



### Day Time - Detailed Excavation - Hammer Attachments

Project  
Client SMW - CTP: North Strathfield  
AFJV

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### Acoustic terms and acronyms

AA	Acoustic Advisor
AMM	Additional mitigation measures – applicable where standard measures have been implemented and NML is still expected to be exceeded.
dB(A)	Unit used to measure ‘A-weighted’ sound pressure levels. A-weighting is an adjustment made to sound-level measurement to approximate the response of the human ear.
DPIE	NSW Department of Planning, Industry and Environment
EIS	Environmental Impact Statement
ICNG	Interim Construction Noise Guideline (Department of Environment and Climate Change 2009)
NCA	Noise Catchment Area
Noise level statistics	<p><math>L_{A90}</math> - The A-weighted sound pressure level exceeded 90% of the monitoring period. This is considered to represent the background noise.</p> <p><math>L_{Aeq}</math> - The equivalent continuous A-weighted noise level—the level of noise equivalent to the energy average of noise levels occurring over a measurement period.</p> <p><math>L_{A1}</math> – The A-weighted sound pressure level exceeded 1% of the monitoring period.</p> <p><math>L_{Amax}</math> – The maximum A-weighted noise level associated with the measurement period.</p>
NML	Noise Management Level
PPV	Peak Particle Velocity – Measurement of ground-borne vibration in units of mm/s
RBL	Rating Background Level - a single figure that represents the background noise level for assessment purposes
ROL	Road Occupancy Licence – granted by Transport for NSW and required for any activity likely to impact on traffic flow.
SWL	Sound Power Level - The A-weighted sound power level is a logarithmic ratio of the acoustic power output of a source relative to 10-12 watts and expressed in decibels. Sound power level is calculated from measured sound pressure levels and represents the level of total sound power radiated by a sound source.
SPL	<p>Sound pressure level - This is the level of noise, usually expressed in dB(A), as measured by a standard sound level meter with a pressure microphone. The sound pressure level in dB(A) gives a close indication of the subjective loudness of noise.</p> <p>A technical definition for the sound pressure level, in decibels, is 20 times the logarithm (base 10) of the ratio of any two quantities related to a given sound pressure to a reference pressure (typically 20 <math>\mu</math>Pa equivalent to 0 dB).</p>
Tonal noise	Noise with perceptible and definite pitch or tone
VDV	Vibration dose value – used when assessing intermittent vibration as it is sensitive to peaks in vibration acceleration and accumulates the vibration energy received over the daytime and night-time periods



# 0 Introduction

## 0.1 Overview

The Sydney Metro Central Tunnelling Package is being delivered by the Acciona Ferrovia Joint Venture (ACJV) and involves excavation of around 11.5 kilometres of twin-bore tunnel linking five station boxes at The Bays, Five Dock, Strathfield, Burwood North and Sydney Olympic Park (the Project).

During the Project, there is potential for nearby sensitive receivers to experience adverse impacts relating to noise and vibration. The project's Noise and Vibration Management Sub Plan (NVMP) was developed to satisfy the project's Conditions of Approval (CoA) and addresses the assessment and management of noise and vibration impacts during construction.

CoA D43 requires planned works to be assessed within a Detailed Noise and Vibration Impact Statement (DNVIS) where works may exceed the NMLs, vibration criteria and/or ground-borne noise levels specified in CoA D39 and D40 at any residence outside construction hours identified in CoA D35, or where receivers will be highly noise affected.

Under the NVMP, KNOWnoise™, a project-specific noise prediction tool, has been developed to prepare site and activity-specific noise assessments for ongoing risk analysis during project delivery and for when out-of-hours work is proposed (as per the Project's out-of-hours protocol).

This DNVIS has been prepared using KNOWnoise™ and addresses activities for construction of the North Strathfield Station box located adjacent to the existing North Strathfield train station, as illustrated in Figure 1.

The structure of this DNVIS meets the requirements of CoA D43 and the CNVS and includes:

- Section 1.2 – Construction works and hours with justification for these works in Section 1.3
- Section 2 – Existing environment
- Section 3 – Assessment framework including noise and vibration management levels
- Section 4 – Controls and Safe Guards

## 0.2 Planned works

The AFJV plans to carry out the works described in Appendix A, which lists each assessed activity, its timing and proposed equipment.

## 0.3 Justification of the works

In line with the Interim Construction Noise Guidelines (DECC 2009), justification is typically required to work outside approved construction hours. These situations may involve low impact or emergency works and works under an out-of-hours work protocol.

The AFJV proposes the works subject to this assessment are for approved standard construction hours for high noise impact works under condition D36.



## Sydney Metro West- North Strathfield

### Legend

- Footprint
- Excavation Area
- Sydney Metro West Alignment

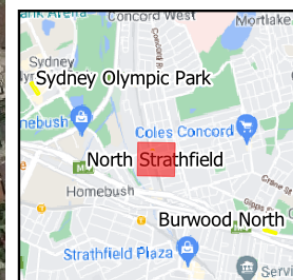
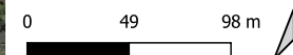


Figure 1 Location map

## 1 Existing environment

### 1.1 Sensitive receivers

The North Strathfield construction zone is located to the east of the existing North Strathfield Station and is adjacent to Queen Street as illustrated in Figure 1.

The area surrounding the Construction Site is generally suburban with a mixture of residential, commercial and educational receivers. The nearest receivers are opposite the site, across Queen Street. Commercial receivers adjacent to the Site are typically of retail use.

### 1.2 Heritage items

There are items of heritage value identified in the EIS, which include the following. These items will be considered for impacts of vibration-intensive activities.

- North Strathfield Railway Station Group

### 1.3 Noise catchment areas

To facilitate the assessment of noise impacts from the project and to apply representative Noise Management Levels (NMLs) to all receivers, receivers adjacent to the North Strathfield site have been divided into Noise Catchment Areas (NCAs).

NCAs group individual sensitive receivers by representative traits such as existing noise environment and potential exposure to noise and vibration from the Project.

NCAs established as part of the EIS are summarised in Table 1 and illustrated in Figure 1. Background noise monitoring has been completed as part of the EIS to apply appropriate NML to each NCA.

**Table 1 Summary of work areas, Noise Catchment Areas and land uses**

NCA	Location	Description	Ambient noise influences
NCA10	North Strathfield, West of the existing rail corridor	Mainly residential. Commercial receivers are the M4 Motorway and in the west. 'Other sensitive' receivers include McDonald College and Our Lady of the Assumption Primary School	Existing noise levels in this study area are controlled by transportation noise from the surrounding road network and existing rail line
NCA11	North Strathfield, East of the existing rail corridor	Mainly residential, with areas of commercial receivers along Queen Street and Concord Road. Strathfield North Public School is in the north	



## 2 Assessment framework

### 2.1 Approved construction hours

Working hours are set by CoA D35 to D36 as summarised in Table 2. Use of power saws, rock breakers, drills and other tonal or impulsive activities are defined as annoying under the Interim Construction Noise Guideline (ICNG) and are 'highly noise intensive works'.

**Table 2 Approved construction hours**

CoA	Construction activity	Monday to Friday	Saturday	Sunday / Public holiday
D35	Approved construction	7:00 am to 6:00 pm	8:00 am to 6:00 pm	No work (unless approved under out-of-hours work protocol)
D36	Highly noise intensive works	8:00 am to 6:00 pm <sup>1</sup>	8:00 am to 1:00 pm <sup>1</sup>	No work (unless approved under out-of-hours work protocol)

Notes:

1. if continuously, then not exceeding three hours, with a minimum cessation of work of not less than one hour.

### 2.2 Noise assessment criteria

#### 2.2.1 Construction noise

The ICNG describes noise in excess of the background level as potentially having an adverse impact on sensitive receivers and increasing the likelihood of complaint. During standard construction hours, where construction noise is within 10 dB(A) of the RBL, impacts would be acceptable.

Where construction noise is more than 10 dB(A) above the RBL during standard construction hours, a residential receiver is considered noise affected and the proponent should undertake all reasonable and feasible steps necessary to manage the impact and consult with the affected community.

Above a  $L_{Aeq, 15 \text{ minute}}$  noise level of 75 dB(A), a receiver is highly affected, requiring consideration of additional mitigation measures.

In addition, annoying noise such as rock hammers, impact piling, or other impulsive noise sources usually result in greater annoyance than continuous construction noise. A 5 dB(A) penalty is applicable to such activities prior to comparison with the NMLs.



**Table 3 Residential noise management levels**

Time of day	NML $L_{Aeq}$ (15 min) *	How to apply
Standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm	Noise affected RBL + 10 dB	<p>The noise affected level represents the point above which there may be some community reaction to noise.</p> <p>Where the predicted or measured <math>L_{Aeq}</math> (15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level.</p> <p>The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.</p>
	Highly noise affected 75 dB(A)	<p>The highly noise affected level represents the point above which there may be strong community reaction to noise.</p> <p>Where noise is above this level, the relevant authority may require respite periods by restricting the hours that the very noisy activities can occur, taking into account:</p> <ul style="list-style-type: none"> <li>- times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences);</li> <li>- if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.</li> </ul>
Outside recommended standard hours	Noise affected RBL + 5 dB	<p>A strong justification would typically be required for works outside the recommended standard hours.</p> <p>The proponent should apply all feasible and reasonable work practices to meet the noise affected level.</p> <p>Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community.</p>

\* Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence. Noise levels may be higher at upper floors of the noise affected residence.

Other sensitive land uses, such as schools and offices, typically find noise from construction disruptive when the properties are being used (such as during work and school times). The noise management levels for non-residential receivers set in accordance with the Interim Construction Noise Guideline are provided in Table 4. These levels apply only during hours when the non-residential premises are being used.

The difference between an internal noise level and the external noise level is about 10 dB(A), which provides a conservative assumption that windows are open for ventilation. Buildings where windows are fixed or cannot otherwise be opened may achieve a greater noise level performance.



**Table 4 Non-residential sensitive land uses noise management levels**

Land use	Noise assessment location	NML ( $L_{Aeq,15min}$ )
Classrooms at schools and other educational institutions	Internal	45
Places of worship		
Active recreation areas (such as sporting activities and activities which generate their own noise or focus for participants)	External	65
Passive recreation areas (contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation)	External	60
Industrial premises	External	75
Office, retail outlets	External	70

### 2.3 Project construction noise management levels

The Project specific construction noise management levels for residential receivers have been established in line with the ICNG, based on the RBLs relevant to each NCA. These are presented in Table 5. NMLs for non-residential sensitive receivers are described in Table 4.

**Table 5 Project specific construction NMLs**

NCA	Noise Management Level, $L_{Aeq\ 15\ minute}$						
	Approved hours		Outside approved hours				
	Noise affected	Highly noise affected	Day	Evening	Night	Sleep disturbance (CNVS)	
						$L_{Aeq,\ 15\ minute}$	$L_{Amax}$
NCA10	57	75	52	52	49	49	59
NCA11	61	75	56	52	44	44	54

As part of these works, standard mitigation measures, as described in the CNVMP and NST DNVIS Rev 4, are implemented where reasonable and feasible. The use of rippers and pineapple attachments will be used where possible to complete detailed excavation, however rock hammering will be required where harder rock is encountered. Additionally, after these measures have been applied, noise and vibration levels may continue to exceed the NMLs. Hoarding has been installed around the site as part of the DNVIS mitigation measures.

In this case, additional mitigation measures outlined in the CNVS, which largely focus on engagement with affected sensitive receivers, should be implemented where reasonable and feasible, unless other agreements are in place with the impacted receiver.

Triggers and additional mitigation measures for airborne noise are taken from the Project's OOHV Protocol and summarised in the Noise and Vibration Management Plan. Further details of specific additional mitigation measures are described in the CNVS.



**Table 6 Triggers for additional mitigation measures – Airborne noise (Roads and Maritime 2016)**

Construction hours	Class	dB above NML	Additional management measures
<b>Approved hours</b> Monday – Friday: 7am – 6pm Saturday: 8am to 6pm	B	0 to 10	-
	C	10 to 20	LB
	D	20 to 30	LB, M, SN
	E	>30	LB, M, SN
<b>Evening</b> Monday – Friday: 6pm – 10pm Saturday: 7am – 8am, 6pm – 10pm Sunday / PH: 8am – 6pm	B	0 to 10	LB
	C	10 to 20	LB, M
	D	20 to 30	LB, M, SN, RO
	E	> 30	LB, M, SN, IB, PC, RO
<b>Night</b> Monday – Saturday: 10am – 7am Saturday: 10pm – 8am) Sunday / PH: 6pm – 7am	B	0 to 10	LB
	C	10 to 20	LB, M, SN, RO
	D	20 to 30	LB, M, SN, IB, PC, RO, AA
	E	> 30	LB, M, SN, IB, PC, RO, AA

Notes: PC = Phone Calls and emails  
M = Monitoring  
IB = Individual briefings  
AA = Alternative accommodation

SN = Specific notification  
LB = Letterbox drops  
RO = Project specific respite offer

## 2.4 Vibration management

### 2.4.1 Human comfort

When assessing human exposure to construction-related vibration, the CNVS requires vibration goals to be established using *Environmental Noise Management Assessing Vibration: A Technical Guideline* (DECC 2006), which provides criteria for the assessment of vibration impacts on humans.

Construction activities typically generate vibration of an intermittent nature, which is assessed using a Vibration Dose Value (VDV). Acceptable values of vibration doses are presented in Table 7 for sensitive receivers.

**Table 7 VDV Vibration criteria**

Receiver type	Low probability of adverse comment ( $m/s^{1.75}$ )	Adverse comment possible ( $m/s^{1.75}$ )	Adverse comment probable ( $m/s^{1.75}$ )
Residential buildings – 16 hour day (7am to 11pm) <sup>1</sup>	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential buildings – 8 hour night (11pm to 7am) <sup>1</sup>	0.13	0.26	0.51

Note 1: Day time and night time as described in BS6472:1992 (as referenced in the CNVS), i.e. a daytime period of 16 h or a night time period of 8 h, for example 23.00 h to 07.00 h.

### 2.4.2 Buildings

Potential building damage from construction vibration requires the application of values in BS 7385 Part 2-1993 *Evaluation and measurement for vibration in buildings* Part 2. These values are presented in Table 8 and relate to transient vibration which does not give rise to resonant responses in structures, and to low-rise buildings.



**Table 8 Guideline values for vibration velocity for the effects of short-term vibration on structures (BS 7385).**

Line	Type of building	Peak component particle velocity in frequency range of predominant pulse	
		4 Hz to 15 Hz	15 Hz and above
1	Reinforced or framed structures Industrial and heavy commercial buildings	50	
2	Unreinforced or light framed structures Residential or light commercial type buildings	15 at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz to 50 mm/s at 40 Hz and above

Where vibration may give rise to magnification due to resonance, especially at lower frequencies where lower guide values apply, the guide values may be reduced by 50%. The CNVS describes rock breaking/hammering and sheet piling activities as having potential to cause dynamic loading in some structures (e.g. residences).

For activity involving rock breakers, piling rigs, vibratory rollers, excavators, vibration predominantly occurs at frequencies in the 10 Hz to 100 Hz range. On this basis, a conservative vibration damage screening level is:

- Reinforced or framed structures: 25.0 mm/s
- Unreinforced or light framed structures: 7.5 mm/s

### 2.4.3 Heritage

Heritage buildings and structures would be assessed under a conservative cosmetic damage objectives of 2.5 mm/s peak component particle velocity (from DIN 4150). Where vibration levels at heritage items are identified as exceeding this screening level, structural assessment would be completed by the Project team to confirm the structure's sensitivity to vibration. If a heritage building or structure is found to be structurally unsound (following inspection) the conservative criterion would stand. Where the structure is suitably sound, the guideline values from Table 8 would be applicable.

### 2.4.4 Additional mitigation measures

The CNVS recommends additional mitigation measures where all standard mitigation measures to minimise vibration at the nearest receivers have been implemented and vibration is still predicted to exceed the maximum guideline values. The Additional Mitigation Measures Matrix (AMMM) for vibration from the CNVS is presented in Table 9.

**Table 9 Additional Vibration Mitigation Measures (CNVS)**

Construction hours	Mitigation measures where predicted vibration levels exceed maximum levels
<b>Approved hours</b> Monday – Friday: 7am – 6pm, Saturday: 8am to 6pm	LB, M, RO
<b>Evening</b> Monday – Friday: 6pm – 10pm; Saturday: 7am – 8am, 6pm – 10pm; Sunday / PH: 8am – 6pm	LB, M, IB, PC, RO, SN
<b>Night</b> Monday – Saturday: 10am – 7am Saturday: 10pm – 8am; Sunday / PH: 6pm – 7am	LB, M, IB, PC, RO, SN, AA



### 3 Impact assessment

#### 3.1 Modelling method

Predictions of noise impacts were performed using KNOWnoise™, a project-specific noise assessment tool developed by Hutchison Weller for the CTP Project. KNOWnoise calculates the maximum  $L_{Aeq,15\text{minute}}$  noise level for each identified receiver for each proposed activity using predictions from SoundPlan noise modelling software. Predictions include geometric spreading, air and ground absorptions as well as topographical and structural screening and reflection.

The following components were incorporated in the model:

- Topography – Based on terrain data of 1 m resolution.
- Individual sensitive receivers – Worst-affected façade of each building to 700 metres from the works
- Construction noise sources – Activities and equipment provided by AFJV were included in the noise model as individual sources across the nominated work areas for each activity. The maximum predicted  $L_{Aeq}$  noise level within each work area was identified for each receiver.
- Cumulative impacts – all activities with overlapping time periods are included in cumulative results
- Source height – construction noise sources assumed to be at 1.5 metres above ground level.
- Ground Absorption – Ground assumed to be mixed hard and soft with absorption factor of 0.5
- Meteorology – worst-case meteorological conditions (gentle breeze from source to receiver and stable conditions).
- Residential building structures are included in the model, meaning screening provided by neighboring houses is considered.
- Results are shown for all floors of assessed buildings with the worst-case façade result assumed for the whole floor.

Equipment proposed to be used for rock hammering activities have estimated sound power levels for each item in Appendix A. These works are in addition to the plan listed in the DNVIS Rev 4.

The sound power levels and ultimate predicted noise levels will depend on the number of plant items operating at any one time and their precise location relative to a sensitive receiver. In practice, the predicted levels will vary due to plant moving around the site and not operating intensively or concurrently for a 15 minute assessment period. Shielding and reflection provided by buildings will also vary as plant moves around the site. Therefore, predicted noise levels are conservative.



### 3.2 Predicted noise levels

Detailed predicted noise levels for each potentially affected receiver are presented Appendix C.

A summary of predicted noise levels for the Day period is presented in Table 10, with the worst-case predicted noise level of 82 dB(A) during the works, resulting in 21 receivers classed as highly noise affected.

With reference to the CNVS, 2 receivers are predicted to be classified as Highly Impacted during the Day period.

**Table 10 Summary of predicted noise levels with comparison against ICNG criteria for the Day period.**

Maximum cumulative predicted $L_{Aeq, 15 \text{ minute}}$ noise level		82 dB(A)
Number of highly noise affected receivers (>75 dB)		21
Impact class	Predicted noise level	Predicted number of receivers
Noticable	$0 \leq 10 \text{ dB above NML}$	96
Clearly Audible	$10 \leq 20 \text{ dB above NML}$	32
Moderately Intrusive	$20 \leq 30 \text{ dB above NML}$	2
Highly Intrusive	$> 30 \text{ dB above NML}$	0

Predicted impact classes for the Day period are illustrated graphically in Appendix B. Each identified receiver in the study area has been coloured to highlight the predicted level of impact.

### 3.3 Vibration

The CNVS requires attended vibration measurements at commencement of vibration generating activities to confirm vibration levels satisfy the criteria for that activity.

Where there is potential for exceedances of the criteria further vibration site law investigations would be undertaken to determine the site-specific safe working distances for that vibration generating activity. Continuous vibration monitoring with audible and visible alarms would be conducted at the nearest sensitive receivers whenever vibration generating activities need to take place inside the calculated safe-working distances.

Based on the proposed work locations and selected equipment, indicative exceedances of the vibration criteria are summarised in Table 12. The exceedances are based on recommended minimum working distances from vibration intensive plant given in Appendix D of the Construction Noise and Vibration Strategy (Transport for NSW 2019). Vibration impacts for each sensitive receiver are listed in Appendix C.

**Table 12 Predicted exceedances of vibration criteria**

Impact classification	Number of potentially affected receivers
Human comfort	16
Cosmetic damage	0
Heritage structure	0



### 4 Controls and safeguards

The Project represents a risk of adverse impacts on sensitive receivers, particularly when working close to the project boundary and outside approved hours.

Where short term noise impacts are unavoidable, mitigation measures described in the project construction environment management plan will be implemented together with the recommendations in Table 13 and additional mitigation measures for each receiver identified in Appendix B and summarised in table 14.

Community consultation	<ul style="list-style-type: none"> <li>Community consultation methods are outlined in section 7.1.5 of the DNVIS Rev 4</li> <li>Where practicable, works will be scheduled to not conflict with major student examination periods, church congregation times, and other sensitive periods identified through community consultation.</li> </ul>
Site induction	<ul style="list-style-type: none"> <li>All workers will be inducted to the project prior to commencing work and will be cognisant of their noise and vibration obligations under the CNVMP.</li> </ul>
Behavioural practices	<ul style="list-style-type: none"> <li>Avoid swearing and unnecessary shouting or loud radios onsite.</li> <li>Avoid dropping materials from height.</li> </ul>
Equipment selection	<ul style="list-style-type: none"> <li>Priority given to the use of quieter and less vibration emitting construction methods which are referred to in section 2.3 beneath the Table</li> <li>The noise levels of plant and equipment would meet the maximum noise requirements of the CNVS.</li> </ul>
Use and siting of plant	<ul style="list-style-type: none"> <li>Locate compounds away from sensitive receivers and discourage access from local roads.</li> <li>Plant used intermittently to be throttled down or shut down.</li> <li>Noise-emitting plant to be directed away from sensitive receivers where possible.</li> <li>Stationary plant should be located behind a structure or enclosed if practicable.</li> <li>Deliveries should be made as far as practical from sensitive receivers. Dedicated loading/unloading sites should be shielded where possible, if close to receivers.</li> <li>Plan traffic flow, parking and loading/unloading areas to minimise reversing.</li> <li>Avoid compression breaking on approach to the site.</li> <li>Where additional activities or plant may result in marginal noise increases and speed works up, consider concentrating activities at one location and complete works as quickly as possible.</li> </ul>
Non-tonal reversing alarms.	<ul style="list-style-type: none"> <li>Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work.</li> </ul>
Noise monitoring	<ul style="list-style-type: none"> <li>Monitoring should be completed to verify the assumptions of this CNVIS regarding estimated equipment noise emissions and to ensure compliance with the CNVS.</li> </ul>
Vibration monitoring	<ul style="list-style-type: none"> <li>Attended vibration measurements should be completed at commencement of vibration generating activities predicted to occur within safe working distances for cosmetic damage.</li> <li>Where monitoring demonstrates maximum levels exceeded, consider alternative methodologies/equipment</li> </ul>
<b>Implement any project specific mitigation measures</b>	
Respite periods will be followed for High Impact Noise Works in accordance with project NVMP.	



**Table 13 Standard mitigation measures**

Community consultation	<ul style="list-style-type: none"> <li>Potentially affected receivers will be notified of OOH works in accordance with project requirements.</li> <li>Where practicable, works will be scheduled to not conflict with major student examination periods, church congregation times, and other sensitive periods identified through community consultation.</li> </ul>
Site induction	<ul style="list-style-type: none"> <li>All workers will be inducted to the project prior to commencing work and will be cognisant of their noise and vibration obligations under the CNVMP.</li> </ul>
Behavioural practices	<ul style="list-style-type: none"> <li>Avoid swearing and unnecessary shouting or loud radios onsite.</li> <li>Avoid dropping materials from height.</li> </ul>
Equipment selection	<ul style="list-style-type: none"> <li>Priority given to the use of quieter and less vibration emitting construction methods and plant alternatives where feasible and reasonable.</li> <li>The noise levels of plant and equipment would meet the maximum noise requirements of the CNVS.</li> </ul>
Use and siting of plant	<ul style="list-style-type: none"> <li>Locate compounds away from sensitive receivers and discourage access from local roads.</li> <li>Plant used intermittently to be throttled down or shut down.</li> <li>Noise-emitting plant to be directed away from sensitive receivers where possible.</li> <li>Stationary plant should be located behind a structure or enclosed if practicable.</li> <li>Deliveries should be made as far as practical from sensitive receivers. Dedicated loading/unloading sites should be shielded where possible, if close to receivers.</li> <li>Plan traffic flow, parking and loading/unloading areas to minimise reversing.</li> <li>Avoid compression breaking on approach to the site.</li> <li>Where additional activities or plant may result in marginal noise increases and speed works up, consider concentrating activities at one location and complete works as quickly as possible.</li> </ul>
Non-tonal reversing alarms.	<ul style="list-style-type: none"> <li>Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work.</li> </ul>
Noise monitoring	<ul style="list-style-type: none"> <li>Monitoring should be completed to verify the assumptions of this CNVIS regarding estimated equipment noise emissions and to ensure compliance with the CNVS.</li> </ul>
Vibration monitoring	<ul style="list-style-type: none"> <li>Attended vibration measurements should be completed at commencement of vibration generating activities predicted to occur within safe working distances for cosmetic damage.</li> <li>Where monitoring demonstrates maximum levels exceeded, consider alternative methodologies/equipment</li> </ul>
<b>Implement any project specific mitigation measures</b>	
Respite periods will be followed for High Impact Noise Works in accordance with project NVMP.	

**Table 14 Additional mitigation measures**

Code	Measure	Description
AA	Alternative accommodation	Alternative accommodation options may be provided for residents living in close proximity to construction works that are likely to incur unreasonably high impacts over an extended period of time. Alternative accommodation will be determined on a case-by-case basis.
M	Monitoring	Where it has been identified that specific construction activities are likely to exceed the relevant noise or vibration goals, noise or vibration monitoring may be conducted at the affected receiver(s) or a nominated representative location (typically the nearest receiver where more than one receiver have been identified). 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.





## Detailed noise and vibration impact statement

Code	Measure	Description
IB	Individual briefings	Individual briefings 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.
LB	Letterbox drops	For each Sydney Metro project, a newsletter is produced and distributed to the local community via letterbox drop and the project mailing list. These newsletters provide an overview of current and upcoming works across the project and other topics of interest. The objective is to engage and 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. Content and newsletter length is determined on a project-by-project basis. Most projects distribute notifications on a monthly basis. Each newsletter is graphically designed within a branded template.
RO	Respite offer	The purpose of a project specific respite offer is to provide residents subjected to lengthy periods of noise or vibration respite from an ongoing impact.
PC	Phone calls	Phone calls and/or emails detailing relevant information would be made to identified/affected stakeholders within 7 days of proposed work. Phone calls and/or emails provide affected stakeholders with personalised contact and tailored advice, with the opportunity to provide comments on the proposed work and specific needs etc.
SN	Specific notifications	Specific notifications 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.



### Appendix A Proposed activities and associated sound power levels

#### North Hammering

hammering

24/08/2023 8:00 AM - 30/10/2023 6:00 PM

A reduction as been applied based on the depth of the station box excavation at approximately 11m and the additional hoarding that is approximately 4m above the top of the excavation

Equipment	Quantity	Usage	Reduction	SWL
Excavator 12 t (1000 kg Breaker)*	1	50 %	8	107
Excavator 30 t (2200 kg Breaker)*	1	50 %	8	115

**Activity Sound Power Level: 116**

\* includes 5 dB penalty for potentially annoying characteristics in line with the ICNG

#### Mid Hammering

hammering

24/08/2023 8:00 AM - 30/10/2023 6:00 PM

Equipment	Quantity	Usage	Reduction	SWL
Excavator 12 t (1000 kg Breaker)*	1	50 %	8	107
Excavator 30 t (2200 kg Breaker)*	1	50 %	8	115

**Activity Sound Power Level: 116**

\* includes 5 dB penalty for potentially annoying characteristics in line with the ICNG

## Appendix B Map showing predicted noise impacts by impact class





Appendix C Detailed predictions

C.1 Noise





Detailed noise and vibration impact statement

Assessment: Day Time - Detailed Excavation - Hammer Attachments					NML, LAeq, 15 minute				Sleep, LAmax		Predicted noise level, dBA		Exceedance summary										
NCA	Rec	Address	Flr	Land use	Day	O/day	Eve	Night	Screen	Awake	Cumulative LAeq, 15 minute	LMax	Highly Affected?	Exceed NML by (dB):				Exceed sleep disturbance by (dB):		Impact classification			
														Day	O/day	Eve	Night	Screen	Awake	Day	O/day	Eve	Night
NCA_10	5566 52	17 GEORGE ST, NORTH STRATHFIELD	1	EDU	55	55	55	55			61	64		6	6	6	6	-	6	Noticable	Noticable	Noticable	Noticable
NCA_10	5566 39	19-21 GEORGE ST, NORTH STRAT	3	RES	57	52	52	49			60	63		3	8	8	11	-	3	Noticable	Noticable	Noticable	Clearly Audible
NCA_10	5566 38	19-21 GEORGE ST, NORTH STRAT	2	RES	57	52	52	49			60	63		3	8	8	11	-	3	Noticable	Noticable	Noticable	Clearly Audible
NCA_10	5566 37	19-21 GEORGE ST, NORTH STRAT	1	RES	57	52	52	49			59	62		2	7	7	10	-	2	Noticable	Noticable	Noticable	Clearly Audible
NCA_10	5566 32	19-21 GEORGE ST, NORTH STRATHF	3	RES	57	52	52	49			62	65		5	10	10	13	-	5	Noticable	Noticable	Noticable	Clearly Audible
NCA_10	5566 31	19-21 GEORGE ST, NORTH STRATHF	2	RES	57	52	52	49			61	64		4	9	9	12	-	4	Noticable	Noticable	Noticable	Clearly Audible
NCA_10	5566 30	19-21 GEORGE ST, NORTH STRATHF	1	RES	57	52	52	49			60	64		3	8	8	11	-	3	Noticable	Noticable	Noticable	Clearly Audible
NCA_10	5566 25	2A HAMILTON ST, NORT	4	RES	57	52	52	49			60	63		3	8	8	11	-	3	Noticable	Noticable	Noticable	Clearly Audible
NCA_10	5566 24	2A HAMILTON ST, NORT	3	RES	57	52	52	49			60	63		3	8	8	11	-	3	Noticable	Noticable	Noticable	Clearly Audible
NCA_10	5566 23	2A HAMILTON ST, NORT	2	RES	57	52	52	49			60	63		3	8	8	11	-	3	Noticable	Noticable	Noticable	Clearly Audible
NCA_10	5566 22	2A HAMILTON ST, NORT	1	RES	57	52	52	49			59	62		2	7	7	10	-	2	Noticable	Noticable	Noticable	Clearly Audible
NCA_10	5566 02	17 GEORGE ST, NORTH STRATHFIELD	2	EDU	55	55	55	55			62	66		7	7	7	7	-	7	Noticable	Noticable	Noticable	Noticable
NCA_10	5566 01	17 GEORGE ST, NORTH STRATHFIELD	1	EDU	55	55	55	55			60	64		5	5	5	5	-	5	Noticable	Noticable	Noticable	Noticable
NCA_10	5565 92	19-21 GEORGE ST, NORTH STRATH	3	RES	57	52	52	49			58	60		1	6	6	9	-	1	Noticable	Noticable	Noticable	Noticable
NCA_10	5565 90	19-21 GEORGE ST, NORTH STRATH	1	RES	57	52	52	49			57	60		0	5	5	8	-	0	Noticable	Noticable	Noticable	Noticable
NCA_10	5565 83	9 MALTA ST, NORTH STRATHFIELD	1	RES	57	52	52	49			57	61		0	5	5	8	-	0	Noticable	Noticable	Noticable	Noticable
NCA_10	5565 46	19-21 GEORGE ST, NORTH STRATH	4	RES	57	52	52	49			67	71		10	15	15	18	-	10	Clearly Audible	Clearly Audible	Clearly Audible	Clearly Audible
NCA_10	5565 45	19-21 GEORGE ST, NORTH STRATH	3	RES	57	52	52	49			67	70		10	15	15	18	-	10	Noticable	Clearly Audible	Clearly Audible	Clearly Audible
NCA_10	5565 44	19-21 GEORGE ST, NORTH STRATH	2	RES	57	52	52	49			65	68		8	13	13	16	-	8	Noticable	Clearly Audible	Clearly Audible	Clearly Audible
NCA_10	5565 43	19-21 GEORGE ST, NORTH STRATH	1	RES	57	52	52	49			65	68		8	13	13	16	-	8	Noticable	Clearly Audible	Clearly Audible	Clearly Audible
NCA_10	5565 41	66 GEORGE ST, NORTH STRATHFIELD	1	RES	57	52	52	49			58	61		1	6	6	9	-	1	Noticable	Noticable	Noticable	Noticable
NCA_10	5565 37	88 GEORGE ST, NORTH STRATHFIELD	2	RES	57	52	52	49			57	62		0	5	5	8	-	0	Noticable	Noticable	Noticable	Noticable
NCA_10	5565 24	2G QUEEN ST, NORTH STRATHFIELD	2	IND	75	75	75	75			77	81	Y	2	2	2	2	-	2	Noticable	Noticable	Noticable	Noticable
NCA_10	5565 23	2G QUEEN ST, NORTH STRATHFIELD	1	IND	75	75	75	75			77	81	Y	2	2	2	2	-	2	Noticable	Noticable	Noticable	Noticable
NCA_10	5564 95	17 GEORGE ST, NORTH STRATHFIELD	4	EDU	55	55	55	55			64	65		9	9	9	9	-	9	Noticable	Noticable	Noticable	Noticable
NCA_10	5564 94	17 GEORGE ST, NORTH STRATHFIELD	3	EDU	55	55	55	55			60	62		5	5	5	5	-	5	Noticable	Noticable	Noticable	Noticable
NCA_10	5564 93	17 GEORGE ST, NORTH STRATHFIELD	2	EDU	55	55	55	55			57	60		2	2	2	2	-	2	Noticable	Noticable	Noticable	Noticable
NCA_10	5564 92	17 GEORGE ST, NORTH STRATHFIELD	1	EDU	55	55	55	55			56	58		1	1	1	1	-	1	Noticable	Noticable	Noticable	Noticable
NCA_10	5564 90	1A HAMILTON ST, NORTH STRATHFIELD	1	EDU	55	55	55	55			61	64		6	6	6	6	-	6	Noticable	Noticable	Noticable	Noticable
NCA_10	5564 85	19-21 GEORGE ST, NORTH STRAT	3	RES	57	52	52	49			62	65		5	10	10	13	-	5	Noticable	Noticable	Noticable	Clearly Audible
NCA_10	5564 84	19-21 GEORGE ST, NORTH STRAT	2	RES	57	52	52	49			62	65		5	10	10	13	-	5	Noticable	Noticable	Noticable	Clearly Audible
NCA_10	5564 83	19-21 GEORGE ST, NORTH STRAT	1	RES	57	52	52	49			62	65		5	10	10	13	-	5	Noticable	Clearly Audible	Clearly Audible	Clearly Audible
NCA_10	5564 79	17 GEORGE ST, NORTH STRATHFIELD	1	EDU	55	55	55	55			69	72		14	14	14	14	-	14	Clearly Audible	Clearly Audible	Clearly Audible	Clearly Audible
NCA_10	5564 68	5 MALTA ST, NORTH STRATHFIELD	1	RES	57	52	52	49			57	62		0	5	5	8	-	0	Noticable	Noticable	Noticable	Noticable



Detailed noise and vibration impact statement

NCA_10	5564 45	62 GEORGE ST, NORTH STRATHFIELD	1	RES	57	52	52	49			58	60		1	6	6	9	-	1	Noticable	Noticable	Noticable	Noticable
NCA_10	5564 40	1A HAMILTON ST, NORTH STRATHFIELD	2	EDU	55	55	55	55			66	69		11	11	11	11	-	11	Clearly Audible	Clearly Audible	Clearly Audible	Clearly Audible
NCA_10	5564 39	1A HAMILTON ST, NORTH STRATHFIELD	1	EDU	55	55	55	55			64	67		9	9	9	9	-	9	Noticable	Noticable	Noticable	Noticable
NCA_10	5564 32	90 GEORGE ST, NORTH STRATHFIELD	1	RES	57	52	52	49			58	62		1	6	6	9	-	1	Noticable	Noticable	Noticable	Noticable
NCA_10	5564 18	3 MALTA ST, NORTH STRATHFIELD	1	RES	57	52	52	49			59	63		2	7	7	10	-	2	Noticable	Noticable	Noticable	Noticable
NCA_10	5564 09	1A HAMILTON ST, NORTH STRATHFIELD	5	EDU	55	55	55	55			69	73		14	14	14	14	-	14	Clearly Audible	Clearly Audible	Clearly Audible	Clearly Audible
NCA_10	5564 08	1A HAMILTON ST, NORTH STRATHFIELD	4	EDU	55	55	55	55			68	72		13	13	13	13	-	13	Clearly Audible	Clearly Audible	Clearly Audible	Clearly Audible
NCA_10	5564 07	1A HAMILTON ST, NORTH STRATHFIELD	3	EDU	55	55	55	55			68	72		13	13	13	13	-	13	Clearly Audible	Clearly Audible	Clearly Audible	Clearly Audible
NCA_10	5564 06	1A HAMILTON ST, NORTH STRATHFIELD	2	EDU	55	55	55	55			67	71		12	12	12	12	-	12	Clearly Audible	Clearly Audible	Clearly Audible	Clearly Audible
NCA_10	5564 05	1A HAMILTON ST, NORTH STRATHFIELD	1	EDU	55	55	55	55			66	70		11	11	11	11	-	11	Clearly Audible	Clearly Audible	Clearly Audible	Clearly Audible
NCA_10	5564 03	2A HAMILTON ST, NORT	4	RES	57	52	52	49			63	67		6	11	11	14	-	6	Noticable	Clearly Audible	Clearly Audible	Clearly Audible
NCA_10	5564 02	2A HAMILTON ST, NORT	3	RES	57	52	52	49			63	66		6	11	11	14	-	6	Noticable	Clearly Audible	Clearly Audible	Clearly Audible
NCA_10	5564 01	2A HAMILTON ST, NORT	2	RES	57	52	52	49			62	66		5	10	10	13	-	5	Noticable	Clearly Audible	Clearly Audible	Clearly Audible
NCA_10	5564 00	2A HAMILTON ST, NORT	1	RES	57	52	52	49			62	66		5	10	10	13	-	5	Noticable	Noticable	Noticable	Clearly Audible
NCA_10	5563 99	72 GEORGE ST, NORTH STRATHFIELD	1	RES	57	52	52	49			60	64		3	8	8	11	-	3	Noticable	Noticable	Noticable	Clearly Audible
NCA_10	5563 94	2A HAMILTON ST, NORT	4	RES	57	52	52	49			59	62		2	7	7	10	-	2	Noticable	Noticable	Noticable	Noticable
NCA_10	5563 93	2A HAMILTON ST, NORT	3	RES	57	52	52	49			59	61		2	7	7	10	-	2	Noticable	Noticable	Noticable	Noticable
NCA_10	5563 92	2A HAMILTON ST, NORT	2	RES	57	52	52	49			58	61		1	6	6	9	-	1	Noticable	Noticable	Noticable	Noticable
NCA_10	5563 91	2A HAMILTON ST, NORT	1	RES	57	52	52	49			58	61		1	6	6	9	-	1	Noticable	Noticable	Noticable	Noticable
NCA_10	5563 88	17 GEORGE ST, NORTH STRATHFIELD	2	EDU	55	55	55	55			66	69		11	11	11	11	-	11	Clearly Audible	Clearly Audible	Clearly Audible	Clearly Audible
NCA_10	5563 87	17 GEORGE ST, NORTH STRATHFIELD	1	EDU	55	55	55	55			64	67		9	9	9	9	-	9	Noticable	Noticable	Noticable	Noticable
NCA_10	5563 79	64 GEORGE ST, NORTH STRATHFIELD	1	RES	57	52	52	49			58	59		1	6	6	9	-	1	Noticable	Noticable	Noticable	Noticable
NCA_10	5563 61	7 MALTA ST, NORTH STRATHFIELD	1	RES	57	52	52	49			58	61		1	6	6	9	-	1	Noticable	Noticable	Noticable	Noticable
NCA_10	5563 42	68 GEORGE ST, NORTH STRATHFIELD	1	RES	57	52	52	49			57	61		0	5	5	8	-	0	Noticable	Noticable	Noticable	Noticable
NCA_10	5563 37	1A HAMILTON ST, NORTH STRATHFIELD	3	EDU	55	55	55	55			62	65		7	7	7	7	-	7	Noticable	Noticable	Noticable	Noticable
NCA_10	5563 36	1A HAMILTON ST, NORTH STRATHFIELD	2	EDU	55	55	55	55			61	64		6	6	6	6	-	6	Noticable	Noticable	Noticable	Noticable
NCA_10	5563 35	1A HAMILTON ST, NORTH STRATHFIELD	1	EDU	55	55	55	55			60	62		5	5	5	5	-	5	Noticable	Noticable	Noticable	Noticable
NCA_10	5563 26	2A HAMILTON ST, NORT	2	RES	57	52	52	49			57	60		0	5	5	8	-	0	Noticable	Noticable	Noticable	Noticable
NCA_10	5563 18	17 GEORGE ST, NORTH STRATHFIELD	2	EDU	55	55	55	55			70	72		15	15	15	15	-	15	Clearly Audible	Clearly Audible	Clearly Audible	Clearly Audible
NCA_10	5563 17	17 GEORGE ST, NORTH STRATHFIELD	1	EDU	55	55	55	55			69	71		14	14	14	14	-	14	Clearly Audible	Clearly Audible	Clearly Audible	Clearly Audible
NCA_10	5563 03	17 GEORGE ST, NORTH STRATHFIELD	5	RES	55	55	55	55			67	68		12	12	12	12	-	12	Clearly Audible	Clearly Audible	Clearly Audible	Clearly Audible
NCA_10	5563 02	17 GEORGE ST, NORTH STRATHFIELD	4	RES	55	55	55	55			67	69		12	12	12	12	-	12	Clearly Audible	Clearly Audible	Clearly Audible	Clearly Audible
NCA_10	5563 01	17 GEORGE ST, NORTH STRATHFIELD	3	RES	55	55	55	55			63	67		8	8	8	8	-	8	Noticable	Noticable	Noticable	Noticable
NCA_10	5563 00	17 GEORGE ST, NORTH STRATHFIELD	2	RES	55	55	55	55			62	66		7	7	7	7	-	7	Noticable	Noticable	Noticable	Noticable
NCA_10	5562 99	17 GEORGE ST, NORTH STRATHFIELD	1	RES	55	55	55	55			61	66		6	6	6	6	-	6	Noticable	Noticable	Noticable	Noticable
NCA_10	5562 84	4 HAMILTON ST, NORTH STRATHFIELD	1	RES	57	52	52	49			57	60		0	5	5	8	-	0	Noticable	Noticable	Noticable	Noticable





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NCA_10	5562 80	92 GEORGE ST, NORTH STRATHFIELD	1	RES	57	52	52	49			57	61		0	5	5	8	-	0	Noticable	Noticable	Noticable	Noticable
NCA_10	5562 78	70 GEORGE ST, NORTH STRATHFIELD	1	RES	57	52	52	49			58	62		1	6	6	9	-	1	Noticable	Noticable	Noticable	Noticable
NCA_10	5562 74	17 GEORGE ST, NORTH STRATHFIELD	3	EDU	55	55	55	55			71	74		16	16	16	16	-	16	Clearly Audible	Clearly Audible	Clearly Audible	Clearly Audible
NCA_10	5562 73	17 GEORGE ST, NORTH STRATHFIELD	2	EDU	55	55	55	55			71	73		16	16	16	16	-	16	Clearly Audible	Clearly Audible	Clearly Audible	Clearly Audible
NCA_10	5562 72	17 GEORGE ST, NORTH STRATHFIELD	1	EDU	55	55	55	55			69	71		14	14	14	14	-	14	Clearly Audible	Clearly Audible	Clearly Audible	Clearly Audible
NCA_11	5560 27	101 QUEEN ST, NORTH STRATHFIELD	2	COM	70	70	70	70			81	85	Y	11	11	11	11	-	11	Clearly Audible	Clearly Audible	Clearly Audible	Clearly Audible
NCA_11	5560 26	101 QUEEN ST, NORTH STRATHFIELD	1	COM	70	70	70	70			81	85	Y	11	11	11	11	-	11	Clearly Audible	Clearly Audible	Clearly Audible	Clearly Audible
NCA_11	5559 50	69 QUEEN ST, NORTH STRATHFIELD	1	RES	61	56	52	44			64	68		3	8	12	20	-	3	Noticable	Noticable	Clearly Audible	Clearly Audible
NCA_11	5559 47	25 BERONGA ST, NORTH STRATHFIELD	1	RES	61	56	52	44			67	71		6	11	15	23	-	6	Noticable	Clearly Audible	Clearly Audible	Moderately Intrusive
NCA_11	5558 95	125 QUEEN ST, NORTH STRATHFIELD	1	RES	61	56	52	44			79	83	Y	18	23	27	35	-	18	Clearly Audible	Moderately Intrusive	Moderately Intrusive	Highly Intrusive
NCA_11	5558 78	21 BERONGA ST, NORTH STRATHFIELD	1	RES	61	56	52	44			64	68		3	8	12	20	-	3	Noticable	Noticable	Clearly Audible	Moderately Intrusive
NCA_11	5558 57	59 QUEEN ST, NORTH STRATHFIELD	2	RES	61	56	52	44			64	67		3	8	12	20	-	3	Noticable	Noticable	Clearly Audible	Clearly Audible
NCA_11	5558 56	59 QUEEN ST, NORTH STRATHFIELD	1	RES	61	56	52	44			64	67		3	8	12	20	-	3	Noticable	Noticable	Clearly Audible	Clearly Audible
NCA_11	5558 23	113 QUEEN ST, NORTH STRATHFIELD	1	COM	70	70	70	70			70	75		0	0	0	0	-	0	Noticable	Noticable	Noticable	Noticable
NCA_11	5558 08	57 QUEEN ST, NORTH STRATHFIELD	1	RES	61	56	52	44			62	65		1	6	10	18	-	1	Noticable	Noticable	Clearly Audible	Clearly Audible
NCA_11	5557 66	123 QUEEN ST, NORTH STRATHFIELD	2	RES	61	56	52	44			79	83	Y	18	23	27	35	-	18	Clearly Audible	Moderately Intrusive	Moderately Intrusive	Highly Intrusive
NCA_11	5557 65	123 QUEEN ST, NORTH STRATHFIELD	1	RES	61	56	52	44			78	83	Y	17	22	26	34	-	17	Clearly Audible	Moderately Intrusive	Moderately Intrusive	Highly Intrusive
NCA_11	5557 51	131 QUEEN ST, NORTH STRATHFIELD	1	RES	61	56	52	44			72	76		11	16	20	28	-	11	Clearly Audible	Clearly Audible	Clearly Audible	Moderately Intrusive
NCA_11	5557 33	15 WARATAH ST, NORTH STRATHFIELD	1	RES	61	56	52	44			65	69		4	9	13	21	-	4	Noticable	Noticable	Clearly Audible	Moderately Intrusive
NCA_11	5557 32	23 BERONGA ST, NORTH STRATHFIELD	1	RES	61	56	52	44			66	69		5	10	14	22	-	5	Noticable	Noticable	Clearly Audible	Moderately Intrusive
NCA_11	5556 67	135 QUEEN ST, NORTH STRATHFIELD	1	RES	61	56	52	44			62	66		1	6	10	18	-	1	Noticable	Noticable	Clearly Audible	Clearly Audible
NCA_11	5556 62	13 WARATAH ST, NORTH STRATHFIELD	2	RES	61	56	52	44			65	69		4	9	13	21	-	4	Noticable	Noticable	Clearly Audible	Moderately Intrusive
NCA_11	5556 61	13 WARATAH ST, NORTH STRATHFIELD	1	RES	61	56	52	44			61	65		0	5	9	17	-	0	Noticable	Noticable	Noticable	Clearly Audible
NCA_11	5556 01	16 BERONGA ST, NORTH STRATHFIELD	1	RES	61	56	52	44			63	64		2	7	11	19	-	2	Noticable	Noticable	Clearly Audible	Clearly Audible
NCA_11	5555 99	93 QUEEN ST, NORTH STRATHFIELD	2	RES	61	56	52	44			76	81	Y	15	20	24	32	-	15	Clearly Audible	Moderately Intrusive	Moderately Intrusive	Highly Intrusive
NCA_11	5555 98	93 QUEEN ST, NORTH STRATHFIELD	1	COM	70	70	70	70			75	79		5	5	5	5	-	5	Noticable	Noticable	Noticable	Noticable
NCA_11	5555 76	101 QUEEN ST, NORTH STRATHFIELD	2	RES	61	56	52	44			82	87	Y	21	26	30	38	-	21	Moderately Intrusive	Moderately Intrusive	Highly Intrusive	Highly Intrusive
NCA_11	5555 75	101 QUEEN ST, NORTH STRATHFIELD	1	COM	70	70	70	70			82	87	Y	12	12	12	12	-	12	Clearly Audible	Clearly Audible	Clearly Audible	Clearly Audible
NCA_11	5555 37	18 BERONGA ST, NORTH STRATHFIELD	1	RES	61	56	52	44			66	70		5	10	14	22	-	5	Noticable	Noticable	Clearly Audible	Moderately Intrusive
NCA_11	5555 04	17 WARATAH ST, NORTH STRATHFIELD	1	RES	61	56	52	44			67	72		6	11	15	23	-	6	Noticable	Clearly Audible	Clearly Audible	Moderately Intrusive
NCA_11	5554 80	107 QUEEN ST, NORTH STRATHFIELD	1	COM	70	70	70	70			82	87	Y	12	12	12	12	-	12	Clearly Audible	Clearly Audible	Clearly Audible	Clearly Audible
NCA_11	5554 76	27 SHIPLEY AV, NORTH STRATHFIELD	2	RES	61	56	52	44			62	66		1	6	10	18	-	1	Noticable	Noticable	Noticable	Clearly Audible
NCA_11	5554 73	109 WELLBANK ST, NORTH STRATHFIELD	1	RES	61	56	52	44			62	67		1	6	10	18	-	1	Noticable	Noticable	Clearly Audible	Clearly Audible
NCA_11	5554 72	93 QUEEN ST, NORTH STRATHFIELD	2	RES	61	56	52	44			78	82	Y	17	22	26	34	-	17	Clearly Audible	Moderately Intrusive	Moderately Intrusive	Highly Intrusive
NCA_11	5554 71	93 QUEEN ST, NORTH STRATHFIELD	1	PoW	55	55	55	55			76	80	Y	21	21	21	21	-	21	Moderately Intrusive	Moderately Intrusive	Moderately Intrusive	Moderately Intrusive
NCA_11	5554 45	67 QUEEN ST, NORTH STRATHFIELD	2	RES	61	56	52	44			64	68		3	8	12	20	-	3	Noticable	Noticable	Clearly Audible	Moderately Intrusive



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NCA_11	5554 44	67 QUEEN ST, NORTH STRATHFIELD	1	RES	61	56	52	44			64	67		3	8	12	20	-	3	Noticable	Noticable	Clearly Audible	Clearly Audible
NCA_11	5554 42	117 QUEEN ST, NORTH STRATHFIELD	3	COM	70	70	70	70			77	81	Y	7	7	7	7	-	7	Noticable	Noticable	Noticable	Noticable
NCA_11	5554 41	117 QUEEN ST, NORTH STRATHFIELD	2	COM	70	70	70	70			77	81	Y	7	7	7	7	-	7	Noticable	Noticable	Noticable	Noticable
NCA_11	5554 40	117 QUEEN ST, NORTH STRATHFIELD	1	COM	70	70	70	70			76	79	Y	6	6	6	6	-	6	Noticable	Noticable	Noticable	Noticable
NCA_11	5554 26	27 BERONGA ST, NORTH STRATHFIELD	2	RES	61	56	52	44			68	71		7	12	16	24	-	7	Noticable	Clearly Audible	Clearly Audible	Moderately Intrusive
NCA_11	5554 25	27 BERONGA ST, NORTH STRATHFIELD	1	RES	61	56	52	44			67	70		6	11	15	23	-	6	Noticable	Clearly Audible	Clearly Audible	Moderately Intrusive
NCA_11	5554 24	85 QUEEN ST, NORTH STRATHFIELD	2	COM	70	70	70	70			73	77		3	3	3	3	-	3	Noticable	Noticable	Noticable	Noticable
NCA_11	5554 23	85 QUEEN ST, NORTH STRATHFIELD	1	COM	70	70	70	70			71	75		1	1	1	1	-	1	Noticable	Noticable	Noticable	Noticable
NCA_11	5554 01	135 QUEEN ST, NORTH STRATHFIELD	1	RES	61	56	52	44			62	65		1	6	10	18	-	1	Noticable	Noticable	Noticable	Clearly Audible
NCA_11	5553 47	65 QUEEN ST, NORTH STRATHFIELD	1	RES	61	56	52	44			64	67		3	8	12	20	-	3	Noticable	Noticable	Clearly Audible	Clearly Audible
NCA_11	5553 46	11 WARATAH ST, NORTH STRATHFIELD	1	RES	61	56	52	44			62	66		1	6	10	18	-	1	Noticable	Noticable	Clearly Audible	Clearly Audible
NCA_11	5553 41	19 BERONGA ST, NORTH STRATHFIELD	1	RES	61	56	52	44			63	67		2	7	11	19	-	2	Noticable	Noticable	Clearly Audible	Clearly Audible
NCA_11	5553 17	111 QUEEN ST, NORTH STRATHFIELD	1	COM	70	70	70	70			80	84	Y	10	10	10	10	-	10	Noticable	Noticable	Noticable	Noticable
NCA_11	5553 11	133 QUEEN ST, NORTH STRATHFIELD	1	RES	61	56	52	44			63	66		2	7	11	19	-	2	Noticable	Noticable	Clearly Audible	Clearly Audible
NCA_11	5553 09	28 WARATAH ST, NORTH STRATHFIELD	1	RES	61	56	52	44			67	71		6	11	15	23	-	6	Noticable	Clearly Audible	Clearly Audible	Moderately Intrusive
NCA_11	5552 93	121 QUEEN ST, NORTH STRATHFIELD	1	RES	61	56	52	44			75	79		14	19	23	31	-	14	Clearly Audible	Clearly Audible	Moderately Intrusive	Highly Intrusive
NCA_11	5552 74	16 BERONGA ST, NORTH STRATHFIELD	1	RES	61	56	52	44			64	69		3	8	12	20	-	3	Noticable	Noticable	Clearly Audible	Moderately Intrusive
NCA_11	5552 63	95 QUEEN ST, NORTH STRATHFIELD	2	RES	61	56	52	44			79	83	Y	18	23	27	35	-	18	Clearly Audible	Moderately Intrusive	Moderately Intrusive	Highly Intrusive
NCA_11	5552 62	95 QUEEN ST, NORTH STRATHFIELD	1	COM	70	70	70	70			78	82	Y	8	8	8	8	-	8	Noticable	Noticable	Noticable	Noticable
NCA_11	5552 59	109 QUEEN ST, NORTH STRATHFIELD	2	COM	70	70	70	70			81	85	Y	11	11	11	11	-	11	Clearly Audible	Clearly Audible	Clearly Audible	Clearly Audible
NCA_11	5552 58	109 QUEEN ST, NORTH STRATHFIELD	1	COM	70	70	70	70			81	85	Y	11	11	11	11	-	11	Clearly Audible	Clearly Audible	Clearly Audible	Clearly Audible
NCA_11	5552 57	129 QUEEN ST, NORTH STRATHFIELD	1	RES	61	56	52	44			74	78		13	18	22	30	-	13	Clearly Audible	Clearly Audible	Moderately Intrusive	Moderately Intrusive
NCA_11	5552 40	87 QUEEN ST, NORTH STRATHFIELD	2	RES	61	56	52	44			74	78		13	18	22	30	-	13	Clearly Audible	Clearly Audible	Moderately Intrusive	Moderately Intrusive
NCA_11	5552 39	87 QUEEN ST, NORTH STRATHFIELD	1	COM	70	70	70	70			73	77		3	3	3	3	-	3	Noticable	Noticable	Noticable	Noticable



## Detailed noise and vibration impact statement

### C.2 Vibration

NCA	Receiver	Address	Land use	Vibration Impact
NCA_10	556274	17 GEORGE ST, NORTH STRATHFIELD	EDU	Human Comfort
NCA_10	556273	17 GEORGE ST, NORTH STRATHFIELD	EDU	Human Comfort
NCA_10	556272	17 GEORGE ST, NORTH STRATHFIELD	EDU	Human Comfort
NCA_11	555997	20 BERONGA ST, NORTH STRATHFIELD	RES	Human Comfort
NCA_11	555947	25 BERONGA ST, NORTH STRATHFIELD	RES	Human Comfort
NCA_11	555895	125 QUEEN ST, NORTH STRATHFIELD	RES	Human Comfort
NCA_11	555766	123 QUEEN ST, NORTH STRATHFIELD	RES	Human Comfort
NCA_11	555765	123 QUEEN ST, NORTH STRATHFIELD	RES	Human Comfort
NCA_11	555751	131 QUEEN ST, NORTH STRATHFIELD	RES	Human Comfort
NCA_11	555442	117 QUEEN ST, NORTH STRATHFIELD	COM	Human Comfort
NCA_11	555441	117 QUEEN ST, NORTH STRATHFIELD	COM	Human Comfort
NCA_11	555440	117 QUEEN ST, NORTH STRATHFIELD	COM	Human Comfort
NCA_11	555426	27 BERONGA ST, NORTH STRATHFIELD	RES	Human Comfort
NCA_11	555425	27 BERONGA ST, NORTH STRATHFIELD	RES	Human Comfort
NCA_11	555293	121 QUEEN ST, NORTH STRATHFIELD	RES	Human Comfort
NCA_11	555257	129 QUEEN ST, NORTH STRATHFIELD	RES	Human Comfort



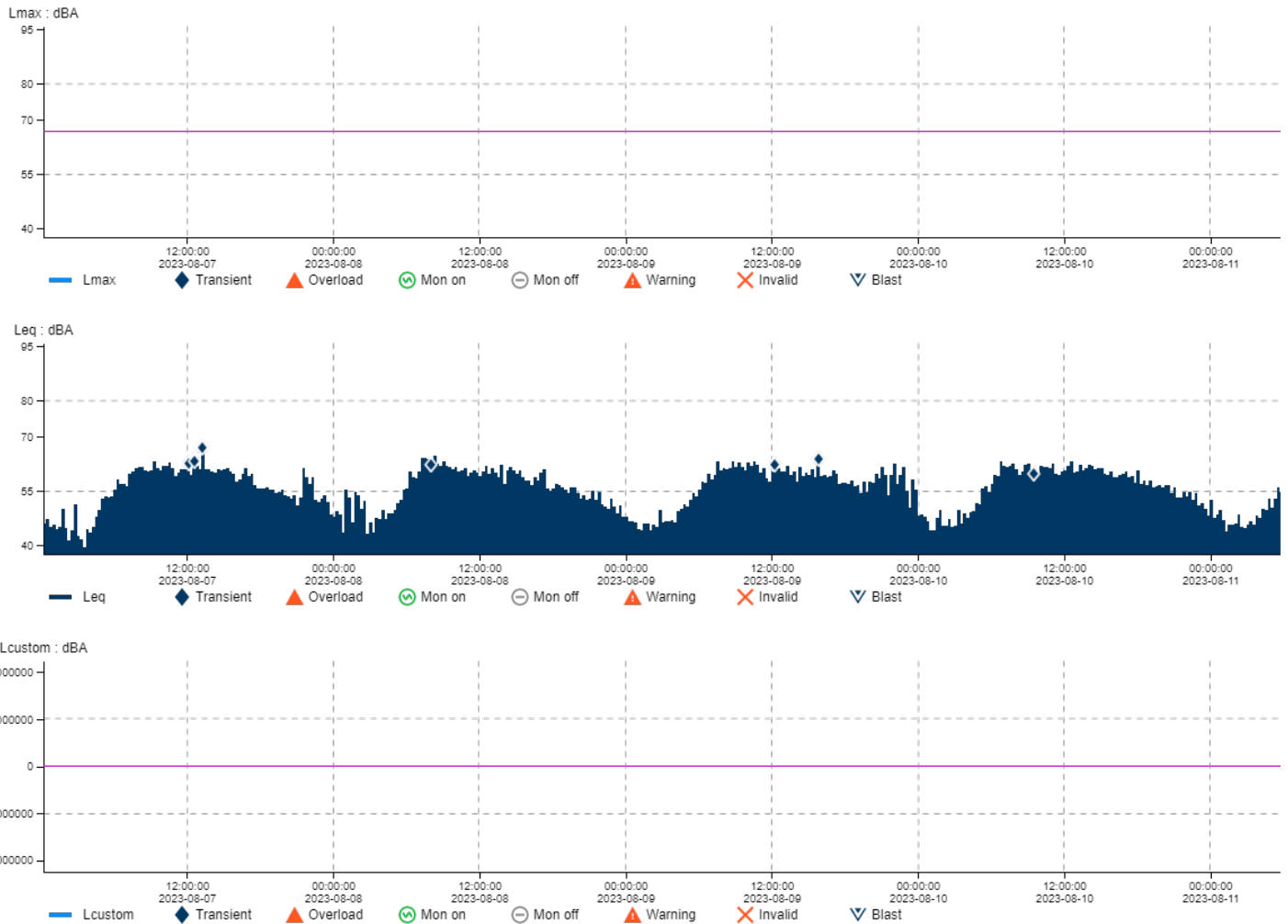
## Detailed noise and vibration impact statement

### **Appendix D Unattended Noise Monitoring Data – North Strathfield Monitor**

The below data are representative samples of noise impacts from daytime station box excavation work occurring at the North Strathfield site.

Project NST  
Project maintainer -  
Time frame 2023-08-07 00:13 - 2023-08-11 05:45 (Australia/Sydney)

NST Hire S50, NST Sound hire, S50, Serial number: 10785, Calibrated: 2022-05-22, true



X-span 2023-08-07 00:13 - 2023-08-11 05:45

Y-span Lmax, Leq : dBA: 37.62 - 95.98, Lcustom : dBA: 9007199254740991 - -9007199254740991

	Lmax	Leq	Lcustom
Max	92.1 dBA	67.4 dBA	
Date	2023-08-09	2023-08-07	-
Time	16:00:00	13:30:00	-
Hz			

## ACOUSTICS ADVISOR ENDORSEMENT SYDNEY METRO WEST (SSI 10038)

<b>Review of:</b>	<b>Central Tunnelling Package:</b> DNVIS Addendum for North Strathfield	<b>Reviewed document reference:</b>	SMW – CTP_North Strathfield – Day Time – Detailed Excavation – rock Hammering Rev4.pdf (KNOWnoise assessment received via email 27/08/2023)
<b>Prepared by:</b>	Larry Clark, Alternate Acoustics Advisor		Assessment Date: 23/08/2023
<b>Date of issue:</b>	27 August 2023		

As approved alternate Acoustics Advisor (AA) for the Sydney Metro West project, I reviewed and provided comments on previous versions of AFJV's Detailed Noise and Vibration Impact Assessment (DNVIS) Addendum: SMW – CTP\_North Strathfield – Day Time – Detailed Excavation – rock Hammering Rev4.pdf (KNOWnoise assessment received via email 27/08/2023).

I am satisfied that my comments have been adequately addressed and I endorse Rev 4 of the DNVIS Addendum for North Strathfield Station for implementation, as per Condition of Approval A36(e).



Larry Clark, Metro West Alternate Acoustics Advisor