBLs and average ambient noise levels for the day, evening and night assessment periods are summarised in Table 3.1 and in Table B.1 in APPENDIX B.

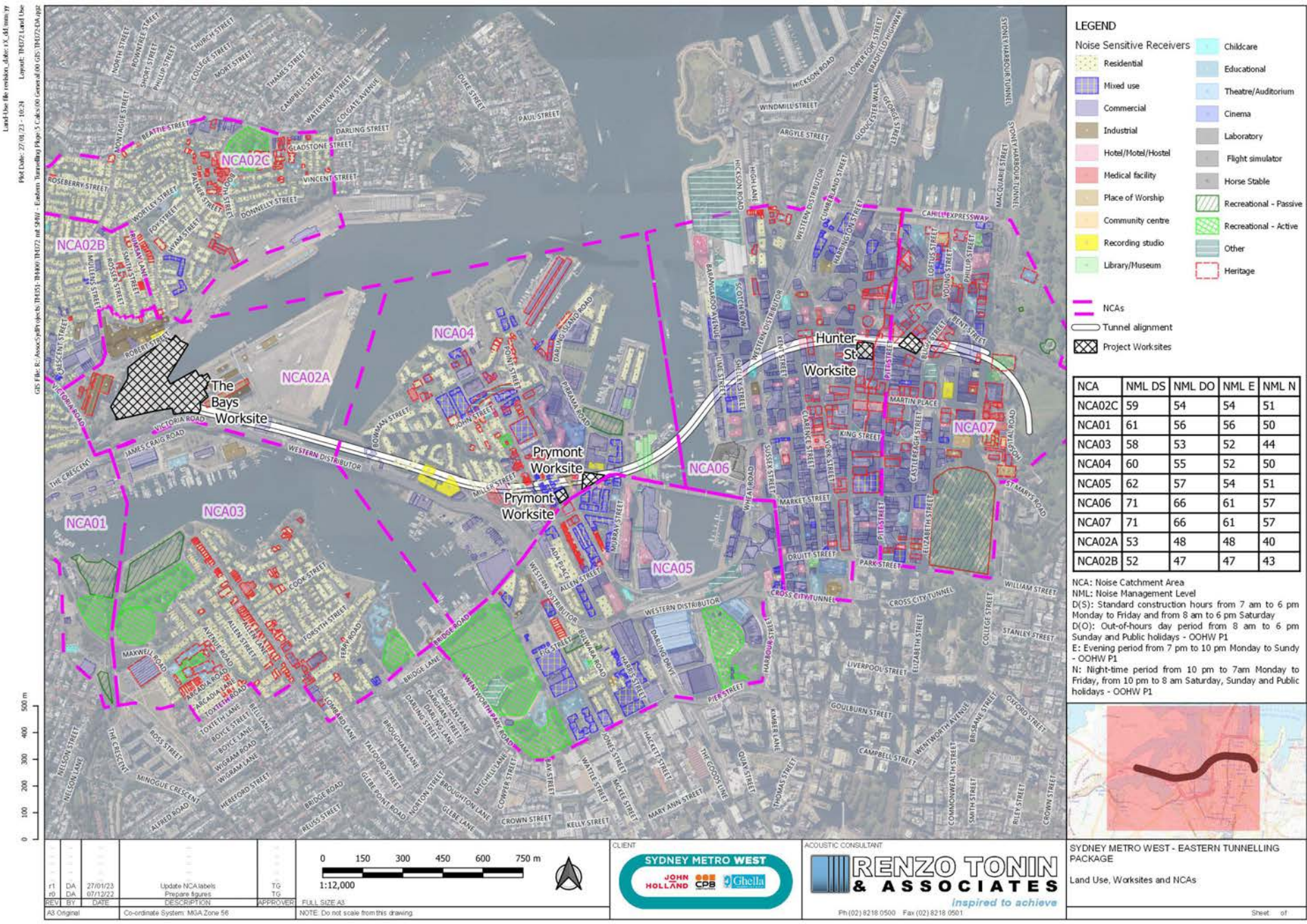
**Table 3.1: Summary of baseline noise monitoring data from EIS**

Construction work area	Monitor ID	Rating Background Noise (RBL) <sup>1</sup>			Ambient Noise Level (L <sub>Aeq(15min)</sub> ) <sup>1</sup>			Representative NCA
		Day <sup>2</sup>	Eve <sup>2</sup>	Ngt <sup>2</sup>	Day <sup>2</sup>	Eve <sup>2</sup>	Ngt <sup>2</sup>	
The Bays	B.02	51	51	45	57	57	54	NCA01
	B.01	43	43	35	56	54	47	NCA02A
	B40 <sup>3</sup>	42	44	38	54	53	48	NCA02B
	B.35 <sup>3</sup>	49	49	46	54	51	49	NCA02C
	B.03	48	47	39	59	58	51	NCA03
Pyrmont Station	B.04	50	47	45	56	50	47	NCA04
	B.05	52	49	46	61	59	56	NCA05
Hunter Street Station	B.06	61	56	52	66	62	63	NCA06 and NCA07

Notes: 1. RBL and L<sub>Aeq</sub> noise levels determined with reference to NPfI procedures  
2. Day is 7.00am to 6.00pm; Eve (evening) is 6.00pm to 10.00pm; Ngt (night) is 10.00pm to 7.00am



Figure 3-1: Noise Catchment Areas applicable to The Bays, Pyrmont and Hunter Street Station worksites





## 4 Construction noise and vibration objectives

Construction noise and vibration objectives are detailed in the CNVS Section 2. A summary of the objectives as applicable to the Hunter Street East worksite is provided in Table 4.1.

**Table 4.1: Summary of construction noise and vibration objectives**

Impact	Relevant guideline	
Airborne noise	NSW Interim Construction Noise Guideline (ICNG) [6] CNVS [1]	<p>Construction noise management levels (NMLs) for residential receivers are based on long-term noise logging conducted on behalf of Sydney Metro to quantify ambient noise levels for the EIS [3]. During standard construction hours, a highly affected noise objective of <math>L_{Aeq(15min)}</math> 75dB(A) applies at all residential receivers.</p> <p>The NMLs for 'other' sensitive receivers are from the ICNG, as reported in Section 2.2 of the CNVS.</p> <p>Receivers are considered 'noise affected' where construction noise levels are greater than the noise management levels identified in Table B.1 of APPENDIX B.</p> <p>Where construction activities are tonal or impulsive in nature and are described in the ICNG as being particularly annoying, a +5dB(A) correction must be added to the activity noise.</p> <p>construction related activities that could exceed the NMLs shall be identified and managed in accordance with the noise and mitigation and management measures set out in Section 6.3.</p>
Sleep disturbance	Noise Policy for Industry (EPA 2017) [7] CNVS [1]	<p>Initial screening level</p> <ul style="list-style-type: none"> <li>• <math>L_{AFmax} \leq 52</math> dB(A) or RBL + 15 dB (whichever is greater); and/ or</li> <li>• <math>L_{Aeq,15min} \leq 40</math> dB(A) or RBL + 5 dB (whichever is greater).</li> </ul> <p>Where noise events are found to exceed the initial screening level, further analysis will be made to identify:</p> <ul style="list-style-type: none"> <li>• the likely number of events that might occur during the night assessment period, and</li> <li>• Whether events exceed an 'awakening reaction' level of 55 dB(A) <math>L_{AFmax}</math> (internal) that equates to NML of 65 dB(A) externally (assuming open windows).</li> </ul>
Ground-borne noise	NSW Interim Construction Noise Guideline (ICNG) [6] CNVS [1]	<p>Receivers are considered 'ground-borne noise affected' where construction noise levels are greater than the noise management levels identified in Table B.2 of APPENDIX B.</p>
Construction traffic	ICNG refers to the NSW Road Noise Policy (RNP) [8] CNVS [1]	<p>Construction traffic impact initial screening test:</p> <ul style="list-style-type: none"> <li>• Traffic noise levels increase <math>\leq 2</math> dB(A) because of construction traffic</li> </ul> <p>Where traffic noise levels increase by more than 2 dB(A):</p> <ul style="list-style-type: none"> <li>• Freeway/arterial/sub-arterial road - 60 dB <math>L_{Aeq(15hour)}</math> day and 55 dB <math>L_{Aeq(9hour)}</math> night</li> <li>• Existing local road - 55 dB <math>L_{Aeq(1hour)}</math> day and 50 dB <math>L_{Aeq(1hour)}</math> night</li> </ul>

Impact	Relevant guideline	Construction noise/ vibration objective
Vibration – disturbance to building occupants	NSW 'Environmental Noise Management Assessing Vibration: A Technical Guideline' (AVTG) [9] CNVS [1]	<p>To assess the potential for vibration impact on human comfort, an initial screening test will be done based on peak velocity units, as this metric is also used for the cosmetic damage vibration assessment. The initial screening test values are:</p> <ul style="list-style-type: none"> <li>• Critical areas - 0.28 mm/s (day or night)</li> <li>• Residential buildings - 0.56 mm/s (16h day); 0.40 mm/s (8h night)</li> <li>• Offices, schools, educational institutions and places of worship - 1.10 mm/s (day or night)</li> <li>• Workshops - 2.20 mm/s (day or night).</li> </ul> <p>If the predicted vibration exceeds the initial screening test, the total estimated Vibration Dose Value (i.e. eVDV) will be determined based on the level and duration of the vibration event causing exceedance as detailed in Section 2.3.1 of the CNVS and Section 2.4 of the AVTG.</p>
Vibration – structural damage to buildings	British Standard BS 7385-2:1993 'Evaluation and measurement for vibration in buildings'[13] German Standard DIN 4150-3: 2016-12, Structural vibration - Effects of vibration on structures [14] CNVS [1]	<p>A conservative vibration damage screening level (peak component particle velocity) per receiver type is detailed in Section 2.4 of the CNVS and outlined below:</p> <ul style="list-style-type: none"> <li>• Reinforced or framed structures: 25.0 mm/s</li> <li>• Unreinforced or light framed structures: 7.5 mm/s.</li> </ul> <p>Heritage buildings and structures found to be structurally unsound (following inspection) would adopt a more conservative vibration damage screening level (peak component particle velocity):</p> <ul style="list-style-type: none"> <li>• Heritage structures (structurally unsound): 2.5 mm/s.</li> </ul> <p>Where the predicted and/or measured vibration is greater than shown above, a more detailed analysis of the building structure, vibration source, dominant frequencies and dynamic characteristics of the structure will be completed to determine the applicable vibration limit.</p>



## 5 Construction airborne noise assessment

### 5.1 Noise prediction methodology

Assessment of airborne noise impacts from the construction works were determined by predicting noise levels using a Cadna-A computer noise model developed for this project. The Cadna-A noise model incorporates ground elevation contours, building heights, the built environment and atmospheric conditions to predict the contribution of each noise source at identified sensitive receiver locations and allows for the prediction of the total noise from a worksite for the various construction stages.

Key details regarding the construction work locations, the likely plant and equipment, and hours of operation were informed by the Design and Construction Teams.

A summary of the noise model input parameters is detailed in Table 5.1.

**Table 5.1: Summary of noise modelling parameters**

Parameters	Inputs
Calculation method	ISO 9613-2:1996 implementing quality standard ISO 17534-1:2015
Location of noise sources	0.5m to 2m above the ground depending on the equipment or plant in use
Height of receivers	1.5m above ground level to represent 1.5m above ground floor level Additional 3m height for every additional floor assessed (i.e. 4.5m above ground for first floor, 7.5m for second floor etc.)
Ground topography	1m digital ground contours
Sound power levels of plant and equipment	Detailed in Table C.1 in APPENDIX C. Activity timing, number of plant and hours of operation also in Table C1.
Ground absorption	0.5
Noise barriers and screening	Site noise barriers identified in Figure C1 and Table C3 in APPENDIX C.
Acoustic sheds/ enclosures/ existing buildings	Site acoustic sheds/ enclosures/ existing buildings identified in Table C2 in APPENDIX C. Note that: <ul style="list-style-type: none"> <li>- the acoustic shed on this site is existing and was design to manage 24 hour tunnelling and support activity for the Sydney Metro City and South West Tunnels and Station Box Excavation project.</li> <li>- Existing buildings that will be demolished as part of the Project will be used to mitigate OOHW as noted in Table C1 and Table C2 in APPENDIX C.</li> </ul>
Noise source corrections	Noise source penalty corrections have been applied in accordance with Section 4.5 of the NSW Interim Construction Noise Guideline (INCG).

The noise predictions in this report represent a realistic worst-case scenario when construction occurs at a works location close to residences and other sensitive receivers. At each receiver, noise levels will vary during the construction period based on:

- the position of equipment within the worksite and distance to the receiver;
- the construction activities being undertaken;
- the noise levels of plant items and equipment

- temporary noise barriers/ construction hoarding/ acoustic sheds or enclosures.

Predicted noise levels presented in APPENDIX D are the maximum noise levels for each building. Actual noise levels will often be less than the predicted levels presented in this report.

## 5.2 Predicted noise levels

Noise impacts during construction works have been predicted and compared to the noise management levels (NMLs). A receiver is considered construction noise affected when the predicted construction noise level is above the NML. Table 5.3 and Table 5.4 present a summary of the number of residential receivers and 'other sensitive receivers (respectively) likely to be noise affected by the proposed activities. The tables are colour coded to indicate how much the predicted noise level is above the NML and the corresponding perceived noise impact, based on the CNVS, as noted in Table 5.2.

**Table 5.2: Key to the predicted construction noise results tables**

Assessment	Time of day		
			21-30 dB(A) above NML (orange)
			> 30 dB(A) above NML (purple)
		<b>L<sub>Aeq,15min</sub> above 40 dB(A) or RBL plus 5 dB, whichever is the greater (yellow)</b>	<b>L<sub>Amax</sub> above 52 dB(A) or RBL plus 15 dB, whichever is the greater (purple)</b>

Notes: 1. Highly noise affected (HNA) which is greater than 75dB(A) during standard construction hours is shown with **Bold** text and applies to residential receiver buildings only.

Table 5.3 summarises the number of construction noise affected residential receivers (i.e. receivers where predicted L<sub>Aeq</sub> noise levels construction works are above the NML) and the likely perceived noise impact. Table 5.4 presents the number of construction noise affected other sensitive receivers. Detailed predicted L<sub>Aeq</sub> noise levels for all receivers in each NCA are presented in Table D.1 of APPENDIX D.

Table 5.3: Number of receiver buildings over the airborne noise management level (all NCAs) – residential receivers

Worksite	Construction activity	Assessment reference (For detail, refer to Table C1 in APPENDIX C)	Highly noise affected <sup>3,4</sup>	Day (standard hours) <sup>3,4</sup>					Day (outside standard hours) <sup>3,4</sup>				Evening <sup>3,4</sup>				Night <sup>3,4</sup>				Sleep disturbance <sup>3,4</sup>	
			L <sub>Aeq</sub>	L <sub>Aeq</sub>					L <sub>Aeq</sub>				L <sub>Aeq</sub>				L <sub>Aeq</sub>				L <sub>Aeq</sub>	L <sub>Amax</sub>
			> 75 dB(A)	1 – 10 dB(A)	11 – 20 dB(A)	21-30 dB(A)	> 30 dB(A)	1 – 10 dB(A)	11 – 20 dB(A)	21-30 dB(A)	> 30 dB(A)	1 – 10 dB(A)	11 – 20 dB(A)	21-30 dB(A)	> 30 dB(A)	1 – 10 dB(A)	11 – 20 dB(A)	21-30 dB(A)	> 30 dB(A)	> 40 or RBL+5 dB(A)	> 52 or RBL+15 dB(A)	
Project wide	Survey control, instrumentation, and monitoring		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Geotechnical drilling		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
The Bays	Use of existing offices, amenities for start-up	UO-B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Secure site	SS-B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Extension of high voltage construction power supply and water supply from existing CTP substation	HV-B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Establish pedestrian bridge over site access road	PB-B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Installation of environmental controls/ERSED	EC-B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Pymont West	Utility works along Paternoster Lane	UT-PW1	8 (12)	10 (40)	3 (4)	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1		
	Utility works along Pymont Bridge Road and Pymont Street	UT-PW2	0 (4)	19 (12)	1 (11)	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1		
	Initial demolition works	DE-PW	12	29	5	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1		
	Five archaeological test trenches and if triggered salvage excavations	SI-PW	4 (34)	13 (77)	5 (14)	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1		
Pymont East	Utility works along Union Street	UT-PE1	0	7 (8)	0 (2)	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1		
	Utility works along Edward Street adjacent to work site	UT-PE2	1 (2)	4 (4)	1 (4)	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1		
	Utility works along Edward Street opposite to work site	UT-PE3	2 (2)	2 (5)	0 (2)	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1		
	Tree trimming and removal on Union Street	TR-PE1	10	36	1	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1		
	Tree trimming and removal on Edward Street	TR-PE2	9	36	2	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1		
	Tree trimming and removal on Pymont Bridge Road	TR-PE3	9	67	7	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1		
	Initial demolition works	DE-PE	1	6	3	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1		
	Detailed site investigation to determine contamination potential	SI-PE	4 (12)	8 (53)	1 (2)	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1		
Hunter Street West	Archaeological investigations of DeMestre Place (if access dates allow)	SI-HW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Utility works and temporary services investigation and installation at DeMestre Place	UT-HW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Initial demolition works	DE-HW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Hunter Street East	Maintenance of existing temporary WTP	WT-HE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Internal temporary fitout within existing acoustic shed:	IF-HE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Initial demolition works	DE-HE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		

- Note:
1. No work is proposed outside standard construction hours for this work activity.
  2. Construction noise level cells are shaded based upon the predicted worst case NML exceedance in accordance with the key presented in Table 5.2.
  3. Highly noise affected applies to residential receivers, as per the ICNG.
  4. Values in brackets represent high noise impact scenario, including jackhammer, concrete saw, chainsaw, wood chipper (refer to Table C1 for 'HN' note). Value outside the brackets represents the typical scenario, which excludes high noise plant.

Table 5.4: Number of other sensitive receivers over the airborne noise management levels (all NCAs)

Stage	Construction activity	Assessment reference	Commercial <sup>4</sup>				Childcare <sup>4</sup>				Educational <sup>4</sup>				Recreational <sup>4</sup>				Places of worship <sup>4</sup>				Hotel/Motel/ Hostel <sup>4</sup>				Other <sup>4</sup>			
			1-10 dB(A)	11-20 dB(A)	21-30 dB(A)	> 30 dB(A)	1-10 dB(A)	11-20 dB(A)	21-30 dB(A)	> 30 dB(A)	1-10 dB(A)	11-20 dB(A)	21-30 dB(A)	> 30 dB(A)	1-10 dB(A)	11-20 dB(A)	21-30 dB(A)	> 30 dB(A)	1-10 dB(A)	11-20 dB(A)	21-30 dB(A)	> 30 dB(A)	1-10 dB(A)	11-20 dB(A)	21-30 dB(A)	> 30 dB(A)	1-10 dB(A)	11-20 dB(A)	21-30 dB(A)	> 30 dB(A)
Project wide	Survey control, instrumentation, and monitoring		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Geotechnical drilling		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
The Bays	Use of existing offices, amenities for start-up	UO-B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
	Secure site	SS-B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
	Extension of high voltage construction power supply and water supply from existing CTP substation	HV-B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0
	Establish pedestrian bridge over site access road	PB-B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
	Installation of environmental controls/ERSED	EC-B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Pymont West	Utility works along Paternoster Lane	UT-PW1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1 (1)	0
	Utility works along Pymont Bridge Road and Pymont Street	UT-PW2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(1)	0	2 (1)	0
	Initial demolition works	DE-PW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Five archaeological test trenches and if triggered salvage excavations	SI-PW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(3)	0	2	0
Pymont East	Utility works along Union Street	UT-PE1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1 (1)	(1)	0	0
	Utility works along Edward Street adjacent to work site	UT-PE2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1 (1)	(1)	0	0
	Utility works along Edward Street opposite to work site	UT-PE3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1 (1)	(1)	0	0
	TR-PE1 Tree trimming and removal on Union Street	TR-PE1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1 (1)	1 (1)	1 (1)	0
	Tree trimming and removal on Edward Street	TR-PE2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tree trimming and removal on Pymont Bridge Road	TR-PE3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	2	0
	Initial demolition works	DE-PE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
	Detailed site investigation to determine contamination potential	SI-PE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(1)	2	(2)	0
Hunter Street West	Archaeological investigations of DeMestre Place	SI-HW	2 (13)	0 (4)	1 (1)	0 (1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Utility works and temporary services investigation and installation at DeMestre Place	UT-HW	2 (10)	0 (1)	0 (1)	1 (1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Initial demolition works	DE-HW	12	7	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	2	0	0	0	0	0	0	0	0	0
Hunter Street East	Maintenance of existing temporary WTP	WT-HE	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Internal temporary fitout within existing acoustic shed	IF-HE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Initial demolition works	DE-HE	10	3	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	4	1	1	0	0	1	0	0

Note:

- Commercial, recreational and other sensitive receivers have been assessed against the respective NMLs (see Table B1 in APPENDIX B), and exceedances have been presented in the count table. 'Other' includes industrial receivers, television or recording studios. For more detail on specific impacts to receivers refer to Appendix D (Table D.1).
- Impacts only applicable when facility is in use.
- Highly noise affected does not apply to OSRs, as per the ICNG.
- Values in brackets represent high noise impact scenario, including jackhammer, concrete saw, chainsaw, wood chipper (refer to Table C1 for 'HN' note). Value outside the brackets represents the typical scenario, which excludes high noise plant.

### 5.2.1 Standard construction hours

The results summarised in Table 5.3 show that:

- At The Bays there are no residential receivers that are expected to be construction noise affected by the low impact works during standard hours. Other sensitive receivers, including a place of worship and some industrial receivers may be construction noise affected where they are in use during the proposed works.
- Residential receivers at Pymont will be construction noise affected by the low impact works during standard construction hours. The results summarised in Table 5.4 show that no other sensitive receivers are expected to be construction noise affected by the low impact works at the Pymont work sites during standard construction hours.
- At Hunter Street there are no residential receivers that are expected to be construction noise affected by the low impact works during standard hours. Other sensitive receivers including hotels are expected to be construction noise affected by the works at the Hunter Street worksites.

### 5.2.2 Out of hours work

The results summarised in Table 5.3 show that no residential receivers are expected to be construction noise affected by the low impact works at all sites outside standard construction hours. Table 5.4 show that other sensitive receivers are expected to be construction noise affected by the low impact works at Hunter Street. Aside from the hotels, other sensitive receivers are unlikely to be in use outside standard construction hours.

Plant and equipment used on site will be limited (as noted in APPENDIX C, Table C1) to ensure construction noise levels meet the NMLs outside standard construction hours for residential and hotel receivers.

### 5.2.3 Sleep disturbance

The results summarised in Table 5.3 show that the no residential receivers are expected to experience construction noise levels above the sleep disturbance criteria.

## 5.3 Noise mitigation and management

### 5.3.1 High noise impact activities

The Project-wide low impact works have been assessed in this DNVIS. Works during standard construction hours will be managed to reduce noise impacts to nearby receivers. Potential impact from high noise impact activities has been minimised through the implementation of noise mitigation measures, including temporary noise barriers and limiting plant on site, where practicable. The predicted noise levels presented in Table 5.3 indicate that there may be residential receivers above the highly

noise affected level of 75 dB(A) at the nearest residential, as defined in the Conditions of Approval and in Table 4.1. The predictions indicate this is only likely to occur during the worst case works (e.g. concrete sawing, jack hammering) when the works are close to receivers during standard construction hours.

Respite from high noise activities will be provided by limiting activities as follows to satisfy CoA D22 (amended to satisfy any future EPL conditions):

- Between the hours of 8:00am to 6:00pm Monday to Friday
- Between the hours of 8:00am to 1:00pm Saturday, and
- In continuous blocks not exceeding three hours each with a minimum respite from those activities or works of not less than one hour.

For the purposes of this requirement 'continuous' includes any period during which there is less than one-hour respite between ceasing and recommencing any of the work that is subject to this requirement.

### 5.3.2 Consultation with affected receivers

JCG has commenced consultation with potentially affected stakeholders including Councils, business and residential receivers. The consultation is focussed on specific mitigation and management measures applicable to the works at this worksite. These measures may include minimising high noise impact works during night time hours; limiting night time works in individual locations to no more than two consecutive nights; scheduling high noise impact works around sensitive periods where feasible and reasonable; offers of movie or dinner vouchers; alternative accommodation offers. Details of completed consultation is recorded in the Sydney Metro Stakeholder Management System, Consultation Manager. A summary of the consultation program is provided below:

- Consultation with relevant community members on low impact works, including local area and utility works, site establishment, and preliminary works, including tunnel excavation within the acoustic shed at Hunter Street East.
- Consultation with noise affected receivers identified in APPENDIX D to ensure additional mitigation measures are provided (if required, refer to Section 5.3.4).

Following community consultation, JCG will endeavour to provide between two weeks and one month's notice for any 24-hour tunnel excavation. JCG is committed to undertake noise and vibration monitoring proactively and in response to complaints.

### 5.3.3 Noise control and management measures

Noise mitigation and management measures to reduce potential noise impacts will be implemented during the low impact construction works, where reasonable and feasible. In accordance with the ICNG and consistent with the CNVS, feasible noise mitigation measures are

those work practices or measures to reduce noise that are capable of being put into practice or of being engineered and are practical to build given project constraints such as safety and maintenance requirements. Reasonable noise mitigation measures are those feasible noise mitigation measures that are considered reasonable in the circumstances, based on a judgement that the overall noise benefits outweigh the overall adverse social economic and environmental effects, including the cost of implementing the measure. To make such a judgement, consideration is to be given to noise level impacts, duration of impacts, noise mitigation benefits, cost effectiveness of noise mitigation and community views.

Table 5.5 outlines the noise control measures that would be implemented on site during the low impact construction works, where feasible and reasonable.



Table 5.5 Site noise control measures

Control measure	Description of the control measure	Feasible mitigation test	Deemed feasible?	Reasonable mitigation test	Deemed reasonable?	Adopted?	Justification and commentary
<b>At source control measures</b>							
Site planning and layout	Locate noise-generating activities away from sensitive receivers, where practicable. Plan traffic flow, parking, loading/unloading, and other vehicle movements to keep vehicles away from sensitive receivers where possible and to minimise reversing movements.	Limited capacity to do this for local area utility works.	Yes	- Potential benefit of 5-10 dB(A). - Sufficient noise reduction could be achieved at enough receivers. - Deemed to be cost effective. - Outweighs the identified social, economic and environmental effects.	Yes	Yes	There is limited capacity apply this on local area and utility works, but this will be applied where practicable.
Noise control kits	Plant that is brought to site for works should meet the sound power limits identified in Table C1 of this assessment. Where plant are above limits then the plant may require installation of 'noise control kits' to comply with the noise limits in this assessment. Such 'noise control kits' comprise: • high performance 'residential-grade' exhaust mufflers, • additional engine cowling / enclosure lined inside with sound absorbent industrial-grade foam, and • air intake and discharge silencers / louvres.	This measure could be feasibly implemented. Subject to availability for each equipment item.	Yes	- Potential benefit of 5-10 dB(A). - Sufficient noise reduction could be achieved at enough receivers. - Deemed to be cost effective. - Outweighs the identified social, economic and environmental effects. - Deemed to be cost effective. - Outweighs the identified social, economic and environmental effects.	Yes	Yes, subject to noise testing on site	The need to fit 'noise control kits' onto the identified plant, will be confirmed once each plant item is tested prior to its regular use on site, or alternative the plant will be swapped for lower noise plant.
Limit equipment in use	Only the equipment necessary during each stage of the works will be used.	This measure could be feasibly implemented.	Yes	- Sufficient noise reduction could be achieved at enough receivers. - Outweighs the identified social, economic and environmental effects. Cost effectiveness to be determined on a case-by-case basis.	Yes	Yes	Excess equipment will be avoided where it is not needed for the works and where it is reasonable to do without it.
Timing of equipment in use	Where practicable, activities and plant will be scheduled/limited as outlined in Table C1 of this assessment	This measure is not feasible for all works as there is limited time for works to be completed under ROL (or similar).	Not for all works	- Sufficient noise reduction could be achieved at enough receivers and cost effective etc, however the OOHW are required due to the high risk to construction personnel or public safety triggering ROL.	Not for all works	Not for all works	Where practicable, the timing of works would be managed to reduce noise levels during more sensitive periods (i.e. after 10pm and after 12am).
Limit activity duration	Any equipment not in use for extended periods shall be switched off. For example, heavy vehicles should switch engines off when not in use.	This measure could be feasibly implemented.	Yes	- Sufficient noise reduction could be achieved at enough receivers. - Deemed to be cost effective. - Outweighs the identified social, economic, and environmental effects.	Yes	Yes	Equipment that is not directly needed for works at a given time will be switched off.
Equipment selection	Use quieter and less noise/vibration emitting construction methods where feasible and reasonable.	This measure could be feasibly implemented. To be determined on a case-by-case basis.	Yes	- Sufficient noise reduction could be achieved at enough receivers. - Deemed to be cost effective. - Outweighs the identified social, economic, and environmental effects.	Yes	Yes	Project team shall review plant and equipment on a case-by-case basis and find opportunities to use items with lower noise/vibration impacts.



Control measure	Description of the control measure	Feasible mitigation test	Deemed feasible?	Reasonable mitigation test	Deemed reasonable?	Adopted?	Justification and commentary
Truck movements	Where practicable, avoid the use of park air brakes at night. Set up relevant traffic management measures to minimise the use of air brakes when leaving site. Air brake silencers are to be correctly installed and fully operational for any heavy vehicles (as per CNVMP). Minimise unnecessary acceleration on site and avoid vigorous slamming of truck doors.	This measure could be feasibly implemented.	Yes	- Sufficient noise reduction could be achieved at enough receivers. - Deemed to be cost effective. - Outweighs the identified social, economic, and environmental effects.	Yes	Yes	There are only limited truck movements associated with the low impact works. Nonetheless, drivers will be reminded to drive responsibly, especially when accessing and departing the work area.
Non-tonal reversing alarms	Alternative reverse alarms, such as 'quackers' will be installed on all vehicles & mobile plant regularly used on site and on all vehicles & mobile plant required for OOHV.	This measure could be feasibly implemented.	Yes	- Sufficient noise reduction could be achieved at enough receivers. - Deemed to be cost effective. - Outweighs the identified social, economic, and environmental effects.	Yes	Yes	Project team will mandate use of non-tonal reversing alarms on equipment.
<b>Path mitigation measures</b>							
Noise barriers or temporary noise screens	Construction works generating noise levels above NMLs should utilise temporary noise screens (e.g. Echo-barrier, FlexShield or similar) to provide noise screening. The screen should be located around work areas as close as possible to the plant to ensure adequate shielding of the plant to receivers.	This measure is generally feasible, provided there is sufficient space to complete the works.	Yes, where there is sufficient space	- Potential benefit of 5-10 dB(A). - Sufficient noise reduction could be achieved at enough receivers. - Deemed to be cost effective. - Safety can be compromised if the workspace is too small or adjacent to busy road	Yes, where safe to do so	Yes, as noted	Temporary noise screens will be utilised to shield sensitive receivers wherever is safe and practicable to do so.
<b>At-receiver</b>							
At-property treatments	Design and installation of architectural treatments to sensitive receiver buildings to reduce internal noise levels to key rooms.	Not relevant to this project.	No	- Sufficient noise reduction could be achieved at enough receivers. - Short term OOHV will be managed - Not cost effective.	No	No	Short term impacts will be managed in accordance with the CNVS and this DNVIS.
<b>Noise management measures</b>							
Site inductions & Toolbox Talks	All employees, contractors and subcontractors will receive a Project induction. The environmental component may be covered in toolboxes and should include (but is not limited to): • location of nearest sensitive receivers • relevant project specific and standard noise and vibration mitigation measures; • permitted hours of work; • OOHV Procedure and Form • construction employee parking areas.	This measure could be feasibly implemented.	Yes	Routine task for project team.	Yes	Yes	Inductions and toolbox talks will continue to be conducted for the project.
Community consultation - disseminating information	Provide information to community of construction activity and potential impacts.	This measure could be feasibly implemented.	Yes	Routine task for project team.	Yes	Yes	Updates will be distributed regularly for the duration of the project.

Control measure	Description of the control measure	Feasible mitigation test	Deemed feasible?	Reasonable mitigation test	Deemed reasonable?	Adopted?	Justification and commentary
Community consultation - active communication with nearby sensitive receivers	Seek feedback from community to identify more sensitive times of the day, or particularly sensitive days. An example is identifying when student exams (such as Higher School Certificate exams, end of semester exams) will take place.	This measure could be feasibly implemented.	Yes	Routine task for project team.	Yes	Yes	Project team shall proactively contact nearby sensitive receivers, particularly those which may have special requirements (e.g. recording studios).
Behavioural practices	No swearing or unnecessary shouting or loud stereos/radios on site. No dropping of materials from height, throwing of metal items and slamming of doors.	This measure could be feasibly implemented.	Yes	Routine task for project team.	Yes	Yes	Project team shall monitor site behaviour and advise supervisors if issues arise or additional behavioural practices are needed.
Noise monitoring	Noise monitoring to be conducted at key locations to quantify noise impacts at sensitive receivers.	This measure could be feasibly implemented.	Yes	Deemed to be cost effective. Outweighs the identified social, economic and environmental effects.	Yes	Yes	Noise monitoring shall be carried out as detailed in this assessment.
Update DNVIS	Regular updates of the DNVIS to account for changes in noise and vibration management strategies.	This measure could be feasibly implemented.	Yes	Can be reasonably undertaken by project team where required.	Yes	Yes	Updates to the DNVIS will be carried out where required and will be reviewed regularly.
Respite coordination	Consult with proponents of other construction works in the vicinity of the worksite and take reasonable steps to coordinate works to minimise cumulative impacts of noise and vibration and maximise respite for affected sensitive receivers (e.g. aligning respite evenings).	This measure could be feasibly implemented, if required.	Yes	Sufficient noise reduction could be achieved at enough receivers. Deemed to be cost effective. Outweighs the identified social, economic and environmental effects.	Yes	Yes	Respite coordination shall be conducted with neighbouring projects.
Implement additional management measures	Identify and implement additional management measures outlined in this assessment.	This measure could be feasibly implemented.	Yes	Consistency with CNVS	Yes	Yes	Additional management measures to be identified on a case-by-case basis and with consideration of the standard mitigation and management measures outlined in this report.

### 5.3.4 Additional management measures

Section 5 of the CNVS directs that in instances where, after the application of all reasonable and feasible mitigation and management measures (refer to Section 5.3.2), the  $L_{Aeq(15minute)}$  airborne construction noise levels are still predicted to exceed the NMLs, additional management measures can be applied to further limit the risk of annoyance from construction noise. The CNVS suggests the Project should consider implementing additional management measures such as:

- **Alternative accommodation (AA)** options may be provided for residents living close to construction works that are likely to incur unreasonably high impacts over an extended period of time (more than 2 consecutive days). Alternative accommodation will be determined on a case-by-case basis.
- **Monitoring (M)** of noise or vibration may be conducted at the affected receiver(s) or a nominated representative location where it has been identified that specific construction activities are likely to exceed the relevant noise or vibration objectives. Monitoring can be in the form of either unattended logging or operator attended surveys. The purpose of monitoring is to inform the relevant personnel when the noise or vibration goal has been exceeded so that additional management measures may be implemented.
- **Individual briefings (IB)** are used to inform stakeholders about the impacts of high noise activities and mitigation measures that will be implemented. Communications representatives from the contractor would visit identified stakeholders at least 48 hours ahead of potentially disturbing construction activities. Individual briefings provide affected stakeholders with personalised contact and tailored advice, with the opportunity to comment on the project.
- **Letter box drops (LB)** in the form of a newsletter produced and distributed to the local community via letterbox drop or email via the project mailing list. The newsletter will provide an overview of current and upcoming works across the project and other topics of interest. The objective is to engage, inform and provide project-specific messages. Advanced warning of potential disruptions (e.g. traffic changes or noisy works) can assist in reducing the impact on the community.
- **Project specific respite offers (RO)** provide residents subjected to lengthy periods of noise or vibration respite from an ongoing impact.
- **Phone calls and emails (PC)** detailing relevant information about construction works would be made to identified noise or vibration affected stakeholders within 7 days of proposed work to provide tailored advice and the opportunity for stakeholders to provide comments on the proposed work and specific needs etc.
- **Specific notifications (SN)** would be letterbox dropped or hand distributed to identified stakeholders no later than 7 days ahead of construction activities that are likely to exceed the noise objectives. This form of communication is used to support periodic notifications, or to advertise unscheduled works.

The steps to be carried out to determine the additional management measures to be implemented are identified in Figure 5-1.

Figure 5-1: Additional airborne noise management measures

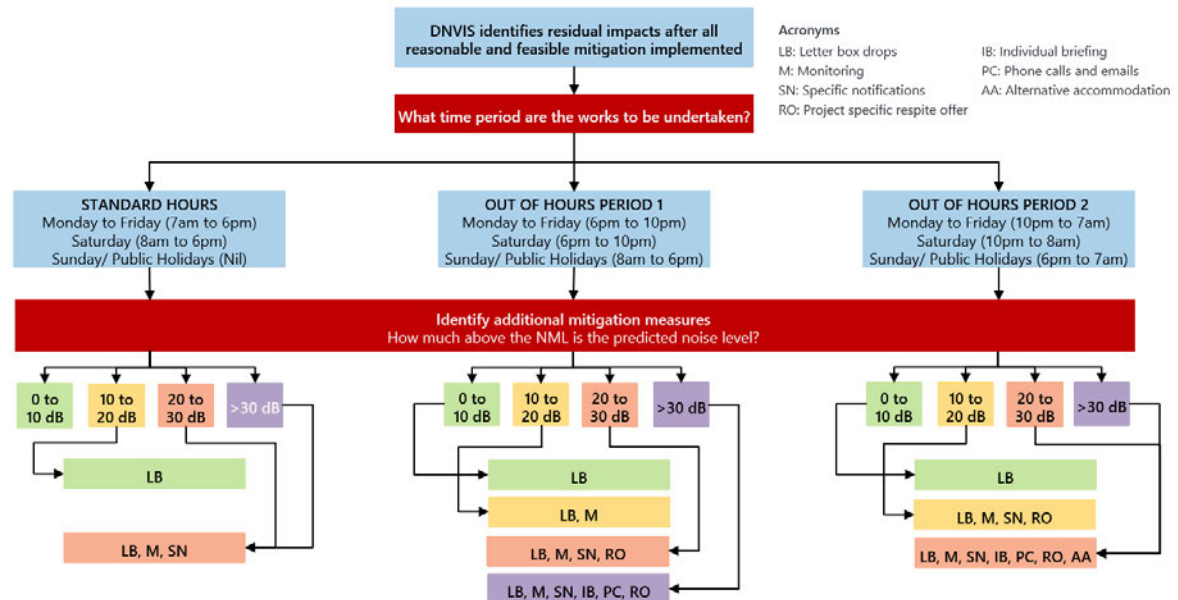


Figure 5-1 presents a summary of the additional management measures applicable for construction activities where, after application of all reasonable and feasible mitigation options, construction noise levels are still above the NMLs.

Prior to the commencement of low impact works, receivers identified in APPENDIX D.3 will be notified to advise that noise from the works may at times be audible. All potentially impacted receivers will be kept informed of the nature of works to be carried out, the expected noise levels and duration, as well as be given appropriate enquiries and complaints contact details (see Section 5.3.7).

### 5.3.5 Managing site specific activities and cumulative noise impacts (Gateway)

This DNVIS has established the overall impacts associated with the proposed works. A 3D construction noise and vibration management tool (Gateway, [www.gateway.com.au](http://www.gateway.com.au)) is being developed specifically for the ETP Works to allow specific work areas and activities to be assessed as construction works progress. It also allows cumulative noise impact from other aspects of the Project or, where relevant noise from other construction projects, to be assessed and managed in accordance with relevant Indicative condition.

Gateway will be used regularly to plan, assess and manage works progressively.

Gateway incorporates ground elevation contours, building heights, the built environment and atmospheric conditions to predict construction noise in accordance with the International Standard ISO 9613-2:1996 implementing quality standard ISO 17534-1:2015. All sensitive receivers identified by the land use survey are integrated into the Gateway tool.

### 5.3.6 Attended noise monitoring

Attended noise monitoring is to be undertaken to verify that noise levels resulting from construction works are in accordance with the levels predicted in this report, subject to obtaining the property owner/occupier's consent to access the property (where required). Noise monitoring will be completed in publicly accessible areas on or near the nominated receivers, typically at ground floor level. Where, following community consultation, specific sensitive receivers are identified for additional monitoring, access to the property will be sought through the Stakeholder and Community Relations team.

**Table 5.6: Nominated verification monitoring locations**

Type of monitoring	NCA	Nominated receiver address
Attended	NCA01	3 HORNSEY STREET ROZELLE
Attended	NCA02A	31 MANSFIELD STREET ROZELLE 2039
Attended	NCA02B	2 RUMSAY STREET ROZELLE 2039
Attended	NCA04	206 HARRIS STREET PYRMONT
Attended	NCA04	125 PYRMONT STREET PYRMONT
Attended	NCA04	63 EDWARD STREET PYRMONT
Attended	NCA05	1-9 PYRMONT BRIDGE ROAD PYRMONT
Attended	OSR_HTL	2 HUNTER STREET SYDNEY
Attended	OSR_HTL	15-17 HUNTER STREET SYDNEY
Attended	OSR_HTL	30 HUNTER STREET SYDNEY

APPENDIX D.3 identifies the activities where monitoring should be carried out for each NCA.

Noise monitoring should follow the Noise and Vibration Monitoring procedures included in the Preliminary CEMP. Note that monitoring at all properties may be undertaken from the property boundary to limit any inconvenience to property owners. Monitoring should be undertaken at a minimum of two of the most affected locations nominated in Table 5.6.

### 5.3.7 Complaints handling

Noise complaints received and responded to will be managed in accordance with the JCG Community Communication Strategy prepared under Condition D52 and the Overarching Community Communications Strategy.

Sydney Metro operate a 24-hour construction complaints line. Enquiries/ complaints may also be received through the project email mailbox ([sydneymetrowest@transport.nsw.gov.au](mailto:sydneymetrowest@transport.nsw.gov.au)) or through the complaints hotline (1800 612 173).



## 6 Construction vibration impacts

### 6.1 Vibration assessment methodology

#### 6.1.1 Vibration intensive activities

From the plant and equipment listed in APPENDIX C, the site establishment activities with dominant vibration generating plant and equipment include:

**Table 6.1: Vibration intensive activities/ works under this DNVIS**

Activity	Aspect	Vibration intensive plant?
The Bays	Use of existing offices, amenities for start-up	No
	Secure site	No
	Extension of High voltage construction power supply and water supply from existing CTP substation	No
	Establish pedestrian bridge over site access road	No
	Installation of environmental controls/ERSED	No
Pymont West	Utility works, including: - establishment of temporary construction services, - investigation and protection of existing assets, and - decommissioning of redundant assets	Yes
	Initial demolition works including: - Hazmat investigation and structural investigation within existing buildings to be demolished - Secure site including establishment of hoardings - Create truck access to facilitate soft strip - Demolition soft strip	Yes
	Five archaeological test trenches and if triggered salvage excavations	Yes
Pymont East	Utility works, including: - establishment of temporary construction services, - investigation and protection of existing assets, and - decommissioning of redundant assets	Yes
	Tree trimming and removal on Pymont Bridge Road, Union Street, and Edward Street	No
	Initial demolition works including: - Hazmat investigation and structural investigation within existing buildings to be demolished - Secure site including establishment of hoardings - Create truck access to facilitate soft strip - Demolition soft strip	Yes
	Detailed site investigation to determine contamination potential	Yes
Hunter Street West	Archaeological investigations of DeMestre Place (if access dates allow)	Yes
	Utility works and temporary services investigation and installation at DeMestre Place	Yes



Vibration sensitive receiver	Minimum working distances for vibration intensive plant, m		
	Concrete saw	Jackhammer	Truck mounted drill rig
Screening criteria - non-heritage structures <sup>1,2</sup>	1	2	3
Screening criteria - heritage structures <sup>1,2</sup>	2	3	6
<b>Disturbance to building occupants<sup>3</sup></b>			
Critical areas <sup>4,7</sup>	15	25	30
Residences - Day	10	15	20
Residences - Night	10	20	20
Offices <sup>6,7</sup>	5	10	10
Workshops <sup>7</sup>	5	5	10

- Notes:
1. Initial screening test criteria reduced by 50% due to potential dynamic magnification in accordance with BS7385.
  2. In accordance with NVMP, a site inspection should determine whether a heritage structure is structurally unsound.
  3. Minimum working distances are conservative to account for the intrinsic uncertainty of this screening method. Jackhammers/ saws are likely to have minimum working distances smaller than indicated.
  4. Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring.
  5. Daytime is 7 am to 10 pm; Night-time is 10 pm to 7am.
  6. Examples include offices, schools, educational institutions, and place of worship.
  7. Applicable when in use.

## 6.2 Vibration assessment

The numbers of buildings which are likely to be vibration impacted are shown in Table 6.3. More detailed results are provided in APPENDIX E, which presents the vibration impact for nearby receivers over aerial photographs that also show the work areas and the land uses.

**Table 6.3: Number of buildings within minimum working distances for vibration impact**

Vibration sensitive receiver	Number of buildings within minimum working distances <sup>6</sup>		
	Concrete saw	Jackhammer	Truck mounted drill rig
<b>Structural damage to buildings</b>			
Reinforced or frame structures (Line 1) <sup>1</sup>	0	2	4
Screening criteria - non-heritage structures <sup>1,2</sup>	0	1	0
Screening criteria - heritage structures <sup>1,2</sup>	0	2	2
<b>Disturbance to building occupants</b>			
Critical areas <sup>2,5</sup>	0	5	3
Residences – Day <sup>3</sup>	0	22	13
Residences – Night <sup>4</sup>	-	-	-
Offices <sup>4,5</sup>	0	7	6
Workshops <sup>5</sup>	0	1	0

- Notes:
1. Site inspection should determine structural conditions of all potentially vibration affected buildings
  2. Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring.
  3. Daytime is 7 am to 10 pm; Night-time is 10 pm to 7am.
  4. Examples include offices, schools, educational institutions, and place of worship.
  5. Applicable when in use.
  6. Actual distances between vibration intensive work location and sensitive receiver or building/ structure should be confirmed prior to commencement of works

### 6.2.1 Structural damage

Buildings/ structures have been identified as within the conservative screening minimum working distance for vibration impact (see Table 6.3 for details). The risk of vibration impact on these items is dependent on the location of vibration intensive plant item relative to the identified structures. Site investigation will be undertaken to identify the actual location of the vibration intensive activities (i.e. jackhammering and drilling works) and confirm whether the identified structures will be within the minimum working distance.

Where plant is required to operate within minimum working distances, works will be paused and the construction methodology will be revised to ensure the vibration intensive plant only operates outside the minimum working distance. Alternatively, vibration monitoring is recommended to determine site specific minimum working distances to verify that vibration levels achieve compliance with the structural damage objectives as outlined in Section 6.3.4.

If the monitoring above identifies that vibration is likely to exceed the structural damage objectives the works will be completed as preliminary construction works under the PCEMP or as construction works under the CEMP.

### 6.2.2 Heritage structures

The following heritage structures are identified within the minimum working distance for the conservative screening limit for cosmetic damage for 'unsound' heritage structures:

- 196 George Street, Sydney, where jackhammering occurs within 3 metres of the structure during the utility works, and
- 65-67 Edward Street, where the drill rig is required to operate within 6 metres of the structure during the initial demolition: Hazmat investigation and structural investigation; and
- The Tank Stream, where the drill rig is required to operate within 6 metres of the structure during the initial demolition: Hazmat investigation and structural investigation.

Where this is confirmed on site as true (see Section 6.2.1 regarding site investigation and review of works), a building condition report should be undertaken on these buildings to assess whether they are 'structurally unsound'.

If the buildings are found to be structurally unsound, vibration monitoring and review of construction methodology should be undertaken as outlined in Section 6.2.1. Works near the heritage structures would be managed to ensure the vibration intensive activities (jackhammering and drilling works) will only occur outside the minimum working distances. This may require use of alternative construction methodologies such as concrete saws and hand tools to replace jack hammering.

### 6.2.3 Human annoyance

The assessing vibration guideline [7] notes that inside dwellings, adverse comments often arise when occupants can perceive (feel) vibration, particularly when the vibration arises from a source located

outside their home (or outside their control) and assume that the vibration has the potential to damage their building or contents. However, it is noted that vibration levels required to cause minor cosmetic damage are typically 10 x higher than levels that will cause disturbance to building occupants. Many building occupants assume that building damage is occurring when they feel vibration or observe rattling of loose objects, however the level of vibration at which people perceive vibration or at which loose objects may rattle is far lower than vibration levels that can cause damage to structures.

At properties near the worksite, it is possible that the nearest receivers will be able to feel vibration levels when vibration-generating equipment is being utilised. Properties where vibration levels may be above the vibration disturbance goals in Table 4.1 and there is a probability of adverse comment are shown in Table 6.3. It is important to note that human comfort levels are much lower than vibration levels likely to result in property damage and people therefore may be disturbed by vibration with no potential to result in property damage. More detailed results are presented in APPENDIX E.

As can be noted from Table 6.3, nearby sensitive properties are expected to experience vibration levels above the screening limit for human annoyance. The above assessment is based on vibration-generating equipment being operating constantly at the closest location to nearby receivers. When vibration-generating equipment operates further from the closest point, the predicted vibration levels will reduce along with the probability of adverse comment.

Attended vibration measurements are proposed to be carried out proactively and in response to vibration complaints. If measurement results indicate events above the vibration objectives for human annoyance, vibration control and management measures will be provided to reduce vibration impact (see Section 6.3).

After applying all feasible and reasonable vibration mitigation measures, if vibration monitoring still identifies that measured vibration levels are above the relevant vibration criteria for human annoyance, appropriate additional management measures should be considered (see Section 6.3.3).

## **6.3 Vibration mitigation measures**

### **6.3.1 Consultation with affected receivers**

JCG has commenced consultation with potentially affected stakeholders including Councils, business and residential receivers. The consultation is focussed on specific mitigation and management measures applicable to the works. These measures may include minimising works during night time hours that generate vibration; limiting night time works in individual locations to no more than two consecutive nights; scheduling works around sensitive periods where feasible and reasonable; offers of movie or dinner vouchers; alternative accommodation offers. Details of completed consultation is recorded in the Sydney Metro Stakeholder Management System, Consultation Manager. A summary of the consultation program is provided below:



- Consultation with relevant community members on low impact works, including local area and utility works, site establishment, and preliminary works, including tunnel excavation within the acoustic shed at Hunter Street East.
- Consultation with affected receivers identified in APPENDIX D to ensure additional mitigation measures are provided (if required, refer to Section 6.3.3).

Following community consultation, JCG will endeavour to provide between two weeks and one month's notice for any 24-hour tunnel excavation. JCG is committed to undertake noise and vibration monitoring proactively and in response to complaints.

It is noted that properties are identified as at risk of exceeding the screening criteria for cosmetic damage, therefore consultation is required to satisfy Condition D31. As noted in Section 6.2.2 a building condition report should be undertaken on this building to assess whether it is 'structurally unsound'.

### **6.3.2 Vibration control and management measures**

The following vibration management measures are provided to minimise vibration impact from construction activities to the nearest affected receivers and to meet the relevant human comfort vibration and structural damage limits.

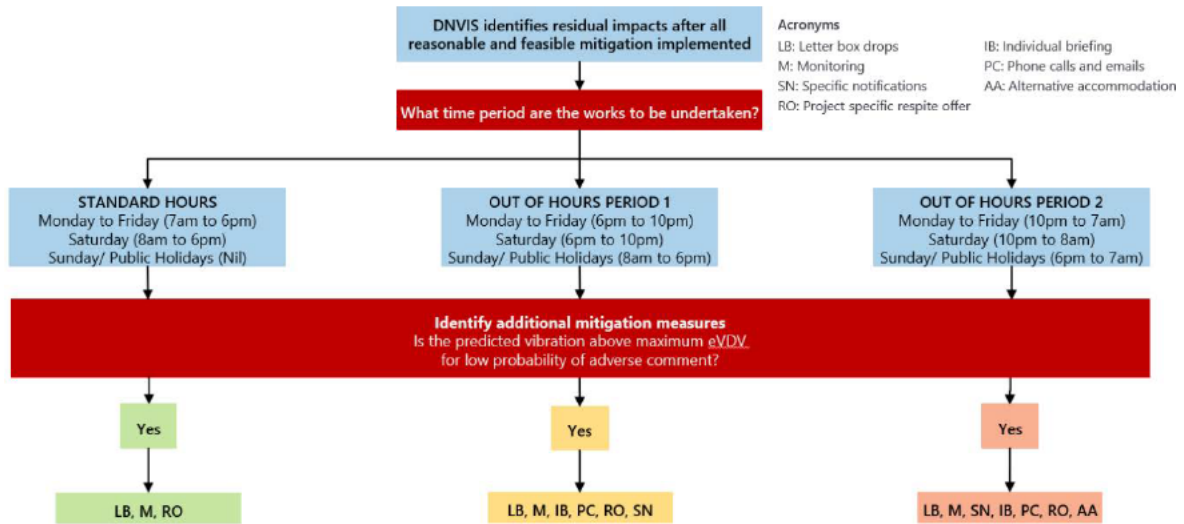
Table 6.4: Site vibration control measures

Control measure	Description of the control measure	Feasible mitigation test	Deemed feasible?	Reasonable mitigation test	Deemed reasonable?	Adopted?	Justification and commentary
<b>Construction Planning</b>							
Building condition surveys	Undertake building dilapidation surveys on all buildings located at least within the minimum working distances established for cosmetic damage prior to commencement of activities with the potential to cause property damage (see Section 6.1).	Yes	Yes	Deemed to be cost effective. Outweighs the identified social, economic and environmental effects.	Yes	Yes	Buildings identified within the MWD for cosmetic damage will undergo building condition survey, to reduce the risk of cosmetic damage.
Community consultation	Implement community consultation measures – inform community of construction activity & potential impacts – inform community that the level of vibration at which people perceive it, or at which loose objects may rattle, is far lower than the level at which minor cosmetic damage is expected to occur	Yes	Yes	Routine task for project team.	Yes	Yes	Updates will be distributed regularly for the duration of the project.
Site specific vibration monitoring	Where vibration intensive works are confirmed to be within the minimum working distances identified in Table 6.2, site specific vibration monitoring would be undertaken as outlined in Section 6.3.4.	Yes	Yes	Routine task for project team.	Yes	Yes	Site specific minimum working distances would be determined from on-site measurements and risk of impact would be confirmed.
Alternative construction methodology	Where plant is required to operate within minimum working distances, works will be paused and the construction methodology will be revised to a less vibration intensive method.	Yes	Yes	Routine task for project team.	Yes	Yes	Construction methodology will be revised to ensure the vibration intensive plant only operates outside the minimum working distance
Construction hours and scheduling	Where feasible and reasonable, construction would be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels would be scheduled during less sensitive time periods.	Yes	Yes	Sufficient vibration reduction could be achieved at enough receivers.	Yes	No	Vibration intensive works causing exceedance of the vibration objectives at sensitive receivers are not proposed as part of the low impact works.

### 6.3.3 Additional management measures

After applying all feasible and reasonable mitigation measures identified in Table 6.4, if vibration monitoring at representative locations still exceeds relevant vibration objectives for human annoyance, the appropriate additional management measures, based on the CNVS [1], presented in Figure 6-1, should be provided.

Figure 6-1: Additional vibration mitigation measures



### 6.3.4 Vibration monitoring

The assessment found that some buildings and structures nearest the work areas are within the recommended minimum working distances and therefore at risk of experiencing vibration levels above the limit for structural damage. The assessment is conservatively based on the plant item operating at the closest location within the work area to the building or structure. The buildings/ structures are identified in Table 6.5.

Table 6.5: Buildings/ structures to be reviewed for vibration monitoring

Worksite	Assessment reference	Plant item	Address	Vibration objectives	
				Reinforced/unreinforced structures	Heritage structures
Pymont East	UT-PE1	Jackhammer	65-67 EDWARD ST PYRMONT	-	✓
Hunter St West	SI-HW	Jackhammer	320 GEORGE ST, SYDNEY	✓	-
Hunter St West	UT-HW	Jackhammer	320 GEORGE ST, SYDNEY	✓	-
Hunter St West	UT-HW	Jackhammer	196 GEORGE ST, SYDNEY	-	✓
Hunter St West	DE-HW	Truck mounted Drill Rig	15-17 HUNTER ST SYDNEY	✓	-
			109 PITT ST, SYDNEY	✓	-
			196 GEORGE ST, SYDNEY	-	✓

Assessment reference	Plant item	Address	Vibration objectives	
			Reinforced/unreinforced structures	Heritage structures
		107 PITT ST, SYDNEY	✓	
		320 GEORGE ST, SYDNEY	✓	
		Tank Stream		✓

As noted in Section 6.2.1, a site inspection would be undertaken prior to the commencement of the works identified in Table 6.5 to confirm whether the plant item will operate within the recommended minimum working distance in Table 6.2. Where plant is confirmed as outside the recommended minimum working distance, the likelihood of vibration generated structural damage caused by the low impact works is low to negligible. Vibration monitoring is not required.

Attended vibration monitoring is to be undertaken to determine and verify site specific minimum working distances for cosmetic damage, where the plant item is confirmed to be operating within the minimum working distances identified in Table 6.2.

If the monitoring above identifies that vibration is likely to exceed the structural damage objectives, the works will be completed as preliminary construction works under the PCEMP or as construction works under the CEMP.

### 6.3.5 Complaints handling

Vibration complaints received and responded to will be managed in accordance with the CEMP, the JCG Community Communication Strategy prepared under Condition D52 and the Overarching Community Communications Strategy. Each complaint shall be investigated and where vibration levels are established as exceeding the set limits, appropriate amelioration measures shall be put in place to mitigate future occurrences. Management measures may include modification of construction methods such as using smaller equipment and establishment of minimum working distances as mentioned above.

Sydney Metro operate a 24-hour construction complaints line. Enquiries/ complaints may also be received through the project email mailbox ([sydneywest@transport.nsw.gov.au](mailto:sydneywest@transport.nsw.gov.au)) or through the complaints hotline (1800 612 173).

## 7 Impact classification

The CNVS requires that on completion of a DNVIS, the subjective classification of the noise (and vibration) impact is to be evaluated and documented as:

- Low Impact
- Moderate Impact
- High Impact.

The classifications are to be determined on a case-by-case basis with consideration of the items addressed in the table below and the requirements of SSI 10051 Condition E41 (b) which defines Low impact.

**Table 7.1: Impact classification for the low impact works – Project-wide**

No.	Impact item description	Analysis	Classification
1	The location of the works in relation to NSRs with consideration of noise attenuation features such as noise barriers including topographical features (earth-mounds), buildings, dividing fences etc (distance of works from sensitive receiver(s)).	Majority of NSRs close to the Hunter Street Station worksites are commercial receivers. Majority of the NSRs close to the Pyrmont Station worksites are mixed use residential and commercial receivers. Majority of NSRs adjacent to The Bays station worksite are commercial and industrial receivers and residential receivers nearby.	Moderate
2	The type and sensitivity of the NSRs: - Low Impact: e.g. Commercial buildings/ Scattered Residential (low density) - Moderate Impact: e.g. Standard residential (typical density) - High Impact: e.g. Residential home for the elderly/high density unit blocks/persistent complainers/ residents deemed to have "construction noise fatigue".	Commercial receivers and four hotels near the Hunter Street Station worksites. Two recording studios, one hotel and residential receivers located close to the Pyrmont Station worksites. Industrial and commercial receivers and a place of worship located close to The Bays station worksite.	Moderate
3	Land use zoning and planning amenity objectives for the area.	Commercial land use near Hunter Street Station worksite. Commercial and mixed land use near Pyrmont Station worksite. Commercial and industrial land use near The Bays Station worksite.	Low to moderate
4	Construction and architectural design of impacted building, particularly the presence of any existing noise mitigation including that provided under a Noise Abatement Program or required by the ISEPP, Council DCP or other planning instrument.	Multi-storey commercial and hotel receivers with sufficient facade attenuation at Hunter Street Station worksites. At the Pyrmont Station worksites there is a mix of commercial, hotel and multi-storey residential and mixed-use residential receivers with additional facade attenuation. Single occupancy residential or older multi-storey residential are assumed to be standard construction with no extra noise mitigation. Large warehouses for industrial and commercial receivers adjacent to The Bays Station worksite. One to two storey residential buildings are assumed to be standard construction with no extra noise mitigation.	Low to high
5	Existing ambient levels.	Moderate to high existing ambient noise levels during daytime ( $L_{Aeq(15min)}$ 71 dB(A)); evening ( $L_{Aeq(15min)}$ 61 dB(A)); and night ( $L_{Aeq(15min)}$ 57 dB(A)) at Hunter Street. Moderate existing ambient noise levels during daytime ( $L_{Aeq(15min)}$ 56 dB(A)); evening ( $L_{Aeq(15min)}$ 50 dB(A)); and night ( $L_{Aeq(15min)}$ 47 dB(A)) at Pyrmont. Moderate existing ambient noise levels during daytime ( $L_{Aeq(15min)}$ 54 dB(A)); evening ( $L_{Aeq(15min)}$ 53 dB(A)); and night ( $L_{Aeq(15min)}$ 48 dB(A)) at The Bays.	Low



No.	Impact item description	Analysis	Classification
6	The extent of noise exceedance above Noise Management Level.	Mitigation measures including temporary noise barriers will be implemented to reduce noise from the works, where reasonable and feasible. Impacts at The Bays low as commercial and industrial receivers are likely to be unoccupied. Impacts at Pyrmont moderate due to proximity of residential receivers to the works, noting that the works are only during standard construction hours. OOHW impacts at Hunter Street Station would be low as commercial receivers are likely to be unoccupied and hotel receivers typically have adequate façade attenuation. No residential receiver is noise affected by low impact works outside standard construction hours. Note that the level of impact would not be continuous as the location of construction activity will vary as the works progress.	Moderate (standard hours) Low (outside standard hours)
7	The likelihood for potential sleep disturbance (as described in the NPfI).	No residential receivers are likely to experience construction noise levels above the sleep disturbance criteria at The Bays, Pyrmont, and Hunter Street during typical impact works.	Low
8	The type of and intensity of noise emitted from works (i.e. tonal or impulsive): - Lower Impact: No high noise and/or vibration intensive activities - Moderate Impact: Short/intermittent high noise and/or vibration intensive activities - High Impact: Prolonged high noise and/or vibration intensive activities.	The proposed works consist of 'typical impact', with limited high noise and/or vibration intensive activities such as concrete sawing or jackhammering during the day. All reasonable and feasible measures will be applied to minimise noise and vibration impacts. High noise activities will be completed during standard construction hours and managed as per Section 5.3.1. All works are typically short term, as noted in .	Low
9	The duration of any OOHW required.	The assessed OOHW will be undertaken for up to 6 weeks	Low
10	The time frames for any OOHW: - Lower Impact: 6.00 pm till 10.00 pm weekdays 1.00 pm till 10.00pm Saturdays 8.00 am till 6.00 pm Sundays or Public Holidays. - Moderate Impact: 10.00 pm to 7.00 am Weekday Nights 10.00 pm to 8.00 am Saturdays. - High Impact: 6.00 pm to 7.00 am Sundays and Public Holidays.	Some assessed low impact works will be conducted OOHW where the requirements of Condition D23b) are satisfied.	Low
11	As a result of noise classification and/or the noise level exceedances at sensitive receivers provided by the DNVIS reports, appropriate reasonable and feasible noise mitigation is to be adopted and implemented. For sites where works are predicted to significantly exceed noise goals and impact on receivers for a significant period of time, additional reasonable and feasible noise mitigation measures such as those outlined in Section 5 of the CNVS would be considered if practical to reduce the noise levels and impact on sensitive receivers.	Mitigation measures outlined in Section 5.3 and 6.3 will be implemented to manage and reduce impacts from low impact works.	Low

Review of the overall noise impact of Project-wide low impact works is considered **low**. No residential or other sensitive receivers are expected to be airborne construction noise affected during standard construction hours and outside standard construction hours. Minor impacts from ground-borne noise have been predicted at the closest commercial properties to the tunnel excavation. The Mitigation and management measures will be implemented to reduce noise levels with the aim of achieving the NMLs.

Properties at risk of vibration impact have been identified through the conservative screening process set out in the CNVS [1]. Vibration significant works will be managed in accordance with Section 6.3. The overall vibration impact of the Project-wide low impact works is considered **low**.

## 8 Conclusion

In conclusion, construction works associated with the Project-wide low impact works have been described in this DNVIS to identify potential environmental risks associated with construction noise and vibration. Construction noise and vibration objectives have been established consistent with the indicative condition allocations for the Project and the EIS.

### **Construction airborne noise**

The predicted noise levels indicate nearby residential receivers are expected to experience construction noise levels above the corresponding NMLs during standard construction hours and below the corresponding NMLs outside standard construction hours during typical impact works. Noise mitigation and management measures, including noise monitoring requirements, have been presented in Section 5.3 to aid in providing additional noise reduction benefits where noise levels are above the NMLs.

### **Construction ground-borne noise**

The Project-wide low impact works will be surface construction works. Due to the nature of surface works, airborne noise is expected to be much higher than ground-borne noise levels at the nearest sensitive receivers. On this basis, the potential impact of ground-borne noise from the proposed construction activities is expected to be negligible and the risk of annoyance due to ground-borne noise is considered low.

### **Construction vibration**

The risk of structural damage from the Project-wide low impact works have been assessed as moderate, as several structures fall within the minimum working distance for cosmetic damage. Actual location of works relative to the identified structures should be confirmed and where buildings are confirmed as within the minimum working distance, further review of the works would be undertaken as outlined in Section 6.3.1.

Where the two heritage buildings, 196 George Street and 65-67 Edward Street are confirmed as within minimum working distances, a building condition report is required to assess whether the buildings are 'structurally unsound', as outlined in Section 6.2. Works near the heritage structures would be managed to ensure the vibration intensive activities (jackhammering and drilling works) will occur outside the minimum working distances. This may require use of alternative construction methodologies such as concrete saws and hand tools to replace jack hammering.

Sensitive receivers located close to vibration significant low impact works (namely drilling and jack hammering) may experience vibration levels above the screening limit for human annoyance.

Vibration mitigation and management measures, including vibration monitoring requirements, have been presented in Section 6.3 to reduce the risk of damage to buildings near the worksites and to manage human annoyance from construction vibration.

**Construction traffic**

The predicted noise impacts are assessed as low and generally within the minimum requirements in the CNVS.

**Impact classification**

The overall noise and vibration impact of the Project-wide low impact works is considered **low**.

## References

- [1] Sydney Metro Construction Noise and Vibration Standard Version 4.3 (SM-20-00098866) – 4 November 2020
- [2] Transport for NSW Construction Noise and Vibration Strategy (ref: ST-157/4.1) April 2019
- [3] Sydney Metro West Out-of-hours Work Protocol (in progress)
- [4] SLR Consulting Australia Pty Ltd 2021 Sydney Metro West - Major civil construction between The Bays and Sydney CBD - Technical Paper 2: Noise and Vibration October 2020
- [5] Sydney Metro 2022 Sydney Metro West – Submissions Report - Major civil construction between The Bays and Sydney CBD
- [6] Department of Environment and Climate Change 2009 NSW Interim Construction Noise Guideline (ICNG)
- [7] Environment Protection Authority 2017 NSW Noise Policy for Industry (NPfI)
- [8] Department of Environment, Climate Change and Water 2011 NSW Road Noise Policy (RNP)
- [9] Department of Environment Conservation NSW 2006 Assessing Vibration; a technical guideline
- [10] Environment Protection Authority 2000 NSW Industrial Noise Policy (INP)
- [11] British Standard BS 6472-2008, Evaluation of human exposure to vibration in buildings (1-80Hz)
- [12] Australian Standard AS 2187.2-2006 Explosives - Storage and Use - Use of Explosives
- [13] British Standard BS 7385 Part2-1993, Evaluation and measurements for vibration in buildings Part 2
- [14] German Standard DIN 4150-3: 2016-12, Structural vibration - Effects of vibration on structures, December 2016
- [15] ASHRAE Applications Handbook (SI) 2003, Chapter 47 Sound and Vibration Control, pp47.39-47.40
- [16] Australian Standard 2834-1995 Computer Accommodation, Chapter 2.9 Vibration, p16
- [17] Australian Standard AS/NZS 2107:2000 *Acoustics - Recommended design sound levels and reverberation times for building interiors*



## APPENDIX A Glossary of terminology

The following is a brief description of the technical terms used to describe noise to assist in understanding the technical issues presented.

Adverse weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).
Ambient noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.
Assessment period	The period in a day over which assessments are made.
Assessment point	A point at which noise measurements are taken or estimated. A point at which noise measurements are taken or estimated.
Attenuation	The reduction in the level of sound or vibration.
AVTG	Assessing Vibration – a technical guideline (DEC 2006)
Background noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L90 noise level (see below).
CNVS	Construction Noise and Vibration Standard (Sydney Metro 2021)
Indicative condition	Condition of Approval
Decibel [dB]	The units that sound is measured in. The following are examples of the decibel readings of every day sounds: 0dB The faintest sound we can hear 30dB A quiet library or in a quiet location in the country 45dB Typical office space. Ambience in the city at night 60dB CBD mall at lunch time 70dB The sound of a car passing on the street 80dB Loud music played at home 90dB The sound of a truck passing on the street 100dB The sound of a rock band 115dB Limit of sound permitted in industry 120dB Deafening
dB(A)	A-weighted decibels. The A-weighting noise filter simulates the response of the human ear at relatively low levels, where the ear is not as effective in hearing low frequency sounds as it is in hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter.
dB(C)	C-weighted decibels. The C-weighting noise filter simulates the response of the human ear at relatively high levels, where the human ear is nearly equally effective at hearing from mid-low frequency (63Hz) to mid-high frequency (4kHz), but is less effective outside these frequencies.
DEC	Department of Environment and Conservation (now EPA)
DECC	Department of Environment and Climate Change (now EPA)
DECCW	Department of Environment, Climate Change and Water (now EPA)
DNVIS	Detailed Noise and Vibration Impact Statement

DP&E	NSW Department of Planning and Environment
ECRTN	Environmental Criteria for Road Traffic Noise (EPA 1999)
EIS	Environmental Impacts Statement
EPA	NSW Environment Protection Authority
Feasible and reasonable	Consideration of best practice taking into account the benefit of proposed measures and their technological and associated operational application in the NSW and Australian context. Feasible relates to engineering considerations and what is practical to build. Reasonable relates to the application of judgement in arriving at a decision, taking into account mitigation benefits and cost of mitigation versus benefits provided, community views and nature and extent of potential improvements.
Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.
GIS	Geographic Information System
ICNG	Interim Construction Noise Guideline (DECC, 2009)
INP	NSW Industrial Noise Policy (EPA, 2000)
Impulsive noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
Intermittent noise	The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.
L <sub>Max</sub>	The maximum sound pressure level measured over a given period.
L <sub>Min</sub>	The minimum sound pressure level measured over a given period.
L <sub>1</sub>	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L <sub>10</sub>	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L <sub>90</sub>	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
L <sub>eq</sub>	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.
MWD	Minimum Working Distance
NCA	Noise Catchment Areas
NML	Noise management levels
NSR	Noise Sensitive Receivers
OEH	Office of Environment and Heritage
OOHW	Out-of-Hours Works – work completed outside of standard construction hours
PPV	Peak Particle Velocity
RBL	The Rating Background Level for each period is the medium value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period (day, evening and night)
Reflection	Sound wave changed in direction of propagation due to a solid object obscuring its path.
SEL	Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain L <sub>eq</sub> sound levels over any period of time and can be used for predicting noise at various locations.
RNP	NSW Road Noise Policy (DECCW 2011)

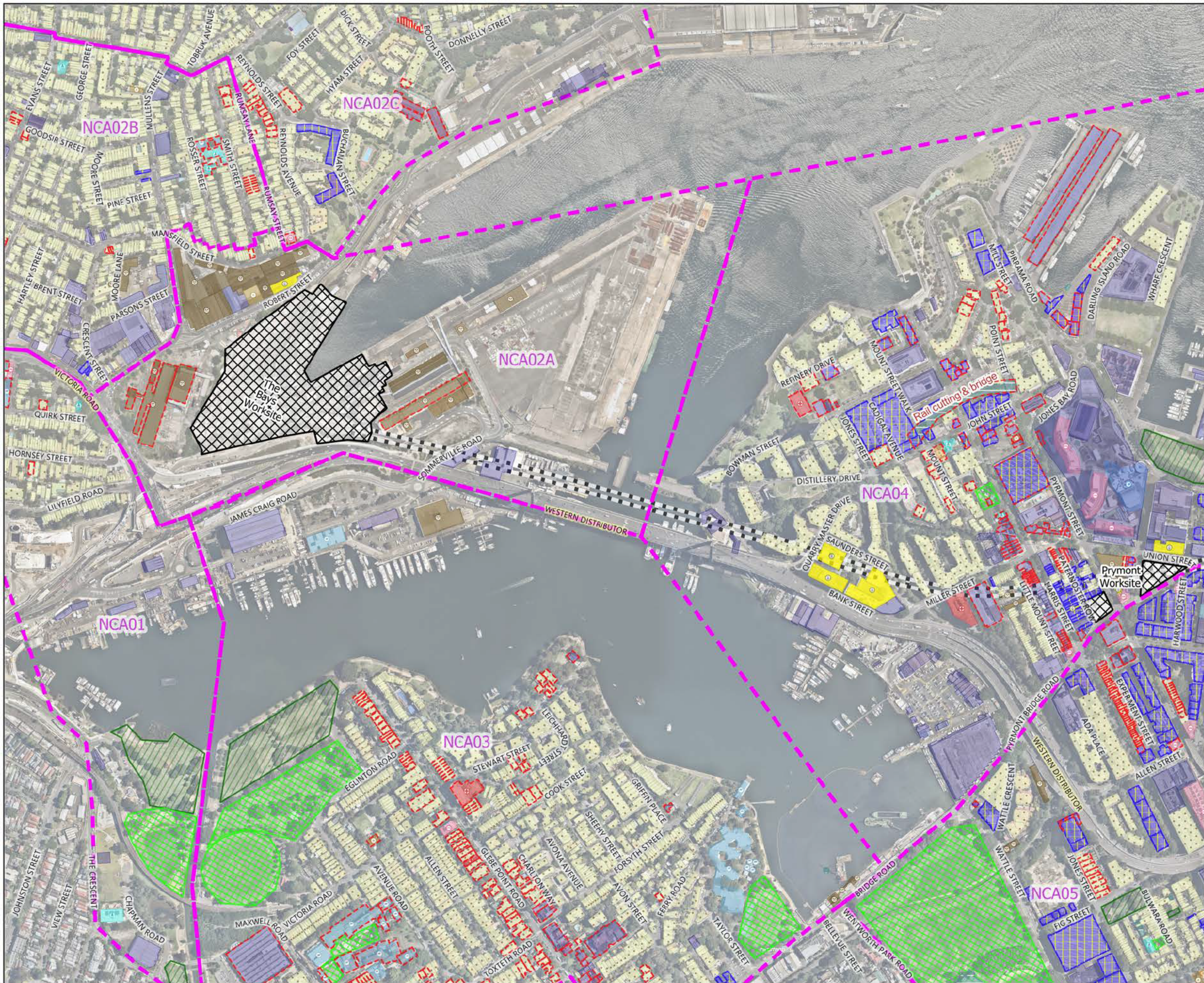
Sound	A fluctuation of air pressure which is propagated as a wave through air.
Sound absorption	The ability of a material to absorb sound energy through its conversion into thermal energy.
Sound level meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound pressure level (SPL)	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone.
Sound power level (SWP)	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.
Standard construction hours	Hours during which construction work is permitted by the Indicative condition.
Tonal noise	Containing a prominent frequency and characterised by a definite pitch.

## **APPENDIX B**      Sensitive receivers and noise management levels



## **B.1 NCAs and sensitive receiver identification**





### LEGEND

**Noise Sensitive Receiver**

- Residential
- Mixed use
- Commercial
- Industrial
- Hotel/Motel/Hostel
- Medical facility
- Place of Worship
- Community centre
- Recording studio
- Library/Museum
- Childcare
- Educational
- Theatre/Auditorium
- Cinema
- Laboratory
- Flight simulator
- Animal Enclosure
- Recreational - Passive
- Recreational - Active
- Other
- Heritage

**Project NCA's**

**Project Worksites**

**Tunnel Alignment**

NCA	NML DS	NML DO	NML E	NML N
NCA01	61	56	56	50
NCA02A	53	48	48	40
NCA02B	52	47	47	43
NCA02C	59	54	54	51
NCA03	58	53	52	44
NCA04	60	55	52	50
NCA05	62	57	54	51

NCA: Noise Catchment Area  
 NML: Noise Management Level  
 D(S): standard construction hours from 7 am to 6 pm Monday to Friday and from 8 am to 6 pm Saturday  
 D(O): out-of-hours day period from 8 am to 6 pm Sunday and Public holidays - OOHW P1  
 E: evening period from 6 pm to 10 pm Monday to Sunday - OOHW P1  
 N: night-time period from 10 pm to 7 am Monday to Friday, from 10 pm am to 8 am Saturday, Sunday and Public holidays - OOHW P2



**SYDNEY METRO WEST – EASTERN TUNNELLING PACKAGE**

REV	BY	DATE	DESCRIPTION	APPROVER
r4	SS	19/01/23	Updated Landuse	TG
r3	SS	12/12/22	Labeling specific Heritage	TG
r2	SS	23/11/22	OSR Corrections	TG
r1	SS	16/11/22	Update Landuse	TG
r0	SS	23/06/22	Prepare figures	TG

A3 Original Co-ordinate System: MGA Zone 56

0 200 400 600 m

1:7,000 At A3

FULL SIZE A3. REDUCED TO A4

NOTE: Do not scale from this drawing.

CLIENT

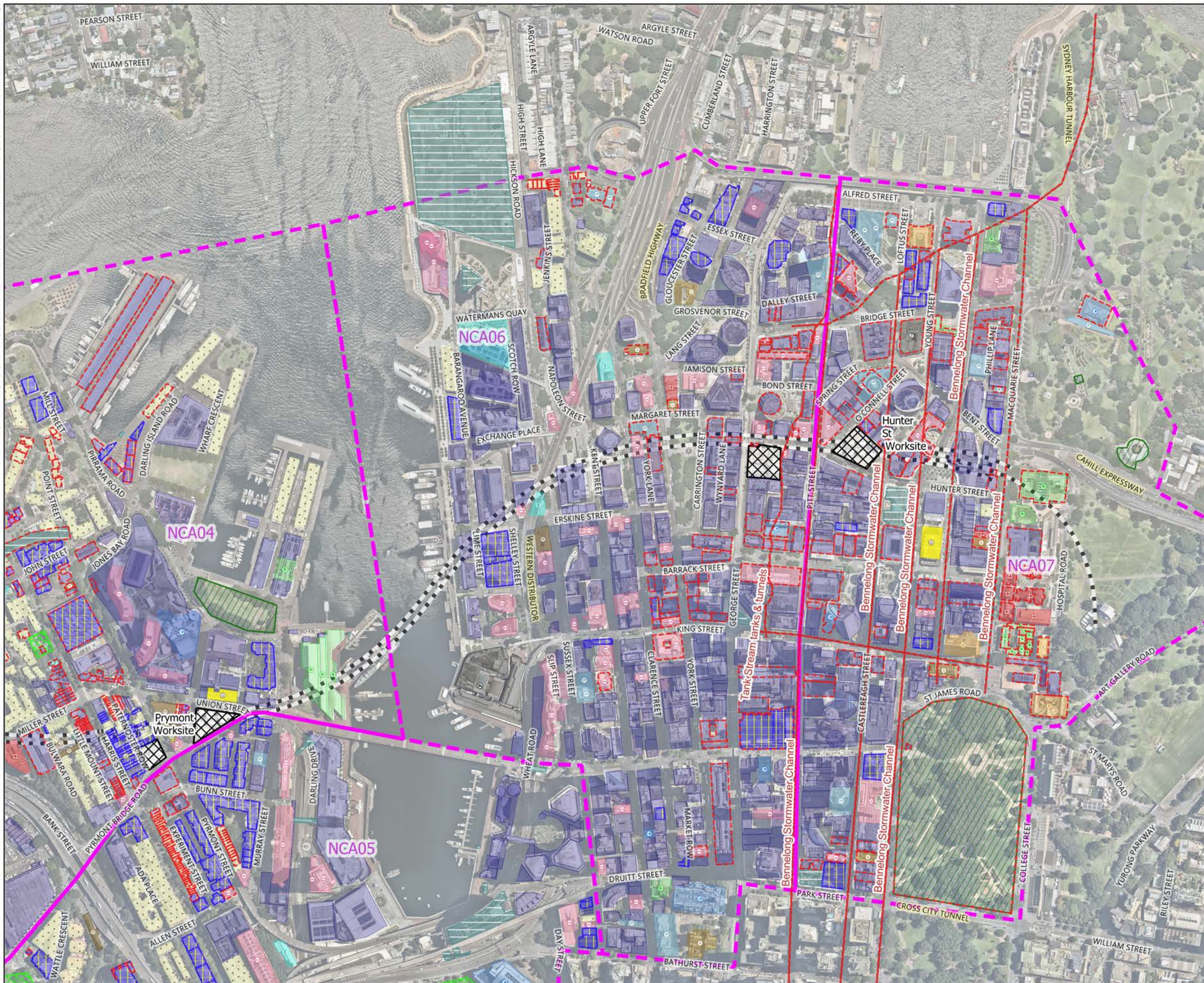
**JOHN HOLLAND** **CPB** CONTRACTORS **Ghella**

ACOUSTIC CONSULTANT

**RENZO TONIN & ASSOCIATES**  
*inspired to achieve*

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### LEGEND

**Noise Sensitive Receiver**

- Residential
- Mixed use
- Commercial
- Industrial
- Hotel/Motel/Hostel
- Medical facility
- Place of Worship
- Community centre
- Recording studio
- Library/Museum
- Childcare
- Educational
- Theatre/Auditorium
- Cinema
- Laboratory
- Flight simulator
- Animal Enclosure
- Recreational - Passive
- Recreational - Active
- Other
- Heritage

Project NCAs  
 Project Worksites  
 Tunnel Alignment

NCA	NML DS	NML DO	NML E	NML N
NCA04	60	55	52	50
NCA05	62	57	54	51
NCA06	71	66	61	57
NCA07	71	66	61	57

NCA: Noise Catchment Area  
 NML: Noise Management Level  
 D(S): standard construction hours from 7 am to 6 pm Monday to Friday and from 8 am to 6 pm Saturday  
 D(O): out-of-hours day period from 8 am to 6 pm Sunday and Public holidays - OOHW P1  
 E: evening period from 6 pm to 10 pm Monday to Sunday - OOHW P1  
 N: night-time period from 10 pm to 7 am Monday to Friday, from 10 pm am to 8 am Saturday, Sunday and Public holidays - OOHW P2



**SYDNEY METRO WEST – EASTERN TUNNELLING PACKAGE**

Landuse, Worksites and NCAs



REV	BY	DATE	DESCRIPTION	APPROVER
r4	SS	19/01/23	Updated Landuse	TG
r3	SS	12/12/22	Labeling specific Heritage	TG
r2	SS	23/11/22	OSR Corrections	TG
r1	SS	16/11/22	Update Landuse	TG
r0	SS	23/06/22	Prepare figures	TG

A3 Original  
 Co-ordinate System: MGA Zone 56

FULL SIZE A3, REDUCED TO A4  
 NOTE: Do not scale from this drawing.

CLIENT

**JOHN HOLLAND** **CPB** **Ghella**  
 CONTRACTORS

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## **B.2 NCAs and noise management levels**



**Table B1: Noise Sensitive Receivers and Construction Noise Management Levels (airborne noise)**

**LOW IMPACT WORKS - PROJECT WIDE**

NCA	Receiver Type	Reference RBL	Existing Noise Levels, dB(A)						Airborne NMLs based on ICNG (external)					Sleep Dist. L <sub>Amax</sub>		Comments
			RBL Day	RBL Evening	RBL Night	LAeq_D	LAeq_E	LAeq_N	NMLD(S)	NMLD(O)	NMLE	NMLN	NMLMS	L <sub>Aeq</sub> (15min)	L <sub>Afmax</sub>	
<b>Residential receivers</b>																
NCA01	Predominantly Residential	B.02	51	51	45	57	57	54	61	56	56	50	53	50	60	Nearest worksite
NCA02A	Predominantly Residential	B.01	43	43	35	56	54	47	53	48	48	40	44	40	52	The Bays.
NCA02B	Predominantly Residential	B.40	42	44	38	54	53	48	52	47	47	43	45	43	53	The Bays.
NCA02C	Predominantly Residential	B.35	49	49	46	54	51	49	59	54	54	51	53	51	61	The Bays.
NCA03	Predominantly Residential	B.03	48	47	39	59	58	51	58	53	52	44	49	44	54	The Bays.
NCA04	Predominantly Residential	B.04	50	47	45	56	50	47	60	55	52	50	53	50	60	Pyrmont
NCA05	Predominantly Residential	B.05	52	49	46	61	59	56	62	57	54	51	54	51	61	Pyrmont
NCA06	Predominantly Residential	B.06	61	56	52	66	62	63	71	66	61	57	62	57	67	Hunter Street
NCA07	Predominantly Residential	B.06	61	56	52	66	62	63	71	66	61	57	62	57	67	Hunter Street
<b>ICNG 'Other sensitive' receivers (NML applicable when in use)</b>																
Classrooms at schools and other educational institutions									65	65	65	65	65	-	-	Source: ICNG, assuming a conservative façade loss of 20 dB(A) in CBD
Hospital wards and operating theatres									65	65	65	65	65	-	-	Source: ICNG, assuming a conservative façade loss of 20 dB(A)
Places of worship									55	55	55	55	55	-	-	Source: ICNG, assuming a conservative façade loss of 10 dB(A)
Passive recreation areas (e.g. area used for reading, meditation)									60	60	60	60	60	-	-	Source: ICNG
Active recreation areas (e.g. sports fields)									65	65	65	65	65	-	-	Source: ICNG
Commercial premises (including offices and retail outlets)									70	70	70	70	70	-	-	Source: ICNG
Industrial premises									75	75	75	75	75	-	-	Source: ICNG
<b>Non-ICNG 'Other sensitive' receivers (GBNML applicable when in use)</b>																
Hotel - daytime and evening									70	70	70	70	70	-	-	Source: CNVS Section 2.2.1 & AS2107 'maximum', assuming 20 dB(A) facade loss
Hotel - night-time									60	60	60	60	60	-	-	Source: CNVS Section 2.2.1 & AS2107 'maximum', assuming 20 dB(A) facade loss for standard hotels; 30 dB(A) facade loss for luxury hotels (e.g. Radisson)
Café/ Bar/ Restaurant									60	60	60	60	60	-	-	Source: CNVS Section 2.2.1 & AS2107 'maximum', assuming 10 dB(A) facade loss
Childcare centre (indoor sleeping areas)									55	55	55	55	55	-	-	Source: CNVS Section 2.2.1, assuming a conservative façade loss of 10 dB(A)
Childcare centre (play areas)									65	65	65	65	65	-	-	Source: CNVS Section 2.2.1
Public Building									60	60	60	60	60	-	-	Source: CNVS Section 2.2.1 & AS2107 'maximum', assuming 10 dB(A) facade loss
Studio building (music recording studio)									45	45	45	45	45	-	-	Source: CNVS Section 2.2.1 & AS2107 'maximum', assuming 20 dB(A) facade loss
Studio building (film or television studio)									50	50	50	50	50	-	-	Source: AS2107 'maximum', assuming 20 dB(A) facade loss
Theatre/ Auditorium									50	50	50	50	50	-	-	Source: CNVS Section 2.2.1 & AS2107 'maximum', assuming 20 dB(A) facade loss
Notes:	D(S): standard construction hours from 7 am to 6 pm Monday to Friday and from 8 am to 6 pm Saturday								N: night-time period from 10 pm to 7 am Monday to Friday, from 10 pm to 8 am Saturday, Sunday and Public holidays - OOHWP2							
	D(O): out-of-hours day period from 8 am to 6 pm Sunday and Public holidays - OOHWP1								MS: morning shoulder period from 5 am to 7 am Monday to Friday, from 6 am to 8 am Saturday, Sunday and Public holidays - OOHWP1							
	E: evening period from 6 pm to 10 pm Monday to Sunday - OOHWP1															

**Table B2: Noise Sensitive Receivers and Construction Noise Management Levels (groundborne noise)**

NCA	Receiver Type	Groundborne NMLs based on ICNG (internal)					Comments									
		NMLDS	NMLDO	NMLE	NMLN	MS										
<b>Residential receivers</b>																
All	All residential receivers	(50)*	(50)*	40	35		Source: ICNG									
<i>*Human comfort vibration limit applies during the day. 50 dB(A) used as screening guideline.</i>																
<b>ICNG 'Other sensitive' receivers (NML applicable when in use)</b>																
Classrooms at schools and other educational institutions							45	45	45	45	45	-	-	Source: ICNG		
Hospital wards and operating theatres							45	45	45	45	45	-	-	Source: ICNG		
Places of worship							45	45	45	45	45	-	-	Source: ICNG		
Commercial premises (including offices and retail outlets)							50	50	50	50	50	-	-	Source: ICNG, assuming a conservative façade loss of 20 dB(A)		
Industrial premises							55	55	55	55	55	-	-	Source: ICNG, assuming a conservative façade loss of 20 dB(A)		
<b>Non-ICNG 'Other sensitive' receivers (GBNML applicable when in use)</b>																
Hotel - daytime and evening							50	50	50	50	50	-	-	Source: CNVS Section 2.2.1 & AS2107 'maximum'		
Hotel - night-time							40	40	40	40	40	-	-	Source: CNVS Section 2.2.1 & AS2107 'maximum'		
Café/ Bar/ Restaurant							50	50	50	50	50	-	-	Source: CNVS Section 2.2.1 & AS2107 'maximum'		
Childcare centre (indoor sleeping areas)							45	45	45	45	45	-	-	Source: CNVS Section 2.2.1 & AS2107 'maximum'		
Childcare centre (play areas)							55	55	55	55	55	-	-	Source: CNVS Section 2.2.1, assuming a conservative façade loss of 10 dB(A)		
Public Building							50	50	50	50	50	-	-	Source: CNVS Section 2.2.1 & AS2107 'maximum'		
Studio building (music recording studio)							25	25	25	25	25	-	-	Source: CNVS Section 2.2.1 & AS2107 'maximum'		
Studio building (film or television studio)							30	30	30	30	30	-	-	Source: CNVS Section 2.2.1 & AS2107 'maximum'		
Theatre/ Auditorium							30	30	30	30	30	-	-	Source: CNVS Section 2.2.1 & AS2107 'maximum'		
Notes:	D(S): standard construction hours from 7 am to 6 pm Monday to Friday and from 8 am to 6 pm Saturday								N: night period from 22:00 to 07:00 Monday to Friday, and from 22:00 to 08:00 Saturday, Sunday and Public holidays - OOHWP2							
	D(O): out-of-hours day period from 8 am to 6 pm Sunday and Public holidays - OOHWP1								MS: Morning shoulder from 05:00 to 07:00 Monday to Friday, and from 06:00 to 08:00 Saturday, Sunday and Public holidays - OOHWP2							
	E: evening period from 6 pm to 10 pm Monday to Sunday - OOHWP1															

## APPENDIX C Construction timetable/ activities/ management

## C.1 Construction timetable/activities/equipment

Table C1: Construction timetable/ activities/ equipment

LOW IMPACT WORKS - PROJECT WIDE

Worksite	Activity/ Work Area	Assessment reference	Plant/ Equipment	Plant/ Equipment (as provided by client)	Day			Evening		Night		Timing of Activity		Sound Power Level (Lw re: 1pW) in Noise Model dB(A)			High noise plant	Vibration intensive plant	Notes	
					7am - 6pm	6pm - 10pm	10pm - 7am	Start Date	Duration	L <sub>Aeq</sub>	Penalty	L <sub>Amax</sub>								
The Bays	Use of existing offices, amenities for start-up	UO-B	Light vehicles / traffic control utes	Light vehicle	3 per hour	3 per hour	3 per hour						89	-	100	-	-			
			Light vehicles / traffic control utes	Light vehicle	3 per hour	3 per hour	3 per hour							89	-	100	-	-		
	Secure site (refer to Figure 2-1 for work areas)	SS-B	Handtool - non-powered	Hand tools	1	1								105	-	118	-	-	Use at Night restricted, subject to additional screening and verification monitoring	
			Lighting tower	Lighting tower	-	1	1							99	-	102	-	-		
			Excavator w bucket (25t)	Excavator w bucket	1	1	1							103	-	108	-	-		
			Vacuum Truck	Vacuum truck	1	1								107	-	111	-	-	Use at Night restricted, subject to additional screening and verification monitoring	
	Extension of High voltage construction power supply and water supply from existing CTP substation (Assessment reference)	HV-B	Handtool - power	Power Hand Tools	2	2								108	-	118	-	-	Use at Night restricted, subject to additional screening and verification monitoring	
			Water cart/ Street Sweeper	Water cart	1	1								107	-	111	-	-	Use at Night restricted, subject to additional screening and verification monitoring	
			Hiab	Hiab	1	1	1							95	-	98	-	-		
			EWP	EWP / Scissor Lift	1	1	1							95	-	98	-	-		
			Concrete Agitator	Concrete truck	1 per hour	1 per hour								108	-	111	-	-	Use at Night restricted, subject to additional screening and verification monitoring	
			Concrete Agi	Concrete Agi	1	1								108	-	111	-	-	Use at Night restricted, subject to additional screening and verification monitoring	
	Establish pedestrian bridge over site access road (refer to Figure 2-1 for work areas)	PB-B	Concrete pump	Concrete Pump	1	1	1							103	-	107	-	-		
			Road truck (deliveries to site)	Delivery truck	1 per hour	1 per hour	1 per hour							106	-	111	-	-		
			Excavator w bucket (25t)	Excavator w bucket	1	1	1							103	-	108	-	-		
			Telehandler / Franna crane (20t)	Franna crane	1	1	1							98	-	102	-	-		
			Tipper	Site bogie	1	1	1							103	-	111	-	-		
			Compressor	Compressor	1	1	1							102	-	103	-	-		
			Generator	Generator	1	1	1							94	-	95	-	-		
			Excavator w bucket (25t)	Excavator 20T w bucket and auger	2	2	2							103	-	108	-	-		
	Installation of environmental controls/ERSED (refer to Figure 2-1 for work areas)	EC-B	Telehandler / Franna crane (20t)	Franna Crane / Manitou	2	2	2							98	-	102	-	-		
			Concrete Agitator	Concrete Agi	4 p.h.	4 p.h.								108	-	111	-	-	Use at Night restricted, subject to additional screening and verification monitoring	
			Handtool - power	Power Hand Tools	6	6								108	-	118	-	-	Use at Night restricted, subject to additional screening and verification monitoring	
			EWP	EWP / Scissor Lift	4	4	4							95	-	98	-	-		
Mobile crane (20t-250t)			Mobile Crane 150T	1	1								104	-	108	-	-	Use at Night restricted, subject to additional screening and verification monitoring		
Excavator w bucket (25t)			Excavator w bucket	1									103	-	108	-	-	Utility works under low impact limited to Standard Hours at Pymont.		
Truck and Dog			Rigid Truck	2 per hour									106	-	111	-	-			
EWP			EWP / Scissor Lift	1									95	-	98	-	-			
Pymont West (refer to Figure 2-2 for work areas)	UT-PW1 & UT-PW2	Compressor	Compressor	1									102	-	103	-	-			
		Jackhammer	Jackhammer	1									111	5	121	HN	X			
		Vacuum Truck	Vacuum truck	1									107	-	111	-	-			
		Generator	Generator	1									94	-	95	-	-			
		Compactor / Wacker packer	Wacker Plate and plate compactor	1									108	-	110	-	X			
		Water cart/ Street Sweeper	Water cart	1									107	-	111	-	-			
		Initial demolition works including: - Hazmat investigation and structural investigation within existing buildings to be demolished - Secure site including establishment of hoardings - Create truck access to facilitate soft strip - Demolition soft strip	DE-PW (refer to Figure 2-2 for work areas)	Drill rig	Truck-mounted drill rig	1									106	-	116	-	X	
				Concrete corer	Concrete core drilling machine	1									113	-	116	-	-	
				Vacuum Truck	Vacuum truck	1									107	-	111	-	-	
				Excavator w bucket (25t)	Excavator w bucket	2									103	-	108	-	-	
				Concrete Agitator	Concrete Agi	1									108	-	111	-	-	
				Telehandler / Franna crane (20t)	Franna Crane	1									98	-	102	-	-	
Five archaeological test trenches and if triggered salvage excavations (refer to Figure 2-2 for work areas)	SI-PW	EWP	EWP / Scissor Lift	1									95	-	98	-	-			
		Road truck (deliveries to site)	Delivery truck	1 per hour									106	-	111	-	-			
		Hiab	Hiab	1									95	-	98	-	-			
		Handtool - non-powered	Hand tools	2									105	-	118	-	-			
		Excavator w bucket (25t)	Excavator w bucket	1									103	-	108	-	-			
		Concrete cutting saw	Concrete saw	1									119	5	124	HN	X			
Pymont East (refer to Figure 2-2 for work areas)	UT-PE1 to UT-PE3	Jackhammer	Jackhammer	1									111	5	121	HN	X			
		Vacuum Truck	Vacuum truck	1									107	-	111	-	-			
		Generator	Generator	1									94	-	95	-	-			
		Compactor / Wacker packer	Wacker Plate and plate compactor	1									108	-	110	-	X			
		Water cart/ Street Sweeper	Water cart	1									107	-	111	-	-			
		Establish High Voltage construction power supply (refer to Figure 2-2 for work areas)	UT-PE1 to UT-PE3	Excavator w bucket (25t)	Excavator w bucket	1									103	-	108	-	-	
				Vacuum Truck	Vacuum truck	1									107	-	111	-	-	
				Handtool - power	Power Hand Tools	2									108	-	118	-	-	
				Water cart/ Street Sweeper	Water cart	1									107	-	111	-	-	
				Hiab	Hiab	1									95	-	98	-	-	
				EWP	EWP / Scissor Lift	1									95	-	98	-	-	
		Tree trimming and removal - Pymont Bridge Road - Union Street - Edward Street (refer to Figure 2-2 for work areas)	UT-TR1 to UT-TR3	Excavator w bucket (25t)	Excavator 25T w grabs and bucket	1									103	-	108	-	-	Tree trimming works under low impact limited to Standard Hours at Pymont.
Chainsaw (Petrol)	Chainsaw			4									116	5	120	HN	-			
Mulcher/ Tub grinder	Truck & Wood Chipper			2									120	5	124	HN	-			
Mobile crane (20t-250t)	Mobile Crane			1									104	-	108	-	-			
Tipper	Site bogie			2									103	-	111	-	-			



Table C1: Construction timetable/ activities/ equipment

LOW IMPACT WORKS - PROJECT WIDE

Worksite	Activity/ Work Area	Assessment reference	Plant/ Equipment	Plant/ Equipment (as provided by client)	Day		Evening	Night	Timing of Activity		Sound Power Level (Lw re: 1pW) in Noise Model dB(A)			High noise plant	Vibration intensive plant	Notes		
					7am - 6pm	6pm - 10pm	10pm - 7am	Start Date	Duration	L <sub>Aeq</sub>	Penalty	L <sub>Amax</sub>						
	Initial demolition works including: - Hazmat investigation and structural investigation within existing buildings to be demolished - Secure site including establishment of hoardings - Create truck access to facilitate soft strip - Demolition soft strip	DE-PE (refer to Figure 2-2 for work areas)	Drill rig	Truck-mounted drill rig	1	-	-					106	-	116	-	X		
			Concrete corer	Concrete core drilling machine	1	-	-						113	-	116	-	-	
			Vacuum Truck	Vacuum truck	1	-	-						107	-	111	-	-	
			Excavator w bucket (25t)	Excavator w bucket	2	-	-						103	-	108	-	-	
			Concrete Agitator	Concrete Agi	1	-	-						108	-	111	-	-	
			Telehandler / Franna crane (20t)	Franna Crane	1	-	-						98	-	102	-	-	
			EWP	EWP / Scissor Lift	1	-	-						95	-	98	-	-	
			Road truck (deliveries to site)	Delivery truck	1	per hour	-	-					106	-	111	-	-	
			Hiab	Hiab	1	-	-						95	-	98	-	-	
			Handtool - non-powered	Hand tools	2	-	-						105	-	118	-	-	
	Detailed site investigation to determine contamination potential	SE-PE (refer to Figure 2-2 for work areas)	Drill rig	Truck-mounted drill rig	1	-	-					106	-	116	-	X		
			Vacuum Truck	Vacuum truck	1	-	-					107	-	111	-	-		
			Concrete corer	Concrete core drilling machine	1	-	-					113	-	116	-	-		
			Concrete cutting saw	Concrete saw	1	-	-					119	5	124	HN	X		
			Excavator w bucket (25t)	Excavator w bucket	1	-	-					103	-	108	-	-		
			Tipper	Site bogie	1	-	-					103	-	111	-	-		
	Hunter Street West	Archaeological investigations of DeMestre Place (if access dates allow)	SI-HW (refer to Figure 2-3 for work areas)	Excavator w bucket (25t)	Excavator w bucket	1	1	1				103	-	108	-	-		
				Concrete cutting saw	Concrete saw	1	-	-				119	5	124	HN	X	OOHW use restricted, subject to additional screening and verification monitoring	
				Jackhammer	Jackhammer	1	-	-				111	5	121	HN	X	OOHW use restricted, subject to additional screening and verification monitoring	
				Handtool - non-powered	Hand tools	2	2	2				105	-	118	-	-		
Utility works and temporary services investigation and installation at DeMestre Place		UT-HW (refer to Figure 2-3 for work areas)	Excavator w bucket (25t)	Excavator w bucket	1	1	1					103	-	108	-	-		
			Truck and Dog	Bogie trucks	1	per hour	1	per hour	1	per hour			106	-	111	-	-	
			Air Compressor	Air compressor	1	1	1						70	-	-	-	-	
			Drill rig	Truck-mounted drill rig	1	1	1						106	-	116	-	X	
			Vacuum Truck	Vacuum truck	1	1	1						107	-	111	-	-	
			Jackhammer	Jackhammer	1	-	-						111	5	121	HN	X	OOHW use restricted, subject to additional screening and verification monitoring
Hunter Street West	Initial demolition works including: - Hazmat investigation and structural investigation within existing buildings to be demolished - Secure site including establishment of hoardings - Create truck access to facilitate soft strip - Demolition soft strip	DE-HW (refer to Figure 2-3 for work areas)	Drill rig	Truck-mounted drill rig	1	1	1				106	-	116	-	X			
			Concrete corer	Concrete core drilling machine	1	1	1					113	-	116	-	-		
			Vacuum Truck	Vacuum truck	1	1	1						107	-	111	-	-	
			Excavator w bucket (25t)	Excavator w bucket	2	2	2						103	-	108	-	-	
			Concrete Agitator	Concrete Agi	1	1	1						108	-	111	-	-	
			Telehandler / Franna crane (20t)	Franna Crane	1	1	1						98	-	102	-	-	
			EWP	EWP / Scissor Lift	1	1	1						95	-	98	-	-	
			Road truck (deliveries to site)	Delivery truck	1	per hour	1	per hour	1	per hour			106	-	111	-	-	
			Hiab	Hiab	1	1	1						95	-	98	-	-	
			Handtool - non-powered	Hand tools	2	2	2						105	-	118	-	-	
Hunter Street East	Maintenance of existing temporary WTP	WT-HE	Handtool - non-powered	Hand tools	1	1	1				105	-	118	-	-			
			Handtool - non-powered	Hand tools	1	1	1					103	-	108	-	-		
	Internal temporary fitout within the existing acoustic shed: - Reticulate HV power supply ready for decline excavation - Site adjustments within the acoustic shed, to facilitate the HV construction power reconfiguration - Establish (including assembly) road header, dust scrubber, shotcrete and bolting equipment on site - Site establishment within existing offices and amenities	IF-HE (refer to Figure 2-3 for work areas)	Excavator w bucket (25t)	Excavator w bucket	1	1	1					107	-	111	-	-		
			Vacuum Truck	Vacuum truck	1	1	1					108	-	118	-	-		
			Handtool - power	Power Hand Tools	2	2	2						107	-	111	-	-	
			Water cart/ Street Sweeper	Water cart	1	1	1						108	-	118	-	-	
			Hiab	Hiab	1	1	1						107	-	111	-	-	
			EWP	EWP / Scissor Lift	1	1	1						95	-	98	-	-	
	Hunter Street East	Initial demolition works including: - Hazmat investigation and structural investigation within existing buildings to be demolished - Secure site including establishment of hoardings - Create truck access to facilitate soft strip - Demolition soft strip	DE-HE (refer to Figure 2-3 for work areas)	Drill rig	Truck-mounted drill rig	1	1	1					106	-	116	-	X	
				Excavator w bucket (25t)	Excavator w bucket	2	2	2						103	-	108	-	-
Telehandler / Franna crane (20t)				Franna Crane	1	1	1						98	-	102	-	-	
EWP				EWP / Scissor Lift	1	1	1						95	-	98	-	-	
Road truck (deliveries to site)				Delivery truck	1	per hour	1	per hour	1	per hour			106	-	111	-	-	
Hiab				Hiab	1	1	1						95	-	98	-	-	
Handtool - non-powered				Hand tools	1	1	1						105	-	118	-	-	
Concrete Agitator				Concrete truck	1	per hour	1	per hour	1	per hour			108	-	111	-	-	
Hunter Street East	Concrete Agitator	DE-HE (refer to Figure 2-3 for work areas)	Concrete Agi	Concrete Agi	1	1	1				108	-	111	-	-			
			Concrete pump	Concrete pump	1	1	1					103	-	107	-	-		
			Grader (16G)	Grader	1	-	-						113	-	121	-	-	
			Asphalt Paver	Asphalt paver	1	1	1						105	-	112	-	-	

## C.2 Specific mitigation measures

**Table C2: Construction Noise Management Schedule**

**LOW IMPACT WORKS - PROJECT WIDE**

Area to be Managed		Specific Mitigation/ Management Measure	Details
<b>1</b>	<b>Low Impact works</b>		
1.1	Work during Standard Construction Hours	DAY: Standard hours activities	see Table C1 for details
1.2	Work outside Standard Construction Hours	D(O)/EVE/ NGT: OOHW activities limited as noted below and in Table C1	see Table C1 for details
1.3	Existing acoustic enclosures/sheds	D(O)/EVE/ NGT: Acoustic shed to allow OOHW. Refer to <i>DNVIS - Preliminary Works - Hunter Street East</i> <b>Roller doors</b> on the <b>northwestern side</b> of the shed to be closed in the evening and at night. All plant and equipment would operate inside the acoustic shed.	see Table C4 for details see Table C4 for details
1.4	Works within existing buildings to be demolished	D(O)/EVE/ NGT: OOHW to be completed entirely within the existing building (prior to demolition). All plant and equipment would operate inside the existing building. Demolition waste shoot to drop material from upper floors to the basement level will be installed inside the existing building/s and directed to basement level OOHW delivery/ waste removal trucks to be loaded/ unloaded within the building basement.	see Table C4 for details see Table C4 for details
1.5	Truck restrictions during the OOHW period (to existing acoustic shed)	Avoid the use of park air brakes outside the sheds at night. Set up relevant traffic management measures to minimise the use of air brakes when leaving the site. Air brake silencers are to be correctly installed and fully operational for any heavy vehicles (as per CNVMP). Minimise unnecessary acceleration on site.	
1.6	Ventilation Fan (TBC)	2 x Ventilation fans with silencer + additional attenuation (duct lining/ inlet attenuator/ plenum room). Intake located on roof. Refer to <i>DNVIS - Preliminary Works - Hunter Street East</i>	see Table C5 for performance requirements
1.7	Water treatment plant	Additional enclosure subject to compliance testing. Refer to <i>DNVIS - Preliminary Works - Hunter Street East</i> .	see Table C5 for performance requirements
1.8	Notification	Notification should be sent to all noise affected and/ or vibration affected receivers identified in Appendix E	see Appendix D for noise affected receivers see Appendix E for vibration affected receivers

## APPENDIX D Construction noise impacts



## D.1 Predicted noise levels

*The detailed predicted levels have been provided to JCG in a spreadsheet table to more adequately mitigate and manage potential noise impacts.*

## **D.2 Number of receivers above NMLs**

*The number of exceedances has been provided to JCG in a spreadsheet table.*

### **D.3 Additional management measures**

*The additional management measures have been provided to JCG in a spreadsheet table to more adequately mitigate and manage potential noise impacts.*

## APPENDIX E Construction vibration impacts



## **E.1 Minimum working distance for vibration impact**



200 m  
160  
120  
80  
40  
0



**LEGEND**

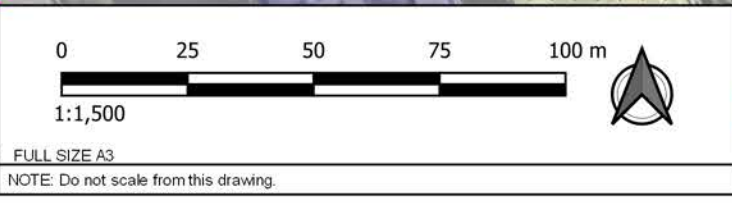
	Childcare
	Residential
	Mixed use
	Commercial
	Industrial
	Hotel/Motel/Hostel
	Medical facility
	Place of Worship
	Community centre
	Recording studio
	Library/Museum
	Educational
	Theatre/Auditorium
	Cinema
	Laboratory
	Flight simulator
	Horse Stable
	Recreational - Park
	Recreational - Active
	Other
	Heritage

- NCAs
  - Tunnel Alignment
  - Work Area
  - Receivers within MWD for cosmetic damage
- MWD for cosmetic damage and human annoyance for Jackhammer**
- Unreinforced structures (7.5mm/s ppv)
  - Heritage structures (2.5mm/s ppv)
  - Human annoyance - Residential (day)



REV	BY	DATE	DESCRIPTION	APPROVER
r1	DA	27/01/23	Update plant MWDs	TG
r0	DA		Prepare figures	TG

A3 Original Co-ordinate System MGA Zone 56



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SYDNEY METRO WEST  
 Utility Works  
 MWD for Cosmetic Damage and Human Annoyance  
 Work Activity: Jackhammer

Sheet 1 of 10



200 m  
160  
120  
80  
40  
0



**LEGEND**

**Noise Sensitive Receivers**

- Residential
- Mixed use
- Commercial
- Industrial
- Hotel/Motel/Hostel
- Medical facility
- Place of Worship
- Community centre
- Recording studio
- Library/Museum
- Childcare
- Educational
- Theatre/Auditorium
- Cinema
- Laboratory
- Flight simulator
- Horse Stable
- Recreational - Park
- Recreational - Active
- Other
- Heritage

NCAs

Tunnel Alignment

Work Area

MWD for cosmetic damage and human annoyance for Truck-mounted drill rig

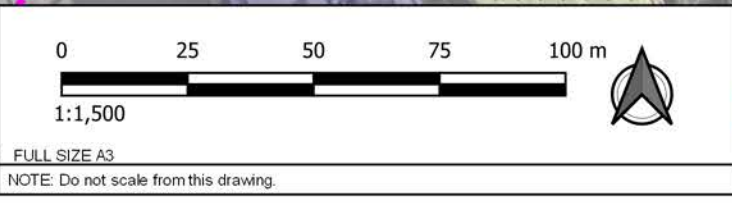
- Unreinforced structures (7.5mm/s ppv)
- Heritage structures (2.5mm/s ppv)
- Human annoyance - Residential (day)



REV	BY	DATE	DESCRIPTION	APPROVER
r1	DA	27/01/23	Update plant MWDs	TG
r0	DA		Prepare figures	TG

A3 Original

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SYDNEY METRO WEST  
 Initial Demo Works

MWD for Cosmetic Damage and Human Annoyance  
 Work Activity: Truck-mounted drill rig

Sheet 2 of 10



200 m  
160  
120  
80  
40  
0



**LEGEND**

**Noise Sensitive Receivers**

- Residential
- Mixed use
- Commercial
- Industrial
- Hotel/Motel/Hostel
- Medical facility
- Place of Worship
- Community centre
- Recording studio
- Library/Museum
- Childcare
- Educational
- Theatre/Auditorium
- Cinema
- Laboratory
- Flight simulator
- Horse Stable
- Recreational - Park
- Recreational - Active
- Other
- Heritage

NCAs

Tunnel Alignment

Work Area

**MWD for cosmetic damage and human annoyance for Jackhammer**

- Unreinforced structures (7.5mm/s ppv)
- Heritage structures (2.5mm/s ppv)
- Human annoyance - Residential (day)



REV	BY	DATE	DESCRIPTION	APPROVER
r1	DA	27/01/23	Update plant MWDs	TG
r0	DA		Prepare figures	TG

A3 Original

Co-ordinate System MGA Zone 56

0 25 50 75 100 m

1:1,500

NOTE: Do not scale from this drawing.

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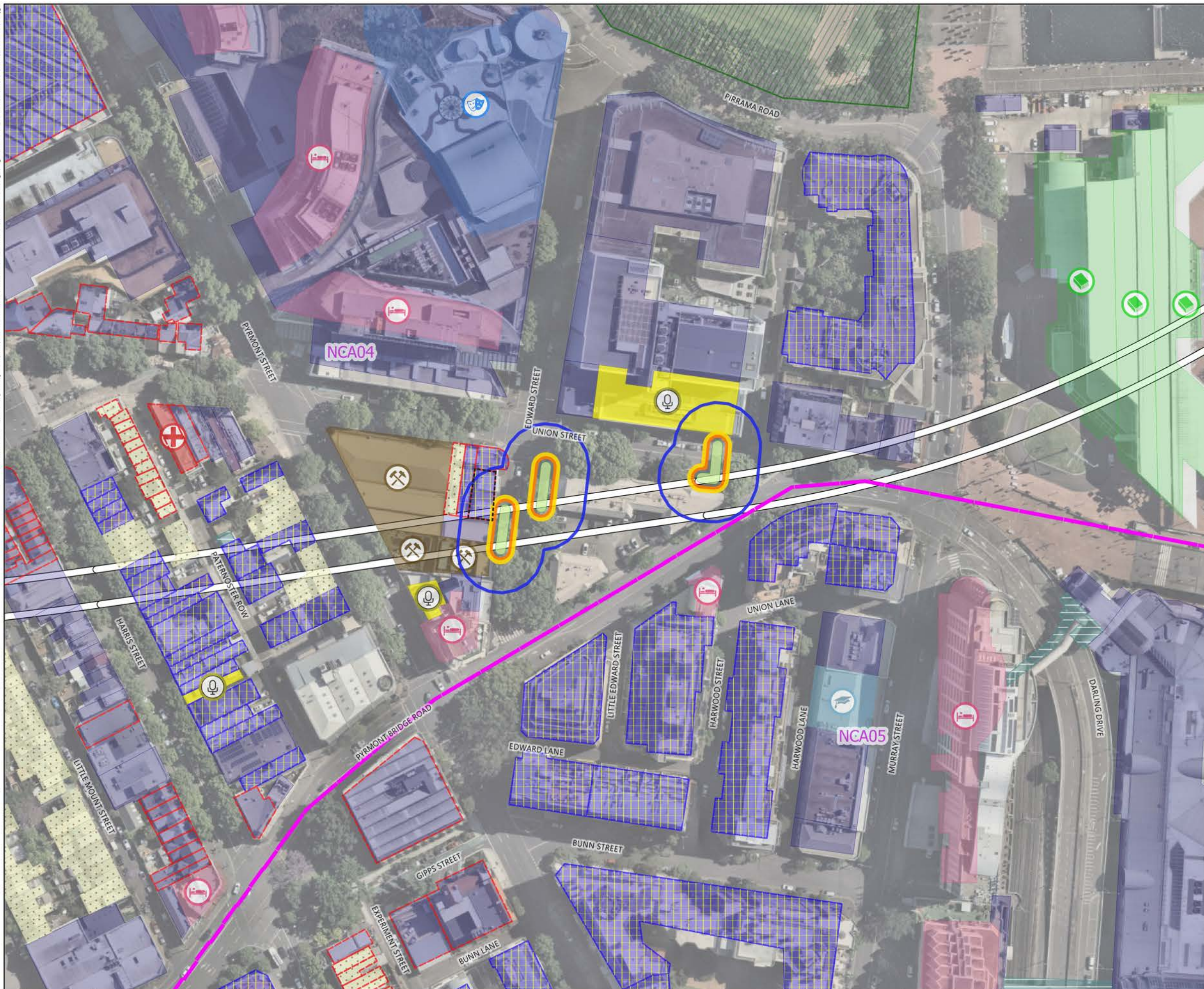
SYDNEY METRO WEST  
 Archaeological Investigation Works

MWD for Cosmetic Damage and Human Annoyance  
 Work Activity: Jackhammer

Sheet 3 of 10



200 m  
160  
120  
80  
40  
0



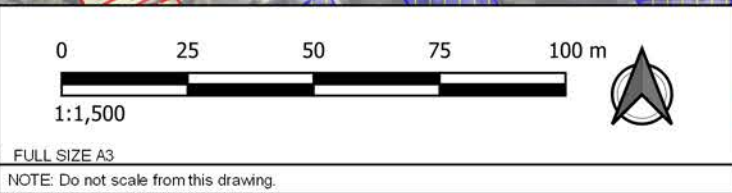
- LEGEND**
- Noise Sensitive Receivers**
- Residential
  - Mixed use
  - Commercial
  - Industrial
  - Hotel/Motel/Hostel
  - Medical facility
  - Place of Worship
  - Community centre
  - Recording studio
  - Library/Museum
  - Childcare
  - Educational
  - Theatre/Auditorium
  - Cinema
  - Laboratory
  - Flight simulator
  - Horse Stable
  - Recreational - Passive
  - Recreational - Active
  - Other
  - Heritage

- NCAs
  - Tunnel Alignment
  - Work Area
  - Receivers within MWD for cosmetic damage
- MWD for cosmetic damage and human annoyance for Jackhammer**
- Unreinforced structures (7.5mm/s ppv)
  - Heritage structures (2.5mm/s ppv)
  - Human annoyance - Residential (day)



REV	BY	DATE	DESCRIPTION	APPROVER
r1	DA	27/01/23	Update plant MWDs	TG
r0	DA		Prepare figures	TG

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SYDNEY METRO WEST  
 Utility Works

MWD for Cosmetic Damage and Human Annoyance  
 Work Activity: Jackhammer

Sheet 4 of 10

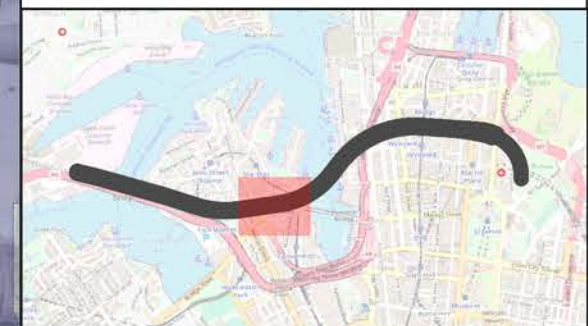


200 m  
160  
120  
80  
40  
0

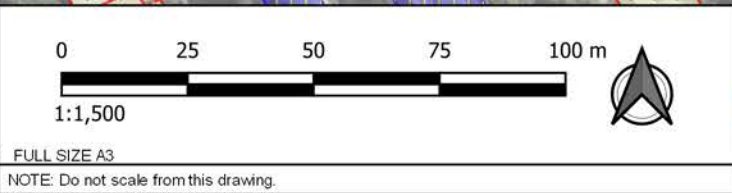


- LEGEND**
- Noise Sensitive Receivers**
- Residential
  - Mixed use
  - Commercial
  - Industrial
  - Hotel/Motel/Hostel
  - Medical facility
  - Place of Worship
  - Community centre
  - Recording studio
  - Library/Museum
  - Childcare
  - Educational
  - Theatre/Auditorium
  - Cinema
  - Laboratory
  - Flight simulator
  - Horse Stable
  - Recreational - Park
  - Recreational - Active
  - Other
  - Heritage

- NCAs
  - Tunnel Alignment
  - Work Area
- MWD for cosmetic damage and human annoyance for Truck-mounted drill rig**
- Unreinforced structures (7.5mm/s ppv)
  - Heritage structures (2.5mm/s ppv)
  - Human annoyance - Residential (day)



REV	BY	DATE	DESCRIPTION	APPROVER
r1	DA	27/01/23	Update plant MWDs	TG
r0	DA		Prepare figures	TG
A3	Original		Co-ordinate System MGA Zone 56	



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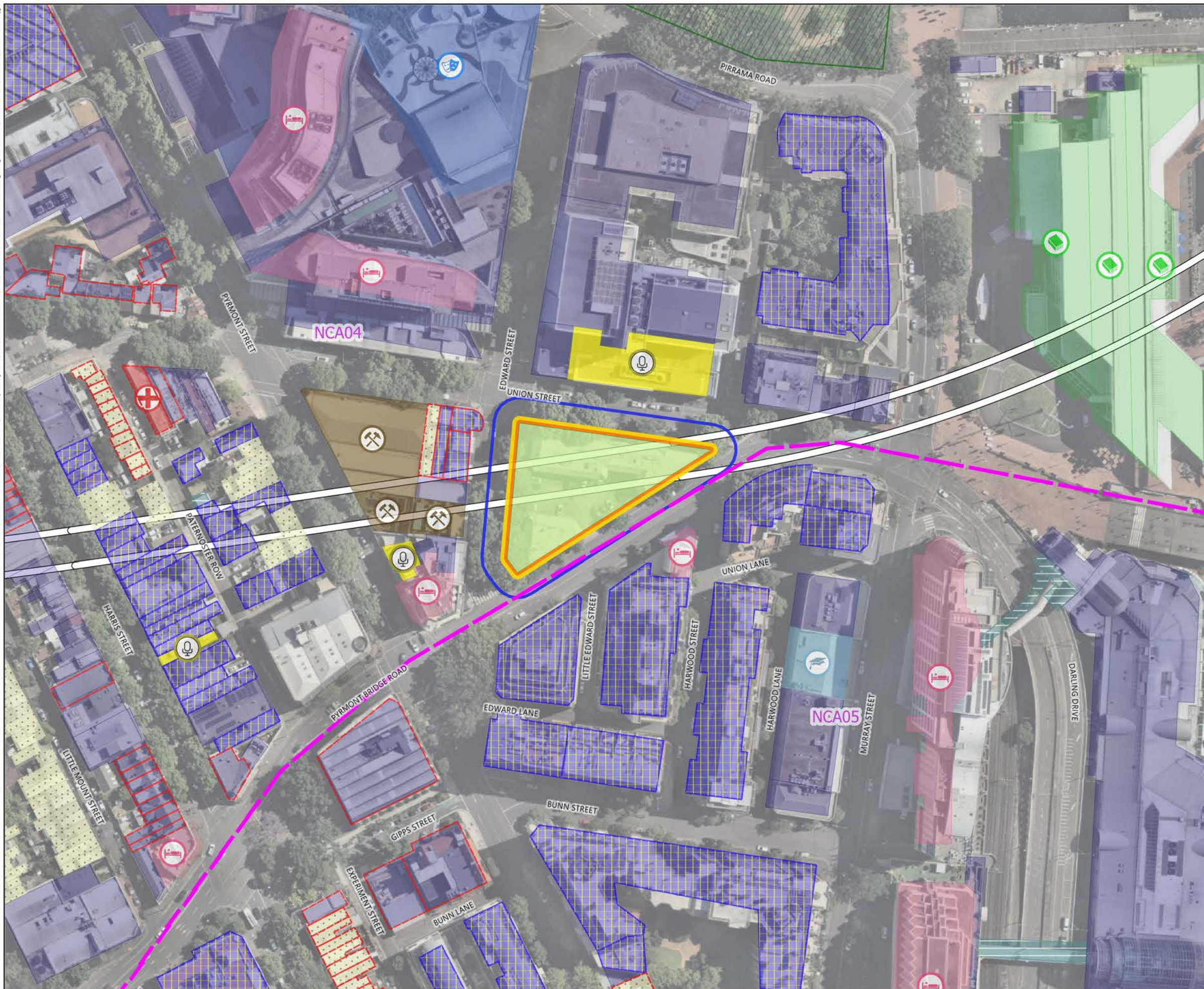
SYDNEY METRO WEST  
Initial Demo Works

MWD for Cosmetic Damage and Human Annoyance  
Work Activity: Truck-mounted drill rig

Sheet 5 of 10



200 m  
160  
120  
80  
40  
0



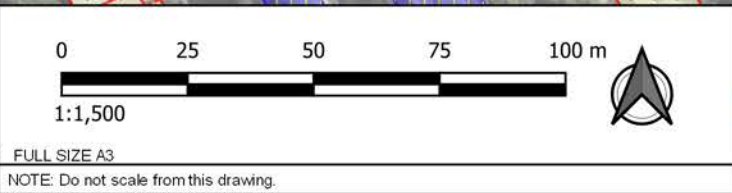
- LEGEND**
- Noise Sensitive Receivers**
- Residential
  - Mixed use
  - Commercial
  - Industrial
  - Hotel/Motel/Hostel
  - Medical facility
  - Place of Worship
  - Community centre
  - Recording studio
  - Library/Museum
  - Childcare
  - Educational
  - Theatre/Auditorium
  - Cinema
  - Laboratory
  - Flight simulator
  - Horse Stable
  - Recreational - Park
  - Recreational - Active
  - Other
  - Heritage

- NCAs
  - Tunnel Alignment
  - Work Area
- MWD for cosmetic damage and human annoyance for Concrete saw**
- Unreinforced structures (7.5mm/s ppv)
  - Heritage structures (2.5mm/s ppv)
  - Human annoyance - Residential (day)



REV	BY	DATE	DESCRIPTION	APPROVER
r1	DA	27/01/23	Update plant MWDs	TG
r0	DA		Prepare figures	TG

A3 Original Co-ordinate System MGA Zone 56



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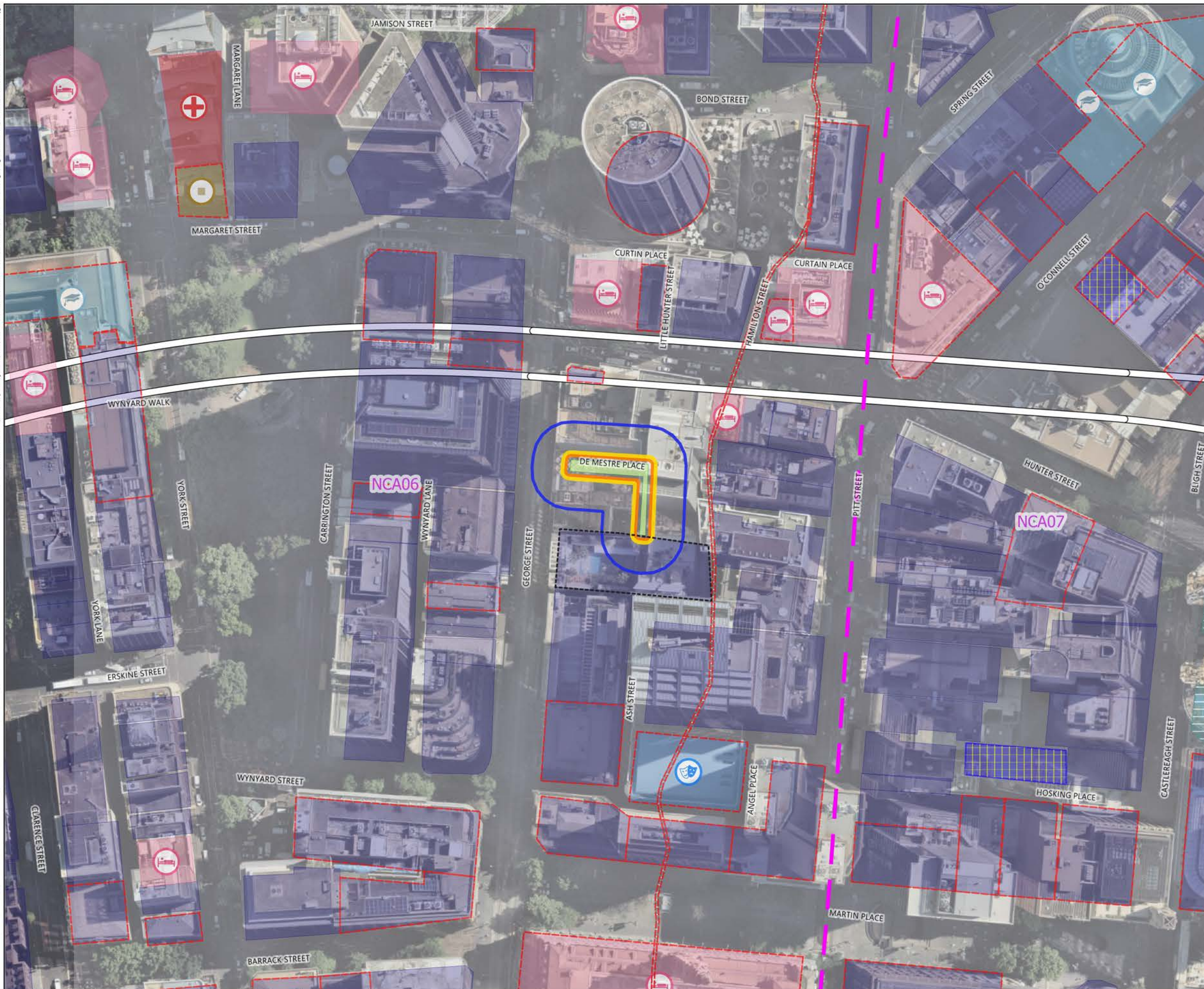
SYDNEY METRO WEST  
 Site Investigation Works

MWD for Cosmetic Damage and Human Annoyance  
 Work Activity: Concrete saw

Sheet 6 of 10



200 m  
160  
120  
80  
40  
0



**LEGEND**

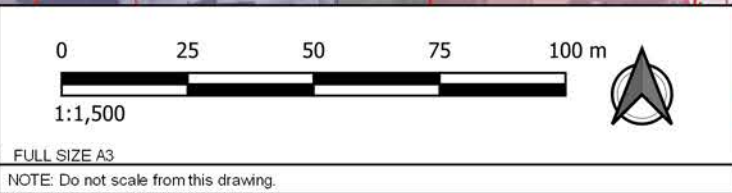
	Residential		Childcare
	Mixed use		Educational
	Commercial		Theatre/Auditorium
	Industrial		Cinema
	Hotel/Motel/Hostel		Laboratory
	Medical facility		Flight simulator
	Place of Worship		Horse Stable
	Community centre		Recreational - Pa
	Recording studio		Recreational - Act
	Library/Museum		Other
	Heritage		Heritage

- NCAs
  - Tunnel Alignment
  - Work Area
  - Receivers within MWD for cosmetic damage
- MWD for cosmetic damage and human annoyance for Jackhammer**
- Unreinforced structures (7.5mm/s ppv)
  - Heritage structures (2.5mm/s ppv)
  - Human annoyance - Residential (day)



REV	BY	DATE	DESCRIPTION	APPROVER
r1	DA	27/01/23	Update plant MWDs	TG
r0	DA		Prepare figures	TG

A3 Original  
 Co-ordinate System MGA Zone 56



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200 m  
160  
120  
80  
40  
0



**LEGEND**

**Noise Sensitive Receivers**

- Residential
- Mixed use
- Commercial
- Industrial
- Hotel/Motel/Hostel
- Medical facility
- Place of Worship
- Community centre
- Recording studio
- Library/Museum
- Childcare
- Educational
- Theatre/Auditorium
- Cinema
- Laboratory
- Flight simulator
- Horse Stable
- Recreational - Park
- Recreational - Active
- Other
- Heritage

NCAs

Tunnel Alignment

Work Area

Receivers within MWD for cosmetic damage

**MWD for cosmetic damage and human annoyance for Jackhammer**

- Unreinforced structures (7.5mm/s ppv)
- Heritage structures (2.5mm/s ppv)
- Human annoyance - Residential (day)



REV	BY	DATE	DESCRIPTION	APPROVER
r1	DA	27/01/23	Update plant MWDs	TG
r0	DA		Prepare figures	TG
A3 Original			Co-ordinate System MGA Zone 56	



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SYDNEY METRO WEST  
 Utility Works

MWD for Cosmetic Damage and Human Annoyance  
 Work Activity: Jackhammer

Sheet 8 of 10



200 m  
160  
120  
80  
40  
0



**LEGEND**

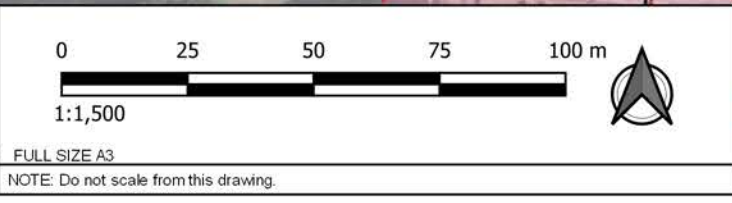
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	Mixed use		Educational
	Commercial		Theatre/Auditorium
	Industrial		Cinema
	Hotel/Motel/Hostel		Laboratory
	Medical facility		Flight simulator
	Place of Worship		Horse Stable
	Community centre		Recreational - Park
	Recording studio		Recreational - Active
	Library/Museum		Other
			Heritage

- NCAs
  - Tunnel Alignment
  - Work Area
  - Receivers within MWD for cosmetic damage
- MWD for cosmetic damage and human annoyance for Truck-mounted drill rig**
- Unreinforced structures (7.5mm/s ppv)
  - Heritage structures (2.5mm/s ppv)
  - Human annoyance - Residential (day)



REV	BY	DATE	DESCRIPTION	APPROVER
r1	DA	27/01/23	Update plant MWDs Prepare figures	TG
r0	DA			TG

A3 Original Co-ordinate System MGA Zone 56



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**SYDNEY METRO WEST**

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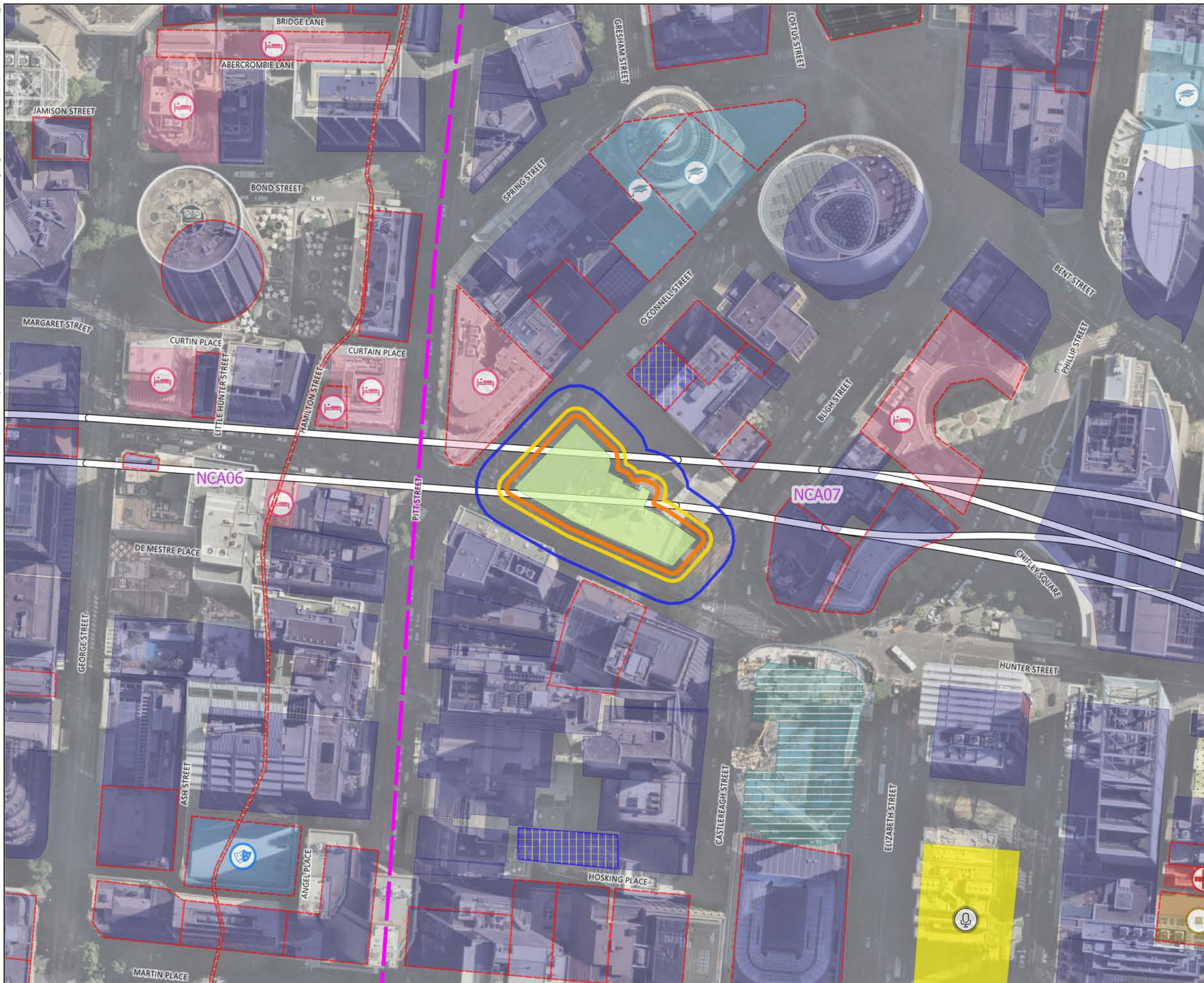
**RENZO TONIN & ASSOCIATES**

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200 m  
160  
120  
80  
40  
0



**LEGEND**

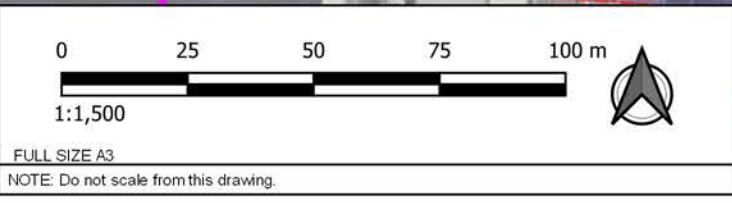
	Residential		Childcare
	Mixed use		Educational
	Commercial		Theatre/Auditorium
	Industrial		Cinema
	Hotel/Motel/Hostel		Laboratory
	Medical facility		Flight simulator
	Place of Worship		Horse Stable
	Community centre		Recreational - Park
	Recording studio		Recreational - Active
	Library/Museum		Other
			Heritage

- NCAs
  - Tunnel Alignment
  - Work Area
- MWD for cosmetic damage and human annoyance for Truck-mounted drill rig**
- Unreinforced structures (7.5mm/s ppv)
  - Heritage structures (2.5mm/s ppv)
  - Human annoyance - Residential (day)



REV	BY	DATE	DESCRIPTION	APPROVER
r1	DA	27/01/23	Update plant MWDs	TG
r0	DA		Prepare figures	TG

A3 Original Co-ordinate System MGA Zone 56



CLIENT

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SYDNEY METRO WEST  
 High Voltage Construction Works

MWD for Cosmetic Damage and Human Annoyance  
 Work Activity: Truck-mounted drill rig

Sheet 10 of 10



## E.2 Attended vibration monitoring - nominated representative locations

Table 8.1: Attended vibration monitoring - nominated representative locations

Worksite	Plant item		Vibration objectives	
			Cosmetic damage	Human annoyance <sup>1</sup>
Pymont Station	Jackhammer	102 Pymont Street, Pymont	-	√
		104 Pymont Street, Pymont	-	√
		119 Pymont Street, Pymont	-	√
		121 Pymont Street, Pymont	-	√
		125 Pymont Street, Pymont	-	√
		13 Union Street, Pymont	-	√
		13-29 Union Street, Pymont	-	√
		186-188 Harris Street, Pymont	-	√
		190 Harris Street, Pymont	-	√
		192 Harris Street, Pymont	-	√
		194 Harris Street, Pymont	-	√
		196 Harris Street, Pymont	-	√
		198 Harris Street, Pymont	-	√
		200-202 Harris Street, Pymont	-	√
		204 Harris Street, Pymont	-	√
		206 Harris Street, Pymont	-	√
		210 Harris Street, Pymont	-	√
		212 Harris Street, Pymont	√	√
		214-216 Harris Street, Pymont	-	√
		26-28 Paternoster Row, Pymont	-	√
	31 Union Street, Pymont	-	√	
	33 Union Street, Pymont	-	√	
	60 Union Street, Pymont	-	√	
	63 Edward Street, Pymont	-	√	
	65-67 Edward Street, Pymont	√	√	
	Truck-mounted drill rig	1-9 Pymont Bridge Road, Pymont	-	√
		102 Pymont Street, Pymont	-	√
		104 Pymont Street, Pymont	-	√
		119 Pymont Street, Pymont	-	√
		121 Pymont Street, Pymont	-	√
		125 Pymont Street, Pymont	-	√
		190 Harris Street, Pymont	-	√
		192 Harris Street, Pymont	-	√
194 Harris Street, Pymont		-	√	
196 Harris Street, Pymont		-	√	
198 Harris Street, Pymont		-	√	



Worksite	Plant item	Address	Vibration objectives	
			Cosmetic damage	Human annoyance <sup>1</sup>
		200-202 Harris Street, Pyrmont	-	√
		204 Harris Street, Pyrmont	-	√
		206 Harris Street, Pyrmont	-	√
		210 Harris Street, Pyrmont	-	√
		212 Harris Street, Pyrmont	-	√
		26-28 Paternoster Row, Pyrmont	-	√
		60 Union Street, Pyrmont	-	√
		63 Edward Street, Pyrmont	-	√
		65-67 Edward Street, Pyrmont	-	√
Hunter Street Station	Jackhammer	15-17 Hunter Street, Sydney	-	√
		196 George Street, Sydney	√	√
		320 George Street, Sydney	√	√
		2 Hunter Street, Sydney	-	√
	Truck-mounted drill rig	103-105 Pitt Street, Sydney	-	√
		107 Pitt Street, Sydney	√	√
		109 Pitt Street, Sydney	√	√
		2 Hunter Street, Sydney	-	√
		15-17 Hunter Street, Sydney	√	√
		196 George Street, Sydney	√	√
		320 George Street, Sydney	√	√
		27 O'Connell Street, Sydney	-	√

Note: 1. Monitoring is required in the event of complaint in relation to vibration  
2. Subject to building condition report, as noted in Section 6.2.2

## ACOUSTICS ADVISOR ENDORSEMENT SYDNEY METRO WEST (SSI 19238057)

Review of	<b>Eastern Tunnelling Package:</b> Detailed Noise and Vibration Impact Statement (DNVIS) – Low Impact Works – Project Wide	Reviewed document reference:	TM372-02-1-06F03 SMW-ETP DNVIS-PWE Low Impact (rev0)
Prepared by:	[REDACTED], Acoustics Advisor		Revision 0 dated 10 February 2023
Date of issue:	10 February 2023		

As approved Acoustics Advisor for the Sydney Metro West project, I have reviewed and provided comment on Revision r2 of the Detailed Noise and Vibration Impact Statement (DNVIS) for the Eastern Tunnelling Package Low Impact Works. The DNVIS was prepared by Renzo Tonin Associates on behalf of JCG, the contractor for Eastern Tunnelling Package works.

I am satisfied that Revision 0 has addressed my comments and endorse it for implementation with the following notes:

- Conditions D29 and D30 both require that DNVISs must “*include specific mitigation measures identified through consultation with affected sensitive land user(s)*”. The low impact work documented in this DNVIS involves relatively short-term noise and vibration impacts; the logical “specific mitigation measure” is ongoing notification and communication with land users to inform them of upcoming work. JCG has confirmed that they will do this, so I am comfortable that this requirement of Conditions D29 and D30 is addressed.
- The project team has identified the recording studios at 102 Pyrmont Street as a noise and vibration sensitive business that is potentially affected by the project. This is unlikely during the low impact works documented in this DNVIS but JCG has committed to finding early opportunities, such as during this work, to quantify and verify the way noise and vibration may affect this premises during future works, such as demolition and shaft excavation. This will inform specific mitigation measures (required by Conditions D29 and D30) and timetabling or other reasonable arrangements (required by Condition D27) for the future works.

On that basis I endorse Revision 0 of the DNVIS for implementation.

[REDACTED]

[REDACTED], Metro West Acoustics Advisor