ACOUSTICS AND AIR

VICTORIA CROSS INTEGRATED STATION DEVELOPMENT

CONSTRUCTION NOISE & VIBRATION MANAGEMENT PLAN

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VERSION E

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PREPARED FOR

LENDLEASE
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GLOSSARY OF ACOUSTIC TERMS

Most environments are affected by environmental noise which continuously varies, largely as a result of road traffic. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are demonstrated in the graph below, are here defined.

Maximum Noise Level (L_{Amax}) – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

L_{A1} – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

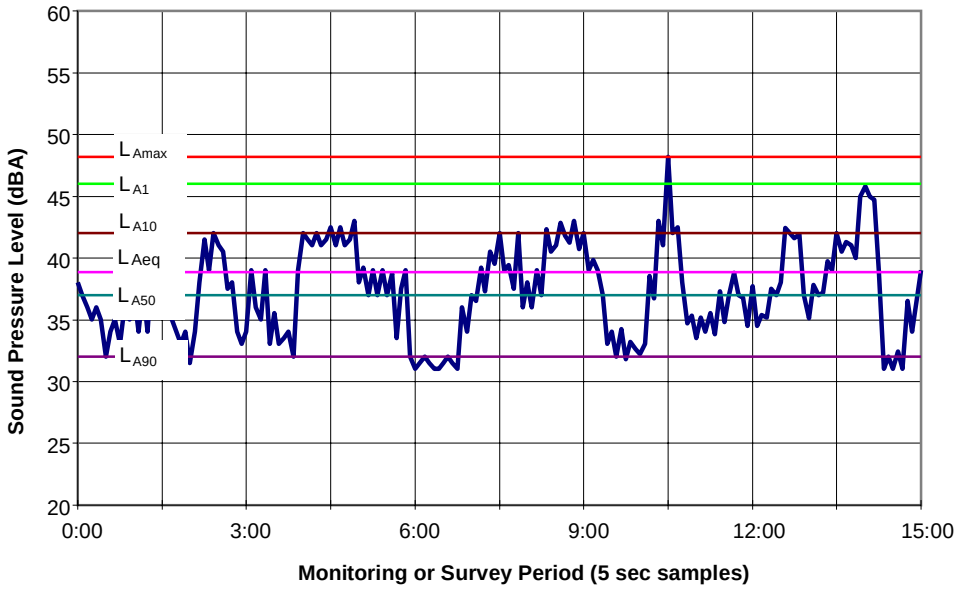
L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

ABL – The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening and night time) for each day. It is determined by calculating the 10th percentile (lowest 10th percent) background level (L_{A90}) for each period.

RBL – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period – daytime, evening and night time.

Typical Graph of Sound Pressure Level vs Time



1 INTRODUCTION

Wilkinson Murray Pty Limited (WM) has been engaged by Lendlease (LL) to prepare Construction Noise and Vibration Impact Statements and a Management Plan for the Victoria Cross Integrated Station Development (ISD), which forms part of the Sydney Metro City & Southwest – Chatswood to Sydenham project.

Primarily, this document has been prepared to fulfill the requirements of:

- the Critical State Significant Infrastructure (CSSI) 7400 Approval Condition C3(a) that requires a Construction Noise and Vibration Management Plan (CNVMP), Condition C9(a) that requires a Construction Noise and Vibration Monitoring Program and Condition E33 that requires preparation of Construction Noise and Vibration Impact Statements.
- the State Significant Development (SSD) 10294 Approval Condition B45(a) that requires a Construction Noise and Vibration Management Plan (CNVMP).

This CNVMP forms part of the Construction Environmental Management Plan (CEMP), or equivalent document, in accordance with the Sydney Metro Construction Environmental Management Framework (CEMF). The CEMP and CEMP sub-plans, as approved by the Secretary, including any minor amendments approved by the Environmental Representative (ER) (or the Independent Acoustic Advisor (AA) in regard to the Construction Noise and Vibration Plan), must be implemented for the duration of station construction.

The Construction Monitoring Programs, as approved by the Secretary including any minor amendments approved by the ER (or AA in regard to the Noise and Vibration Construction Monitoring Program), 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.

The included assessments have been undertaken in accordance with:

- the provisions of the *NSW Interim Construction Noise Guideline* – (ICNG),
- the *Sydney Metro City and Southwest Construction Noise & Vibration Strategy (Ver 0.4, 9 August 2017)* – (CNVS);
- relevant Conditions of Approval as set out in the Department of Planning and Environment's *Critical State Significant Infrastructure Sydney Metro City & Southwest Chatswood to Sydenham Conditions of Approval – SSI 15_7400*, dated 2017, including modifications up to *CSSI 7400 MOD8 – Administrative Changes,* determined 25 November 2020; and
- relevant Conditions of Approval as set out in the Department of Planning and Environment's *State Significant Development Key Sites Conditions of Approval – SSD 10294*, dated 6 July 2020.

The Victoria Cross ISD is not subject to an Environment Protection Licence (EPL).

ISD construction works generally occur within standard construction hours, however, the planning approvals allow for alternate working hours for the works to be completed in an efficient and timely manner. This document details Noise Management Level (NML) exceedances and mitigation outcomes for all periods to illustrate the potential impacts for all periods, to support assessment of alternate working hours that may arise. Ultimately, the extent of works undertaken outside of standard hours is dependent on relevant approvals and be subject to specific negotiated respite measures, as permissible under:

- the CSSI Approval, particularly within the provisions of conditions E37, E44, E47 and E48; and

- the SSD approval, conditions D3-D7 and D10 (with proposed modifications to conditions D5 and D10).

The main objectives of this plan are to minimise unreasonable noise and vibration impacts on residents and businesses, and to avoid structural damage to buildings or heritage items as a result of construction vibration.

This plan aims to support active community communication and maintain positive, cooperative relationships with schools, local residents and building owners. It is noted that ongoing community engagement and management of such relationships is primarily managed via the Victoria Cross ISD Community Communications Strategy.

This plan was initially developed in consultation with Sydney Metro, the AA, ER, EPA and North Sydney Council and submitted to the Secretary one month before commencement of station construction. The updated plan will be submitted to the Secretary prior to commencement of OSD construction.

The plan continues to be reviewed/endorsed by the Sydney Metro, the AA and ER in relation to the station CSSI component of works.

2 SITE DESCRIPTION

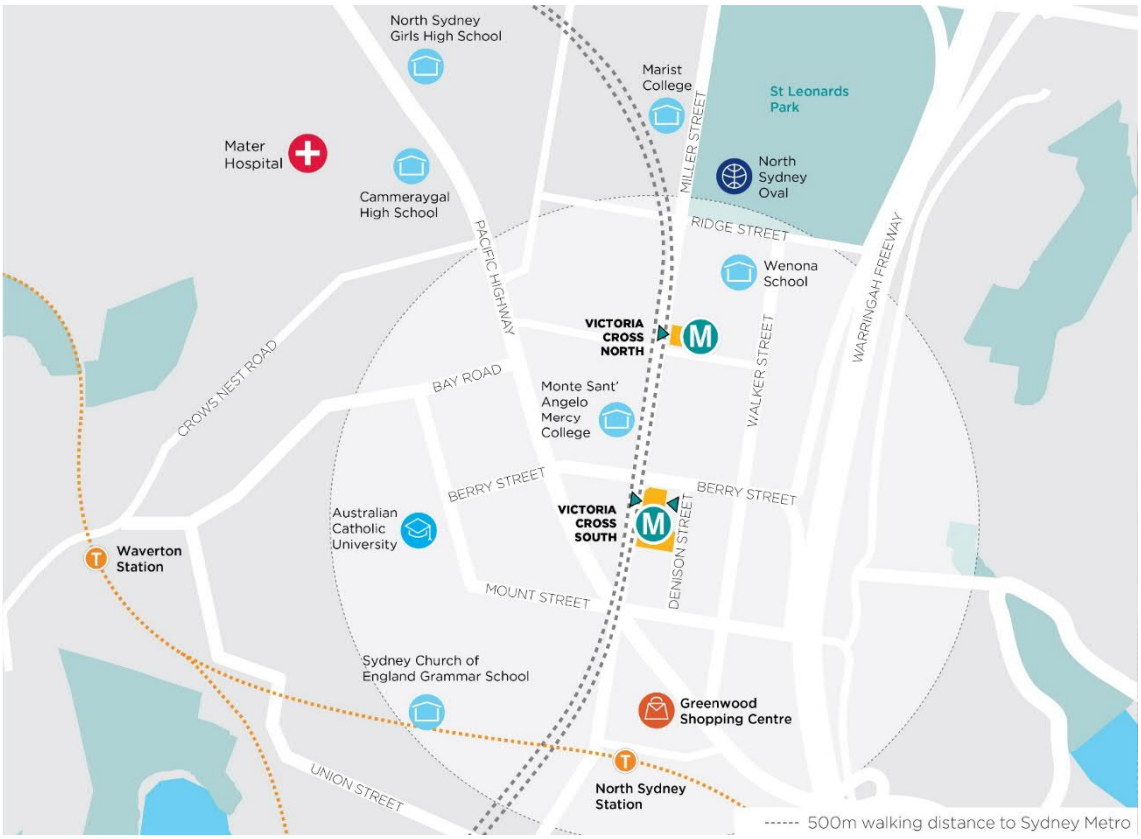
The Victoria Cross Station will be located in the heart of North Sydney's business district, with two station entrance boxes - Victoria Cross North (VCN) and Victoria Cross South (VCS) connected by a cavern platform directly beneath Miller Street.

The VCN site will provide station access via the northern services building on McLaren Street whilst the VCS site will provide access through a pedestrian plaza opening to Miller, Denison and Berry Streets.

The VCS site will additionally include a 42 storey, 168m tall commercial office tower (Over Station Development – OSD) above the station.

A Site Location Plan is shown in Figure 2-1.

Figure 2-1 Site Location Plan



3 INTEGRATED STATION DEVELOPMENT

On 9 January 2017, the Minister for Planning approved the Sydney Metro City & Southwest - Chatswood to Sydenham project as a Critical State Significant Infrastructure project (SSI 15_7400) (CSSI Approval). The CSSI Approval concerns all works required to construct the Sydney Metro Victoria Cross Integrated Station Development (VCISD), including construction of below and above ground improvements with the metro station structure for appropriate integration with the Over Station Development (OSD).

In addition, CSSI 15_7400 Modification 1 was approved on 18 October 2017 to include relocation of the Victoria Cross northern entrance and services building from 194-196A Miller Street to a new location at 50 McLaren Street and provide a new lift only station access at this location.

The Victoria Cross development comprises the following main components:

- A new underground station located at Victoria Cross (VCISD), approved under CSSI 15_7400.
- An Over-Station Development (OSD) tower, integrated into the station. The Sydney Metro Victoria Cross OSD - Stage 1 concept approval was granted on 18 December 2018, under SSD 8874. The Stage 2 detailed design approval was granted on 6 July 2020 under SSD 10294.

3.1 Planning Relationship between Victoria Cross Station & OSD

While Victoria Cross Station and the OSD form an integrated development, the planning pathways defined under the Environmental Planning & Assessment Act 1979 require separate approval for each component of the development. In this regard, the approved station works (CSSI Approval) are subject to the provisions of Part 5.1 of the EP&A Act (now referred to as Division 5.2) and the OSD component is subject to the provisions of Part 4 of the EP&A Act.

For clarity, the approved station works under the CSSI Approval included the construction of below and above ground structures necessary for delivering the station and also enabling construction of the integrated OSD. This includes but is not limited to:

- demolition of existing development (completed by others, not assessed under this plan)
- excavation (completed by others, not assessed under this plan)
- integrated station and OSD structure (including concourse and platforms)
- lobbies & retail spaces within the station building
- public domain improvements and pedestrian through-site link
- access arrangements including vertical transport such as escalators and lifts
- space provisioning and services necessary to enable the future development of the OSD, such as lift cores, plant rooms, access, parking, retail, utilities connections and building services.

The vertical extent of the station works above ground level is defined by the ‘transfer level’, above which would sit the OSD. This delineation is illustrated in Figure 3-1.

All associated public domain improvement works around the site would be delivered as part of the CSSI Approval.

Figure 3-1 Schematic 3D View of the ISD Showing OSD & Station Components

Note: Northern (McLaren Street) station entrance shown on left, Southern (Berry Street) entrance shown on right.

An artist's impression of Victoria Cross Station (Southern Site), is shown in Figure 3-2.

Figure 3-2 Artist's Impression of Victoria Cross Station (Southern Site)

3.2 Construction Noise & Vibration Assessment Approach

Considering the differing approval pathways for the Station and the OSD development, the provisions of the Metro CNVS apply to the Station, whereas the stipulations of the *ICNG* apply to the OSD.

However, as the staging of the Victoria Cross works (discussed in Section 5) show, the Station and OSD works to some degree would be undertaken concurrently.

On this basis, for the purposes of this assessment, the provisions of the Metro CNVS have been applied to both the Station and OSD developments.

It is noted that a key difference between the CNVS and *ICNG* relates to the definition of out of hours (OOH) works timeframes.

The *ICNG* defines standard hours as Monday to Friday 7.00am to 6.00pm; and Saturday 8.00am to 1.00pm. Outside of the identified standard hours timeframes, the *ICNG* considers all works, simply as 'Out of Hours'.

The Metro CNVS, provides additional breakdown of the 'Out of Hours' timeframes, with the adoption of the OOH Period 1 and OOH Period 2 timeframes, according to the generally accepted noise sensitivities within these Periods.

The Metro CNVS defines construction hours as follows:

Standard Hours:

- Monday to Friday 7.00am - 6.00pm; and
- Saturday 8.00am - 6.00pm.

OOH Period 1:

- Monday to Friday 6.00pm - 10.00pm;
- Saturday 6.00pm - 10.00pm; and
- Sunday/Public Holiday 8.00am - 6.00pm.

OOH Period 2:

- Monday to Friday 10.00pm - 7.00am;
- Saturday 10.00pm - 8.00am; and
- Sunday/Public Holiday 6.00pm - 7.00am.

With respect to the specification of mitigation, in the case of notable exceedances of the noise and/or vibration management levels the Metro CNVS provides more detailed prescriptive mitigation measures, beyond those stipulated by the *ICNG*. In this regard, it is noted that in any case, it is standard practice to defer to the guidance of the CNVS where substantial exceedances of the *ICNG* criteria are determined, so the final mitigation outcomes would be expected to be substantially the same, considering the *ICNG* or CNVS approaches.

Construction works generally occur within standard construction hours, however, the CSSI planning approval allows for station works to be completed in a timely and efficient manner with alternate working hours able to be conducted, particularly within the provisions of conditions E37, E44, E47 and E48.

Accordingly, within the provisions of the approval LL proposes to undertake various works outside of standard hours. Notably, extended hours will likely be sought under CSSI Approval Conditions:

- E37 which allows for works up to 8.00pm;

- E44 which includes provision for deliveries required to take place outside standard hours as directed by police or other authority, emergency works, low impact works, community negotiated agreements and works approved via the Sydney Metro Out of Hours Works Protocol;
- E47 which includes provision of Sydney Metro's Out of Hours Work Protocol; and
- E48 that includes conditional approval for 24-hour deliveries and station fit-out.

This document details NML exceedances and mitigation outcomes for all periods to illustrate the potential impacts for all periods to facilitate any future out of hours works applications. A morning shoulder period, for hours between 5.00am to 7.00am is also included.

All VCISD works (including utility works associated with the project where undertaken by third parties) are to be coordinated to provide the required respite periods identified in accordance with the CSSI planning approval.

At no time can noise generated by construction exceed the National Standard for occupational noise exposure of $L_{Aeq,8hr}$ 85dBA for any employee working at a location near the project.

4 RELEVANT CONDITIONS OF APPROVAL

4.1 CSSI Approval Conditions

CSSI 7400 Approval Conditions E28 to E56 specifically concern noise and vibration. These are set out in a table in Appendix D, along with supplementary notes regarding how each condition has been addressed within this document, where relevant.

4.2 SSD Approval Conditions

SSD 10294 Approval Conditions D3 to D7, and D10 to D15, specifically concern noise and vibration. These are set out in a table in Appendix D, along with supplementary notes regarding how each condition has been addressed within this document, where relevant.

Note that Conditions D5 and D10 are subject to modification to align potential out of hours works with the CSSI approval.

5 DESCRIPTION OF CONSTRUCTION WORKS

The Project involves the staged construction of the VCN and VCS station sites and the 42 storey OSD development. Staging Plans provided by LL outlining the works are included in Appendix A. These form the basis of this assessment and allow for an accurate cumulative impact across the Station and OSD works. Additional staging plans related to the latter stages of the OSD are included in the OSD CNVIS in Appendix F.

5.1 Works Schedule

The staging plans identify nine discreet stages for the southern site and seven discreet stages for the northern site, with works on both sites occurring together. For the purposes of assessment, construction noise predictions have been undertaken for each of the identified stages, as summarised in Tables 5-1 and 5-2.

Table 5-1 Construction Stages – Victoria Cross North (VCN)

Stage	Dates	Description
Stage 1	Feb 2021 – Mar 2021	Site Establishment - Work Zones Established - Hoardings Installed
Stage 2	Mar 2021 – May 2021	Detailed Excavation & Footings - Loadout of Excavation Spoil - Detailed Excavation in Shaft
Stage 3	May 2021 – June 2022	Superstructure B11 – L00 - Formwork Systems Established - Concrete Structure Works Commence
Stage 4	June 2022 – Aug 2022	Above Ground Structure L00 – L04 Roof - Above Ground Concrete Structure Commence - Perimeter Scaffold/Class B Hoardings Installed
Stage 5	Aug 2022 – Sept 2022	Façade & Internal Finishes - External Façade Works using Perimeter Scaffold
Stage 6	Sept 2022 – Nov 2022	Public Realm Works - Scaffold and hoarding removed - Tower Crane Removed
Stage 7	Nov 2022 – Aug 2023	Regrading Adjacent Property - Demobilisation of Site Amenities - Removal of Concrete Hardstand & Roadway

Table 5-2 Construction Stages – Victoria Cross South (VCS)

Stage	Dates	Description
Stage 1	Feb 2021 – Apr 2021	Site Establishment - Tower Crane Installed - Work Zone Established - Detailed Excavation and Loadout Commences - Concrete Footings Commence
Stage 2	May 2021 – Jul 2021	Stormwater / Superstructure - Station Concrete Frame / Superstructure Commences
Stage 3	Aug 2021 – Oct 2021	Concrete Frame Below Ground Level - Station Concrete Frame Continues Below Ground - Denison Street Stormwater Works
Stage 4	Nov 2021 – Oct 2022	- Concrete Frame Below Ground Level - Station Fitout Below Ground - Station Concrete Frame Above Ground
Stage 5	Oct 2022 – Jan 2023	- Station Fitout Continues - Station Concrete Frame Above Ground Continues - Station Façade Installation Commences - OSD Concrete Frame Commences
Stage 6	Feb 2023 – Apr 2023	- Station Concrete Frame Infills - Station Fitout Continues - Station Façade Installation Continues - Miller Street Stormwater Works Commence - OSD Concrete Frame Continues - OSD Façade & Finishes Commence
Stage 7	May 2023 – May 2024	Station Handed to Metro for Commissioning - OSD Concrete Frame Completed - OSD Façade & Finishes Completed
Stage 8	June 2024 – Nov 2024	Station Open for Operation - OSD Finishes & Commissioning - Public Domain Works Commenced
Stage 9	November 2024	Works Completed

Noting that the works across both sites coincide, the combined noise levels for the southern and northern sites have been considered, with cumulative construction noise levels for Scenarios A to I predicted, as identified in Table 5-3.

It is noted that the northern site plans show some overlap between the stages. In these cases, the northern site stage with the higher noise emission has been combined with the corresponding southern site's noise emission to determine the cumulative noise level.

Table 5-3 Noise Modelling Scenarios

SCENARIO	COINCIDING STAGES	DATE	SOUTHERN SITE STAGES						NORTHERN SITE STAGES					
		Jan-21												
A	VCS1 / VCN1	Feb-21	STAGE 1						STAGE 1					
		Mar-21								STAGE 2				
B	VCS1 / VCN2 / VCN3	Apr-21												
		May-21		STAGE 2							STAGE 3			
		Jun-21												
		Jul-21												
		Aug-21			STAGE 3									
C	VCS3 / VCN3 / VCN4	Sep-21												
		Oct-21												
		Nov-21				STAGE 4								
		Dec-21												
		Jan-22												
D	VCS4 / VCN4 / VCN5	Feb-22												
		Mar-22												
		Apr-22												
		May-22												
		Jun-22										STAGE 4		
E	VCS5 / VCN5 / VCN6	Jul-22												
		Aug-22											STAGE 5	
		Sep-22												STAGE 6
		Oct-22					STAGE 5							
F	VCS6 / VCN6 / VCN7	Nov-22												
		Dec-22												
		Jan-23												
		Feb-23						STAGE 6						
		Mar-23												
		Apr-23												
G	VCS7 / VCN7	May-23							STAGE 7					
		Jun-23												
		Jul-23												
		Aug-23												
		Sep-23												
		Oct-23												
H	VCS7	Nov-23												
		Dec-23												
		Jan-24												
		Feb-24												
		Mar-24												
		Apr-24												
		May-24												
		Jun-24								STAGE 8				
I	VCS8	Jul-24												
		Aug-24												
		Sep-24												
		Oct-24												
		Nov-24									STAGE 9			

5.2 Construction Hours

Works would predominantly be completed within standard hours, with some extensions as permissible under the CSSI Approval.

The construction hours for the Project are defined by the CSSI and SSD planning approvals. The standard construction hours of work are defined in CSSI Condition E36 and SSD Conditions D3-D5 and summarised in Table 8.3.

Works may be carried out outside standard hours under CSSI conditions E37, E38, E41, E42, E44, E46 and E48, or SSD condition D5. Where works are proposed to be undertaken outside of the standard hours, specific respites and management measures would be considered and developed for those works as required.

5.3 Out of Hours Works

The following conditions allow for construction work to be undertaken outside standard construction hours, under defined circumstances within the CSSI approval:

- Out of Hours Works (OOHW) under conditions E37, E38, E41, E42.
- Variation to standard construction hours under condition E44.
- Emergency construction works under condition E45.
- OOHW rock breaking and other particularly annoying activities under condition E46.

All out of hours works (except in emergency situations) will be managed under the Sydney Metro Out of Hours Works Protocol (Reference Document: SM ES-PW-317) as required under CSSI condition E47, which applies to out of hours work not subject to an EPL.

In accordance with the Sydney Metro Out of Hours Work Protocol, an out of hours application will be

submitted to Sydney Metro, the independent Acoustic Advisor and independent Environmental Representative for relevant endorsements and approval when out of hours works are planned under the CSSI approval.

The Community Communication Strategy will also support Lendlease's application for undertaking out of hours work. It will detail how the community will be notified in advance of planned activities, kept informed of works progress and how potential noise impacts will be managed.

Rock breaking and other particularly annoying activities for station shaft or cut and cover stations is not permitted outside of standard construction hours, except as outlined below;

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 approved through an Out of Hours Work Protocol developed in accordance with Condition E47; or

c) construction that causes:

   i. $L_{Aeq,15\ min}$ noise levels no more than 5 dB above the rating background level at any residence in accordance with the Interim Construction Noise Guideline (DECC, 2009); and

   ii. noise levels 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 levels, as measured at the most affected residence that do not exceed the acceptable values of human exposure, as specified in Table 2.2 of Assessing Vibration: a technical guideline (DEC, 2006); and

   iv. intermittent vibration values measured at the most affected residence that are no more than those for human exposure to vibration, specified in Table 2.4 of Assessing Vibration: a technical guideline (DEC, 2006).

5.4 Out of Hours Deliveries

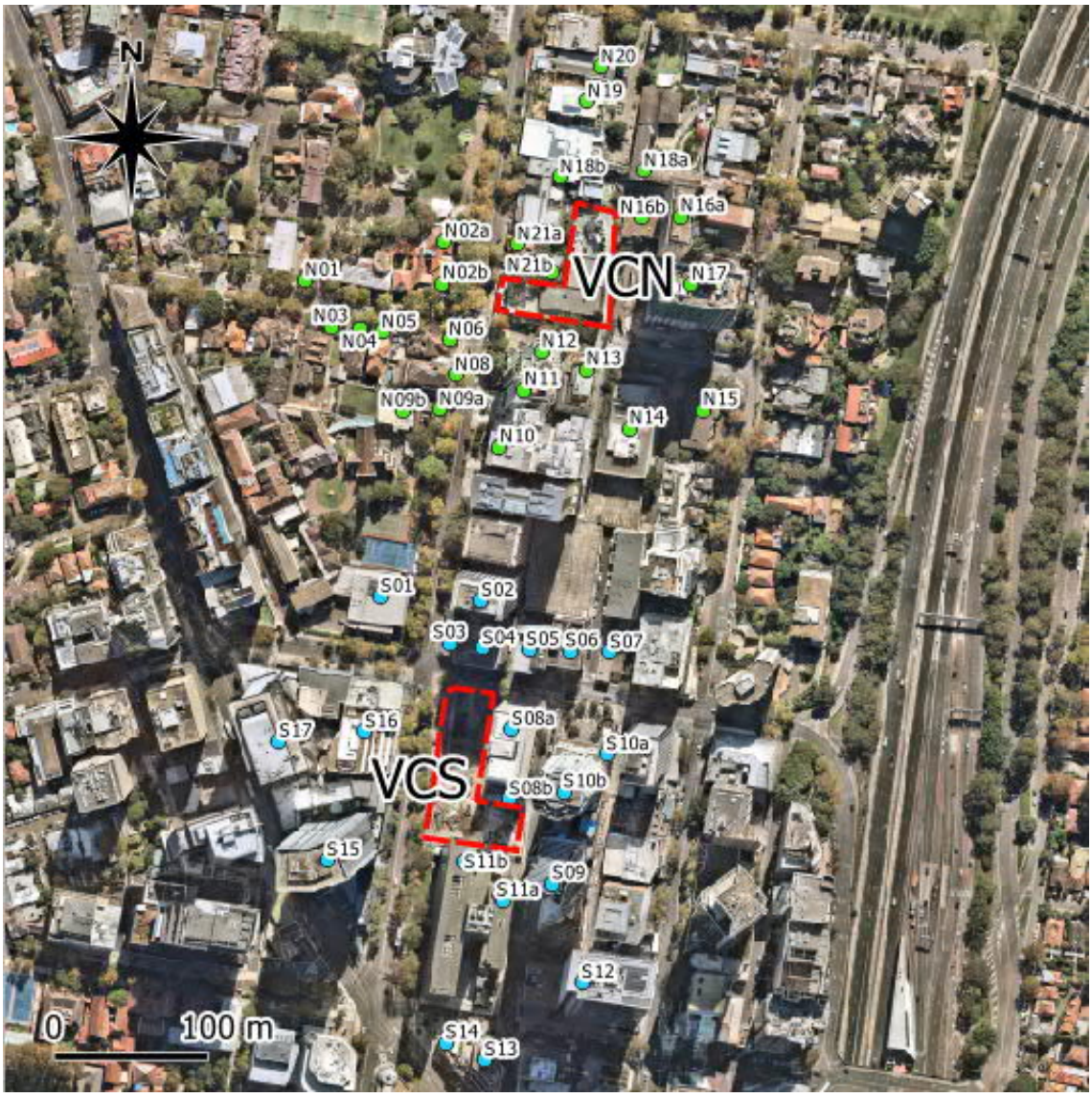
Delivery of most plant and equipment to the worksite will be undertaken during standard construction hours. However, during the various stages of construction works, there will be instances where oversized deliveries are necessary. Oversized movements can cause disruptions to the existing traffic and can be a potential hazard for road users. Therefore, there is a requirement for these 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. These deliveries are permitted under CSSI condition E44(a).

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 movements and where required the issuing of a Road Occupancy Licence (ROL).

6 SENSITIVE RECEIVERS

Figure 6-1 shows the sensitive receivers surrounding the VCN and VCS sites considered by this assessment.

Figure 6-1 Sensitive Receivers



7 EXISTING NOISE ENVIRONMENT

Table 7-1 sets out the existing ambient and background noise levels considered by this assessment.

The levels for the Day, Evening and Night periods are consistent with the survey results identified by the Victoria Cross CSSI EIS.

In the absence of EIS ambient noise data and to support any future proposed works within the 5.00am to 7.00am timeframe, for the purposes of this assessment, the background and ambient noise levels for this period are taken as the arithmetic average of the Night and Day levels. This approach is consistent with the EPA's guideline document - NSW Industrial Noise Policy (now superseded) which considers the 5.00am to 7.00am period as a shoulder period. Furthermore, this approach is considered conservative for this location given that this time period includes a high degree of traffic noise.

The Rating Background Noise Levels (RBLs) shown have been considered in determining the construction noise criteria, as discussed in Section 8.

Table 7-1 Ambient Noise Survey – Victoria Cross ISD – EIS Technical Paper 2

Location	Day		Evening		Night		Morning Shoulder	
	RBL (L_{A90})	Ambient (L_{Aeq})	RBL (L_{A90})	Ambient (L_{Aeq})	RBL (L_{A90})	Ambient (L_{Aeq})	RBL (L_{A90})	Ambient (L_{Aeq})
VCS (81 Berry Street)	65	68	63	65	52	62	59	65
VCN (237 Miller Street)	65	74	57	71	51	67	58	71

Note: Monitoring locations identified by the EIS as Locations B16 and B18; Morning Shoulder Period is 5.00am to 7.00am, Mon-Sat, not including public holidays.

8 AIRBORNE CONSTRUCTION NOISE

8.1 Airborne Construction Noise Criteria

8.1.1 NSW *Interim Construction Noise Guideline* (ICNG)

The CNVS notes that Construction Noise Management Levels (NMLs) for all Sydney Metro projects should be determined in accordance with the procedures nominated in the DECCW's "*Interim Construction Noise Guideline*" dated July 2009 (ICNG).

The noise criteria set out in the *ICNG* have been considered in the assessment of potential impacts from the project works. Table 8-1 summarises the construction noise criteria recommended by the *ICNG* for residential receivers and Table 8-2 summarises the criteria for non-residential receivers. Table 8-2 additionally includes the construction noise criteria for relevant special use receivers (other sensitive land uses) not identified by the *ICNG*.

Table 8-1 *ICNG* Airborne Construction Noise Criteria – Noise at Residences[1]

Time of Day	Management Level $L_{Aeq,15min}$	How to Apply
Recommended Standard Hours: Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays or Public Holidays	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq,15min}$ is greater than the noise affected level, the proponent would apply all feasible and reasonable work practices to minimise noise. The proponent would 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 75 dBA	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 proponent would consider very carefully if there is any other feasible and reasonable way to reduce noise to below this level. If no quieter work method is feasible and reasonable, and the works proceed, the proponent would communicate with the impacted residents by clearly explaining the duration and noise level of the works, and by describing any respite periods that will be provided.
Outside recommended standard hours	Noise affected RBL + 5 dB	A strong justification would typically be required for works outside the recommended standard hours. The proponent would 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 5 dBA above the noise affected level, the proponent would negotiate with the community. For guidance on negotiating agreements see Section 7.2.2 of the *ICNG*

Note 1: Adopted from the *ICNG*.
Note 2: Noise levels apply at the property boundary that is most exposed to construction noise (or receiver building façade that is most exposed to construction noise, noting that noise levels may be higher at upper floors of the noise affected receiver buildings). If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise affected point within 30 m of the residence.

Table 8-2 Airborne Construction Noise Criteria – Other Sensitive Land Uses

Land Use	Management Level $L_{Aeq, 15min}$ (applies when properties are being used)	Reference
Classrooms at schools and other educational institutions	Internal noise level: 45 dBA[1]	*ICNG*[7]
Hospital wards and operating theatres	Internal noise level: 45 dBA [2]	*ICNG*[7]
Places of worship	Internal noise level: 45 dBA [3]	*ICNG*[7]
Active recreation areas	External noise level: 65 dBA	*ICNG*[7]
Passive recreation areas	External noise level: 60 dBA	*ICNG*[7]
Commercial premises (offices, etc)	External noise level: 70 dBA	*ICNG*[7]
Industrial premises	External noise level: 75 dBA	*ICNG*[7]
Hotels - Sleeping Areas (Hotels near major roads)	Internal noise level: 40 dBA [4]	AS2107[8]
Childcare Centres (Sleeping areas)	Internal noise level: 40 dBA [5]	AAAC[9]
Recording Studios	Internal noise level: 25 dBA [6]	AS2107[8]

Notes: 1, 2, 3: External Noise Management Levels (NML) of $L_{Aeq,15min}$ 55 dBA are considered by this assessment, assuming 10dB attenuation achieved by façades with open window(s);
4, 5: External Noise Management Levels (NML) of $L_{Aeq,15min}$ 60 dBA are considered by this assessment, assuming 20 dB attenuation achieved by façades with closed/fixed window(s);
6: External Noise Management Levels (NML) of $L_{Aeq,15min}$ 55 dBA are considered by this assessment, assuming 30 dB attenuation achieved by façades with closed/fixed window(s);
7: Management Levels specified by Interim Construction Noise Guideline;
8: Management Levels specified by Australian Standard 2107;
9: Management Level specified by Australian Acoustical Consultants (AAAC) Technical Guideline on Child Care Centre Noise Assessments.

As discussed in Section 3.2, the out of hours periods identified by the Sydney Metro City and Southwest Construction Noise & Vibration Strategy have been considered. These are shown in Table 8-3, with the resultant project specific NMLs set out in Table 8-4.

Table 8-3 Sydney Metro City & Southwest CNVS Construction Hours

Day	12am	1am	2am	3am	4am	5am	6am	7am	8am	9am	10am	11am	12pm	1pm	2pm	3pm	4pm	5pm	6pm	7pm	8pm	9pm	10pm	11pm
Monday																								
Tuesday																								
Wednesday			OOHW Period 2								Standard Hours									OOHW Period 1				
Thursday																								
Friday																								
Saturday																								
Sunday or Public Holiday											OOH Period 1									OOHW Period 2				

Table 8-4 Airborne Noise Management Levels

Location	Standard Hours (Day)		OOHW Period 1 (Day)		OOHW Period 1 (Evening)		OOHW Period 2 (Night)		Morning Shoulder (5.00am–7.00am)	
	RBL	NML	RBL	NML	RBL	NML	RBL	NML	RBL	NML
VCS Residential	65	75	65	70	63	68	52	57	59	64
VCN Residential	65	75	65	70	57	62	51	56	58	63
School (Classrooms)	n/a	55	n/a	55	n/a	55	n/a	55	n/a	55
Commercial (Offices)	n/a	70	n/a	70	n/a	70	n/a	70	n/a	70
Hotels (Sleeping Areas)	n/a	60	n/a	60	n/a	60	n/a	60	n/a	60
Childcare Centre (Sleeping areas)	n/a	60	n/a	60	n/a	60	n/a	60	n/a	60
Recording Studio	n/a	55	n/a	55	n/a	55	n/a	55	n/a	55

Notes: RBL - Rating Background Noise Level; NML - Noise Management Level; Non-residential criteria only apply when receiver building is in use. Noise levels apply at the property boundary that is most exposed to construction noise (or receiver building façade that is most exposed to construction noise, noting that noise levels may be higher at upper floors of the noise affected receiver buildings). If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise affected point within 30 m of the residence.

Potential airborne construction noise impacts have been assessed in reference to the NMLs shown in Table 8-4.

8.1.2 Sydney Metro Construction Noise & Vibration Strategy (CNVS)

In addition to the *ICNG*, the noise criteria set out in the Sydney Metro City and Southwest Construction Noise & Vibration Strategy (CNVS) have been considered.

The CNVS recognises that works requiring the use of heavy machinery can generate high noise and vibration levels and in urban areas there is often limited setback distance between these noise sources and nearby buildings and receivers. Under such circumstances, typically there is limited opportunity to practicably mitigate the noise and vibration effects in a cost-effective manner. Therefore, potential disturbance impacts are usually minimised as much as practicable through management techniques. For residential receivers, depending on how far the predicted airborne construction noise level is above RBL, the CNVS recommends the adoption of the management measures set out in

Table 8-5. Full definitions of the identified management measures are set out in the CNVS.

Table 8-5 Additional Airborne Noise Management Measures (Residential)

Time Period		Mitigation Measures			
		Predicted $L_{Aeq,15min}$ Noise Level Above Background (RBL)			
		0 to 10 dB	10 to 20 dB	20 to 30 dB	> 30 dB
Standard	Mon-Fri (7.00am - 6.00pm) Sat (8.00am - 6.00pm) Sun/Pub Hol (Nil)	-	-	M, LB	M, LB
OOH Period 1	Mon-Fri (6.00pm - 10.00pm) Sat (6.00pm - 10.00pm) Sun/Pub Hol (8.00am - 6.00pm)	-	LB	M, LB	M, IB, LB, PC, RO, SN
OOH Period 2	Mon-Fri (10.00pm - 7.00am) Sat (10.00pm - 8.00am) Sun/Pub Hol (6.00pm - 7.00am)	-	M, LB	M, IB, LB, PC, RO, SN	AA, M, IB, LB, PC, RO, SN

Notes: AA – Alternative Accommodation; M – Monitoring; IB – Individual Briefings; LB – Letterbox drops; RO – Project Specific Respite Offer; PC – Phone Calls and emails; SN – Specific Notifications. Full definitions of these Additional Mitigation Measures are set out in Table 13 of the Sydney Metro City and Southwest Construction Noise & Vibration Strategy (Ver 0.4, 9 August 2017).

8.2 Airborne Construction Noise Assessment

At any particular location, the potential impacts can vary greatly depending on factors such as the relative proximity of sensitive receivers, the overall duration of the construction works, the intensity of the works, the time at which the construction works are undertaken and the character of the emissions.

8.2.1 Construction Stages

Assessment of airborne noise impacts from the construction activities have been determined by modelling the noise sources, receiver locations, topographical features and worksite hoardings.

Key details regarding the construction site layouts, the likely plant and equipment (including truck movements), and hours of operation were informed by the Design and Construction Teams. This information is presented in Appendix A and forms the basis for all modelling assumptions used in this assessment.

8.2.2 Construction Equipment

For the purposes of this assessment, the construction equipment and sound power levels set out in Appendix B have been considered across the identified works areas as shown in the Staging Plans

provided in Appendix A. The sound power levels in Appendix B have been determined by measurements undertaken by WM on other similar projects.

8.2.3 Construction Noise Modelling

Construction noise emissions from the works have been modelled using the Cadna-A (Version 2019) environmental noise prediction software. This program is used and recognised internationally and is also recognised by NSW regulatory authorities as a preferred computer noise model. Factors that are addressed in the noise modelling are:

- Construction equipment sound power levels;
- Location of construction equipment;
- Screening from existing structures;
- Receiver locations, including multiple storey receivers;
- Ground topography and absorption;
- Noise attenuation due to geometric spreading; and
- Atmospheric absorption.

8.2.4 Construction Noise Predictions

The predicted worst-case construction noise levels for the CSSI7400 construction stages identified in Tables 5-1 to 5-3 (and Appendix A) at each of the identified receivers are set out in Table 8-6.

The predicted worst-case construction noise levels for the SSD 10294 OSD construction stages are identified in Tables B1-B4 in the CNVIS in Appendix F.

The predictions represent the typical-worst case noise levels that may be expected to arise at the external facades of the receiver buildings when all noise sources operate simultaneously. It should be noted that construction noise levels would frequently be lower than the worst-case levels considered for significant periods of time. This would be apparent as works move around the sites and are therefore more distant/more shielded from receivers and when less noisy activities are being undertaken.

Observations related to the SSD 10294 OSD construction stages are:

- All stages are modelled to have up to 7 dBA exceedances above the NMLs during the day time for some commercial receivers, with little to no exceedances for most other receivers.
- The modelled Stage 5 & Stage 6 OSD works predicted noise levels below evening and night time NMLs at residential receivers.
- The modelled Stage 7 OSD works predicted noise levels above evening NMLs by up to 8 dBA, and night time NMLs by up to 15dBA, at residential receivers.
- Stage 8 works are slightly quieter compared to Stage 7 works with no exceedances above the NMLs during evening time and up to 6 dBA exceedance above the NMLs during night time.
- Exceedances above NMLs for commercial and school receivers are not relevant during evening, night time and morning shoulder periods in general.

Table 8-6 $L_{Aeq,15min}$ Construction Noise Predictions – VCN Stages 1-7 and VCS Stages 1-8

ID	Address	Description	Land Use	RBL 5am-7am	RBL Day	RBL Eve	RBL Night	VCN Stg 1	VCN Stg 2	VCN Stg 3	VCN Stg 4	VCN Stg 5	VCN Stg 6	VCN Stg 7	VCS Stg 1	VCS Stg 2	VCS Stg 3	VCS Stg 4	VCS Stg 5	VCS Stg 6	VCS Stg 7	VCS Stg 8		VCN Range	VCS Range
N01	34A McLaren St	-	Commercial	58	65	57	51	47	44	41	42	43	39	42	45	44	42	45	53	53	52	51		39 - 47	42 - 53
N02a	200 Miller St	North Sydney Council	Commercial	58	65	57	51	67	65	68	70	69	65	54	44	39	37	49	37	51	52	51		54 - 70	37 - 52
N02b	200 Miller St	North Sydney Council	Commercial	58	65	57	51	68	65	68	70	69	66	53	45	41	35	36	38	51	53	52		53 - 70	35 - 53
N03	27 McLaren St	Stormanston House	Residential	58	65	57	51	61	59	60	61	61	55	46	47	46	44	45	55	55	54	53		46 - 61	44 - 55
N04	29 McLaren St	Coolock House	Residential	58	65	57	51	61	58	58	63	62	57	46	44	41	36	36	52	53	54	53		46 - 63	36 - 54
N05	31 McLaren St	Bermondsey Lodge	Commercial	58	65	57	51	63	61	62	65	64	59	50	50	43	39	41	47	54	54	53		50 - 65	39 - 54
N06	196 Miller St	Pizza Pasta Benne	Comm/Res	58	65	57	51	68	65	68	69	69	64	52	45	41	34	35	35	38	46	51		52 - 69	34 - 51
N08	194 Miller St	Office Building	Commercial	58	65	57	51	67	65	67	69	68	63	53	68	56	54	57	57	58	55	54		53 - 69	54 - 68
N09a	128 Miller St	Monte Sant' Angelo	School	58	65	57	51	63	62	62	65	65	54	47	69	57	55	57	58	59	56	54		47 - 65	54 - 69
N09b	128 Miller St	Monte Sant' Angelo	School	58	65	57	51	50	55	55	48	50	42	41	69	56	55	57	57	59	56	54		41 - 55	54 - 69
N10	225 Miller St	The Mulberry on Miller	Comm/Res	58	65	57	51	59	61	61	62	62	58	55	69	56	55	55	55	58	55	57		55 - 62	55 - 69
N11	231 Miller St	-	Comm/Res	58	65	57	51	63	61	61	65	65	62	57	64	56	54	54	54	57	53	55		57 - 65	53 - 64
N12	237 Miller St	-	Residential	58	65	57	51	74	72	74	76	76	67	66	54	54	53	53	53	52	54	55		66 - 76	52 - 55
N13	39 McLaren St	-	Residential	58	65	57	51	73	72	73	75	74	67	67	36	35	28	28	30	30	45	54		67 - 75	28 - 54
N14	41 McLaren St	-	Commercial	58	65	57	51	69	67	68	68	67	64	64	46	48	45	54	54	55	56	55		64 - 69	45 - 56
N15	45 McLaren St	-	Residential	58	65	57	51	66	65	66	67	65	60	61	37	35	28	29	30	46	54	53		60 - 67	28 - 54
N16	54 McLaren St	Rydges North Sydney	Commercial	58	65	57	51	72	70	71	71	70	67	69	35	34	30	31	31	41	52	51		67 - 72	30 - 52
N16	54 McLaren St	Rydges North Sydney	Commercial	58	65	57	51	83	74	74	75	74	73	75	32	31	27	27	28	28	50	51		73 - 83	27 - 51
N17	168 Walker St	-	Commercial	58	65	57	51	74	72	73	73	72	69	71	47	47	47	50	51	53	54	53		69 - 74	47 - 54
N18a	170 Walker St	Wenona School	School	58	65	57	51	79	68	68	69	68	65	67	31	30	25	25	26	28	50	50		65 - 79	25 - 50
N18b	176 Walker St	Wenona School	School	58	65	57	51	79	71	72	73	72	69	71	46	43	42	42	42	49	49	52		69 - 79	42 - 52
N19	267 Miller St	-	Residential	58	65	57	51	69	63	64	65	64	59	61	45	41	40	40	40	45	51	50		59 - 69	40 - 51
N20	269 Miller St	The Independent	Commercial	58	65	57	51	64	57	57	57	57	57	59	35	31	27	27	27	29	49	48		57 - 64	27 - 49
N21a	243 Miller St	-	Comm/Res	58	65	57	51	72	68	72	76	74	70	70	47	43	42	42	42	49	49	51		68 - 76	42 - 51
N21b	243 Miller St	-	Residential	58	65	57	51	79	81	81	81	74	78	79	32	31	21	21	22	24	26	29		74 - 81	21 - 32
S01	128 Miller St	Monte Sant' Angelo	School	59	65	63	52	55	54	55	57	58	52	33	78	68	68	69	69	69	66	66		33 - 58	66 - 78
S02	201 Miller St	Intel Security Building -	Commercial	59	65	63	52	53	47	47	54	55	49	37	77	75	62	64	66	66	65	62		37 - 55	62 - 77
S03	199 Miller St	Rag & Famish (Hotel)	Commercial	59	65	63	52	51	33	24	53	53	49	21	82	73	73	74	74	74	72	72		21 - 53	72 - 82
S04	50 Berry St	-	Commercial	59	65	63	52	51	31	25	28	38	47	24	83	80	74	74	75	74	73	73		24 - 51	73 - 83
S05	56 Berry St	-	Commercial	59	65	63	52	50	35	30	30	30	28	28	80	77	69	70	71	70	69	69		28 - 50	69 - 80
S06	66 Berry St	-	Commercial	59	65	63	52	55	52	52	52	52	52	54	74	67	67	67	67	68	67	67		52 - 55	67 - 74
S07	72 Berry St	Ausgrid	Industrial	59	65	63	52	43	42	42	42	42	42	43	60	64	64	64	64	65	65	64		42 - 43	60 - 65
S08a	65 Berry St	-	Commercial	59	65	63	52	45	33	29	30	30	26	26	88	83	76	78	87	87	76	76		26 - 45	76 - 88
S09	1 Denison St	Includes Channel 9	Commercial	59	65	63	52	21	28	22	22	22	20	20	82	82	81	81	81	79	79	79		20 - 28	79 - 82
S10a	77 Berry St	-	Commercial	59	65	63	52	45	45	45	45	45	45	48	81	81	75	75	75	74	71	71		45 - 48	71 - 81
S10b	79-81 Berry St	-	Residential	59	65	63	52	52	49	49	49	49	49	50	81	82	72	72	72	69	69	67		49 - 52	67 - 82
S11a	105-153 Miller St	-	Commercial	59	65	63	52	20	27	20	21	20	18	18	79	69	72	72	72	71	67	66		18 - 27	66 - 79
S11b	105-153 Miller St	-	Commercial	59	65	63	52	45	28	23	23	22	44	21	90	91	77	78	75	75	66	65		21 - 45	65 - 91
S12	80 Mount St	-	Commercial	59	65	63	52	35	36	35	35	35	35	35	71	62	65	65	65	65	62	61		35 - 36	61 - 71
S13	2 Elizabeth Plaza	-	Commercial	59	65	63	52	25	26	21	22	21	19	20	58	58	60	60	62	61	60	59		19 - 26	58 - 62
S14	51 Mount St	-	Commercial	59	65	63	52	20	26	21	21	21	18	19	45	45	45	45	46	56	58	57		18 - 26	45 - 58
S15	100 Miller St	-	Comm/Res	59	65	63	52	47	33	28	48	48	46	26	82	81	72	73	72	73	69	66		26 - 48	66 - 82
S16	53 Berry St	-	Commercial	59	65	63	52	51	38	46	54	54	49	23	89	82	75	76	76	76	70	70		23 - 54	70 - 89
S17	177 Pacific Hwy	-	Commercial	59	65	63	52	50	48	50	54	54	46	22	67	67	67	67	67	67	62	59		22 - 54	59 - 67

Note: Morning Shoulder Period is 5.00am to 7.00am, Mon-Sat, not including public holidays

Table 8-7 $L_{Aeq,15min}$ Construction Noise Predictions – Cumulative

ID	Address	Description	Land Use	RBL 5am-7am	RBL Day	RBL Eve	RBL Night	A	B	C	D	E	F	G	H	I
N01	34A McLaren St	-	Commercial	58	65	57	51	49	47	45	47	53	53	52	52	51
N02a	200 Miller St	North Sydney Council Chambers	Commercial	58	65	57	51	67	68	70	70	69	65	56	52	51
N02b	200 Miller St	North Sydney Council Chambers	Commercial	58	65	57	51	68	68	70	70	69	66	56	53	52
N03	27 McLaren St	Stormanston House	Residential	58	65	57	51	61	60	61	61	62	58	55	54	53
N04	29 McLaren St	Coolock House	Residential	58	65	57	51	61	58	63	63	63	58	55	54	53
N05	31 McLaren St	Bermondsey Lodge	Commercial	58	65	57	51	63	63	65	65	64	60	56	54	53
N06	196 Miller St	Pizza Pasta Benne	Comm/Res	58	65	57	51	68	68	69	69	69	64	53	46	51
N08	194 Miller St	Office Building	Commercial	58	65	57	51	71	71	69	69	69	65	57	55	54
N09a	128 Miller St	Monte Sant' Angelo	School	58	65	57	51	70	70	66	66	66	61	56	56	54
N09b	128 Miller St	Monte Sant' Angelo	School	58	65	57	51	69	69	58	58	58	59	56	56	54
N10	225 Miller St	The Mulberry on Miller	Comm/Res	58	65	57	51	70	70	62	63	63	61	58	55	57
N11	231 Miller St	-	Comm/Res	58	65	57	51	66	66	65	65	65	63	59	53	55
N12	237 Miller St	-	Residential	58	65	57	51	74	74	76	76	76	67	67	54	55
N13	39 McLaren St	-	Residential	58	65	57	51	73	73	75	75	74	67	67	45	54
N14	41 McLaren St	-	Commercial	58	65	57	51	69	68	68	68	67	65	65	56	55
N15	45 McLaren St	-	Residential	58	65	57	51	66	66	67	67	65	61	62	54	53
N16	54 McLaren St	Rydges North Sydney (Hotel)	Commercial	58	65	57	51	72	71	71	71	70	69	69	52	51
N16	54 McLaren St	Rydges North Sydney (Hotel)	Commercial	58	65	57	51	83	74	75	75	74	75	75	50	51
N17	168 Walker St	-	Commercial	58	65	57	51	74	73	73	73	72	71	71	54	53
N18a	170 Walker St	Wenona School	School	58	65	57	51	79	68	69	69	68	67	67	50	50
N18b	176 Walker St	Wenona School	School	58	65	57	51	79	72	73	73	72	71	71	49	52
N19	267 Miller St	-	Residential	58	65	57	51	69	64	65	65	64	61	61	51	50
N20	269 Miller St	The Independent	Commercial	58	65	57	51	64	57	57	57	57	59	59	49	48
N21a	243 Miller St	-	Comm/Res	58	65	57	51	72	72	76	76	74	70	70	49	51
N21b	243 Miller St	-	Residential	58	65	57	51	79	81	81	81	78	79	79	26	29
S01	128 Miller St	Monte Sant' Angelo Mercy College	School	59	65	63	52	78	78	68	69	69	69	66	66	66
S02	201 Miller St	Intel Security Building - Fixed Glass Windows	Commercial	59	65	63	52	77	77	62	64	66	66	65	65	62
S03	199 Miller St	Rag & Famish (Hotel)	Commercial	59	65	63	52	82	82	73	74	74	74	72	72	72
S04	50 Berry St	-	Commercial	59	65	63	52	83	83	74	74	75	74	73	73	73
S05	56 Berry St	-	Commercial	59	65	63	52	80	80	69	70	71	70	69	69	69
S06	66 Berry St	-	Commercial	59	65	63	52	74	74	67	67	67	68	67	67	67
S07	72 Berry St	Ausgrid	Industrial	59	65	63	52	60	60	64	64	64	65	65	65	64
S08a	65 Berry St	-	Commercial	59	65	63	52	88	88	76	78	87	87	76	76	76
S09	1 Denison St	Includes Channel 9 Studios	Commercial	59	65	63	52	82	82	81	81	81	79	79	79	79
S10a	77 Berry St	-	Commercial	59	65	63	52	81	81	75	75	75	74	71	71	71
S10b	79-81 Berry St	-	Residential	59	65	63	52	81	81	72	72	72	69	69	69	67
S11a	105-153 Miller St	-	Commercial	59	65	63	52	79	79	72	72	72	71	67	67	66
S11b	105-153 Miller St	-	Commercial	59	65	63	52	90	90	77	78	75	75	66	66	65
S12	80 Mount St	-	Commercial	59	65	63	52	71	71	65	65	65	65	62	62	61
S13	2 Elizabeth Plaza	-	Commercial	59	65	63	52	58	58	60	60	62	61	60	60	59
S14	51 Mount St	-	Commercial	59	65	63	52	45	45	45	45	46	56	58	58	57
S15	100 Miller St	-	Comm/Res	59	65	63	52	82	82	72	73	72	73	69	69	66
S16	53 Berry St	-	Commercial	59	65	63	52	89	89	75	76	76	76	70	70	70
S17	177 Pacific Hwy	-	Commercial	59	65	63	52	67	67	67	67	67	67	62	62	59

A - (VCS1 / VCN1); B - (VCS1 / VCN2 or VCN3); C - (VCS3 / VCN3 / VCN4); D - (VCS4 / VCN4 / VCN5); E - (VCS5 / VCN5 / VCN6); F - (VCS6 / VCN6 / VCN7); G - (VCS7 / VCN7); H - (VCS7); I - (VCS8).

8.2.5 CNVS Additional Mitigation Measures – Airborne Construction Noise

Table 8-5 (based on Table 14 of the CNVS) sets out the Additional Mitigation Measures to be applied in the case of exceedances of the airborne noise criteria for works under both the CSSI and SSD approvals.

The airborne noise predictions indicate that at the closest residential receivers, during standard hours no specific Additional Mitigation Measures are required, but during the out of hours works, various residents should be provided with letterbox drop notifications regarding the forthcoming works and monitoring should be undertaken to confirm noise levels. Specifically, these requirements apply within various works stages to residential receivers N05, N10, N12, N13, N19, N21a, N21b, S10b and S15.

The resultant requirements for residential receivers are set out in Appendix C, in Tables C1 to C8.

The airborne noise predictions indicate that at the closest non-residential receivers some monitoring, and letterbox drop notifications are also required. Specifically, these requirements apply to Monte Sant' Angelo School (N09), Rydges Hotel (N16), Wenona School (N18), Commercial Use (N21a), Monte Sant' Angelo College (S01), Rag & Famish Hotel (S03), Commercial Use (S04), Commercial Use (S08a), Commercial Use – Including Channel 9 Studios (S09), Commercial Use (S10a), Commercial Use (S15), and Commercial Use (S16).

The resultant requirements for non-residential receivers are set out in Appendix C, in Table C9. It should be noted that the non-residential Additional Mitigation Measures are only applicable when the receiver building is in use.

8.2.6 Receiver Consultation in Accordance with CSSI 7400 E33 & E34

In accordance with Conditions E33 and E34, LL has consulted with the operators of Channel 9 Studios located within the building located at 1 Denison Street (S09) to negotiate suitable respite requirements to minimise any potential noise/vibration impacts on Channel 9 operations.

Further to this, local schools - Wenona School (N18) and Monte Sant' Angelo College (S01), were consulted to determine any particular noise sensitivities.

8.2.7 Receiver Consultation in Accordance with CSSI 7400 E38

There is a marginal risk of levels exceeding $L_{Aeq,15min}$ 60 dBA internally at 243 Miller Street (N21b). Considering a 20 dB reduction through the building façade, at this location, the potential exceedance is minor (i.e. approximately only 1 dB exceedance). Accordingly, LL regularly consults with this resident.

It should be noted that N21b is not the primary residence at 243 Miller Street, however is occupied as a residence. This is the only receiver where there is a potential for exceedance of the $L_{Aeq,15min}$ 60 dBA internal noise criterion.

8.2.8 Community Consultation

All project community consultation will be completed in accordance with the Sydney Metro Overarching Community Communications Strategy (OCCS) and project specific VCISD Community Communications Strategy (CCS). Forecast noise and vibration levels and predicted potential impacts detailed in this CNVMP will be used to inform and guide the required project consultation as per the OCCS and VCISD CCS.

8.3 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.

Currently, it is not intended to undertake any high noise generating works during the night. Notwithstanding

this, for completeness and to evaluate the potential for sleep disturbances, a sleep disturbance screen level assessment has been undertaken.

To assess the likelihood of sleep disturbance, an assessment of maximum noise levels against the screening level of L_{Amax} = RBL + 15 dB has been undertaken for residential receivers.

CSSI 7400

Tables C10 and C11 (Appendix C) set out the predicted maximum noise levels for each stage and identify where exceedances may occur during the night and morning shoulder periods if the works were undertaken in these periods.

It is noted that the CNVS AMMs are based on the degree to which the $L_{Aeq,15min}$ level exceeds the RBL and not the L_{Amax} level. The AMMs based on the $L_{Aeq,15min}$ assessment would be expected to adequately address potential sleep disturbance impacts.

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Table B5 in the CNVIS in Appendix F set out the predicted maximum noise levels for each stage and identify where exceedances may occur during the night and morning shoulder periods if the works were undertaken in these periods.

It is noted that the CNVS AMMs are based on the degree to which the $L_{Aeq,15min}$ level exceeds the RBL and not the L_{Amax} level. The AMMs undertaken for the CSSI 7400 works would be expected to adequately address potential sleep disturbance impacts.

9 GROUNDBORNE CONSTRUCTION NOISE & VIBRATION

9.1 Construction Vibration Criteria

The effects of vibration in buildings can be divided into three main categories; those in which the occupants or users of the building are inconvenienced or possibly disturbed (human comfort), those where the building contents may be affected (effects on building contents) and those in which the integrity of the building or the structure itself may be prejudiced (structural damage).

9.1.1 Human Comfort

The DECCW's "*Assessing Vibration: a technical guideline*" (AVTG) dated February 2006 (DEC, 2006) recommends the use of BS 6472-1992 for the purpose of assessing vibration in relation to human comfort.

British Standard 6472-1992 "*Guide to evaluation of human exposure to vibration in building*" 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 provides guideline values for continuous, transient and intermittent events that are based on a Vibration Dose Value (VDV), rather than a continuous vibration level. 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 9-1 (based on CNVS Table 5).

Table 9-1 Vibration Dose Value Ranges which Might Result in Various Probabilities of Adverse Comment within Residential Buildings

Place and time	Low Probability of Adverse Comment ($m/s^{1.75}$)	Adverse Comment Possible ($m/s^{1.75}$)	Adverse Comment Probable ($m/s^{1.75}$)
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

Note: For offices and workshops, multiplying factors of 2 and 4 respectively would be applied to the above vibration dose value ranges for a 16-hr day.

With respect to VDV, WM notes that there can be practical difficulties in the prediction and measurement of this parameter, particularly given the limited available measured data. For the purpose of this assessment, WM considers the equivalent Peak Particle Velocity (PPV) level as recognised by AVTG is an acceptable substitution (as per table C1.1 of the AVTG).

This is a common approach in the industry and allows alignment with structural damage vibration guide values and provides an opportunity for the same vibration equipment to measure for comfort and damage.

9.1.2 Effects on Building Contents

People can perceive floor vibration at levels well below those likely to cause damage to building contents or affect the operation of typical equipment found in most buildings that is not particularly vibration sensitive.

For most receivers, the controlling vibration criterion is the human comfort criterion, and it is therefore not

normally required to set separate criteria in relation to the effect of construction vibration on typical building contents.

Where appropriate, objectives for the satisfactory operation of vibration sensitive critical instruments or manufacturing processes should be sourced from manufacturer's data and/or other published objectives.

9.1.3 Structural Damage

Most commonly specified 'safe' structural vibration limits are designed to minimise the risk of threshold or cosmetic surface cracks and are set well below the levels that have potential to cause damage to the main structure. The CSSI Approval includes statutory requirements, including limits, for vibration under Condition E28 as follows:

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 Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration.

BS 7385 Part 2-1993 sets guide values for building vibration based on the lowest vibration levels above which damage has been credibly demonstrated. These levels are judged to give a minimum risk of vibration induced damage, where minimal risk for a named effect is usually taken as a 95% probability of no effect.

Sources of vibration that are considered in the standard include demolition, blasting (carried out during mineral extraction or construction excavation), piling, ground treatments (eg compaction), construction equipment, tunnelling, road and rail traffic and industrial machinery.

The recommended limits (guide values) for transient vibration to ensure minimal risk of cosmetic damage to residential and industrial buildings are presented numerically in Table 9-2 (based on CNVS Table 6).

Table 9-2 Transient Vibration Guide Values – Minimal Risk of Cosmetic Damage

Building Type	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
	4 Hz to 15 Hz	15 Hz and Above
Reinforced or framed structures. Industrial and heavy commercial buildings.	50 mm/s at 4 Hz and above	
Unreinforced or light framed structures. Residential or light commercial type buildings.	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

In order to assess the likelihood of cosmetic damage due to vibration measurements would be as a minimum undertaken at the base of the building in three orthogonal vibration components (transverse, longitudinal and vertical directions).

It is noteworthy that extra to the guide values nominated in Table 6, the standard states that:

"Some data suggests that the probability of damage tends towards zero at 12.5 mm/s peak component particle velocity. This is not inconsistent with an extensive review of the case history information available in the UK."

Also that:

"A building of historical value should not (unless it is structurally unsound) be assumed to be more sensitive."

Additionally, Condition E59 requires that before commencement of construction, all property owners of buildings identified as being at risk of damage must be offered a building condition survey. Where an offer is accepted a structural engineer must undertake the survey. The results of the surveys must be documented in a Building

Condition Survey Report for each building surveyed. Copies of Building Condition Survey Reports must be provided to the owners of the buildings surveyed, and if agreed by the owner, the Relevant Council within three (3) weeks of completing the Survey Report and no later than one (1) month before the commencement of construction. It is noted that no buildings have been identified as being at risk of damage.

9.1.4 General Vibration Screening Criterion

The Standard states that the guide values (Table 9-2) relate predominantly to transient vibration which does not give rise to resonant responses in structures and low-rise buildings.

Where the dynamic loading caused by continuous vibration may give rise to dynamic magnification due to resonance, especially at the lower frequencies where lower guide values apply, then the guide values in Table 6 may need to be reduced by up to 50%.

Note: rockbreaking/hammering and sheet piling activities are considered (by TfNSW) to have the potential to cause dynamic loading in some structures (eg residences) and it may therefore be appropriate to reduce the transient values by 50%.

Therefore, for most construction activities involving intermittent vibration sources such as rockbreakers, 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, a conservative vibration damage screening level per receiver type is given below:

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

9.1.5 Guidelines for Heritage Structures

Heritage buildings and structures would be assessed as per the screening criteria as they should not be assumed to be more sensitive to vibration unless they are found to be structurally unsound. If a heritage building or structure is found to be structurally unsound (following inspection) a more conservative cosmetic damage criteria of 2.5 mm/s peak component particle velocity (from DIN 4150) would be considered.

Table 9-3 outlines the heritage listed items within the vicinity of the project, none of which have been assessed as being structurally unsound.

Table 9-3 Heritage Items

Heritage Item / Location	Register Listings	Significance	Location
Monte Sant' Angelo Group	North Sydney LEP 2013 I0894	Local	North-west of southern site
MLC Building	North Sydney LEP 2013 I0893	Local	Immediately south of southern site
Rag & Famish Hotel (199 Miller Street)	North Sydney LEP 2013 I0901	Local	Adjacent to southern site, north on Berry Street
Commercial building (201 Miller Street)	North Sydney LEP 2013 I0904	Local	North of the southern site
McLaren Street Heritage Conservation Area	North Sydney LEP 2013 CA19	Local	West of northern site
Walker & Ridge Streets Heritage Conservation Area	North Sydney LEP 2013 (CA20)	Local	North-east of northern site
North Sydney Council Chambers (including fountain in park adjacent to Council Chambers)	North Sydney LEP 2013 (I0902)	Local	West of northern site
243 Miller Street, also known as "Garston"	North Sydney LEP 2013 (I0908)	Local	Immediately adjacent (west) northern site
House (255–257 Miller Street)	North Sydney LEP 2013 (I0912)	Local	Immediately adjacent (west) northern site
Simsmetal House	North Sydney LEP 2013 (I0889)	Local	South of northern site

9.1.6 Guidelines for Sensitive Scientific & Medical Equipment

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 in Table 7 of the CNVS.

9.1.7 Other Vibration Sensitive Structures & Utilities

Where structures and utilities are encountered which may be considered to be particularly sensitive to vibration, a vibration goal which is more stringent than structural damage goals may need to be adopted. Examples of such structures and utilities include tunnels, gas pipelines, and fibre optic cables.

Specific vibration goals would be determined on a case-by-case basis with the structure or utility's owner in order to determine acceptable vibration levels.

9.1.8 CNVS Additional Mitigation Measures – Groundborne Construction Vibration

In addition to the vibration criteria discussed above, the CNVS requires the consideration of Additional Mitigation Measures, in the case of appreciable levels of vibration occurring at sensitive receivers. Table 9-4 (based on Table 16 of the CNVS) sets out the Additional Mitigation Measures to be applied in the case of exceedances of the groundborne vibration management levels.

Table 9-4 Additional Groundborne Vibration Management Measures (Residential)

Time Period		Mitigation Measures
		Predicted Vibration Levels Exceed Maximum Levels
Standard	Mon-Fri (7.00am - 6.00pm)	M, LB, RP
	Sat (8.00am - 1.00pm)	
	Sun/Pub Hol (Nil)	
OOH Period 1	Mon-Fri (6.00pm - 10.00pm)	M, IB, LB, PC, RO, SN
	Sat (1.00pm - 10.00pm)	
	Sun/Pub Hol (8.00am - 6.00pm)	
OOH Period 2	Mon-Fri (10.00pm - 7.00am)	AA, M, IB, LB, PC, RO, SN
	Sat (10.00pm - 8.00am)	
	Sun/Pub Hol (6.00pm - 7.00am)	

Notes: AA – Alternative Accommodation; M – Monitoring; IB – Individual Briefings; LB – Letterbox drops; RO – Project Specific Respite Offer; PC – Phone Calls and emails; SN – Specific Notifications. Full definitions of these Additional Mitigation Measures are set out in Table 13 of the Sydney Metro City and Southwest Construction Noise & Vibration Strategy (Ver 0.4, 9 August 2017). The 'maximum' vibration value is taken as the 'Maximum Peak Velocity (mm/s)' value identified in Table C1.1 in the *Assessing Vibration: A technical guideline* (DEC 2006).

9.2 Groundborne Construction Noise Criteria

9.2.1 *ICNG* Groundborne Construction Noise Criteria

Groundborne (regenerated) noise is noise generated by vibration transmitted through the ground into a structure. Groundborne noise caused, for example by underground works such as tunnelling, can be more noticeable than airborne noise. The following groundborne noise levels for residences are nominated in the *ICNG* and indicate when management actions would be implemented. These levels recognise the temporary nature of construction and are only applicable when groundborne noise levels are higher than airborne noise levels.

The groundborne noise management levels considered by this assessment are shown in

Table 9-5.

Table 9-5 Groundborne Noise Management Levels

Receiver Type	Standard Hours (Day)	OOHW Period 1 (Day)	OOHW Period 1 (Evening)	OOHW Period 2 (Night)	Morning Shoulder (5.00am – 7.00am)
	$L_{Aeq,15min}$ dBA	$L_{Aeq,15min}$ dBA	$L_{Aeq,15min}$ dBA	$L_{Aeq,15min}$ dBA	$L_{Aeq,15min}$ dBA
Residential	45	40	40	35	35
Commercial			50 when in use		
Childcare			40 when in use		
School			45 when in use		
TV Studio			25 when in use		

Note: The Groundborne Noise Management Levels for non-residential uses only apply when the building is in use.

The daytime criteria are applicable to both residential and commercial receivers, whereas the evening and night-time criteria are only applicable to residential receivers. The Groundborne Noise Management Levels for non-residential uses only apply when the receiver building is in use.

The internal noise levels are to be assessed at the centre of the most-affected habitable room.

9.2.2 CNVS Additional Mitigation Measures – Groundborne Construction Noise

Table 9-6 (based on Table 15 of the CNVS) sets out the Additional Mitigation Measures to be applied in the case of exceedances of the groundborne noise management levels.

Table 9-6 Additional Groundborne Noise Management Measures (Residential)

Time Period		Mitigation Measures		
		Predicted $L_{Aeq,15min}$ Noise Level Exceedance		
		0 to 10 dB	10 to 20 dB	> 20 dB
Standard	Mon-Fri (7.00am - 6.00pm)	LB	LB	M, LB, SN
	Sat (8.00am - 1.00pm)			
	Sun/Pub Hol (Nil)			
OOH Period 1	Mon-Fri (6.00pm - 10.00pm)	LB	M, LB, SN	M, IB, LB, PC, RO, SN
	Sat (1.00pm - 10.00pm)			
	Sun/Pub Hol (8.00am - 6.00pm)			
OOH Period 2	Mon-Fri (10.00pm - 7.00am)	M, LB, SN	AA, M, IB, LB, PC, RO, SN	AA, M, IB, LB, PC, RO, SN
	Sat (10.00pm - 8.00am)			
	Sun/Pub Hol (6.00pm - 7.00am)			

Notes: AA – Alternative Accommodation; M – Monitoring; IB – Individual Briefings; LB – Letterbox drops; RO – Project Specific Respite Offer; PC – Phone Calls and emails; SN – Specific Notifications. Full definitions of these Additional Mitigation Measures are Mitigation abbreviation code definitions set out in Table 13 of the Sydney Metro City and Southwest Construction Noise & Vibration Strategy (Ver 0.4, 9 August 2017).

9.3 Groundborne Construction Noise & Vibration Assessment

The greatest levels of groundborne noise and vibration would be expected to arise with the use of hydraulic

hammers during the early part of the works (within VCS Stages 1 & 2 and VCN Stage 2). For the purpose of assessment, the groundborne noise and vibration levels expected to occur from the large rockbreakers have been considered.

It should be noted that the vibration generating works at the VCN and VCS sites following LL's occupation of the sites would be relatively minor in comparison with the substantial vibration generating works already undertaken in the bulk excavation and formation of the station shafts.

9.3.1 Predicted Groundborne Noise & Vibration Levels

Predicted groundborne noise and vibration levels at the closest receivers are set out in Table 9-7. These are based on empirical data obtained by WM from hydraulic hammering works undertaken by large rockbreakers (hammer size approx. 1.5t) in similar geological conditions (predominantly sandstone).

Table 9-7 Predicted Groundborne Noise & Vibration Levels at Closest Receivers

Site	ID	Address	Land Use	Slant Distance (m)	Groundborne Noise Level ($L_{Aeq,15min}$ dBA)	Groundborne Vibration Levels - PPV (mm/s)
VCN	N21a	243 Miller St	Residential	43	47	0.14
VCN	N21b	243 Miller St	Residential	39	49	0.14
VCN	N12	237 Miller St	Residential	45	40	0.1
VCS	S10b	79-81 Berry St	Residential	39	40	0.1
VCN	N21b	243 Miller St	Commercial	39	49	0.14
VCS	S09	77-81 Berry St	Channel 9	39	49	0.14
VCS	S11b	105-153 Miller St	Commercial	30	56	0.2
VCS	S08a	65 Berry St	Commercial	30	56	0.2
VCS	S10a	77 Berry Steet	Commercial	39	49	0.1
VCS	S01	128 Miller St	School	63	38	0.1

9.3.2 CNVS Additional Mitigation Measures – Groundborne Noise & Vibration

Tables C12 and C13 in Appendix C set out the groundborne construction noise & vibration management level exceedances and CNVS additional mitigation requirements.

Notably, no specific additional mitigation measures relating to groundborne vibration are found to be necessary, beyond the standard measures defined by the *ICNG*. Application of the standard measures (outlined in Section 11) would be expected to be sufficient to ensure vibration effects on the occupants of nearby buildings are satisfactorily managed.

Additionally, predictions indicate no vibration screening criteria exceedances or risk of structural/building damage.

With respect to groundborne noise, management levels are predicted to be marginally exceeded during standard hours and moderately exceeded outside standard hours at residential receivers N21a, N21b. These exceedances trigger 'letterbox drop' notifications at these receivers.

Table C12 (Appendix C) identifies the potential for significant exceedances if the hammering works were undertaken within the OOH Period 2 timeframe. Given this, LL would not propose to undertake any hydraulic hammering works within OOH Period 2.

9.3.3 Channel 9 Studios – 1 Denison Street

Special consideration should be given to groundborne effects on Channel 9 Studios (S09) located at 1 Denison Street (understood to be operational at approximately August 2020). Table C12 (Appendix C) identifies the potential for groundborne noise levels of up to approximately $L_{Aeq,15min}$ 49 dBA the Channel 9 building, a significant exceedance of the L_{Aeq} 25 to 30 dBA criterion recommended by AS2107 for film or television studios.

WM is not aware of what, if any, vibration isolation has been included in the base building design of 1 Denison street. This assessment assumes no reduction for any isolation that may exist.

Given the potential for noise disturbance, LL proposes to undertake consultation with Channel 9 Studios (S09) to further assess impacts with the new studio developer and operators, taking account of any vibration or noise isolation designed into the building and determine appropriate hours of respite for this receiver, if necessary.

Furthermore, it is recommended that during consultation with Channel 9, appropriate criteria is confirmed. At the time of preparing this CNVMP, information requested by WM was not made available.

10 CONSTRUCTION ROAD TRAFFIC NOISE

10.1.1 Construction Road Traffic Noise Guidelines

Criteria for off-site road traffic noise applicable to existing residences affected by additional traffic on existing local roads generated by land use developments are specified in the NSW *Road Noise Policy* (RNP). Whilst these criteria do not specifically apply to construction traffic movements, they have been conservatively considered and are summarised in Table 10-1.

Table 10-1 *RNP* Criteria for Road Traffic Noise

Type of Development	Assessment Criteria dB(A)	
	Daytime (07:00-22:00)	Night (22:00-07:00)
Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq,15\ hour}$ 60 (external)	$L_{Aeq,9\ hour}$ 55 (external)
Existing residences affected by additional traffic on existing local roads generated by land use developments	$L_{Aeq,1\ hour}$ 55 (external)	$L_{Aeq,1\ hour}$ 50 (external)

Note: The identified criteria do not apply to vehicle movements within the Project Site. For the purpose of assessment, any noise generated by on-site vehicle movements is considered as construction noise and assessed holistically with on-site mobile plant in accordance with the *ICNG*.

As required by the *RNP*, an initial screening test should first be applied by evaluating whether noise levels would increase by more than 2 dB (an increase in the number vehicles of approximately 60%) due to construction traffic or a temporary reroute due to a road closure.

Where noise levels increase by more than 2 dB further assessment is required using the criteria presented in the *RNP*, as shown in Table 10-1. A 2 dB increase is typically considered not noticeable.

10.1.2 Construction Road Traffic Assessment

Lendlease estimates that a maximum of 28 heavy vehicle movements per hour would be required during the peak construction phase.

Considering the high existing volume of traffic on the adjacent roads, the noise impact generated by construction delivery vehicles arriving and leaving the site would be expected to result in an increase in road traffic noise levels of less than 2 dB which is in compliance with the established criteria.

On this basis, no material construction traffic noise impacts are expected.

11 CONSTRUCTION NOISE & VIBRATION MITIGATION MEASURES

The CNVS sets out standard construction noise and vibration mitigation measures to be implemented on all Sydney Metro projects by default in order to minimise potential noise and vibration impacts at the surrounding Noise Sensitive Receivers. These will be implemented by LL where feasible and reasonable and are summarised in Table 11-1. A summary of roles and responsibilities is provided in

Table 11-2.

Table 11-1 Standard Noise & Vibration Mitigation Measures

Action required	Applies to	Details	Responsible Key Contributor
Management Measures			
Implementation of any project specific mitigation measures required	Airborne noise Groundborne noise and vibration	In addition to the measures set out in this table, any project specific mitigation measures identified in the environmental assessment documentation (e.g. EIS, submissions or representations report) or approval or licence conditions must be implemented as required.	Environment Manager
Implement community consultation measures	Airborne noise Groundborne noise and vibration	Notification detailing work activities, dates and hours, impacts and mitigation measures and indication of work schedule. • Periodic notifications (letterbox drop, emails, etc) • Specific notifications (email distributions list, phone calls, face-to-face) • Website updates • Sydney Metro 1800 telephone line • Place Managers These measures are further detailed in the corresponding project Community Communications Strategy.	Community / Place Manager Environment Manager
Register of Noise Sensitive Receivers	Airborne noise Groundborne noise and vibration	A register of all noise and vibration sensitive receivers (NSRs) would be kept on site. The register would include the following details for each NSR: • Address of receiver • Category of receiver (Residential, Commercial etc.) • Contact details	Community / Place Manager Environment Manager
Site inductions	Airborne noise Groundborne noise and vibration	All employees, contractors and subcontractors are to receive a site induction. The induction must at least include: • Relevant project specific and standard noise and vibration mitigation measures • Relevant approval conditions • Permissible hours of work • Any limitations on high noise generating activities • Location of nearest sensitive receivers • Construction employee parking arrangements	Environment Manager Safety Manager
Behavioural Practices	Airborne noise	No unnecessary shouting or loud stereos/radios; on site. No dropping of materials from height; throwing of metal items; and slamming of doors. No excessive revving of plant and vehicle engines. Controlled release of compressed air.	Construction Manager Foreman Site Manager
Monitoring	Airborne noise Groundborne noise and vibration	A monitoring program is to be carried out for the duration of the works considering this assessment and any approval and licence conditions. This will involve a combination of attended and unattended monitoring including real-time data.	Environment Manager
Respites	Airborne noise Groundborne noise and vibration	Ensure appropriate respites are included when planning construction activities, in accordance with: - E37-E40 (CSSI approved respites) - E44e (Negotiated agreements) and - Sydney Metro CNVS respite provisions Consult with impacted receivers regarding respites as per	Environment Manager Construction Manager Site Manager Community / Place Manager

Action required	Applies to	Details	Responsible Key Contributor
		E38. High noise generating activities would be scheduled for less sensitive period considering the nearby receivers.	
Source Controls			
Construction hours and scheduling	Airborne noise Groundborne noise and 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.	Environment Manager Construction Manager Site Manager
Construction respite period	Airborne noise Groundborne noise and Vibration	In accordance with this CNVMP appropriate construction respites will be developed in consultation with receivers identified in accordance with Condition E37 and as per any community negotiated agreements under Condition E44.	Environment Manager Community / Place Manager Construction Manager Site Manager
Equipment selection	Airborne noise Groundborne noise and vibration	Use quieter and less vibration emitting construction methods where feasible and reasonable. Residential grade mufflers would be fitted to all permanent mobile plant. Dampened rock hammers to be used.	Construction Manager Site Manager
Rental plant and equipment	Airborne noise	The noise levels of plant and equipment items are to be considered in rental decisions.	Construction Manager Site Manager
Plan worksites and activities to minimise noise and vibration	Airborne noise Groundborne vibration	Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site. Plan sites to maximise offset distances between noisy plant and sensitive receivers.	Construction Manager Site Manager
Reduce coincidence of equipment	Airborne noise	Where feasible, minimise the coincidence of noisy plant working simultaneously close together.	Construction Manager Site Manager
Non-tonal reversing alarms	Airborne noise	Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site.	Construction Manager Site Manager
Minimise disturbance arising from delivery of goods to construction sites	Airborne noise	Loading and unloading of materials/deliveries is to occur as far as possible from NSRs Select site access points and roads as far as possible away from NSRs. Delivery vehicles to be fitted with straps rather than chains for unloading, wherever feasible and reasonable.	Construction Manager Site Manager
Path Controls			
Shield stationary noise sources such as pumps, compressors, fans etc	Airborne noise	Where feasible, stationary noise sources would be enclosed or shielded whilst ensuring that the occupational health and safety of workers is maintained. Appendix F of AS 2436: 1981 lists materials suitable for shielding.	Construction Manager Site Manager
Shield sensitive receivers from noisy activities	Airborne noise	Use structures to shield residential receivers from noise such as site shed placement; fencing; hoarding and consideration of site topography when situating plant.	Construction Manager Site Manager

Table 11-2 Roles and Responsibilities

Role	Definition and Responsibilities
Project Environment Manager	• Oversee the implementation of all noise and vibration management initiatives including coordinating responses to noise and vibration complaints. • Manage review and continual improvement of the CNVMP. • Ensure that sufficient resources are allocated for the implementation of the CNVMP. • Consider and advise senior management on compliance obligations regarding noise and vibration. • Ensure that the outcomes of compliance monitoring / incident reporting are systematically evaluated as part of ongoing management of construction activities. • Ensure all appropriate noise and vibration mitigation measures are implemented.
Site Supervisor	• Ensure that all requirements of the CNVMP are effectively implemented. • Ensure all appropriate noise and vibration mitigation measures are implemented.
EHS Coordinators	• Assist the Project Environment Manager and Construction Managers in implementing the CNVMP. • Oversee noise and vibration training including inductions, toolbox talks and specific technical training on monitoring equipment. • Ensure all appropriate noise and vibration mitigation measures are implemented. • Monitoring and reporting on compliance.
Site Engineers	• Assist the Construction Manager in implementing the CNVMP.
Project Noise and Vibration Consultant	• Provide Lendlease with specialist noise and vibration input and advice including development of the CNVMP, CNVIS and discussions regarding progressive construction works. • Undertaking noise and vibration monitoring when required. • Assisting in community consultation when required.
Construction Manager	• Manage the delivery of the construction process, in relation to noise and vibration management across the site together with the Environment Manager. • Ensure that all requirements of the CNVMP are effectively implemented, including all subcontractors
Stakeholder and Community Relations Manager	• Manage notifications and consultation for noise and vibration and liaise with the Environment Manager about management of noise and vibration complaints. • Assist in coordinating responses to noise and vibration complaints.

11.1 CNVS Additional Mitigation Measures

Based on the predictions, all reasonable and feasible mitigation measures to minimise noise and vibration from construction are identified. This includes the Standard Mitigation Measures (SMM) set out in Table 11-1 and the Additional Mitigation Measures (AMM) required by the CNVS, as set out in Appendix C.

In relation to groundborne noise impacts, Channel 9 Studios will require Specific Notifications (SN) and for this reason, LL has undertaken negotiations with Channel 9 to confirm operational queries and respite options.

Should works be undertaken outside of standard hours under the relevant provisions of the planning approval, additional mitigation measures described in Appendix C will be implemented.

11.2 Construction Noise & Vibration Monitoring Program

Conditions C9 - C17 specify in detail requirements for monitoring. These matters are addressed in the following sections. CNVMP references to demonstrate compliance with individual/specific Conditions are included in Appendix D. Appendix C and the CNVIS in Appendix F will inform the most impacted receivers that trigger monitoring requirements.

The Construction Noise and Vibration Monitoring Guideline in the Sydney Metro CNVS sets out the requirements for:

- Operator attended monitoring (short-term)
- Continuous, unattended monitoring (including real-time monitoring)

This construction noise and vibration monitoring program will apply for the duration of works that pose a risk of exceeding set criteria. Monitoring is not required where activities to be undertaken do not pose risk of exceeding set criteria from the project planning approval.

The Construction Noise and Vibration Monitoring Program results related to station construction will be submitted to the EPA and relevant Councils, as required by CSSI Condition C9(a).

Noise and vibration monitoring will be undertaken to verify compliance with the noise and vibration objectives and/or the predicted levels in the relevant CNVIS's.

11.2.1 Baseline Noise Monitoring Data

Baseline noise monitoring data was reported in the CSSI EIS. Near the Victoria Cross worksites, ambient noise measurements were undertaken at two noise monitoring locations (VCS - 81 Berry Street and VCN - (237 Miller Street). A summary of the noise monitoring results at these locations is provided in Table 7-1. No further baseline data is required to be obtained.

11.2.2 Attended Airborne Noise Monitoring in the Community

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

- As described in this CNVMP to ensure that noise and vibration levels in the adjacent community remain consistent with the requirements of the project planning approval conditions. Attended monitoring will be completed during each work stage, to ensure appropriate management measures are implemented for the corresponding works.
- Where appropriate in response to a noise related complaint(s) (determined on a case-by-case basis).

Attended monitoring will be undertaken at a location representative of the most affected noise sensitive receiver(s) in proximity to construction activities. Noise monitoring locations will consider factors including:

- The location of previous monitoring sites;
- The proximity of the receiver to the Project works area;
- The sensitivity of the receiver to noise;
- Background noise levels;
- The expected duration of the impact.

Subject to site conditions, attended noise monitoring will be undertaken at the representative locations identified in Table 11-3 to verify predictions and ensure suitable management measures are in place. Depending on the

locations of works, the monitoring locations identified may be varied based on work locations and receivers.

Table 11-3 Attended Monitoring Locations

Victoria Cross Site	Receiver ID	Receiver Address	Monitoring Location
VCN	N21b	243 Miller Street	Within Rear Yard of Property
VCN	N12	237 Miller Street	Footpath on Miller Street
VCS	S11b	105 Miller Street (MLC)	Footpath on Miller Street
VCS	S08b	65 Berry Street	Footpath on Berry Street

Note: In case of access issues, monitoring to be or undertaken at representative location within publicly accessible area such as on the public footpath. Depending on the locations of works, the monitoring locations identified may be varied based on work locations and receivers.

Monitoring may also be undertaken in response to a complaint. Where any investigation identifies works or activities being undertaken on the subject worksite as the likely source of the complaint, the proponent must offer to undertake attended noise or vibration monitoring at the complainant's premises. 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.

Where noise monitoring indicates that the activity, work or combination of simultaneous activities or works has caused or is causing noise or vibration levels higher than the predicted levels at any noise sensitive receiver, Lendlease must review and where possible, modify the work or activity to prevent any recurrence.

Records of community enquiries and complaints, and the Lendlease's response will be managed via the project Community Communications Strategy.

11.2.3 Parameters to be Monitored

As a minimum, when assessing construction noise levels, the $L_{Aeq,15min}$ and L_{Amax} (fast response) shall be measured and reported.

As a minimum, when assessing construction noise levels, the Peak Particle Velocity - PPV (mm/s) in three orthogonal directions will be simultaneously measured.

11.2.4 Plant & Equipment Noise

Regular inspection of each item of plant will include listening for excessive noise from sources such as poorly performing mufflers, loose engine cowling and moving parts needing lubrication. Plant maintenance records to be checked where excessive noise production is identified.

If subjective evaluation indicates excessive noise from any plant item(s), subject to safety, plant noise measurements shall be undertaken to confirm plant noise levels do not exceed the maximum permissible levels allowable, as set out in Table 11 of the Metro CNVS. If attended noise monitoring demonstrates exceedance of the maximum allowable plant noise level(s), corrective actions are to be identified to eliminate excessive noise and these are to be implemented as soon as practicable.

11.2.5 Attended Groundborne Noise Monitoring in the Community

Attended monitoring of groundborne construction noise levels will be undertaken, where appropriate, in

response to a noise related complaint(s) (determined on a case-by-case basis).

Monitoring will 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. Note that the room selected for noise monitoring should be well shielded from airborne noise intrusions, such as road traffic noise, to allow the groundborne 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 and vibration, who is familiar with the requirements of the relevant standards and procedures.

11.2.6 Real-Time (Unattended) Noise Monitoring

Real-time (unattended) noise monitoring will be undertaken to satisfy Condition C11.

Real-time noise monitors were deployed prior to 'high risk' activities commencing, at 243 Miller Street and 65 Berry Street to manage noise impacts from 'high risk' activities, where there was likely to be a high risk of annoyance from construction noise. The monitors were installed by a suitable qualified person.

The locations of the noise monitors may be varied (as required) according to the current stage of the works so that the measurement locations accurately represent areas of the buildings with the highest potential noise impacts.

A secure website will be established for data storage for the duration of monitored station construction activities and real-time monitoring data will be made available to Lendlease, Sydney Metro, ER, AA, EPA and DPE.

Real-time noise monitoring commenced at the initial stages of the works and remain in place, however this may be reassessed based on ongoing compliance with project criteria and the nature of works remaining to be completed. Where activities being undertaken do not pose risk of exceeding set criteria from the project planning approval, real-time monitoring may be ceased.

11.2.7 Attended Vibration Monitoring

Attended vibration monitoring is to be undertaken at commencement of operation for each plant or activity on site, which has potential to generate significant vibration levels, where the vibration screening criteria is likely to be exceeded. Exceedance of the vibration screening criteria is not anticipated as part of the VCISD project; however, monitoring will be undertaken for station construction activities as required.

11.2.8 Real-Time (Unattended) Vibration Monitoring

Real-time (unattended) vibration monitoring is being undertaken to satisfy CSSI 7400 Condition C11. Real-time vibration monitors were deployed prior to the commencement of 'high risk' activities commencing, at 243 Miller Street and 65 Berry Street to manage vibration impacts from 'high risk' activities, where there was likely to be a high risk of annoyance (or potential building damage) from construction vibration or prolonged exceedance of set criteria. Where activities being undertaken do not pose risk of exceeding set criteria from the project planning approval, real-time monitoring may be ceased, following consultation with the AA.

The position of monitors may be varied as required, according to the current stage of the works and whether the key risk is associated with cosmetic building damage (normally measured at a position near the building foundations) or human comfort (at positions where staff are impacted).

The real-time monitoring data for station construction will be made available to Lendlease, Sydney Metro, ER, AA, EPA and DPE.

It is anticipated that real-time vibration monitoring will be in place from the commencement of project works

and remain in place for detailed excavation works, as these works have the highest potential to cause vibration impacts, after which the real-time monitors may be removed. However, this may be reassessed, in consultation with the AA, based on ongoing compliance with project criteria and the nature of works remaining to be completed.

11.2.9 Heritage-Listed Structures

Section 9.1.5 identifies local heritage listed structures, none of which have been assessed as being structurally unsound and therefore are not considered particularly vibration sensitive on account of their heritage classifications. Section 9.3.1 outlines predicted vibration levels on adjacent structures. Forecast vibration levels are far lower than any threshold or criteria for commercial buildings, or for that matter heritage items. As such, no specific vibration monitoring of heritage structures is proposed.

In the event measurements become necessary (e.g. complaints), Lendlease would seek the advice of a Heritage consultant on methods and locations for installing equipment used for vibration monitoring of heritage-listed structures as required.

Where an exceedance of the vibration screening criterion is identified, the responsible works will cease, and the corresponding methodology will be reviewed and reassessed before recommencing works.

11.2.10 Continual Improvement & Corrective Action

Where:

- Monitored ambient noise levels or vibration levels are above modelling predictions; or
- Two or more complaints are received and found to result from the activity, work or combination of simultaneous activities or works

Lendlease 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.

Application of the Sydney Metro CNVS Additional Mitigation Measures is outlined in Section 11.1 and Appendix C.

The ongoing risk assessment processes set out in the VCISD EHS Management Plan will inform any changes that may be needed to noise and vibration management measures detailed within this CNVMP. An Impacts & Hazards Risk Assessment (IHRA) was completed prior to commencement of the construction and is updated regularly, including noise and vibration aspects. The risk assessment will include any open or unresolved risks that require management in the construction stages of that were identified during design reviews. The completion of the IHRA is conducted in accordance with the methodology outlined in the LLB EHS Risk Management Procedure, which requires all key risks rated as moderate or greater specific to the project to be included in the IHRA. To ensure the IHRA remains current it will be reviewed:

- during project coordination meetings when reviewing the next 4-6 weeks of activities; and
- at maximum six (6) week intervals during Project Review Meetings.

Should additional mitigation measures be identified during the IHRA process, this CNVMP will be reviewed and amended as required in consultation with the AA, ER and, where required, DPE.

11.2.11 Consultation & Documentation

CSSI Condition C9(a) requires the Construction Noise and Vibration Monitoring Program to be developed in consultation with EPA and North Sydney Council. This monitoring program, as a part of the Construction Noise and Vibration Management Plan, was issued to both EPA and North Sydney Council for consultation during its preparation. A record of this consultation is set out in Appendix E.

11.2.12 Reporting

The results of noise and vibration monitoring in relation to CSSI 7400 works shall be documented in a 6 monthly construction noise and vibration monitoring report and submitted to the Secretary for information after AA endorsement. The 6 monthly reports shall contain:

- Details of the type of monitoring completed and a brief statement of the measurement method;
- Relevant noise and vibration planning approval conditions and management objectives;
- Monitoring equipment specifications and locations;
- Description of works, construction equipment, and nearest affected sensitive receivers;
- Unattended & attended monitoring results;
- Identification of any non-compliances against noise and vibration planning approval conditions and management objectives, including reasons for any identified non-compliances and strategies for minimising further occurrence of identified non-compliances.

11.2.13 Emergency Works

Lendlease shall conform with the notification requirements in the event of any emergency work requirements, as follows:

CSSI 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.*

SSD D6:

> *Notification of such activities must be given to affected residents before undertaking the activities* [Condition D5] *or as soon as is practical afterwards.*

12 CONCLUSION

Wilkinson Murray Pty Limited (WM) has been engaged by Lendlease (LL) to prepare a Construction Noise and Vibration Impact Statement and Management Plan (CNVIS & MP) for the Victoria Cross Integrated Station Development (ISD), which forms part of the Sydney Metro City & Southwest – Chatswood to Sydenham project, and Over Station Development (OSD).

Primarily, this document has been prepared to fulfill the requirements of the Critical State Significant Infrastructure (CSSI) Approval Condition C3(a) that requires a Construction Noise and Vibration Management Plan (CNVMP), Condition C9(a) that requires a Construction Noise and Vibration Monitoring Program and Condition E33 that requires preparation of Construction Noise and Vibration Impact Statements. This CNVMP forms part of the Construction Environmental Management Plan (CEMP), or equivalent document, in accordance with the Sydney Metro Construction Environmental Management Framework (CEMF).

Additionally, this document has been prepared to fulfill the requirements of the State Significant Development (SSD) 10294 Approval Condition B45 that requires a Construction Noise and Vibration Management Plan (CNVMP).

This assessment has been undertaken in accordance with the provisions of the NSW *Interim Construction Noise Guideline* – (ICNG), the *Sydney Metro City and Southwest Construction Noise & Vibration Strategy (Ver 0.4, 9 August 2017)* – (CNVS) and relevant Conditions of Approval (as set out in the Department of Planning and Environment's *Critical State Significant Infrastructure Sydney Metro City & Southwest Chatswood to Sydenham Conditions of Approval – SSI 15_7400*, dated 2017, including modifications up to *CSSI 7400 MOD9,* determined 30 June 2022.

It is expected that noise and vibration impacts can be effectively managed. The key conclusions are as follows:

- Construction traffic noise is expected to be no more than 2dB above current traffic noise levels.
- Construction vibration is expected to comply with human comfort values nominated in this assessment and on this basis the risk of building damage (even cosmetic) is negligible to all building structures including heritage.
- Groundborne noise is expected to exceed criteria at a limited number of receivers. These exceedances may be generally managed with Letterbox Notifications, with additional mitigation potentially required for Channel 9.
- Airborne noise is expected exceed criteria at several receivers, however, no specific additional mitigation measures are required for residential receivers within standard hours. Exceedances at non-residential receivers, or exceedances at residential receivers outside standard hours, may be managed with Letterbox Notifications and Monitoring.
- Based on the findings of the assessment within this CNVMP, Lendlease has undertaken specific consultation on noise and vibration management and respites with the following receivers prior to construction noise and vibration impacts commencing:
    - 1 Dension Street, North Sydney – Channel 9
    - 176 Walker Street, North Sydney – Wenona School
    - 128 Miller Street, North Sydney – Monte Sant' Angelo College
    - 243 Miller Street, North Sydney – Residence

APPENDIX A

CONSTRUCTION STAGING PLANS

Deliveries

Semi Trailers and Rigid Trucks

Concrete Works

Truck mounted concrete pump and concrete agitator truck

Excavation

1 x small piling rig
1 x 20t Excavator working with Rock hammers

Legend

- Project Boundary
- A-Class Hoarding 2.4m
- Site Fencing
- B-Class Hoarding
- Workzone

S01 S02 S03 S04 S05 S06 S07 S08 S10 S11 S12 S13 S14

5170 8180 8650 7945 2695 9305 9000 9000 9000 9000 9000 9000 5390

TC1

Hoist

Hoist moving between Street Level and B6 (approx 30m)

Crane

Electric Crane machine deck approx 40m above street level

Excavation

3 x 33t Excavator working with Rock hammers
and

1 x 20t Excavator

Deliveries

Rigid Trucks hand upload only

RAG & FAMISH

50 BERRY STREET

56 BERRY STREET

CAFE

COLONNADE

MLC BUILDING

Denison Street Stormwater

Excavation and Loading etc in stromwork zone

20t Excvator
Truck (no dog)

STAGE 1 - Site Establishment
Feb-21 to Apr-21

-TC1 crane footing and crane erection
- Work zone establishments including: concrete cross overs, sheds, hoardings, site fencing etc.
- Denison St Stormwater works commence
- Detailed excavation and load out commence Miller and Denison
- Concrete Footings commence

Location:
Excavation approx 30m down from Street Level
Street Level works as marked up (Denison Street approx RL 60, Miller Street approx RL 63)

Plant and Equipment:
Excavators, Tower Crane, trucks, concrete pump, Personal hoists

Deliveries

Semi Trailers and Rigid Trucks

Concrete Works

Truck mounted concrete pump and concrete agitator truck concrete Placing booms within the site footprint

Legend

- Project Boundary
- A-Class Hoarding 2.4m
- Site Fencing
- B-Class Hoarding
- Workzone

S01 S02 S03 S04 S05 S06 S07 S08 S10 S11 S12 S13 S14

5170 8180 8650 7945 2695 9305 9000 9000 9000 9000 5390

TC1

Hoist

Hoist moving between Street Level and B6 (approx 30m)

Excavation

3 x 33t Excavator workgin with Rock hammers

Crane

Electric Crane machine deck approx 40m above street level

Super Structure Works

Concrete frame work beginning in this half of project approx 25m down from street level.

TC4

TC3

Deliveries

Semi Trailers and Rigid Trucks Deliveries

Denison Street Stormwater

Excavation and Loading etc in stromwork zone

20t Excvator Truck (no dog)

RAG & FAMISH

50 BERRY STREET

56 BERRY STREET

65 BERRY STREET

BERRY STREET

CAFE

COLONNADE

MLC BUILDING

STAGE 2

May-21 to Jul-21

- Denison St Stormwater works complete and work zone established
- Detailed excavation and load out complete
- Station Concrete frame/Super Structure commences

Location:
Works inside the station and at street Level

Plant and Equipment:
Excavators, Tower Crane, trucks, concrete pump, Personal hoists

Legend

- Project Boundary
- A-Class Hoarding 2.4m
- Site Fencing
- B-Class Hoarding
- Workzone

Deliveries

Semi Trailers and Rigid Trucks

Concrete Works

Truck mounted concrete pump and concrete agitator truck concrete Placing booms within the site footprint

Hoist

Hoist moving between Street Level and B6 (approx 30m)

Crane

Electric Crane machine deck approx 40m above street level

Super Structure Works

Concrete frame work ongoing though out full project footprint

Location street level to approx 25m below street level

Deliveries

Semi Trailers and Rigid Trucks Deliveries

Deliveries

Semi Trailers and Rigid Trucks

Concrete Works

Truck mounted concrete pump and concrete agitator truck

STAGE 3

Aug -21 to Oct-21

- Station Concrete frame ongoing below GL

Location:
Works inside the station and at street Level

Plant and Equipment:
Tower Crane, trucks, concrete pump, Personal hoists

Legend

- Project Boundary
- A-Class Hoarding 2.4m
- Site Fencing
- B-Class Hoarding
- Workzone

Deliveries

Semi Trailers and Rigid Trucks

Concrete Works

Truck mounted concrete pump and concrete agitator truck concrete Placing booms within the site footprint

Hoist

Hoist moving between Street Level and B6 (approx 30m)

Crane

Electric Crane machine deck approx 40m above street level

Super Structure Works

Concrete frame work ongoing though out full project footprint

Street Level to approx 35m up

Deliveries

Semi Trailers and Rigid Trucks Deliveries

Concrete Works

Truck mounted concrete pump and concrete agitator truck

Deliveries

Semi Trailers and Rigid Trucks

STAGE 4
Nov-21 to Apr-22

- Station Concrete frame ongoing below GL
- Station Fit out work commence Below GL
- Station Concrete frame commence above GL

Location:
Works inside the station, street Level and up to level 4

Plant and Equipment:
Tower Crane, trucks, concrete pump, Personal hoists

Deliveries

Semi Trailers and Rigid Trucks

Concrete Works

Truck mounted concrete pump and concrete agitator truck concrete Placing booms within the site footprint

Legend

- Project Boundary
- A-Class Hoarding 2.4m
- Site Fencing
- B-Class Hoarding
- Workzone

S01 S02 S03 S04 S05 S06 S07 S08 S10 S11 S12 S13 S14

5170 8180 8650 7945 2695 9305 9000 9000 9000 9000 5390

TC1

Hoist

Hoist moving between Street Level and B6 (approx 30m)

Crane

Electric Crane machine deck approx 40m above street level

Super Structure Works (OSD)

Concrete frame work ongoing moving into tower construction.

Approx 35 m from street level up to 200m

TC4

TC3

Deliveries

Semi Trailers and Rigid Trucks Deliveries

Deliveries

Semi Trailers and Rigid Trucks

Concrete Works

Truck mounted concrete pump and concrete agitator truck

STAGE 5

May-22 to Jul-22

- Station Concrete frame below GL complete
- Station Fit out work continue
- Station Concrete frame above GL continue
- Station Facade install commence
- OSD Concrete Frame commence (above Lv4)

Location:
Works inside the station, street level and above level 4

Plant and Equipment:
Tower Crane, trucks, concrete pump, Personal hoists. mobile cranes

CAFE

COLONNADE

MLC BUILDING

RAG & FAMISH

50 BERRY STREET

BERRY STREET

56 BERRY STREET

Stormwater Works

Excavator and Truck

Deliveries

Semi Trailers and Rigid Trucks
Semi when no concrete being poured

Concrete Works

Truck mounted concrete pump and concrete agitator truck concrete Placing booms within the site footprint

Legend

- Project Boundary
- A-Class Hoarding 2.4m
- Site Fencing
- B-Class Hoarding
- Workzone

MILLER STREET

S01 S02 S03 S04 S05 S06 S07 S08 S09 S11 S12 S13 S14

5170 8180 8650 7945 2695 9305 9000 9000 9000 9000 9000 9000 5390

TC1

TC4

SINGLE STOREY CAFE

COLONNADE

MLC BUILDING

RAG & FARMISH

50 BERRY STREET

56 BERRY STREET

BERRY STREET

Crane (stage 2)

Electric Crane machine deck moving up the tower as OSD proceeds

Super Structure Works (OSD)

Concrete frame work ongoing moving into tower construction.

Approx 35 m from street level up to 200m

OSD Lowrise Structure ongoing

Deliveries

Semi Trailers and Rigid Trucks Deliveries

Hoist

Servicing from Street Level up the tower

Concrete Works

Note Denison Street Concrete works moved within basement

Deliveries

Semi Trailers and Rigid Trucks

STAGE 6

Aug-22 to Apr -23

- Station Concrete frame infills
- Station Fit out work continue
- Station Facade install ongoing
- Miller Street Stormwater works commence
- OSD Concrete Frame works ongoing
- OSD Facade and Finishes commence Oct 22

Location:

Works inside the station, street level and above level 4

Plant and Equipment:

Tower Crane, trucks, concrete pump, Personal hoists. mobile cranes

Legend

- Project Boundary
- A-Class Hoarding 2.4m
- Site Fencing
- B-Class Hoarding
- Workzone

MILLER STREET

S01 S02 S03 S04 S05 S06 S07 S08 S09 S10 S11 S12 S13 S14

5170 8180 8650 7945 2695 9305 9000 9000 9000 9000 9000 9000 5390

TC1

TC4

Crane (stage 2)

Electric Crane machine deck moving up the tower as OSD proceeds

OSD Midrise Structure ongoing

Deliveries

Semi Trailers and Rigid Trucks Deliveries

Hoist

Servicing from Street Level up the tower

Deliveries

Rigid Trucks and concrete Pumping via basement

SINGLE STOREY CAFE

COLONNADE

MLC BUILDING

RAG & FAMISH

50 BERRY STREET

56 BERRY STREET

BERRY STREET

5R1 709 710

STAGE 7

May-23 to Nov-23

- Station handed to Metro for commissioning works May 23
- OSD Concrete Frame works completed Oct 23
- OSD Facade complete Nov 23

Location:

Works above level 4 (note delivery at street level)

Plant and Equipment:

Tower Crane, trucks, concrete pump, Personal hoists. mobile cranes

Legend

- Project Boundary
- A-Class Hoarding 2.4m
- Site Fencing
- B-Class Hoarding
- Workzone

MILLER STREET

S01 S02 S03 S04 S05 S06 S07 S08 S09 S10 S11 S12 S13 S14

5170 8180 8650 7945 2695 9305 9000 9000 9000 9000 9000 9000 5390

TC1

Crane (stage 3)

1 crane removed 1 still servicing tower

OSD Midrise Structure ongoing

Deliveries

Semi Trailers and Rigid Trucks Deliveries

Hoist

Servicing from Street Level up the tower

Deliveries

Rigid Trucks and concrete Pumping via basement

SINGLE STOREY CAFE

COLONNADE

MLC BUILDING

RAG & FAMISH

50 BERRY STREET

BERRY STREET

56 BERRY STREET

STAGE 8

Dec 23 to Feb-24

- Station open for operation Dec 23
- OSD Finishes and commissioning
- Public domain works under-way

Location:
Works above level 4 (note delivery at street level)

Plant and Equipment:
Tower Crane, trucks, Personal hoists

Legend

- Project Boundary
- A-Class Hoarding 2.4m
- Site Fencing
- B-Class Hoarding
- Workzone

MILLER STREET

S01 S02 S03 S04 S05 S06 S07 S08 S09 S10 S11 S12 S13 S14

5170 8180 8650 7945 2695 9305 9000 9000 9000 9000 9000 9000 5390

SINGLE STOREY CAFE

COLONNADE

MLC BUILDING

RAG & FAMISH

50 BERRY STREET

65 BERRY STREET

56 BERRY STREET

BERRY STREET

DENISON STREET ENTRY

Finishes to last OSD floors ongoing

STAGE 9

Mar-24 (Nett)

- Works completed

STAGE 1 - Site Establishment
Feb-21 to Mar-21

-TC5 crane footing and crane erection
- Work zone establishments including: concrete cross overs, sheds, hoardings, site fencing etc.
- Detailed excavation and load out commence

Location:
Works inside the shaft and at Ground Level over entire site
Ground Level is between RL70 to RL80 AHD

Plant and Equipment:
Excavators, Tower Crane, trucks, concrete pump, hoists, Forklift, Mobile Cranes

Legend

- Project Boundary
- A-Class Hoarding
- Site Fencing
- Turnstiles
- B-Class Hoarding
- TSE Stair
- Hanging Stretcher Stair
- Stretcher Stair
- Temporary Personnel Hoist
- Alimak
- FRP Works in Progress
- Workzone
- Traffic Controller
- Excavation Zone
- TC5 — Tower Crane
- Concrete Placing Boom
- Perimeter Scaffold
- Weatherproof access
- 50t Mobile Crane
- 20t Excavator.

Class A Hoarding Height is min. 2.1m

SHAFT EXCAVATION

Small Diesel Forklift - Manitou MC25 or similar

TC5

SITE ACCOM.

Mobile Crane - Liebherr LTM1050 or simlar

Trucks per day
a) Standard Heavy Vehicles up to 3 per hour for crane unload/load.
b) Potential for 1-2 concrete trucks per day at this stage

STAGE 2 - Detailed Excavation and Footings
Mar-21 to Apr-21

- McLaren St Worksite used for loadout of excavation spoil
- Detailed excavation continues in shaft
- Concrete Pour of footings and pits in shaft

Location:
Works at base of excavation only and at Ground Level
Base of Excavation is RL32
Ground Level is RL 70-RL80

Plant and Equipment:
Excavators, Tower Cranes, trucks, concrete pumps, compressors, hoists, forklifts, mobile cranes

20T Excavator with up to 100T rock breaker and excavating to a depth of 2m below MCO - approx RL30

FOUNDATIONS

Twin Alimak Scando 650 mid speed

TC5

TC5 is an electric Jaso J438
Based of ground level at RL76, the top of the motor/winch sits at RL111 and the maximum height of the jib is RL162

SITE ACCOM.

Trucks per day
a) Standard Heavy Vehicles up to 3 per hour for crane unload/load.
b) Concrete trucks will be up to 6 per hour

Legend

- Project Boundary
- A-Class Hoarding
- Site Fencing
- Turnstiles
- B-Class Hoarding
- TSE Stair
- Hanging Stretcher Stair
- Stretcher Stair
- Temporary Personnel Hoist
- Alimak
- FRP Works in Progress
- Workzone
- Traffic Controller
- Excavation Zone
- Tower Crane (TC5)
- Concrete Placing Boom
- Perimeter Scaffold
- Weatherproof access
- 50t Mobile Crane
- 20t Excavator.

STAGE 3 - Superstructure B11 - L00
APR-21 to SEP-21

- Formwork Systems Established
- Concrete Structure works commence
- Increased tower crane, concrete pumping and hoist use

Location:
Works inside the shaft and at street Level
Shaft Works from RL32 to RL70
Ground Level is RL 70-RL80

Plant and Equipment:
Tower Cranes, trucks, concrete pumps, compressors, hoists, forklifts, mobile cranes

Legend
- Project Boundary
- A-Class Hoarding
- Site Fencing
- Turnstiles
- B-Class Hoarding
- TSE Stair
- Hanging Stretcher Stair
- Stretcher Stair
- Temporary Personnel Hoist
- Alimak
- FRP Works in Progress
- Workzone
- Traffic Controller
- Excavation Zone
- Tower Crane (TC5)
- Concrete Placing Boom
- Perimeter Scaffold
- Weatherproof access
- 50t Mobile Crane
- 20t Excavator.

Concrete Pump
Stationary pump and Truck mounted boom pumps in use up to maximum sizes ex 50m Putzmeister BSF 51Z

Trucks per day
a) Standard Heavy Vehicles up to 3 per hour for crane unload/load.
b) Concrete trucks will be up to 6 per hour

STRUCTURE BUILD

TC5

SITE ACCOM.

STREET

MCLAREN

STAGE 4 - Above Ground Structure L00-L04 Roof

SEP-21 to FEB-22

- Above Ground Concrete Structure works commence
- Perimeter scaffold and B class hoarding on Mclaren St Erected

Location:
Works from Street Level up to L4 Roof RL104

Plant and Equipment:
Tower Cranes, trucks, concrete pumps, compressors, hoists, forklifts, mobile cranes

Additional works in cavern and materials loading using tower crane and hoist

Legend

- Project Boundary
- A-Class Hoarding
- Site Fencing
- Turnstiles
- B-Class Hoarding
- TSE Stair
- Hanging Stretcher Stair
- Stretcher Stair
- Temporary Personnel Hoist
- Alimak
- FRP Works in Progress
- Workzone
- Traffic Controller
- Excavation Zone
- TC5 — Tower Crane
- Concrete Placing Boom
- Perimeter Scaffold
- Weatherproof access
- 50t Mobile Crane
- 20t Excavator.

STRUCTURE BUILD

TC5

SITE ACCOM.

STREET

MCLAREN

Trucks per day

a) Standard Heavy Vehicles up to 3 per hour for crane unload/load.
b) Concrete trucks will be up to 6 per hour

STAGE 5 - Facade and Internal Finishes

FEB-22 to JUL-22

- External Facade Works using full perimeter scaffold
- Twin Hoist dismantled - internal builders lift in operation

Location:
Works from Street Level up to L4 Roof RL 104

Plant and Equipment:
Tower Cranes, trucks, forklifts, mobile cranes, Concrete Trucks and Pumps, Internal Elevator

Legend

- Project Boundary
- A-Class Hoarding
- Site Fencing
- Turnstiles
- B-Class Hoarding
- TSE Stair
- Hanging Stretcher Stair
- Stretcher Stair
- Temporary Personnel Hoist
- Alimak
- FRP Works in Progress
- Workzone
- Traffic Controller
- Excavation Zone
- Tower Crane (TC5)
- Concrete Placing Boom
- Perimeter Scaffold
- Weatherproof access
- 50t Mobile Crane
- 20t Excavator.

STRUCTURE COMPLETE

Internal Builders Lift

Mobile Crane 250T
Liebherr LTM 1250

TC5

SITE ACCOM.

Trucks per day
a) Standard Heavy Vehicles up to 3 per hour for crane unload/load (deliveries and spoil removal)
b) No concrete trucks

STREET

MCLAREN

STAGE 6 - Public Realm Works
JUL-22 to NOV-22

- Scaffold and hoarding removed
- Tower crane removed

Location:
Street level on Miller and McLaren St including footpath
RL70-RL80

Plant and Equipment:
Excavators, Mobile Cranes, Trucks, Concrete Trucks and Pumps

20T excavator
(no rockbreaking)

Mobile Crane
Liebherr LTM 1050

Trucks per day
a) Standard Heavy Vehicles up to 3 per hour for crane unload/load (deliveries and spoil removal)
b) Minimal concrete trucks and no pumps

SITE ACCOM.

STREET

MCLAREN

Legend

- Project Boundary
- A-Class Hoarding
- Site Fencing
- Turnstiles
- B-Class Hoarding
- TSE Stair
- Hanging Stretcher Stair
- Stretcher Stair
- Temporary Personnel Hoist
- Alimak
- FRP Works in Progress
- Workzone
- Traffic Controller
- Excavation Zone
- TC5 Tower Crane
- Concrete Placing Boom
- Perimeter Scaffold
- Weatherproof access
- 50t Mobile Crane
- 20t Excavator.

STAGE 7 - Regrading Adjacent Property.
NOV-22 to AUG 23 Completion

- All Plant and materials removed from Station Site
- Demobilisation of site amenities
- Removal of concrete hardstand and roadway
- Hoardings and fences remain until completion

Location:
Ground level on McLaren Street Worksite

Plant and Equipment:
Excavators, Trucks, Rock Breakers,

Legend

- Project Boundary
- A-Class Hoarding
- Site Fencing
- Turnstiles
- B-Class Hoarding
- TSE Stair
- Hanging Stretcher Stair
- Stretcher Stair
- Temporary Personnel Hoist
- Alimak
- FRP Works in Progress
- Workzone
- Traffic Controller
- Excavation Zone
- Tower Crane (TC5)
- Concrete Placing Boom
- Perimeter Scaffold
- Weatherproof access
- 50t Mobile Crane
- 20t Excavator.

20T excavator w/ rockbreaker

Regraded Area

Trucks per day
a) Standard Heavy Vehicles up to 2 per hour for excavator load (deliveries and spoil removal)
b) Minimal concrete trucks and no pumps

APPENDIX B

CONSTRUCTION NOISE SOURCES

Site	Stage	Plant/Equipment	Location	Sound Power Level (Lw, dBA)		Octave Band Spectra (dB Linear)								
				($L_{Aeq,15min}$)	(L_{Amax})	31.5Hz	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
VCS	1	Concrete Pump	Refer Appendix A	104	113	107	107	104	99	100	99	98	92	87
		TC1 - Tower Crane	Refer Appendix A	100	106	99	99	100	102	98	95	88	87	77
		33T Excv - Hammer	Refer Appendix A	122 + 5 penalty	128	111	111	111	110	113	117	115	115	113
		33T Excv - Hammer	Refer Appendix A	122 + 5 penalty	128	111	111	111	110	113	117	115	115	113
		33T Excv - Hammer	Refer Appendix A	122 + 5 penalty	128	111	111	111	110	113	117	115	115	113
		20T Excv - Bucket	Refer Appendix A	105	114	107	107	110	103	100	99	97	97	90
		20T Excv - Bucket	Refer Appendix A	105	114	107	107	110	103	100	99	97	97	90
		20T Excv - Hammer	Refer Appendix A	120 + 5 penalty	129	109	109	109	108	111	115	113	113	111
		Concrete Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
		Semi Trailer or Rigid Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
		Semi Trailer or Rigid Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
		Semi Trailer or Rigid Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
		Semi Trailer or Rigid Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
VCS	2	Concrete Pump	Refer Appendix A	104	113	107	107	104	99	100	99	98	92	87
		TC1 - Tower Crane	Refer Appendix A	100	106	99	99	100	102	98	95	88	87	77
		TC3 - Tower Crane	Refer Appendix A	100	106	99	99	100	102	98	95	88	87	77
		TC4 - Tower Crane	Refer Appendix A	100	106	99	99	100	102	98	95	88	87	77
		33T Excv - Hammer	Refer Appendix A	122 + 5 penalty	128	111	111	111	110	113	117	115	115	113
		33T Excv - Hammer	Refer Appendix A	122 + 5 penalty	128	111	111	111	110	113	117	115	115	113
		33T Excv - Hammer	Refer Appendix A	122 + 5 penalty	128	111	111	111	110	113	117	115	115	113
		20T Excv - Bucket	Refer Appendix A	105	114	107	107	110	103	100	99	97	97	90
		Superstructure Works	Refer Appendix A	110	116	92	92	84	82	90	102	106	102	102
		Concrete Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
		Semi Trailer or Rigid Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
		Semi Trailer or Rigid Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
		Semi Trailer or Rigid Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
		Semi Trailer or Rigid Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
		Semi Trailer or Rigid Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86

Site	Stage	Plant/Equipment	Location	Sound Power Level (Lw, dBA)		Octave Band Spectra (dB Linear)								
				($L_{Aeq,15min}$)	(L_{Amax})	31.5Hz	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
VCS	3	Concrete Pump	Refer Appendix A	104	113	107	107	104	99	100	99	98	92	87
		Concrete Pump	Refer Appendix A	104	113	107	107	104	99	100	99	98	92	87
		TC1 - Tower Crane	Refer Appendix A	100	106	99	99	100	102	98	95	88	87	77
		TC3 - Tower Crane	Refer Appendix A	100	106	99	99	100	102	98	95	88	87	77
		TC4 - Tower Crane	Refer Appendix A	100	106	99	99	100	102	98	95	88	87	77
		Superstructure Works	Refer Appendix A	110	116	92	92	84	82	90	102	106	102	102
		Superstructure Works	Refer Appendix A	110	116	92	92	84	82	90	102	106	102	102
		Concrete Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
		Concrete Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
		Semi Trailer or Rigid Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
		Semi Trailer or Rigid Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
		Semi Trailer or Rigid Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
		Semi Trailer or Rigid Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
VCS	4	Concrete Pump	Refer Appendix A	104	113	107	107	104	99	100	99	98	92	87
		Concrete Pump	Refer Appendix A	104	113	107	107	104	99	100	99	98	92	87
		TC1 - Tower Crane	Refer Appendix A	100	106	99	99	100	102	98	95	88	87	77
		TC3 - Tower Crane	Refer Appendix A	100	106	99	99	100	102	98	95	88	87	77
		TC4 - Tower Crane	Refer Appendix A	100	106	99	99	100	102	98	95	88	87	77
		Superstructure Works	Refer Appendix A	110	116	92	92	84	82	90	102	106	102	102
		Superstructure Works	Refer Appendix A	110	116	92	92	84	82	90	102	106	102	102
		Concrete Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
		Concrete Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
		Semi Trailer or Rigid Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
		Semi Trailer or Rigid Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
		Semi Trailer or Rigid Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
		Semi Trailer or Rigid Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
VCS	5	Concrete Pump	Refer Appendix A	104	113	107	107	104	99	100	99	98	92	87
		Concrete Pump	Refer Appendix A	104	113	107	107	104	99	100	99	98	92	87
		TC1 - Tower Crane	Refer Appendix A	100	106	99	99	100	102	98	95	88	87	77

Site	Stage	Plant/Equipment	Location	Sound Power Level (Lw, dBA)		Octave Band Spectra (dB Linear)								
				($L_{Aeq,15min}$)	(L_{Amax})	31.5Hz	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
		TC3 - Tower Crane	Refer Appendix A	100	106	99	99	100	102	98	95	88	87	77
		TC4 - Tower Crane	Refer Appendix A	100	106	99	99	100	102	98	95	88	87	77
		Superstructure OSD - Stage 5 - West	Refer Appendix A	110	116	92	92	84	82	90	102	106	102	102
		Superstructure OSD - Stage 5 - South	Refer Appendix A	110	116	92	92	84	82	90	102	106	102	102
		Superstructure OSD - Stage 5 - East	Refer Appendix A	110	116	92	92	84	82	90	102	106	102	102
		Superstructure OSD - Stage 5 - North	Refer Appendix A	110	116	92	92	84	82	90	102	106	102	102
		Concrete Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
		Concrete Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
		Semi Trailer or Rigid Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
		Semi Trailer or Rigid Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
		Semi Trailer or Rigid Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
		Semi Trailer or Rigid Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
VCS	6	Concrete Pump	Refer Appendix A	104	113	107	107	104	99	100	99	98	92	87
		TC1 - Tower Crane	Refer Appendix A	100	106	99	99	100	102	98	95	88	87	77
		TC4 - Tower Crane	Refer Appendix A	100	106	99	99	100	102	98	95	88	87	77
		20 T Excavator - Bucket	Refer Appendix A	105	114	107	107	110	103	100	99	97	97	90
		Superstructure OSD Stage6 - North	Refer Appendix A	110	116	92	92	84	82	90	102	106	102	102
		Superstructure OSD Stage6 - East	Refer Appendix A	110	116	92	92	84	82	90	102	106	102	102
		Superstructure OSD Stage6 - South	Refer Appendix A	110	116	92	92	84	82	90	102	106	102	102
		Superstructure OSD Stage6 - West	Refer Appendix A	110	116	92	92	84	82	90	102	106	102	102
		Concrete Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
		Semi Trailer or Rigid Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
		Semi Trailer or Rigid Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
		Semi Trailer or Rigid Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
		Semi Trailer or Rigid Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
		Semi Trailer or Rigid Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
VCS	7	TC1 - Tower Crane	Refer Appendix A	100	106	99	99	100	102	98	95	88	87	77
		TC4 - Tower Crane	Refer Appendix A	100	106	99	99	100	102	98	95	88	87	77
		Superstructure OSD Stage7 - North	Refer Appendix A	110	116	92	92	84	82	90	102	106	102	102

Site	Stage	Plant/Equipment	Location	Sound Power Level (Lw, dBA)		Octave Band Spectra (dB Linear)								
				($L_{Aeq,15min}$)	(L_{Amax})	31.5Hz	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
		Superstructure OSD Stage7 - East	Refer Appendix A	110	116	92	92	84	82	90	102	106	102	102
		Superstructure OSD Stage7 - South	Refer Appendix A	110	116	92	92	84	82	90	102	106	102	102
		Superstructure OSD Stage7 - West	Refer Appendix A	110	116	92	92	84	82	90	102	106	102	102
		Semi Trailer or Rigid Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
		Semi Trailer or Rigid Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
		Semi Trailer or Rigid Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
VCS	8	TC1 - Tower Crane	Refer Appendix A	100	106	99	99	100	102	98	95	88	87	77
		Superstructure OSD Stage8 - West	Refer Appendix A	110	116	92	92	84	82	90	102	106	102	102
		Superstructure OSD Stage8 - South	Refer Appendix A	110	116	92	92	84	82	90	102	106	102	102
		Superstructure OSD Stage8 - East	Refer Appendix A	110	116	92	92	84	82	90	102	106	102	102
		Superstructure OSD Stage8 - North	Refer Appendix A	110	116	92	92	84	82	90	102	106	102	102
		Semi Trailer or Rigid Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
		Semi Trailer or Rigid Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
		Semi Trailer or Rigid Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
VCN	1	20 T Excv - Bucket	Refer Appendix A	105	114	107	107	110	103	100	99	97	97	90
		Forklift	Refer Appendix A	103	109	103	103	101	96	96	98	99	89	84
		Install Hoarding	Refer Appendix A	105	111	83	83	73	77	85	96	101	97	97
		Install Hoarding	Refer Appendix A	105	111	83	83	73	77	85	96	101	97	97
		Install Hoarding	Refer Appendix A	105	111	83	83	73	77	85	96	101	97	97
		Install Hoarding	Refer Appendix A	105	111	83	83	73	77	85	96	101	97	97
		Install Hoarding	Refer Appendix A	105	111	83	83	73	77	85	96	101	97	97
		Install Hoarding	Refer Appendix A	105	111	83	83	73	77	85	96	101	97	97
		Install Hoarding	Refer Appendix A	105	111	83	83	73	77	85	96	101	97	97
		Install Hoarding	Refer Appendix A	105	111	83	83	73	77	85	96	101	97	97
		Install Hoarding	Refer Appendix A	105	111	83	83	73	77	85	96	101	97	97
		Install Hoarding	Refer Appendix A	105	111	83	83	73	77	85	96	101	97	97
		Install Hoarding	Refer Appendix A	105	111	83	83	73	77	85	96	101	97	97
		50 T Mobile Crane	Refer Appendix A	100	106	100	100	98	93	93	95	96	86	81

Site	Stage	Plant/Equipment	Location	Sound Power Level (Lw, dBA)		Octave Band Spectra (dB Linear)								
				($L_{Aeq,15min}$)	(L_{Amax})	31.5Hz	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
VCN	2	Concrete Pump	Refer Appendix A	104	113	107	107	104	99	100	99	98	92	87
		TC5 - Tower Crane	Refer Appendix A	100	106	99	99	100	102	98	95	88	87	77
		20T Excv w Hammer	Refer Appendix A	120 + 5 penalty	129	109	109	109	108	111	115	113	113	111
		20T Excv w Hammer	Refer Appendix A	120 + 5 penalty	129	109	109	109	108	111	115	113	113	111
		Forklift	Refer Appendix A	103	106	103	103	101	96	96	98	99	89	84
		Concrete Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
		Concrete Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
VCN	3	Concrete Pump	Refer Appendix A	104	113	107	107	104	99	100	99	98	92	87
		TC5 - Tower Crane	Refer Appendix A	100	106	99	99	100	102	98	95	88	87	77
		Forklift	Refer Appendix A	103	109	103	103	101	96	96	98	99	89	84
		Superstructure	Refer Appendix A	110	116	92	92	84	82	90	102	106	102	102
		Concrete Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
		Concrete Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
VCN	4	Concrete Pump	Refer Appendix A	104	113	107	107	104	99	100	99	98	92	87
		TC5 - Tower Crane	Refer Appendix A	100	106	99	99	100	102	98	95	88	87	77
		Forklift	Refer Appendix A	103	109	103	103	101	96	96	98	99	89	84
		50 T Mobile Crane	Refer Appendix A	100	106	100	100	98	93	93	95	96	86	81
		Superstructure - Stage 4 - North	Refer Appendix A	110	116	92	92	84	82	90	102	106	102	102
		Superstructure - Stage 4 - West	Refer Appendix A	110	116	92	92	84	82	90	102	106	102	102
		Superstructure - Stage 4 - South	Refer Appendix A	110	116	92	92	84	82	90	102	106	102	102
		Superstructure - Stage 4 - East	Refer Appendix A	110	116	92	92	84	82	90	102	106	102	102
		Concrete Truck	Refer Appendix A	107	116	111	111	108	106	104	102	99	95	86
VCN	5	TC5 - Tower Crane	Refer Appendix A	100	106	99	99	100	102	98	95	88	87	77
		Forklift	Refer Appendix A	103	109	103	103	101	96	96	98	99	89	84
		50 T Mobile Crane	Refer Appendix A	100	106	100	100	98	93	93	95	96	86	81
		Superstructure - Stage 5 - North	Refer Appendix A	110	116	92	92	84	82	90	102	106	102	102
		Superstructure - Stage 5 - West	Refer Appendix A	110	116	92	92	84	82	90	102	106	102	102
		Superstructure - Stage 5 - South	Refer Appendix A	110	116	92	92	84	82	90	102	106	102	102
		Superstructure - Stage 5 - East	Refer Appendix A	110	116	92	92	84	82	90	102	106	102	102

Site	Stage	Plant/Equipment	Location	Sound Power Level (Lw, dBA)		Octave Band Spectra (dB Linear)								
				($L_{Aeq,15min}$)	(L_{Amax})	31.5Hz	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
VCN	6	20 T Excv - Bucket	Refer Appendix A	105	114	107	107	110	103	100	99	97	97	90
		Forklift	Refer Appendix A	103	109	103	103	101	96	96	98	99	89	84
		50 T Mobile Crane	Refer Appendix A	100	106	100	100	98	93	93	95	96	86	81
		Truck Idle	Refer Appendix A	100	106	104	104	101	99	97	95	92	88	79
		Truck Idle	Refer Appendix A	100	106	104	104	101	99	97	95	92	88	79
VCN	7	20T Excv - Bucket	Refer Appendix A	105	114	107	107	110	103	100	99	97	97	90
		20T Excv - Bucket	Refer Appendix A	105	114	107	107	110	103	100	99	97	97	90

APPENDIX C

CNVS ADDITIONAL MITIGATION MATRICIES

C 1 Standard Hours – Additional Mitigation Measures – Airborne Construction Noise – Residential Receivers

ID	Address	Land Use	RBL 5-7am	RBL Day	RBL Eve	RBL Night	VCN Stage 1	VCN Stage 2	VCN Stage 3	VCN Stage 4	VCN Stage 5	VCN Stage 6	VCN Stage 7	VCS Stage 1	VCS Stage 2	VCS Stage 3	VCS Stage 4	VCS Stage 5	VCS Stage 6	VCS Stage 7	VCS Stage 8
N03	27 McLaren St	Residential	58	65	57	51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N04	29 McLaren St	Residential	58	65	57	51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N06	196 Miller St	Comm/Res	58	65	57	51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N10	225 Miller St	Comm/Res	58	65	57	51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N11	231 Miller St	Comm/Res	58	65	57	51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N12	237 Miller St	Residential	58	65	57	51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N13	39 McLaren St	Residential	58	65	57	51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N15	45 McLaren St	Residential	58	65	57	51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N19	267 Miller St	Residential	58	65	57	51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N21a	243 Miller St	Comm/Res	58	65	57	51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N21b	243 Miller St	Residential	58	65	57	51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S10b	79-81 Berry St	Residential	59	65	63	52	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S15	100 Miller St	Comm/Res	59	65	63	52	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

C 2 Standard Hours – Additional Mitigation Measures – Cumulative Airborne Construction Noise – Residential Receivers

ID	Address	Land Use	RBL 5-7am	RBL Day	RBL Eve	RBL Night	A (VCS1 / VCN1)	B (VCS1 / VCN2 / VCN3)	C (VCS3 / VCN3 / VCN4)	D (VCS4 / VCN4 / VCN5)	E (VCS5 / VCN5 / VCN6)	F (VCS6 / VCN6 / VCN7)	G (VCS7 / VCN7)	H (VCS7)	I (VCS8)
N03	27 McLaren St	Residential	58	65	57	51	-	-	-	-	-	-	-	-	-
N04	29 McLaren St	Residential	58	65	57	51	-	-	-	-	-	-	-	-	-
N06	196 Miller St	Comm/Res	58	65	57	51	-	-	-	-	-	-	-	-	-
N10	225 Miller St	Comm/Res	58	65	57	51	-	-	-	-	-	-	-	-	-
N11	231 Miller St	Comm/Res	58	65	57	51	-	-	-	-	-	-	-	-	-
N12	237 Miller St	Residential	58	65	57	51	-	-	-	-	-	-	-	-	-
N13	39 McLaren St	Residential	58	65	57	51	-	-	-	-	-	-	-	-	-
N15	45 McLaren St	Residential	58	65	57	51	-	-	-	-	-	-	-	-	-
N19	267 Miller St	Residential	58	65	57	51	-	-	-	-	-	-	-	-	-
N21a	243 Miller St	Comm/Res	58	65	57	51	-	-	-	-	-	-	-	-	-
N21b	243 Miller St	Residential	58	65	57	51	-	-	-	-	-	-	-	-	-
S10b	79-81 Berry St	Residential	59	65	63	52	-	-	-	-	-	-	-	-	-
S15	100 Miller St	Comm/Res	59	65	63	52	-	-	-	-	-	-	-	-	-

C 3 Out of Hours Period 1 (Evening) – Additional Mitigation Measures – Airborne Construction Noise – Residential Receivers

ID	Address	Land Use	RBL 5-7am	RBL Day	RBL Eve	RBL Night	VCN Stage 1	VCN Stage 2	VCN Stage 3	VCN Stage 4	VCN Stage 5	VCN Stage 6	VCN Stage 7	VCS Stage 1	VCS Stage 2	VCS Stage 3	VCS Stage 4	VCS Stage 5	VCS Stage 6	VCS Stage 7	VCS Stage 8
N03	27 McLaren St	Residential	58	65	57	51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N04	29 McLaren St	Residential	58	65	57	51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N06	196 Miller St	Comm/Res	58	65	57	51	LB	-	-	LB	LB	-	-	-	-	-	-	-	-	-	-
N10	225 Miller St	Comm/Res	58	65	57	51	-	-	-	-	-	-	-	LB	-	-	-	-	-	-	-
N11	231 Miller St	Comm/Res	58	65	57	51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N12	237 Miller St	Residential	58	65	57	51	LB	LB	LB	LB	LB	-	-	-	-	-	-	-	-	-	-
N13	39 McLaren St	Residential	58	65	57	51	LB	LB	LB	LB	LB	-	-	-	-	-	-	-	-	-	-
N15	45 McLaren St	Residential	58	65	57	51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N19	267 Miller St	Residential	58	65	57	51	LB	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N21a	243 Miller St	Comm/Res	58	65	57	51	LB	LB	LB	LB	LB	LB	LB	-	-	-	-	-	-	-	-
N21b	243 Miller St	Residential	58	65	57	51	M, LB	M, LB	M, LB	M, LB	LB	M, LB	M, LB	-	-	-	-	-	-	-	-
S10b	79-81 Berry St	Residential	59	65	63	52	-	-	-	-	-	-	-	LB	LB	-	-	-	-	-	-
S15	100 Miller St	Comm/Res	59	65	63	52	-	-	-	-	-	-	-	LB	LB	-	-	-	-	-	-

C 4 Out of Hours Period 1 (Evening) – Additional Mitigation Measures – Cumulative Airborne Construction Noise – Residential Receivers

ID	Address	Land Use	RBL 5-7am	RBL Day	RBL Eve	RBL Night	A (VCS1 / VCN1)	B (VCS1 / VCN2 / VCN3)	C (VCS3 / VCN3 / VCN4)	D (VCS4 / VCN4 / VCN5)	E (VCS5 / VCN5 / VCN6)	F (VCS6 / VCN6 / VCN7)	G (VCS7 / VCN7)	H (VCS7)	I (VCS8)
N03	27 McLaren St	Residential	58	65	57	51	-	-	-	-	-	-	-	-	-
N04	29 McLaren St	Residential	58	65	57	51	-	-	-	-	-	-	-	-	-
N06	196 Miller St	Comm/Res	58	65	57	51	LB	LB	LB	LB	LB	-	-	-	-
N10	225 Miller St	Comm/Res	58	65	57	51	LB	LB	-	-	-	-	-	-	-
N11	231 Miller St	Comm/Res	58	65	57	51	-	-	-	-	-	-	-	-	-
N12	237 Miller St	Residential	58	65	57	51	LB	LB	LB	LB	LB	-	-	-	-
N13	39 McLaren St	Residential	58	65	57	51	LB	LB	LB	LB	LB	-	-	-	-
N15	45 McLaren St	Residential	58	65	57	51	-	-	-	-	-	-	-	-	-
N19	267 Miller St	Residential	58	65	57	51	LB	-	-	-	-	-	-	-	-
N21a	243 Miller St	Comm/Res	58	65	57	51	LB	LB	LB	LB	LB	LB	LB	-	-
N21b	243 Miller St	Residential	58	65	57	51	M, LB	M, LB	M, LB	M, LB	M, LB	M, LB	M, LB	-	-
S10b	79-81 Berry St	Residential	59	65	63	52	LB	LB	-	-	-	-	-	-	-
S15	100 Miller St	Comm/Res	59	65	63	52	LB	LB	-	-	-	-	-	-	-

C 5 Out of Hours Period 2 (Night) – Additional Mitigation Measures – Airborne Construction Noise – Residential Receivers

ID	Address	Land Use	RBL 5-7am	RBL Day	RBL Eve	RBL Night	VCN Stage 1	VCN Stage 2	VCN Stage 3	VCN Stage 4	VCN Stage 5	VCN Stage 6	VCN Stage 7	VCS Stage 1	VCS Stage 2	VCS Stage 3	VCS Stage 4	VCS Stage 5	VCS Stage 6	VCS Stage 7	VCS Stage 8
N03	27 McLaren St	Residential	58	65	57	51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N04	29 McLaren St	Residential	58	65	57	51	-	-	-	LB	LB	-	-	-	-	-	-	-	-	-	-
N06	196 Miller St	Comm/Res	58	65	57	51	LB	LB	LB	LB	LB	LB	-	-	-	-	-	-	-	-	-
N10	225 Miller St	Comm/Res	58	65	57	51	-	-	-	-	LB	-	-	LB	-	-	-	-	-	-	-
N11	231 Miller St	Comm/Res	58	65	57	51	LB	-	-	LB	LB	LB	-	LB	-	-	-	-	-	-	-
N12	237 Miller St	Residential	58	65	57	51	M, LB	LB	M, LB	M, LB	M, LB	LB	LB	-	-	-	-	-	-	-	-
N13	39 McLaren St	Residential	58	65	57	51	M, LB	M, LB	M, LB	M, LB	M, LB	LB	LB	-	-	-	-	-	-	-	-
N15	45 McLaren St	Residential	58	65	57	51	LB	LB	LB	LB	LB	-	-	-	-	-	-	-	-	-	-
N19	267 Miller St	Residential	58	65	57	51	LB	LB	LB	LB	LB	-	-	-	-	-	-	-	-	-	-
N21a	243 Miller St	Comm/Res	58	65	57	51	M, LB	LB	M, LB	M, LB	M, LB	LB	LB	-	-	-	-	-	-	-	-
N21b	243 Miller St	Residential	58	65	57	51	M, LB	M, LB	M, LB	M, LB	M, LB	M, LB	M, LB	-	-	-	-	-	-	-	-
S10b	79-81 Berry St	Residential	59	65	63	52	-	-	-	-	-	-	-	M, LB	M, LB	LB	LB	LB	LB	LB	LB
S15	100 Miller St	Comm/Res	59	65	63	52	-	-	-	-	-	-	-	M, LB	M, LB	LB	M, LB	LB	M, LB	LB	LB

C 6 Out of Hours Period 2 (Night) – Additional Mitigation Measures – Cumulative Airborne Construction Noise – Residential Receivers

ID	Address	Land Use	RBL 5-7am	RBL Day	RBL Eve	RBL Night	A (VCS1 / VCN1)	B (VCS1 / VCN2 / VCN3)	C (VCS3 / VCN3 / VCN4)	D (VCS4 / VCN4 / VCN5)	E (VCS5 / VCN5 / VCN6)	F (VCS6 / VCN6 / VCN7)	G (VCS7 / VCN7)	H (VCS7)	I (VCS8)
N03	27 McLaren St	Residential	58	65	57	51	-	-	-	-	LB	-	-	-	-
N04	29 McLaren St	Residential	58	65	57	51	-	-	LB	LB	LB	-	-	-	-
N06	196 Miller St	Comm/Res	58	65	57	51	LB	LB	LB	LB	LB	LB	-	-	-
N10	225 Miller St	Comm/Res	58	65	57	51	LB	LB	LB	LB	LB	-	-	-	-
N11	231 Miller St	Comm/Res	58	65	57	51	LB	LB	LB	LB	LB	LB	-	-	-
N12	237 Miller St	Residential	58	65	57	51	M, LB	M, LB	M, LB	M, LB	M, LB	LB	LB	-	-
N13	39 McLaren St	Residential	58	65	57	51	M, LB	M, LB	M, LB	M, LB	M, LB	LB	LB	-	-
N15	45 McLaren St	Residential	58	65	57	51	LB	LB	LB	LB	LB	-	LB	-	-
N19	267 Miller St	Residential	58	65	57	51	LB	LB	LB	LB	LB	-	-	-	-
N21a	243 Miller St	Comm/Res	58	65	57	51	M, LB	M, LB	M, LB	M, LB	M, LB	LB	LB	-	-
N21b	243 Miller St	Residential	58	65	57	51	M, LB	M, LB	M, LB	M, LB	M, LB	M, LB	M, LB	-	-
S10b	79-81 Berry St	Residential	59	65	63	52	M, LB	M, LB	LB	LB	LB	LB	LB	LB	LB
S15	100 Miller St	Comm/Res	59	65	63	52	M, LB	M, LB	LB	M, LB	LB	M, LB	LB	LB	LB

C 7 5am - 7am Shoulder Period (OOH Period 2) – Additional Mitigation Measures – Airborne Construction Noise – Residential Receivers

ID	Address	Land Use	RBL 5-7am	RBL Day	RBL Eve	RBL Night	VCN Stage 1	VCN Stage 2	VCN Stage 3	VCN Stage 4	VCN Stage 5	VCN Stage 6	VCN Stage 7	VCS Stage 1	VCS Stage 2	VCS Stage 3	VCS Stage 4	VCS Stage 5	VCS Stage 6	VCS Stage 7	VCS Stage 8
N03	27 McLaren St	Residential	58	65	57	51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N04	29 McLaren St	Residential	58	65	57	51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N06	196 Miller St	Comm/Res	58	65	57	51	-	-	-	LB	LB	-	-	-	-	-	-	-	-	-	-
N10	225 Miller St	Comm/Res	58	65	57	51	-	-	-	-	-	-	-	LB	-	-	-	-	-	-	-
N11	231 Miller St	Comm/Res	58	65	57	51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N12	237 Miller St	Residential	58	65	57	51	LB	LB	LB	LB	LB	-	-	-	-	-	-	-	-	-	-
N13	39 McLaren St	Residential	58	65	57	51	LB	LB	LB	LB	LB	-	-	-	-	-	-	-	-	-	-
N15	45 McLaren St	Residential	58	65	57	51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N19	267 Miller St	Residential	58	65	57	51	LB	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N21a	243 Miller St	Comm/Res	58	65	57	51	LB	-	LB	LB	LB	LB	LB	-	-	-	-	-	-	-	-
N21b	243 Miller St	Residential	58	65	57	51	M, LB	M, LB	M, LB	M, LB	LB	LB	M, LB	-	-	-	-	-	-	-	-
S10b	79-81 Berry St	Residential	59	65	63	52	-	-	-	-	-	-	-	M, LB	M, LB	LB	LB	LB	LB	LB	-
S15	100 Miller St	Comm/Res	59	65	63	52	-	-	-	-	-	-	-	M, LB	M, LB	LB	LB	LB	LB	-	-

C 8 5am - 7am Shoulder Period (OOH Period 2) – Additional Mitigation Measures – Cumulative Airborne Construction Noise – Residential Receivers

ID	Address	Land Use	RBL 5-7am	RBL Day	RBL Eve	RBL Night	A (VCS1 / VCN1)	B (VCS1 / VCN2 / VCN3)	C (VCS3 / VCN3 / VCN4)	D (VCS4 / VCN4 / VCN5)	E (VCS5 / VCN5 / VCN6)	F (VCS6 / VCN6 / VCN7)	G (VCS7 / VCN7)	H (VCS7)	I (VCS8)
N03	27 McLaren St	Residential	58	65	57	51	-	-	-	-	-	-	-	-	-
N04	29 McLaren St	Residential	58	65	57	51	-	-	-	-	-	-	-	-	-
N06	196 Miller St	Comm/Res	58	65	57	51	-	-	LB	LB	LB	-	-	-	-
N10	225 Miller St	Comm/Res	58	65	57	51	LB	LB	-	-	-	-	-	-	-
N11	231 Miller St	Comm/Res	58	65	57	51	-	-	-	-	-	-	-	-	-
N12	237 Miller St	Residential	58	65	57	51	LB	LB	LB	LB	LB	-	-	-	-
N13	39 McLaren St	Residential	58	65	57	51	LB	LB	LB	LB	LB	-	-	-	-
N15	45 McLaren St	Residential	58	65	57	51	-	-	-	-	-	-	-	-	-
N19	267 Miller St	Residential	58	65	57	51	LB	-	-	-	-	-	-	-	-
N21a	243 Miller St	Comm/Res	58	65	57	51	LB	LB	LB	LB	LB	LB	LB	-	-
N21b	243 Miller St	Residential	58	65	57	51	M, LB	M, LB	M, LB	M, LB	LB	M, LB	M, LB	-	-
S10b	79-81 Berry St	Residential	59	65	63	52	M, LB	M, LB	LB	LB	LB	LB	LB	LB	-
S15	100 Miller St	Comm/Res	59	65	63	52	M, LB	M, LB	LB	LB	LB	LB	-	-	-

C 9 Additional Mitigation Measures – Airborne Construction Noise – Non-Residential Receivers (Applicable when in Use)

ID	Address	Description	Land Use	NML	VCN Stage 1	VCN Stage 2	VCN Stage 3	VCN Stage 4	VCN Stage 5	VCN Stage 6	VCN Stage 7	VCS Stage 1	VCS Stage 2	VCS Stage 3	VCS Stage 4	VCS Stage 5	VCS Stage 6	VCS Stage 7	VCS Stage 8
N01	34A McLaren St	-	Commercial	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N02a	200 Miller St	North Sydney Council Chambers	Commercial	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N02b	200 Miller St	North Sydney Council Chambers	Commercial	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N05	31 McLaren St	Bermondsey Lodge	Commercial	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N06	196 Miller St	Pizza Pasta Benne	Comm/Res	65	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N08	194 Miller St	Office Building	Commercial	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N09a	128 Miller St	Monte Sant' Angelo	School	55	-	-	-	-	-	-	-	M, LB	-	-	-	-	-	-	-
N09b	128 Miller St	Monte Sant' Angelo	School	55	-	-	-	-	-	-	-	M, LB	-	-	-	-	-	-	-
N10	225 Miller St	The Mullberry on Miller	Comm/Res	65	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N11	231 Miller St	-	Comm/Res	65	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N14	41 McLaren St	-	Commercial	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N16	54 McLaren St	Rydges North Sydney (Hotel)	Commercial	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N16	54 McLaren St	Rydges North Sydney (Hotel)	Commercial	70	M, LB	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N17	168 Walker St	-	Commercial	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N18a	170 Walker St	Wenona School	School	55	M, LB	M, LB	M, LB	M, LB	M, LB	-	M, LB	-	-	-	-	-	-	-	-
N18b	176 Walker St	Wenona School	School	55	M, LB	M, LB	M, LB	M, LB	M, LB	M, LB	M, LB	-	-	-	-	-	-	-	-
N20	269 Miller St	The Independent	Commercial	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N21a	243 Miller St	-	Comm/Res	65	-	-	-	M, LB	-	-	-	-	-	-	-	-	-	-	-
S01	128 Miller St	Monte Sant' Angelo College	School	55	-	-	-	-	-	-	-	M, LB	M, LB	M, LB	M, LB	M, LB	M, LB	M, LB	M, LB
S02	201 Miller St	Intel Security Building	Commercial	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S03	199 Miller St	Rag & Famish (Hotel)	Commercial	70	-	-	-	-	-	-	-	M, LB	-	-	-	-	-	-	-
S04	50 Berry St	-	Commercial	70	-	-	-	-	-	-	-	M, LB	-	-	-	-	-	-	-
S05	56 Berry St	-	Commercial	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S06	66 Berry St	-	Commercial	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S07	72 Berry St	Ausgrid	Industrial	75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S08a	65 Berry St	-	Commercial	70	-	-	-	-	-	-	-	M, LB	M, LB	-	-	M, LB	M, LB	-	-
S08b	65 Berry St	Childcare	Childcare	60	-	-	-	-	-	-	-	M, LB	M, LB	M, LB	M, LB	M, LB	M, LB	M, LB	M, LB
S09	1 Denison St	Includes Channel 9 Studios	Commercial	70	-	-	-	-	-	-	-	M, LB	M, LB	M, LB	M, LB	M, LB	-	-	-
S10a	77 Berry St	-	Commercial	70	-	-	-	-	-	-	-	M, LB	M, LB	-	-	-	-	-	-
S11a	105-153 Miller St	-	Commercial	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S11b	105-153 Miller St	-	Commercial	70	-	-	-	-	-	-	-	M, LB	M, LB	-	-	-	-	-	-
S12	80 Mount St	-	Commercial	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S13	2 Elizabeth Plaza	-	Commercial	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S14	51 Mount St	-	Commercial	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S15	100 Miller St	-	Comm/Res	65	-	-	-	-	-	-	-	M, LB	M, LB	-	-	-	-	-	-
S16	53 Berry St	-	Commercial	70	-	-	-	-	-	-	-	M, LB	M, LB	-	-	-	-	-	-
S17	177 Pacific Hwy	-	Commercial	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

C 10 L_{Amax} Airborne Construction Noise – Night Time Maximum Noise Levels & Potential Sleep Disturbance Impacts – Residential Receivers

ID	Address	Land Use	RBL 5-7am	RBL Day	RBL Eve	RBL Night	VCN Stage 1	VCN Stage 2	VCN Stage 3	VCN Stage 4	VCN Stage 5	VCN Stage 6	VCN Stage 7	VCS Stage 1	VCS Stage 2	VCS Stage 3	VCS Stage 4	VCS Stage 5	VCS Stage 6	VCS Stage 7	VCS Stage 8
N03	27 McLaren St	Residential	58	65	57	51	**67**	**67**	**68**	**67**	**67**	62	49	52	51	51	51	61	61	60	59
N04	29 McLaren St	Residential	58	65	57	51	**67**	66	66	**69**	**68**	63	49	48	45	43	44	58	59	60	59
N06	196 Miller St	Comm/Res	58	65	57	51	**74**	**73**	**75**	**75**	**75**	**72**	52	49	45	43	43	43	45	52	57
N10	225 Miller St	Comm/Res	58	65	57	51	**67**	**70**	**70**	**69**	**68**	66	63	**74**	65	64	64	64	66	61	63
N11	231 Miller St	Comm/Res	58	65	57	51	**69**	**69**	**69**	**71**	**71**	**70**	65	**69**	65	63	63	63	64	59	61
N12	237 Miller St	Residential	58	65	57	51	**80**	**79**	**81**	**81**	**81**	**73**	**72**	63	63	62	62	62	61	60	61
N13	39 McLaren St	Residential	58	65	57	51	**79**	**79**	**80**	**81**	**80**	**71**	**73**	40	38	36	36	37	37	51	60
N15	45 McLaren St	Residential	58	65	57	51	**72**	**73**	**73**	**73**	**71**	64	**68**	41	39	37	37	38	52	60	59
N19	267 Miller St	Residential	58	65	57	51	**75**	**71**	**71**	**72**	**69**	63	**68**	51	48	47	47	47	52	57	56
N21a	243 Miller St	Comm/Res	58	65	57	51	**78**	**76**	**79**	**82**	**80**	**78**	**78**	52	50	49	49	49	56	55	57
N21b	243 Miller St	Residential	58	65	57	51	**85**	**89**	**89**	**89**	**80**	**84**	**87**	35	34	30	30	30	31	33	35
S10b	79-81 Berry St	Residential	59	65	63	52	57	50	49	49	50	49	55	**84**	**84**	**80**	**80**	**81**	**78**	**76**	**76**
S15	100 Miller St	Comm/Res	59	65	63	52	53	37	34	54	54	54	32	**86**	**84**	**81**	**81**	**81**	**81**	**75**	**73**

Notes: Exceedances of sleep disturbance screening level (L_{Amax} = $RBL_{,Night}$ + 15 dB) are shown in bold. Additional Mitigation Measures are not based on maximum noise levels.

C 11 L_{Amax} Airborne Construction Noise – Morning Shoulder Maximum Noise Levels & Potential Sleep Disturbance Impacts – Residential Receivers

ID	Address	Land Use	RBL 5-7am	RBL Day	RBL Eve	RBL Night	VCN Stage 1	VCN Stage 2	VCN Stage 3	VCN Stage 4	VCN Stage 5	VCN Stage 6	VCN Stage 7	VCS Stage 1	VCS Stage 2	VCS Stage 3	VCS Stage 4	VCS Stage 5	VCS Stage 6	VCS Stage 7	VCS Stage 8
N03	27 McLaren St	Residential	58	65	57	51	67	67	68	67	67	62	49	52	51	51	51	61	61	60	59
N04	29 McLaren St	Residential	58	65	57	51	67	66	66	69	68	63	49	48	45	43	44	58	59	60	59
N06	196 Miller St	Comm/Res	58	65	57	51	**74**	73	**75**	**75**	**75**	72	52	49	45	43	43	43	45	52	57
N10	225 Miller St	Comm/Res	58	65	57	51	67	70	70	69	68	66	63	**74**	65	64	64	64	66	61	63
N11	231 Miller St	Comm/Res	58	65	57	51	69	69	69	71	71	70	65	69	65	63	63	63	64	59	61
N12	237 Miller St	Residential	58	65	57	51	**80**	**79**	**81**	**81**	**81**	73	72	63	63	62	62	62	61	60	61
N13	39 McLaren St	Residential	58	65	57	51	**79**	**79**	**80**	**81**	**80**	71	73	40	38	36	36	37	37	51	60
N15	45 McLaren St	Residential	58	65	57	51	72	73	73	73	71	64	68	41	39	37	37	38	52	60	59
N19	267 Miller St	Residential	58	65	57	51	**75**	71	71	72	69	63	68	51	48	47	47	47	52	57	56
N21a	243 Miller St	Comm/Res	58	65	57	51	**78**	**76**	**79**	**82**	**80**	**78**	**78**	52	50	49	49	49	56	55	57
N21b	243 Miller St	Residential	58	65	57	51	**85**	**89**	**89**	**89**	**80**	**84**	**87**	35	34	30	30	30	31	33	35
S10b	79-81 Berry St	Residential	59	65	63	52	57	50	49	49	50	49	55	**84**	**84**	**80**	**80**	**81**	**78**	**76**	**76**
S15	100 Miller St	Comm/Res	59	65	63	52	53	37	34	54	54	54	32	**86**	**84**	**81**	**81**	**81**	**81**	**75**	73

Notes: Exceedances of sleep disturbance screening level (L_{Amax} = $RBL_{,Night}$ + 15 dB) are shown in bold. Additional Mitigation Measures are not based on maximum noise levels.

C 12 Additional Mitigation Measures – Groundborne Construction Noise – Residential & Non-Residential Receivers

ID	Address	Land Use	Predicted GBNL - $L_{Aeq,15min}$ (dBA)	GBNL Criteria - $L_{Aeq,15min}$ (dBA)			Exceedance of GBNL Criteria (dB)			Additional Mitigation Measures		
Closest Residential Receivers				Standard Hours	OOH Period 1	OOH Period 2	Standard Hours	OOH Period 1	OOH Period 2	Standard Hours	OOH Period 1	OOH Period 2
N21a	243 Miller St	Residential	47	45	40	35	2	7	12	LB	LB	AA, M, IB, LB, PC, RO, SN
N21b	243 Miller St	Residential	49	45	40	35	4	9	14	LB	LB	AA, M, IB, LB, PC, RO, SN
N12	237 Miller St	Residential	40	45	40	35	-	-	5	-	-	M, LB, SN
S10b	79-81 Berry St	Residential	40	45	40	35	-	-	5	-	-	M, LB, SN
Closest Non-Residential Receivers			**Predicted GBNL - $L_{Aeq,15min}$ (dBA)**	Standard Hours	OOH Period 1	OOH Period 2	Standard Hours	OOH Period 1	OOH Period 2	Standard Hours	OOH Period 1	OOH Period 2
N21b	243 Miller St	Commercial	49	50	50	50	-	-	-	-	-	-
S08b	65 Berry St	Childcare*	49	40	40	40	9	9#	9#	LB	LB#	M, LB, SN#
S09	1 Denison St	Includes Ch 9**	49	25	25	25	24	24	24	M, LB, SN	M, IB, LB, PC, RO, SN	AA, M, IB, LB, PC, RO, SN
S11b	105-153 Miller St	Commercial	56	50	50	50	6	6#	6#	LB	LB#	M, LB, SN#
S08a	65 Berry St	Commercial	56	50	50	50	6	6#	6#	LB	LB#	M, LB, SN#
S10a	77 Berry St	Commercial	49	50	50	50	-	-	-	-	-	-
S01	128 Miller St	School***	38	45	45	45	-	-	-	-	-	-

Notes: GBNL: Ground Bourne Noise Level (Inclusive of 5 dB penalty)

The groundborne noise predictions above are based on the use of large rockbreakers (hydraulic hammer size approx 1.5t). The use of these plant items would be limited to the early part of the works - within VCS Stages 1 & 2 and VCN Stage 2.

Non-Residential OOH criteria and mitigation measures are shown for all periods (for completeness) – however, these only apply when the receiver building is in use. It is expected that the non-residential OOH mitigation may generally be disregarded.

* Childcare Centre Ground Bourne Noise Criteria assumed to be 40dBA (as per AAC)

** Channel 9 Ground Bourne Noise Criteria assumed to be 25dBA (as per AS2107)

** School Ground Bourne Noise Criteria assumed to be 45dBA (as per AS2107)

AA – Alternative Accommodation (Note this does not apply to non-residential receivers)
M – Monitoring;
IB – Individual Briefing;
LB – Letterbox Notification;
PC – Phone Call;
RO – Respite Offer;
SN – Specific Notification.

C 13 Additional Mitigation Measures – Groundborne Construction Vibration – Residential & Non-Residential Receivers

ID	Address	Land Use	Predicted GBVL (PPV, mm/s)	GBVL Criteria - (PPV, mm/s)			Exceedance of GBVL Criteria (dB)			Additional Mitigation Measures		
Closest Residential Receivers				Standard Hours	OOH Period 1	OOH Period 2	Standard Hours	OOH Period 1	OOH Period 2	Standard Hours	OOH Period 1	OOH Period 2
N21a	243 Miller St	Residential	0.14	0.56	0.4	0.4	-	-	-	-	-	-
N21b	243 Miller St	Residential	0.14	0.56	0.4	0.4	-	-	-	-	-	-
N12	237 Miller St	Residential	0.1	0.56	0.4	0.4	-	-	-	-	-	-
S10b	79-81 Berry St	Residential	0.1	0.56	0.4	0.4	-	-	-	-	-	-
Closest Non-Residential Receivers			**Predicted GBVL (PPV, mm/s)**	Standard Hours	OOH Period 1	OOH Period 2	Standard Hours	OOH Period 1	OOH Period 2	Standard Hours	OOH Period 1	OOH Period 2
N21b	243 Miller St	Commercial	0.14	1.1	1.1	1.1	-	-	-	-	-	-
S08b	65 Berry St	Childcare*	0.14	0.56	0.56	0.56	-	-	-	-	-	-
S09	1 Denison St	Includes Ch 9**	0.14	0.14	0.14	0.14	-	-	-	-	-	-
S11b	105-153 Miller St	Commercial	0.2	1.1	1.1	1.1	-	-	-	-	-	-
S08a	65 Berry St	Commercial	0.2	1.1	1.1	1.1	-	-	-	-	-	-
S10a	77 Berry St	Commercial	0.1	1.1	1.1	1.1	-	-	-	-	-	-
S01	128 Miller St	School***	0.1	0.56	0.56	0.56	-	-	-	-	-	-

Notes: GBVL: Ground Bourne Vibration Level (PPV, mm/s)

Non-Residential OOH criteria and mitigation measures are shown for all periods (for completeness) – however, these only apply when the receiver building is in use. It is expected that the non-residential OOH mitigation may generally be disregarded.

The groundborne vibration predictions above are based on the use of large rockbreakers (hydraulic hammer size approx 1.5t). The use of these plant items would be limited to the early part of the works - within VCS Stages 1 & 2 and VCN Stage 2.

* Childcare Centre Ground Bourne Vibration Criteria assumed to be consistent with Residential (Daytime)

** Channel 9 Ground Bourne Vibration Criteria assumed to be consistent with Critical Working Areas (AVTG)

** School Ground Bourne Vibration Criteria assumed to be consistent with Residential (Daytime)

AA – Alternative Accommodation (Note this does not apply to non-residential receivers)
M – Monitoring;
IB – Individual Briefing;
LB – Letterbox Notification;
PC – Phone Call;
RO – Respite Offer;
SN – Specific Notification.

APPENDIX D

CSSI & SSD APPROVAL CONDITIONS

CSSI 7400 Approval Condition	Where Addressed in CNVMP
CNVMP Subplan Requirements of C3(a), C4, C5, C6, C8	
C3(a) The following CEMP sub-plans must be prepared in consultation with relevant government agencies identified for each CEMP sub-plan and be consistent with the CEMF and CEMP referred to in Condition C1: (a) Noise & Vibration	The CNVMP has primarily been prepared to address C3(a).
C4 The CEMP sub-plans must state how: (a) the environmental performance outcomes identified in the EIS as amended by the documents listed in A1 will be achieved; (b) the mitigation measures identified in the EIS as amended by documents listed in A1 will be implemented; (c) the relevant terms of this approval will be complied with; and (d) issues requiring management during construction, as identified through ongoing environmental risk analysis, will be managed	The CNVMP has addressed these matters. Appendix D outlines how performance outcomes and mitigation measures identified in the EIS, and relevant terms of the planning approval are complied with. Issues requiring management during construction are outlined in Sections 8, 9 and 11. Ongoing risk analysis is completed via the Construction Noise and Vibration Monitoring Program in Section 11.2.
C5 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.	No comments raised by North Sydney Council regarding the CNVMP(C3). Stakeholder consultation table provided in Appendix E.
C6 Any of the CEMP sub-plans may be submitted to the Secretary along with, or subsequent to, the submission of the CEMP but in any event, no later than one (1) month before commencement of construction.	Lendlease notes this Condition.
C8 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 (or AA in regards to the Noise and Vibration sub-plan), 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.	Lendlease notes this Condition. Section 1.
Monitoring Program Requirements C9-C17	
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.	Construction Noise & Vibration Monitoring Program included in Section 11.2 of the CNVMP.
C10 Each Construction Monitoring Program must provide: (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;	These matters are addressed in the Construction Noise & Vibration Monitoring Program included in Section 11.2 of the CNVMP. (a) 11.2.1, Table 7-1. (b) 11.2.1. (c) 11.2.2, 11.2.4, 11.2.5, 11.2.6, 11.2.7, 11.2.8. (d) 11.2.3. (e) 11.2.2, 11.2.4, 11.2.5, 11.2.6, 11.2.7, 11.2.8. (f) 11.2.2, Table 11-2, 11.2.6, 11.2.8. (g) 11.2.12.

(h) procedures to identify and implement additional mitigation measures where results of monitoring are unsatisfactory; and (i) any consultation to be undertaken in relation to the monitoring programs	(h) 11.2.10. (i) 11.2.11.
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.	These matters are addressed in the Construction Noise & Vibration Monitoring Program included in Section 11.2 of the CNVMP, specifically Section 11.2.6 and 11.2.8.
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.	No comments raised by Nth Sydney Council or EPA regarding the Noise and Vibration Monitoring Program (C9).
C13 The Construction Monitoring Programs must be endorsed by the ER (or AA in regards to the Noise and Vibration Construction Monitoring Program) 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.	Lendlease notes this Condition.
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.	Lendlease notes this Condition. Section 1.
C15 The Construction Monitoring Programs, as approved by the Secretary including any minor amendments approved by the ER (or AA in regards to the Noise and Vibration Construction Monitoring Program), 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.	Lendlease notes this Condition. Section 1.
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.	Lendlease notes this Condition.
C17 Where a relevant CEMP sub-plan exists, the relevant Construction Monitoring Program may be incorporated into that CEMP sub-plan.	Lendlease notes this Condition.

CSSI 7400 Approval Condition	Where Addressed in CNVMP / CNVIS
Vibration	
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 *Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration*	Vibration Assessed in Section 9. Predictions indicate compliance with the vibration limits set out in the British Standard BS 7385-2:1993.
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	Vibration Assessed in Section 9. Predictions indicate no risk of exceeding the screening criteria for cosmetic damage.
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.	Vibration Assessed in Section 9. Predictions indicate no risk of exceeding the screening criteria for heritage items.
E31 The Proponent must seek the advice of a heritage specialist on methods and locations for installing equipment used for vibration, movement and noise monitoring of heritage-listed structures.	Lendlease notes this Condition. 11.2.9.
Construction Noise and Vibration Strategy	
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: (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.	The provisions of the *Sydney Metro City and Southwest Construction Noise and Vibration Strategy* have been considered in the preparation of this CNVIS. Refer Sections 1, 3.2, 8.1.1, 8.1.2, 8.2.5, 9.1.1, 9.1.8, 9.2.2, 9.3.2, 11.
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 measures identified through consultation with affected sensitive receivers.	The CNVIS has specifically been prepared to address E33. Refer Sections 2, 5, 6, 7, 8, 9, 10, Appendix B.
E34 Noise 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.	Lendlease consulted with the operators of Channel 9 Studios located within the building located at 1 Denison Street (S09) to negotiate suitable respite requirements, to minimise any potential noise/ vibration impacts on Channel 9 operations. Additionally, Lendlease consulted with the operators of the childcare centre located at 65 Berry Street (S08b) to negotiate suitable respite requirements, prior to its closure in 2020. Additionally, Lendlease consulted with Wenona (N18) and Monte College (S01), to determine appropriate hours of respite. Refer Sections 8.2.6, 8.2.7, 9.1.6, 9.1.7, 9.2, 9.3.

CSSI 7400 Approval Condition	Where Addressed in CNVMP / CNVIS
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.	Hydraulic rock hammering is required for trimming works. It is not feasible to use a pulveriser for this activity. Rock hammering would be undertaken for a relatively short duration. Specific respites would be developed during consultation with affected receivers. Blasting is not required for the Victoria Cross ISD works.
Standard Construction Hours	
E36 Construction, except as allowed by Condition E48 (excluding cut and cover tunnelling), must only be undertaken during the following standard construction hours: (a) 7:00am to 6:00pm Mondays to Fridays, inclusive; (b) 8:00am to 6:00pm Saturdays; and (c) at no time on Sundays or public holidays.	Construction hours are addressed in Section 5.2, 5.3, 5.4 and 3.2. Amended as per SCCI7400 Mod 9. Works would predominantly be completed within standard hours (as per E36), with some extensions as permissible under the CSSI Approval - particularly within provisions of conditions E37, E44 and E48.
Respite for Receivers	
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 (groundborne) noise or a perceptible level of vibration is planned (including works associated with utility adjustments), between 7am – 8pm at: (a) Crows Nest, Victoria Cross, Blues Point, Barangaroo, Martin Place, Pitt Street, and Central; and (b) Marrickville, Newtown, St Peters, Sydenham and Tempe for works specified in SSI7400_MOD 4 referenced in Condition A1 (c).	Predicted worst case groundborne noise levels are set out in Appendix C (Table C-12). No exceedances of internal noise levels greater than $L_{Aeq,15min}$ 60 dBA (inclusive of a 5 dB penalty for rock breaking) are predicted. Refer Sections 8.2.5, 9.3.2, 9.3.3.
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 groundborne noise), does not exceed internal noise levels of: (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 groundborne 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 groundborne 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.	Predicted airborne noise levels are set out in Tables 8-6 and 8-7. These represent noise levels at external façade. Internal noise levels may be expected to be at least some 20-25 dB lower than the external façade levels with windows closed. On this basis, the identified internal noise levels would be expected to be achieved at all residential receivers. There is a marginal risk of levels exceeding $L_{Aeq,15min}$ 60 dBA internally at 243 Miller Street (N21b). Lendlease consults with this resident regularly. Refer Section 8.2.7. Additionally, Lendlease consulted with non-residential receivers: Wenona School (N18), Monte Sant' Angelo College (S01), Channel 9 Studios (S09) and Childcare Centre ant 65 Berry Street (S08b).
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.	Lendlease is not aware of any other major projects in the vicinity of the project that may coincide such as to materially contribute to cumulative noise impacts. Should such projects be identified, associated cumulative impacts will be investigated.

CSSI 7400 Approval Condition	Where Addressed in CNVMP / CNVIS
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.	Lendlease notes this Condition. Section 3.2.
Mitigation – Non-residential Zones	
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 groundborne 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.	Additional mitigation requirements have been determined in accordance with the Sydney Metro City and South West Noise and Vibration Strategy for all potentially affected receivers. Refer Sections 8.2.4, 8.2.5, 8.3, 9.1.8, 9.2.1, 9.3.2.
Mitigation – Residential receivers in residential zones	
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 groundborne 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.	Additional mitigation requirements have been determined in accordance with the Sydney Metro City and South West Noise and Vibration Strategy for all potentially affected receivers. Refer Sections 8.2.4, 8.2.5, 8.3, 9.1.8, 9.2.1, 9.3.2.
Workplace health and safety for nearby workers	
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.	Predictions indicate that off-site noise levels would comply with the National Standard for occupational noise exposure of $L_{Aeq,8hr}$ 85dBA. Refer Section 8. Section 3.2.
Variation to Standard Construction Hours	
E44 Notwithstanding Condition E36 construction associated with the CSSI may be undertaken outside the hours specified under those conditions in the following circumstances: (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	Refer Sections 3.2, 5.2, 5.3, Table 11-1.

CSSI 7400 Approval Condition	Where Addressed in CNVMP / CNVIS
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 groundborne 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	
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.	Lendlease notes this Condition.
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 (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 approved through an Out of Hours Work Protocol developed in accordance with Condition E47; 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).	Lendlease notes this Condition. Section 5.3.
Out of Hours Work Protocol for works not subject to an EPL	
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: (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	E47 is applicable as VCISD is not subject to an EPL. Refer Sections 3.2 and 5.3.

CSSI 7400 Approval Condition	Where Addressed in CNVMP / CNVIS
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.	
24 Hour Construction	
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: (a) tunnelling and associated support activities (excluding cut and cover tunnelling, and excluding the installation and decommissioning of the Blues Point acoustic shed except where compliance with Condition E44 is achieved); (b) excavation within an acoustic enclosure (excluding the Blues Point temporary site except where compliance with Condition E44 is achieved); (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.	Refer Sections 3.2, 5.2, Section 10. Station fit-out works are not expected to generate any off-site noise effects due to the inherent shielding from the station structure. OOH station fit-out works, deliveries and haulage will all be subject to approvals required via the Sydney Metro OOH Protocol required under E47.
Building Condition Survey	
E59 Before commencement of construction, all property owners of buildings identified as being at risk of damage must be offered a building condition survey. Where an offer is accepted a structural engineer must undertake the survey. The results of the surveys must be documented in a Building Condition Survey Report for each building surveyed. Copies of Building Condition Survey Reports must be provided to the owners of the buildings surveyed, and if agreed by the owner, the Relevant Council within three (3) weeks of completing the Survey Report and no later than one (1) month before the commencement of construction.	Section 9.1.3. It is noted that no buildings have been identified as being at risk of damage.

CSSI REMMs: NV1- NV4, NV6- NV7, NV10, NV11	Where Addressed in CNVMP / CNVIS
NV1 The Construction Noise and Vibration Strategy would be implemented with the aim of achieving the noise management levels where feasible and reasonable. This would include the following example standard mitigation measures where feasible and reasonable: - Provision of noise barriers around each construction site - Provision of acoustic sheds at Chatswood dive site, Crows Nest, Victoria Cross, Blues Point, Barangaroo, Martin Place, Pitt Street, Waterloo and Marrickville dive site - The coincidence of noisy plant working simultaneously close together would be avoided - Offset distances between noisy plant and sensitive receivers would be increased - Residential grade mufflers would be fitted to all mobile plant - Dampened rock hammers would be used - Non-tonal reversing alarms would be fitted to all permanent mobile plant - High noise generating activities would be scheduled for less sensitive period considering the nearby receivers - The layout of construction sites would consider opportunities to shield receivers from noise This would also include carrying out the requirements in relation to construction noise and vibration monitoring.	The CNVMP has addressed these matters. Refer Sections 11, 11.1 and Table 11-1. It is noted that no acoustic sheds are being utilised during the Victoria Cross station construction. these were implemented for bulk earthworks and tunnelling activities, completed by others.
NV2 Unless compliance with the relevant traffic noise criteria can be achieved, night time heavy vehicle movements at the Chatswood dive site, Crows Nest Station, Victoria Cross Station (southern) and Waterloo Station sites would be restricted to: - The Pacific Highway and Mowbray Road at the Chatswood dive site - The Pacific Highway, Hume Street and Oxley Street at the Crows Nest Station construction site - McLaren Street, Miller Street and Berry Street at the Victoria Cross Station southern construction site - Botany Road and Raglan Street at the Waterloo Station construction site.	Section 10 of the CNVMP has addressed traffic noise. Haulage routes have also been discussed with the relevant roads authorities, including North Sydney Council, Sydney Coordination Office and RMS (TfNSW) and included in the corresponding Victoria Cross ISD Construction Traffic Management Plan.
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.	The CNVMP has addressed these matters – no vibration screening criteria exceedances are predicted.
NV4 Feasible and reasonable measures would be implemented to minimise groundborne noise where exceedances are predicted.	Section 9 of the CNVMP has addressed groundborne noise.
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.	Noted. Sydney Metro have engaged an Independent Acoustic Advisor (AA) prior to engagement of Lendlease or VCISD works commencing. This CNVMP, including construction noise and vibration impact statement and monitoring program, will be consulted and endorsed by the AA prior to commencing works. Acoustic Advisor roles and responsibilities are included in the VCISD EHS Management Plan.
NV7 Alternative demolition techniques that minimise noise and vibration levels would be investigated and implemented where feasible and reasonable. This would include consideration of: - The use of hydraulic concrete shears in lieu of hammers/rock breakers	No demolition works undertaken within the VCISD scope.

- Sequencing works to shield noise sensitive receivers by retaining building wall elements - Locating demolition load out areas away from the nearby noise sensitive receivers - Providing respite periods for noise intensive works - Methods to minimise structural-borne noise to adjacent buildings including separating the structural connection prior to demolition through saw-cutting and propping, using hand held splitters and pulverisers or hand demolition - Installing sound barrier screening to scaffolding facing noise sensitive neighbours - Modifying demolition works sequencing / hours to minimise impacts during peak pedestrian times and / or adjoining neighbour outdoor activity periods.	
NV10 Further background monitoring would be conducted at a receiver addressing McLaren Street during the preparation of the Construction Noise and Vibration Impact Statements to confirm the applicable noise management levels for construction.	The CNVMP has relied on existing background noise levels consistent with the CSSI EIS. Current TSE works do not allow for further representative background monitoring to be completed. Noise levels will be monitored during construction works to ensure appropriate mitigation and management measures are in place.
NV11 Opportunities to minimise heavy vehicle movements from the Victoria Cross Station northern construction site at night would be further investigated during detailed construction planning	Section 10 of the CNVMP addressed traffic noise. Heavy vehicle requirements have also been discussed with relevant road authorities and North Sydney Council and included in the corresponding VCISD Construction Traffic Management Plan.

CSSI EIS Revised Environmental Performance Outcomes - Noise & Vibration	Where Addressed in CNVMP / CNVIS
Noise and vibration – amenity Construction noise and vibration (including airborne noise, groundborne noise and blasting) are effectively managed to minimize adverse impacts on acoustic amenity. Noise and vibration – structural Construction noise and vibration (including airborne noise, groundborne noise and blasting) are effectively managed to minimize adverse impacts on the structural integrity of buildings and items including Aboriginal places and environmental heritage. - 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.	The CNVMP has addressed these matters - refer sections 8, 9, 10, 11. Predictions indicate no vibration screening criteria exceedances or risk of structural/building damage. No registered Aboriginal places and environmental heritage have been identified in proximity to the work site.

Relevant Sydney Metro CEMF Requirements (Chapter 9)	Where Addressed in CNVMP / CNVIS
9.1 - Construction Noise and Vibration Management Objectives a. The following noise and vibration management objectives will apply to construction: i. Minimise unreasonable noise and vibration impacts on residents and businesses; ii. Avoid structural damage to buildings or heritage items as a result of construction vibration; iii. Undertake active community consultation; and iv. Maintain positive, cooperative relationships with schools, childcare centres, local residents and building owners.	The CNVMP has addressed these matters. Refer Sections 1, 11, 11.1, 11.2 and Table 11-1.
9.2 - Construction Noise and Vibration Management Implementation 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: i. Identification of work areas, site compounds and access points; ii. Identification of sensitive receivers and relevant construction noise and vibration goals; 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); 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; v. Identification of feasible and reasonable procedures and mitigation measures to ensure relevant vibrations and blasting criteria are achieved, including a suitable blast program; vi. Community consultation requirements and Community notification provisions specifically in relation to blasting; vii. The requirements of any applicable EPL conditions; viii. Additional requirements in relation to activities undertaken 24 hours of the day, 7 days per week; ix. Pre-construction compliance requirements and hold points; x. The responsibilities of key project personnel with respect to the implementation of the plan; xi. Noise monitoring requirements; xii. Compliance record generation and management; and xiii. An Out of Hours Works Protocol applicable to all construction methods and sites. b. 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. c. Noise and vibration monitoring would be undertaken for construction as specified in the CNVS and the EPL. d. The following compliance records would be kept by Principal Contractors: i. Records of noise and vibration monitoring results against appropriate NMLs and vibration criteria; and ii. Records of community enquiries and complaints, and the Contractor's response.	The CNVMP has addressed these matters. a. (i) Section 2, Appendix A. (ii) Sections 6, 8.1, 9.1, 9.2, 10.1.1. (iii) Sections 1, 3.2, 8.1.1, 8.1.2, 8.2.5, 9.1.1, 9.1.8, 9.2.2, 9.3.2, 11. (iv) Sections 5, 8.2, 9.3, Appendix A (v) Sections 9.1, 9.3, 11.1, 11.2. Note: no blasting undertaken. (vi) No blasting undertaken. (vii) No EPL applicable to Victoria Cross ISD works. (viii) 5.2, 5.3, 5.4, 8.1.2, 8.2.5, 8.3, 9.1.8, 9.2.2, 9.3.2, 11.1. (ix) Sections 1, 5.3, 8.2.5, 8.2.6, 8.2.7, 9.1.8, 9.2.2, 9.3.2, 11, 11.1, 11.2. (x) Section 11. (xi) Section 11.2. (xii) 11.2.10, 11.2.12. (xiii) VCISD will be working under the Sydney Metro OOH Works Protocol as per E47. Refer Sections 3.2, 5.3. b. Sections 6, 7, 8, 9, 10, Appendices A, B, C. OOH works are subject to the Sydney Metro OOH Works Protocol as per E47. No EPL applicable to Victoria Cross ISD works. c. Section 11.2. No EPL applicable to Victoria Cross ISD works. d.(i) Section 11.2.12 (ii) Records of community enquiries and complaints, and the Lendlease's response will be managed via the project Community Communications Strategy. Refer Section 11.2.2.
9.3 Construction Noise and Vibration Mitigation a. All feasible and reasonable mitigation measures would be implemented in accordance with the CNVS. Examples of noise and vibration mitigation measures include: i. Construction hours will be in accordance with the working hours specified in Section 5.1; 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.	The CNVMP has addressed these matters. a. Section 11.1 (i) Sections 3.2, 5.2, 5.3, 5.4, 5.5. (ii) Section 11, 11.1, Table 11-1. (iii) Section 11, 11.1, Table 11-1.

SSD 10294 Approval Condition	Where Addressed in CNVMP / CNVIS
CNVMP Subplan Requirements	
B45. Prior to the issue of the relevant Construction Certificate, the Applicant shall:	
(a) amend, or prepare an addendum to, the Construction Noise and Vibration Management Sub-Plan (CNVMP) applicable to the CSSI approval (CSSI 7400) to apply to the development. The amended CNVMP must be submitted to the Planning Secretary and Certifying Authority, or	This CNVMP and CNVIS in Appendix F.
(b) prepare and implement a Construction Noise and Vibration Management Sub-Plan (CNVMP) for the development, independent of the CNVMP approved with the CSSI station works. A copy of the CNVMP must be submitted to the Planning Secretary and Certifying Authority. The Sub-Plan must include: (i) identification of the specific activities that will be carried out and associated noise sources at the premises; (ii) identification of all potentially affected sensitive residential receiver locations; (iii) quantification of the rating background noise level (RBL) for sensitive receivers, as part of the Sub-Plan, or as undertaken in the EIS; (iv) the construction noise, ground-borne noise and vibration objectives derived from an application of the EPA Interim Construction Noise Guideline (ICNG), as reflected in conditions of approval; (v) prediction and assessment of potential noise, ground-borne noise (as relevant) and vibration levels from the proposed construction methods expected at sensitive receiver premises against the objectives identified in the ICNG and conditions of approval; (vi) where objectives are predicted to be exceeded, an analysis of feasible and reasonable noise mitigation measures that can be implemented to reduce construction noise and vibration impacts; (vii) description of management methods and procedures, and specific noise mitigation treatments/measures that can be implemented to control noise and vibration during construction; (viii) where objectives cannot be met, additional measures including, but not necessarily limited to, the following should be considered and implemented where practicable; reduce hours of construction, the provision of respite from noisy/vibration intensive activities, acoustic barriers/enclosures, alternative excavation methods or other negotiated outcomes with the affected community; (ix) where night-time noise management levels cannot be satisfied, a report shall be submitted to the Planning Secretary outlining the mitigation measures applied, the noise levels achieved and justification that the outcome is consistent with best practice; (x) measures to identify non-conformances with the requirements of the Sub-Plan, and procedures to implement corrective and preventative action; (xi) suitable contractual arrangements to ensure that all site personnel, including sub-contractors, are required to adhere to the noise management provisions in the Sub-Plan; (xii) procedures for notifying residents of construction activities that are likely to affect noise & vibration amenity; (xiii) measures to monitor noise performance and respond to complaints; (xiv) measures to reduce noise related impacts associated with offsite vehicle movements on nearby access and egress routes from the site; (xv) procedures to allow for regular professional acoustic input to construction activities and planning; and (xvi) effective site induction, and ongoing training and awareness measures for personnel (e.g. toolbox talks, meetings etc).	Not used.
D3. Construction, including the delivery of materials to and from the site, may only be carried out between the following hours: (a) between 7am and 6pm, Mondays to Fridays inclusive; and (b) between 8am and 1pm, Saturdays.	Construction hours are addressed in Sections 5.2, 5.3, 5.4 and 3.2, along with Appendix F. Works would predominantly be completed within standard hours (as per D3), with some extensions as permissible under the SSD condition D5 (as proposed to be modified).

D4. No work may be carried out on Sundays or public holidays.	As per Condition D3.
D5. Activities may be undertaken outside of these hours if required: (a) by the Police or a public authority for the delivery of vehicles, plant or materials; or (b) in an emergency to avoid the loss of life, damage to property or to prevent environmental harm.	As per Condition D3. Note that Condition D5 is proposed to be modified to allow for other criteria permitting out of hours work.
D6. Notification of such activities must be given to affected residents before undertaking the activities or as soon as is practical afterwards.	Section 11.2.13.
D7. Rock breaking, rock hammering, sheet piling, pile driving and similar activities may only be carried out between the following hours: (a) 9am to 12pm, Monday to Friday; (b) 2 pm to 5pm Monday to Friday; and (c) 9am to 12pm, Saturday .	As per Condition D3. These activities will not be undertaken under SSD 10924.
D10. The development must be constructed to achieve the construction noise management levels detailed in the Interim Construction Noise Guideline (DECC, 2009). All feasible and reasonable noise mitigation measures must be implemented and any activities that could exceed the construction noise management levels must be identified and managed in accordance with the management and mitigation measures identified in the approved CNVMP.	Predicted airborne noise levels are set out in Appendix F. Note that Condition D10 is proposed to be modified to better describe the ICNG requirements where NMLs are exceeded.
D11. The Applicant must ensure construction vehicles (including concrete agitator trucks) do not arrive at the subject site or surrounding residential precincts outside of the construction hours of work outlined under condition D3.	Appendix F, noting that deliveries would be made out of hours under the proposed modifications to Condition D5.
D12. The Applicant must implement, where practicable and without compromising the safety of construction staff or members of the public, the use audible movement alarms of a type that would minimise noise impacts on surrounding noise sensitive receivers	Appendix F
D13. The Applicant must ensure that any work generating high noise impact (i.e. work exceeding a NML of LAeq 75dBA) as measured at the sensitive receiver must only be undertaken in continuous blocks of no more than 3 hours, with at least a 1 hour respite between each block of work generating high noise impact, where the location of the work is likely to impact the same receivers. For the purposes of this condition 'continuous' includes any period during which there is less than one hour respite between ceasing and recommencing any of the work the subject of this condition.	Predicted airborne noise levels are set out in Appendix F.
D14. Any noise generated during construction of the development must not be offensive noise within the meaning of the Protection of the Environment Operations Act 1997 or exceed approved noise limits for the site.	Predicted airborne noise levels are set out in Appendix F.
D15. Vibration caused by construction at any residence or structure outside the Site must be limited to: (a) for structural damage, the latest version of DIN 4150-3 (1992-02) Structural vibration - Effects of vibration on structures (German Institute for Standardisation, 1999); (b) for human exposure to vibration, the evaluation criteria set out in the Environmental Noise Management Assessing Vibration: a Technical Guideline (Department of Environment and Conservation, 2006) (as may be updated or replaced from time to time); (c) vibratory compactors must not be used closer than 30 metres from residential or heritage buildings unless vibration monitoring confirms compliance with the vibration criteria specified above; and (d) these limits apply unless otherwise outlined in the amended CNVMP applicable to the CSSI approval (CSSI 7400) or the project specific CNVMP required by condition B45.	Vibration Assessed in Appendix F. Predictions indicate no risk of exceeding the various standards, screening criteria for cosmetic damage or screening criteria for heritage items.

APPENDIX E

AGENCY CONSULTATION

AGENCY CONSULTATION

This CNVMP was distributed to the required government agencies for comment as per CSSI condition C3(a) and C9(a) with summarised details provided below.

Stakeholder	CNVMP Revision and Issue Date	Comments Received
North Sydney Council	Version B, 27/05/20	27/05/20, Confirmation of Council receipt of CNVMP. 09/06/20, Council stated they would provide comment by 19//06/20. 23/06/20, Council confirmed no comments would be provided on the CNVMP.
NSW EPA (required consultation for Noise and Vibration Monitoring Program content)	Version B, 27/05/20	28/05/20, Confirmed receipt of the CNVMP and included monitoring program, and that EPA did not wish to provide comment or be directly involved in the development of the document.

APPENDIX F

CONSTRUCTION NOISE & VIBRATION IMPACT STATEMENT

REPORT

VICTORIA CROSS SOUTH–OSD TOWER

NORTH SYDNEY NSW 2060

CONSTRUCTION NOISE AND VIBRATION IMPACT STATEMENT

RWDI # 2101617.03

3 May 2022

SUBMITTED TO

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DOCUMENT CONTROL

Version	Status	Date	Prepared By	Reviewed By
A	Draft	28 February 2022	Adrian Pinto	Remi Larmandieu
B	Final	3 May 2022	Adrian Pinto	Remi Larmandieu

NOTE

All materials specified by RWDI Australia Pty Ltd (RWDI) have been selected solely on the basis of acoustic performance. Any other properties of these materials, such as fire rating, chemical properties etc. should be checked with the suppliers or other specialised bodies for fitness for a given purpose.

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WILKINSON MURRAY

In October 2020, Wilkinson Murray Pty Ltd merged with RWDI Group, a leading international consulting firm. Wilkinson Murrays core practice areas of noise, acoustics, vibration and air quality consulting built since 1962 servicing Australia and Asia-Pacific region will complement RWDI practice areas. Combined, RWDI+Wilkinson Murray is one of the largest teams globally specialising in the area of noise, acoustics, vibration and air quality.

RWDI

RWDI is a team of highly specialised consulting engineers and scientists working to improve the built environment through three core areas of practice: building performance, climate engineering and environmental engineering. More information is available at www.rwdi.com.

AAAC

This firm is a member firm of the Association of Australasian Acoustical Consultants and the work here reported has been carried out in accordance with the terms of that membership.

QUALITY ASSURANCE

RWDI Australia Pty Ltd operates a Quality Management System which complies with the requirements of AS/NZS ISO 9001:2015. This management system has been externally certified by SAI Global and Licence No. QEC 13457 has been issued for the following scope: The provision of consultancy services in acoustic engineering and air quality; and the sale, service, support and installation of acoustic monitoring and related systems and technologies.

GLOSSARY OF ACOUSTIC TERMS

Most environments are affected by environmental noise which continuously varies, largely as a result of road traffic. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are demonstrated in the graph below, are here defined.

Maximum Noise Level (L_{Amax}) – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

L_{A1} – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

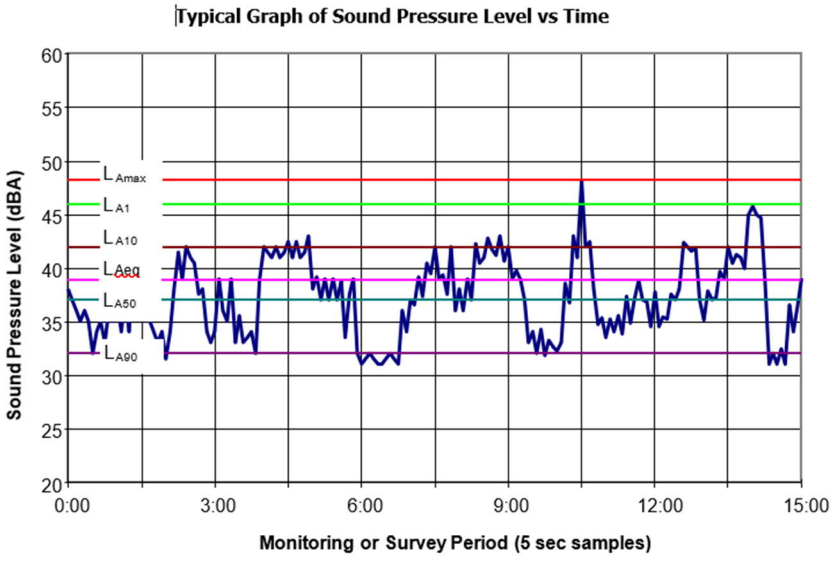
L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

ABL – The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening and night time) for each day. It is determined by calculating the 10th percentile (lowest 10th percent) background level (L_{A90}) for each period.

RBL – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period – daytime, evening and night time.



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1 INTRODUCTION

RWDI was engaged by Lendlease (Victoria Cross) Pty Ltd (LL) to provide a construction noise & vibration impact statement (CNVIS) for the Over Station Development (OSD) tower above the south entry to the station.

The approved SSD application allows the construction of the OSD tower during standard working hours only. The proposed modification to the consent would potentially allow for construction of the Victoria Cross OSD tower outside of standard hours for consistency with relevant provisions in the Sydney Metro approval CSSI 7400. The CSSI 7400 approval relates to the Victoria Cross Integrated Station Development (ISD).

This construction noise and vibration impact statement (CNVIS) has been prepared in accordance with construction noise requirements detailed in the Wilkinson Murray (WM) *Construction Noise & Vibration Management Plan (CNVMP)* dated 22 July 2020 (ref 16095-VC).

As defined in the CNVMP, the works covered by this CNVIS are part of the approvals outlined in Table 1-1 below. Construction Noise and Vibration Impact Statements (CNVIS) must be prepared for each construction site before construction noise and vibration impacts commence and include specific mitigation measures identified through consultation with affected sensitive receivers.

Table 1-1 Approvals relevant to this CNVIS

Relevant approval	Proponent	Applicable Works	Relevant to this CNVIS
CSSI 7400	Sydney Metro	• Construction of the new Victoria Cross Metro station (above and below ground) along with construction of below ground structural and other components of the OSD tower. • Construction of above ground structural and other components of the OSD tower below Level 4.	Condition E33
SSD 8874	Sydney Metro	• Victoria Cross concept approval for building envelopes of the OSD tower.	Condition B9(c)
SSD 10294	Lendlease (Victoria Cross)	• Construction of a 40-storey (plus rooftop plant) commercial (OSD) tower above the southern entrance of the new Victoria Cross Metro Station. • OSD construction works, including structures, internal fitout and facade works, from Level 4 upwards.	Modification proposed to change hours of work in Condition D5

2 SITE DESCRIPTION

The New South Wales (NSW) Government through the Transport for NSW (TfNSW) is implementing Sydney's Rail Future, a plan to transform and modernise Sydney's rail network so that it can grow with the city's population and meet the needs of commuters and customers in the future.

Sydney Metro is a new standalone rail network identified in Sydney's Rail Future. The Sydney Metro network consists of Sydney Metro Northwest (previously known as the North West Rail Link), Sydney Metro City & Southwest and Sydney Metro West.

The Victoria Cross Integrated Station Development (ISD), made up of the metro station and over station development, will include the following features.

- Two station entrances including a northern entrance opening to Miller and McLaren streets, and a southern entrance with pedestrian access to Miller and Denison streets.
- A commercial building above the station's southern entrance.
- Station concourse and platforms beneath Miller Street.
- A commercial and retail hub.
- Enhancement of pedestrian infrastructure around the station, as well as new bike parking at the northern entrance, and new kiss and ride bays on McLaren Street opposite the northern entrance.
- Improvements to the public domain.

The Victoria Cross Station will be located in the heart of North Sydney's business district, with two station entrance boxes - Victoria Cross North (VCN) and Victoria Cross South (VCS) connected by a cavern platform directly beneath Miller Street.

The VCN site will provide station access via the northern services building on McLaren Street whilst the VCS site will provide access through a pedestrian plaza opening to Miller, Denison and Berry Streets. The VCS site will additionally include a 42 storey, 168m tall commercial office tower above the station. A Site Location Plan is shown in **Figure 2-1**.

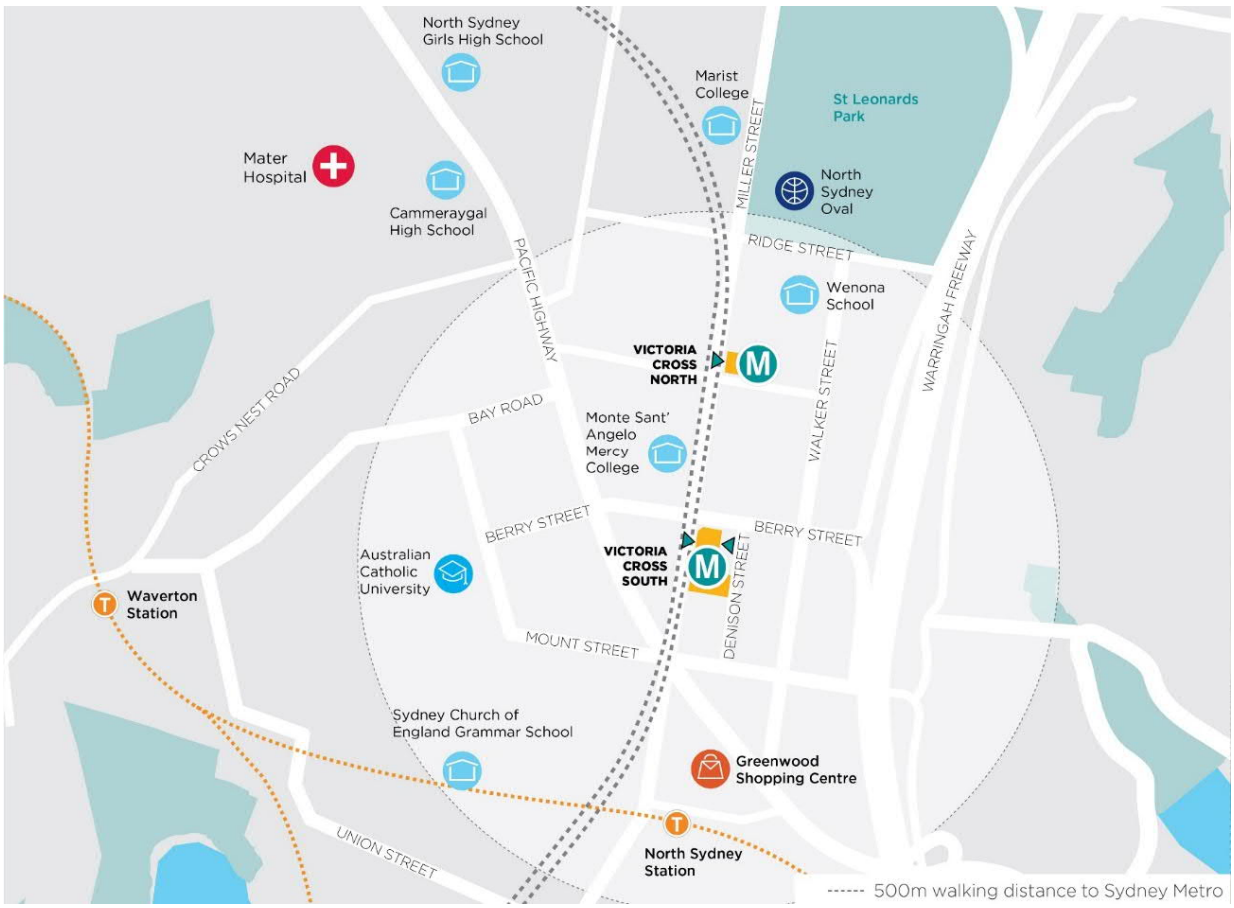


Figure 2-1 Site Location

The out of standard hours construction works assessed in this CNVIS is proposed to be undertaken by Lendlease for the OSD tower to be located at the VCS site.

Figure 2-2 shows the Schematic 3D View of the ISD Showing OSD & Station Components.

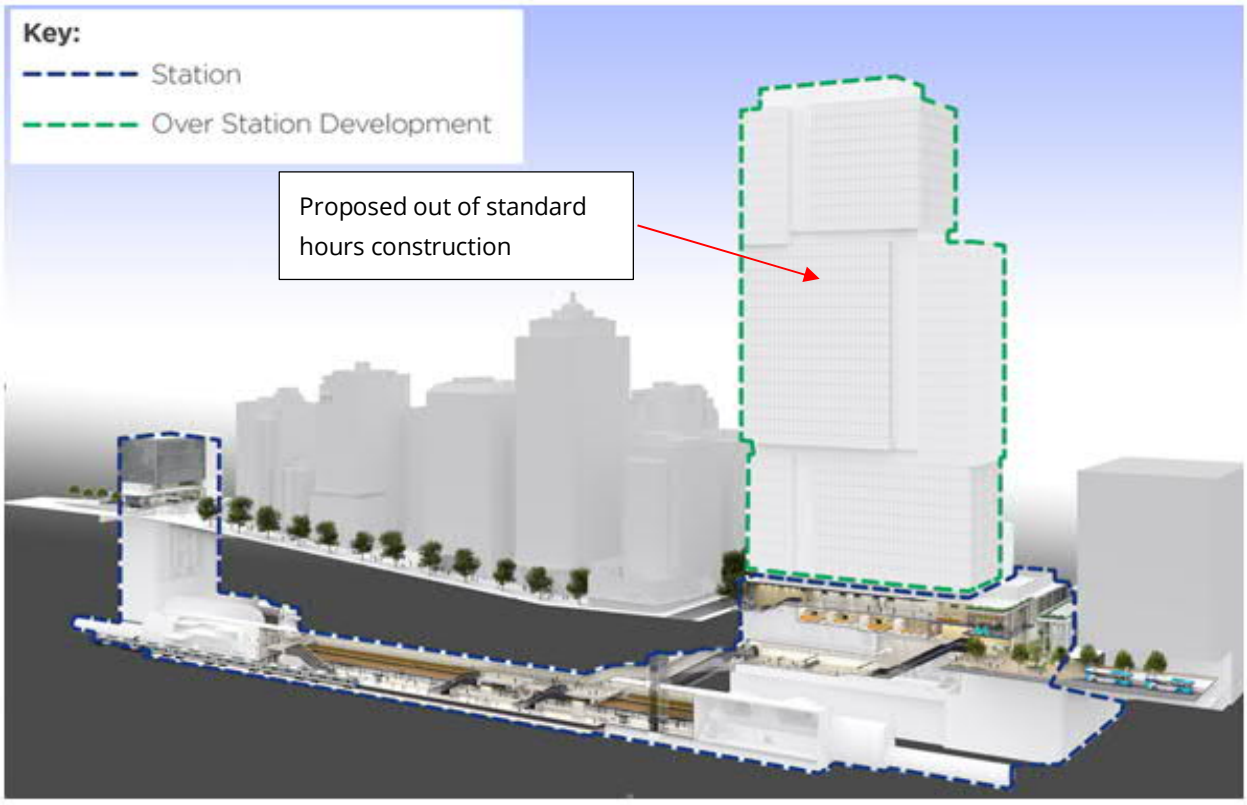


Figure 2-2 Schematic 3D View of the ISD Showing OSD & Station Components

Note: Northern (McLaren Street) station entrance shown on left, Southern (Berry Street) entrance shown on right.

2.1 Noise Sensitive Receivers

Figure 2-3 shows the sensitive receivers surrounding the VCN and VCS sites considered by this assessment.

Figure 2-3 Sensitive Receivers

3 APPROVED DEVELOPMENT CONSENT CONDITIONS

On 9 January 2017, the Minister for Planning approved the Sydney Metro City & Southwest - Chatswood to Sydenham project as a Critical State Significant Infrastructure project (SSI 15_7400) (CSSI Approval). The CSSI Approval concerns all works required to construct the Sydney Metro Victoria Cross Integrated Station Development (VCISD), including construction of below and above ground improvements with the metro station structure for appropriate integration with the Over Station Development (OSD).

The Victoria Cross development comprises the following main components:

- The metro station located at Victoria Cross, North Sydney (VCISD), approved under CSSI 15_7400.
- An Over-Station Development (OSD) tower, integrated into the station. The Victoria Cross OSD - Stage 1 concept approval was granted on 18 December 2018, under SSD 8874. The Victoria Cross OSD - Stage 2 concept approval was granted on 6 July 2020, under SSD 10294.

3.1 Hours of Construction

3.1.1 **Approved** Out of Standard Hours of Work

The construction hours for the OSD Tower are defined by the SSD 10294 planning approval. The standard construction hours of work are defined in condition D3 to D7 and summarised in Table 3-1.

Works may be carried out outside standard hours (out of hours works – OOHW) under conditions D5 and D6.

Table 3-1 SSD 10294 Approved Hours for Construction Work

Approved works	Day	Approved Hours	Approval Condition
Construction, including the delivery of materials to and from the site,	Monday to Friday	7.00 am and 6.00 pm	D3
	Saturday	8.00 am to 1.00 pm	
	Sundays or Public Holidays	No work	D4
a) Activities by the Police or a public authority for the delivery of vehicles, plant or materials; or b) in an emergency to avoid the loss of life, damage to property or to prevent environmental harm.	Outside of Standard hours		D5, D6
Rock breaking, rock hammering, sheet piling, pile driving and similar activities	Monday to Friday	9.00 am to 12.00 pm	D7
		2.00 pm to 5.00 pm	
	Saturday.	9.00 am to 12.00 pm	

3.1.2 **Proposed** Out of Standard Hours of Work

Proposed out of standard hours works are proposed that are in addition to those under SSD 10294 conditions D5 and D6. The proposed modifications would amend Condition D3 as outlined below:

D3 Construction, including the delivery of materials to and from the site, may only be carried out between the following hours:

(a) between 7 am and 6 pm, Mondays to Fridays inclusive; and

(b) between 8 am and 1 pm, Saturdays.

D4 No work may be carried out on Sundays or public holidays.

D5 (1) Activities Notwithstanding Conditions D3 and D4, construction associated with the SSD may be undertaken outside of these hours if required the hours specified under those conditions in the following circumstances:

(a) by the Police or a public authority for the delivery of vehicles, plant or materials; or

(b) in an emergency to avoid the loss of life, damage to property or to prevent environmental harm; or

(c) 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

(d) 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

(e) as directed by a roads authority to undertake works outside of standard hours, where those activities during standard hours would result in a high risk to road network operational performance; or

(f) carrying out works that during standard hours would 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"; or

(g) the relevant utility service operator has advised the Proponent in writing that carrying out the works and activities during standard hours would result in a high risk to the operation and integrity of the utility network; or

(h) as otherwise approved by the Secretary.

(2) The Construction Noise & Vibration Management Plan (CNVMP) approved under Condition B45 must be updated prior to works commencing to identify the types and durations of activities proposed to be undertaken in each of the circumstances set out in D5(1)(c)-(g). The CNVMP must:

(a) include provisions from the Victoria Cross South– OSD Tower Construction Noise And Vibration Impact Statement (RWDI, April 2022) which forecasted construction impacts on surrounding receivers;

(b) identify the types of mitigations required for receivers based on the various levels of forecast noise and vibration impacts, including:

i. community notification and consultation requirements,

ii. individual briefings,

iii. noise monitoring,

iv. specific respites,

v. other alternate arrangements as agreed with individual receivers

D6 Notification of such activities must be given to affected residents before undertaking the activities or as soon as is practical afterwards.

D7 Rock breaking, rock hammering, sheet piling, pile driving and similar activities may only be carried out between the following hours:

(a) 9am to 12pm, Monday to Friday.

(b) 2pm to 5pm, Monday to Friday, and

(c) 9am to 12pm Saturday.

3.1.3 **Justification** for OOHW

Lendlease Development proposes to modify Condition D5 of the SSD consent to align with Condition E44 of the CSSI approval given the integrated nature of the SSD and CSSI project, as both the SSD and CSSI projects are being delivered entirely by a single contractor. Accordingly, it is considered appropriate that the same out of hours works parameters are set between the two projects for consistency. This approach will support a whole-of-precinct management approach that has been applied to other SSD conditions.

3.2 Other Construction noise and vibration requirements

Other approved SSD10294 construction noise and vibration requirements are detailed below:

"D10. The development must be constructed to achieve the construction noise management levels detailed in the Interim Construction Noise Guideline (DECC, 2009). All feasible and reasonable noise mitigation measures must be implemented and any activities that could exceed the construction noise management levels must be identified and managed in accordance with the management and mitigation measures identified in the approved CNVMP.

D11. The Applicant must ensure construction vehicles (including concrete agitator trucks) do not arrive at the subject site or surrounding residential precincts outside of the construction hours of work outlined under condition D3

D12. The Applicant must implement, where practicable and without compromising the safety of construction staff or members of the public, the use audible movement alarms of a type that would minimise noise impacts on surrounding noise sensitive receivers.

D13. The Applicant must ensure that any work generating high noise impact (i.e. work exceeding a NML of L_{Aeq} 75dBA) as measured at the sensitive receiver must only be undertaken in continuous blocks of no more than 3 hours, with at least a 1 hour respite between each block of work generating high noise impact, where the location of the work is likely to impact the same receivers. For the purposes of this condition 'continuous' includes any period during which there is less than one hour respite between ceasing and recommencing any of the work the subject of this condition.

D14. Any noise generated during construction of the development must not be offensive noise within the meaning of the Protection of the Environment Operations Act 1997 or exceed approved noise limits for the site

D15. Vibration caused by construction at any residence or structure outside the Site must be limited to:

a) for structural damage, the latest version of DIN 4150-3 (1992-02) Structural vibration - Effects of vibration on structures (German Institute for Standardisation, 1999);
b) for human exposure to vibration, the evaluation criteria set out in the Environmental Noise Management Assessing Vibration: a Technical Guideline (Department of Environment and Conservation, 2006) (as may be updated or replaced from time to time);
c) vibratory compactors must not be used closer than 30 metres from residential or heritage buildings unless vibration monitoring confirms compliance with the vibration criteria specified above; and
d) these limits apply unless otherwise outlined in the amended CNVMP applicable to the CSSI approval (CSSI 7400) or the project specific CNVMP required by condition B45."

4 DESCRIPTION OF PROPOSED CONSTRUCTION WORKS

The OSD Project involves the staged construction of the 42 storey OSD development. Staging Plans provided by Lendlease outlining the works are included in **Appendix A**.

4.1 Proposed Works Schedule

The proposed OOHW modifications would relate to Stage 5 to Stage 9 of works at the VCS site, i.e., the construction of the OSD and as detailed in **Table 4-1**.

Table 4-1 Construction Stages – Victoria Cross South (VCS)

Stage	Dates	Description	Progress
Stage 1	Feb 2021 – Apr 2021	• Site establishment • Tower crane installed • Work zone established • Denison street stormwater works commences • Detailed excavation and loadout commence • Concrete footings commence	Complete
Stage 2	May 2021 – Jul 2021	• Stormwater / superstructure • Station concrete frame / superstructure commences	Complete
Stage 3	Aug 2021 – Oct 2021	• Concrete frame below ground level • Station concrete frame continues below ground	Complete
Stage 4	Nov 2021 – Oct 2022	• Concrete frame below ground level • Station fit out below ground • Station concrete frame above ground	In progress
Stage 5	Oct 2022 – Jan 2023	• Station above ground complete • OSD concrete frame commences	Scheduled
Stage 6	Feb 2023 – Apr 2023	• OSD concrete frame continues • OSD façade & finishes commence	Scheduled
Stage 7	May 2023 – May 2024	• OSD concrete frame completed • OSD façade & finishes completed	Scheduled
Stage 8	June 2024 – Nov 2024	• OSD finishes & commissioning	Scheduled
Stage 9	November 2024	• Works completed	Scheduled

4.2 Proposed Activities

Works would predominantly be completed within standard hours. Currently, works may be carried out outside standard hours under conditions D5 and D6 of the SSD approval.

Lendlease proposes to undertake Out of Hours Work (OOHW) during the OSD tower works at the VCS site as per the hours indicated in **Table 4-2**, which is the subject of this CNVIS. In a broad overview, the following is summarised:

- *Deliveries, tower cranes, hoists operating*: 6am to 10pm Mondays to Saturdays.
- *Structures:* 7am to 10pm Mondays to Saturdays.
- *Façade work:* normal hours only.
- *Internal fit-out and services works*: 24 hours once façade is installed, plus the core hoist running for access.

Where works are proposed to be undertaken outside of the standard hours, specific respite periods and management measures would be considered and developed for those works as required.

All plant equipment to be used during the proposed hours are not vibration intensive and do not have any annoying characteristics. Hence no additional penalties apply to these plant items.

It is understood that the equipment may operate simultaneously at any location in the VCS site.

Table 4-2 Proposed operation of plant and equipment for the OSD Tower works

Activity/ Work Area	Aspect	Plant/ Equipment	Day	Evening	Night	Morning Shoulder	Timing of Activity		Sound Power Level (Lw re: 1pW) in Noise Model, dB(A)			High noise plant ?	Vibration Intensive Plant	Notes
			7am - 6pm	6pm - 10pm	10pm - 6am	6am - 7 am	Start Date	End Date	L_{Aeq}	Penalty	L_{Amax}			
Compound general activities	Deliveries, Materials handling, Office areas, Storage areas, Car parking	Delivery trucks	4 per hour	4 per hour	-	2 per hour	Nov-22	Feb-24	106	-	111	-	-	
		Light vehicle	50 in/ out	-	-	-	Nov-22	Feb-24	89	-	100	-	-	
		Tower Crane 50T	1	1	-	1	Oct-22	Jul-24	104	-	108	-	-	Jaso Electric J438 External Climbing Tower Crane
		Tower Crane 30T	1	1	-	1	Oct-22	Feb-24	104	-	108	-	-	Jaso Electric J280 Internal Core Climbing Tower Crane
		Twin Hoists	1	1	-	1	Oct-22	Jun-24	96	-	101	-	-	Twin man & material hoists - Servicing LG-L40
		Single jump form core hoist	1	-	-	-	Oct-22	Feb-24	94	-	98	-	-	Single Man & material Hoist - Servicing L3 - L29
		Single jump form core hoist	1	1	1	1	Oct-22	Feb-24	94	-	98	-	-	Servicing B1-Jumpform level (up to level 42)
		Franna Crane/Forklift	1	1	-	1	Oct-22	May-24	98	-	102	-	-	Intermittent
Structure construction (steel/formwork/concrete)	Formwork	Formwork hoist	2	2	-	-	Nov-22	Feb-24	96	-	101	-	-	
		Hand tools	1	1	-	-	Dec-22	May-24	105	-	118	-	-	
		Walkie reach	1	1	-	-	Dec-22	May-24	99	-	103	-	-	
	Concrete pours	Concrete placement booms	3	3	-	-	Oct-22	May-24	93	-	98	-	-	Located at either end of the floor plates and one in the core and climbed progressively with the structure
		Static concrete pump	2	2	-	-	Oct-22	May-24	103	-	107	-	-	Ground floor, allowing a two-truck feed with drive-in and drive-out access from Miller St. Additional Single truck feed zone on Berry St.
		Concrete agitator trucks	6 per hour	6 per hour	-	-	Oct-22	May-24	108	-	111	-	-	
		Compressor	2	2	-	-	Oct-22	May-24	102	-	103	-	-	
	Structural steel	Power hand tools	4	4	-	-	Jun-23	Jul-24	108	-	118	-	-	
		Impact wrench	4	4	-	-	Jun-23	Jul-24	107	-	118	-	-	
Facade installation	Tower Façade L4 – L39	Walkie Reach with job & winch	1	-	-	-	Feb-23	May-24	99	-	103	-	-	
		Crane (Maeda)	1	-	-	-	Feb-23	May-24	99	-	103	-	-	
		EWP/Star 10	2	-	-	-	Feb-23	May-24	95	-	98	-	-	
		Crawler crane	2	-	-	-	Feb-23	May-24	104	-	108	-	-	
		Power hand tools	1	-	-	-	Feb-23	May-24	108	-	118	-	-	
	Plantroom and rooftop façade L40-L42	Walkie Reach with job & winch	1	-	-	-	Jan-24	Jul-24	99	-	103	-	-	
		Crawler crane	2	-	-	-	Jan-24	Jul-24	104	-	108	-	-	
		Crane (Maeda)	1	-	-	-	Jan-24	Jul-24	99	-	103	-	-	
		Scissor lift	2	-	-	-	Jan-24	Jul-24	106	-	109	-	-	
		Boom lift	2	-	-	-	Jan-24	Jul-24	105	-	108	-	-	
		Power hand tools	1	-	-	-	Jan-24	Jul-24	108	-	118	-	-	
Internal fit-out	Waterproofing	Power hand tools	1	-	-	-	Mar-24	Jul-24	108	-	118	-	-	
	Building services installation	Compressor	2	2	2	-	Jan-23	Jul-24	102	-	103	-	-	
		Crawler crane	1	1	1	1	Jan-23	Jul-24	104	-	108	-	-	
		Power hand tools	3	3	3	3	Jan-23	Jul-24	108	-	118	-	-	
		Forklift	1	1	1	1	Jan-23	Jul-24	99	-	103	-	-	
		EWP/Star 10	15	15	15	15	Apr-23	Nov-24	95	-	98	-	-	Per floor

Activity/ Work Area	Aspect	Plant/ Equipment	Day	Evening	Night	Morning Shoulder	Timing of Activity		Sound Power Level (Lw re: 1pW) in Noise Model, dB(A)			High noise plant ?	Vibration Intensive Plant	Notes
			7am - 6pm	6pm - 10pm	10pm - 6am	6am - 7 am	Start Date	End Date	L_{Aeq}	Penalty	L_{Amax}			
	Plantrooms/ Services Risers & Rough-in	Forklift	1	1	1	1	Apr-23	Nov-24	99		103	-	-	
		Power hand tools	10	10	10	10	Apr-23	Nov-24	108	-	118	-	-	Per floor
	Internal fit out and finishes	EWP	10	10	10	10	Apr-23	Nov-24	95	-	98	-	-	Per floor
		Grinder	1	-	-	-	Jan-23	Nov-24	108	-	118	-	-	Concrete Floor Grinders
		Power hand tools	10	10	10	-	Apr-23	Nov-24	108	-	118	-	-	Per floor
Services connections (water, power, communications, etc)	Services Fit-off	Delivery trucks	2	2	2	2	Apr-23	Oct-24	106	-	111	-	-	Per floor
		Elevated work platform	10	10	10	10	Apr-23	Oct-24	95	-	98	-	-	Per floor
		Power hand tools	10	10	10	10	Apr-23	Oct-24	108	-	118	-	-	Per floor
		Forklift	1	1	1	1	Apr-23	Oct-24	99	-	103	-	-	Per floor

Note: daytime (7.00am 6.00pm); evening (6.00pm 10.00pm); night time (10.00pm 7.00am); morning shoulder (6.00am – 7.00am)

5 AIRBORNE CONSTRUCTION NOISE

5.1 Airborne Construction Noise Criteria

5.1.1 NSW Interim Construction Noise Guideline (ICNG)

The SSD 10294 Condition B45 notes that construction should be undertaken in accordance with the procedures nominated in the DECCW's "*Interim Construction Noise Guideline*" dated July 2009 (ICNG).

The noise criteria set out in the *ICNG* have been considered in assessing potential impacts from project works. **Table 5-1** summarises construction noise criteria recommended by the *ICNG* for residential receivers and **Table 5-2** summarises the criteria for non-residential receivers. **Table 5-2** additionally includes the construction noise criteria for relevant special use receivers (other sensitive land uses) not identified by the *ICNG*.

Table 5-1 *ICNG* Airborne Construction Noise Criteria – Noise at Residences[1]

Time of Day	Management Level $L_{Aeq,15min}$	How to Apply
Recommended Standard Hours: Monday to Friday 7am to 6pm	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq,15min}$ is greater than the noise affected level, the proponent would apply all feasible and reasonable work practices to minimise noise. The proponent would 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.
Saturday 8am to 1pm No work on Sundays or Public Holidays	Highly noise affected 75 dBA	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 proponent would consider very carefully if there is any other feasible and reasonable way to reduce noise to below this level. If no quieter work method is feasible and reasonable, and the works proceed, the proponent would communicate with the impacted residents by clearly explaining the duration and noise level of the works, and by describing any respite periods that will be provided.
Outside recommended standard hours	Noise affected RBL + 5 dB	A strong justification would typically be required for works outside the recommended standard hours. The proponent would 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 5 dBA above the noise affected level, the proponent would negotiate with the community. For guidance on negotiating agreements see Section 7.2.2 of the ICNG.

Note 1 Adopted from the ICNG.

Note 2 Noise levels apply at the property boundary that is most exposed to construction noise (or receiver building façade that is most exposed to construction noise, noting that noise levels may be higher at upper floors of the noise affected receiver buildings). If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise affected point within 30 m of the residence.

Table 5-2 Airborne Construction Noise Criteria – Other Sensitive Land Uses

Land Use	Management Level $L_{Aeq, 15min}$ (applies when properties are being used)	Reference
Classrooms at Schools & other educational institutions	Internal noise level: 45 dBA[1]	ICNG[7]
Hospital Wards & Operating Theatres	Internal noise level: 45 dBA[2]	ICNG[7]
Places of Worship	Internal noise level: 45 dBA[3]	ICNG[7]
Active recreation areas	External noise level: 65 dBA	ICNG[7]
Passive recreation areas	External noise level: 60 dBA	ICNG[7]
Commercial premises (offices, etc)	External noise level: 70 dBA	ICNG[7]
Industrial premises	External noise level: 75 dBA	ICNG[7]
Hotels – Sleeping areas (hotels near major roads)	Internal noise level: 40 dBA[4]	AS2107[8]
Childcare Centres (Sleeping areas)	Internal noise level: 40 dBA[5]	AAAC[9]
Recording Studios	Internal noise level: 25 dBA[6]	AS2107[8]

Note 1, 2, 3 External Noise Management Levels (NML) of $L_{Aeq,15min}$ 55 dBA are considered by this assessment, assuming 10dB attenuation achieved by façades with open window(s);

Note 4, 5 External Noise Management Levels (NML) of $L_{Aeq,15min}$ 60 dBA are considered by this assessment, assuming 20 dB attenuation achieved by façades with closed/fixed window(s);

Note 6 External Noise Management Levels (NML) of $L_{Aeq,15min}$ 55 dBA are considered by this assessment, assuming 30 dB attenuation achieved by façades with closed/fixed window(s);

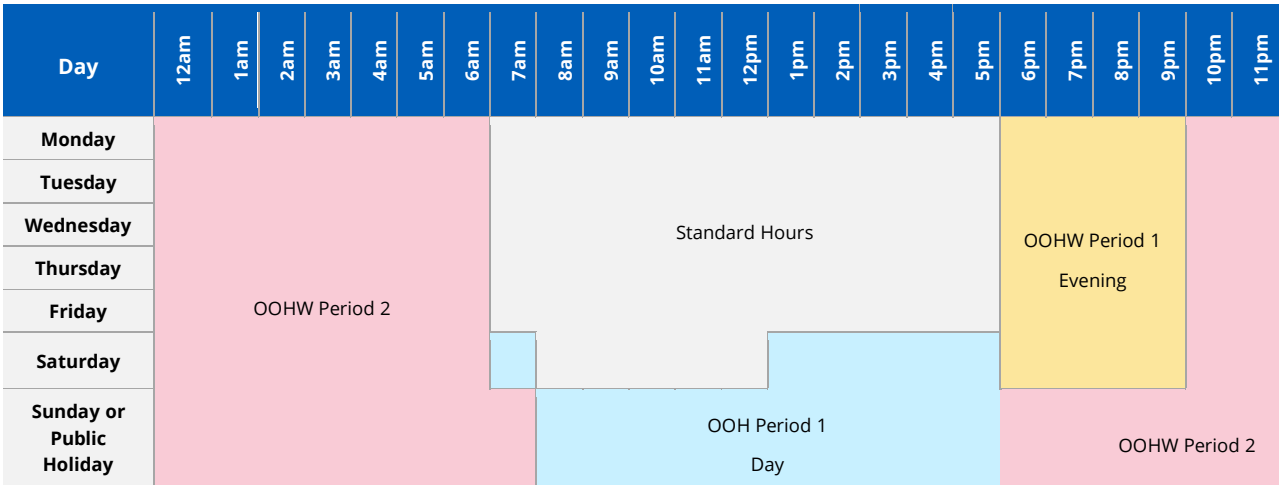
Note 7 Management Levels specified by Interim Construction Noise Guideline;

Note 8 Management Levels specified by Australian Standard 2107;

Note 9 Management Level specified by Association of Australasian Acoustical Consultants (AAAC) Technical Guideline on Child Care Centre Noise Assessments.

The out of hours periods identified by the Sydney Metro City and Southwest Construction Noise & Vibration Strategy have been considered. These are shown in **Table 5-3** with the resultant project-specific NMLs set out in **Table 5-4**. Potential airborne construction noise impacts have been assessed in reference to the NMLs shown in **Table 5-4**.

Table 5-3 Sydney Metro City & Southwest CNVS Construction Hours



Note 1 Standard construction hours are defined as: Monday to Friday 7:00am to 6:00pm and Saturdays from 8:00am to 1:00pm.

Note 2 Work outside of standard construction hours is defined as Out-of-Hours Work (OOHW) and can be divided into 2 periods of sensitivity.

OOHW Period 1 is defined as Monday to Saturday 6:00pm to 10:00pm (evenings), Saturday 7:00am to 8:00am and 1:00pm to 10:00pm (day & evening) and Sunday and public holidays 8:00am to 6:00pm (days).

OOHW Period 2 is defined as Monday to Saturday 10:00pm to 7:00am (nights) and

Sundays and public holidays 6:00pm to 8:00am (nights)

Table 5-4 Airborne Noise Management Levels

Location	Standard Hours (Day)		OOHW Period 1 (Day)		OOHW Period 1 (Evening)		OOHW Period 2 (Night)		Morning Shoulder (5am–7am)	
	RBL	NML	RBL	NML	RBL	NML	RBL	NML	RBL	NML
VCS Residential	65	75	65	70	63	68	52	57	59	64
VCN Residential	65	75	65	70	57	62	51	56	58	63
School (Classrooms)	-	55	-	55	-	55	-	55	-	55
Commercial (Offices)	-	70	-	70	-	70	-	70	-	70
Hotels (Sleeping areas)	-	60	-	60	-	60	-	60	-	60
Childcare Centre (Sleeping areas)	-	60	-	60	-	60	-	60	-	60
Recording Studios	-	55	-	55	-	55	-	55	-	55

Notes RBL - Rating Background Noise Level; NML - Noise Management Level;

Non-residential criteria only apply when receiver building is in use. Noise levels apply at the property boundary that is most exposed to construction noise (or receiver building façade that is most exposed to construction noise, noting that noise levels may be higher at upper floors of the noise affected receiver buildings). If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise affected point within 30 m of the residence.

5.1.2 Sleep Disturbance

Noise sources of short duration and high level that may cause disturbance to sleep if occurring during the night-time and morning shoulder periods need to be considered.

The approach recommended by the *NPfI* is to apply the following initial screening noise levels:

- $L_{Aeq,15min}$ 40dBA or the prevailing RBL + 5dB, whichever is the greater; and/or
- L_{AFmax} 52dBA or the prevailing RBL + 15dB, whichever is the greater.

The sleep disturbance screening noise levels apply outside bedroom windows during the night period.

Where the screening noise levels cannot be met, a detailed maximum noise level event assessment should be undertaken. It may also be appropriate to consider other guidelines including the NSW *Road Noise Policy* (RNP) which contains additional guidance relating to potential sleep disturbance impacts.

5.1.3 Sydney Metro Construction Noise & Vibration Strategy (CNVS)

In addition to the *ICNG*, the noise criteria set out in the Sydney Metro City and Southwest Construction Noise & Vibration Strategy (CNVS) have been considered.

The CNVS recognises that works requiring the use of heavy machinery can generate high noise and vibration levels and in urban areas there is often limited setback distance between these noise sources and nearby

buildings and receivers. Under such circumstances, typically there is limited opportunity to practicably mitigate the noise and vibration effects in a cost-effective manner. Therefore, potential disturbance impacts are usually minimised as much as practicable through management techniques. For residential receivers, depending on how far the predicted airborne construction noise level is above RBL, the CNVS recommends the adoption of the management measures set out in **Table 5-5**. Full definitions of the identified management measures are set out in the CNVS.

Table 5-5 Additional Airborne Noise Management Measures (Residential)

Time Period		Mitigation Measures			
		Predicted $L_{Aeq,15min}$ Noise Level Above Background (RBL)			
		0 to 10 dB	10 to 20 dB	20 to 30 dB	> 30 dB
Standard	Mon-Fri (7am - 6pm) Sat (8am - 1pm) Sun/Pub Hol (Nil)	-	-	M, LB	M, LB
OOH Period 1	Mon-Fri (6pm - 10pm) Sat (1pm - 10pm) Sun/Pub Hol (8am - 6pm)	-	LB	M, LB	M, IB, LB, PC, RO, SN
OOH Period 2	Mon-Fri (10pm - 7am) Sat (10pm - 8am) Sun/Pub Hol (6pm - 7am)	-	M, LB	M, IB, LB, PC, RO, SN	AA, M, IB, LB, PC, RO, SN

Notes AA – Alternative Accommodation
M – Monitoring
IB – Individual Briefings
LB – Letterbox drops
RO – Project Specific Respite Offer
PC – Phone Calls and emails
SN – Specific Notifications.
Full definitions of these Additional Mitigation Measures are set out in Table 13 of the Sydney Metro City and Southwest Construction Noise & Vibration Strategy (Ver 0.4, 9 August 2017).

5.2 Airborne Construction Noise Assessment

At any particular location, the potential impacts can vary greatly depending on factors such as the relative proximity of sensitive receivers, the overall duration of the construction works, the intensity of the works, the time at which the construction works are undertaken and the character of the emissions.

5.2.1 Construction Stages

Assessment of airborne noise impacts from the construction activities have been determined by modelling the noise sources, receiver locations, topographical features and worksite hoardings.

Key details regarding the construction site layouts, the likely plant and equipment (including truck movements), and hours of operation were informed by the Design and Construction Teams from Lendlease. This information is presented in **Appendix A** and forms the basis for all modelling assumptions used in this assessment.

5.2.2 Construction Equipment

For the purposes of this assessment, the construction equipment and sound power levels set out in **Section 4.2** have been considered across the identified works areas as shown in the Staging Plans provided in **Appendix A**. The sound power levels in **Section 4.2** have been determined by measurements undertaken by RWDI on other similar projects and also from Lend Lease.

5.2.3 Construction Noise Modelling

Construction noise emissions from the works have been modelled using the Cadna-A (Version 2021) environmental noise prediction software. This program is used and recognised internationally and is also recognised by NSW regulatory authorities as one of the preferred computer noise modelling software. Factors that are addressed in the noise modelling are:

- Construction equipment sound power levels;
- Location of construction equipment;
- Screening from existing structures;
- Receiver locations, including multiple storey receivers;
- Ground topography;
- Noise attenuation due to geometric spreading;
- Ground absorption; and
- Atmospheric absorption.

Each stage of construction of the OSD towers (Stage 5 onwards) has been separately modelled taking the impacts from OOHWs into consideration along with Standard Hour Works. The construction noise has been assessed during a worst case 15-minute period. **Table 4-2** details the noise levels of the equipment used for the construction stages. No modifying factors are required for the predicted noise as the mobile plant equipment are assumed to be fitted with broadband reversing alarms. Where required, plant equipment such as power tools are assumed to operate for typical durations via a usage factor.

5.2.4 Construction Noise Predictions

The predicted worst-case construction noise levels for the construction stages identified in **Table 4-1** (and **Appendix A**) at each of the identified receivers are set out in **Table B 1, Table B 2, Table B 3** and **Table B 4 in Appendix B** for the day, evening, night and the morning shoulder periods respectively.

The predictions represent the typical-worst case noise levels that may be expected to arise at the external facades of the receiver buildings when all noise sources operate simultaneously over a 15-minute duration. It should be noted that construction noise levels would frequently be lower than the worst-case levels considered for significant periods of time. This would be apparent as works move around the sites and are therefore more distant/more shielded from receivers and when less noisy activities are being undertaken.

Other observations are:

- All stages are modelled to have up to 7 dBA exceedances above the NMLs during the day time for some commercial receivers, with little to no exceedances for most other receivers.
- The modelled Stage 5 & Stage 6 works predicted levels below evening and night time NMLs at residential receivers.
- The modelled Stage 7 works predicted above evening NMLs by up to 8 dBA, and night time NMLs by up to 15dBA, at residential receivers.
- Stage 8 works are slightly quieter compared to Stage 7 works with no exceedances above the NMLs during evening time and up to 6 dBA exceedance above the NMLs during night time.
- Exceedances above NMLs for commercial and school receivers are not relevant during evening, night time and morning shoulder periods in general.

Table 5-6 Exceedance above Noise Management Levels - Day Period (OOHW)

ID	Address	Description	Land Use	NML Day	VCS Stage 5	VCS Stage 6	VCS Stage 7	VCS Stage 8	VCS Exceedance Range
S01	128 Miller St	Monte Sant' Angelo Mercy College	School	55	0	0	0	0	0 - 0
S02	201 Miller St	Intel Security Building - Fixed Glass Windows	Commercial	70	0	0	0	0	0 - 0
S03	199 Miller St	Rag & Famish (Hotel)	Commercial	70	2	2	4	0	2 - 4
S04	50 Berry St	Fixed Glass Windows	Commercial	70	5	5	7	0	5 - 7
S05	56 Berry St	-	Commercial	70	0	0	0	0	0 - 0
S06	66 Berry St	-	Commercial	70	0	0	0	0	0 - 0
S07	72 Berry St	Ausgrid	Industrial	75	0	0	0	0	0 - 0
S08a	65 Berry St	-	Commercial	70	0	1	2	0	0 - 2
S09	77-81 Berry St	-	Commercial	70	0	0	0	0	0 - 0
S10a	77 Berry St	-	Commercial	70	0	0	0	0	0 - 0
S10b	79-81 Berry St	-	Residential	70	0	0	0	0	0 - 0
S11a	105-153 Miller St	-	Commercial	70	0	0	0	0	0 - 0
S11b	105-153 Miller St	-	Commercial	70	0	0	0	0	0 - 0
S12	80 Mount St	Fixed Glass Windows	Commercial	70	0	0	0	0	0 - 0
S13	2 Elizabeth Plaza	-	Commercial	70	0	0	0	0	0 - 0
S14	51 Mount St	-	Commercial	70	0	0	0	0	0 - 0
S15	100 Miller St	-	Comm/Res	70	2	1	2	2	0 - 2
S16	53 Berry St	-	Commercial	70	0	0	2	0	0 - 2
S17	177 Pacific Hwy	-	Commercial	70	0	0	0	0	0 - 0

Table 5-7 Exceedance above Noise Management Levels - Evening Period (OOHW)

ID	Address	Description	Land Use	NML Eve	VCS Stage 5	VCS Stage 6	VCS Stage 7	VCS Stage 8	VCS Exceedance Range
S01	128 Miller St	Monte Sant' Angelo Mercy College	School	55	4	4	6	0	4-6
S02	201 Miller St	Intel Security Building - Fixed Glass Windows	Commercial	70	0	0	0	0	0 - 0
S03	199 Miller St	Rag & Famish (Hotel)	Commercial	70	9	9	10	0	9 - 10
S04	50 Berry St	Fixed Glass Windows	Commercial	70	12	12	14	0	12 - 14
S05	56 Berry St	-	Commercial	70	4	4	5	0	4 - 5
S06	66 Berry St	-	Commercial	70	1	1	3	0	1 - 3
S07	72 Berry St	Ausgrid	Industrial	75	0	0	1	0	0 - 1
S08a	65 Berry St	-	Commercial	70	6	7	8	0	6 - 8
S09	77-81 Berry St	-	Commercial	70	2	2	5	0	2 - 5
S10a	77 Berry St	-	Commercial	70	0	0	0	0	0 - 0
S10b	79-81 Berry St	-	Residential	68	0	0	5	0	0 - 5
S11a	105-153 Miller St	-	Commercial	70	1	2	5	0	1 - 5
S11b	105-153 Miller St	-	Commercial	70	0	0	0	0	0 - 0
S12	80 Mount St	Fixed Glass Windows	Commercial	70	0	0	0	0	0 - 0
S13	2 Elizabeth Plaza	-	Commercial	70	0	0	0	0	0 - 0
S14	51 Mount St	-	Commercial	70	0	0	0	0	0 - 0
S15	100 Miller St	-	Comm/Res	68	9	7	8	0	7 - 9
S16	53 Berry St	-	Commercial	70	7	6	8	0	7 - 8
S17	177 Pacific Hwy	-	Commercial	70	0	0	1	0	0 - 1

Table 5-8 Exceedance above Noise Management Levels - Night Period (OOWH)

ID	Address	Description	Land Use	NML Night	VCS Stage 5	VCS Stage 6	VCS Stage 7	VCS Stage 8	VCS Range
S01	128 Miller St	Monte Sant' Angelo Mercy College	School	55	0	0	12	5	0 - 12
S02	201 Miller St	Intel Security Building - Fixed Glass Windows	Commercial	70	0	0	2	0	0 - 2
S03	199 Miller St	Rag & Famish (Hotel)	Commercial	70	0	0	12	5	0 - 12
S04	50 Berry St	Fixed Glass Windows	Commercial	70	0	0	13	6	0 - 13
S05	56 Berry St	-	Commercial	70	0	0	8	3	0 - 8
S06	66 Berry St	-	Commercial	70	0	0	8	2	0 - 8
S07	72 Berry St	Ausgrid	Industrial	75	0	0	3	0	0 - 3
S08a	65 Berry St	-	Commercial	70	0	0	9	2	0 - 9
S09	77-81 Berry St	-	Commercial	70	0	0	13	5	0 - 13
S10a	77 Berry St	-	Commercial	70	0	0	3	0	0 - 3
S10b	79-81 Berry St	-	Residential	57	0	0	14	5	0 - 14
S11a	105-153 Miller St	-	Commercial	70	0	0	14	5	0 - 14
S11b	105-153 Miller St	-	Commercial	70	0	0	1	0	0 - 1
S12	80 Mount St	Fixed Glass Windows	Commercial	70	0	0	4	0	0 - 4
S13	2 Elizabeth Plaza	-	Commercial	70	0	0	6	0	0 - 6
S14	51 Mount St	-	Commercial	70	0	0	0	0	0 - 0
S15	100 Miller St	-	Comm/Res	57	0	0	15	6	0 - 15
S16	53 Berry St	-	Commercial	70	0	0	13	5	0 - 13
S17	177 Pacific Hwy	-	Commercial	70	0	0	5	0	0 - 5

Table 5-9 Exceedance above Noise Management Levels – Morning Shoulder Period

ID	Address	Description	Land Use	NML 5am-7am	VCS Stage 5	VCS Stage 6	VCS Stage 7	VCS Stage 8	VCS Range
S01	128 Miller St	Monte Sant' Angelo Mercy College	School	55	0	0	0	0	0
S02	201 Miller St	Intel Security Building - Fixed Glass Windows	Commercial	70	0	0	0	0	0
S03	199 Miller St	Rag & Famish (Hotel)	Commercial	70	0	0	0	0	0
S04	50 Berry St	Fixed Glass Windows	Commercial	70	0	0	0	0	0
S05	56 Berry St	-	Commercial	70	0	0	0	0	0
S06	66 Berry St	-	Commercial	70	0	0	0	0	0
S07	72 Berry St	Ausgrid	Industrial	75	0	0	0	0	0
S08a	65 Berry St	-	Commercial	70	0	0	0	0	0
S09	77-81 Berry St	-	Commercial	70	0	0	0	0	0
S10a	77 Berry St	-	Commercial	70	0	0	0	0	0
S10b	79-81 Berry St	-	Residential	64	0	0	0	0	0
S11a	105-153 Miller St	-	Commercial	70	0	0	0	0	0
S11b	105-153 Miller St	-	Commercial	70	0	0	0	0	0
S12	80 Mount St	Fixed Glass Windows	Commercial	70	0	0	0	0	0
S13	2 Elizabeth Plaza	-	Commercial	70	0	0	0	0	0
S14	51 Mount St	-	Commercial	70	0	0	0	0	0
S15	100 Miller St	-	Comm/Res	64	0	0	0	0	0
S16	53 Berry St	-	Commercial	70	0	0	0	0	0
S17	177 Pacific Hwy	-	Commercial	70	0	0	0	0	0

5.3 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.

To evaluate the potential for sleep disturbances, a sleep disturbance screen level assessment has been undertaken. To assess the likelihood of sleep disturbance, an assessment of maximum noise levels against the screening level of L_{Amax} = RBL + 15 dB has been undertaken for residential receivers. Table B 5 (**Appendix B**) sets out the predicted maximum noise levels for each stage and identify where exceedances may occur during the night and morning shoulder periods if the works were undertaken in these periods.

The additional guidance relating to potential sleep disturbance impacts contained in the NSW *Road Noise Policy* (RNP) was reviewed to quantify the significance of the potential residual exceedance of the sleep disturbance screening levels at residential receivers.

According to the RNP, research on sleep disturbance indicates that in some circumstances, higher noise levels may occur without significant sleep disturbance. Based on currently available research results, the RNP concludes that:

- "Maximum internal noise levels below 50 dBA to 55 dBA are unlikely to cause awakening reactions."
- "One or two noise events per night, with maximum internal noise levels of 65 dBA to 70 dBA, are not likely to affect health and wellbeing significantly."

Maximum noise levels from works during the night time period and morning shoulder period are predicted to be up to 77 - 78 dBA outside the windows of the Denison St (Stage 7 only) and Miller Street (Stage 7 & Stage 8) receivers. This is mainly due to power tool usage and delivery trucks. It is noted that residential receivers at 100 Miller Street have no operable windows, and therefore the potential for sleep disturbance at this location is very low.

Based on an estimated external to internal noise reduction of 25 dBA, maximum internal noise levels of 45-50 dBA are predicted. These levels are above the sleep disturbance screening level of 45 dB(A) L_{Amax} (internal), but within the 'awakening reaction' level of 55 dBA L_{Amax} (internal).

During the morning shoulder period, deliveries should be conducted along Miller Street and Berry Street, when possible.

Truck drivers should be instructed to minimise unnecessary noise, slamming of doors. Broadband reversing alarms should be installed on heavy vehicles.

Table 5-10 details predicted exceedances of the screening levels for residential receivers surrounding the site.

Table 5-10 Predicted Exceedances above Night/Shoulder period Screening Levels , L_{Amax} -

ID	Address	Description	Land Use	NML 5am-7am	NML Night	VCS Stage 5	VCS Stage 6	VCS Stage 7	VCS Stage 8	VCS Range
S10b	79-81 Berry St	-	Residential	74	67	0	0	10	0	0 - 10
S15	100 Miller St	-	Comm/Res	74	67	0	0	11	10	2 - 11

5.4 Management and Additional Mitigation Measures

5.4.1 CNVS Additional Mitigation Measures – Airborne Construction Noise

Table 5-5 (based on Table 14 of the CNVS) sets out the Additional Mitigation Measures to be applied in the case of exceedances of the airborne noise criteria.

The airborne noise predictions indicate that at the closest residential receivers, during standard hours no specific Additional Mitigation Measures are required, but during the out of hours works, various residents should be provided with letterbox drop notifications regarding the forthcoming works and monitoring should be undertaken to confirm noise levels.

5.4.2 Community Consultation

All project community consultation will be completed in accordance with the Sydney Metro Overarching Community Communications Strategy (OCCS) and project specific VCISD Community Communications Strategy (CCS). Forecast noise and vibration levels and predicted potential impacts detailed in this CNVMP will be used to inform and guide the required project consultation as per the OCCS and VCISD CCS.

6 GROUNDBORNE CONSTRUCTION NOISE & VIBRATION

6.1 Construction Vibration Criteria

The effects of vibration in buildings can be divided into three main categories; those in which the occupants or users of the building are inconvenienced or possibly disturbed (human comfort), those where the building contents may be affected (effects on building contents) and those in which the integrity of the building or the structure itself may be prejudiced (structural damage).

6.1.1 Human Comfort

The DECCW's "*Assessing Vibration: a technical guideline*" (AVTG) dated February 2006 (DEC, 2006) recommends the use of BS 6472-1992 for the purpose of assessing vibration in relation to human comfort.

British Standard 6472-1992 "*Guide to evaluation of human exposure to vibration in building*" 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 provides guideline values for continuous, transient and intermittent events that are based on a Vibration Dose Value (VDV), rather than a continuous vibration level. 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 6-1** (based on CNVS Table 5).

Table 6-1 Vibration Dose Value Ranges which might result in various probabilities of Adverse Comment within Residential Buildings

Place & Time	Low Probability of Adverse Comment ($m/s^{1.75}$)	Adverse Comment Possible ($m/s^{1.75}$)	Adverse Comment Probable ($m/s^{1.75}$)
Residential buildings 16-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

Note: For offices and workshops, multiplying factors of 2 and 4 respectively would be applied to the above vibration dose value ranges for a 16-hr day.

With respect to VDV, RWDI notes that there can be practical difficulties in the prediction and measurement of this parameter, particularly given the limited available measured data. For the purpose of this assessment, RWDI considers the equivalent Peak Particle Velocity (PPV) level as recognised by AVTG is an acceptable substitution (as per Table C1.1 of the AVTG).

This is a common approach in the industry and allows alignment with structural damage vibration guide values and provides an opportunity for the same vibration equipment to measure for comfort and damage.

6.1.2 Effects on Building Contents

People can perceive floor vibration at levels well below those likely to cause damage to building contents or affect the operation of typical equipment found in most buildings that is not particularly vibration sensitive.

For most receivers, the controlling vibration criterion is the human comfort criterion, and it is therefore not normally required to set separate criteria in relation to the effect of construction vibration on typical building contents.

Where appropriate, objectives for the satisfactory operation of vibration sensitive critical instruments or manufacturing processes should be sourced from manufacturer's data and/or other published objectives.

6.1.3 Structural Damage

Most commonly specified 'safe' structural vibration limits are designed to minimise the risk of threshold or cosmetic surface cracks and are set well below the levels that have potential to cause damage to the main structure.

The SSD 10294 approval includes statutory requirements, including limits, for vibration under Condition D15 as follows:

D15. Vibration caused by construction at any residence or structure outside the Site must be limited to:
(a) for structural damage, the latest version of DIN 4150-3 (1992-02) Structural vibration - Effects of vibration on structures (German Institute for Standardisation, 1999);
(b) for human exposure to vibration, the evaluation criteria set out in the Environmental Noise Management Assessing Vibration: a Technical Guideline (Department of Environment and Conservation, 2006) (as may be updated or replaced from time to time);
(c) vibratory compactors must not be used closer than 30 metres from residential or heritage buildings unless vibration monitoring confirms compliance with the vibration criteria specified above; and
(d) these limits apply unless otherwise outlined in the amended CNVMP applicable to the CSSI approval (CSSI 7400) or the project specific CNVMP required by condition B45.

BS 7385 Part 2-1993 sets guide values for building vibration based on the lowest vibration levels above which damage has been credibly demonstrated. These levels are judged to give a minimum risk of vibration induced damage, where minimal risk for a named effect is usually taken as a 95% probability of no effect.

Sources of vibration that are considered in the standard include demolition, blasting (carried out during mineral extraction or construction excavation), piling, ground treatments (e.g. compaction), construction equipment, tunnelling, road and rail traffic and industrial machinery.

The recommended limits (guide values) for transient vibration to ensure minimal risk of cosmetic damage to residential and industrial buildings are presented numerically in **Table 6-2** (based on CNVS Table 6).

Table 6-2 Transient Vibration Guide Values – Minimal Risk of Cosmetic Damage

Building Type	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
	4 Hz to 15 Hz	15 Hz & Above
Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
Unreinforced or light framed structures Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

In order to assess the likelihood of cosmetic damage due to vibration measurements would be as a minimum undertaken at the base of the building in three orthogonal vibration components (transverse, longitudinal and vertical directions).

It is noteworthy that extra to the guide values nominated in Table 6, the standard states that:

> *"Some data suggests that the probability of damage tends towards zero at 12.5 mm/s peak component particle velocity. This is not inconsistent with an extensive review of the case history information available in the UK."*

Also that:

> *"A building of historical value should not (unless it is structurally unsound) be assumed to be more sensitive."*

Additionally, CSSI 7400 Condition E59 and SSD 10294 Condition B37 require that before commencement of construction, all property owners of buildings identified as being at risk of damage must be offered a building condition survey. Where an offer is accepted a structural engineer must undertake the survey. The results of the surveys must be documented in a Building Condition Survey Report for each building surveyed. It is noted that at this stage, no buildings have been identified as being at risk of damage.

6.1.4 General Vibration Screening Criterion

The Standard states that the guide values (**Table 6-2**) relate predominantly to transient vibration which does not give rise to resonant responses in structures and low-rise buildings.

Where the dynamic loading caused by continuous vibration may give rise to dynamic magnification due to resonance, especially at the lower frequencies where lower guide values apply, then the guide values in Table 6 may need to be reduced by up to 50%.

Note: rock breaking / hammering and sheet piling activities are considered (by TfNSW) to have the potential to cause dynamic loading in some structures (e.g. residences) and it may therefore be appropriate to reduce the transient values by 50%.

Therefore, for most construction activities involving intermittent vibration sources such as rockbreakers, 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, a conservative vibration damage screening level per receiver type is given below:

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

6.1.5 Guidelines for Heritage Structures

Heritage buildings and structures would be assessed as per the screening criteria as they should not be assumed to be more sensitive to vibration unless they are found to be structurally unsound. If a heritage building or structure is found to be structurally unsound (following inspection) a more conservative cosmetic damage criteria of 2.5 mm/s peak component particle velocity (from DIN 4150) would be considered. **Table 6-3** outlines the heritage listed items within the vicinity of the OSD project, none of which have been assessed as being structurally unsound.

Table 6-3 Heritage Items

Heritage Item / Location	Register Listings	Significance	Location
Monte Sant' Angelo Group	North Sydney LEP 2013 I0894	Local	North-west of southern site
MLC Building	North Sydney LEP 2013 I0893	Local	Immediately south of southern site
Rag & Famish Hotel (199 Miller Street)	North Sydney LEP 2013 I0901	Local	Adjacent to southern site, north on Berry Street
Commercial building (201 Miller Street)	North Sydney LEP 2013 I0904	Local	North of the southern site

6.1.6 Guidelines for Sensitive Scientific & Medical Equipment

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 in Table 7 of the CNVS.

6.1.7 Other Vibration Sensitive Structures & Utilities

Where structures and utilities are encountered which may be considered to be particularly sensitive to vibration, a vibration goal which is more stringent than structural damage goals may need to be adopted. Examples of such structures and utilities include tunnels, gas pipelines and fibre optic cables.

Specific vibration goals would be determined on a case-by-case basis with the structure or utility's owner in order to determine acceptable vibration levels.

6.1.8 CNVS Additional Mitigation Measures – Groundborne Construction Vibration

In addition to the vibration criteria discussed above, the CNVS requires the consideration of Additional Mitigation Measures, in the case of appreciable levels of vibration occurring at sensitive receivers. **Table 6-4** (based on Table 16 of the CNVS) sets out the Additional Mitigation Measures to be applied in the case of exceedances of the groundborne vibration management levels.

Table 6-4 Additional Groundborne Vibration Management Measures (Residential)

Time Period		Mitigation Measures
		Predicted Vibration Levels Exceed Maximum Levels
Standard	Mon-Fri (7.00am - 6.00pm)	M, LB, RP
	Sat (8.00am - 1.00pm)	
	Sun/Pub Hol (Nil)	
OOH Period 1	Mon-Fri (6.00pm - 10.00pm)	M, IB, LB, PC, RO, SN
	Sat (1.00pm - 10.00pm)	
	Sun/Pub Hol (8.00am - 6.00pm)	
OOH Period 2	Mon-Fri (10.00pm - 7.00am)	AA, M, IB, LB, PC, RO, SN
	Sat (10.00pm - 8.00am)	
	Sun/Pub Hol (6.00pm - 7.00am)	

Notes: AA – Alternative Accommodation; M – Monitoring; IB – Individual Briefings; LB – Letterbox drops; RO – Project Specific Respite Offer; PC – Phone Calls and emails; SN – Specific Notifications. Full definitions of these Additional Mitigation Measures are set out in Table 13 of the Sydney Metro City and Southwest Construction Noise & Vibration Strategy (Ver 0.4, 9 August 2017). The 'maximum' vibration value is taken as the 'Maximum Peak Velocity (mm/s)' value identified in Table C1.1 in the *Assessing Vibration: A technical guideline* (DEC 2006).

6.2 Groundborne Construction Noise Criteria

6.2.1 *ICNG* Groundborne Construction Noise Criteria

Groundborne (regenerated) noise is noise generated by vibration transmitted through the ground into a structure. Groundborne noise caused, for example by underground works such as tunnelling, can be more noticeable than airborne noise. Groundborne noise levels for residences are nominated in the *ICNG* and indicate when management actions would be implemented. These levels recognise the temporary nature of construction and are only applicable when groundborne noise levels are higher than airborne noise levels.

The groundborne noise management levels considered by this assessment are shown in **Table 6-5**.

Table 6-5 Ground borne Noise Management Levels

Receiver Type	Standard Hours (Day)	OOHW Period 1 (Day)	OOHW Period 1 (Evening)	OOHW Period 2 (Night)	Morning Shoulder (5am –7am)
	$L_{Aeq,15min}$ dBA	$L_{Aeq,15min}$ dBA	$L_{Aeq,15min}$ dBA	$L_{Aeq,15min}$ dBA	$L_{Aeq,15min}$ dBA
Residential	45	40	40	35	35
Commercial	50 when in use				
Childcare	40 when in use				
School	45 when in use				
TV Studio	25 when in use				

Note: The Groundborne Noise Management Levels for non-residential uses only apply when the building is in use.

The daytime criteria are applicable to both residential and commercial receivers, whereas the evening and night-time criteria are only applicable to residential receivers. The Groundborne Noise Management Levels for non-residential uses only apply when the receiver building is in use. The internal noise levels are to be assessed at the centre of the most-affected habitable room.

6.2.2 CNVS Additional Mitigation Measures – Groundborne Construction Noise

Table 6-6 (based on Table 15 of the CNVS) sets out the Additional Mitigation Measures to be applied in the case of exceedances of the ground borne noise management levels.

Table 6-6 Additional Ground borne Noise Management Measures (Residential)

Time Period		Mitigation Measures		
		Predicted $L_{Aeq,15min}$ Noise Level Exceedance		
		0 to 10 dB	10 to 20 dB	> 20 dB
Standard	Mon-Fri (7.00am - 6.00pm)	LB	LB	M, LB, SN
	Sat (8.00am - 1.00pm)			
	Sun/Pub Hol (Nil)			
OOH Period 1	Mon-Fri (6.00pm - 10.00pm)	LB	M, LB, SN	M, IB, LB, PC, RO, SN
	Sat (1.00pm - 10.00pm)			
	Sun/Pub Hol (8.00am - 6.00pm)			
OOH Period 2	Mon-Fri (10.00pm - 7.00am)	M, LB, SN	AA, M, IB, LB, PC, RO, SN	AA, M, IB, LB, PC, RO, SN
	Sat (10.00pm - 8.00am)			
	Sun/Pub Hol (6.00pm - 7.00am)			

Notes: AA – Alternative Accommodation; M – Monitoring; IB – Individual Briefings; LB – Letterbox drops; RO – Project Specific Respite Offer; PC – Phone Calls and emails; SN – Specific Notifications. Full definitions of these Additional Mitigation Measures are Mitigation abbreviation code definitions set out in Table 13 of the Sydney Metro City and Southwest Construction Noise & Vibration Strategy (Ver 0.4, 9 August 2017).

6.3 Ground borne Construction Noise & Vibration Assessment

Due to the nature of the works during Stages 5, 6, 7 and 8 of the VCS OSD South Tower site, ground borne noise and vibration levels are considered to be insignificant. As a result, the risk of annoyance due to ground borne noise and vibration is not addressed further in this CNVIS.

7 CONSTRUCTION ROAD TRAFFIC NOISE

7.1.1 Construction Road Traffic Noise Guidelines

Criteria for off-site road traffic noise applicable to existing residences affected by additional traffic on existing local roads generated by land use developments are specified in the NSW Road Noise Policy (RNP). Whilst these criteria do not specifically apply to construction traffic movements, they have been conservatively considered and are summarised in **Table 7-1**.

Table 7-1 *RNP* Criteria for Road Traffic Noise

Type of Development	Assessment Criteria dB(A)	
	Day (07:00-22:00)	Night (22:00-07:00)
Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq,15\ hour}$ 60 (external)	$L_{Aeq,9\ hour}$ 55 (external)
Existing residences affected by additional traffic on existing local roads generated by land use developments	$L_{Aeq,1\ hour}$ 55 (external)	$L_{Aeq,1\ hour}$ 50 (external)

Note: The identified criteria do not apply to vehicle movements within the Project Site. For the purpose of assessment, any noise generated by on-site vehicle movements is considered as construction noise and assessed holistically with on-site mobile plant in accordance with the *ICNG*.

As required by the *RNP*, an initial screening test should first be applied by evaluating whether noise levels would increase by more than 2 dB (an increase in the number vehicles of approximately 60%) due to construction traffic or a temporary reroute due to a road closure.

Where noise levels increase by more than 2 dB further assessment is required using the criteria presented in the *RNP*, as shown in **Table 7-1**. A 2 dB increase is typically considered not noticeable.

7.1.2 Construction Road Traffic Assessment

Lendlease estimates that a maximum of 28 heavy vehicle movements per hour would be required during the peak construction phase.

Considering the high existing volume of traffic on the adjacent roads, the noise impact generated by construction delivery vehicles arriving and leaving the site would be expected to result in an increase in road traffic noise levels of less than 2 dB which is in compliance with the established criteria.

On this basis, no material construction traffic noise impacts are expected.

8 CONCLUSIONS AND RECOMMENDATIONS

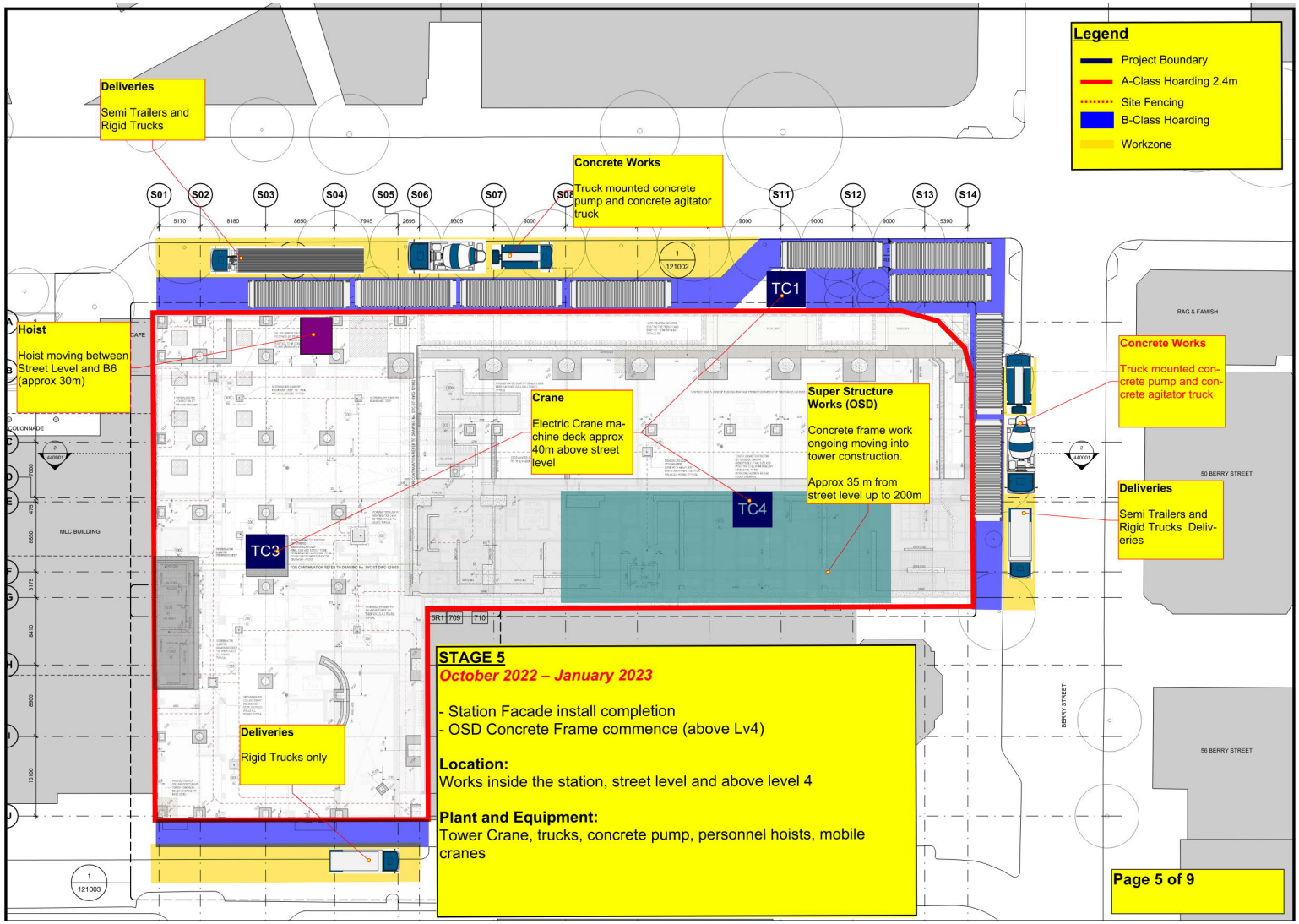
RWDI has been engaged by Lendlease (Victoria Cross) to prepare a Construction Noise and Vibration Impact Statement (CNVIS) for the Victoria Cross Over Station Development (OSD).

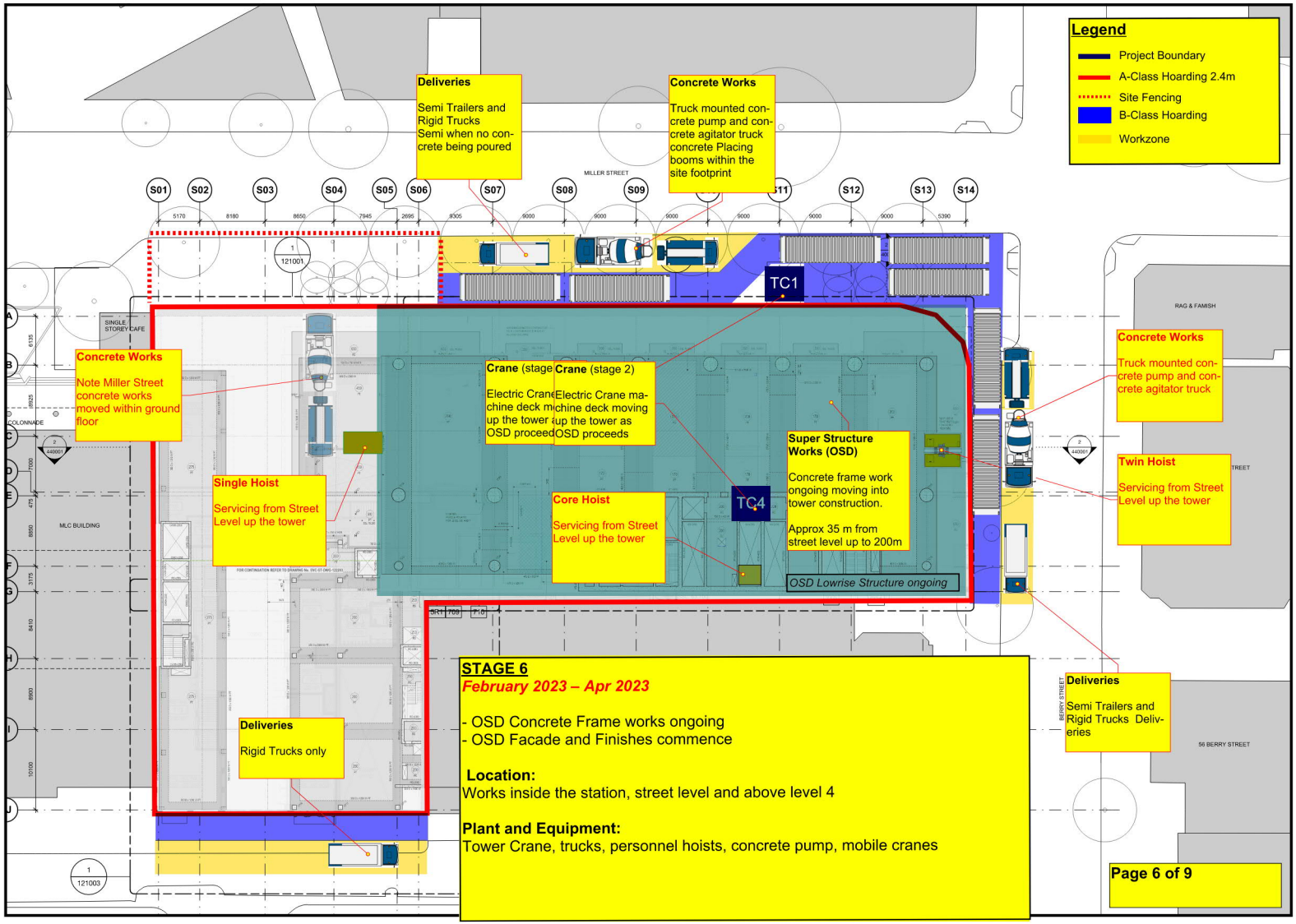
This assessment has been undertaken in accordance with the provisions of the NSW *Interim Construction Noise Guideline* – (ICNG), the *Sydney Metro City and Southwest Construction Noise & Vibration Strategy* (Ver 0.4, 9 August 2017) – (CNVS) and relevant SSD 10294 Conditions of Approval.

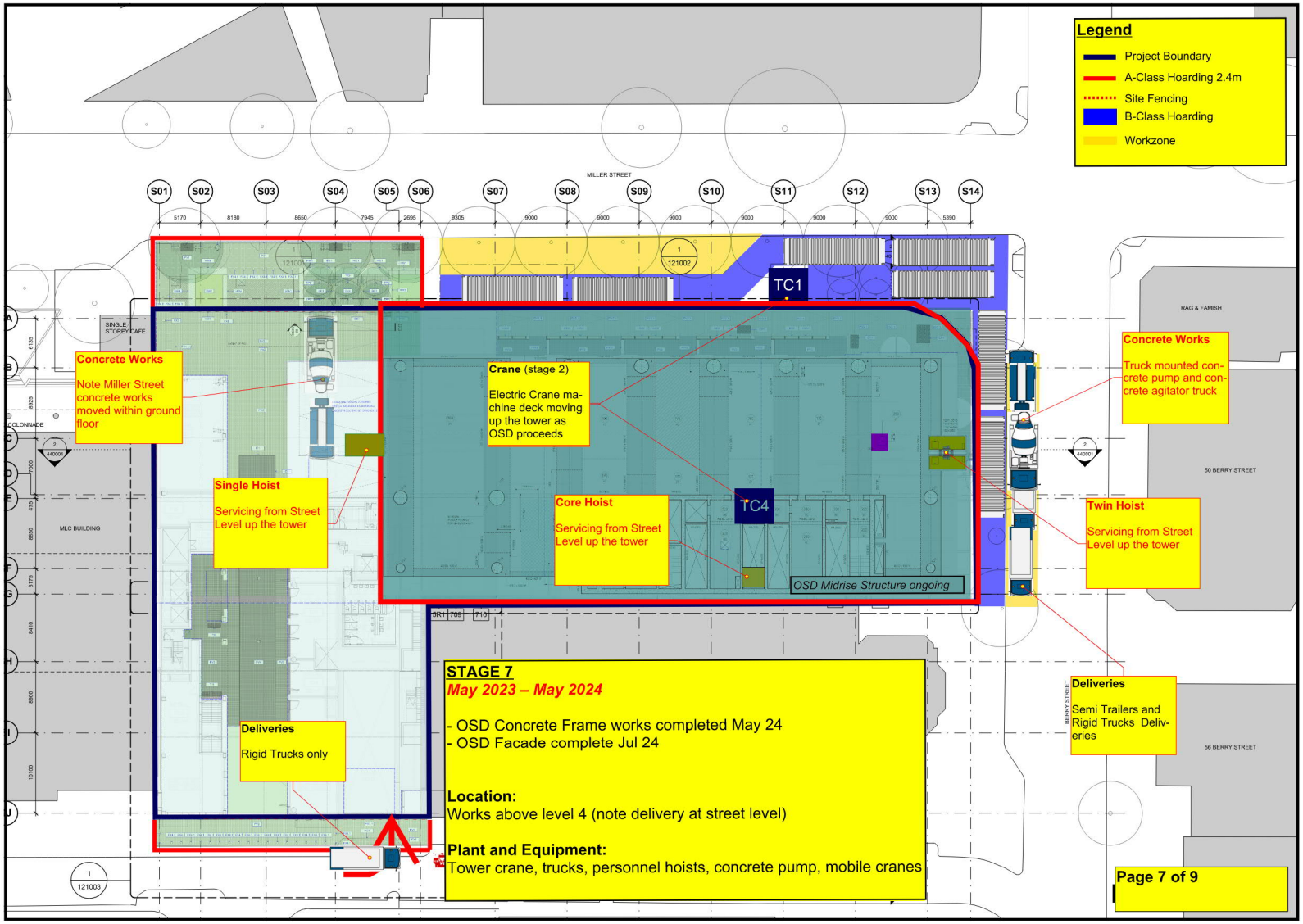
It is expected that noise and vibration impacts from the modelled out of standard hours works can be effectively managed. The key conclusions are as follows:

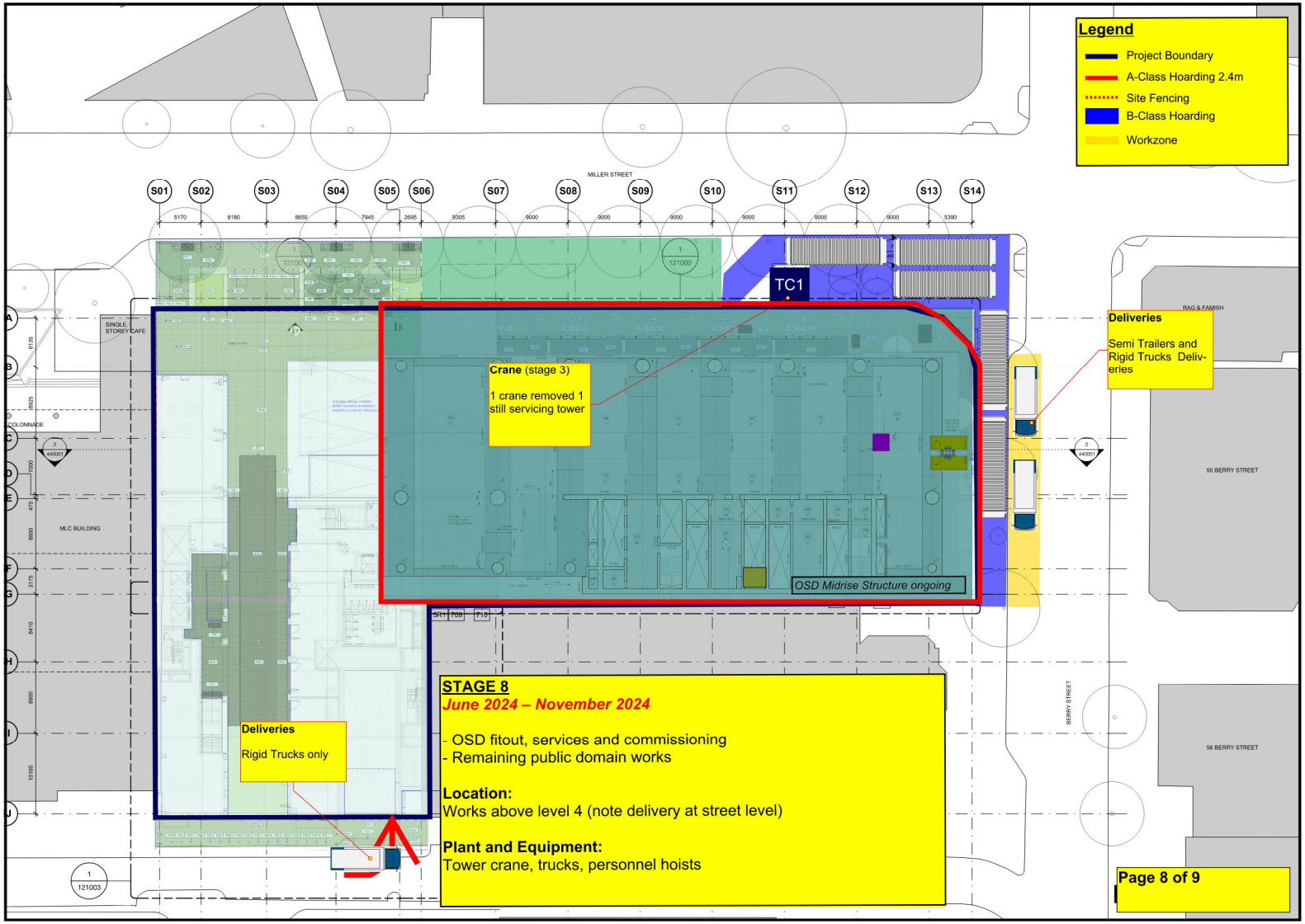
- Results indicate that airborne noise impacts from these out of standard hours works will likely exceed the established Noise Management Levels at various times.
- Additional mitigation measures detailed in Table 5-5 are required for residential receivers. Exceedances at non-residential receivers may be managed with letterbox notifications and monitoring.
- Sleep disturbance impacts have been assessed and are predicted to be generated by deliveries and power tools mainly during Stage 7 and 8. Exceedances are expected to be minor and can be efficiently managed.
- Construction traffic noise is expected to be no more than 2 dB above current traffic noise levels.
- Construction vibration is expected to comply with human comfort values nominated in this assessment and on this basis the risk of building damage (even cosmetic) is negligible to all building structures including heritage-listed structures.

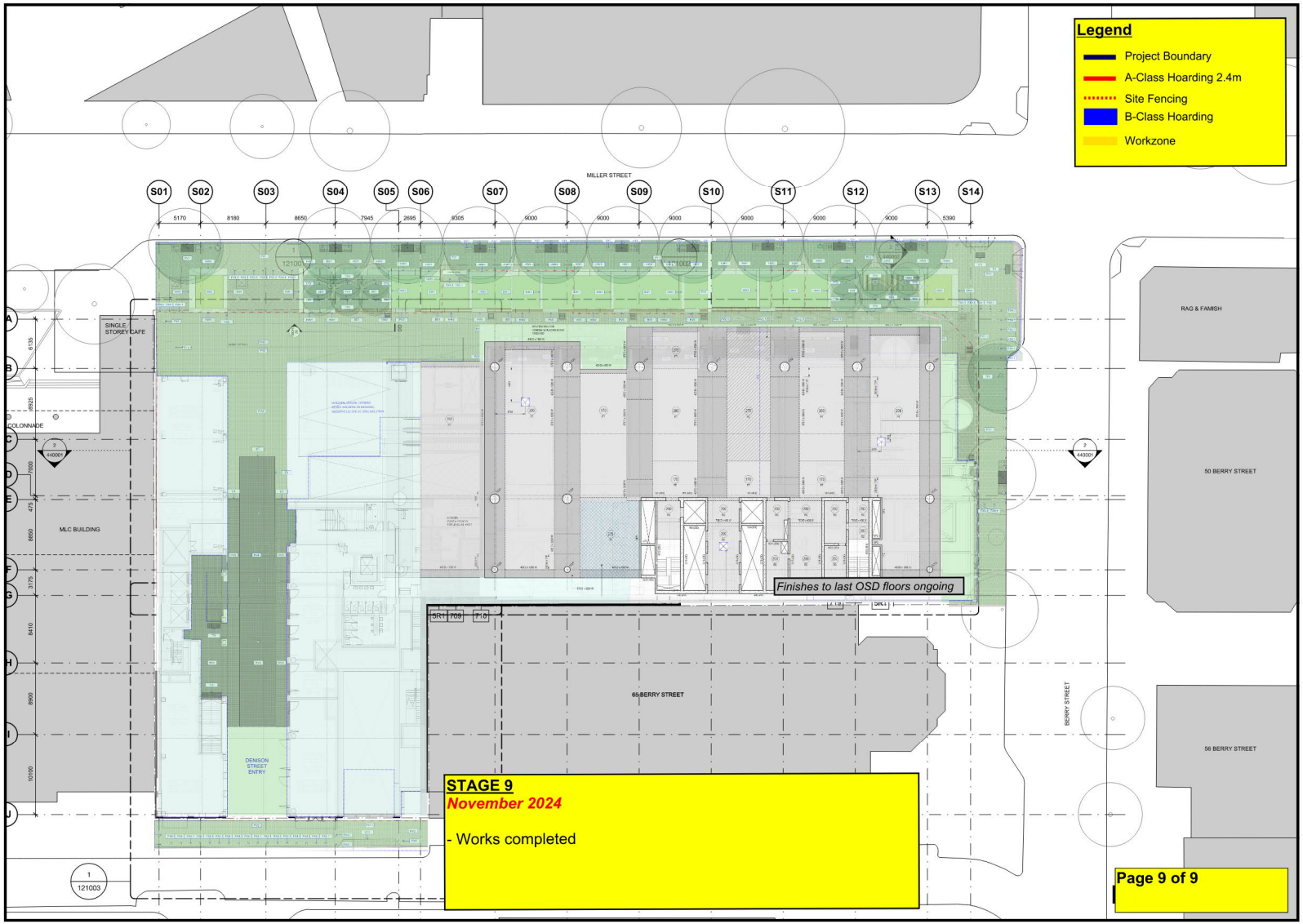
APPENDIX A - STAGING PLANS




Legend
Project Boundary
A-Class Hoarding 2.4m
Site Fencing
B-Class Hoarding
Workzone
Deliveries
Semi Trailers and Rigid Trucks Semi when no concrete being poured
Concrete Works
Truck mounted concrete pump and concrete agitator truck concrete Placing booms within the site footprint
MILLER STREET
S01 S02 S03 S04 S05 S06 S07 S08 S09 S11 S12 S13 S14
TC1
Concrete Works
Note Miller Street concrete works moved within ground floor
Crane (stage 1)
Electric Crane machine deck moving up the tower as OSD proceeds
Crane (stage 2)
Electric Crane machine deck moving up the tower as OSD proceeds
Super Structure Works (OSD)
Concrete frame work ongoing moving into tower construction.
Approx 35 m from street level up to 200m
TC4
Core Hoist
Servicing from Street Level up the tower
Single Hoist
Servicing from Street Level up the tower
OSD Lowrise Structure ongoing
Deliveries
Rigid Trucks only
RAG & FAMISH
Concrete Works
Truck mounted concrete pump and concrete agitator truck
Twin Hoist
Servicing from Street Level up the tower
Deliveries
Semi Trailers and Rigid Trucks Deliveries
BERRY STREET
56 BERRY STREET
MLC BUILDING
COLONNADE
SINGLE STOREY CAFE
STAGE 6
February 2023 – Apr 2023
- OSD Concrete Frame works ongoing
- OSD Facade and Finishes commence
Location:
Works inside the station, street level and above level 4
Plant and Equipment:
Tower Crane, trucks, personnel hoists, concrete pump, mobile cranes
Page 6 of 9


Legend
Project Boundary
A-Class Hoarding 2.4m
Site Fencing
B-Class Hoarding
Workzone
MILLER STREET
S01
S02
S03
S04
S05
S06
S07
S08
S09
S10
S11
S12
S13
S14
TC1
TC4
Concrete Works
Note Miller Street concrete works moved within ground floor
Crane (stage 2)
Electric Crane machine deck moving up the tower as OSD proceeds
Single Hoist
Servicing from Street Level up the tower
Core Hoist
Servicing from Street Level up the tower
OSD Midrise Structure ongoing
Concrete Works
Truck mounted concrete pump and concrete agitator truck
Twin Hoist
Servicing from Street Level up the tower
Deliveries
Rigid Trucks only
Deliveries
Semi Trailers and Rigid Trucks Deliveries
STAGE 7
May 2023 – May 2024
- OSD Concrete Frame works completed May 24
- OSD Facade complete Jul 24
Location:
Works above level 4 (note delivery at street level)
Plant and Equipment:
Tower crane, trucks, personnel hoists, concrete pump, mobile cranes
Page 7 of 9
RAG & FAMISH
50 BERRY STREET
56 BERRY STREET
BERRY STREET
MLC BUILDING
COLONNADE
SINGLE STOREY CAFE


Legend
Project Boundary
A-Class Hoarding 2.4m
Site Fencing
B-Class Hoarding
Workzone
MILLER STREET
S01
S02
S03
S04
S05
S06
S07
S08
S09
S10
S11
S12
S13
S14
TC1
Crane (stage 3)
1 crane removed 1 still servicing tower
OSD Midrise Structure ongoing
Deliveries
Semi Trailers and Rigid Trucks Deliveries
Deliveries
Rigid Trucks only
STAGE 8
June 2024 – November 2024
- OSD fitout, services and commissioning
- Remaining public domain works
Location:
Works above level 4 (note delivery at street level)
Plant and Equipment:
Tower crane, trucks, personnel hoists
Page 8 of 9
SINGLE STOREY CAFE
COLONNADE
MLC BUILDING
RAG & FAMISH
50 BERRY STREET
56 BERRY STREET
BERRY STREET


Legend
Project Boundary
A-Class Hoarding 2.4m
Site Fencing
B-Class Hoarding
Workzone
MILLER STREET
S01
S02
S03
S04
S05
S06
S07
S08
S09
S10
S11
S12
S13
S14
SINGLE STOREY CAFE
COLONNADE
MLC BUILDING
DENISON STREET ENTRY
RAG & FAMISH
50 BERRY STREET
65 BERRY STREET
56 BERRY STREET
BERRY STREET
Finishes to last OSD floors ongoing
STAGE 9
November 2024
- Works completed
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APPENDIX B – PREDICTED CONSTRUCTION NOISE LEVELS

Table B 1 Predicted Noise Levels - day period

ID	Address	Description	Land Use	NML Day	VCS Stage 5	VCS Stage 6	VCS Stage 7	VCS Stage 8	VCS Range
S01	128 Miller St	Monte Sant' Angelo Mercy College	School	55	72	73	75	63	63 - 75
S02	201 Miller St	Intel Security Building - Fixed Glass Windows	Commercial	70	66	68	69	56	56 - 69
S03	199 Miller St	Rag & Famish (Hotel)	Commercial	70	77	77	79	63	63 - 79
S04	50 Berry St	Fixed Glass Windows	Commercial	70	80	80	82	64	64 - 82
S05	56 Berry St	-	Commercial	70	72	72	74	61	61 - 74
S06	66 Berry St	-	Commercial	70	69	69	72	59	59 - 72
S07	72 Berry St	Ausgrid	Industrial	75	67	68	70	57	57 - 70
S08a	65 Berry St	-	Commercial	70	74	76	77	61	61 - 77
S09	77-81 Berry St	-	Commercial	70	70	71	73	65	65 - 73
S10a	77 Berry St	-	Commercial	70	63	64	66	56	56 - 66
S10b	79-81 Berry St	-	Residential	70	68	69	73	63	63 - 73
S11a	105-153 Miller St	-	Commercial	70	69	71	74	63	63 - 74
S11b	105-153 Miller St	-	Commercial	70	68	69	69	57	57 - 69
S12	80 Mount St	Fixed Glass Windows	Commercial	70	66	66	68	55	55 - 68
S13	2 Elizabeth Plaza	-	Commercial	70	66	67	68	58	58 - 68
S14	51 Mount St	-	Commercial	70	63	65	65	53	53 - 65
S15	100 Miller St	-	Comm/Res	70	77	76	77	64	64 - 77
S16	53 Berry St	-	Commercial	70	75	75	77	63	63 - 77
S17	177 Pacific Hwy	-	Commercial	70	67	69	70	58	58 - 70

Table B 2 Predicted noise levels - evening period

ID	Address	Description	Land Use	NML Eve	VCS Stage 5	VCS Stage 6	VCS Stage 7	VCS Stage 8	VCS Range
S01	128 Miller St	Monte Sant' Angelo Mercy College	School	55	72	72	74	62	62 - 74
S02	201 Miller St	Intel Security Building - Fixed Glass Windows	Commercial	70	66	67	68	56	56 - 68
S03	199 Miller St	Rag & Famish (Hotel)	Commercial	70	77	77	78	62	62 - 78
S04	50 Berry St	Fixed Glass Windows	Commercial	70	80	80	82	64	64 - 82
S05	56 Berry St	-	Commercial	70	72	72	73	61	61 - 73
S06	66 Berry St	-	Commercial	70	69	69	71	59	59 - 71
S07	72 Berry St	Ausgrid	Industrial	75	67	68	69	56	56 - 69
S08a	65 Berry St	-	Commercial	70	74	75	76	61	61 - 76
S09	77-81 Berry St	-	Commercial	70	70	70	73	64	64 - 73
S10a	77 Berry St	-	Commercial	70	63	63	66	56	56 - 66
S10b	79-81 Berry St	-	Residential	68	68	69	73	62	62 - 73
S11a	105-153 Miller St	-	Commercial	70	69	70	73	62	62 - 73
S11b	105-153 Miller St	-	Commercial	70	68	67	68	55	55 - 68
S12	80 Mount St	Fixed Glass Windows	Commercial	70	66	66	67	54	54 - 67
S13	2 Elizabeth Plaza	-	Commercial	70	66	66	68	58	58 - 68
S14	51 Mount St	-	Commercial	70	63	64	64	53	53 - 64
S15	100 Miller St	-	Comm/Res	68	77	75	76	64	64 - 77
S16	53 Berry St	-	Commercial	70	75	74	76	63	63 - 76
S17	177 Pacific Hwy	-	Commercial	70	67	68	69	58	58 - 69

Table B 3 Predicted noise levels - night time

ID	Address	Description	Land Use	NML Night	VCS Stage 5	VCS Stage 6	VCS Stage 7	VCS Stage 8	VCS Range
S01	128 Miller St	Monte Sant' Angelo Mercy College	School	55	41	42	69	62	41 - 69
S02	201 Miller St	Intel Security Building - Fixed Glass Windows	Commercial	70	33	34	59	54	33 - 59
S03	199 Miller St	Rag & Famish (Hotel)	Commercial	70	44	45	69	62	44 - 69
S04	50 Berry St	Fixed Glass Windows	Commercial	70	47	47	70	63	47 - 70
S05	56 Berry St	-	Commercial	70	35	36	65	60	35 - 65
S06	66 Berry St	-	Commercial	70	35	36	65	59	35 - 65
S07	72 Berry St	Ausgrid	Industrial	75	34	34	60	56	34 - 60
S08a	65 Berry St	-	Commercial	70	34	35	66	59	34 - 66
S09	77-81 Berry St	-	Commercial	70	38	45	70	62	38 - 70
S10a	77 Berry St	-	Commercial	70	23	23	60	55	23 - 60
S10b	79-81 Berry St	-	Residential	57	40	43	71	62	40 - 71
S11a	105-153 Miller St	-	Commercial	70	41	44	71	62	41 - 71
S11b	105-153 Miller St	-	Commercial	70	37	38	58	53	37 - 58
S12	80 Mount St	Fixed Glass Windows	Commercial	70	37	38	61	54	37 - 61
S13	2 Elizabeth Plaza	-	Commercial	70	39	39	63	57	39 - 63
S14	51 Mount St	-	Commercial	70	31	32	54	51	31 - 54
S15	100 Miller St	-	Comm/Res	57	43	46	72	63	43 - 72
S16	53 Berry St	-	Commercial	70	43	44	70	62	43 - 70
S17	177 Pacific Hwy	-	Commercial	70	42	42	62	57	42 - 62

Table B 4 Predicted noise levels – Morning Shoulder Period

ID	Address	Description	Land Use	NML 5am-7am	VCS Stage 5	VCS Stage 6	VCS Stage 7	VCS Stage 8	VCS Range
S01	128 Miller St	NULLMonte Sant' Angelo Mercy College	School	55	55	54	62	62	54 - 62
S02	201 Miller St	Intel Security Building - Fixed Glass Windows	Commercial	70	55	54	55	55	54 - 55
S03	199 Miller St	Rag & Famish (Hotel)	Commercial	70	56	55	62	62	55 - 62
S04	50 Berry St	Fixed Glass Windows	Commercial	70	58	58	63	63	58 - 63
S05	56 Berry St	-	Commercial	70	53	54	60	60	53 - 60
S06	66 Berry St	-	Commercial	70	49	50	58	58	49 - 58
S07	72 Berry St	Ausgrid	Industrial	75	50	51	56	56	50 - 56
S08a	65 Berry St	-	Commercial	70	54	55	60	60	54 - 60
S09	77-81 Berry St	-	Commercial	70	59	58	63	63	58 - 63
S10a	77 Berry St	-	Commercial	70	45	47	55	55	45 - 55
S10b	79-81 Berry St	-	Residential	64	50	50	62	62	50 - 62
S11a	105-153 Miller St	-	Commercial	70	50	52	62	62	50 - 62
S11b	105-153 Miller St	-	Commercial	70	51	51	55	54	51 - 55
S12	80 Mount St	Fixed Glass Windows	Commercial	70	47	50	54	54	47 - 54
S13	2 Elizabeth Plaza	-	Commercial	70	49	51	57	57	49 - 57
S14	51 Mount St	-	Commercial	70	45	48	52	52	45 - 52
S15	100 Miller St	-	Comm/Res	64	57	57	63	63	57 - 63
S16	53 Berry St	-	Commercial	70	56	56	62	62	56 - 62
S17	177 Pacific Hwy	-	Commercial	70	52	52	57	57	52 - 57

Table B 5 Predicted Noise Levels L_{Amax} – Night time and Morning Shoulder periods

ID	Address	Description	Land Use	NML 5am-7am	NML Night	VCS Stage 5	VCS Stage 6	VCS Stage 7	VCS Stage 8	VCS Range
S01	128 Miller St	NULLMonte Sant' Angelo Mercy College	School	74	67	57	57	75	66	57 - 75
S02	201 Miller St	Intel Security Building - Fixed Glass Windows	Commercial	N/A	N/A	48	48	64	57	48 - 64
S03	199 Miller St	Rag & Famish (Hotel)	Commercial	N/A	N/A	61	62	76	69	61 - 76
S04	50 Berry St	Fixed Glass Windows	Commercial	N/A	N/A	61	62	77	71	61 - 77
S05	56 Berry St	-	Commercial	N/A	N/A	53	51	70	68	51 - 70
S06	66 Berry St	-	Commercial	N/A	N/A	51	51	72	63	51 - 72
S07	72 Berry St	Ausgrid	Industrial	74	67	49	50	65	62	49 - 65
S08a	65 Berry St	-	Commercial	N/A	N/A	51	52	73	69	51 - 73
S09	77-81 Berry St	-	Commercial	N/A	N/A	53	67	77	67	53 - 77
S10a	77 Berry St	-	Commercial	N/A	N/A	42	44	65	62	42 - 65
S10b	79-81 Berry St	-	Residential	74	67	55	62	77	67	55 - 77
S11a	105-153 Miller St	-	Commercial	N/A	N/A	55	62	77	67	55 - 77
S11b	105-153 Miller St	-	Commercial	N/A	N/A	52	52	66	66	52 - 66
S12	80 Mount St	Fixed Glass Windows	Commercial	N/A	N/A	50	54	67	57	50 - 67
S13	2 Elizabeth Plaza	-	Commercial	N/A	N/A	51	50	66	58	50 - 66
S14	51 Mount St	-	Commercial	N/A	N/A	47	47	56	56	47 - 56
S15	100 Miller St	-	Comm/Res	74	67	58	62	78	77	58 - 78
S16	53 Berry St	-	Commercial	N/A	N/A	60	60	76	69	60 - 76
S17	177 Pacific Hwy	-	Commercial	N/A	N/A	54	54	65	59	54 - 65