Construction Noise and Vibration Management Plan – C2B

Line Wide Works Contract Sydney Metro City & Southwest

Project number:	C600
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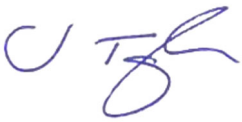
Revision:	6

Document Approval

	Environment Manager	Project Director
Signature:		
26/06/2025	Mikaela Malcolm	Justin Taylor

Details of Revision Amendments

Document Control

The Project Director is responsible for ensuring that this plan is reviewed and approved. The Project Environment and Sustainability Manager is responsible for updating this plan to reflect changes to legal and other requirements, as required.

Amendments

Any revisions or amendments must be approved by the Project Director and/or client before being distributed / implemented.

Revision Details

Revision	Date	Prepared by	Details
A	19/11/2019	T. Gowen	Drafted by Renzo Tonin & Associates. Issued for review. This version of this Sub-Plan addresses compliance requirements under SSI 7400 and SSI 8256 Planning Approval as per Sydney Metro Staging report.
B	17/01/2020	T. Gowen	Updated to address comments from Sydney Metro, ER, AA and stakeholder consultation.
0	20/02/2020	A Taylor	Updated to address comments from DPE - For Approval
1	30/10/2020	K Truscott	Scheduled review Updates to Section 2.2 Compliance Requirements, Table 7 Indicative Construction Activities Program and Table 8 Construction Hours
2	30/09/2021	K Truscott	Scheduled review Updates to 4.2 Construction Hours, 4.3 Respite for Noise Intensive Activities, 4.4 Out of Hours Deliveries, Element 4, OOHW Procedure
3	12/08/2022	K Truscott	Scheduled review Updates to Table 1 - Description of works for Portion 3, Table 7 - Indicative Construction Activities Program Section 4.2 Construction Hours, Element 4 Project Specific Requirements, CSSI 7400 Condition E36, OOHW procedure
4	02/06/2023	N Nasser	Scheduled review
5	20/09/2023	T McCormick	Updated to address comments Sydney Metro, ER and AA Update to Section 3.7.2 - acronym amended Update to Table 7 - program timeframes updated and inclusion dynamic train testing Update to Element 3 – 3.2 – requirement to report NCRs
6	26/06/2024	M Malcolm	Updated to reflect the completion of Portions 2 and 3, and the limited scope remaining of Portion 4 will not require the noise and vibration monitoring program.

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CNVMP COMPLIANCE MATRIX

Construction Environmental Management Framework – City & Southwest (Sydney Metro 2017)		
Condition	**Requirement**	**Reference**
3.4 a	Subject to Section 3.3(b) and Section 3.2(b) the Principal Contractor will prepare issue-specific environmental sub plans to the CEMP and SMP which will address each of the relevant environmental impacts at a particular site or stage of the project. Issue specific sub plans will include: (iv) Noise and vibration management	This plan
9.2 a	Principal Contractors will develop and implement a Construction Noise and Vibration Management Plan for their scope of works consistent with the Interim Construction Noise Guidelines (Department of Environment and Climate Change, 2009). The Construction Noise and Vibration Management Plan will include as a minimum:	This plan
(i)	Identification of work areas, site compounds and access points;	Appendix B
(ii)	Identification of sensitive receivers and relevant construction noise and vibration goals;	Section 5 and Section 6
(iii)	Be consistent with, and include the requirements of the noise and vibration mitigation measures as detailed in, the environmental approval documentation and the Sydney Metro Construction Noise and Vibration Strategy (CNVS);	Section 2.4 and Section 7
(iv)	Details of construction activities and an indicative schedule for construction works, including the identification of key noise and/or vibration generating construction activities (based on representative construction scenarios) that have the potential to generate noise or vibration impacts on surrounding sensitive receivers, in particular residential areas;	Section 1.3, Section 4.1 and Appendix B
(v)	Identification of feasible and reasonable procedures and mitigation measures to ensure relevant vibrations and blasting criteria are achieved, including a suitable blast program;	Section 6.3.3 (Blasting is not currently proposed)
(vi)	Community consultation requirements and Community notification provisions specifically in relation to blasting;	Section 6.3.3 (Blasting is not currently proposed)
(vii)	The requirements of any applicable EPL conditions;	Section 2.2
(viii)	Additional requirements in relation to activities undertaken 24 hours of the day, 7 days per week;	Section 4.2.1
(ix)	Pre-construction compliance requirements and hold points;	Section 6.3
(x)	The responsibilities of key project personnel with respect to the implementation of the plan;	Section 3 and Part B
(xi)	Noise monitoring requirements;	Section 8 and Appendix F
(xii)	Compliance record generation and management; and	Section 2 and Part B Element 2:
(xiii)	An Out of Hours Works Protocol applicable to all construction methods and sites.	Section 1.4 and Section 6.3.4

All construction works associated with CSSI 7400 have now been completed and are not triggered under this sub-plan.

<table>
<tr><th colspan="3">Planning Approval SSI-7400</th></tr>
<tr><th>Condition</th><th>Requirement</th><th>Reference</th></tr>
<tr><td>C3</td><td>The following CEMP sub-plans must be prepared in consultation with relevant government agencies identified for each CEMP sub-plan can be consistent with the CEMF and CEMP referred to in Condition C1.
(a) Noise and vibration</td><td>This Plan</td></tr>
<tr><td>C4</td><td>The CEMP sub-plans must state how:</td><td></td></tr>
<tr><td>(a)</td><td>The environmental performance outcomes identified in the EIS as amended by the documents listed in A1 will be achieved;</td><td>Part B Element 4</td></tr>
<tr><td>(b)</td><td>The mitigation measures identified in the EIS as amended by documents listed in A1 will be implemented;</td><td>Section 7</td></tr>
<tr><td>(c)</td><td>The relevant terms of this approval will be complied with; and</td><td>Part B: Element 4</td></tr>
<tr><td>(d)</td><td>The issues requiring management during construction, as identified through ongoing environmental risk analysis, will be managed.</td><td>Section 7.5</td></tr>
<tr><td>C5</td><td>The CEMP sub-plans must be developed in consultation with relevant government agencies. Where an agency(ies) request(s) is not included, the Proponent must provide the Secretary justification as to why. Details of all information requested by an agency to be included in a CEMP sub-plan as a result of consultation and copies of all correspondence from those agencies, must be provided with the relevant CEMP sub-plan.</td><td>Section 1.5 and Appendix G</td></tr>
<tr><td>C6</td><td>Any of the CEMP Sub-plans may be submitted along with, or subsequent to, the submission of the CEMP but in any event, no later than one (1) month before Construction</td><td>Section 1.1</td></tr>
<tr><td>C8</td><td>Construction must not commence until the CEMP and all CEMP sub-plans have been approved by the Secretary. The CEMP and CEMP sub-plans, as approved by the Secretary, including any minor amendments approved by the ER, must be implemented for the duration of construction. Where the CSSI is being staged, construction of that stage is not to commence until the relevant CEMP and sub-plans have been approved by the Secretary.</td><td>Section 1.1</td></tr>
<tr><td>C9</td><td>The following Construction Monitoring Programs must be prepared in consultation with the relevant government agencies identified for each to compare actual performance of Construction of the CSSI against the predicted performance.
<table>
<tr><th></th><th>Required Construction Monitoring Programs</th><th>Relevant government agencies to be consulted for each Construction Monitoring Program</th></tr>
<tr><td>(a)</td><td>Noise and Vibration</td><td>EPA and Relevant Council(s)</td></tr>
</table></td><td>Section 8 and Appendix F
Section 1.5 and Appendix G</td></tr>
<tr><td>C17</td><td>Where a relevant CEMP sub-plan exists, the relevant Construction Monitoring Program may be incorporated into that CEMP sub-plan.</td><td>Section 8</td></tr>
<tr><td>E29</td><td>Owners of properties at risk of exceeding the screening criteria for cosmetic damage must be notified before construction that generates vibration commences in the vicinity of those properties. The management of construction works in the vicinity of properties at risk of exceeding the</td><td>Section 5.5, Section 6.3 and Section 7.3</td></tr>
</table>

	screening criteria for cosmetic damage must be considered in the **Noise and Vibration management sub plan** required by Condition C3.	

<table>
<tr><th colspan="3">Planning Approval SSI-8256</th></tr>
<tr><th>Condition</th><th>Requirement</th><th>Reference</th></tr>
<tr><td>C3</td><td>The CEMP Sub-plans must be prepared in consultation with the relevant government agencies identified for each CEMP Sub-plan and be consistent with the CEMF and CEMP referred to in Condition C1:
(a) Noise and vibration – Relevant Councils</td><td>Section 1.5 and Appendix G</td></tr>
<tr><td>C4</td><td>The CEMP sub-plans must be prepared in accordance with the CEMF.</td><td>Section 1.1</td></tr>
<tr><td>C5</td><td>Details of all information requested by an agency to be included in a CEMP Sub-plan as a result of consultation, including copies of all correspondence from those agencies, must be provided with the relevant CEMP Sub-plan.</td><td>Section 1.5 and Appendix G</td></tr>
<tr><td>C8</td><td>The following Construction Monitoring Programs must be prepared in consultation with the relevant government agencies identified for each to compare actual performance of Construction of the CSSI against the predicted performance
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<tr><th></th><th>Required Construction Monitoring Programs</th><th>Relevant government agencies to be consulted for each Construction Monitoring Program</th></tr>
<tr><td>(a)</td><td>Noise and Vibration</td><td>Relevant Council(s)</td></tr>
</table></td><td>Section 8 and Appendix F
Section 1.5 and Appendix G</td></tr>
<tr><td>C15</td><td>Where a relevant CEMP Sub-plan exists, the relevant Construction Monitoring Program may be incorporated into that CEMP Sub-plan.</td><td>Section 8 and Appendix F</td></tr>
</table>

Glossary / Abbreviations

Term	Definition
ABL	Assessment Background Level, is the single figure background level representing each assessment period – day, evening and night – over each 24 hour period of monitoring. Determination of the ABL is by the tenth percentile method as prescribed in EPA policies.
Acoustic Barrier	Solid walls or partitions, solid fences, earth mounds, earth berms, buildings, etc. used to reduce noise, without eliminating it.
Adverse weather	Weather effects that enhance noise (wind and temperature inversions) that occur at a site for a significant period of time (wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of nights in winter).
Airborne noise	This refers to noise which is fundamentally transmitted by way of the air and can be attenuated by the use of barriers and walls placed physically between the noise and receiver.
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.
ANZECC	Australian and New Zealand Environment Conservation Council
AS	Australian Standard
Assessment Period	The period in a day over which assessments are made.
Assessment Point	A point at which noise measurements are taken or estimated.
Audible Range	The limits of frequency which are audible or heard as sound. The normal ear in young adults detects sound having frequencies in the region 20 Hz to 20 kHz, although it is possible for some people to detect frequencies outside these limits.
AVTG	NSW Assessing Vibration: a technical guideline (AVTG) (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).
BS	British Standard
CEMF	Construction Environmental Management Framework
CEMP	Construction Environmental Management Plan
CoA	Condition of Approval
CNVIS	Construction Noise And Vibration Impact Statement
CNVMP	Construction Noise and Vibration Management Plan
Decibel [dB]	The level of noise is measured objectively using a Sound Level Meter. This instrument has been specifically developed to mimic the operation of the human ear. The human ear responds to minute pressure variations in the air. These pressure variations can be likened to the ripples on the surface of water but of course cannot be seen. The pressure variations in the air cause the eardrum to vibrate and this is heard as sound in the brain. The stronger the pressure variations, the louder the sound is heard.

Term	Definition
	The range of pressure variations associated with everyday living may span over a range of a million to one. On the top range may be the sound of a jet engine and on the bottom of the range may be the sound of a pin dropping. Instead of expressing pressure in units ranging from a million to one, it is found convenient to condense this range to a scale 0 to 120 and give it the units of decibels. The following are examples of the decibel readings of every day steady or quasi-steady sounds; 0dB the faintest sound we can hear 20dB quiet bedroom at night or recording studio 30dB quiet library or quiet location in the country 40dB living room 50dB typical office space or ambience in the city at night 60dB normal conversational speech 70dB a car passing by 80dB kerbside of a busy road 90dB truck passing by 100dB nightclub 110dB rock band or 2m from a jackhammer 120dB 70m from a jet aircraft 130dB threshold of pain 140dB 25m from a jet aircraft
dB(A); A-weighted decibels	The ear is not as effective in hearing low frequency sounds as it is 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 in is denoted as dB(A). Practically all noise is measured using the A filter.
DECC	Department of Environment and Climate Change (now OEH and EPA)
DECCW	Department of Environment and Climate Change and Water (now OEH and EPA)
Diffraction	The distortion around solid obstacles of waves travelling past.
DIN	German Standard
DPE	NSW Department of Planning and Environment
EIS	Environmental Impact Statement
EMS	Environmental Management System developed within the framework of AS/NZS ISO 14001:2004
EPA	NSW Environment Protection Authority
EPL	Environment Protection Licence
EP&A Act	Environmental Planning and Assessment Act 1979
EP&A Regulation	Environmental Planning and Assessment Regulation 2000
ER	Environmental Representative
Fluctuating Noise	Noise that varies continuously and to an appreciable extent over the period of observation.
Frequency	Of a periodic quantity: the time rate of repetition. The reciprocal of the period. Frequency is measured in Hertz (Hz).
FRP	Form/Rebar/Pour (concrete)
GBNML	Ground-borne Noise Management Level

Term	Definition
GIS	Geographic Information System
Ground-borne noise	Ground-borne noise propagating through the ground as vibration and then radiated by vibrating building elements such as wall and floor surfaces. This noise is normally noticeable only in areas that are well protected from airborne noise.
Hertz (Hz)	Units of frequency
IC	Independent Certifier
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.
ICNG	NSW Interim Construction Noise Guideline (ICNG) (DECC, 2009)
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.
LAUW	Local area and utility works
Loudness	A 3dB increase represents a doubling of the sound pressure, however an increase of about 10dB is required before the sound will subjectively appear to be twice as loud. That is, a sound of 85dB is twice as loud as a sound of 75dB which is twice as loud as a sound of 65dB and so on. That is, the sound of 85dB is four times as loud as a sound of 65dB. The smallest change which can be readily heard is approximately 2dB. An increase beyond 5dB is considered to represent the level at which a change in loudness begins to be clearly perceived.
L1	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L10	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L90	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).
Leq	Equivalent sound pressure level – the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring.
Lmax	The maximum sound pressure level measured over a given period.
Lmin	The minimum sound pressure level measured over a given period.
LW	Line-Wide (contract scope under ITC 0600)
Microphone	An electro-acoustic transducer which receives an acoustic signal and delivers a corresponding electric signal.
$m/s^{1.75}$	Units of Vibration Dose Value
NCA	Noise Catchment Area – an area of receivers grouped by similarities in existing or likely noise exposure levels, distance setback from noise source/s, geographical layout, shielding from noise source/s, types of development, building types or other features.
NHMRC	National Health and Medical Research Council
NML	Noise Management Level, as set out in the NSW 'Interim Construction Noise Guideline' (ICNG), Department of Environment and Climate Change, 2009
Noise	Sound which a listener does not wish to hear.
Noise Monitor	See "sound level meter".
OEH	Office of Environment and Heritage
ONVR	Operational Noise and Vibration Review

Term	Definition
OOHW	Out-of-hours work (construction works outside of standard construction hours)
POEO Act	Protection of the Environment Operations Act 1997
The Project	Sydney Metro City & Southwest
Project Approvals	Minister for Planning and Infrastructure's Approvals for the Sydney Metro City & Southwest, including: • SSI 5931 SMTF Expansion • SSI 7400 Sydney Metro City & Southwest Chatswood to Sydenham • SSI 8256 Sydney Metro City & Southwest Sydenham to Bankstown
RBL	Rating Background Level, is the overall single figure background noise level representing each assessment period – day, evening and night – over the whole monitoring period. The RBL is determined by taking the median of the assessment background levels (ABLs) for each day, evening and night periods (see ABL for definition), as set out in EPA policies.
Reflection	Sound wave changed in direction of propagation due to a solid object obscuring its path
REMM	Revised Environmental Mitigation Measures.
RFT	Request for Tender
RMS	Root Mean Squared
ROL	Road Occupancy Licence
RT&A	Renzo Tonin & Associates
SM	Sydney Metro
SMC&S	Sydney Metro City & Southwest
SM-CNVS	Sydney Metro City & Southwest Construction Noise and Vibration Strategy (CNVS) (SM ES-ST-201 – Report No 610.14213-R3) (Sydney Metro, 2017)
SMS	Short Message Service text message
SMTF	Sydney Metro Trains Facility (formerly known as Rapid Transit Trains Facility)
SMTF South	Sydney Metro Trains Facility South (located at Marrickville)
Sound	An alteration in pressure, stress, particle displacement, or particle velocity which is propagated in an elastic material or the superposition of such propagated alterations.
Sound Exposure Level (SEL)	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 Leq sound levels over any period of time and can be used for predicting noise at various locations.
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 sound pressure, expressed in decibels, as measured by a standard sound level meter with a microphone.
Sound Power Level (SWL)	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.
Spoil	All material generated by excavation into the ground including the excavation of station boxes and tunnels
Structure-borne noise	Vibration propagating through solid structures in the form of compressional or bending waves, heard as sound.
SSI	State Significant Infrastructure

Term	Definition
Sydney Metro	Transport for New South Wales
Tonal noise	Containing a prominent frequency and characterised by a definite pitch.
VDV	Vibration Dose Value
ITP	Inspection and Test Plan

PART A – OVERVIEW

1. Plan Overview

1.1 Purpose and application

The purpose of this Construction Noise and Vibration Management Sub-Plan (CNVMP C2B) is to describe how Systems Connect will minimise and manage noise and vibration impacts throughout the delivery of the Sydney Metro City & Southwest (SMCSW) Line-wide (LW) Works between Chatswood and Bankstown (C2B). Line-wide (LW) also referred to as the project, will be delivered by Systems Connect (a CPB Contractors and UGL Engineering joint venture).

This Sub-Plan has been prepared to address the requirements of relevant Minister for Planning's Conditions of Approval (CoA), including CSSI 7400 and CSSI 8256, the Revised Environmental Mitigation Measures (REMMs), applicable legislation, the Environmental Impact Statements (EIS), contractual requirements including Schedule C1 Scope of Works and Technical Criteria (SWTC) of ITC 600, the Sydney Metro Construction Environment Management Framework (CEMF) and the LW Works' Environment Protection Licences. Further details about the above-mentioned compliance requirements are provided in Section 2.2 and in the Construction Environmental Management Plan – C2B (SMCSWLWC-SYC-1NL-PM-PLN-000033).

1.2 Background

Systems Connect is delivering LW in four distinct portions as follows, and as described in detail in Section 1.3.

- Portion 1 – Sydney Metro Trains Facility (SMTF) expansion
- Portion 2 – SMTF South
- Portion 3 - Chatswood to Sydenham Greenfield Works
- Portion 4 – Sydenham to Bankstown Power Works

This plan addresses Systems Connect's compliance requirements in relation to Portions 2, 3 and 4 under SSI 7400 and SSI 8256 Planning Approvals.

This CNVMP sets out the strategies and processes to:

- Minimise construction noise and vibration and any potential adverse impacts
- Address obligations to deliver the project under SSI Planning Approvals 7400 and 8256
- Manage construction works in order achieve the construction noise management levels in the Interim Construction Noise Guideline (ICNG) and the Sydney Metro City & Southwest Construction Noise and Vibration Strategy (Sydney Metro 2017)
- Manage construction hours, high impact activities that generate impulsive or tonal noise and out-of-hours works
- Manage noise and vibration from works carried out outside of standard construction hours and the required mitigation measures to reduce the potential impacts
- Manage community consultation requirements regarding noise emissions.
- Manage potential noise and vibration issues so they are identified and controlled to meet legislative requirements.

1.3 LW Project Overview and Scope

The SMC&S project will extend Sydney Metro Northwest to the CBD and beyond to Bankstown.

The SMC&S project is being delivered through a suite of contracts for the tunnels, stations, line-wide infrastructure and systems.

Line-wide Works is a key component of the SMC&S project, with works taking place over the full length of the project.

Line-wide Works is being delivered in four distinct portions. Portion 1 SMTF expansion is addressed in separate CEMP and sub Plans. An overview of Portions 2-4 is provided below.

1.3.1 Portion 2 – SMTF South Works – Construction Completed

Portion 2 was delivered under CSSI 7400 and construction works were completed on 23 May 2025.

1.3.2 Portion 3 – Chatswood to Sydenham Tunnels and Stations Works

Portion 3 was also delivered under CSSI 7400 and construction works were completed on 29 May 2024.

1.3.3 Portion 4 – Power Supply Works (Southwest Corridor)

Portion 4 is delivered under SSI 8256. Portion 4 is delivered under 2 sub-portions as described in the following table. The remaining works are limited in nature and low impact. Where text has been greyed out, works have been completed.

Table 1 - Description of works for Portion 4

Portion 4 – Power Supply Works	Description
Bulk Power Supply (BPS)	The Bulk Power Supply Works includes: Cable routes and cable protection, feeder cables and cable joints, control and pilot cable and connections and terminations 33kV feeders from each of; • Ausgrid's Canterbury Sub-Transmission Substation to the Campsie bulk supply infeed substation
Southwest Corridor Power	Southwest Corridor power Works includes systems and building works from Sydenham to Bankstown including: • a HV Reticulation System • a Traction Power System • a Power Control System • an Earthing and Bonding System, Electrolysis Control Measures and Lightning Protection

1.4 Noise and Vibration Management Objectives

Systems Connect's objectives for management of noise and vibration during delivery of LW Works are aligned with those established through the EIS and those set out in the CEMF.

The below objectives for noise and vibration management include, but are not limited to, the environmental performance outcomes identified in the EIS:

- Noise levels would be minimised with the aim of achieving the noise management levels where feasible and reasonable
- The project would avoid any damage to buildings from vibration
- Community consultation would be undertaken to ensure communication with sensitive receivers is upheld (i.e. schools, childcare centres, local residents and building owners).

In achieving these objectives this CNVMP will:

- Identify sensitive receivers and relevant construction noise and vibration goals
- Identify key noise and/or vibration generating construction activities

- Identify and implement all feasible and reasonable construction noise and vibration mitigation measures
- Establish and implement an effective Out of Hours Works Protocol
- Undertake all necessary noise and vibration monitoring
- Respond to and address community complaints and enquiries in a timely and efficient manner
- Maintain records for noise and vibration monitoring and for community enquiries and complaints
- Ensure compliance with relevant Conditions of Approval and applicable Environment Protection Licences.

1.5 Agency and Stakeholder Consultation

This Plan is developed in consultation with the prescribed stakeholders including Sydney Metro, the Environment Protection Authority (EPA), the Environmental Representative (ER), the Acoustic Advisor (AA), and Local Councils as indicated in Table 2. Any comments received and Systems Connect's response to those comments will be provided in Appendix G.

Further detail outlining the community consultation process is provided in Section 3.6. The construction noise and vibration monitoring program is described in detail in Section 8.

Table 2 – Summary of Review, Endorsements and Approvals of this Plan

Plan		Local Councils	Environment Protection Authority Review	ER Review & Endorsement prior to Secretary Submission	AA Review & Endorsement prior to Secretary Submission	Secretary Review & Approval	ER/ AA Approval of Minor Amendments
CSSI 7400		✓	✓	✓	✓	✓	✓
CSSI 8256		✓		✓		✓	✓

1.6 Plan Structure

Table 3 - Plan Structure

Plan Structure	Details
Part A: Overview	This Part defines: **Section 1.** Plan Overview **Section 2.** Legal and Other Requirements **Section 3.** People and Collaboration **Section 4**. Hours of Work, Construction Activities and Program **Section 5**. Construction Noise and Vibration Objectives **Section 6**. Noise and Vibration Sensitive Receivers **Section 7**. Noise and Vibration Management

Plan Structure	Details
	Section 8. Construction Noise and Vibration Monitoring Program
Part B: Implementation	This section outlines in detail the key processes and systems to support implementation of environmental management outcomes for the project: **Element 1.** Training **Element 2.** Monitoring, Compliance, Records and Reporting **Element 3.** Auditing, Review and Improvement **Element 4.** Project Specific Requirements
Part C: Appendices	A – Land Use Survey Figures B – Indicative Site Layouts C – Out of Hours Work Procedure D – Out of Hours Work Protocol E – Monitoring Specifications F – Consultation

1.7 Interactions with other Management Plans

This CNVMP is a sub-plan of the LW Construction Environmental Management Plan C2B (CEMP C2B) (SMCSWLWC-SYC-1NL-PM-PLN-000033). It has the following relationships with other management plans and documents:

- Construction Noise & Vibration Impact Statements (CNVIS) detail predicted noise and vibration impacts and site-specific management and mitigation measures for the LW Works packages
- Site Environment Plans identify adjacent residential and other sensitive receivers and Noise Catchment Areas and will be progressively updated to incorporate physical noise and vibration management measures identified in CNVIS
- The Community Communications Strategy C2B (SMCSWLWC-SYC-1NL-CL-PLN-000027) details the procedures and processes for community notification, consultation and complaints management.

1.8 Revision and Update

This CNVMP will be reviewed regularly and amended as needed to ensure that it remains consistent with client and legal requirements and with project priorities, activities and personnel, taking into account factors including:

- The status and progress of LW project activities
- Changes in LW scope, design or delivery operations
- Changes in work site conditions
- Lessons learnt during delivery and operations
- Changes in project personnel
- Changes arising from stakeholder consultation
- Changes as directed by Sydney Metro
- Any exceedances of predicted construction noise levels above Noise Management Levels (NMLs) requiring additional mitigation measures
- Noise and vibration complaints

Prior to implementation, updates and amendments to this CNVMP will be:

- Provided to relevant stakeholders for review and comment

- Submitted to Sydney Metro the ER and AA for review and comment
- Submitted to the Independent Certifier for certification (as requested)

Minor amendments to the Construction Noise and Vibration Management Plan will be submitted to the Environmental Representative (ER) for review and approval. Minor amendments would generally include changes to systems or processes.

1.9 Distribution and Document Control

This CNVMP is available to all personnel and sub-contractors via the Systems Connect document control management system. A printed or electronic copy of this CNVMP is available at each work site.

2. Legal and Other Requirements

2.1 Relevant Legislation

The key legislation relevant to noise and vibration management includes:

- *Environmental Planning and Assessment Act 1979*
- *Protection of the Environment Operations Act 1997 (POEO Act)*

Refer to the CEMP C2B (SMCSWLWC-SYC-1NL-PM-PLN-000033) for further details of legislative requirements.

2.2 Project Compliance Requirements

Line-Wide Works (C2B) have been assessed and approved via a number of applications under the Environmental Planning and Assessment Act 1979 (EP&A Act) and are classified as Critical State Significant Infrastructure:

- SSI 7400. Sydney Metro City & Southwest Chatswood to Sydenham (scope now completed) and
- SSI 8256. Sydney Metro City & Southwest Sydenham to Bankstown.

Detailed environmental assessments have been carried out to gain the necessary planning approvals.

Element 4: Project Specific Requirements, includes the key compliance requirements for air quality management which are applicable to the LW Works. Requirements are drawn from Conditions of Approvals, Revised Environmental Mitigation Measures and the Sydney Metro Construction Environmental Management Framework (CEMF).

This plan will also deliver compliance with the Systems Connect EMS, contractual requirements including Schedule C1 Scope of Works and Technical Criteria (SWTC) of ITC 600 and any Environmental Protection License (EPL) the project is delivered under. The EPA issued EPL 21423 to the Project on 31 July 2020 for the scheduled activity “Railway activities - railway infrastructure construction”, which applies to certain prescribed premises between Chatswood Dive Site and Sydenham Dive Site.

Details about the EPL strategy for LW are provided in Section 3.4 of the CEMP (SMCSWLWC-SYC-1NL-PM-PLN-000033). There are many conditions in the license which relate to noise and vibration. The license should be referred to directly, due to the likelihood of numerous variations and to avoid potential inconsistency or error.

2.3 Relevant Guidelines, Policies and Standards

Guidelines, policies and standards relating to management of construction noise and vibration on the project include:

- NSW Interim Construction Noise Guideline (ICNG) (DECC, 2009)
- NSW Road Noise Policy (DECCW, 2011)
- NSW Assessing Vibration: a technical guideline (AVTG) (DEC, 2006)
- NSW Industrial Noise Policy (EPA, 2000)
- NSW Environmental Criteria for Road Traffic Noise (EPA, 1999)
- Sydney Metro City & Southwest Construction Noise and Vibration Strategy (CNVS) (SM ES-ST-201 – Report No 610.14213-R3) (Sydney Metro, 2017)
- AS/NZS 2107:2000 Acoustics – Recommended design sound levels and reverberation times for building interiors
- AS 2834-1995 Computer Accommodation, Chapter 2.9 Vibration
- AS 2436-1981 Guide to Noise Control on Construction, Maintenance and Demolition Sites

- British Standard BS 6472-2008 Evaluation of human exposure to vibration in buildings (1-80Hz)
- British Standard 7385: Part 2-1993 Evaluation and measurement of vibration in buildings
- German Standard DIN 150-1999 Structural vibration Part 3: Effects of vibration on structures
- ASHRAE Applications Handbook (SI) 2003, Chapter 47 Sound and Vibration Control
- Gordon GC 28 September 1999 Generic Vibration Criteria for Vibration Sensitive Equipment

2.4 Construction Noise and Vibration Strategy

The Sydney Metro City & Southwest Construction Noise and Vibration Strategy (SM-CVNS) (SM ES-ST-210 - Report No 610.14213-R3, 2017) provides best-practice techniques and practical guidance for managing construction noise and vibration. It outlines all feasible and reasonable mitigation measures that can be used to reduce noise and vibration generated during the construction of the Sydney Metro City & Southwest project, including additional measures when construction noise is predicted to exceed the NMLs.

Systems Connect will adopt the SM-CNVS to guide the management of construction noise and vibration.

3. People and Collaboration

3.1 Systems Connect Team

The roles and responsibilities of key project personnel with respect to construction noise and vibration are outlined in Table 4.

Table 4 - Roles and Responsibilities

Role	Responsibility for construction noise and vibration
Project Director	Manage the delivery of the Line-wide Works including overseeing implementation of Noise and Vibration Management Act as Contractor's Representative
Environment and Sustainability Manager (or delegate)	Oversee the preparation, approval and implementation of this Plan Oversee the implementation of all noise and vibration management initiatives including coordinating Systems Connect's response to noise and vibration complaints Manage the ongoing compliance with conditions of approval
Environmental Advisor	Assist the Environment and Sustainability Manager in the development and implementation of this Plan and other site specific environmental documents Implement the environmental induction program Conduct and participate in environmental audits The investigation and close out of environmental complaints Assist in the implementation of site environmental controls Undertake environmental monitoring and inspections
Stakeholder and Community Relations Manager	Manage notifications and consultation for noise and vibration Liaise with the Environment and Sustainability Manager in responding to and resolving noise and vibration complaints
Human Resources Manager	Ensure provision of appropriate training in noise and vibration management for relevant project personnel in conjunction with the Environment and Sustainability Manager
Commercial Manager	Ensure sufficient resources are allocated to noise and vibration management
Engineering Manager	Ensure relevant noise & vibration management and mitigation measures are addressed and incorporated in design development
Traffic Engineer	Ensure that relevant noise & vibration management obligations are addressed and incorporated in traffic management plans
Safety Manager	Ensure relevant noise & vibration management approvals and control measures are addressed in relevant safety documents
Construction Manager	Manage the delivery of the construction process across all sites in relation to noise and vibration management and in compliance with this Plan in conjunction with the Environment and Sustainability Manager
Area Managers	Manage construction in relation to noise and vibration management for their work activity in conjunction with the Environment and Sustainability Manager and Environment Coordinators Implement and ensure compliance with this Plan
Site Superintendents	Construction delivery in relation to noise and vibration management and compliance in conjunction with the Environment and Sustainability Manager and Environment Coordinators

Role	Responsibility for construction noise and vibration
	Implement and ensure compliance with this Plan Direct construction personnel to carry out actions to avoid or minimise noise and vibration impacts and to ensure compliance with this plan
Environment Coordinator	Assist the Environment and Sustainability Manager and Area Managers in implementing this Plan Oversee noise and vibration training including inductions, toolbox talks and specific technical training on monitoring equipment Monitoring and reporting on noise and vibration compliance Manage, review and continual improvement of this Plan
Project Engineers Site Engineers Site Supervisors	Implement and monitor onsite noise and vibration compliance measures including all required mitigation measures in conjunction with environmental coordinators Assist the Area Managers and Site Superintendents in implementing this Plan.

3.2 Specialist Consultants

Renzo Tonin & Associates (RT&A) has been engaged to provide specialist noise & vibration advice and services in the preparation of this Plan. RT&A will continue to provide specialist advice and services in the ongoing development and implementation of this throughout LW delivery to ensure that impacts can be avoided, minimised or appropriately mitigated, including:

- Undertaking noise and vibration modelling
- Preparing Construction Noise and Vibration Impact Statements
- Undertaking noise and vibration monitoring when required
- Assisting in stakeholder meetings when required
- Assisting in community consultation when required

3.3 Environmental Representative

The Environmental Representatives (ER) is engaged by Sydney Metro in accordance with the Planning Approval requirements. Table 5 bellow details the ER responsibilities according with each Planning Approval conditions:

Table 5 - ER responsibilities

Planning Approval	Responsibility for construction noise and vibration
CSSI 8256 – Sydenham to Bankstown	(a) receive and respond to communication from the Planning Secretary in relation to the environmental performance of the CSSI; (b) consider and inform the Planning Secretary on matters specified in the terms of this approval; (c) consider and recommend to the Proponent any improvements that may be made to work practices to avoid or minimise adverse impact to the environment and to the community; (d) review documents identified in Conditions C1, C3 and C8 and any other documents that are identified by the Planning Secretary, to ensure they are consistent with requirements in or under this approval and if so: (i) make a written statement to this effect before submission of such documents to the Planning Secretary (if those documents are required to be approved by the Planning Secretary), or (ii) make a written statement to this effect before the implementation of such documents (if those documents are required to be submitted to the

Planning Approval	Responsibility for construction noise and vibration
	Planning Secretary for information or are not required to be submitted to the Secretary); (e) regularly monitor the implementation of the documents listed in Conditions C1, C3 and C8 to ensure implementation is being carried out in accordance with the document and the terms of this approval; (f) as may be requested by the Planning Secretary, help plan, attend or undertake audits of the development commissioned by the Department including scoping audits, programming audits, briefings and site visits, but not independent environmental audits required under Condition A34 of this approval; (g) as may be requested by the Planning Secretary, assist the Department in the resolution of community complaints; (h) assess the impacts of minor ancillary facilities as required by Condition A19 of this approval; (i) consider any minor amendments to be made to the documents listed in Conditions C1, C3 and C8 and any document that requires the approval of the Planning Secretary that comprise updating or are of an administrative or minor nature and are consistent with the terms of this approval and the documents listed in Conditions C1, C3 and C8 or other documents approved by the Planning Secretary and, if satisfied such amendment is necessary, approve the amendment. This does not include any modifications to the terms of this approval; and (j) prepare and submit to the Planning Secretary and other relevant regulatory agencies, for information, an Environmental Representative Monthly Report detailing the ER's actions and decisions on matters for which the ER was responsible in the preceding month. The Environmental Representative Monthly Report must be submitted within seven (7) days following the end of each month for the duration of the ER's engagement for the CSSI.

3.4 Working with Interface Contactors

Interface contractors are responsible for management of environmental aspects and impacts associated with their own scope of works. In line with the Interface Management Plan (SMCSWLWC-SYC-1NL-PM-PLN-000040) and relevant contract requirements, Systems Connect will facilitate interface meetings, at all levels within project delivery teams, to ensure that requirements for compliance with environmental obligations are understood, agreed, implemented, monitored and maintained by Interface contractors working within Line-wide Works delivery areas.

Systems Connect delivery teams will, when working in Interface Contractors delivery areas, maintain any processes or controls impacted by Line-wide Works

Key elements of interface agreement, with regard to environment and community, include:

- Timing for handover of site and which contractor is principal over a given site.
- Requirements for interface contractors to work under Principal Contractor's management systems
- Requirements for working under existing EPLs
- Requirements for coordination and resolution of issues

Systems Connect will commence interface coordination meetings with interface contactors prior to access of any project site to determine the detailed requirements for coordination of environmental management associated with the site (or sites).

3.5 Collaboration with Sydney Metro, ER, AA and IC

As noted above, the ER, AA and the Independent Certifier (IC) have roles that include overseeing noise and vibration management.

Systems Connect will provide Sydney Metro, the ER the AA and the IC with:

- Noise and vibration documents for review
- Access to monitoring activities and data

Systems Connect will work collaboratively with Sydney Metro, the ER, AA and the IC to ensure all reasonable and feasible noise mitigation measures are implemented.

3.6 Proactive and Responsive Community Consultation

Systems Connect will strive to maintain positive, cooperative relationships with community stakeholders including schools, childcare centers, local residents and building owners, building on the relationships and processes established during the delivery of prior contracts such as TSE (Tunnels & Station Excavation).

The methods and timeframes for community consultation are detailed within the Community Communications Strategy C2B (SMCSWLWC-SYC-1NL-CL-PLN-000027).

Community consultation in relation to construction activities and circumstances during which noise and vibration objectives will be exceeded are detailed in Section 7.4 of this CNVMP.

Consultation with potentially-affected community, religious and educational institutions and proponents of other construction works in the vicinity of the SMTF are described below.

3.6.1 Community, religious and educational institutions

In accordance with the Project Approval, Systems Connect will consult with any potentially affected community, religious and educational institutions and noise and vibration-sensitive businesses and critical working areas (such as theatres, laboratories and operating theatres) to ensure, where feasible and reasonable, that noise generating construction works in the vicinity of the institutions are not timetabled during sensitive periods.

While developing the CNVISs for Portion 2, Portion 3 and Portion 4, any work activities that indicate that there are potentially affected institutions, then Systems Connect will consult with those institutions in relation to timetabling of noise generating construction works. Such consultation with any affected institutions, if and when required, will be in an appropriate form and may include meetings, briefings, telephone calls and emails.

Stakeholder feedback relevant to construction noise and vibration will be included in the CNVISs where appropriate.

3.6.2 Proponents of other construction works

Systems Connect will consult with the proponents of other construction works in the vicinity of the SMC&SW Line-wide Works and will take reasonable steps to coordinate works to minimise impacts on, and maximise respite for, affected sensitive receivers.

4. Hours of Work, Construction Activities and Program

4.1 Indicative Construction Program and Activities

An overview of the construction activities for each stage of the project and the indicative timing for each are displayed in Table 6 below.

4.1.1 Key Noise and Vibration Generating Activities

The key noise and vibration generating construction activities which have the potential to impact upon nearby sensitive receivers, based on the indicative construction activities program shown in Table 6, are presented in Appendix C.

A CNVIS would be prepared for each LW site identified in Table 6 detailing the construction activities and the associated plant and equipment to be used at each stage of the works, the predicted noise and vibration impacts of those activities and the mitigation and management measures to be applied to the site, as detailed in Section 6.3.

All activities outlined in Table 7 have been greyed out to indicate that works have been completed and the remaining activities under Portion 4 is limited in nature and will not have noise and vibration impacts.

Table 6 - Indicative Construction Activities Program

LW site	Construction Activities	Indicative Timeframes*
Portion 2	**SMTF South Works**	**Q3 2021 to Q1 2024**
	• Site establishment • General worksite, car parking, storage, delivery & laydown area • Earthworks & CSR; • Track Construction including Grinding & Turnouts • OHW Foundations, Structures and Wiring • Services buildings	May 2021 to Nov 2023
	• Operational WTP upgrade	Aug 2023 to Feb 2024
Portion 3	**Chatswood to Sydenham Tunnels and Stations Works**	**Q1 2020 to Q4 2023**
Tunnel and Stations	• Delivery of materials • Track Construction including Grinding & Turnouts • OHW Structures • Utilities/systems fit out and connections in stations and tunnels	Sep 2020 to Mar 2023
	• Tunnel defect rectifications • Dynamic Train Testing	Mar 2023 to Nov 2023

LW site	Construction Activities	Indicative Timeframes*
Open Northern Dive	• Construction Compound & Car Park • Site establishment Permanent Down (Sydney Trains Works) • Earthworks & CSR; Stormwater Drainage/ Sewer/ Potable / Recycled Water Excavation • Track Construction including Tamping, Grinding & Turnouts • OHW Foundations, Structures and Wiring Structures Open Dive (Sydney Metro Connection) • Form/Rebar/Pour (FRP) (Capping Beam) • Earthworks & CSR; Stormwater Drainage/ Sewer/ Potable / Recycled Water Excavation • Track Construction including Tamping, Grinding & Turnouts • OHW Foundations, Structures and Wiring	Feb 2020 to Feb 2021 Mar 2020 to Jun 2020 Mar 2020 to Jan 2021 Sep 2020 to Jan 2021 Jun 2020 to Sep 2020 Apr 2020 to Jul 2020 Jul 2020 to Nov 2021 Mar 2020 to Apr 2021 June 2022 to Sep 2022 June 2022 to Nov 2022
Open Southern Dive	• FRP (Capping Beam) • Earthworks & CSR; Stormwater Drainage/ Sewer/ Potable / Recycled Water Excavation • Track Construction including Tamping, Grinding & Turnouts • OHW Foundations, Structures and Wiring	Aug 2021 to Jun 2023
Waterloo to Surry Hills BPS Route Compound	• Site establishment • General worksite, car parking, storage, delivery & laydown area	November 2020 to April 2022
Artarmon to Willoughby BPS Route Compound	• Site establishment • General worksite, car parking, storage, delivery & laydown area	November 2020 to October 2021
Waterloo to Surry Hills BPS Route	• Site establishment • Cable routes excavation, conduits installation, temporary surface reinstatement • Cable Installation and Jointing	November 2020 to Nov 2023
Artarmon to Willoughby BPS Route	• Site establishment • Cable routes excavation, conduits installation, temporary surface reinstatement • Cable Installation and Jointing	November 2020 to October 2023
Portion 4	**Power Supply Works (Southwest Corridor)**	**Q1 2020 to Q4 2023**
Campsie to Canterbury BSP Route Compound	• Site establishment • General worksite, car parking, storage, delivery & laydown area	May 2020 to July 2021
Campsie to Canterbury BSP Route	• Site establishment • Cable routes excavation, conduits installation, temporary surface reinstatement • Cable Installation and Jointing	May 2020 to Nov 2023
Padmounts and Traction Substations	• Excavation for TSS footings and basement • FRP for basement slab and walls • Delivery of building on site • Fencing & precast panels	Dec 2020 to Jun 2021 Feb 2021 to Sep 2021 Jul 2021 to Dec 2022 May 2021 to Sep 2023
Rail corridor power cables and ancillary works	• HV Cabling (Marrickville Dive to Campsie Traction Substation) • HV Cabling (Campsie to Bankstown) • 11kV Padmount Substation Installation (Marrickville to Bankstown)	Feb 2021 to Jul 2023 Feb 2022 to Jul 2023

**Timeframes are indicative and are subject to change as the program progresses.*

4.2 Construction Hours

The standard construction hours for Line-wide Works are defined by Planning Approval SSI 8256, and the CEMF and are summarised in Table 7 below.

The majority of Line-wide Works construction activities will be undertaken during the standard construction hours of 7am – 6pm on weekdays and 8am – 6pm on Saturdays. CoA E36 – Saturday hours were modified under Modification 9 (determined 30 June 2022).

Some activities will need to be undertaken outside of these hours as identified in Table 7.

Table 7 - Construction Hours

Construction Activity	Construction Hours / Comments
Portion 4 (SSI 8256)	
Standard construction hours • Condition E19	Monday to Friday: 7am – 6pm Saturdays: 8am to 6pm Sundays & Public Holidays: No work
Highly noise intensive work • Condition E24	Monday to Friday: 8am – 6pm Saturdays: 8am to 1pm In continuous blocks not exceeding three hours each with a minimum respite from those activities and works of not less than one hour between each block.
Non-disruptive preparatory work, repairs or maintenance may be carried out • Condition E20(e)	Sundays: 8am – 6pm Where construction causes: • $L_{Aeq(15\ min)}$ noise levels not more than 5 dB(A) above the NML or the 'Noise affected' noise management levels specified in Table 3 of the Interim Construction Noise Guideline (DECC, 2009) • vibration values, measured at the most affected residence no more than the maximum values for human exposure to vibration, specified in Table 2.2 and Table 2.4 of Assessing Vibration: a technical guideline (DEC, 2006)
Activities requiring the temporary possession of roads • Condition E20(c) and (d)	May need to be undertaken outside the standard hours during periods of low demand to minimise safety impacts and inconvenience to commuters.
Activities requiring rail possessions: • Condition E20(c) and (d)	May need to be undertaken outside the standard construction hours up to 24 hours per day, seven days per week.

4.2.1 Works Outside of Standard Construction Hours

In accordance with the Project Planning Approval, construction works outside of the standard construction hours may be undertaken in the following circumstances:

- construction works that generate air-borne noise that is:
  - no more than 5 dB(A) above rating background level at any residence in accordance with the ICNG;
  - no more than the noise management levels specified in Table 3 of the INCG at other sensitive receivers;

- vibration values, measured at the most affected residence are no more than the maximum values for human exposure to vibration specified in Assessing Vibration: a technical guideline (DEC, 2006)
  - Table 2.2 for continuous or impulsive vibration, and
  - Table 2.4 for impulsive vibration;
- where a negotiated agreement has been reached with affected receivers, where the prescribed noise and vibration levels cannot be achieved;
- for the delivery of materials required outside these hours by the NSW Police Force or other authorities (including RMS) for safety reasons;
- where it is required in an emergency to avoid the loss of lives, property and/or to prevent environmental harm;
- Works approved through an EPL;
- Works approved under an Out-of-Hours Work Protocol for Work not subject to an EPL.

Except for emergency works, LW construction activities will not take place outside of standard hours without prior discussion with and / or notification of local residents and businesses. Out of hours works will be managed in accordance with the Out of Hours Work (OOHW) Protocol presented in Appendix B. The OOHW Protocol will be applied through a separate OOHW Procedure, presented in Appendix F, which addresses elements including:

- An OOHW Application form and approval process
- A process for the assessment of OOHW noise and vibration impacts against the relevant criteria, including the determination of low and high-risk activities
- A process for identifying mitigation measures for residual impacts that will be applied, including community notifications
- A process that considers the risk of activities, proposed mitigation, management, and coordination, including where:
  - low risk activities and high risk activities that cease by 9pm can be approved by the ER, and
  - all other high risk activities must be approved by the Planning Secretary (unless otherwise approved through an EPL)
- Identifying the notification arrangements for approved Out-of-Hours Work, which may be detailed in the Community Communication Strategy.

4.3 Respite for Noise Intensive Activities

4.3.1 Identified precincts (SSI 7400 and SM-CNVS)

Construction activities (including works associated with utility adjustments) at identified precincts (Crows Nest, Victoria Cross, Blues Point, Barangaroo, Martin Place, Pitt Street, Central, Marrickville, Newtown, St Peters, Sydenham and Tempe) between 7am and 8pm that result in high noise impact, such as rock breaking or other annoying activities shall be managed in accordance with SSI 7400 Planning Approval Conditions E37,E38 and E48.1 (refer Table 8). Best endeavours will be made to schedule annoying activities, including steel hammering and movement of the self-propelled modular trailer, at the Blues Point temporary site between 7am and 8pm.

Condition E37 requires consultation with all receivers with predicted internal noise levels greater than $L_{Aeq(15minute)}$ 60 dB(A) to determine appropriate hours of respite.

High noise and vibration generating activities (e.g. jack and rock hammering, sheet and pile driving, rock breaking and vibratory rolling) at sites other than those listed above may only be carried out in continuous blocks, not exceeding 3 hours each, with a minimum respite period of one hour between each block, unless otherwise agreed under Project Planning Approval Condition E38 or the Environment Protection Licence (EPL).

4.3.2 All other work locations

At all other work locations, other than the identified precincts (Section 4.3.1), activities resulting in highly noise intensive work or impulsive or tonal noise emission (such as rock breaking, rock hammering, pile driving) shall only be undertaken:

- between the hours of 8:00 am to 6:00 pm Monday to Friday;
- between the hours of 8:00 am to 1:00 pm Saturday; and
- in continuous blocks not exceeding three hours each with a minimum respite from those activities and works of not less than one hour between each block.
- except as permitted by an EPL or works approved under an Out of Hours Work Protocol (see Section 4.2.1 and Appendix E)

For the purposes of this requirements 'continuous' includes any period during which there is less than a one hour respite between ceasing and recommencing any of the work the subject of this condition.

This approach is consistent with SSI 8256 Condition E22, E23 and E24 for works in Portion 4.

4.4 Out of Hours Deliveries

Delivery of most plant and equipment to worksites will be undertaken during standard construction hours. There will however be instances where oversized deliveries are necessary. Oversized movements can cause disruptions to the existing traffic and can be a potential hazard for road users. There is a requirement for oversize vehicles to move during off-peak hours when traffic volumes are typically at a minimum, thereby ensuring road user and public safety and minimising disruption to the road network.

The transportation of oversized equipment and machinery may require the occupation of more than one traffic lane. Where this occurs, all movements are to be strictly in accordance with RMS guidelines for oversized vehicle movements and where required the issuing of a Road Occupancy License (ROL).

All out of hours works (except in emergency situations) will be assessed and managed in accordance with the OOHW Protocol.

Heavy vehicle deliveries to the Blues Point temporary site are only permitted between 7 am and 10 pm except where permitted otherwise through an EPL or where oversized vehicle movement is directed by NSW Police and/or Transport for NSW at other times.

5. Construction Noise and Vibration Objectives

5.1 Airborne Construction Noise Management Levels

Line-wide Works will be carried out with the aim of achieving the construction noise management levels as detailed in the NSW Interim Construction Noise Guideline (ICNG) (DECC, 2009) and the Conditions of Approval, in accordance with the Sydney Metro City & Southwest Construction Noise and Vibration Strategy.

All feasible and reasonable noise mitigation measures will be implemented and any activities that could exceed the construction noise management levels will be identified and managed in accordance with this CNVMP.

5.1.1 Internal noise management levels from SSI 7400 Conditions of Approval

In addition to the construction noise management levels derived from the ICNG, SSI 7400 Conditions of Approval E37, E38, E41 and E42 set internal noise limits that apply as outlined below:

- At worksites in the Crows Nest, Victoria Cross, Blues Point, Barangaroo, Martin Place, Pitt Street, Central, Marrickville, Newtown, St Peters, Sydenham and Tempe precincts (referred to as 'identified precincts' in Addendum A of the Sydney Metro CNVS), internal noise levels are applicable at sensitive receiver locations during the 7am to 8pm period per SSI 7400 Conditions of Approval E37 and E38.
- At worksites with approved OOHW, internal noise levels are applicable at residential receiver locations during the 8pm to 7am period per SSI 7400 Conditions of Approval E41 and E42.
- In all other cases, internal and external noise management levels are derived from the ICNG.

Table 8 below (reproduced from Addendum A of Sydney Metro CNVS) sets out the internal noise criteria levels for residential and other sensitive receivers.

Table 8 - Internal construction noise levels (SSI 7400 Conditions of Approval)

Area	Receiver Type	Approval Condition	Time Period	Noise level (internal)[4]
Identified Precincts[1]	All	E38	7am to 8pm	Noise levels are required to be less than $L_{Aeq(15\ minute)}$ 60 dB(A) for at least 6.5 hours between 7am and 8pm, of which at least 3.25 hours must be below $L_{Aeq(15\ minute)}$ 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.[3]
Non-residential zones	Residential	E41	8pm to 9pm	$L_{Aeq(15minute)}$ 60 dB(A)
			9pm to 7am	$L_{Aeq(15minute)}$ 45 dB(A)
Residential zones	Residential	E42	8pm to 7am	$L_{Aeq(15minute)}$ 45 dB(A)
All	All	E43	All	$L_{Aeq(8hour)}$ 85 dB(A) (external) near the CCSI

1. Identified precincts are provided in SSI 7400 Condition E37 and include Crows Nest, Victoria Cross, Blues Point, Barangaroo, Martin Place, Pitt Street Central, Marrickville, Newtown, St Peters, Sydenham and Tempe.
2. These are identified by the applicable Local Environmental Plan land zoning of the receiver.

3. Criteria as described in SSI 7400 Condition E38
4. A 5 dB penalty shall be applied if rock breaking or any other annoying activity likely to result in ground-borne noise or a perceptible level of vibration is planned

5.1.2 Noise Management Levels from ICNG

Construction noise management levels for worksites not included in Section 5.1.1 are determined using the ICNG. Table 9 below (reproduced from Table 2 of the ICNG) sets out the noise management levels and how they are to be applied.

Note: The ICNG identifies 'particularly annoying' activities that require the addition of 5dB(A) to the predicted level before comparing to the construction NML.

Table 9 - Noise Management Levels at Residential Receivers

Time of Day	Noise Management Level LAeq(15min)	How to Apply
Standard hours: Monday to Friday 7 am to 6 pm Saturdays 8 am to 1 pm No work on Sundays or public holidays	RBL + 10dB(A)	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq\ (15\ min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. 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.
	Highly noise affected 75dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: 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 if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times
Outside recommended standard hours	Noise affected RBL + 5dB(A)	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5dB(A) above the noise affected level, the proponent should negotiate with the community. For guidance on negotiating agreements see section 7.2.2 of the ICNG.

Table 10 below sets out the noise management levels for various non-residential noise-sensitive receivers, as adopted from the ICNG. Internal (or indoor) noise management levels for land uses not identified in the ICNG are referenced to the 'maximum' internal noise levels presented in Australian Standard AS2107. The noise management levels are applicable when the premises are in use.

Table 10 presents a detailed, but not exhaustive list of typical 'other' land uses identified along the Project route. Where a land use has not been identified in Table 10, a suitable noise management level can be determined by taking guidance from Australian Standard AS2107.

As identified for residential receivers, where the predicted or measured $L_{Aeq(15\ min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. Systems Connect would inform potentially impacted receivers of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.

Table 10 - Noise Management Levels at Other Noise-Sensitive Land Uses

Land Use	Noise Management Level $L_{Aeq(15min)}$	Where NML Applies	Referenced from:
Studio building (music recording studio)	25 dB(A)	Internal noise level	AS2107 'maximum'
Studio building (film or television studio)	30 dB(A)	Internal noise level	AS2107 'maximum'
Theatre/ Auditorium (drama theatre)	30 dB(A)	Internal noise level	AS2107 'maximum'
Cinema Space	35 dB(A)	Internal noise level	AS2107 'maximum'
Hotel (Sleeping areas: Hotels near major roads)	40 dB(A)	Internal noise level	AS2107 'maximum'
Classrooms at schools and other educational institutions	45 dB(A)	Internal noise level	ICNG
Hospital wards and operating theatres	45 dB(A)	Internal noise level	ICNG
Places of worship	45 dB(A)	Internal noise level	ICNG
Library (reading areas)	45 dB(A)	Internal noise level	AS2107 'maximum'
Office building (general office areas)	45 dB(A)	Internal noise level	AS2107 'maximum'
Community centres – Municipal Buildings	50 dB(A)	Internal noise level	AS2107 'maximum'
Cafe/ Restaurant/ Bar (bars and lounges) – indoor areas	50 dB(A)	Internal noise level	AS2107 'maximum'
Railway platform and concourse areas	55 dB(A)	Internal noise level	AS2107 'maximum'

Land Use	Noise Management Level $L_{Aeq(15min)}$	Where NML Applies	Referenced from:
Cafe/ Restaurant/ Bar (bars and lounges) – outdoor areas	60 dB(A)	External noise level	AS2107 'maximum'[1]
Passive recreation areas (e.g. area used for reading, meditation)	60 dB(A)	External noise level	ICNG
Active recreation areas (e.g. sports fields)	65 dB(A)	External noise level	ICNG
Commercial premises (including offices and retail outlets)	70 dB(A)	External noise level	ICNG
Industrial premises	75 dB(A)	External noise level	ICNG

1. Outdoor noise level based on recommended maximum internal noise level in AS 2107 plus 10 dB (10dB is a conservative estimate of the difference between internal and external noise levels, taken from ICNG p13).

5.1.3 Sleep disturbance

The ICNG recommends that where construction works are planned to extend over more than two consecutive nights, maximum noise levels and the extent and frequency of maximum noise level events exceeding the RBL should be considered. In line with the ICNG, further guidance is taken from the NSW Environmental Criteria for Road Traffic Noise (ECRTN, Environment Protection Authority 1999).

To assess the likelihood of sleep disturbance, an initial screening level of (L_{Amax} or $L_{A1(1min)}$) ≤ $L_{A90(15min)}$ + 15 dB(A) is used. In situations where this results in an external screening level of less than 55 dB(A), a minimum screening level of 55 dB(A) is set. Note that this is equivalent to a maximum internal noise level of 45 dB(A) with windows open.

Where there are noise events found to exceed the initial screening level, further analysis is made to identify:

- the likely number of events that might occur during the night assessment period
- whether events exceed an 'awakening reaction' level of 55dBA L_{Amax} (internal) that equates to NML of L_{Amax} 65 dB(A) (assuming open windows).

The ICNG recommends that where construction works are planned to extend over more than two consecutive nights, maximum noise levels and the extent and frequency that maximum noise levels exceed the RBL should be analysed.

5.2 Ground-Borne Construction Noise Management Levels

Ground-borne noise management levels (GNMLs) are based on the ICNG and Conditions of Approval, in accordance with the Sydney Metro City & Southwest Construction Noise and Vibration Strategy (SM-CNVS).

5.2.1 Internal noise management levels from SSI 7400 Conditions of Approval

The internal noise management outlined in Section 5.1.1 represent the total noise levels from airborne and ground-borne noise sources.

5.2.2 Noise management levels from ICNG

The following ground-borne noise management levels (GBNMLs) for residences are nominated in the ICNG and summarized in Table 11 below for the evening and night period. The ICNG

does not specify a GBNML for residential premises during the day period. Guidance is taken from the Sydney Metro City & Southwest Construction Noise and Vibration Strategy.

The GBNMLs recognise the temporary nature of construction and are only applicable when ground-borne noise levels are higher than airborne noise levels. This is typically where noise sensitive receivers are located above tunneling works or some critical spaces such as recording studios and cinemas, which are designed to reduce airborne noise intrusion. The GBNMLs are internal noise levels that indicate when management actions would be implemented.

Table 11 - Ground-Borne Noise Objectives at Residences

Assessment period	Time of day	Ground-borne Noise Management Level $L_{Aeq(15minute)}$
Daytime	7:00am to 6:00pm	45 dB
Evening	6:00pm to 10:00pm	40 dB
Night	10:00pm to 6:00am	35 dB

For other sensitive receivers, including commercial receivers such as offices and retail areas, the ICNG does not provide guidance in relation to acceptable ground-borne noise levels. This CNVMP however has adopted an internal GBNML derived from the airborne NML presented in the ICNG for commercial premises and assuming a minimum 20dB(A) noise reduction from outside to inside with closed windows, consistent with the SM-CNVS.

For other noise sensitive receivers, such as cinema spaces and recording studios, guidance is taken from the recommended 'maximum' internal noise levels in AS/NZS 2107:2000 'Acoustics - Recommended design sound levels and reverberation times for building interiors' to determine suitable noise management levels.

The ground-borne noise objectives for ‘other’ noise sensitive land uses are identified below in Table 12

Table 12 - Ground-Borne Noise Objectives at Other Sensitive Land Uses

Land Use	Noise Management Level $L_{Aeq(15min)}$	Where NML Applies	Referenced from:
Classrooms at schools and other educational institutions	45 dB(A)	Internal noise level	ICNG
Hospital wards and operating theatres	45 dB(A)	Internal noise level	ICNG
Places of worship	45 dB(A)	Internal noise level	ICNG
Commercial premises (including offices)	50 dB(A)	Internal noise level	ICNG
Commercial premises (including retail outlets)	55 dB(A)	Internal noise level	AS/NZS 2107:2000
Industrial premises	55-60 dB(A)	Internal noise level	ICNG and AS/NZS 2107:2000

5.3 Construction Related Road Traffic Noise Objectives

When trucks and other vehicles are operating within the boundaries of Line-wide Works controlled construction sites, road vehicle noise contributions are included in the overall predicted $L_{Aeq(15minute)}$ construction site noise emissions. When construction related traffic moves onto the public road network a different noise assessment methodology is appropriate, as vehicle movements would be regarded as 'additional road traffic' rather than as part of the construction site.

Guidance in relation to construction related road traffic goals and assessment is taken from the NSW Road Noise Policy (RNP).

One of the objectives of the RNP is to apply relevant permissible noise increase criteria to protect sensitive receivers against excessive decreases in amenity. Construction traffic NMLs set at 2 dB above the existing road traffic noise levels during the daytime and night-time periods are considered appropriate to identify the onset of potential noise impacts. Where the road traffic noise levels are predicted to increase by more than 2 dB as a result of construction traffic, consideration would be given to applying feasible and reasonable noise mitigation measures to reduce the potential noise impacts and preserve acoustic amenity.

In considering feasible and reasonable mitigation measures where the relevant noise increase is greater than 2 dB, consideration would also be given to the actual noise levels associated with construction traffic and whether or not these levels comply with the following road traffic noise criteria in the RNP:

- 60 dB(A) $L_{Aeq(15hour)}$ day and 55 dB(A) $L_{Aeq(9hour)}$ night for existing freeway/ arterial/ sub-arterial roads.
- 55 dB(A) $L_{Aeq(1hour)}$ day and 50 dB(A) $L_{Aeq(1hour)}$ night for existing local roads.

This approach is consistent with the SM-CNVS.

5.3.1 Sleep disturbance and maximum noise level events

If heavy vehicle movements occur during the 10pm to 7am night-time period, guidance on the potential for sleep disturbance, the RNP refers to Practice Note 3 of the ENMM for specific impacts from road traffic. The ENMM recommends an evaluation of the number and distribution of night-time pass-by events where the L_{AFmax} - $L_{Aeq(1hour)}$ difference is greater than 15 dB, and the maximum noise level of that event is greater than 65 dB L_{Amax}.

On the basis of the current guidance:

- External sleep disturbance screening criterion of RBL + 15 dB
- External sleep disturbance criterion of 65 dB L_{Amax} (assuming open windows).

This approach is consistent with the SM-CNVS.

5.4 Construction Vibration – disturbance to building occupants

The Line-wide Works shall be constructed with the aim of managing potential disturbance from construction vibration on human occupants in accordance with the guideline 'Assessing Vibration; a technical guideline' (AVTG, DECC 2006), consistent with the SM-CNVS. The guideline provides criteria which are based on the British Standard BS 6472-1992 'Guide to evaluation of human exposure to vibration in buildings (1- 80Hz)'.

BS6472-1992 nominates guideline values for various categories of disturbance, the most stringent of which are the levels of building vibration associated with a "low probability of adverse comment" from occupants. BS 6472-1992 was amended in 2008 to extend the use of the Vibration Dose Values (VDV) to all types of vibration (i.e. continuous, impulsive and intermittent). The vibration dose value is dependent upon the level and duration of the short-term vibration event, as well as the number of events occurring during the daytime or night-time period.

The vibration dose values recommended in BS 6472-1992 for which various levels of adverse comment from occupants may be expected are presented in Table 13.

Table 13 - Vibration Dose Value ranges which might result in various probabilities of adverse comment within buildings

Place and time	Low probability of adverse comment ($m/s^{1.75}$)	Adverse comment possible ($m/s^{1.75}$)	Adverse comment probable ($m/s^{1.75}$)
Critical areas (day or night)[1]	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8
Residential buildings 16 hr day	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential buildings 8 hr night	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8
Offices, schools, educational institutions and places of worship (day or night)	0.4 to 0.8	0.8 to 1.6	1.6 to 2.4
Workshops (day or night)	0.8 to 1.6	1.6 to 3.2	3.2 to 6.4

2. Critical areas include hospital operating theatres and precision laboratories where sensitive operations are occurring. There may be cases where sensitive equipment or delicate tasks require more stringent criteria than the human comfort criteria specify above.

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. This screening test is a conservative approach since it is based on the continuous vibration velocity criteria (i.e. vibration that continues uninterrupted for a defined assessment period) whilst construction works are mostly intermittent.

The screening test will be based on the maximum peak values, as shown in Table 14, for construction works which are intermittent in nature. This approach has been adopted so that the screening test is not unduly stringent.

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.

Table 14 - Construction vibration disturbance – initial screening test

Place and time	Preferred peak velocity, mm/s (>8Hz)	Maximum peak velocity, mm/s (>8Hz)
Critical areas (day or night)[1]	0.14	0.28
Residential buildings 16 hr day	0.28	0.56
Residential buildings 8 hr night	0.20	0.40
Offices, schools, educational institutions and places of worship (day or night)	0.56	1.10
Workshops (day or night)	1.10	2.20

1. Critical areas include hospital operating theatres and precision laboratories where sensitive operations are occurring. There may be cases where sensitive equipment or delicate tasks require more stringent criteria than the human comfort criteria specify above.

5.5 Construction vibration – structural damage to buildings

The Line-wide Works shall be constructed with the aim of achieving the following construction vibration goals structural damage to buildings:

- British Standard BS 7385-2:1993 Evaluation and measurement for vibration in buildings. Guide to damage levels from ground-borne vibration; and
- German Standard DIN 4150-3: Structural Vibration - effects of vibration on structures.

This CNVMP limits the use of the DIN 4150-3 goals to only assess/manage potential impacts to heritage structures. This approach has been adopted in order to achieve consistency across the full scope of the Project, taking into account the following:

- CSSI Planning Approval 7400 SMC&S – Chatswood to Sydenham adopts BS 7385-2 for vibration impact on buildings and does not reference DIN 4150-3
- CSSI Planning Approval 8256 – Sydenham to Bankstown references both BS 7385-2 (as they are applicable to Australian conditions) and the vibration limits set out in DIN 4150-3
- The SM-CNVS adopts DIN4150 as screening criteria for heritage structures only.

5.5.1 Cosmetic damage to buildings

BS7385 suggests levels at which ‘cosmetic’, ‘minor’ and ‘major’ categories of damage might occur. The ‘cosmetic’ damage levels set by BS 7385 are considered ‘safe limits’ up to which no damage due to vibration effects has been observed for particular building types. Damage comprises minor non-structural effects such as hairline cracks on drywall surfaces, hairline cracks in mortar joints and cement render, enlargement of existing cracks and separation of partitions or intermediate walls from load bearing walls. ‘Minor’ damage is considered possible at vibration magnitudes which are twice those given and ‘major’ damage to a building structure may occur at levels greater than four times those values.

Table 15 sets out the recommended limits from BS7385 for transient vibration to ensure minimal risk of cosmetic damage to residential, commercial and industrial buildings. This is shown graphically in Figure 4.

These limits relate predominantly to transient vibration which does not give rise to resonant responses in structures, and to low-rise buildings. Where the dynamic loading caused by continuous vibration is such as to give rise to dynamic magnification due to resonance, especially at the lower frequencies where lower guide values apply, then the guide values in Table 15 may need to be reduced by up to 50%, as shown by Line 3 of Figure 6 for Residential Buildings.

Note: rock breaking/hammering and sheet piling activities are considered to have the potential to cause dynamic loading in some structures (e.g. residences) and it may be appropriate to reduce the transient values by 50%. In addition, for most construction activities involving intermittent vibration sources such as rock breakers, piling rigs, vibratory rollers, excavators and the like, the predominant vibration energy occurs at frequencies greater than 4 Hz (and usually in the 10 Hz to 100 Hz range). On this basis, consistent with the SM-CNVS a conservative vibration damage screening level per receiver type is given below:

- Reinforced or framed structures (Line 1): 25.0 mm/s
- Unreinforced or light framed structures (Line 2): 7.5 mm/s

At locations where the predicted and/or measured vibration levels are greater than shown above (peak component particle velocity), a more detailed analysis of the building structure, vibration source, dominant frequencies and dynamic characteristics of the structure would be required to determine the applicable safe vibration level. The analysis would take into

consideration the transient vibration guide values for minimal risk of cosmetic damage set out in Table 15 and Figure 1 following.

Table 15 - Transient vibration guide values - minimal risk of cosmetic damage (BS 7385) - peak component particle velocity

Line	Type of structure	Frequency range 4 to 15 Hz	Frequency range 15 to 40 Hz	Frequency range 40 Hz and above
1	Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s	50 mm/s	50 mm/s
2	Unreinforced or light framed structures Residential or light commercial type buildings	15 mm/s at 4Hz, increasing to 20 mm/s at 15Hz	20 mm/s at 15Hz, increasing to 50 mm/s at 40Hz	50 mm/s

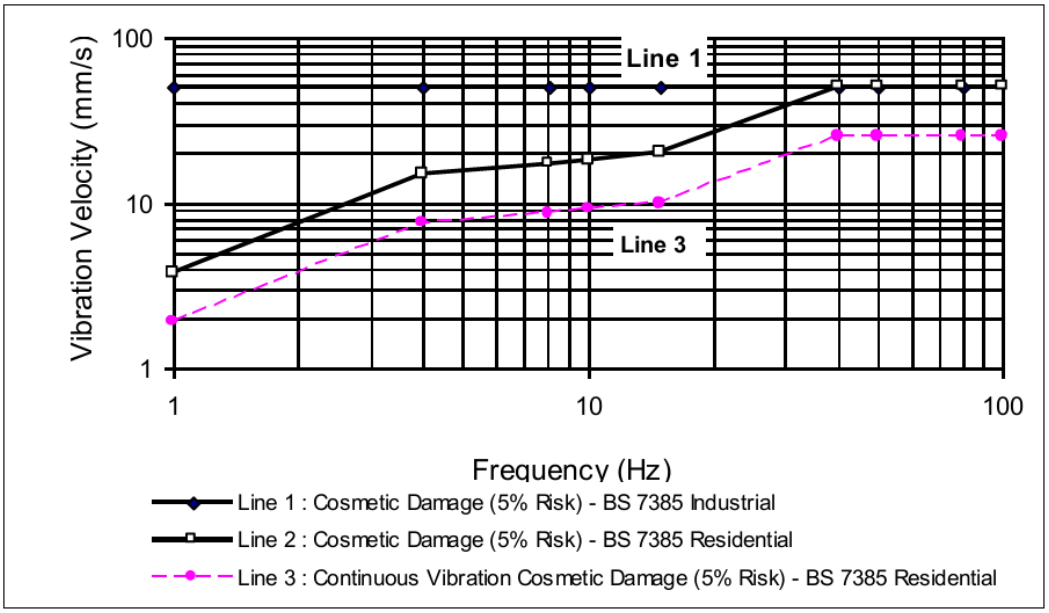


Figure 1 - Graph of Transient Peak Component Particle Velocity Vibration Guide Values for Cosmetic Damage

5.5.2 Heritage structures

The vibration management strategy in relation to heritage structures that may be impacted by Line-wide Works is detailed below.

The British Standard BS 7385 states that, “A building of historical value should not (unless it is structurally unsound) be assumed to be more sensitive.”

If a heritage building or structure is found to be structurally unsound (following inspection) a more conservative cosmetic damage objective of 2.5 mm/s peak component particle velocity (from DIN 4150) would be considered. Unless otherwise advised, heritage buildings and structures would be assessed as per the screening criteria in Section 5.5.1as they should not be assumed to be more sensitive to vibration unless they are found to be structurally unsound. This approach is consistent with the EIS and the SM-CNVS.

The approach to manage potential vibration impact on heritage items shall be to:

1. Identify heritage items where the 2.5 mm/s peak component particle velocity objective may be exceeded during specific construction activities
2. Structural engineering report to be undertaken on identified heritage items, to confirm structural integrity of the building and confirm if item is ‘structurally sound’
3. If item confirmed as ‘structurally sound’, the screening criteria in Section 5.5.1 shall be adopted, or
4. If item confirmed as ‘structurally unsound’, the more conservative cosmetic damage objectives of 2.5 mm/s peak component particle velocity would be adopted.

5.5.3 Sensitive Scientific and Medical Equipment

The vibration management strategy in relation to sensitive scientific and medical equipment that may be impacted by Line-wide Works is based on the approach outlined in the SM-CNVS and detailed below.

Some scientific equipment (e.g. electron microscopes and microelectronics manufacturing equipment) can require more stringent objectives than those applicable to human comfort.

Where it has been identified that vibration sensitive scientific and/or medical instruments are likely to be in use inside the premises of an identified vibration sensitive receiver, objectives for the satisfactory operation of the instrument would be sourced from manufacturer’s data. Where manufacturer’s data is not available, generic vibration criterion (VC) curves as published by the Society of Photo-Optical Instrumentation Engineers (Colin G. Gordon - 28 September 1999) may be adopted as vibration goals. These generic VC curves are presented below in Figure 2 and Table 16.

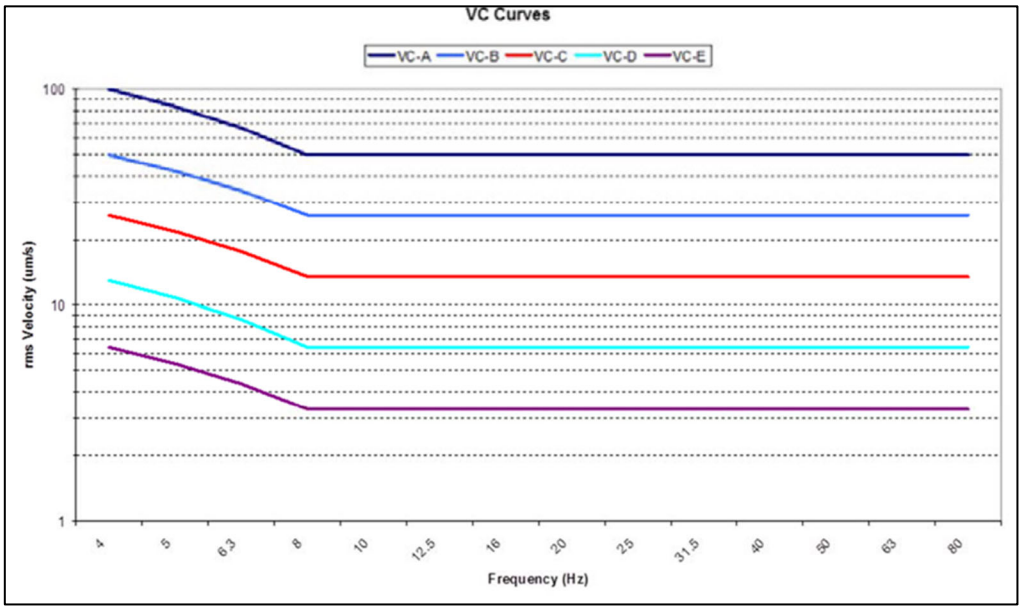


Figure 2 - Vibration Criterion (VC) Curves

Table 16 - Application and Interpretation of the Generic Vibration Criterion (VC) Curves (as shown in Figure 2)

Criterion Curve	Max Level (µm/sec, rms)[1]	Detail Size (microns)[2]	Description of Use
VC-A	50	8	Adequate in most instances for optical microscopes to 400X, microbalances, optical balances, proximity and projection aligners, etc.
VC-B	25	3	An appropriate standard for optical microscopes to 1000X, inspection and lithography equipment (including steppers) to 3 micron line widths.
VC-C	12.5	1	A good standard for most lithography and inspection equipment to 1 micron detail size.
VC-D	6	0.3	Suitable in most instances for the most demanding equipment including electron microscopes (TEMs and SEMs) and E-Beam systems, operating to the limits of their capability.
VC-E	3	0.1	A difficult criterion to achieve in most instances. Assumed to be adequate for the most demanding of sensitive systems including long path, laser-based, small target systems and other systems requiring extraordinary dynamic stability.

1. As measured in one-third octave bands of frequency over the frequency range 8 to 100 Hz.
2. The detail size refers to the line widths for microelectronics fabrication, the particle (cell) size for medical and pharmaceutical research, etc. The values given consider the observation requirements of many items depend upon the detail size of the process.

5.5.4 Utilities and other vibration sensitive structures

Some structures and utilities located near the Project may be particularly sensitive to vibration. A vibration goal which differs from the cosmetic damage goals presented in Section 5.5 may need to be adopted. Examples of such structures and utilities include:

- Tunnels
- Gas pipelines
- Fibre optic cables

The British Standard BS 7385-2:1993 'Evaluation and measurement for vibration in buildings - Part 2: Guide to damage levels from ground-borne vibration' notes that structures below ground are known to sustain higher levels of vibration and are very resistant to damage unless in very poor condition (British Standard BS 7385-2:1993, p5). Further guidance is taken from the German Standard DIN 4150: Part 3-1999.02 ‘Structural vibration in buildings - Effects on Structures’. Section 5.3 of DIN 4150: Part 3 sets out guideline values for vibration velocity to be used when evaluating the effects of vibration on buried pipework.

Table 17 presents the initial reference guideline for utilities and other buried pipework to evaluate the effects of short-term vibration impact. Specific vibration goals should be determined on a case-by-case basis as part of the CNVIS for each work site.

Table 17 - Transient vibration guide values - minimal risk of cosmetic damage (BS 7385) - peak component particle velocity

Line	Pipe material	Guideline values for vibration velocity measured on the pipe[1]
1	Steel (including welded pipes)	100 mm/s
2	Clay, concrete, reinforced concrete, pre-stressed concrete, metal (with or without flange)	80 mm/s
3	Masonry, plastic	50 mm/s

1. Rock breaking/hammering and sheet piling activities are considered to have the potential to cause dynamic loading in some structures and it may therefore be appropriate to reduce the transient values by 50%.

5.6 National Standard for exposure to noise

In accordance with SSI 7400 Condition of Approval E43, LW Works will be managed to ensure that noise generated by construction will not exceed the National Standard for exposure to noise in the occupational environment of an eight-hour equivalent continuous A-weighted sound pressure level of $L_{Aeq,8hour}$ 85dB(A) for any employee working at a location near a Line-Wide Works worksite.

6. Noise and Vibration Sensitive Receivers

6.1 Land Use Survey

In accordance with the Project Planning Approval, Land Use Surveys are being undertaken prior to construction to identify potentially critical areas that are sensitive to construction noise (airborne and ground-borne) and vibration impacts. The survey brought the NSW cadastral database and identified land use details into a Geographic Information System (GIS). The GIS allows potentially critical areas that are sensitive to construction noise, vibration and ground-borne noise impacts to be easily identified and updated as land uses change during the Project timeline. The data can be readily included into the noise and vibration modelling, to allow effective management of noise and vibration impacts on identified sensitive receivers.

6.1.1 Noise and Vibration Sensitive Receivers

To assist in the assessment and management of construction noise and vibration, Noise Catchment Areas (NCAs) have been nominated adjacent to Line-wide Works project areas based on their similar acoustic environment prior to construction commencing. The NCAs for Portion 2 and Portion 3 were established for the Tunnel and Station Excavation (TSE) works of the Sydney Metro City & Southwest Project. The NCAs for Portion 4 established in the EIS were reviewed and modified based on more detailed design information and site-specific characteristics.

The land use information was collated from a combination of site inspections; review of street-level imagery and aerial photography; and review of publicly available land and property information. All cadastral lots within the identified NCAs and within 100m of the proposed rail tunnel alignment and within 400m of surface work areas were classified into one of the following receiver categories:

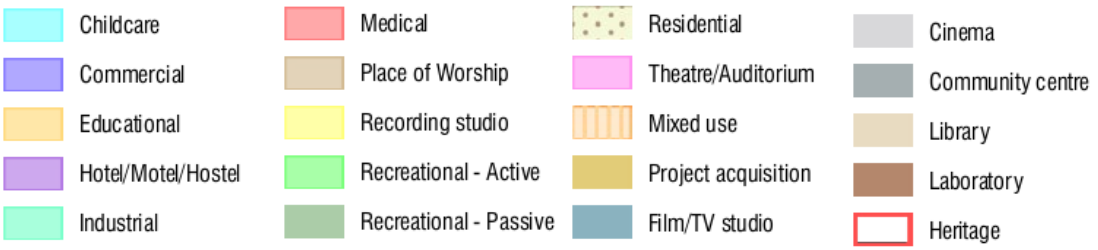


Figure 3 - Land use categories identified in Land Use Survey GIS and Appendix A

The comprehensive Land Use Survey is presented in Appendix A.

6.1.2 Heritage

Renzo Tonin and Associates, in consultation with the project heritage specialist, have identified potentially vibration sensitive heritage properties in each NCA and within 100 m of the proposed rail alignment and surface work site. Heritage properties (see list provided in Appendix B.2) have been included in the land use GIS database, and subsequently incorporated into the vibration models to ensure vibration impacts are managed to minimise the risk of property damage.

6.2 Existing acoustic environment (residential receivers)

The existing noise environment varies along the Project length due to the wide range of residential, commercial, urban and industrial land uses within the study area (within approximately 100 m on either side of the project alignment and within 200 m of the construction compounds). The primary contributor to the ambient noise environment in the study area is traffic noise from the existing road network. Other noise sources include the Main North Rail Line, the Bankstown Rail Line and aircraft noise associated with Sydney Airport.

SLR Consulting Australia Pty Ltd conducted long-term noise monitoring on behalf of TfNSW to quantify ambient noise levels for the EIS (SSI 7400 and SSI 8256). Noise data results used to prepare the EIS are presented in Section 2 of the respective EIS:

- Sydney Metro City & Southwest Chatswood to Sydenham Technical Paper 2 - Noise and Vibration Assessment (28 April 2016)
- Sydney Metro City & Southwest Sydenham to Bankstown Technical Paper 2 - Noise and Vibration Assessment (28 August 2017).

The EIS data was supplemented by additional monitoring data from the Renzo Tonin and Associates noise monitoring database.

Table 18 below summarises the NCAs, describes the residential receiver types in each NCA, identifies the nearest construction work area and comments on the suitability of the EIS RBL data. The representative RBL for each NCA are also presented. Where assessment is required to be undertaken in accordance with the ICNG, the RBLs are used to determine the Noise Management Levels for airborne noise generated by the Line-wide Works construction activities.

Table 18 - Rating Background Levels and Noise Management Levels at Residential Receivers

NCA	Description of NCA Receiver Type	Nearest construction work area	Relationship to EIS NCAs	Logger ID	RBL Day	RBL Evening	RBL Night
Portion 2 and 3							
CDS_01	Residential buildings on Pacific Hwy and along Mowbray Road, south of Mowbray Rd. Traffic noise affected.	Chatswood Dive	EIS Chatswood Dive_A expanded to include EIS Chatswood Dive_F Pacific Highway receivers	RTA TH511-L02 516 Pacific Hwy, Chatswood	55	54	42
CDS_02	Residential apartments on Pacific Highway opposite site and along Mowbray Road, north of Mowbray Rd. Traffic noise affected.	Chatswood Dive	EIS Chatswood Dive_B expanded to include EIS Chatswood Dive_C Pacific Highway receivers	RTA TH511-L02 516 Pacific Hwy, Chatswood	55	54	42
CDS_03	Residential apartments north of Nelson St and west of rail line	Chatswood Dive	EIS Chatswood Dive_C, excluding Pacific Highway receivers	EIS B.24	50	47	39
CDS_04	Residential buildings north of Mowbray Rd, east of railway line (behind rail barrier)	Chatswood Dive	EIS Chatswood Dive_D	EIS B.25	41	40	35

NCA	Description of NCA Receiver Type	Nearest construction work area	Relationship to EIS NCAs	Logger ID	RBL Day	RBL Evening	RBL Night
CDS_05	Residential buildings south of Mowbray Rd, east of railway line (behind rail barrier)	Chatswood Dive	EIS Chatswood Dive_E	EIS B.22	42	41	34
CDS_06	Residential apartments south of Mowbray Rd and west of rail line	Chatswood Dive	EIS Chatswood Dive_F, excluding Pacific Highway receivers	EIS B.24	50	47	39
CDS_07	Residential buildings west of Pacific Hwy and south of Mowbray Road, shielded by CDS_01	Chatswood Dive	In addition to EIS	EIS B.22	42	41	34
CDS_08	Residential buildings west of Pacific Hwy and north of Mowbray Road, shielded by CDS_02	Chatswood Dive	Extension of EIS NCAs to 500m from site	EIS B.25	41	40	35
AS_01	Residential apartments north of Gore Hill Freeway, west of Reserve Rd, south of Butchers Ln	Artarmon Substation	Consolidated 3 EIS catchments (A/B/C) due to shaft relocation	EIS B.21	49	46	41
AS_02	Commercial/ industrial area south of Gore Hill Freeway, east of Pacific Highway	Artarmon Substation	Expanded from the EIS Catchment Artarmon Substation D	EIS B.21	49	46	41
AS_03	Commercial/ industrial area south of AS_02, eastern side of Pacific Highway	Artarmon Substation	Expanded from the EIS Catchment Artarmon Substation D	EIS B.21	49	46	41
CN_01	Residential south near Pacific Highway, north of site (close to highway)	Crows Nest Station	EIS Crows Nest Station_B	EIS B.19 for D/E, RTA TG360 for N	59	55	40
CN_02	Residential northeast of work site (less exposed to traffic)	Crows Nest Station	Combined EIS C,D & E2	RTA TG360	48	44	40

NCA	Description of NCA Receiver Type	Nearest construction work area	Relationship to EIS NCAs	Logger ID	RBL Day	RBL Evening	RBL Night
CN_03	Residential and commercial southeast of work site on Pacific Highway and Falcon Street (exposed to traffic)	Crows Nest Station	EIS Crows Nest Station_E1	EIS B.19 for D&E and RTA TH703 for N	59	55	40
CN_04	Residential south west of site on Pacific Highway (exposed to traffic)	Crows Nest Station	EIS Crows Nest Station_A1	EIS B.19 for D,E and RTA TH703 for N	59	55	40
CN_05	Residential south west of Pacific Highway, south west of Nicholson Place (less exposed to traffic)	Crows Nest Station	EIS C2S Crows Nest Station_A2	RTA TH511-L01 11 Lamont St, Wollstonecraft	45	45	40
VC_01	Residential west of Pacific Hwy and west of Miller Street, south of Berry Street	Victoria Cross Station	EIS C2S Victoria Cross Station_A	EIS B.17	55	50	44
VC_02	Residential west of Miller Street, north of Berry St	Victoria Cross Station	EIS C2S Victoria Cross Station_B	EIS B.17	55	50	44
VC_03	Residential (low rise), north of McLaren Street	Victoria Cross Station	Victoria Cross Station_C	WM Report No 16200	54	47	40
VC_04	Residential (high rise), along McLaren St	Victoria Cross Station	EIS C2S partial NCAs B & C	RTA TH511-L03 29 McLaren St, North Sydney	49	45	39
VC_05	Residential (high rise), East of VC_03 and VC_04, west of Warringah Freeway	Victoria Cross Station	EIS C2S partial NCAs C & D	138 Walker St, Wilkinson Murrays May-June 2015	59	57	44
VC_06	Commercial district with some residential (high rise), east of Miller Street and west of Warringah Freeway,	Victoria Cross Station	EIS C2S partial NCAs C & D	Energy2U Alliance,ref 60100174-RPT02.03, 16/09/2010	54	51	46

NCA	Description of NCA Receiver Type	Nearest construction work area	Relationship to EIS NCAs	Logger ID	RBL Day	RBL Evening	RBL Night
	surrounding southern site						
BP_01	Residential apartments east of Blues Point Rd	Blues Point	Updated NCA boundary, combined E & F from EIS, Night RBL confirmed from attended measurements in report reference 60100174-RPT02.03	EIS B.16	51	49	40
BP_02	Residential apartments west of Blues Point Rd	Blues Point	combined NCAs A&B from EIS C2S	EIS B.14	51	49	40
BN_01	Residential tower under construction	Barangaroo Station	combined NCAs C&D from EIS C2S	EIA B.12	50	45	40
BN_02	Residential buildings north of Argyle St and Bettington St	Barangaroo Station	EIS C2S Barangaroo Station_A	EIS B.12	50	45	40
BN_03	Residential buildings east of High St and south of Kent St	Barangaroo Station	EIS C2S Barangaroo Station_B	EIS B.12	50	45	40
BN_04	Mixed residential and commercial west of Harbour Bridge	Barangaroo Station	Combined EIS NCAs C&D C2S	EIS B.13	62	62	52
BN_05	Mixed residential and commercial at Jones Bay and Pyrmont Bay	Barangaroo Station	In addition to EIS C2S	EIS B.28	51	46	41
BN_06	Residential buildings in Balmain East	Barangaroo Station	In addition to EIS C2S	EIS B.29	49	49	41
BN_07	Mixed residential and commercial south Western Distributor and Erskine St	Barangaroo Station	In addition to EIS C2S	EIS B.13	62	62	52
MP_01	Residential CBD	Martin Place Station	Combined C2S EIS NCAs A,G & F	EIS B.11	61	56	52

NCA	Description of NCA Receiver Type	Nearest construction work area	Relationship to EIS NCAs	Logger ID	RBL Day	RBL Evening	RBL Night
MP_02	Residential CBD	Martin Place Station	EIS C2S Martin Place Station_B	EIS B.11	61	56	52
MP_03	Residential CBD	Martin Place Station	EIS C2S Martin Place Station_C	EIS B.11	61	56	52
MP_04	Residential CBD	Martin Place Station	EIS C2S Martin Place Station_D & E	EIS B.11	61	56	52
PS_01	Residential CBD	Pitt Street Shaft	EIS C2S Pitt Street Shaft_A	RTA TH208	59	57	53
PS_02	Residential CBD	Pitt Street Shaft	Combined B&F from C2S EIS	RTA TH208	59	57	53
PS_03	Residential CBD	Pitt Street Shaft	Combined NCAs Pitt Street Shaft_C&D from C2S EIS	RTA TH208	59	57	53
PS_04	Residential CBD	Pitt Street Shaft	EIS C2S Pitt Street Shaft_E	RTA TH208	59	57	53
PS_05	Residential CBD	Pitt Street Shaft	EIS C2S Pitt Street Shaft_G	RTA TH208	59	57	53
CS_A	Residential CBD	Central Station	EIS C2S CS_A	EIS B.26	58	56	52
CS_B	Residential CBD	Central Station	EIS C2S CS_B	EIS B.26	58	56	52
CS_C	Residential CBD	Central Station	EIS C2S CS_C	EIS B.26	58	56	52
CS_D	Residential CBD	Central Station	EIS C2S CS_D	EIS B.26	58	56	52
CS_G	Residential CBD	Central Station	EIS C2S CS_G	EIS B.09	56	53	45
CS_I	Residential CBD	Central Station	EIS C2S CS_I	EIS B.09	56	53	45
WS_01	Residential apartments north of Raglan St	Waterloo Station	EIS C2S Waterloo Station_A	EIS B.06	54	47	39
WS_02	Residential apartments east of Botany Rd, north of	Waterloo Station	EIS C2S Waterloo Station_B	EIS B.06	54	47	39

NCA	Description of NCA Receiver Type	Nearest construction work area	Relationship to EIS NCAs	Logger ID	RBL Day	RBL Evening	RBL Night
	Buckland St, south of Raglan St						
WS_03	Residential apartments and terraces south of Buckland St	Waterloo Station	C2S EIS Waterloo Station_C	EIS B.06	54	47	39
WS_04	Residential apartments and terraces west of Botany Rd, north of Buckland St, south of Raglan St	Waterloo Station	C2S EIS Waterloo Station_D	EIS B.06	54	47	39
MDS_01	Residential north west of railway line, south west of Edgeware Rd	Marrickville Dive	Combined NCAs Marrickville Dive_B & A from C2S EIS	EIS B.03	52	43	38
MDS_02	Residential north west of railway line, north east of Edgware Rd	Marrickville Dive	C2S EIS Marrickville Dive_C	EIS B.02	58	52	38
MDS_03	Residential south of railway line and east of Bedwin Street	Marrickville Dive	C2S EIS Marrickville Dive_D	EIS B.01	59	53	41
MDS_04	Residential south east of railway line and south west of Bedwin Street	Marrickville Dive	Combined F, G & E from C2S EIS	EIS B.01	59	53	41
Portion 4							
S2B_01	Residential buildings up and down side of railway line with some commercial buildings	Rail corridor	S2B EIS NCA01	EIS B.04	41	41	34
S2B_02	Predominantly residential buildings up and down side of railway line	Rail corridor	S2B EIS NCA02	EIS B.05	40	40	33
S2B_03	Predominantly residential buildings up and down side of railway line	Rail corridor and Bulk Power Supply	S2B EIS NCA03	EIS B.06	38	38 (39)[1]	34

NCA	Description of NCA Receiver Type	Nearest construction work area	Relationship to EIS NCAs	Logger ID	RBL Day	RBL Evening	RBL Night
S2B_04	Commercial around Canterbury Railway Station and residential buildings up side of railway line and south west of Cooks River	Rail corridor and Bulk Power Supply	S2B EIS NCA04	EIS B.07	40	40	35
S2B_05	Predominantly residential buildings up and down side of railway line	Rail corridor and Bulk Power Supply	S2B EIS NCA05	EIS B.09	36	36 (37)[1]	32
S2B_06	Commercial around Campsie Railway Station and residential buildings up and down side of railway line	Rail corridor and Bulk Power Supply	S2B EIS NCA06	EIS B.10	45	42	35
S2B_07	Commercial around Belmore Railway Station and residential buildings up and down side of railway line	Rail corridor	S2B EIS NCA07	EIS B.13	41	41	35
S2B_08	Commercial around Lakemba Railway Station andresidential buildings up and down side of railway line	Rail corridor	S2B EIS NCA08	EIS B.14	47	47	41
S2B_09	Predominantly residential buildings up and down side of railway line with educational buildings	Rail corridor	S2B EIS NCA09	EIS B.16	44	44	36
S2B_10	Commercial buildings surrounding Punchbowl Railway Station with residential.	Rail corridor	S2B EIS NCA10	EIS B.19	47	47	41
S2B_11	Residential buildings up and down side of railway line	Rail corridor	S2B EIS NCA11	EIS B.20	47	47 (49)[1]	39
S2B_12	Commercial buildings surrounding	Rail corridor	S2B EIS NCA12	EIS B.22	54	51	42

NCA	Description of NCA Receiver Type	Nearest construction work area	Relationship to EIS NCAs	Logger ID	RBL Day	RBL Evening	RBL Night
	Bankstown Railway Station						
S2B_13	Residential buildings up and down side of railway line with some commercial buildings	Rail corridor	S2B EIS NCA13	EIS B.23	42	42 (43)[1]	39
BPS_01	Predominantly residential buildings. The exception is the first row of buildings along Canterbury Road, which are mixed commercial/ residential	Bulk Power Supply	Not defined in EIS	EIS B.07	40	40	35

6.3 Evaluation and Assessment of Construction Noise and Vibration Impacts

6.3.1 Site and Activity Construction Noise and Vibration Impact Statements

Construction Noise and Vibration Impact Statements (CNVIS) will be prepared prior to and during project delivery to address the different phases of construction and for working outside of approved hours. CNVISs will be progressively prepared as the design develops. Key CNVISs to be prepared include:

- Portion 2 - SMTF South Works CNVIS
  - Site establishment, enabling and civil works
  - Track system and infrastructure works
- Portion 3 - Chatswood to Sydenham Tunnels and Stations Works
  - Tunnel and Underground Stations works CNVIS
  - Northern Connection works CNVIS
  - Open Northern Dive and Tunnels works CNVIS
  - Open Southern Dive and Tunnels works CNVIS
  - Bulk Power Supply Works (northern)
- Portion 4 – Power Supply Works
  - Bulk Power Supply works (southern) CNVIS
  - Southwest Corridor power works CNVIS
- Other local area or utilities work associated with the Line-wide Works.

The CNVISs will provide detailed construction noise and vibration prediction, assessment, mitigation design outcomes and discussion of management measures to limit impacts to sensitive receivers. Each CNVIS will be prepared before construction noise and vibration impacts commence and will set out the mitigation and management measures required for the construction stage, through consultation with affected receivers (in accordance with SSI 7400 Condition of Approval E33/ SSI 8256 Condition of Approval E27) and the specific measures that must be in place before OOHW can start. The outcomes of each CNVIS feed into the Community Communication Strategy. Site specific management measures will be incorporated into Site Environmental Plans.

Each CNVIS will address:

- Scope of work covered by the CNVIS
- Justification for OOHW (where required)
- Nearest noise and vibration sensitive receivers, based on land use survey
- Construction noise and vibration objectives
- Construction noise and vibration assessment
- Mitigation options and preferred management measures
- Noise and vibration monitoring requirements for each construction worksite/activity.

6.3.2 Process for Assessing Construction Noise and Vibration

The format of the CNVIS and the process of assessment of impacts are detailed in Figure 4 overleaf.

1. Determine noise and vibration objectives		
	For each key construction area:	• Describe the proposed activities including duration of the proposed works, whether works will be outside standard construction hours (strong justification required) and how often the works are required. • Identify noise sensitive receivers • Determine relevant noise and vibration objectives, with reference to Section 5. Note: Assessment usually undertaken at locations considered to be representative of a group of receivers with a similar level of exposure to construction works.
2. Identify Construction Stages		
	For each key construction area:	• Identify construction aspects or stages and key activities for each stage • Include: – the site location; – times of operation; – processes involved; – plant & equipment (inc. size / type). • Identify other construction works in the vicinity of the project. Consult and coordinate with the Proponents of such works to manage and minimise cumulative noise & vibration impacts, in particular in relation to OOHW (refer to Section 3.4) • Where there are OOHW, identify whether the works are low, medium or high risk profile based on SM-CNVS (Figure 4.1)
3. Predict Noise and Vibration Impacts		
	Airborne Construction Noise	• Determine $L_{Aeq(15\ minute)}$ sound power levels (potential noise and vibration impacts) based on operating scenarios for input to noise model (see below). • Establish noise model for construction activity/ component. • The noise model should include: – Height and location of sources and receivers; – Distance attenuation (incorporating noise reflections and ground absorption); – Effects of noise shielding (topography, buildings, boundary fences, noise barriers etc); and – Effects of *standard* noise mitigation measures. • Calculate the $L_{Aeq(15minute)}$ noise levels from the proposed construction activities at each receiver and compare these with the construction noise objectives. • For night-time activities, calculate the maximum (L_{Amax}) noise levels and compare with L_{Amax} 65 dB(A) sleep disturbance criterion, applied at the external facade.

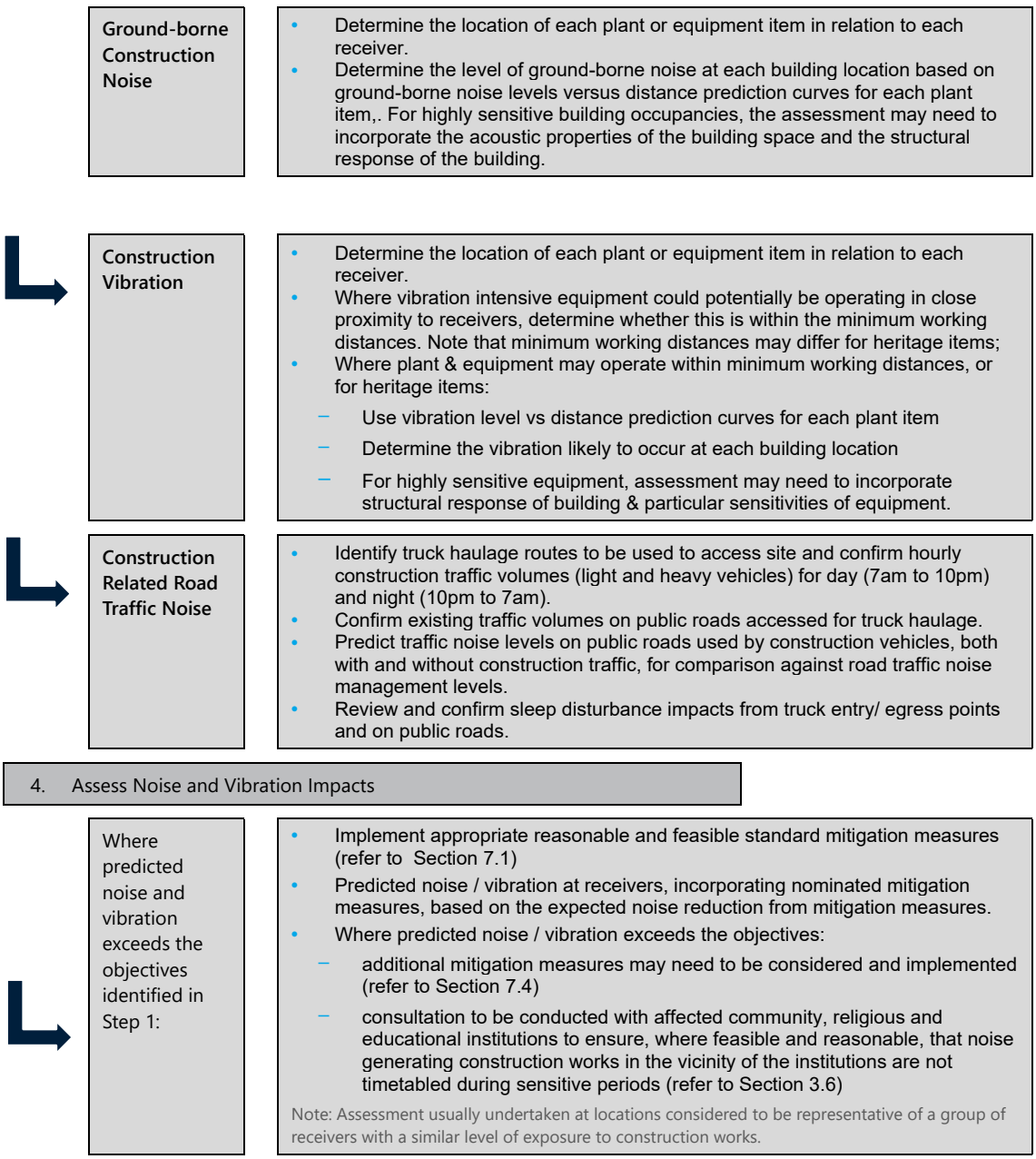


Figure 4 - Process for Assessing Construction Noise and Vibration

6.3.3 Blasting Works

No blasting works are planned as part of the Line-wide Works

Should any blasting works become necessary then a Blasting Management Strategy will be prepared to ensure that the applicable blasting criteria are achieved and that blasting impacts are managed and minimised. The Blasting Management Strategy would be submitted to the DPE for approval prior to any blasting work being conducted, and would take into consideration all relevant factors including:

- Preparation of a CNVIS specifically in relation to the proposed blasting activities
- Establishment of applicable vibration and overpressure criteria
- Assessment of vibration, overpressure and noise levels from the proposed blasting activities at each receiver

- An assessment of the potential vibration, overpressure and noise impacts at each receiver
- Pre- and post-dilapidation surveys of any sensitive structures which may be damaged by blasting
- Preparation of a suitable blast program
- Identification of feasible and reasonable procedures and mitigation measures
- Applicable buffer distances for pre- and post- construction dilapidation surveys of sensitive structures.
- An appropriate community information program
- Blast monitoring

6.3.4 Management procedures and hold points for OOHW

As noted in Section 4.2.1 the Planning Approvals provide two approval pathways for works outside of the standard construction hours:

- Works approved through an EPL or
- Works approved under an Out-of-Hours Work Protocol for Work not subject to an EPL.

Out of hours works subject to an EPL are assessed under the Out of Hours Work Procedure (SMCSWLWC-SYC-1NL-EM-PRO-000807) set out in Appendix D. Note that this procedure will be updated to address relevant conditions once the EPL is granted. Out of hours work not subject to the EPL are assessed under the OOHW Protocol set out in Appendix E.

Both the Protocol and the Procedure address internal approval and hold points relating to:

- The justification of OOHW
- Noise and vibration assessment
- External approvals, including high noise/vibration risk works, either
  - Works approved through an EPL
    - Community notification
    - Tool boxing of the workforce on sensitive receivers and management requirements prior to the commencement of works
    - Noise and vibration verification monitoring.
  - Works approved under an Out-of-Hours Work Protocol (not subject to an EPL)
    - ER approval
      - following endorsement by AA as required for CSSI 7400
      - as required for CSSI 8256
    - DPE approval following endorsement by AA and/or ER for high noise works after 9 pm

All out of hours works (except in emergency situations) will be documented on the relevant Out of Hours Works application.

To further reduce potential noise impacts on the surrounding community, noise monitoring trials will be undertaken in the preceding time-period to confirm noise from the worksite is within the predicted noise levels. This proactive approach involves monitoring in the hour preceding the relevant OOHW period, where feasible, for example for:

- Evening (6pm to 10pm) OOHW, noise monitoring would be completed between 5pm and 6 pm to ensure that construction noise complies with evening predicted noise levels
- Night (10pm to 7am) OOHW, noise monitoring between 9pm and 10 pm to ensure construction noise complies with night-time predicted noise levels.
- Out-of-hours permits will only be issued if the noise level complies in the preceding period.

7. Noise and Vibration Management

7.1 Standard Noise and Vibration Mitigation Measures

Table 19sets out an indicative list of standard noise and vibration mitigation measures to be implemented during the Line-wide Works as required to manage construction noise and vibration. This information is based on information available at the time of preparation of this CNVMP.

Table 19 - Standard Noise and Vibration Mitigation Measures

Action Required		Applies to	Details	Responsibility
Construction Planning	Construction Noise and Vibration Management Plan update	Prior to construction	The CNVMP must be prepared prior to the commencement of Construction and regularly updated to account for changes in noise management issues and strategies.	Construction Manager Environment and Sustainability Manager Environmental Advisor Environmental Coordinator Noise & Vibration Specialist
	Building condition surveys and vibration monitoring	Prior to using vibration significant plant near highly sensitive buildings	Pre-construction condition surveys of vibration sensitive buildings may be warranted. At locations where there are high-risk receptors, such as the heritage buildings listed in Appendix A, vibration monitoring should be conducted during the activities causing vibration.	Construction Manager Environment and Sustainability Manager Environmental Advisor
	Community consultation measures – inform community of construction activity & potential impacts	Airborne noise Ground-borne noise Vibration	Community consultation will be conducted as detailed in the Community Communications Strategy C2B (SMCSWLWC-SYC-1NL-CL-PLN-000027). Also refer to Section 3.6 of this Plan.	Stakeholder & Community Relations Manager Environment and Sustainability Manager Environmental Advisor
	Work scheduling around sensitive areas	Airborne noise Ground-borne noise Vibration	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. When working adjacent to schools, medical facilities and childcare centres, scheduling particularly noisy activities around HSC exam times, child care sleep times and other identified sensitive times should be considered, where feasible and reasonable. When working adjacent to churches and places of worship particularly noisy activities should be scheduled outside services, where feasible and reasonable. Also refer to Section 3.6 of this Plan.	Stakeholder & Community Relations Manager Environment and Sustainability Manager Environmental Advisor
	Cumulative construction noise and vibration impacts	Airborne noise Ground-borne noise Vibration	Consult proponents of other construction works in the vicinity of the Project area, in accordance with Project Planning Approvals. Undertake reasonable steps to coordinate works to minimise impacts on, and maximise respite for, affected sensitive receivers.	Stakeholder & Community Relations Manager Environment and Sustainability Manager Environmental Advisor
	Site inductions	Airborne noise Ground-borne noise	All employees, contractors & subcontractors are to receive a Project induction. The environmental component must include: • relevant licence & approval conditions; • permissible hours of work;	Environmental Advisor Environment Coordinators

Action Required		Applies to	Details	Responsibility
		Vibration	• any limitations on high noise activities; • location of nearest sensitive receivers; • construction employee parking areas; • relevant site-specific mitigation measures • appropriate behavioural practices	
	Behavioural practices	Airborne noise	No swearing or unnecessary shouting or loud stereos/radios on site. No dropping of materials from height where practicable, throwing of items & slamming of doors.	Environment Coordinators Site Supervisors
	Equipment selection	Airborne noise Vibration	Use quieter & less noise/ vibration emitting construction methods where feasible & reasonable. Where vibration intensive equipment is used within the minimum working distances, determine whether alternative construction methodology or less vibration intensive equipment can be used, e.g. use bored piles rather than impact or percussion piling.	Construction Area Managers Project Engineers Site Engineers Site Supervisors Environment Coordinators Environmental Advisor
	Rental plant and equipment	Airborne noise	The noise levels of plant & equipment items are to be considered in rental decisions.	Construction Area Managers Project Engineers Site Engineers Site Supervisors
	Plan worksite and activities to minimise noise and vibration.	Airborne noise Vibration	Plan traffic flow, parking & loading/unloading areas to minimise reversing movements within the site.	Construction Area Managers Project Engineers Site Engineers Site Supervisors Environment Coordinator Environmental Advisor
Hours of Work	Construction hours and scheduling	Airborne noise Ground-borne noise Vibration	Where feasible & reasonable, construction should be carried out during the standard construction hours identified in Section 4.2. Identify sensitive land uses and implement mitigations including altering hours of impact outside of sensitive periods, where feasible and reasonable. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods, where feasible and reasonable. Avoid the coincidence of noisy plant working simultaneously close together and adjacent to sensitive receivers	Construction Manager Construction Area Managers Site Supervisors Environment Coordinators Environmental Advisor
	Construction respite period	Airborne noise Ground-borne noise	Noise intensive activities near sensitive receivers should be undertaken as detailed in Section 4.3of this Plan	Construction Manager Construction Area Managers Site Supervisors Environmental Advisor Environment Coordinators Stakeholder and Community Relations Manager
	Out of Hours Works	Airborne noise Ground-borne noise	Out of Hours Works to be undertaken in accordance with the Project Planning Approval Conditions and this Plan.	Construction Manager Construction Area Managers

Action Required		Applies to	Details	Responsibility
		Vibration	Works would be programmed to minimise the number of consecutive nights impacting the same receptors, where reasonable and feasible	Site Supervisors Environmental Advisor Environment Coordinators
	Minimise disturbance arising from delivery of goods to construction sites.	Airborne noise	Ensure all deliveries occur during standard construction hours, except where detailed in Section 4.4.	Construction Area Managers Project Engineers Site Engineers Site Supervisors Environment Coordinators
Source Controls.	Maximum noise levels	Airborne noise	The noise levels of plant and equipment must have operating Sound Power Levels compliant with the maximum noise levels in Table 3.2 of the SM-CNVS (Section 7.2 of this CNVMP). Regular compliance checks on the noise emissions of all plant and machinery used for the project would indicate whether noise emissions from plant items were higher than predicted. This also identifies defective silencing equipment on the items of plant.	Construction Area Managers Project Engineers Site Engineers Site Supervisors Environment Coordinator Environmental Advisor
	Use and siting of plant	Airborne noise Vibration	Simultaneous operation of noisy plant within discernible range of a sensitive receiver is to be limited/ avoided where possible. The offset distance between noisy plant & adjacent sensitive receivers is to be maximised where practicable. Plant used intermittently to be throttled down or shut down when not in use where practicable. Noise-emitting plant to be directed away from sensitive receivers where possible, particularly during OOHW. NOTE: Due to limited land available for construction this may not at times be practical.	Construction Area Managers Project Engineers Site Engineers Site Supervisors
	Non-tonal reversing alarms.	Airborne noise	Non-tonal movement alarms (or an equivalent mechanism) must be fitted & used on all construction vehicles & mobile plant regularly used on site and on all equipment required for OOHW.	Construction Area Managers Project Engineers Site Engineers Site Supervisors Environment Coordinators Environmental Advisor
Path Controls	Shield sensitive receivers from noisy activities.	Airborne noise	Where reasonable & feasible, use structures to shield residential receivers from noise such as: • site shed placement; • earth bunds; • hoarding • enclosures to shield fixed noise sources such as pumps, compressors, fans etc. (where practicable); • acoustic curtains	Construction Area Managers Project Engineers Site Engineers Site Supervisors Environment Coordinators Environmental Advisor
	Operational noise barriers and temporary noise barriers	Airborne noise	Where feasible and reasonable, • operation noise barriers shall be implemented at the start of construction (or at other times during construction) to minimise construction noise impacts • temporary acoustic fencing/barriers should be installed around the site perimeter where construction is	Construction Area Managers Project Engineers Environment Coordinators Environmental Advisor

Action Required		Applies to	Details	Responsibility
			concentrated in a single area to mitigate construction noise	
	Temporary, relocatable noise barriers during local area and utility works (LAUW)		During local area and utility works (LAUW) such as underbore works use the following controls: • Use a portable barrier (or similar protection) to shield the underbore equipment where works occur in proximity to residential receivers where reasonable and feasible. The height and nature of the barrier would be determined when the equipment selection is finalised. The barrier would be construction of a material of minimum mass 12 kilograms per metre squared such as 20 millimetre plywood or a proprietary barrier such as Echobarrier. • Carry out underbore works within standard construction hours, where this is considered to be feasible. • Orientate and locate underbore equipment to minimise noise impact to residential receivers, where this is considered to be feasible • Notification to surrounding residents of planned works prior to the works commencing	Construction Area Managers Project Engineers Environment Coordinators Environmental Advisor
Monitoring	Monitoring	Airborne noise Ground-borne noise Vibration	Airborne noise and ground-borne & vibration will be monitored: • as detailed in Section 8 • any necessary adaptive management requirements will be identified and implemented where reasonable and feasible.	Environmental Advisor Environment Coordinator
	Site specific attended vibration measurements	Vibration	Representative attended vibration measurements are required at the commencement of vibration generating activities to confirm that vibration is within the acceptable range to prevent cosmetic building damage.	Environmental Advisor Environment Coordinators

7.2 Maximum Noise Levels for Plant and Equipment

The Sound Power Level (SWL) represents the total noise output of operating plant and equipment. The SWL is used in computer noise models to predict Sound Pressure Levels (SPLs) at nearby receivers.

When undertaking site compliance measurements, it is normally the SPL that is measured at a specified distance (typically 7m) from the plant or equipment.

All plant and equipment used for LW should have SWL and SPL which are no higher than the corresponding figures shown in Table 20. Plant and equipment with SWLs or SPLs higher than those on the table would be deemed to be emitting an excessive level of noise and would not be permitted to operate on LW construction sites. Plant and equipment will be subject to regular noise level checks to verify compliance, as stated in Table 20.

Table 20 - Maximum Allowable Sound Power Levels for Construction Equipment

Equipment	Maximum Allowable Sound Power Level (dB) LAmax	Maximum Allowable Sound Pressure Level (dB) LAmax at 7 m
Excavator Hammer	118	93
Excavator (approx. 3 tonne)	90	65
Excavator (approx. 6 tonne)	95	70
Excavator (approx. 10 tonne)	100	75
Excavator (approx. 20 tonne)	105	80
Excavator (approx. 30 tonne)	110	85
Excavator (approx. 40 tonne)	115	90
Skidsteer Loaders (approx. 1/2 tonne)	107	82
Skidsteer Loaders (approx. 1 tonne)	110	85
Dozer (tracking) - equiv. CAT D8	118	93
Dozer (tracking) - equiv. CAT D9	120	95
Dozer (tracking) - equiv. CAT D10	121	96
Backhoe/FE Loader	111	86
Dump Truck (approx. 15 tonne)	108	83
Concrete truck	112	87
Concrete pump	109	84
Concrete vibrator	105	80
Bored piling rig	110	85
Scraper	110	85
Grader	110	85
Vibratory Roller (approx. 10 tonne)	114	89
Vibratory pile driver	121	96
Impact piling rig	134	109
Compressor (approx. 600 CFM)	100	75
Compressor (approx. 1500 CFM)	105	80
Concrete saw	118	93
Jackhammer	113	88
Generator	104	79
Lighting tower	80	55
Flood lights	90	65
Cherry picker	102	77
Mobile crane	110	85
Ballast tamper	115	90
Flush-Butt Welder	105	80
Welding Trucks & Utes	107	82
Hydramulch/seed Truck	110	85
Fast Clip	110	85
Angle Grinder	109	84
Rail/Profile Grinder	103	78
Rail Saw	107	82
Light Vehicle	84	59

Equipment	Maximum Allowable Sound Power Level (dB) LAmax	Maximum Allowable Sound Pressure Level (dB) LAmax at 7 m
Rail Set Train	114	89

7.3 Minimum working distances for vibration intensive activities

The pattern of vibration radiation is very different to the pattern of airborne noise radiation and is very site specific. Final vibration levels are dependent on many factors including the actual plant used, its operation and the intervening geology between the activity and the receiver. Table 21 below presents the recommended minimum working distances for vibration intensive plant. The minimum working distances are quoted for both “cosmetic” damage (BS 7385, see Section 5.5.1) and human comfort (AVTG, see Section 5.4).

The minimum working distances for cosmetic damage must be complied with at all times, unless otherwise approved by the relevant authority.

Table 21 - Recommended minimum working distances from vibration intensive plant

Plant item	Rating/ description	Minimum distance - cosmetic damage (BS 7385)	Minimum distance - human response (AVTG)
Vibratory roller	1-2 tonne	5 m	15 m to 20 m
	2-4 tonne	6 m	20 m
	4-6 tonne	12 m	40 m
	7-13 tonne	15 m	100 m
	13-18 tonne	20 m	100 m
	>18 tonne	25 m	100 m
Small Hydraulic Hammer	300 kg (5 to 12t excavator)	2 m	7 m
Medium Hydraulic Hammer	900 kg (12 to 18t excavator)	7 m	23 m
Large Hydraulic Hammer	1600 kg (18 to 34t excavator)	22 m	73 m
Pile Driver – Vibratory	Sheet piles	2 m to 20 m	20 m
Piling Rig – Bored	≤ 800mm diameter	2 m (nominal)	N/A
Piling Rig – Hammer	12t down force	15 m	50 m
Jackhammer	Hand held	1 m (nominal)	Avoid contact with structure
Ballast tamper	-	5 m	10 m

Note: More stringent conditions may apply to heritage or other sensitive structures

The minimum working distances presented in Table 21 are indicative and will vary depending on the plant item and local geotechnical conditions. They apply to cosmetic damage of typical buildings under typical geotechnical conditions. Vibration monitoring can be carried out to confirm the minimum working distances at specific sites.

For highly sensitive receivers (e.g. high technology facilities, laboratories, recording studios and cinemas), specific assessment is required to ensure satisfactory operation of the facility and determine if any mitigation or management measures are required to minimise the potential impacts. Highly sensitive receivers in the vicinity of Line-wide Works areas will be identified in the relevant CNVIS.

The minimum working distances for human comfort (response) relate to continuous vibration. For most construction activities, vibration emissions are intermittent in nature and for this reason, higher vibration levels, occurring over shorter periods are allowed (see Section 5.4). Where the predicted vibration levels exceed the human comfort objectives, the procedures in Section 7.4 are to be followed to mitigate the potential impacts at sensitive receivers.

Vibration intensive activities are not planned to occur within the minimum working distances shown in Table 21. If vibration intensive activities do become necessary within the minimum working distances, then investigation of alternative construction methodologies will be undertaken. If an alternative methodology is not feasible, then a dilapidation survey of sensitive structures within the minimum working distance will be undertaken. In addition, vibration monitoring will be undertaken to confirm the site-specific minimum working distance, as outlined in Section 8.2 of this Plan. This process will be detailed in the CNVIS for the planned works.

7.4 Additional Noise and Vibration Mitigation Measures

During construction works there will be circumstances where after application of the standard mitigation measures identified Table 18, the construction noise and vibration objectives (refer Section 5) will be exceeded. In these instances, additional noise and vibration mitigation may be applicable, taking into consideration the time period during which works are being undertaken and the level of exceedance.

The Sydney Metro CNVS provides pathways for identifying additional noise and vibration management measures. Additional management measures to be applied when mitigating and managing impacts from Line-wide Works are described in Table 22.

Table 22 - Additional noise management measures

Measure	Description	Abbreviation
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.	AA
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.	M
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.	IB
Letter box 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	LB

Measure	Description	Abbreviation
	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.	
Project specific 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.	RO
Phone calls and emails	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.	PC
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.	SN

The following sections outline the approach to be taken in the adoption of additional mitigation measures during construction.

7.4.1 Additional Airborne Noise Mitigation Measures

In circumstances where, after application of all reasonable and feasible mitigation measures, the $L_{Aeq(15minute)}$ airborne construction noise levels are still predicted to exceed the NMLs, additional airborne noise management measures can be applied to further limit the risk of annoyance from construction noise. This requirement is supplemental to the basic requirements in the ICNG.

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

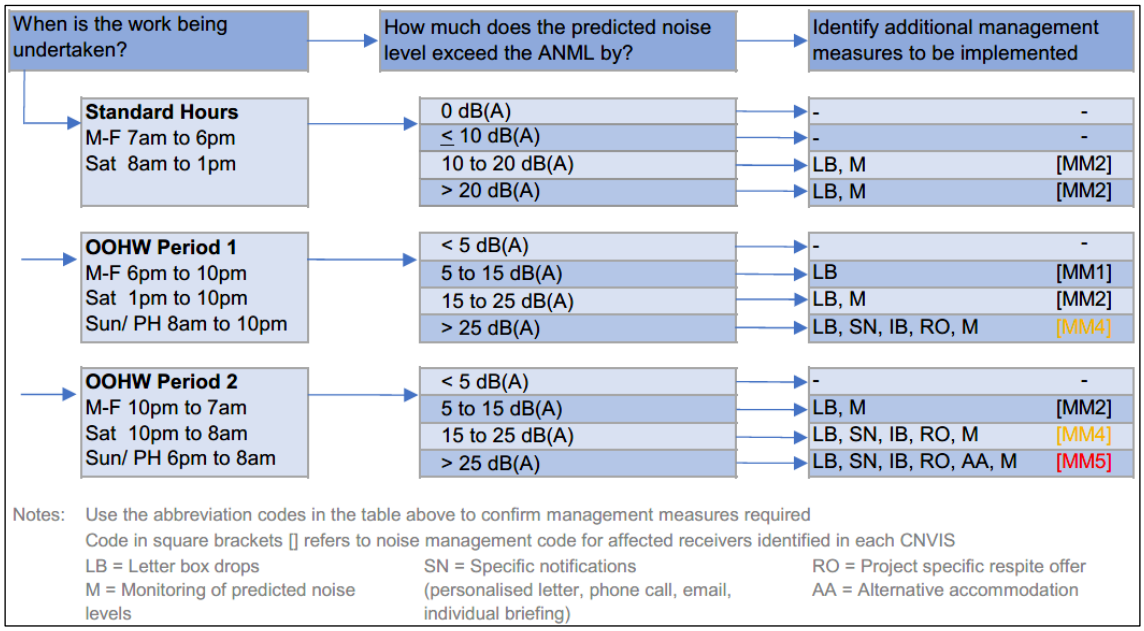


Figure 5 - Additional Airborne Noise Mitigation Measures

7.4.2 Additional Ground-Borne Noise Mitigation Measures

In circumstances where, after application of all reasonable and feasible mitigation measures, the $L_{Aeq(15minute)}$ ground-borne construction noise levels are still predicted to exceed the NMLs, additional ground-borne noise management measures can be applied to further limit the risk of annoyance from construction noise. This requirement is supplemental to the basic requirements in the ICNG.

The steps to be carried out to determine the additional management measures to be implemented are identified in Figure 6.

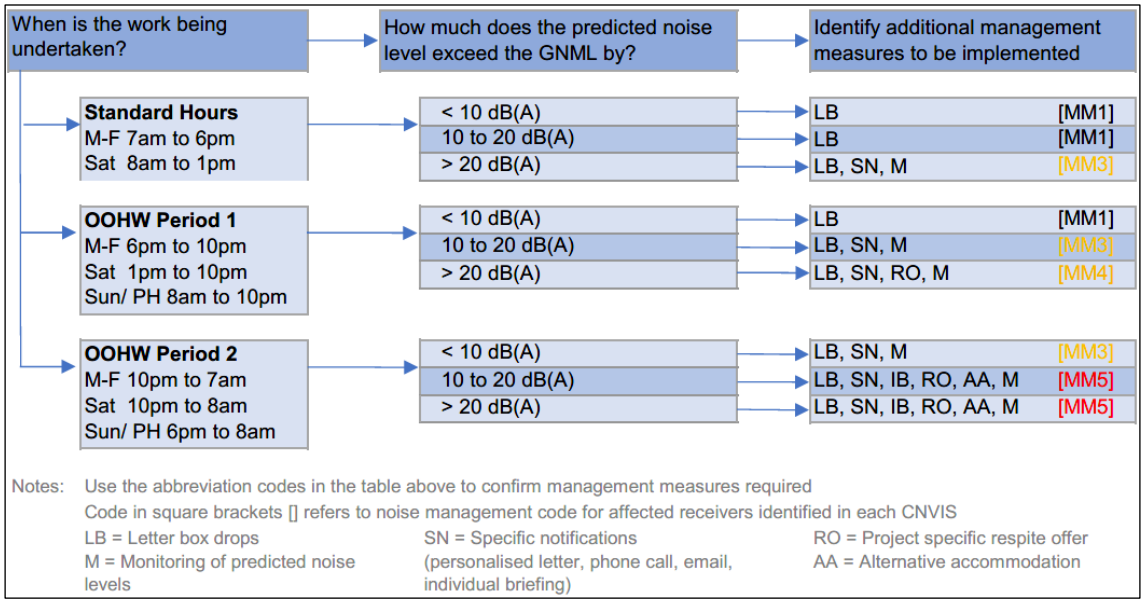


Figure 6 - Additional Ground-Borne Noise Mitigation Measures

7.4.3 Additional Vibration Mitigation Measures

In circumstances where, after application of all reasonable and feasible mitigation measures, construction vibration is still found to exceed the VMLs, additional vibration management measures can be applied to further limit the risk of annoyance from construction noise.

The steps to be carried out to determine the additional management measures to be implemented are identified in Figure 7.

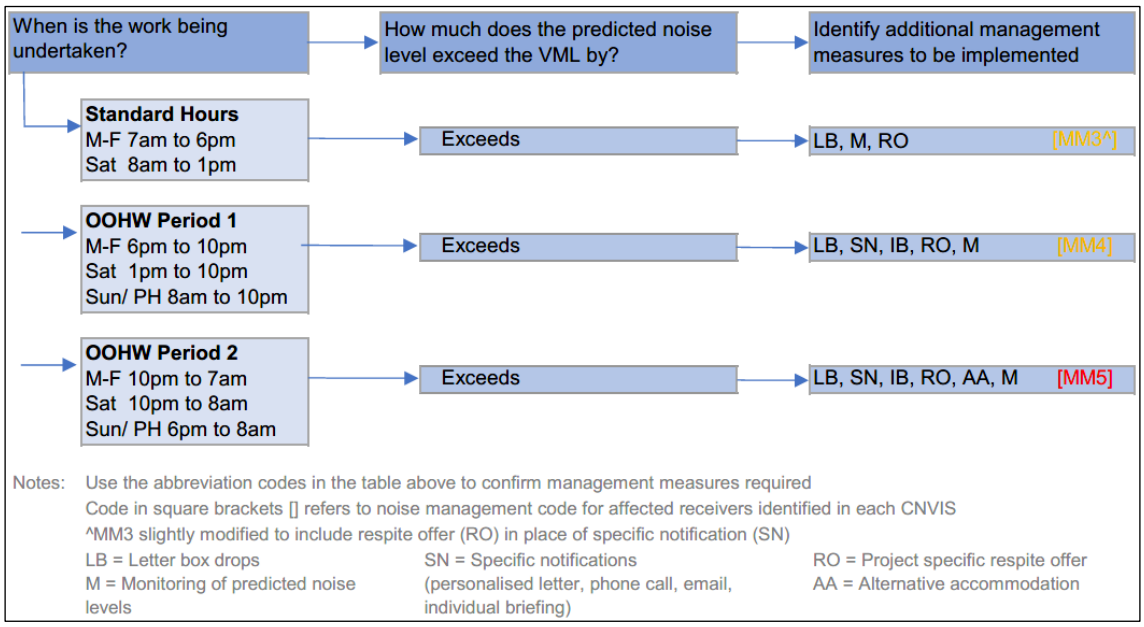
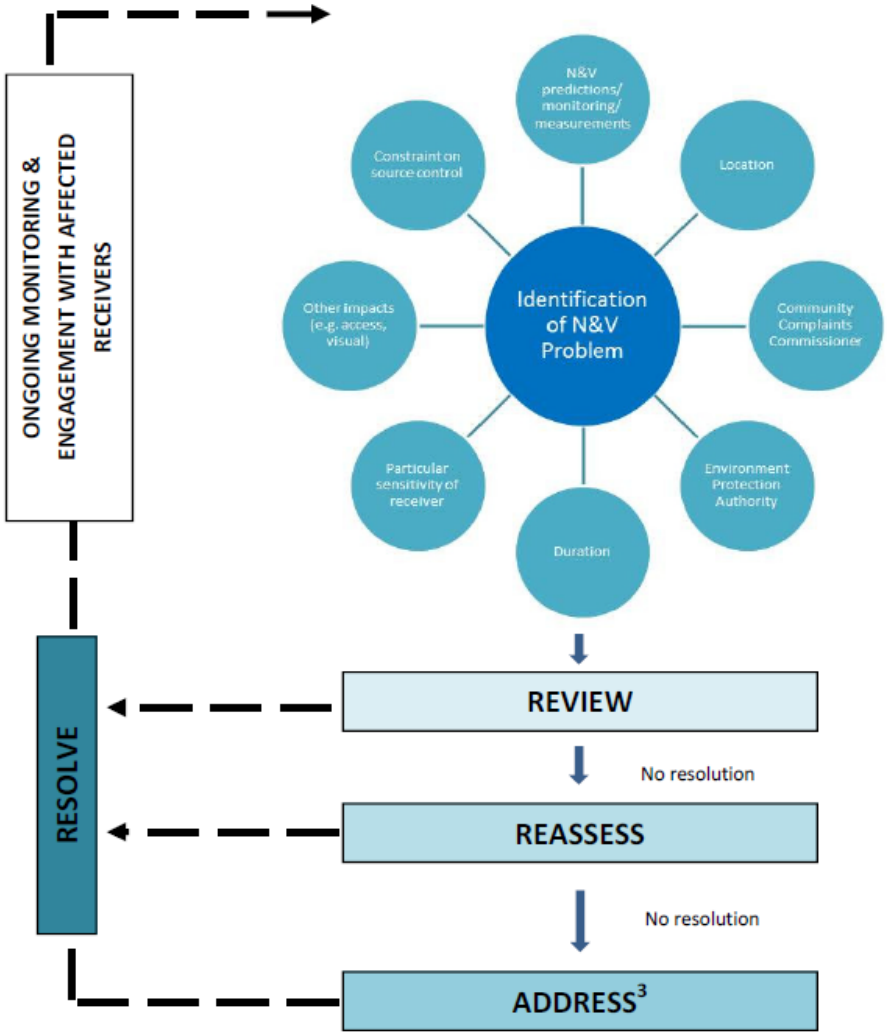


Figure 7 - Additional Ground-Borne Vibration Mitigation Measures

If the predicted ground-borne vibration levels exceed the structural damage objectives in Section 5.2, a different construction method with lower source vibration levels should be considered. Attended measurements should be undertaken at the commencement of all high vibration generating activities. If there is any risk of exceedance of the structural damage objective, a permanent vibration monitoring system should be installed, to warn plant operators (via flashing light, audible alarm, SMS, etc.) when vibration levels are approaching the structural damage objective.

7.4.4 Applying additional management measures – Exceedances of internal noise levels

Should detailed modelling as part of CNVIS predictions indicate exceedances of the noise and vibration objectives, the process described in Section 5.2 of the Sydney Metro CNVS and Figure 8 below will be followed to identify additional mitigation and management measures.



Note 3 – Additional mitigation measures are to be considered (e.g. at property treatment, temporary relocation, other forms of mitigation where impacts are predicted to be long term and significant)

Figure 8 - Mitigation process for locations where impacts are predicted to be long term and significant

7.5 Ongoing Environmental Risk Identification and Management

The ongoing identification and management of environmental risks and opportunities is a key consideration during all project risk assessment activities and is fully described in Section 5.2 Environment Risk Management of the CEMP (SMCSWLWC-SYC-1NL-PM-PLN-000033).

A Project Preliminary Environmental Risk Assessment has been conducted to identify key risks and control measures; to inform the preparation of the CEMP, Sub-Plans and Procedures; and to provide input into the Project Risk Register. The Project Risk Register is a dynamic document that will be reviewed and updated as the project progresses.

Environmental risk assessments are completed at each stage of project planning and delivery, and each level of risk assessment is periodically reviewed. The key documents and activities underpinning ongoing environmental risk assessment are:

- Construction Area Plan (CAP) Risk Assessments

- Work Pack Risk Assessments
- Safe Work Method Statements (SWMS), which also address environmental risks
- Pre-start Meetings.
- Construction Noise and Vibration Impact Statements, which identify risks associated with construction noise and vibration and establishes specific mitigation and management measures.

As outlined in Section 1.3, limited works remain under the Portion 4 scope and there are no noise and vibration impacts anticipated for the remainer of the works.

8. Construction Noise and Vibration Monitoring Program

The Construction Noise and Vibration Monitoring Guideline in the SM-CNVS sets out the requirements for:

- Plant noise auditing, compliance evaluation and reporting
- Construction noise monitoring
- Construction vibration monitoring
- Blast monitoring
- Dilapidation surveys.

This construction noise and vibration monitoring program will apply for the duration of the Line-wide Works construction works, unless a longer period is specified by the Secretary of DPE (SSI 7400 CoA C15 and SSI 8256 CoA C13). Due to the limited scope of works remaining under Portion 4, there will be no activities which are anticipated to cause noise and vibration impacts. This is outlined in Section 1.3 and Section 4.1.1. This mean that the Construction Noise and Vibration Monitoring Program is no longer needed for the remaining work scope.

The Construction Noise and Vibration Monitoring Program has been prepared in consultation with the EPA and relevant Councils, as required by SSI 7400 CoA C9 and SSI 8256 CoA C8.

8.1 Noise monitoring

8.1.1 Baseline noise monitoring data

Baseline noise monitoring data was reported in the EIS as noted in Section 6.2.

8.1.2 Parameters to be monitored

Refer to noise monitoring specifications in Appendix F.

8.1.3 Plant and Equipment Noise Audits

A Plant Induction Process will be put in place for LW construction works. Part of the Plant Induction Process will be to complete periodic noise audits of plant and equipment in use to confirm actual plant noise levels are within the Table 20 maximum noise levels.

Plant and equipment noise monitoring procedure is further detailed in Appendix F.

8.1.4 Attended Airborne Noise Monitoring in the Community

Attended monitoring of construction noise levels will be undertaken as follows:

- At the first opportunity following the commencement of construction activity to confirm the effectiveness of actions and measures determined in CNVIS process;
- Repeated as described in the CNVIS, as part of the audit cycle to ensure that noise and vibration levels in the adjacent community remain consistent with the predicted levels in the CNVIS;
- Where appropriate in response to a noise related complaint(s) (determined on a case-by-case basis);
- During sensitive periods (i.e. night works)
- As directed by an authorised officer of the EPA.

Monitoring would be undertaken at the potentially most exposed receivers in proximity to construction activities. Noise monitoring locations should be consistent with the distances/ locations identified in the CNVIS and will consider factors including:

- The location of previous monitoring sites;
- The proximity of the receiver to a worksite;

- The sensitivity of the receiver to noise;
- Background noise levels; and
- The expected duration of the impact.

Where monitoring indicates that the NML's are not being complied with, work practices would be reviewed and further mitigation measures applied where reasonable and feasible.

The attended measurements will need to be carried out by an appropriately trained person in the measurement and assessment of construction noise, who is familiar with the requirements of the relevant standards and procedures.

8.1.5 Ground-Borne Noise Monitoring in the Community

Attended monitoring of ground-borne construction noise levels will be undertaken as follows:

- Where appropriate in response to a noise related complaint(s) (determined on a case-by-case basis);
- As directed by an authorised officer of the EPA

Monitoring would be undertaken in the most affected room of the residence or other sensitive building and will be conducted in conjunction with vibration measurements whenever practicable (see Section 8.2). Note that the room selected for noise monitoring should be well shielded from airborne noise intrusions, such as road traffic noise; to allow the ground-borne noise to dominate over non-construction generated airborne noise.

The attended measurements will need to be carried out by an appropriately trained person in the measurement and assessment of construction noise, who is familiar with the requirements of the relevant standards and procedures.

8.1.6 Real-time (unattended) noise monitoring

Real time (unattended) noise monitoring will be undertaken to satisfy SSI 7400 Planning Approval Condition C11. The requirement for real time noise monitoring will be determined on a site by site basis and identified in the CNVIS for Line-wide Works sites between Chatswood and Sydenham. Real time noise monitoring will be deployed to manage noise impacts from 'high risk' sites, where the CNVIS noise predictions identify there is a high risk of annoyance from construction noise.

Indicative locations for real-time monitoring are:

- Chatswood (northern connection), Artarmon and Marrickville (southern connection and SMTF South), consistent with SSI 7400 Planning Approval Condition E38
- Up to two locations per site, subject to landowner consent and CNVIS outcomes.

The real-time noise monitors will need to be installed prior to commencement substantial construction at these worksites. A secure website is required for data storage for the duration of the monitoring period.

The monitor will be installed by an appropriately trained person in the measurement and assessment of construction noise and vibration, who is familiar with the requirements of the relevant standards and procedures (refer to Appendix F – Monitoring Specifications).

The real-time monitoring data will be available to Systems Connect, Sydney Metro, ER, AA, DP&E and EPA via a web based portal.

Advice of a heritage specialist will be sought regarding methods and locations for installing equipment used for real-time noise monitoring on heritage-listed structures, accordance the SSI 7400 Condition of Approval E31.

8.2 Vibration Monitoring

8.2.1 Attended Vibration Monitoring in the Community

Attended vibration monitoring is to be undertaken as follows:

- At the commencement of operation for each plant or activity on site, which has the potential to generate significant vibration levels, where the vibration screening criteria is likely to be exceeded, to refine the identified minimum working distances to suit site-specific conditions
- Where it is not feasible to modify construction methodology to reduce vibration intensive construction activities within the minimum working distances for cosmetic damage;
- For short periods of potential risk for cosmetic damage to buildings and structures; and
- Where deemed to be relevant to construction works in response to a vibration related complaint.
- As otherwise required by the CNVIS (or by an authorised officer of the EPA).

Where attended vibration monitoring is not feasible, due to extended periods of vibration intensive works, a permanent vibration monitoring system is to be installed to warn plant operators (via flashing light, audible alarm, etc.) that there is potential cosmetic damage to buildings and structures.

Plant and equipment vibration measurement procedures are further detailed in Appendix F.

Advice of a heritage specialist will be sought regarding methods and locations for installing equipment used for vibration monitoring on heritage-listed structures, accordance the SSI 7400 Condition of Approval E31.

8.2.2 Real-time (unattended) vibration monitoring

Real time (unattended) vibration monitoring will be undertaken to satisfy SSI 7400 Planning Approval Condition C11. The requirement for real time vibration monitoring will be determined on a site by site basis and identified in the CNVIS for for LW worksites between Chatswood and Sydenham. Real time vibration monitoring will be deployed to manage vibration impacts from 'high risk' sites, where the CNVIS vibration predictions identify there is a high risk of annoyance (or potential building damage) from construction vibration. Real-time vibration monitoring may also be used to measure vibration from for the purpose of determining ground-borne noise levels inside noise-sensitive buildings, where appropriate.

Indicative locations for real-time monitoring are:

- Northern Connection worksite and the Bulk Power Supply route at Artarmon, Surry Hills and Campsie (requirement and location will be confirmed in the CNVIS)
- Up to two locations per site, subject to landowner consent and CNVIS outcomes.

The real-time vibration monitors will need to be installed prior to commencement of vibration significant works (as identified in the CNVIS) at these worksites. A secure website is required for data storage for the duration of the monitoring period.

The monitor will be installed by an appropriately trained person in the measurement and assessment of construction noise and vibration, who is familiar with the requirements of the relevant standards and procedures (refer to Appendix E – Monitoring Procedure).

The real-time monitoring data will be available to Systems Connect, Sydney Metro, ER, AA, DP&E and EPA via a web based portal.

Advice of a heritage specialist will be sought regarding methods and locations for installing equipment used for vibration monitoring on heritage-listed structures, accordance the SSI 7400 Condition of Approval E31.

8.3 Blast Monitoring

No blasting works are planned as part of the Line Wide Works.

Should blasting be required, blast vibration and air overpressure monitoring is to be undertaken in accordance with a separate Blast Management Strategy.

A series of small scale test blasting would be undertaken and monitored prior to commencement of full scale blasting to establish appropriate propagation characteristics for the site, to increase the accuracy of blast noise and vibration predictions. 'Buffer zones' shall then be established based on predicted levels.

Appropriate weather data would be obtained prior to blasting to confirm that the meteorological conditions are consistent with achieving the required air blast overpressure limits. If the predictions indicate that air blast overpressure limits are likely to be exceeded, the blast would not proceed until the blast design and buffer zones have been revised to suit the conditions.

Blast monitoring would also be carried out at during all blasts at critical locations surrounding the site to confirm predicted over-pressure and vibration levels and to in turn modify the blast design and 'buffer zones' accordingly around the site.

8.4 Continual improvement and corrective action

Where:

- Monitored ambient noise levels or vibration levels are above modelling predictions; or
- Systems Connect receives two or more complaints found to result from the activity, work or combination of simultaneous activities or works

Systems Connect will review the work or activity or combination of simultaneous works or activities as soon as practicable and where possible, modify the work or activity to prevent any recurrence. In the case of above prediction monitoring results, the need for modelling to be reviewed will also be considered. Lessons learnt will be communicated to relevant personnel in toolbox talks (see Part B, Element 1.3)

8.5 Construction noise and vibration monitoring reporting

The results of construction noise and vibration monitoring undertaken during the Line-wide Works construction works would be prepared as a report and submitted to Sydney Metro and the Secretary of DPE every six months, to satisfy CSSI-7400 Condition C16 and CSSI-8256 Condition C14.

8.6 Complaints Handling and Response

Systems Connect will handle enquiries/ complaints in a responsive manner. Throughout the works, the team will be making contact with multiple and varied internal and external stakeholders. The Community Communications Strategy C2B (SMCSWLWC-SYC-1NL-CL-PLN-000027) details procedures to ensure that the process of dealing with LW enquiries and complaints is consistent and in line with the Sydney Metro Construction Complaints Management System.

The Environment and Sustainability Manager and Environment Coordinators will assist the Stakeholder and Community Relations Manager in responding to environmental complaints and maintain a register of Environmental Complaints for reporting to relevant agencies as required.

Sydney Metro operates a 24-hour information line for construction enquiries and complaints. Enquiries and complaints may also be received through the project email. The information line and project email addresses are as follows.

	24-hour Information Line	Project Email
Sydney Metro City & Southwest	1800 171 386	sydneymetro@transport.nsw.gov.au

Complaints will be responded to within two hours, unless otherwise requested by the complainant. The response will confirm the action to be undertaken.

PART B – SYSTEM AND TOOLS

Elements and Expectations

Part B of this Plan explains how noise and vibration impacts during the LW will be minimised and managed. Compliance with all elements is required at all times to minimise the likelihood of causing unauthorised environmental harm and maximise the uptake of opportunities to reduce environmental impact.

Part B contains the following:

- **Environmental Elements and Expectations:** These describe what is required of Systems Connect to implement the objectives of the Environment and Sustainability Policy Statement:
  - **Element** – Key aspects for managing this function in delivering the LW Works
  - **Intent** – A one-line statement describing the overall purpose of the Element
  - **Expectation** – The outcomes achieved as part of each Element.
- **Requirements:** These are the specific actions required to demonstrate compliance with the Elements and Expectations.
- **Responsibility and Key Contributor:** Designation of responsibility for achieving compliance with the stated Expectation. Key contributors assist/contribute to achieving compliance.
- **Deliverables:** Tangible outcomes produced to demonstrate compliance with the environmental Elements and Expectations.

Element 1: Training

Expectations	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Deliverables
1.1 All LW personnel will complete a LW Project Induction before they are authorised to work on the Project. All LW construction sites personnel will undertake a site induction prior to commencing work on site	Induction presentation will include: • Relevant legislative requirements (POEO Act, etc.). • Noise and vibration objectives • Noise and vibration management process: ◦ Assess ◦ Control ◦ Mitigate ◦ Monitor and measure • Approved construction hours and Out-of-Hours Work Procedure • Noise and vibration control and mitigation measures • Control of high noise impact activities • Duty to report and respond to environmental incidents and complaints	**Environment and Sustainability Manager** Environmental Advisor HR Manager Training Manager	Induction presentation Induction records
1.2 Toolbox talks are used to reinforce key management requirements and lessons learnt	Toolbox talks will be held regularly during site establishment, investigative works and construction works. Toolbox talks will also be presented periodically and when there are changes in site conditions or work methods which may increase the risk of adverse impacts from noise or vibration, such as prior to OOHW. Toolbox talks will reinforce and reiterate information from inductions and will explain the requirements for noise management and noise monitoring in further detail.	**Environment and Sustainability Manager** Environmental Advisor Area Managers Site Supervisors Environmental Advisor Environmental Coordinators	Toolbox talk presentations Toolbox Talk records
1.3 Noise and vibration management training for personnel responsible for assessing potential noise & vibration impacts; identifying and implementing controls and mitigation measures; and conducting monitoring and measurement	Detailed training will be provided to key personnel regarding noise and vibration management. This training will include: • Legislation as it applies to noise and vibration management • Noise and vibration objectives • Locations of sensitive receivers • Assessing potential noise and vibration impacts on sensitive receivers • Identifying and implementing appropriate noise & vibration control measures • Standard and additional noise & vibration mitigation measures • Conducting noise & vibration monitoring and measurement	**Environment and Sustainability Manager** HR Manager Training Manager Environmental Advisor Environmental Coordinators	Training packages and presentations Training records

Element 2: Monitoring, Compliance, Records and Reporting

All staff, employees and subcontractors will actively drive complaint environmental performance of the SMTF Expansion Works

Expectations	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Deliverables
2.1 Worksites will be regularly inspected to ensure the adequacy of controls	Systems Connect will regularly review the LW to ensure compliance with this Plan. A regular monitoring and inspection program for noise management will be conducted as follows: • Details of daily inspections undertaken by the Site Supervisor will be logged in their respective site diaries • Routine weekly inspections of worksites are to be conducted to monitor noise and vibration control measures and compliance with approved construction hours The Environmental Representative will conduct regular inspections of LW work sites, including inspections of noise and vibration control measures, to ensure implementation is being carried out in accordance with this Plan.	**Environment and Sustainability Manager** Superintendents Site Supervisors Environmental Advisor Environmental Coordinators Environmental Representative	Environment Inspection Reports Site Diary entries
2.2 Noise and vibration monitoring	Noise and vibration monitoring will be conducted as set out in Section 8 of this Plan.	**Environment and Sustainability Manager** Environmental Coordinators Environmental Advisor Acoustic Consultant	Noise and vibration monitoring records and reports
2.3 Records and Reporting	Noise and vibration records and reports will be prepared and maintained in relation to all monitoring activities. Typical noise and vibration compliance records would consist of: • Inspections undertaken in relation to noise and vibration management measures • Weekly Environmental Inspection forms • Toolbox training records • Noise monitoring record sheets from plant and environmental noise monitoring • Noise and vibration monitoring reports by specialist consultants • Records of community enquiries and complaints and Systems Connect's responses Results and outcomes of inspections, monitoring and auditing will be reported internally on a monthly basis. Quarterly construction compliance reports will be prepared to report on compliance with the Project Approvals.	**Environment and Sustainability Manager** Environmental Coordinators Environmental Advisor Acoustic Consultant	Noise and vibration monitoring records and reports

Element 3: Auditing, Review and Improvement

Expectations	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Deliverables
3.1 Audits are undertaken to ensure compliance with the requirements of this Plan	Regular audits and reviews will be conducted of LW construction activities and management processes and records to assess and verify compliance with this plan, and to identify any non-compliances and opportunities for improvement. This Plan will be audited within six months of the commencement of construction and thereafter as per the CEMP C2B. Further details of the audit and review process are set out in the CEMP C2B (SMCSWLWC-SYC-1NL-PM-PLN-000033)	**Environment and Sustainability Manager** Environmental Advisor Environmental Coordinators	Audit Reports
3.2 Non-compliances and opportunities are reported and actioned	A noise and vibration non-compliance can generally be defined as a failure to comply with: • Relevant environmental legislation • Project Planning Approvals • Environmental Protection Licences • Deed • Construction Noise and Vibration Management Sub-Plan and related documents Corrective and Preventative Actions may also be raised in accordance with the Construction Environmental Management Plan (SMCSWLWC-SYC-1NL-PM-PLN-000033). All non-compliances are to be reported as per the Sydney Metro Environment Incident and Non-compliance Reporting Procedure.	**Environment and Sustainability Manager** Environmental Advisor Environmental Coordinators	Audit Reports Corrective Action Reports
3.3 Review and update of this plan and continual improvement	This CNVMP will be reviewed regularly and amended as needed to ensure that it remains consistent with client and legal requirements and with project priorities, activities and personnel, in accordance with Section 1.8 of this Plan. This will include reviews and updates based on the based on the findings of audits. The regular review and update of this Plan and the implementation of action plans to address non-compliances or opportunities for improvement will together ensure continual improvement.	**Environment and Sustainability Manager** Environmental Advisor Environmental Coordinators	Regular reviews of and amendments to this Plan

Element 4: Project Specific Requirements

Construction Environmental Management Framework – Sydney Metro City & Southwest (2017)

Construction Environmental Management Framework – Sydney Metro City & Southwest (2017)				
No.	**Requirement**	**How we will meet the Expectations** (minimum requirements)	**Responsibility** Key Contributor	**Timing**
3.3e	The CEMP and associated sub-plans will be reviewed by TfNSW and/or an independent environmental representative (see Section 6.3) prior to any construction works commencing. Depending on the Conditions of Approval, the CEMP and certain sub-plans may also require the approval of the Department of Planning and Environment (DP&E).	Approval process outlined in Section 1.5, 3.3 and **Error! Reference source not found.**	**Environment and Sustainability Manager** Project Environment and Sustainability Manager RT&A	Prior to the commencement of construction
3.6a	Where the requirement for an additional environmental assessment is identified, this will be undertaken prior to undertaking any physical works. The environmental assessment will include: (iii) An assessment of the environmental impacts of the works, including, but not necessarily limited to, traffic, noise and vibration, air quality, soil and water, ecology and heritage; (iv) Details of mitigation measures and monitoring specific to the works that would be implemented to minimise environmental impacts; and	Construction Noise and Vibration Impact Statements will be prepared for the different stages of the works as outlined in Section 6.3	**Environment and Sustainability Manager** Project Environment and Sustainability Manager RT&A	Prior to the commencement of relevant construction activities
3.8a	Principal Contractors will identify hold points, beyond which approval is required to proceed with a certain activity. Example activities include vegetation removal and water discharge. Hold points will be documented in relevant CEMPs.	Hold points identified in relation to out of hours works approval procedure – see Appendix D and Appendix E	**Environment and Sustainability Manager**	Prior to the commencement of relevant construction activities
3.8b	Table 1.4 provides the structure for the register of hold points as well as a preliminary list of hold points which will be implemented.			
5.1a	Standard working hours are between 7am – 6pm on weekdays and 8am – 1pm on Saturdays.	As set out in Section 4.2 of this CNVMP	**Environment and Sustainability Manager**	During construction
5.1b	Works which can be undertaken outside of standard construction hours without any further approval include:	As set out in Section 4.2 of this CNVMP	**Environment and Sustainability Manager**	During construction

Construction Environmental Management Framework – Sydney Metro City & Southwest (2017)				
No.	**Requirement**	**How we will meet the Expectations** (minimum requirements)	**Responsibility** Key Contributor	**Timing**
(i)	Those which have been described in respective environmental assessments as being required to take place 24/7. For example, tunnelling and underground excavations and supporting activities will be required 24/7;			
(ii)	Works which are determined to comply with the relevant Noise Management Level at sensitive receivers;			
(iii)	The delivery of materials outside of approved hours as required by the Police or other authorities (including RMS) for safety reasons;			
(iv)	Where it is required to avoid the loss of lives, property and / or to prevent environmental harm in an emergency; and			
(v)	Where written agreement is reached with all affected receivers.			
5.1c	Principal Contractors may apply for EPA approval to undertake works outside of normal working hours under their respective Environment Protection Licences.	As set out in Section 4.2 of this NVMP	**Environment and Sustainability Manager**	During construction
5.2a	Principal Contractors will consider the following in the layout of construction sites:	Standard mitigation measures as set out in Section 7.1 are to be implemented as required and incorporated into the Construction Noise and Vibration Impact Statements	**Environment and Sustainability Manager** Project Environment and Sustainability Manager RT&A	Prior to the commencement of relevant construction activities
(i)	The location of noise intensive works and 24 hour activities in relation to noise sensitive receivers;			
(ii)	The location of site access and egress points in relation to noise and light sensitive receivers, especially for sites proposed to be utilised 24 hours per day;			
(iii)	The use of site buildings to shield noisy activities from receivers;			
(iv)	The use of noise barriers and / or acoustic sheds where feasible and reasonable for sites proposed to be regularly used outside of daytime hours; and			
(v)	Aim to minimise the requirement for reversing, especially of heavy vehicles.			
9.1a	The following noise and vibration management objectives will apply to construction:	The objectives will be included in the Construction Noise and Vibration Impact Statements preparation of for the works as	**Environment and Sustainability Manager**	Prior to the commencement of
(i)	Minimise unreasonable noise and vibration impacts on residents and businesses;			

Construction Environmental Management Framework – Sydney Metro City & Southwest (2017)				
No.	**Requirement**	**How we will meet the Expectations** (minimum requirements)	**Responsibility** Key Contributor	**Timing**
(ii)	Avoid structural damage to buildings or heritage items as a result of construction vibration;	outlined in Section 1.4, 2.4, 3.23.6, 3.6, 5.5 and 7	Project Environment and Sustainability Manager RT&A	relevant construction activities
(iii)	Undertake active community consultation; and			
(iv)	Maintain positive, cooperative relationships with schools, childcare centres, local residents and building owners.			
9.2b	Detailed Construction Noise and Vibration Impact Statements will be prepared for noise-intensive construction sites and or activities, to ensure the adequacy of the noise and vibration mitigation measures. Specifically, Construction Noise and Vibration Impact Statements will be prepared for EPL variation applications and works proposed to be undertaken outside of standard construction hours.	CNVISs will be prepared progressively for all Line-wide Works, under this Plan – see Section 6.3.	**Environment and Sustainability Manager** Project Environment and Sustainability Manager RT&A	Prior to the commencement of relevant construction activities
9.2c	Noise and vibration monitoring would be undertaken for construction as specified in the CNVS and the EPL.	This CNVMP outlines the monitoring expectations for this project (Section 8). In addition, the Sydney Metro CNVS outlines monitoring requirements.	**Environment and Sustainability Manager** Project Environment and Sustainability Manager RT&A	As specified in the Construction Noise and Vibration Impacts Statement
9.2d	The following compliance records would be kept by Principal Contractors:	Records of noise monitoring will be kept as outlined in:	**Environment and Sustainability Manager** Project Environment and Sustainability Manager	Construction
(i)	Records of noise and vibration monitoring results against appropriate NMLs and vibration criteria; and	Section 8		
(ii)	Records of community enquiries and complaints, and the Contractor's response.	Section 8.5		
9.3a	All feasible mitigation measures would be implemented in accordance with the CNVS. Examples of noise and vibration mitigation measures include:	The CNVIS for the LW will form the key to manage noise and vibration impact. All reasonable and feasible measures detailed in the CNVIS will be adhered to by the relevant construction manager. See Section 6.3 and Section 7	**Approvals, Environment and Sustainability Manager** Project Environment and Sustainability Manager RT&A	Prior to the commencement of relevant construction activities

Construction Environmental Management Framework – Sydney Metro City & Southwest (2017)				
No.	**Requirement**	**How we will meet the Expectations** (minimum requirements)	**Responsibility** Key Contributor	**Timing**
(i)	Construction hours will be in accordance with the working hours specific in Section 4.2;			
(ii)	Hoarding and enclosures will be implemented where required to minimise airborne noise impacts; and			
(iii)	The layout of construction sites will aim to minimise airborne noise impacts to surrounding receivers.			

Planning Approval SSI 7400 – Chatswood to Sydenham

Planning Approval SSI-7400 (CoA)				
No.	**Requirement**	**How we will meet the Expectations** (minimum requirements)	**Responsibility** Key Contributor	**Timing**
A24	From commencement of construction until completion of construction, the approved ER must: (a) receive and respond to communications from the Secretary in relation to the environmental performance of the CSSI; (b) consider and inform the Secretary on matters specified in the terms of this approval; (c) consider and recommend any improvements that may be made to work practices to avoid minimise adverse impact to the environment and to the community; (d) review all documents required to be prepared under the terms of this approval, ensure they address any requirements in or under this approval and if so, endorse them before submission to the Secretary (if required to be submitted to the Secretary) or before implementation (if not required to be submitted to the Secretary). For documents requiring specialist review and/or endorsement the ER is not required to endorse the specialist content; (e) regularly monitor the implementation of all documents required by the terms of this approval for implementation in accordance with what is stated in the document and the terms of this approval; (f) review the Proponent's notification of incidents in accordance with Condition A41 of this approval; (g) as may be requested by the Secretary, help plan, attend or undertake Department audits the CSSI, briefings, and site visits; (h) if conflict arises between the Proponent and the community in relation to the environmental performance of the CSSI, follow the procedure in the Community Communication Strategy approved under Condition B3 of this approval to attempt to resolve the conflict, and if it cannot be resolved, notify the Secretary; (i) review any draft consistency assessment that may be carried out by the Proponent, and provide advice on any additional mitigation measures required to minimise the impact of the work; (j) consider any minor amendments to be made to the CEMP, CEMP sub-plans and monitoring programs that comprise updating or are of an administrative nature, and are consistent with	Requirement held by Sydney Metro. The ER has been approved by the Secretary of DP&E See Section 3.3	LW must: (A) provide the SM with all information, documents, details and data relating to the LW's Activities that could relate to the approved ER's functions and obligations under condition A24; and (B) facilitate any actions necessary for the ER to carry out its functions and obligations under condition A24;	N/A

Planning Approval SSI-7400 (CoA)				
No.	**Requirement**	**How we will meet the Expectations** (minimum requirements)	**Responsibility** Key Contributor	**Timing**
A25	A suitably qualified and experienced Acoustics Advisor (AA), who is independent of the design and construction personnel, must be nominated by the Proponent and engaged for the duration of construction and for no less than six (6) months following operation of the CSSI. The details of the nominated AA must be submitted to the Secretary for approval no later than one (1) month before commencement of works, or within another timeframe as agreed with the Secretary. The Proponent may nominate additional suitably qualified and experienced persons to assist the lead Acoustics Advisor for the Secretary's approval. The Proponent must cooperate with the AA by:	Requirement held by Sydney Metro. The AA has been approved by the Secretary of DPE See Section **Error! Reference source not found.**	SM will be the single point of contact with the Secretary and will provide the LW with the date the submission for approval is made, or notify the LW of any other timeframe relevant to this condition	N/A
(a)	providing access to noise and vibration monitoring activities as they take place;			
(b)	providing for review of noise and vibration plans, assessments, monitoring reports, data and analyses undertaken; and			
(c)	considering any recommendations to improve practices and demonstrating, to the satisfaction of the AA, why any recommendation is adopted.			
A26	Any activities generating noise and vibration in excess of the Noise Management Level derived from the Interim Construction Noise Guideline must not commence until an AA, nominated under Condition A25 of this approval, has been approved by the Secretary.	Requirement held by TfNSW. The AA has been approved by the Secretary of DPE	N/A	N/A
A27	The approved AA must:	Requirement held by TfNSW. The AA has been approved by the Secretary of DPE See Section **Error! Reference source not found.**	N/A	N/A
(a)	receive and respond to communication from the Secretary in relation to the performance of the CSSI in relation to noise and vibration;			
(b)	consider and inform the Secretary on matters specified in the terms of this approval relating to noise and vibration;			
(c)	consider and recommend, to the Proponent, improvements that may be made to work practices to avoid or minimise adverse noise and vibration impacts;			

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(d)	review all noise and vibration documents required to be prepared under the terms of this approval and, should they be consistent with the terms of this approval, endorse them before submission to the Secretary (if required to be submitted to the Secretary) or before implementation (if not required to be submitted to the Secretary);			
(e)	regularly monitor the implementation of all noise and vibration documents required to be prepared under the terms of this approval to ensure implementation is in accordance with what is stated in the document and the terms of this approval;			
(f)	review the Proponent's notification of noise and vibration incidents in accordance with Condition A41 of this approval;			
(g)	in conjunction with the ER, (where required) the AA must: (i) consider requests for out of hours construction activities and determine whether to endorse the proposed activities in accordance with Condition E47; (ii) as may be requested by the Secretary or Complaints Mediator, help plan, attend or undertake audits of noise and vibration management of the CSSI including briefings, and site visits; (iii) if conflict arises between the Proponent and the community in relation to the noise and vibration performance during construction of the CSSI, follow the procedure in the Community Communication Strategy approved under Condition B3 of this approval to attempt to resolve the conflict, and if it cannot be resolved, notify the Secretary; (iv) consider relevant minor amendments made to any noise and vibration document approved by the Secretary the CEMP, relevant sub-plans and noise and vibration monitoring programs that require updating or are of an administrative or minor nature, and are consistent with the terms of this approval and the documents management plans and monitoring programs approved by the Secretary and, if satisfied such amendment is necessary,approve endorse the amendment. This does not include any modifications to the terms of this approval; (v) assess the noise impacts of minor ancillary facilities as required by Condition A18 of this approval; (vi) and prepare and submit to the Secretary and other relevant regulatory agencies, for information, a monthly Noise and Vibration Report detailing the			

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	AAs actions and decisions on matters for which the AA was responsible in the preceding month (or other timeframe agreed with the Secretary). The Noise and Vibration Report must be submitted within seven (7) days following the end of each month for the duration of construction of the CSSI, or as otherwise agreed with the Secretary.			
C9	The following Construction Monitoring Programs must be prepared in consultation with the relevant government agencies identified for each Construction Monitoring Program to compare actual performance of construction of the CSSI against predicted performance. (a) Noise and Vibration	Section 8 and Appendix F	**Environment and Sustainability Manager** Project Environment and Sustainability Manager RT&A	As specified in the Construction Noise and Vibration Impacts Statement
C10	Each Construction Monitoring Program must provide:	Section 8 and Appendix F	**Environment and Sustainability Manager** Project Environment and Sustainability Manager RT&A	As specified in the Construction Noise and Vibration Impacts Statement
(a)	details of baseline data available			
(b)	details of baseline data to be obtained and when			
(c)	details of all monitoring of the project to be undertaken			
(d)	the parameters of the project to be monitored			
(e)	the frequency of monitoring to be undertaken			
(f)	the location of monitoring			
(g)	the reporting of monitoring results			
(h)	procedures to identify and implement additional mitigation measures where results of monitoring are unsatisfactory; and			

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(i)	any consultation to be undertaken in relation to the monitoring programs.			
C11	The Noise and Vibration Construction Monitoring Program and Blast Construction Monitoring Program must include provision of real time noise and vibration monitoring data. The real time data must be available to the construction team, Proponent, ER and AA in real time. The Department and EPA must be provided with access to the real time monitoring data in real time.	Section 8 and Appendix F	**Environment and Sustainability Manager** Environment Advisors and Coordinators RT&A	As specified in the Construction Noise and Vibration Impacts Statement
C12	The Construction Monitoring Programs must be developed in consultation with relevant government agencies as identified in Condition C9 of this approval and must include, to the written satisfaction of the Secretary, information requested by an agency to be included in a Construction Monitoring Programs during such consultation. Details of all information requested by an agency including copies of all correspondence from those agencies, must be provided with the relevant Construction Monitoring Program.	Section 3.5, Section 8 and Appendix F	**Environment and Sustainability Manager** Environment Advisors and Coordinators RT&A	As specified in the Construction Noise and Vibration Impacts Statement
C13	The Construction Monitoring Programs must be endorsed by the ER and then submitted to the Secretary for approval at least one (1) month before commencement of construction or within another timeframe agreed with the Secretary.	Section 3.3, Section 8 and Appendix F	**Environment and Sustainability Manager** Environment Advisors and Coordinators RT&A	As specified in the Construction Noise and Vibration Impacts Statement
C14	Construction must not commence until the Secretary has approved all of the required Construction Monitoring Programs, and all relevant baseline data for the specific construction activity has been collected.	Section 3.3, Section 8 and Appendix F	**Environment and Sustainability Manager** Environment Advisors and Coordinators RT&A	As specified in the Construction Noise and Vibration Impacts Statement
C15	The Construction Monitoring Programs, as approved by the Secretary including any minor amendments approved by the ER, must be implemented for the duration of construction and for any longer period set out in the monitoring program or specified by the Secretary, whichever is the greater.	Section 8 and Appendix F	**Environment and Sustainability Manager** Environment Advisors and Coordinators RT&A	As specified in the Construction Noise and Vibration Impacts Statement

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C16	The results of the Construction Monitoring Programs must be submitted to the Secretary for information, and relevant regulatory agencies, for information in the form of a Construction Monitoring Report at the frequency identified in the relevant Construction Monitoring Program.	Section 8.5	**Environment and Sustainability Manager** Environment Advisors and Coordinators RT&A	As specified in Section 8.5
E28	The Proponent must ensure that vibration from construction activities does not exceed the vibration limits set out in the British Standard BS 7385-2:1993 *Elevation and measurement for vibration in buildings. Guide to Damage levels from groundborne vibration.*	Vibration impact assessed for all LW Works. See Sections 5.5, Section 7 and Section 8.2.	Environment and Sustainability Manager Construction managers Environment Advisors and coordinators RT&A	Construction
E28.1	If the modifications to this approval as described in A1(e) proceed, the vibration screening criterion for 50 Martin Place must remain at 7.5 mm/s, unless a detailed investigation of the construction of the building determines that increasing the screening criterion to 25 mm/s is acceptable. The investigation must be undertaken by a suitably qualified structural engineer with experience assessing heritage structures and approved by the Secretary and must be supported by evidence to demonstrate the higher criterion is appropriate.	Vibration impact assessed for all LW Works. See Sections 5.5, Section 7 and Section 8.2.	Environment and Sustainability Manager Construction managers Environment Advisors and coordinators RT&A	Construction
E29	Owners of properties at risk of exceeding the screening criteria for cosmetic damage must be notified before construction that generates vibration commences in the vicinity of those properties. The management of construction works in the vicinity of properties at risk of exceeding the screening criteria for cosmetic damage must be considered in the Noise and Vibration management sub plan required by Condition C3.	Properties will be identified in the CNVIS and notified before construction that generates vibration commences in the vicinity of those properties. See Section 3.6.	Environment Advisor Environment and Sustainability Manager Construction managers Environment coordinators RT&A	Prior to relevant construction activities
E30	The Proponent must conduct vibration testing before and 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 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.	Highly sensitive receivers in the vicinity of Line-wide Works areas will be identified in the relevant CNVIS. At the commencement of operation vibration intensive activities likely to exceed the vibration screening criteria, attended vibration will be carried	Environment and Sustainability Manager Construction managers Environment Advisors and coordinators RT&A	Prior to and during relevant construction activities

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		out to refine the identified minimum working distances to suit site-specific conditions. Where vibration intensive activities are required within the minimum working distances, then investigation of alternative construction methodologies will be undertaken.. See Section 6.3, Section 7.3 and Section 8.2.		
E31	The Proponent must seek advice of a heritage specialist on methods and locations for installing equipment used for vibration, movement and noise monitoring of heritage-listed structures.	Advice will be sought, as noted in Section 8.1 and Section 8.2	Environment and Sustainability Manager	Prior to monitor installation
E32	The Proponent must review the *Sydney Metro City and Southwest Construction Noise and Vibration Strategy* in the PIR during detailed construction planning to consider scale and duration of impacts, the requirements of this approval and all measures to limit construction noise impacts to sensitive receivers including:	Requirement held by Sydney Metro This CNVMP.	LW must implement and comply with the approved CNVS.	N/A
(a)	at property or architectural treatment;			
(b)	relocation; and			
(c)	other forms of mitigation where impacts are predicted to be long term and significant.			
	The revised *Sydney Metro City and Southwest Construction Noise and Vibration Strategy* must be submitted to the Secretary for approval at least one (1) month before construction commences.			
E33	Construction Noise and Vibration Impact Statements must be prepared for each construction site before construction noise and vibration impacts commence and include specific mitigation measured identified through consultation with affected sensitive receivers.	CNVISs will be prepared for all LW Works, under this Plan. See Section 6.3.	RT&A Environment and Sustainability Manager	Prior to relevant construction activities

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No.	**Requirement**	**How we will meet the Expectations** (minimum requirements)	**Responsibility** Key Contributor	**Timing**
E34	Nosie generating works in the vicinity of potentially-affected, religious, educational, community institutions and noise and vibration-sensitive businesses and critical working areas (such as theatres, laboratories and operating theatres) must not be timetabled within sensitive periods, unless other reasonable arrangements to the affected institutions are made at no cost to the affected institution or as otherwise approved by the secretary.	Allocation to be confirmed with TfNSW Under this plan, consultation will be carried out with affected receivers so that timing of works will be managed to minimise impacts, where practicable. See Section 7.1. TfNSW hold requirements for implementing other reasonable arrangement	Senior Stakeholder and Community Relations Manager Environment and Sustainability Manager	Prior to relevant construction activities
E35	The Proponent must review alternative methods to rock hammering and blasting for excavation as part of the detailed construction planning with a view to adopting methods that minimise impacts on sensitive receivers. Construction Noise and Vibration Impact Statements must be updated for each location or activity to adopt the least impact alternative in any given location unless it can be demonstrated, to the satisfaction of the AA, why it should not be adopted.	Sydney Metro holds this requirement. Not applicable to LW.	N/A	.
E36	Construction, except as allowed by Condition E48 (excluding cut and cover tunnelling), must only be undertaken during the following standard construction hours:	Section 4	Construction Managers Environment and Sustainability Manager Environment Advisors and coordinators RT&A	Construction
(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.			
E37	The Proponent must identify all receivers likely to experience internal noise levels greater than Leq(15 minute) 60 dB(A) inclusive of a 5 dB penalty, if rock breaking or any other annoying activity likely to result in regenerated (ground-borne) noise or a perceptible level of vibration is planned (including works associated with utility adjustments), between 7am – 8pm at:	Section 4.3, Section 5.1 and Section 5.2	Stakeholder and Community Relations Manager Environment and Sustainability Manager Construction Managers Project Managers	Prior to relevant construction activities

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No.	**Requirement**	**How we will meet the Expectations** (minimum requirements)	**Responsibility** Key Contributor	**Timing**
			RT&A	
(a)	Crows Nest, Victoria Cross, Barangaroo, Martin Place, Pitt Street, and Central; and			
(b)	Marrickville, Newtown, St Peters, Sydenham and Tempe for works specified in SSI 7400_MOD 4 referenced in Condition A1 (c).			
E38	The Proponent must consult with all receivers identified in accordance with Condition E37 with the objective of determining appropriate hours of respite so that construction noise (including ground-borne noise), does not exceed internal noise levels of:	Section 5.1 and Section 5.2	Stakeholder and Community Relations Manager Environment and Sustainability Manager Construction Managers Project Managers RT&A	Prior to relevant construction activities
(a)	Leq(15 minute) 60 dB(A) inclusive of a 5 dB penalty if rock breaking or any other annoying 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			
(b)	Leq(15 minute) 55 dB(A) inclusive of a 5 dB penalty if rock breaking or any other annoying 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,			
	unless an agreement is reached with those receivers. This condition does not apply to noise associated with the cutting surface of a TBM as it passes under receivers. Note: This condition requires that noise levels be less than Leq(15 minute) 60 dB(A) for at 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 Leq(15 minutes) 60 dB(A) is allowed for the remaining 6.5 hours between 7am and 8pm.			
E39	The Proponent must consult with proponents of other construction works in the vicinity of the CSSI and take reasonable steps to coordinate works to minimise cumulative impacts of noise and vibration and maximise respite for affected sensitive receivers.	See Section 6.3 and Section 8.5	Senior Stakeholder and Community Relations Manager *Environment and Sustainability Manager*	Prior to relevant construction activities

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			Construction managers RT&A	
E40	The Proponent must ensure all works (including utility works associated with the CSSI where undertaken by third parties) are coordinated to provide the required respite periods identified in accordance with the terms of this approval.	All work undertaken will be assessed as noted in this Plan, see Section 6.3	Environment and Sustainability Manager Construction managers RT&A	Prior to relevant construction activities
E41	The Proponent must ensure that residential receivers, located in non-residential zones, likely to experience an internal noise level exceeding Leq(15 minute) 60 dB(A) between 8pm and 9pm or Leq(15 minute) 45 dB(A) between 9pm and 7am (inclusive of a 5 dB penalty if rock breaking or any other annoying activity likely to result in ground-borne noise, or a perceptible level of vibration is planned (including works associated with utility adjustments)) must be offered additional mitigation in accordance with the Sydney Metro City and South West Noise and Vibration Strategy referenced in Condition E32.	See Section 5.1.1 and Section 5.2.1	Environment and Sustainability Manager Construction managers RT&A	Prior to relevant construction activities
E42	The Proponent must ensure that residential receivers in residential zones likely to experience an internal noise level of Leq(15 minute) 45 dB(A) or greater between 8pm and 7am (inclusive of a 5 dB penalty if rock breaking or any other annoying activity likely to result in ground-borne noise, or a perceptible level of vibration is planned (including works associated with utility adjustments)) must be offered additional mitigation in accordance with the Sydney Metro City and South West Noise and Vibration Strategy referenced in Condition E32.	See Section 5.1.1 and Section 5.2.1	, Environment and Sustainability Manager Construction managers RT&A	Prior to relevant construction activities
E43	At no time can noise generated by construction exceed the National Standard for exposure to noise in the occupational environment of an eight-hour equivalent continuous A-weighted sound pressure level of LAeq,8h, of 85dB(A) for any employee working at a location near the CSSI.	See Section 5.6	Environment and Sustainability Manager Construction Managers	Construction
E44	Notwithstanding Condition E36 construction associated with the CSSI may be undertaken outside the hours specified under those conditions in the following circumstances:	See Section 4.2.1	Environment and Sustainability Manager Construction Managers	Construction

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(a)	for the delivery of materials required by the NSW Police Force or other authority for safety reasons; or			
(b)	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; or			
(c)	where different construction hours are permitted or required under an EPL in force in respect of the construction; or			
(d)	construction that causes LAeq(15 minute) noise levels: (i) no more than 5 dB(A) above the rating background level at any residence in accordance with the *Interim Construction Noise Guideline* (DECC, 2009), and (ii) no more than the noise management levels specified in Table 3 of the *Interim Construction Noise Guideline* (DECC, 2009) at other sensitive land uses, and (iii) continuous or impulsive vibration values, measured at the most affected residence are no more than those for human exposure to vibration, specified in Table 2.2 of *Assessing Vibration: a technical guideline* (DEC, 2006), and (iv) intermittent vibration values measured at the most affected residence are no more than those for human exposure to vibration, specified in Table 2.4 of *Assessing Vibration: a technical guideline* (DEC, 2006); or			
(e)	where a negotiated agreement has been reached with a substantial majority of sensitive receivers who are within the vicinity of and may be potentially affected by the particular construction, and the noise management levels and/or limits for ground-borne noise and vibration (human comfort) cannot be achieved. All agreements must be in writing and a copy forwarded to the Secretary at least one (1) week before the works commencing; or			
(f)	construction approved through an Out of Hours Work Protocol referred to in Condition E47, provided the relevant council, local residents and other affected stakeholders and sensitive receivers are informed of the timing and duration at least five (5) days and no more than 14 days before the commencement of the works.			
	Note: This condition does not apply where an EPL is in force in respect of the construction.			

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E45	On becoming aware of the need for emergency construction in accordance with Condition E44(b), the Proponent must notify the AA, the ER and the EPA (if an EPL applies) of the need for those activities or work. The Proponent must also use best endeavours to notify all affected sensitive receivers of the likely impact and duration of those works.	See Section 6.3	Environment and Sustainability Manager Construction managers	If emergency works required
E46	Notwithstanding Conditions E44 and E48, rock breaking and other particularly annoying activities for station shaft or cut and cover stations is not permitted outside of standard construction hours, except at Central (excluding Central Walk works at 20-28 Chalmers Street, Surry Hills); or	See Section 4	Environment and Sustainability Manager Construction managers	Construction
(a)	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; or			
(b)	where different construction hours are permitted or required under an EPL in force in respect of the construction; or			
(c)	construction that causes LAeq(15 min) noise levels: (i) no more than 5 dB(A) above the rating background level at any residence in accordance with the *Interim Construction Noise Guideline* (DECC, 2009); and (ii) no more than the noise management levels specified in Table 3 of the Interim *Construction Noise Guideline* (DECC, 2009) at other sensitive land uses; and (iii) continuous or impulsive vibration values, measures at the most affected residence are no more than those for human exposure to vibration, specified in Table 2.2 of *Assessing Vibration: a technical guideline* (DEC, 2006); and (iv) intermittent vibration values measured at the most affected residence are no more than those for human exposure to vibration, specified in Table 2.4 of *Assessing Vibration: a technical guideline (DEC, 2006).*			
E47	An Out of Hours Work Protocol for the assessment, management and approval of work outside of standard construction hours, as defined in Condition E36 of this approval, must be prepared in consultation with the EPA and submitted to the Secretary for approval before construction commences for works not subject to an EPL. The protocol must include:	See TfNSW E47 OOHW Protocol in Appendix D	Environment and Sustainability Manager Construction managers Project Environment and Sustainability Manager	Prior to commencement of OOHW not subject to the EPL

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(a)	the identification of low and high risk construction activities;			
(b)	a risk assessment process in which the AA reviews all proposed out of hours activities and identifies their risk levels;			
(c)	a process for the endorsement of out of hours activities by the AA and approval by the ER for construction activities deemed to be of: (i) low environmental risk; or (ii) high risk where all construction works cease by 9pm. All other high risk out of hours construction must be submitted to the Secretary for approval unless otherwise approved through an EPL. The protocol must detail standard assessment, mitigation and notification requirements for high and low risk out of hours works, and detail a standard protocol for referring applications to the Secretary.			
E48	Notwithstanding Condition E36 of this approval and subject to Condition E47, the following activities may be undertaken 24 hours per day, seven (7) days per week:	See Section 4	Environment and Sustainability Manager Construction managers	Construction
(a)	tunnelling and associated support activities (excluding cut and cover tunnelling);			
(b)	excavation within an acoustic enclosure;			
(c)	excavation at Central (excluding Central Walk works at 20-28 Chalmers Street, Surry Hills) without an acoustic enclosure;			
(d)	station and tunnel fit out; and			
(e)	haulage and delivery of spoil and materials.			
E48.1	Notwithstanding E48(a), the Proponent must use best endeavours to schedule annoying activities, including steel hammering and movement of the self-propelled modular trailer, at the Blues Point temporary site between 7am and 8pm.	See Section 4	Environment & Sustainability Manager Construction Managers	Construction (whilst Blues Point site is in use)

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E48.2	Heavy vehicles deliveries to the Blues Point temporary site are only permitted between 7 am and 10 pm except where permitted otherwise through an EPL or where oversized vehicle movement is directed by NSW Police and/or Transport for NSW at other times.	See Section 4	Environment & Sustainability Manager Construction Managers	Construction (whilst Blues Point site is in use)
E50	A Blast Management Strategy must be prepared and include:	See separate Blast Management Strategy to be prepared if blasting is adopted	Environment & Sustainability Manager Construction Managers	To be prepared if blasting is adopted one month prior to first scheduled blast
(a)	sequencing and review of trial blasting to inform blasting;			
(b)	regularity of blasting;			
(c)	intensity of blasting;			
(d)	periods of relief; and			
(e)	blasting program.			
E51	The **Blast Management Strategy** must be endorsed by a suitably qualified and experienced person and reviewed by an independent specialist.	See separate Blast Management Strategy to be prepared if blasting is adopted.	Environment & Sustainability Manager Construction Managers	To be prepared if blasting is adopted one month prior to first scheduled blast
E52	The Blast Management Strategy must be prepared so that all blasting and associated activities are carried out so as not to generate unacceptable noise and vibration impacts or pose a significant risk to sensitive receivers. The Blast Management Strategy must be prepared in accordance with relevant guidelines including the principles outlined in Hazardous Industry Planning Advisory Paper No 6: Hazard Analysis (Department of Planning, January 2011) and Assessment Guideline: Multi-Level Risk Assessment (Department of Planning and Infrastructure, May 2011) for the handling and storage of hazardous materials and include:	See separate Blast Management Strategy to be prepared if blasting is adopted.	Approvals, Environment & Sustainability Manager Construction Managers	To be prepared if blasting is adopted one month prior to first scheduled blast

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(a)	details of blasting to be performed, including location, timing, method and justification of the need to blast;			
(b)	identification of all potentially affected noise and vibration sensitive sites including heritage buildings and utilities;			
(c)	establishment of appropriate criteria for blast overpressure and ground vibration levels at each category of noise sensitive site;			
(d)	details of the storage and handling arrangements for explosive materials and the proposed transport of those materials to the construction site;			
(e)	identification of hazardous situations that may arise from the storage and handling of explosives, the blasting process and recovery of the blast site after detonation of the explosives;			
(f)	determination of potential noise and vibration and risk impacts from blasting and appropriate best management practices; and			
(g)	community consultation procedures.			
E53	The **Blast Management Strategy** must be submitted to the Secretary one (1) month before blasting commences, or as agreed by the Secretary. The **Blast Management Strategy** as submitted to the Secretary, must be implemented for all blasting activities.	See separate Blast Management Strategy to be prepared if blasting is adopted.	Environment & Sustainability Manager Construction Managers	To be prepared if blasting is adopted one month prior to first scheduled blast
E54	Blasting associated with the CSSI must not exceed the following criteria, measured at the most affected residence or other sensitive receiver as specified below:	See separate Blast Management Strategy to be prepared if blasting is adopted.	Environment & Sustainability Manager Construction Managers	To be prepared if blasting is adopted one month prior to first scheduled blast
(a)	airblast overpressure (dB(Lin Peak)) 125 dBL; and			
(b)	vibration (PPV): 25mm/s generally or 7.5mm/s for heritage structures.			

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E55	Blasting must be limited to a single detonation in any one day, and a maximum of six per week, at each station location, or any other frequency agreed by the Secretary. Note: for the purpose of this Condition, a single detonation may involve a number of individual blasts fired in quick succession in a discrete area.	See separate Blast Management Strategy to be prepared if blasting is adopted.	Environment & Sustainability Manager Construction Managers	To be prepared if blasting is adopted one month prior to first scheduled blast
E56	Blasting associated with the project must be undertaken at a time to have the least impact on the nearby sensitive receivers determined in consultation with those receivers. All sensitive receivers affected by any blast must be advised fortnightly of the proposed blasting schedule. The Secretary must also be advised of the advance blasting schedule for any location.	See separate Blast Management Strategy to be prepared if blasting is adopted.	Environment & Sustainability Manager Construction Managers	To be prepared if blasting is adopted one month prior to first scheduled blast

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No.	**Requirement**	**How we will meet the Expectations** (minimum requirements)	**Responsibility** Key Contributor	**Timing**
NV1	The Construction Noise and Vibration Strategy would be implemented with the aim of achieving the noise management levels where feasible and reasonable. This would include the following example standard mitigation measures where feasible and reasonable: • Provision of noise barriers around each construction site • Provision of acoustic sheds at Chatswood dive site, Crows Nest, Victoria Cross, Barangaroo, Martin Place, Pitt Street, Waterloo and Marrickville dive site • The coincidence of noisy plant working simultaneously close together would be avoided • Offset distances between noisy plant and sensitive receivers would be increased • Residential grade mufflers would be fitted to all mobile plant • Dampened rock hammers would be used • Non-tonal reversing alarms would be fitted to all permanent mobile plant • High noise generating activities would be scheduled for less sensitive period considering the nearby receivers • The layout of construction sites would consider opportunities to shield receivers from noise.	All example NV1 mitigation measures will be considered in the development of CNVIS assessments. Relevant requirements of the Sydney Metro CNVS form part of this CNVMP, as noted in Section 2.4. Relevant requirements of the Sydney Metro CNVS will be incorporated into the CNVIS prepared for the LW Works outlined in Section 6.3. Additional mitigation measures, as defined by the Sydney Metro CNVS, are outlined in Section 7.4.	Environment and Sustainability Manager Construction Managers	Construction

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No.	**Requirement**	**How we will meet the Expectations** (minimum requirements)	**Responsibility** Key Contributor	**Timing**
	This would also include carrying out the requirements in relation to construction noise and vibration monitoring.			
NV2	Unless compliance with the relevant traffic noise criteria can be achieved, night time heavy vehicle movements at the Chatswood dive site, Crows Nest Station, Victoria Cross Station and Waterloo Station sites would be restricted to: • The Pacific Highway and Mowbray Road at the Chatswood dive site • The Pacific Highway, Hume Street and Oxley Street at the Crows Nest Station construction site • McLaren Street, Miller Street and Berry Street at the Victoria Cross Station construction site • Botany Road and Raglan Street at the Waterloo Station construction site.	Traffic noise criteria are outlined in Section 5.3 of this CMVMP. Night time heavy vehicle movements will be limited in accordance with this measure. The CNVIS prepared for the LW Works will identify the heavy vehicle route to be utilised by the worksite, confirm potential noise impacts and provide additional mitigation to satisfy the CNVMP.	Construction Managers RT&A	Prior to the use of any heavy vehicle route at night.
NV3	Where vibration levels are predicted to exceed the screening criteria, a more detailed assessment of the structure and attended vibration monitoring would be carried out to ensure vibration levels remain below appropriate limits for that structure. For heritage items, the more detailed assessment would specifically consider the heritage values of the structure in consultation with a heritage specialist to ensure sensitive heritage fabric is adequately monitored and managed.	Vibration criteria, including screening criteria, criteria for vibration sensitive and special structures (including heritage) are outlined in Section 5.45.5. Attended vibration measurements are required to verify that vibration levels comply with the relevant criteria (Section 7.1) These will be adopted and used to assess impact and determine appropriate mitigation in all CNVIS prepared for the project.	Construction Managers RT&A	Prior to the start of each construction stage.
NV4	Feasible and reasonable measures would be implemented to minimise ground borne noise where exceedences are predicted.	All CNVIS review potential ground-borne noise impact and identify feasible and reasonable measures to manage this. See Table 19.	Construction Managers RT&A	Prior to the start of each construction stage.
NV5	Feasible and reasonable mitigation measures would be implemented where power supply works would result in elevated noise levels at receivers. This would include: • Carrying out works during the daytime period when in the vicinity of residential receivers	CNVIS prepared for all local area and utilities work, including power supply works. Feasible and reasonable mitigation measures would be implemented in	Construction Managers RT&A	Prior to the start of each construction stage.

Planning Approval SSI-7400 (REMMs)				
No.	**Requirement**	**How we will meet the Expectations** (minimum requirements)	**Responsibility** Key Contributor	**Timing**
	• Where out of hours works are required, scheduling the noisiest activities to occur in the evening period (up to 10 pm) • Use of portable noise barriers around particularly noisy equipment such as concrete saws.	addition to measures outlined in the Sydney Metro CNVS and this CNVMP. See Section 7.		
NV6	Transport for NSW would engage an Independent Acoustic Advisor to act independently of the design and construction teams and provide oversight of construction methods, construction noise and vibration planning, management and mitigation, and construction noise and vibration monitoring and reporting. The key responsibilities of the Independent Acoustic Advisor would include : • Assurance of contractor noise and vibration planning, modelling, management and monitoring practices • Verification of compliance with relevant guidelines and approval requirements • Audit noise and vibration management practices.	Independent Acoustic Advisor engaged by TfNSW (Section 3.3 and Section **Error! Reference source not found.**).	N/A	N/A

Planning Approval SSI 8256 – Sydenham to Bankstown

Planning Approval SSI-8256 (CoA)				
No.	**Requirement**	**How we will meet the Expectations** (minimum requirements)	**Responsibility** Key Contributor	**Timing**
C8	The following Construction Monitoring Programs must be prepared in consultation with the relevant government agencies identified for each to compare actual performance of Construction of the CSSI against the predicted performance. (a) Noise and vibration	Section 8 and Appendix F	**Environment and Sustainability Manager** RT&A	As specified in the Construction Noise and Vibration Impacts Statement
E18	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, Construction ground-borne noise and Operational noise. The survey may be undertaken on a progressive basis but must be undertaken in any one area before the commencement of Work which generate Construction or Operational noise,	Appendix A	**Environment and Sustainability Manager** RT&A	Prior to relevant construction activities

Planning Approval SSI-8256 (CoA)				
No.	**Requirement**	**How we will meet the Expectations** (minimum requirements)	**Responsibility** Key Contributor	**Timing**
	vibration or ground-borne noise in that area. The results of the survey must be included in the Construction Noise and Vibration Impact Statement(s) or Operational Noise and Vibration Review, where relevant.			
E19	Work must only be undertaken during the following Construction hours:	Section 4.2	Construction Managers Environment and Sustainability Manager Environment Advisors and coordinators RT&A	Construction
(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.			
E20	Notwithstanding Conditions E19 and E24 Work may be undertaken outside the hours specified in the following circumstances:	Section 4.2	Construction Managers Environment and Sustainability Manager Environment Advisors and coordinators RT&A	Construction
(a)	for the delivery of materials required by the NSW Police Force or other authority for safety reasons; or			
(b)	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; or			
(c)	where different Construction hours are permitted or required under an EPL in force in respect of the CSSI; or			
(d)	work approved under an Out-of-Hours Work Protocol for Work not subject to an EPL as required by Condition E25; or			

Planning Approval SSI-8256 (CoA)				
No.	**Requirement**	**How we will meet the Expectations** (minimum requirements)	**Responsibility** Key Contributor	**Timing**
(e)	Construction that causes LAeq(15 minute) noise levels: (i) no more than 5 dB(A) above the rating background level at any residence in (ii) accordance with the Interim Construction Noise Guideline (DECC, 2009), and (iii) no more than the 'Noise affected' noise management levels specified in Table 3 of the Interim Construction Noise Guideline (DECC, 2009) at other sensitive land uses, and (iv) continuous or impulsive vibration values, measured at the most affected residence are no more than the maximum values for human exposure to vibration, specified in Table 2.2 of Assessing Vibration: a technical guideline (DEC, 2006), and (v) intermittent vibration values measured at the most affected residence are no more than the maximum values for human exposure to vibration, specified in Table 2.4 of Assessing Vibration: a technical guideline (DEC, 2006); or			
(f)	where a negotiated agreement has been reached with a substantial majority of sensitive receivers who are within the vicinity of and may be potentially affected by the particular Construction, and the noise management levels and/or limit for ground-borne noise and vibration (human comfort) cannot be achieved. All agreements must be in writing and a copy forwarded to the Planning Secretary at least one (1) week before the commencement of activities. Note: Section 5.24(1)(e) of the EP&A Act requires that an EPL be substantially consistent with this approval.			
E21	On becoming aware of the need for emergency Work in accordance with Condition E20(b), the Proponent must notify the ER and the EPA (if a EPL applies) of the need for that Work. The Proponent must use best endeavours to notify all noise and/or vibration affected sensitive receivers of the likely impact and duration of those Work.	See Section 6.3	Environment and Sustainability Manager Construction managers Project Environment and Sustainability Manager	If emergency works required
E22	E22 Out-of-Hours Work that are regulated by an EPL as per Condition E20(c) or through the Out of-Hours Work Protocol as per Condition E25 include:	Section 4.2	Construction Managers Environment and Sustainability Manager Environment Advisors and coordinators RT&A	Construction

Planning Approval SSI-8256 (CoA)				
No.	**Requirement**	**How we will meet the Expectations** (minimum requirements)	**Responsibility** Key Contributor	**Timing**
(a)	Work which could result in a high risk to construction personnel or public safety, based on a risk assessment carried out in accordance with AS/NZS ISO 31000:2009 “Risk Management – Principles and Guidelines”; or			
(b)	where the relevant road authority has advised the Proponent in writing that carrying out the activities could result in a high risk to road network operational performance; or			
(c)	where the relevant utility service operator has advised the Proponent in writing that carrying out the activities could result in a high risk to the operation and integrity of the utility network; or			
(d)	where the Transport for NSW Transport Management Centre (or other road authority) has advised the Proponent in writing that a road occupancy licence is required and will not be issued for the activities during the hours specified in Conditions E19 and E20; or			
(e)	where Sydney Trains (or other rail authority) has advised the Proponent in writing that a Rail Possession is required. Note: Other Out-of-Hours Work can be undertaken with the approval of an EPL, or through the project’s Out-of-Hours Work Protocol for Work not subject to an EPL.			
E23	In order to undertake Out-of-Hours Work, the Proponent must identify appropriate respite periods for the Out-of-Hours Work 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:	Community consultation will be conducted as detailed in the Community Communications Strategy Sydney Metro Trains Facility (LWW-CCS-SMTF) (SMCSWLWC-SYC-1NL-CL-PLN-000080). Also refer to Section 3.6 of this Plan.	Stakeholder & Community Relations Manager Environment and Sustainability Manager Environmental Advisor	Construction (prior to relevant OOHW commencing)
(a)	a schedule of likely Out-of-Hours Work for a period no less than two (2) months;			
(b)	the potential work, location and duration;			
(c)	the noise characteristics and likely noise levels of the Work; and			

Planning Approval SSI-8256 (CoA)				
No.	**Requirement**	**How we will meet the Expectations** (minimum requirements)	**Responsibility** Key Contributor	**Timing**
(d)	likely mitigation and management measures. The outcomes of the community consultation, the identified respite periods and the scheduling of the likely Out-of-Hours Work must be provided to the EPA (if an EPL applies) and the Planning Secretary (for high risk activities after 9pm) upon request.			
E24	Except as permitted by an EPL, highly noise intensive Work that result in an exceedance of the applicable Noise Management Level at the same receiver must only be undertaken:	This will be identified in the CNVIS prepared for LW Works as noted in Section 4.2 and 4.3 of this CNVMP	Stakeholder & Community Relations Manager Environment and Sustainability Manager Environmental Advisor	Construction
(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)	in continuous blocks not exceeding three (3) hours each with a minimum respite from those activities and Works of not less than one (1) hour between each block. For the purposes of this condition, 'continuous' includes any period during which there is less than a one (1) hour respite between ceasing and recommencing any of the work that are the subject of this condition.			
E25	An Out-of-Hours Work Protocol must be prepared to identify a process for the consideration, management and approval of Work which are outside the hours defined in Condition E19, and that are not subject to an EPL. The Protocol must be approved by the Planning Secretary before commencement of the Work. The Protocol must:	See TfNSW E47 OOHW Protocol in Appendix D	Approvals, Environment and Sustainability Manager Construction managers Project Environment and Sustainability Manager	Prior to commencement of OOHW not subject to the EPL
(a)	provide a process for the consideration of Out-of-Hours Work against the relevant noise and vibration criteria, including the determination of low and high-risk activities;			
(b)	provide a process for the identification of mitigation measures for residual impacts, including respite periods in consultation with the community at each affected location, consistent with the requirements of Condition E23;			

Planning Approval SSI-8256 (CoA)				
No.	**Requirement**	**How we will meet the Expectations** (minimum requirements)	**Responsibility** Key Contributor	**Timing**
(c)	identify procedures to facilitate the coordination of Out-of-Hours Work approved by an EPL to ensure appropriate respite is provided;			
(d)	identify an approval process that considers the risk of activities, proposed mitigation, management, and coordination, including where: (i) low risk activities and high risk activities that cease by 9pm can be approved by the ER, and (ii) all other high risk activities must be approved by the Planning Secretary; and			
(e)	identify Planning Secretary, EPA and community notification arrangements for approved Out-of-Hours Work, which may be detailed in the Community Communication Strategy.			
E26	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:	This will be addressed in the CNVIS prepared for the LW Works, as noted in Section 3.4		
(a)	reschedule Work to provide respite to impacted noise sensitive receivers so that the respite is achieved in accordance with Condition E23; or			
(b)	consider the provision of alternative respite or mitigation to impacted noise sensitive receivers; and			
(c)	provide documentary evidence to the ER in support of any decision made by the Proponent in relation to respite or mitigation.			
E27	Construction Noise and Vibration Impact Statements must be prepared for Construction sites before Construction noise and vibration impacts commence and include specific mitigation measures identified through consultation with affected sensitive receivers. The Statements must augment the Construction Noise and Vibration Management Sub-plan and must be implemented for the duration of Work. The Statements must be informed by a suite of potential management/mitigation options provided in the Construction Noise and Vibration Sub-plan.	CNVISs will be prepared for all LW Works, under this Plan. See Section 6.3.	RT&A Environment and Sustainability Manager	Prior to relevant construction activities

Planning Approval SSI-8256 (CoA)				
No.	**Requirement**	**How we will meet the Expectations** (minimum requirements)	**Responsibility** Key Contributor	**Timing**
E28	Noise generating Work in the vicinity of potentially-affected community, religious, or educational institutions resulting in noise levels above the noise management levels must not be timetabled within sensitive periods, unless other reasonable arrangements with the affected institutions are made at no cost to the affected institution or as otherwise approved by the Planning Secretary.	Allocation to be confirmed with TfNSW Under this plan, consultation will be carried out with affected receivers so that timing of works will be managed to minimise impacts, where practicable. See Section 7.1. TfNSW hold requirements for implementing other reasonable arrangement	Senior Stakeholder and Community Relations Manager Environment and Sustainability Manager	Prior to relevant construction activities
E29	Mitigation measures must be implemented with the aim of achieving the following construction noise management levels and vibration criteria:	Noise and vibration objectives will be incorporated in the CNVISs including:	Environment and Sustainability Manager RT&A	Prior to relevant construction activities
(a)	Construction 'Noise affected' noise management levels established using the Interim Construction Noise Guideline (DECC, 2009);	Section 5.1		
(b)	vibration criteria established using the Assessing vibration: a technical guideline (DEC, 2006) (for human exposure);	Section 5.4		
(c)	BS 7385 Part 2-1993 "Evaluation and measurement for vibration in buildings Part 2" as they are "applicable to Australian conditions"; and	Section 5.5		
(d)	the vibration limits set out in the German Standard DIN 4150-3: Structural Vibration-effects of vibration on structures (for structural damage). Note: The Interim Construction Noise Guideline identifies 'particularly annoying' activities that require the addition of 5 dB(A) to the predicted level before comparing to the Construction Noise Management Level.	Section 5.5		
E30	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-listed structures	Advice will be sought, as noted in Section 8.1 and Section 8.2	Environment and Sustainability Manager	Prior to monitor installation
E33	Where implementation of Operational noise mitigation measures will be physically affected by Construction such that they cannot commence implementation within six (6) months of the commencement of Construction in accordance with Condition	See Section **Error! Reference source not found.**	Sydney Metro	Construction

Planning Approval SSI-8256 (CoA)				
No.	**Requirement**	**How we will meet the Expectations** (minimum requirements)	**Responsibility** Key Contributor	**Timing**
	E32, the Proponent must submit to the Secretary a report providing justification as to why, along with details of temporary measures that would be implemented to address construction noise impacts until such time that the Operational noise mitigation measures identified in Condition E31 are implemented. The report must be submitted to the ER for review. When the ER is satisfied that the justification and alternative measures are appropriate to address construction noise impacts, and within six (6) months of the commencement of Construction which would affect the identified sensitive receivers, the report must be submitted to the Planning Secretary for information.		Environment and Sustainability Manager	

Planning Approval SSI-8256 (REMMs)				
No.	**Requirement**	**How we will meet the Expectations** (minimum requirements)	**Responsibility** Key Contributor	**Timing**
NVC1	In accordance with the Construction Noise and Vibration Strategy, construction noise impact statements would be prepared prior to the commencement of construction components, to consider the scale and duration of construction noise impacts, and identify measures to minimise impacts to sensitive receivers. This would include noise modelling to confirm the results of modelling undertaken as part of the Environmental Impact Statement and Submissions and Preferred Infrastructure Report. Where exceedances of the noise management levels are identified, feasible and reasonable mitigation measures would be identified.	Relevant requirements of the Sydney Metro CNVS form part of this CNVMP, as noted in Section 2.4. Relevant requirements of the Sydney Metro CNVS will be incorporated into the CNVIS prepared for the LW Works outlined in Section 6.3. Additional mitigation measures, as defined by the Sydney Metro CNVS, are outlined in Section 7.4.	Environment and Sustainability Manager Construction Managers	Construction
NVC2	In accordance with the Construction Noise and Vibration Strategy, all employees, contractors and subcontractors would receive an environmental induction. The induction must at least include: • relevant project specific and standard noise and vibration mitigation measures • relevant licence and approval conditions • permissible hours of work • any limitations on high noise generating activities • location of nearest sensitive receivers	All example NVC2 mitigation measures will be considered in the environmental induction.	Environment and Sustainability Manager Construction Managers	Construction

Planning Approval SSI-8256 (REMMs)				
No.	**Requirement**	**How we will meet the Expectations** (minimum requirements)	**Responsibility** Key Contributor	**Timing**
	• designated loading/unloading areas and procedures • site opening/closing times (including deliveries).			
NVC3	Where vibration levels are predicted to exceed the **vibration** screening **level**, a more detailed assessment of the structure would be carried out to determine the appropriate vibration limits for that structure.	Vibration criteria, including screening criteria, criteria for vibration sensitive and special structures (including heritage) are outlined in Section 5.5. Attended vibration measurements are required to verify that vibration levels comply with the relevant criteria (Section 7.1) These will be adopted and used to assess impact and determine appropriate mitigation in all CNVIS prepared for the project.	Construction Managers RT&A	Prior to the start of each construction stage.
NVC4	For heritage items where vibration screening levels are predicted to be exceeded, the more detailed assessment would include condition assessment and specifically consider the heritage values of the structure in consultation with a heritage specialist to ensure sensitive heritage fabric is adequately monitored and managed.	As above	Construction Managers RT&A	Prior to the start of each construction stage.
NVC5	The Construction Noise and Vibration Strategy would be implemented with the aim of achieving the noise management levels where feasible and reasonable. This may include the following example mitigation measures alone or in combination, where feasible and reasonable: • The provision of noise barriers around each construction site. • The coincidence of noisy plant working simultaneously close together would be avoided. • Residential grade mufflers would be fitted to all mobile plant. • Non-tonal reversing alarms would be fitted to all permanent mobile plant. • High noise generating activities would be scheduled for less sensitive periods considering the nearby receivers, where reasonable and feasible. • The layout of construction sites would consider opportunities to shield receivers from noise.	All example NVC5 mitigation measures will be considered in the development of CNVIS assessments.	Environment and Sustainability Manager Construction Managers	Construction

Planning Approval SSI-8256 (REMMs)				
No.	**Requirement**	**How we will meet the Expectations** (minimum requirements)	**Responsibility** Key Contributor	**Timing**
	• Stationary noise sources would be enclosed or shielded whilst ensuring that the occupational health and safety of workers is maintained. • Loading and unloading of materials/deliveries is to occur as far as possible from noise sensitive receivers. • Select site access points and roads as far as possible away from noise sensitive receivers. • Dedicated loading/unloading areas to be shielded if close to noise sensitive receivers wherever feasible and reasonable. • Use quieter and less vibration emitting construction methods where feasible and reasonable. • The noise levels of plant and equipment must have operating Sound Power Levels compliant with the criteria in the Construction Noise and Vibration Strategy. • Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site. • Where feasible and reasonable, the offset distance between noisy plant items and nearby noise sensitive receivers would be as great as possible. • Where reasonable and feasible heavy vehicle movements would be limited to daytime and evening hours, with night-time movements avoided where possible. • Active community consultation and the maintenance of positive, cooperative relationships with schools, local residents and building owners and occupiers, through: – periodic notification or work activities and progress (e.g. regular letterbox drops, e-consult) – specific notification (letter-box drop) prior to especially noisy activities – comprehensive website information – project information and construction response telephone line – email distribution lists. • Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site.			

Planning Approval SSI-8256 (REMMs)				
No.	**Requirement**	**How we will meet the Expectations** (minimum requirements)	**Responsibility** Key Contributor	**Timing**
	• Where feasible and reasonable, the offset distance between noisy plant items and nearby noise sensitive receivers would be as great as possible. • Where reasonable and feasible heavy vehicle movements would be limited to daytime and evening hours, with night-time movements avoided where possible. • Active community consultation and the maintenance of positive, cooperative relationships with schools, local residents and building owners and occupiers, through: – periodic notification or work activities and progress (e.g. regular letterbox drops, econsult) – specific notification (letter-box drop) prior to especially noisy activities – comprehensive website information – project information and construction response telephone line – email distribution lists.			
NVC6	Noise intensive plant for, would not be used during the night-time period (10pm to 7am) unless: • during a weekend rail possession or shut down • a requirement of a road authority, emergency services or Sydney Coordination Office requires works to be undertaken during this period.	See Section 4.2	Environment and Sustainability Manager Construction Managers RT&A	Construction
NVC7	When working adjacent to schools, medical facilities and child care centres, particularly noisy activities would be scheduled outside normal working hours, where reasonable and feasible.	This will be addressed in the CNVIS prepared for Line-Wide Works and will incorporate outcomes of consultation in line with Section 3.6	Environment and Sustainability Manager Construction Managers RT&A	Prior to the relevant construction activity
NVC8	When working adjacent to churches and places of worship, particularly noisy activities would be scheduled outside services, where reasonable and feasible.	This will be addressed in the CNVIS prepared for Line-Wide Works and will incorporate outcomes of consultation in line with Section 3.6	Environment and Sustainability Manager Construction Managers RT&A	Prior to the relevant construction activity

Planning Approval SSI-8256 (REMMs)				
No.	**Requirement**	**How we will meet the Expectations** (minimum requirements)	**Responsibility** Key Contributor	**Timing**
NVC9	Alternative accommodation may be offered to residents living in close proximity to construction works where detailed construction planning identifies unreasonably high noise impacts over a prolonged period. Alternative accommodation arrangements would be offered and discussed with residents on a case-by-case basis.	Additional mitigation measures will be incorporated into the CNVIS as outlined in Section 7.4 of this Plan	Environment and Sustainability Manager Construction Managers RT&A	Prior to the relevant construction activity
NVC10	High noise and vibration generating activities including, ballast tamping, may only be carried out in continuous blocks, not exceeding 3 hours each, with a minimum respite period of one hour between each block and these works.	Respite for noise intensive works will apply as outlined in Section 4.3	Environment and Sustainability Manager Construction Managers RT&A	Prior to the relevant construction activity
NVC11	Ongoing noise monitoring would be undertaken during construction at sensitive receivers during critical periods (i.e. times when noise emissions are expected to be at their highest to identify and assist in managing high risk noise events.	Monitoring will be undertaken as identified in the CNVIS, in accordance with Section 8.1 of this Plan	Environment and Sustainability Manager Construction Managers	Prior to relevant construction activity
NVC12	Where vibration levels are predicted to exceed the vibration screening level, attended vibration monitoring would be carried out to ensure vibration levels remain below appropriate limits for that structure.	This will be addressed in the CNVIS prepared for LW Works in line with Section 5.5	Environment and Sustainability Manager Construction Managers	Prior to relevant construction activity
NVC13	Reasonable and feasible measures would be implemented in accordance with the Construction Noise and Vibration Strategy to minimise ground-borne noise where exceedances are predicted.	All example reasonable and feasible mitigation measures will be considered in the development of CNVIS assessments.	Environment and Sustainability Manager Construction Managers	Prior to relevant construction activity
NVC14	Reasonable and feasible mitigation measures would be implemented where power supply works would result in elevated noise levels at receivers. This could include: • carrying out works during the daytime period when in the vicinity of residential receivers • where out of hours works are required, scheduling the noisiest activities to occur in the evening period (up to 10pm) • use of portable noise barriers around particularly noisy equipment.	All example reasonable and feasible mitigation measures will be considered in the development of CNVIS assessments.	Environment and Sustainability Manager Construction Managers	Prior to relevant construction activity

Planning Approval SSI-8256 (REMMs)				
No.	**Requirement**	**How we will meet the Expectations** (minimum requirements)	**Responsibility** Key Contributor	**Timing**
NVC15	The routes for construction haulage vehicles and bus services associated with the Temporary Transport Strategy would be selected on the basis of compliance with the relevant road traffic noise criteria, where reasonable and feasible. Where compliance with the noise criteria is not possible, reasonable and feasible noise mitigation would be implemented.	All example reasonable and feasible mitigation measures will be considered in the development of CNVIS assessments.	Sydney Metro Environment and Sustainability Manager Construction Managers	Prior to relevant construction activity
NVC16	An Out of Hours Work Strategy would be prepared, in consultation with the Environment Protection Authority, to guide the assessment, management, and approval of works outside recommended standard hours.	See OOHW procedure in Appendix D	Environment and Sustainability Manager Construction Managers RT&A	Prior to the relevant construction activity

PART C – APPENDICES

Appendix A: Land Use Survey

A1.1 C2S Land Use Survey and Noise Catchment Areas

A1.2 S2B Land Use Survey and Noise Catchment Areas

A.2 Heritage receivers

Appendix B: Indicative site layouts

Appendix C: Key noise and/or vibration generating construction activities

Details in this Appendix are based on indicative construction works and representative construction scenarios for modelling completed to date. As set out in Section 6.3 of the CNVMP, detailed outcomes from the design, construction planning and assessment process will be presented in the CNVIS for each LW site. These indicative construction works are therefore current to the revision date of this Plan only.

Appendix D: Out of Hours Work Procedure

Appendix E: Out of Hours Work Protocol

This Sydney Metro City & Southwest Out of Hours Work Strategy/ Protocol (SM ES-PW-317) applies to those construction works on LW Portion 2, 3 and 4 which are to be undertaken outside of the standard construction hours that are not subject to an EPL.

Appendix F: Monitoring Specifications

F.1 Specification for Determining the Sound Power of Construction Plant and Equipment

F.1.1 Scope

This document specifies methods for determination of sound power levels for construction plant including earthmoving equipment and other ancillary plant and equipment used during construction. The limited scope remaining under Portion 4 means that Sound Power monitoring is no longer required.

F.1.2 Referenced Standards

- AS IEC 61672.1 Electroacoustic - Sound Level Meters – Specifications;
- AS 2012.1 Acoustics - Measurement of airborne noise emitted by earth-moving machinery and agricultural tractors - Stationary test condition - Determination of compliance with limits for exterior noise
- ISO 3744 Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Engineering methods for an essentially free field over a reflecting plane
- ISO 3746 Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Survey method using an enveloping measurement surface over a reflecting plane
- ISO 6393 Earth-moving machinery - Determination of sound power level - Stationary test conditions
- ISO 6395 Earth-moving machinery - Determination of sound power level - Dynamic test conditions

F.1.3 Testing Procedures – Earthmoving Machinery

The following procedures are to be followed by personnel suitably qualified and experienced in undertaking acoustic measurements.

Each acoustically significant plant item identified in the CNVIS shall be tested in terms of both the ‘stationary’ and the ‘dynamic’ testing procedures detailed below.

All sound level meters used must be Type 1 instruments as described in AS IEC 61672.1 “Electroacoustic - Sound Level Meters” and calibrated to standards that are traceable to Australian Physical Standards held by the National Measurement Laboratory (CSIRO Division of Applied Physics). The calibration of the meters shall be checked in the field before and after the noise measurement period.

F.1.4 Stationary Testing

Stationary measurements shall be performed on all earthmoving plant according to the method of AS 2012.1 and/or ISO 6393.

In addition to measuring overall A-weighted noise levels, octave band frequency $L_{Aeq,T}$ noise levels shall also be measured at each measurement location from 63Hz to 8kHz inclusive. Background noise shall also be recorded in the same octave band frequency range, and corrections to measured octave-band noise levels shall be applied as described in Table 1 of AS2012.1.

Each plant item should be tested in isolation, without any other noisy plant on site operating. Where this cannot be done for practical reasons, then the noise of the plant being tested shall

be at least 5dB greater than the background noise from other nearby plant, both in terms of the overall A-weighted level and in all octave band frequencies.

Measured octave-band $L_{Aeq,T}$ noise levels shall also be processed as described in Section 8.1 of that Standard to establish octave-band sound power levels.

The overall A-weighted sound power levels to be determined shall be in terms of both the $L_{Aeq,T}$ and $L_{A1,(1min)}$ noise metrics. The measurement sample time shall be selected so that it is representative of the operating cycle/s of the plant being tested.

Where the plant tested or noise measurements are taken within 3.5 metres of large walls or cliffs, then a reflection correction of up to -2.5dB(A) shall be applied to remove the effect of increased noise due to sound reflections from such structures.

All measured noise level data and determined sound power levels shall be included in the test reports.

F.1.5 Dynamic Testing

Details of equipment operation during testing will vary depending on the equipment type. Dynamic measurements shall be performed on all earthmoving plant according to the method in International Standard ISO 6395.

In addition to measuring overall A-weighted noise levels, octave band frequency $L_{Aeq,T}$ noise levels shall also be measured at each measurement location from 63Hz to 8kHz inclusive. Background noise shall also be recorded in the same octave band frequency range, and corrections to measured octave-band noise levels shall be applied as described in International Standard ISO 6395.

Each plant item should be tested in isolation, without any other noisy plant on site operating. Where this cannot be done for practical reasons, then the noise of the plant being tested shall be at least 5dB greater than the background noise from other nearby plant, both in terms of the overall A-weighted level and in all octave band frequencies.

Measured octave-band $L_{Aeq,T}$ noise levels shall also be processed to establish octave-band sound power levels.

Where the plant tested or noise measurements are taken within 3.5 metres of large walls or cliffs, then a reflection correction of up to -2.5dB(A) shall be applied to remove the effect of increased noise due to sound reflections from such structures.

The overall A-weighted sound power levels to be determined shall be in terms of the $L_{Aeq,T}$ and $L_{A1,(1min)}$ noise metrics. The measurement sample time shall be selected so that it is representative of the operating cycle/s of the plant being tested.

All measured noise level data and determined sound power levels shall be included in the test reports.

F.1.6 Testing Procedures – Other Construction Plant

The following procedures are to be followed by personnel suitably qualified and experienced in undertaking acoustic measurements.

All sound level meters used must be Type 1 instruments as described in AS IEC 61672.1 ‘Electroacoustic - Sound Level Meters’. The calibration of the meters shall be checked in the field before and after the noise measurement period.

Noise measurements shall be performed on all acoustically significant non-earthmoving construction plant identified in the CNVIS according to the methods of either ISO 3744 or ISO 3746, whichever is applicable to the items of plant being tested.

Machinery shall be operated at high idle speed. In the case of drilling, boring and rock-breaking machines, the testing location shall allow for these machines to be operated in rock of characteristics that are typical for the project site.

In addition to measuring overall A-weighted noise levels, octave band frequency $L_{Aeq,T}$ noise levels shall also be measured at each measurement location from 63Hz to 8kHz inclusive. Background noise shall also be recorded in the same octave band frequency range, and corrections to measured octave-band noise levels shall be applied as described in Table 1 of AS2012.1.

Each plant item should be tested in isolation, without any other noisy plant on site operating. Where this cannot be done for practical reasons, then the noise of the plant being tested shall be at least 5dB greater than the background noise from other nearby plant, both in terms of the overall A-weighted level and in all octave band frequencies.

Measured octave-band $L_{Aeq,T}$ noise levels shall also be processed as described in Section 8 of that Standard to establish octave-band sound power levels.

The overall A-weighted sound power levels to be determined shall be in terms of both the $L_{Aeq,T}$ and $L_{A1,(1min)}$ noise metrics. The measurement sample time shall be selected so that it is representative of the operating cycle/s of the plant being tested.

Where the plant tested or noise measurements are taken within 3.5 metres of large walls or cliffs, then a reflection correction of up to -2.5dB(A) shall be applied to remove the effect of increased noise due to sound reflections from such structures. All measured noise level data and determined sound power levels shall be included in the test reports.

F.2 Specification for Construction Noise Monitoring

F.2.1 Scope

This document specifies methods for undertaking noise monitoring during the construction phase of the project. The limited scope remaining under Portion 4 means that construction noise monitoring is no longer required.

F.2.2 Referenced Standards & Guidelines

- AS 2659.1 Guide to the use of sound measuring equipment – portable sound level meters
- AS IEC 61672.1 Electroacoustic - Sound Level Meters – Specifications;
- AS 1055 Acoustics - Description and Measurement of Environmental Noise;
- DECCW NSW Interim Construction Noise Guideline 2009; and
- EPA NSW Industrial Noise Policy 2000.

F.2.3 Testing Procedures

The following procedures are to be followed by personnel suitably qualified and experienced in undertaking acoustic measurements.

All noise monitoring equipment used must be at least Type 2 instruments as described in AS IEC 61672.1 ‘Electroacoustic - Sound Level Meters - Specifications’ and calibrated to standards that are traceable to Australian Physical Standards held by the National Measurement Laboratory (CSIRO Division of Applied Physics). The calibration of the monitoring equipment shall also be checked in the field before and after the noise measurement period,

and in the case of long-term noise monitoring, calibration levels shall be checked at minimum weekly intervals.

Long-term noise monitoring equipment or Noise Loggers, consist of sound level meters and computers housed in weather resistant enclosures. The operator may either retrieve the data at the conclusion of each monitoring period either in person or via a telephone modem if the logger is fitted with a mobile phone option.

All environmental noise measurements shall be taken with the following meter settings:

- Time Constant - FAST (i.e. 125 milliseconds)
- Frequency Weightings - A-weighting
- Sample Period - 15 minutes

All outdoor noise measurements shall be undertaken with a windscreen over the microphone. Windscreens reduce wind noise at the microphones.

Measurements of noise should be disregarded when it is raining and/or the wind speed is greater than 5 m/s (18 km/h).

F.2.4 Long-term (unattended) Monitoring

Noise monitoring shall be undertaken in accordance with the environmental noise measurement requirements stipulated in the reference standards and documents listed above.

Noise monitoring equipment shall be placed at positions which have unobstructed views of general site activities, whilst shielded as much as possible from non-construction site noise (e.g. road traffic, rail noise and other surrounding noise).

Every 15 minutes, the data is to be processed statistically and stored in memory. The minimum range of noise metrics to be stored in memory for later retrieval is the following A-weighted noise levels: L90, Leq, and L_{max}.

Where the noise monitors are placed within 3.5 metres of building facades, walls or cliffs, then a reflection correction of up to -2.5dB(A) shall be applied to remove the effect of increased noise due to sound reflections from such structures.

Meteorological conditions such as wind velocity, wind direction and rainfall shall also be either monitored on site or recorded from the nearest weather station to the project site, over the entire noise monitoring period.

F.2.5 Real time (unattended) Monitoring

Real time (unattended noise monitoring should follow the same process as described in Section E.2.4 above.

In addition to the above, the vibration monitoring device must be fitted out with a modem to allow the data processor to monitoring data to a remote server. This allows the monitoring data to be downloaded stored to a networked PC or webserver. A secure website is required for data storage.

The statistical data can be processed in real time and displayed for review. A trigger could be set to warn of the potential for non-compliance by transmitting an email or SMS alert. This allows Systems Connect to respond to potential vibration issues before non-compliance occurs.

Upon receipt of an alert email/ SMS the source of potential non-compliance should be identified. This allows Systems Connect to respond to potential noise issues before non-compliance occurs. A reasonable and feasible alternative construction methodology should be determined to allow the worksite to comply with the noise obligations or relevant works must cease.

F.2.6 Short-term (attended) Monitoring

All attended short-term noise monitoring shall be recorded over 15 minute sample intervals. Every 15 minutes, the data is to be processed statistically and stored in memory. The minimum range of noise metrics to be stored in memory and reported are the following A-weighted noise levels: L_{90}, L_{eq}, and L_{max}.

In addition to measuring and reporting overall A-weighted noise levels, statistical L_{90}, L_{eq}, L_{10} noise levels shall also be measured and reported in third-octave band frequencies from 31.5Hz to 8kHz.

Outdoor noise monitoring is to be undertaken at least 3.5m from any reflecting structure other than the ground. The preferred measurement height is 1.2-1.5m above the ground. Where the noise monitors are placed within 3.5 metres of building facades, walls or cliffs, then a reflection correction of up to -2.5dB(A) shall be applied to remove the effect of increased noise due to sound reflections from such structures.

Measurements inside buildings should be at least 1m from the walls or other major reflecting surfaces, 1.2 m to 1.5m above the floor, and about 1.5m from windows.

Conditions such as wind velocity, wind direction, temperature, relative humidity and cloud cover shall also be recorded during short-term noise monitoring.

Noise monitoring shall be undertaken in accordance with the environmental noise measurement requirements stipulated in the reference standards and documents listed above.

The following information shall be recorded:

- Date and time of measurements
- Name of person undertaking the measurements
- Type and model number of instrumentation
- Results of field calibration checks before and after measurements
- Description of the time aspects of each measurement (i.e. sample times, measurement time intervals and time of day)
- Sketch map of area and monitoring location
- Measurement location details and number of measurements at each location
- Weather conditions during measurements
- Operation and load conditions of the noise sources under investigation
- Any adjustment made for presence or absence of nearby reflecting surfaces
- Noise due to other sources (e.g. traffic, aircraft, trains, dogs barking, insects etc.)

F.3 Specification for Construction Vibration Monitoring

F.3.1 Scope

This document specifies methods for undertaking vibration monitoring during the construction phase of the project. The limited scope remaining under Portion 4 means that construction vibration monitoring is no longer required.

F.3.2 Referenced Standards and Guidelines

- AS 2775 Mechanical Mounting of Accelerometers
- AS 2670.2 Evaluation of human exposure to whole body vibration
- NSW Assessing Vibration: a technical guideline (AVTG) (DEC, 2006)
- DIN 4150.3 Structural Vibration in Buildings – Effects on Structures
- BS 7385:1 Evaluation and Measurement for Vibration in Buildings – Part 1: Guide for measurement of vibrations and evaluation of their effects on buildings

- BS 7385:2 Evaluation and Measurement for Vibration in Buildings – Part 2: Guide to Damage Levels from Ground-borne Vibration
- ISO 4866 Mechanical Vibration & Shock – Vibration of Buildings – Guidelines for the Management of the Vibrations and Evaluation of their Effects on Buildings

F.3.3 Testing Procedures

The following procedures are to be followed by personnel suitably qualified and experienced in undertaking vibration measurements.

All vibration monitoring equipment used must be checked for accuracy (to manufacturer's specification) at least every two years against a reference vibration transducer that is calibrated every three years [ref: NATA General Accreditation Guidance - General Equipment - Calibration and Checks, General Equipment Table (January 2018)].

E.3.4 Short-Term (Attended) Monitoring

Vibration monitoring shall be undertaken at the following locations:

- at the commencement of operation for each plant or activity on site, which has the potential to generate significant vibration levels, so to refine the indicative minimum working distances and provide a site-specific table of minimum working distances
- vibration sensitive locations determined to fall within the 'vibration screening criteria' established for each item of plant. Areas likely to require vibration monitoring are identified in the CNVIS reports prepared for the LW; and
- where vibration complaints or requests from relevant authorities, at the requested location and at any other relevant vibration receiver location with closest proximity to the construction activities;
- where required to determine ground-borne noise levels from tunnelling or excavation works.

Vibration monitoring shall be undertaken over the following period(s):

- for plant operating within the 'minimum working distances', during the commencement of use of each plant on site until site-specific minimum working distances are established; and
- for complaints or requests from relevant authorities, during the of use of requested plant until site-specific minimum working distances are established.

All attended short-term vibration monitoring shall be recorded over 15 minute sample intervals. The following minimum range of vibration metrics should be stored in memory and reported:

- Vibration Dose Values (VDVs)
- root-mean-square (rms) – maximums and statistical levels
- peak-particle velocity (ppv) – maximums and statistical levels.

In addition to measuring and reporting overall vibration, statistical vibration shall also be measured and reported in third-octave band frequencies from 1Hz to 250Hz.

Vibration monitoring shall be undertaken in accordance with the vibration measurement requirements stipulated in the reference standards and documents listed above. The following notes of importance are included here:

- vibration monitoring equipment shall be placed outside at the footings or foundations of the building of interest, closest to the vibrating plant;
- the surface should be solid and rigid to best represent the vibration entering the structure of the building under investigation;
- the vibration sensor or transducer shall not be mounted on loose tiles, loose gravel or other resilient surfaces;
- the vibration sensor or transducer shall be directly mounted to the vibrating surface using either bees wax or a magnetic mounting plate onto a steel washer, plate or bracket which shall be either fastened or glued to the surface of interest; and
- where a suitable mounting surface is unavailable, then a metal stake of at least 300mm in length shall be driven into solid ground adjacent to the building of interest, and the vibration sensor or transducer shall be mounted on that.

- Where vibration monitoring is undertaken to measure tactile vibration levels, vibration monitoring results shall be assessed and reported against the acceptable values of human exposure to vibration set out in Tables 2.2 and 2.4 of the EPA's Assessing Vibration – a technical guideline.

The following information shall be recorded:

- Date and time of measurements;
- Name of person undertaking the measurements
- Type and model number of instrumentation;
- Description of the time aspects of each measurement (i.e. sample times, measurement time intervals and time of day);
- Sketch map of area and measurement location;
- Measurement location details and number of measurements at each location;
- Operation and load conditions of the vibrating plant under investigation; and
- Possible vibration influences from other sources (e.g. domestic vibrations, other mechanical plant, traffic, etc.).

F.3.5 Long-Term (Unattended) Monitoring

Vibration monitoring shall be undertaken at vibration sensitive locations determined to fall within the 'minimum working distances' established for each item of plant during the commencement of use of each plant on site.

Vibration monitoring shall be undertaken over the following period(s):

- continuously whilst the vibrating plant is operational within the pre-determined 'minimum working distance' from the potentially affected building.

Vibration monitoring equipment shall be placed outside at the footings or foundations of the building of interest, closest to the vibrating plant.

The data is to be processed statistically and stored in memory. The minimum range of vibration metrics to be stored in memory for later retrieval is the following:

- vector-sum root-mean-square (rms) – maximums and statistical metrics; or
- vector-sum peak-particle velocity (ppv) – maximums and statistical metrics.

Vibration monitoring shall be undertaken in accordance with the vibration measurement requirements stipulated in the reference standards and documents listed above. The following notes of importance are included here:

- vibration monitoring equipment shall be placed outside at the footings or foundations of the building of interest, closest to the vibrating plant;
- the outside-to-inside vibration transfer function shall be measured, whenever practicable, to assess the potential for humane annoyance inside buildings;
- the surface should be solid and rigid to best represent the vibration entering the structure of the building under investigation;
- the vibration sensor or transducer shall not be mounted on loose tiles, loose gravel or other resilient surfaces;
- the vibration sensor or transducer shall be directly mounted to the vibrating surface using bees wax or a magnetic mounting plate onto a steel plate or bracket either fastened or glued to the surface of interest;
- where a suitable mounting surface is unavailable, then a metal stake of at least 300mm in length shall be driven into solid ground adjacent to the building of interest, and the vibration sensor or transducer shall be mounted on that.; and
- a flashing light alarm should be attached in a visible position from the construction work area. When vibration exceeds the set threshold, the light will flash notifying the operator that works in that area should cease immediately.

F.3.6 Real time (unattended) Monitoring

Real time (unattended) vibration monitoring should follow the same process as described in Section E.3.5 above.

In addition to the above, the vibration monitoring device must be fitted out with a modem to allow the data processor to monitoring data to a remote server. This allows the monitoring data to be downloaded stored to a networked PC or webserver. A secure website is required for data storage.

The statistical data can be processed in real time and displayed for review. A trigger could be set to warn of the potential for non-compliance by transmitting an email or SMS alert. This allows Systems Connect to respond to potential vibration issues before non-compliance occurs. Works should cease immediately until the source of non-compliance is identified and a compliant construction methodology is determined.

Appendix G: Consultation

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Stakeholder	Raised By	Date	Comment No.	Document reference	Topic	Stakeholder comment	Project team response	Amendment made, Y/N?	Section	Close Out
Inner West Council	Manoj Isac	11/12/2019	1		Night works	Proposed night works should be minimised, but it is recognised there will be some situations where this is unavoidable. In these situations, the reason for night works should be explained to affected parties. Adequate notice needs to be given to all residents and business operators by works to allow them sufficient time to plan for the consequences.	Comment Noted. For unavoidable works at night, SC are and will continue to do comprehensive notifications, which will detail the reason for the works and nature of the works. The Sydney Metro City & Southwest Out of Hours Work Strategy / Protocol (in the plan appendices) has a section on notifications.	N	NA	**Y**
Inner West Council	Manoj Isac	11/12/2019	2		Night works / Community notification	Wherever night works are proposed, enough additional notice should be given to affected to enable them to plan for the consequences, and a generous approach to mitigation be adopted, e.g. offer of alternative accommodation. Project workers to be encouraged of residents and business owners, e.g. toolbox talks, discourage workers from idling their vehicles or making other noise in residential streets, particularly in the early morning period.	Comment noted. Further to previous response on notifications. Appropriate mitigation measures are applied to works, based on assessment of the noise impacts prior to works. A range of mitigation measures are available (including offers of alternative accommodation), which are detailed in Section 7 of the plan, including standard and additional measures. The following requirement is included in the Out of Hours Work Procedure (in appendices): “Work crews to be toolboxed prior to start of OOHW to introduce and reinforce mitigation measures, work practices and expected behaviours.”	N	NA	**Y**
AA		9/12/2019	20	Section 1.8	Lessons Learnt	The plan states that it will be "reviewed regularly and amended as needed to ensure that it remains consistent with client and legal requirements and with project priorities, activities and personnel, taking into account factors including lessons learnt during delivery and operation". Have lessons learnt from TSE delivery and operations been captured and reflected in this plan?	Yes, plan has been based on CNVMP for TSE, incorporating lessons learnt. Renzo Tonin are specialist noise consultants on TSE scope of works and on LW scope of works therefore have knowledge of lessons learnt and have incorporated in this plan.	N	NA	**Y**
AA		9/12/2019	21	Section 2.2	EPL	The plan should be clear about whether an EPL is required.	Section 2.2 updated to include: "Details about the EPL strategy for LW are provided in Section 3.4 of the CEMP (SMCSWLWC-SYC-1NL-PM-PLN-000033). Relevant conditions of the Project’s License will be included in this CNVMP, once a License has been obtained."	Y	2.2	**Y**

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Stakeholder	Raised By	Date	Comment No.	Document reference	Topic	Stakeholder comment	Project team response	Amendment made, Y/N?	Section	Close Out
AA		9/12/2019	22	Section 4	Construction Activities	Section 4 and Table 6 do not provide sufficient detail to meet the requirement of CEMF 9.2(a), which requires that the plan provide "Details of construction activities and an indicative schedule for construction works, including the identification of key noise and/or vibration generating construction activities (based on representative construction scenarios) that have the potential to generate noise or vibration impacts".	(note: Table 6 is now Table 7) New Appendix C added including key noise and/or vibration generating construction activities. Details in this Appendix are based on indicative construction works and representative construction scenarios for modelling completed to date.	Y	Appendix C	**Y**
AA		9/12/2019	23	Section 4	Construction Activities	Table 6 lists construction activities for Portion 3 including tamping and OHW foundations: are these relevant to the tunnels?	(note: Table 6 is now Table 7) Removed reference to tamping and OHW foundations under tunnels section of the table.	Y	4.1.1	**Y**
AA		9/12/2019	24	Section 4.2	OOHW	Table 7 provides a generic list of circumstances under which OOH work may be required, but it does not list the specific 'activities that need to be undertaken outside of these hours as identified.' The whole of Section 4 is generic and fails to provide a clear indication of the extent of OOH works likely to be required.	Section 4.2 outlines the conditions/ structure/process by which OOHW may be undertaken for the Project. Detailed information would be provided in the CNVIS prepared for each LW site. Note: more detailed information regarding likely OOHW is provided in the new Appendix C.	Y	Appendix C	**Y**
AA		9/12/2019	25	Section 5.1	NMLs	Section 5.1 states that "The construction noise management levels are not the same for each worksite" but this is not accurate. Noise Management Levels (NMLs) were set in the EIS process and must be implemented under Condition A2. Conditions E37, E38, E41 and E42, on the other hand, set "limits"; these apply in addition to the NMLs.	Section 5.1 and 5.1.1 updated to remove this statement.	Y	5.1, 5.1.1	**Y**
AA		9/12/2019	26	Section 5.6 and 7.5	Op NV Objectives	What is the relevance of 'Operation Noise and Vibration Objectives' to the CNVMP?	Section 5.6 and 7.5 removed.	Y	5.6, 7.5 (deleted)	**Y**
AA		9/12/2019	27	Section 6.1	Land use survey	Does the land use survey for the Chatswood to Sydenham section include input and data from Sydney metro works to date (eg TSE, CSM, NCW, MP-ISD etc)?	Land Use Survey for C2S based on TSE. Area around Artarmon and Surry Hills BPS updated based on review and ground-truthing of EIS data. Land use categories updated as per current survey data.	Y	6.1.1 (Figure 3 updated)	**Y**
AA		9/12/2019	28	Section 6.3.1	CNVIS Docs	Section 6.3.1 is not clear about the anticipated number of CNVIS documents. Is it a) 1 for each portion plus for other LAUW works (total 4), or b) 1 for each bullet point (total approx 10)?	Key CNVISs have been identified. CNVISs will be progressively prepared as required as the design develops.	Y	6.3.1	**Y**

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Stakeholder	Raised By	Date	Comment No.	Document reference	Topic	Stakeholder comment	Project team response	Amendment made, Y/N?	Section	Close Out
AA		9/12/2019	29	Section 6.3.4	Incorrect Appendix Reference	Incorrect Appendix reference to SM OOHW Protocol.	References updated to Appendix D and E for Procedure and protocol respectively	Y	6.3.4	**Y**
AA		9/12/2019	30	Section 7.3	Highly Sensitive Receivers	7.3 states "Highly sensitive receivers in the vicinity of Line-wide Works areas will be identified in the relevant CNVIS". Has this not already been done for the Chatswood to Sydenham section during Sydney Metro works to date?	Highly sensitive receivers have been identified in the Land Use Survey (based on SM works completed to date and recent investigations completed for the Project. Highly sensitive receivers may be impacted dependent on the specific location of vibration generating plant and equipment within the works area. This level of detail is not appropriate in the CNVMP and would be addressed in detail in the CNVISs, and the impacted receivers identified.	N	NA	**Y**
AA		9/12/2019	31	Section 8.1.1	Baseline Monitoring	8.1.1 is inconsistent with earlier section of plan which states that baseline monitoring is required.	Section 6.2 edited to remove reference requiring additional noise monitoring	Y	6.2	**Y**
AA		9/12/2019	32	Section 8	TSE CNVMP	Some content in this draft plan appears to be based on the TSE CNVMP. This is a good template but there is some evidence that the content has not been updated to reflect the scope of LW works; for example, 8.1.6 proposes real time monitoring during the bulk excavation phase. 8.2.2 refers to excavation and tunnelling.	Noted. Text amended to remove references to TSE works.	Y	8.1.6, 8.2.2	**Y**
AA		9/12/2019	33	Section 8.5	Complaint Management Procedure	A procedure for complaint data management should be discussed and agreed with Sydney Metro.	Comment noted. A daily complaint summary is provided to the ER and Sydney Metro, which contains a column "Nature of Complaint" to classify complaint, e.g. noise, dust, etc. The Community Communications Strategy C2B (SMCSWLWC-SYC-1NL-CL-PLN-000027) includes complaint data management, requiring that all complaints will be recorded in Consultation Manager database.	N	NA	**Y**
AA		9/12/2019	34	Appendix A	Heritage Receivers	Has Table 21 (vibration monitoring at heritage receivers) been updated to reflect LW works? Note: it includes reference to 7 Elizabeth Street at Martin Place, which has been demolished.	Table updated	Y	Appendix A2	**Y**
AA		9/12/2019	35	Appendix B	Plant Access	Why does the site plan for "Northern Connection sheet 1 of 2" show "plant set up" in streets such as Hopetoun Avenue, which has no access to the rail corridor?	These sites have been approved for temporary access only, to facilitate plant delivery during possession works. There are temporary access points to the rail corridor in these sites.	N	NA	**Y**

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Stakeholder	Raised By	Date	Comment No.	Document reference	Topic	Stakeholder comment	Project team response	Amendment made, Y/N?	Section	Close Out
AA		9/12/2019	36	Appendix E	Monitoring Specifications	The monitoring specifications are comprehensive; are they necessary for the scope of LW works?	Noted. Agreed, specifications are extensive but prefer to keep in and not use than remove and require later.	N	NA	**Y**
AA		9/12/2019	37	Section 2.3	Road Noise Policy	Road Noise Policy listed twice, ECRTN superseded?	ECRTN referenced as this is referenced in ICNG, specifically in relation to sleep disturbance. Second listing of RNP removed.	Y	2.3	**Y**
AA		9/12/2019	38	Table 10	Performance spaces	Include performance spaces (such as theatres).	(note: Table 10 is now table 11) Performance space (drama theatre) added to table.	Y	5.1.2 Table 11	**Y**
AA		9/12/2019	39	Table 11	Day time NML	Table 11 includes daytime NML for ground borne noise, which is appropriate. But the text above is not correct because this is not specified in ICNG.	Noted. Text modified to reference SM CNVS for day GBNML. (note: Table 11 is now table 12)	Y	5.2.2	**Y**
Willoughby Council*	Gordon Farrelly	17/12/2019	N/A	NA	NA	25/11/2019 - Initial submission of CNVMP to Willoughby Council. 2/12/2019 - AT made follow up call to GF. No response, voicemail indicated that GF was on leave until tomorrow (3/12/2019). Message was left. 3/12/2019 - AT made another follow up call to GF. No response, message was left. 9/12/2019 - MB called GF to discuss requirement of project to seek consultation on management sub-plans. 10/12/2019 - MB emailed GF confirming discussion from yesterday, reminding GF that Systems Connect is targeting feedback from all sub-plans to be received by COB 17/12/2019. 10/12/2019 - Gordon passed on plans to others in council that he considers best suited to review and provide feedback on the management plans. He advised these council members that comments are to be sent directly to MB. 17/12/2019 - No response to date. 12/02/2020 - MB has sent follow up email to GF from Willoughby Council.	No response as of 12/02/2019.	NA	NA	**NA**
Canterbury Bankstown City Council*	Alvin Fung	4/12/2019	NA	NA	NA	We have reviewed and have no further comments on the following plans: 1. Construction Nosie and Vibration Management Plan (CNVMP)	Noted.	NA	NA	**NA**

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Stakeholder	Raised By	Date	Comment No.	Document reference	Topic	Stakeholder comment	Project team response	Amendment made, Y/N?	Section	Close Out
						2. Construction Soil and Water Management Plan (SW&GMP) 3. Construction Waste Spoil and Recycling Management Plan I will come back if we have feedback on the heritage plan.				
City of Sydney*	Elise Webster	17/12/2019	NA	NA	NA	19/11/2019 - Initial submission of CNVMP to City of Sydney Council. 2/12/2019 - Elise expressed that if SC does not hear from CoS by due date, then assume that no comments have been made. No response received as of 17/12/2019. 17/12/2019 - No response received to date. 12/02/2020 - MB has sent a follow up email to EW from City of Sydney Council.	No response as of 12/02/2020.	NA	NA	**NA**
North Sydney Council*	Gavin McConnell	17/12/2019	43	NA	Mitigation Measures	6/11/2019 - Presentation held by Mat Billings and Helena Orel for North Sydney Council to provide information on the Project and management plans. 19/11/2019 - Initial submission of CNVMP to North Sydney Council. 2/12/2019 - Follow up call made by AT. GM believes that there will be minimal impacts, thus they aren't too bothered. They will provide feedback in a couple days. 17/12/2019 - GM responded to initial submission noting that there are no identified objections to the proposed plans and mitigation measures. GM advised that there should be an ongoing dialogue to convey concerns raised and to initiate measures to address concerns as warranted. It was also noted that any surface works, traffic impacts or other discernible impacts should be carried out in a manner that minimises such impacts. 17/12/2019 - MB responded to GM to note and address comments. 17/12/2019 - GM accepted MB response.	Noted. To ensure ongoing dialogue we propose scheduling of regular meetings, commencing when works in North Sydney are due to start. This was communicated during presentation meeting with North Sydney Council on 6/11/2019.	NA	NA	**Y**

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Stakeholder	Raised By	Date	Comment No.	Document reference	Topic	Stakeholder comment	Project team response	Amendment made, Y/N?	Section	Close Out
EPA**	Claire Miles	23/12/2019	NA	NA	NA	CNVMP was issued to EPA on 19/11/2019. Note: Did not attend Project Regulatory Stakeholder briefing held 06/11/19. Follow-up email sent on 18/12/2019. 23/12/2019 - CM from EPA responded via email. CM advised that it is not EPA policy to approve or endorse management plans. The EPA's role is to set environmental objectives/ requirements for environmental management, rather than being directly involved in the development of strategies to achieve those objectives/requirements. You may however wish to submit the NVMP and SWGM Sub Plan, or parts thereof, as supporting information for any future applications for an Environment Protection Licence (EPL) that may be required.	Noted.	NA	NA	**NA**
AA	Dave Anderson	13/02/2020	48	Section 8.2.2	Vibration Monitoring	Section 8.2.2 lists locations that may not require vibration monitoring but omits others that may require it (e.g. trenching works for bulk power). I understand that this will be addressed by a minor modification to the CNVMP / CMP if required and I recognise that the CNVISs will define the actual monitoring locations.	Section 8.2.2 has been updated to revise unattended vibration monitoring locations as advised by Renzo Tonin: Remove "Crows Nest, Victoria Cross, Blues Point, Barangaroo, Martin Place, Pitt Street Marrickville, Newtown, St Peters, Sydenham and Tempe (consistent with SSI 7400 Planning Approval Condition E38)" replace with "Northern Connection worksite and the Bulk Power Supply route at Artarmon, Surry Hills and Campsie (requirement and location will be confirmed in the CNVIS)." Dave Anderson has confirmed by email on 20/02/2020 that his comment has been addressed.	Y	Section 8.2.2	**Y**

* Council consultation that occurred during 2019, but was not included in Rev B of this Comment Register.

** Consultation from EPA occurred between submission to Sydney Metro / ER and DPE submission.