NEW SYDNEY FISH MARKETS

Construction Noise and Vibration Management Plan

Prepared for:

Multiplex Constructions Pty Ltd
Level 22
135 King Street
SYDNEY NSW 2000

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BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Multiplex Constructions Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised	Revision Changes
610.30264.00000-R01-v6.0	19 January 2023	Adam Sirianni	Aaron Miller	Aaron Miller	See **Section 3**
610.30264.00000-R01-v5.1	16 November	Robbie Cain	Aaron Miller	Aaron Miller	
610.30264.00000-R01 -v5.0	9 November 2022	Robbie Cain	Aaron Miller	Aaron Miller	
610.30264.00000-R01-v4.2	19 September 2022	Robbie Cain	Aaron Miller	Aaron Miller	
610.30264.00000-R01-v4.1	5 September 2022	Robbie Cain	Aaron Miller	Aaron Miller	
610.30264.00000-R01-v1.0	3 May 2021	Kieran Murphy	Mark Irish / Alex Campbell	Alex Campbell	

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1 Introduction

1.1 Background

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Multiplex to undertake a Construction Noise and Vibration Management Plan (CNVMP) for the SSD-8925 Condition of Consent (CoC) B79 for the New Sydney Fish Market. The site is located at the head of Blackwattle Bay between the Pyrmont Peninsula and the foreshore of Glebe, situated less than 2 km west of Sydney's CBD and is partially within the City of Sydney Local Government Area (LGA).

The CNVMP addresses the potential noise and vibration impacts associated with the construction of the site and outlines mitigation and management measures to be employed. It does not address Condition B79A, which will be addressed in a future update to this CNVMP.

The locations of relevant items with the report are provided in **Table 1**.

Table 1 Locations of Conditions of Consent B79 within Report

CoC B79	Description	Location within Report
A	Project Description	**Section 4**
B	Construction Stages	**Section 4.1**
C	Project Description	**Section 4**
D	N/A – no identified non-project related construction activities	**N/A**
E	Piling	**Section 4**
F	Construction Stages	**Section 4.1**
G & H	Standard Mitigation Measures & Vibration Mitigation Measures	**Section 7 and Section 8**
I & J	Noise and Vibration Monitoring	**Section 9**

1.2 Relevant Documentation and Guidelines

The CNVMP references the following documents and guidelines:

- Development Consent SSDA 8925 (June 2020) and subsequent modifications.
- *Interim Construction Noise Guideline* (ICNG), Department of Environment and Climate Change, 2009
- *Assessing Vibration: a Technical Guideline* (DEC), Department of Environment and Conservation, 2006
- DIN Standard 4150: Part 3 1999 *Structural Vibration in Buildings – Effects on Structures*, 1999
- British Standard 7385: Part 2 1993 *Evaluation and Measurement of Vibration in Buildings*, 1993
- *Road Noise Policy (RNP)*, Department of Environment and Climate Change, 2011
- Construction Noise and Vibration Strategy (CNVS), Transport for NSW, 2018
- New Sydney Fish Market – 11kV Feeder Works Construction Noise and Vibration management Plan (HV Feeder CNVMP Addendum), SLR report Aconex reference "SLR-AC-PLN-00007[4] – Construction Noise Management Plan – HV Feeder", SLR Report reference "610.30264.00500-R01-v1.0-20220516".

1.3 Terminology

Specific acoustic terminology is used in this report. An explanation of common terms is included in **Appendix A**.

2 Objectives

The Development Consent Conditions from SSD-8925-MOD-9 Schedule 2 Condition B79 states that:

> *Prior to commencement of the MOD 9 works and construction hours, an updated **Construction Noise and Vibration Management Plan (CNVMP)** prepared by a suitably qualified person. The updated CNVMP **shall** address (but not be limited to):*
>
> *a) Identification of each work area, site compound and access route (both private and public),*
>
> *b) Identification of the specific activities that will be carried out and associated noise sources at the premises and access routes,*
>
> *c) Identification of all potentially affected sensitive receivers using the construction noise objectives identified in accordance with the EPA's interim Construction Noise Guideline, vibration objectives as identified in accordance with the document Assessing Vibration: A Technical Guideline (DEC 2006), and the road traffic noise objectives as identified in accordance with the NSW Road Noise Policy (DECCW 2011),*
>
> *d) Identification of non-project related constriction activities in the area that may be,*
>
> *e) identify the noise management levels for the project,*
>
> *f) identify the construction methodology and equipment to be used and the key sources of noise and vibration,*
>
> *g) details of all reasonable and feasible management and mitigation measures to be implemented to minimise construction noise and vibration,*
>
> *h) be consistent with and incorporate all relevant recommendations and noise and vibration mitigation measures outlined in the Noise and Vibration Assessment, prepared by SLR, dated April 2019 and the Noise Statement prepared by SLR, dated 31 April 2022;*
>
> *i) ensure all potentially impacted sensitive receivers are informed by letterbox drops prior to the commencement of construction of the nature of works to be carried out, the expected noise levels arid duration, as well as contact details for a construction community liaison officer, and*
>
> *j) include a suitable proactive construction noise and vibration monitoring program which aims to ensure the construction noise and vibration criteria in this consent are not exceeded.*

3 Report Revision Changes

SLR notes that the following report is Revision 6.0 of the CNVMP. For ease and transparency the changes made to the Revision 1.0 report along with the locations where said changes can be found within the following:

Item #	Description	Location
1	Site Location, Noise Sensitive Receivers R4.1 and R4.2 switched.	**Figure 1**
2	Stage 1 construction scenario added as extra works Multiplex have been engaged to complete before main building construction commences	**Table 3**
3	Construction activity expected time frames	**Table 3**
4	Updated Sound Power Levels Utilised for the 3D SoundPLAN model for noise level predictions at nearby residences. On site measurements were conducted to verify on site noise levels from specific equipment being utilised as part of construction	**Appendix C**
5	Addition of the existing Sydney Fish Market into the noise sensitive receivers (NCA 2)	**Table 7 & Figure 1**
6	Revised predictions based on revised noise levels of select plant	**Table 10 & Table 11**
7	Additional mitigation of barriers along Pyrmont Bridge Road and existing Sydney Fish Market	**Figure 3 & Figure 4**
8	Revised Noise monitoring locations for long term real-time noise monitors. The Figure has been revised to show the actual monitoring locations. Location 1 was installed further north than originally noted due to access and security requirements. Location 2 was installed at the Kauri Foreshore Hotel	**Figure 5**
9	Updated Grid Noise Maps including grid noise maps for scenarios with mitigation applied.	**Appendix B**
10	Attended Mobile Plant measurements summary to verify noise levels from specific mobile plant being utilised in the construction program	**Appendix C**
11	In situ receiver Facade Noise Performance Testing was completed for the school hall and demountable classrooms closest to the Glebe Foreshore	**Appendix D**
12	SSD 8925 Mod 5 highlights the changes to construction hours of noise intensive construction activities and respite periods during the 2021 HSC examination period.	**Appendix E**
13	Noise and Vibration Assessment for SSD 8925 Mod 7 proposal	**Appendix F**
14	Outside of Working hours Project Specific Mitigation for the 11kV Feeder construction works	**Section 7.3.1**
15	SSD 8925 Mod 8 highlights the changes to construction hours of noise intensive construction activities and respite periods during the 2022 HSC examination period.	**Appendix G**
16	Noise Assessment for SSD 8925 Mod 9	**Appendix H**

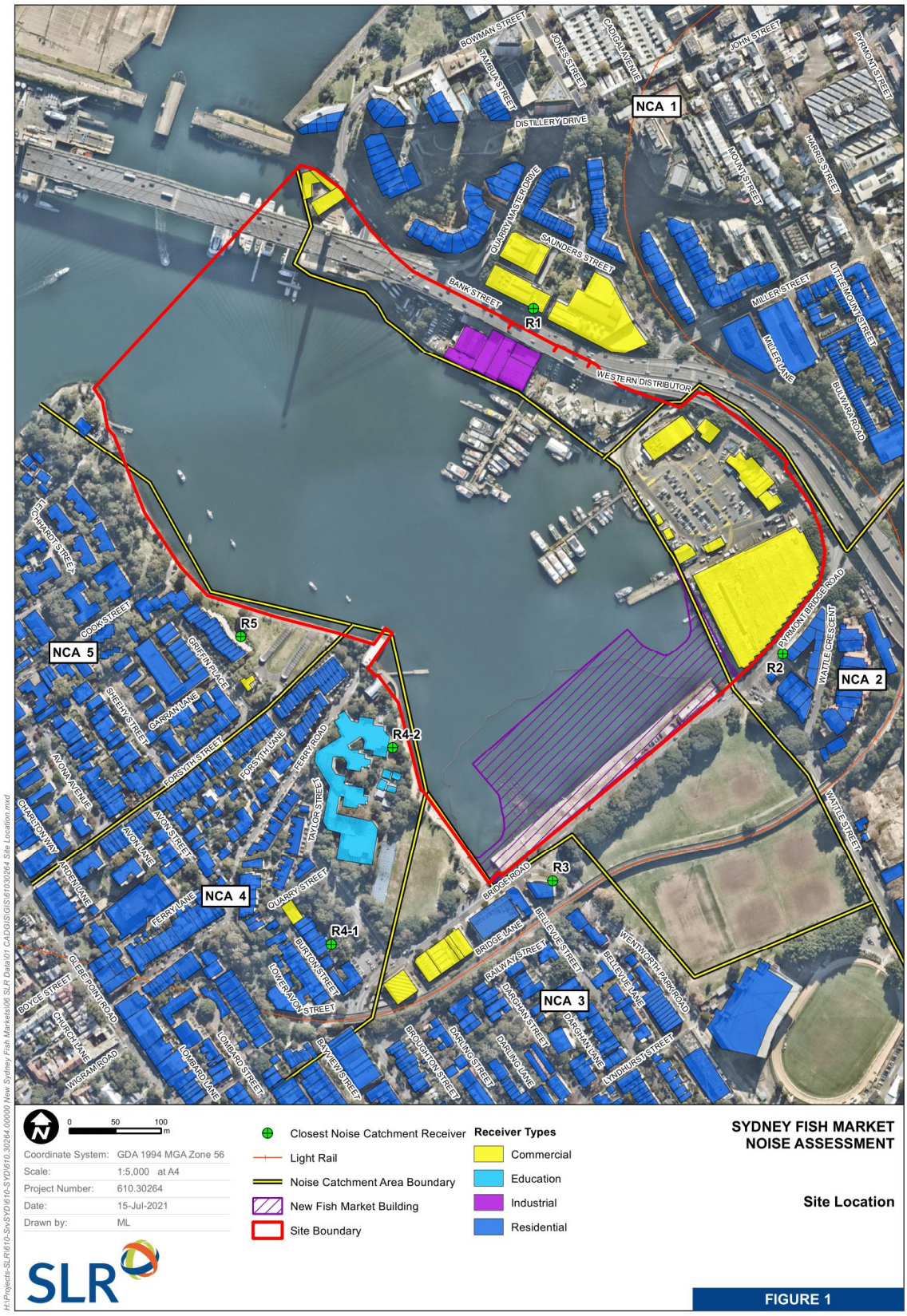
4 Project Description

Figure 1 shows the proposed work zone and nearest sensitive receivers that may be affects by the works. The CNVMP report has defined all potentially noise sensitive receivers near the proposed construction zone which are summarised in **Figure 1**.

Table 2 Noise Catchment Areas (NCA)

NCA	Address of Worst-Care Representative Receiver	Property Description	Approx. Distance to Works (m)
NCA1	31-35 Bank Street, Pyrmont	Commercial	300
NCA2	217/1 Wattle Crescent, Glebe	Residential	55
	Existing Sydney Fish Market	Commercial	40
NCA3	84 Wentworth Park Road, Glebe	Residential	55
NCA4	1A Burton Street, Glebe	Residential	185
	Sydney Secondary College, Glebe	Educational	75
NCA5	13 Griffin Place, Glebe	Residential	255

Figure 1 Site Location and Noise Sensitive Receivers



4.1 Construction Stages

The proposed construction work scenarios with high noise impacts identified for this CNVMP are detailed in **Table 3**. Exact timeframes are not known at this stage, but Multiplex have identified that some activities will occur concurrently. See **Figure 2** for the construction areas with an aerial map overlay.

Table 3 Construction Work Scenarios

Activity	Scenario	Activities	Timing
Pre-construction works *June 2021 – February 2022*	Stage 1	Removal of existing wooden structural piles. Removal and reinforcement of sea wall	Standard hours
	1A	Cofferdam installation (press-in piling method) Set up for marine piling Set up for land piling	Standard hours
	1B	Cofferdam installation (press-in piling method) Hammering marine piles Hammering land piles	High noise impact hours[1]
	2A	Cofferdam installation (press-in piling method) Set up marine piles Auger method land piling	Standard hours
	2B	Cofferdam installation (press-in piling method) Hammering marine piles Auger method land piling	High noise impact hours[1]
Main building construction *March 2022 – Jan 2023*	3A	Construction of the main building including tower cranes, concrete trucks, power tools etc. Set up marine piles	Standard hours
	3B	Construction of the main building including tower cranes, concrete trucks, power tools etc. Hammering marine piles	High noise impact hours[1]
	3C	Construction of the main building including tower cranes, concrete trucks, power tools etc. Cofferdam removal	Standard hours
Road Works Stage 2 *July 2022 – July 2023*	4A	Road overlay construction and new full road construction	Standard hours
	4B	Road overlay construction and new full road construction	Standard hours
Road Works Stage 3 *July 2023 – Jan 2024*	5	Road Completions works	Outside of standard hours (night works)
HV utilities cable to Camperdown *June 2022 – March 2023*	6A[2]	Trenching excavation works and laying of HV conduit	Outside of standard hours (night works)
	6B[2]	Asphalt laying works covering the previously trenched road	Outside of standard hours (night works)

Note 1: High noise impact hours relate directly to SSD-8925 Condition of Consent C7 (refer **Table 5**)

Note 2: SLR have completed a detailed assessment of the HV utilities cable works and has been provided in the HV Feeder CNVMP Addendum (See **Section 1.2** for the report reference).

Figure 2 Construction Areas

Table 4 Equipment Sound Power Levels Per Construction Scenario

Equipment	Sound Power Level (dBA)	Construction Stage
Sheet Piling (Press in)	97	1A, 1B, 2A, 2B, 3C
Auger Piling Rig	105	2A, 2B
Impact Piling Rig (Junttan HHX-300)	138[1]	1B, 2B
Impact Piling Rig (Junttan HHK-10S)	117	1B, 2B, 3B
Setting Up Impact Piling Rig (Vibratory attachment pitching piles)	120[1]	1A, 2A, 3A
Extracting existing wooden piles (vibratory attachment)	119	Stage 1
Concrete Saw	120	1A, 1B, 2A, 2B, 3A, 3B, 3C, 6A, 6B, Stage 1
Angle Grinder	114	3A, 3B, 3C
Bobcat	105	3A, 3B, 3C
Trucks	109	1A, 1B, 2A, 2B, 3A, 3B, 3C
Hand Drilling	94	1A, 1B, 2A, 2B, 3A, 3B, 3C
Electric Saw	112	1A, 1B, 2A, 2B, 3A, 3B, 3C
Impact Drill	105	1A, 1B, 2A, 2B, 3A, 3B, 3C
Asphalt Paver	112	4A, 4B, 5, 6A, 6B
Roller	106	4A, 4B, 5, 6A, 6B
Jackhammer	117	4A, 4B, 5, 6A, 6B
Concrete Trucks	112	1A, 1B, 2A, 2B, 3A, 3B, 3C, 4A, 4B, 5, 6A, 6B
Mobile Crane	102	1A, 1B, 2A, 2B, 3A, 3B, 3C
Concrete Tower Boom	99	2A, 2B, 3A, 3B
Concrete Pump	110	1A, 1B, 2A, 2B, 3A, 3B
Concrete Vibrator	110	1A, 1B, 2A, 2B, 3A, 3B, 3C, 4A, 4B, 5, 6A, 6B
Air Compressor	95	1A, 1B, 2A, 2B, 3A, 3B, 3C
Nail Gun	101	1A, 1B, 2A, 2B, 3A, 3B, 3C
Rattle Gun	110	1A, 1B, 2A, 2B, 3A, 3B, 3C
Tower Crane	108	3A, 3B, 3C
Profiler	110	4A, 4B, 5, 6A, 6B
Excavator /w rock breaker	127	4A, 4B, 5, 6A, 6B, Stage 1
Road Trucks	104	4A, 4B, 5, 6A, 6B
Small Excavator	107	4A, 4B, 5, 6A, 6B, Stage 1

Equipment	Sound Power Level (dBA)	Construction Stage
Water Cart	101	4A, 4B, 5, 6A, 6B
Generator	89	4A, 4B, 5, 6A, 6B
Backhoe	96	4A, 4B, 5, 6A, 6B
Vibratory roller 4t	102	4A, 4B, 5, 6A, 6B
Hot bitumen equipment	104	4A, 4B, 5, 6A, 6B
Lighting generator	94	4A, 4B, 5, 6A, 6B
Suction Truck	99	4A, 4B, 5, 6A, 6B

Note 1: Sound powers are time weighted (i.e. expected equipment level per 15 minute period).

5 Noise and Vibration Guidelines

5.1 SSD-8925 Consent Condition

5.1.1 Hours of Construction

For the construction of the New Sydney Fish Market the SSD-8925-MOD-9 development consent conditions have generally adopted construction hours within the ICNG standard construction hours, with the exception of Saturdays on which works can extend to 3:30 pm. Additionally, SSD-8925 stipulates that certain activities may only be conducted during certain periods of the approved construction hours. The approved construction hours are reproduced below in **Table 5.**

Table 5 Construction Hours

Day	Activity Type	Approved Construction Hours
Monday to Friday	Standard Construction Activities	7 am to 5:30 pm
	Rock breaking, rock hammering, sheet piling, pile driving, and similar activities	9 am to 12 pm 1 pm to 5 pm
Saturdays	Standard Construction Activities	7:30 am to 3:30 pm
	Rock breaking, rock hammering, sheet piling, pile driving, and similar activities	9 am to 1 pm
Sundays or Public Holidays	All activities	No construction

Any work to be conducted outside these hours must fulfil the requirements of condition C4 within SSD-8925. These works also require additional mitigation measures in accordance with condition C5, this is discussed further in **Section 7**.

Appendix E highlights approval for the modification (SSD89-8925 Mod 5) to construction hours of noise intensive construction activities and respite periods during the 2021 HSC examination period. **Appendix G** highlights approval for the modification (SSD89-8925 Mod 8) to construction hours of noise intensive construction activities and respite periods during the 2022 HSC examination period.

5.1.2 Interim Construction Noise Guideline – NSW Environment Protection Authority

5.1.2.1 Recommended Sound Levels

The ICNG recommends that the $L_{Aeq(15minute)}$ noise levels arising from a construction project measured within the curtilage of an occupied noise-sensitive premises (i.e. at boundary or within 30 m of the residence, whichever is the lesser) should not exceed the levels indicated in **Table 6**.

Table 6 Recommended EPA General Noise Management levels Affected by Construction works

Period of Noise Exposure	$L_{Aeq(15minute)}$ Construction Noise Management Levels
Recommended Standard Hours	Noise affected[1] RBL[2] + 10 dBA
	Highly noise affected[3] 75 dBA
Outside Recommended Standard Hours	Noise affected[1] RBL[2] + 5 dBA

Note 1: The noise affected level represents the point above which there may be some community reaction to noise.

Note 2: The RBL noise level is representative of the "average minimum background sound level" (in the absence of the sources under consideration), or simply the background level.

Note 3: The highly noise affected level represents the point above which there may be strong community reaction to noise.

5.1.2.2 Sleep Disturbance

The ICNG states that where works are planned to extend over more than two consecutive nights, the potential for sleep disturbance should be considered. Guidance regarding the potential for sleep disturbance at sensitive receivers is provided within the NPfI and RNP.

In addition to the PNTLs, NPfI provides guidance in relation to the assessment of sleep disturbance. Specifically, the NPfI states:

> *Where the subject development/premises night-time noise levels at a residential location exceed:*
>
> - *$L_{Aeq(15minute)}$ 40 dBA or the prevailing RBL plus 5 dB, whichever is the greater, and/or*
> - *L_{AFmax} 52 dBA or the prevailing RBL plus 15 dB, whichever is the greater,*
>
> *a detailed maximum noise level assessment should be undertaken.*

Where those trigger levels are not met, it is appropriate to consider any effect of the noise with regard to:

- The extent to which the maximum noise level exceeds the rating background noise level.
- How often high noise events will occur.
- The distribution of likely events across the night-time period and the existing ambient maximum events in the absence of the subject development or activity.
- Whether there are times of day when there is a clear change in the noise environment (such as during early-morning shoulder periods).
- Current scientific literature available at the time of the assessment regarding the impact of maximum noise level events at night.

It may also be appropriate to consider other published research including the NSW *Road Noise Policy* which contains additional guidance relating to potential sleep disturbance impacts.

A review of research on sleep disturbance in the RNP indicates that in some circumstances, higher noise levels may occur without significant sleep disturbance. Based on studies into sleep disturbance, the RNP concludes that:

- Maximum internal noise levels below 50 dBA to 55 dBA are unlikely to cause awakening reactions; and that
- 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.

Internal noise levels in a dwelling, with the windows open, are commonly 10 dB lower than external noise levels. Therefore, the first conclusion above suggests that short-term external noises of 60 dBA to 65 dBA are unlikely to cause awakening reactions. The second conclusion suggests that one or two noise events per night with maximum external noise levels of 75 dBA to 80 dBA are not likely to affect health and wellbeing significantly.

5.2 Construction Noise Criteria Summary

In accordance with the above and SLR's 2019 SSDA Acoustic Report, the NMLs derived for the project are detailed in **Table 7**.

Table 7 Receiver NMLs for Construction

NCA	Receiver Category	Standard Construction[1] (RBL+10dB)	Highly Noise Affected	Out of Hours (RBL+5dB)				Sleep Disturbance Screening (RBL+15dB)	
		Daytime	Daytime	Daytime	Evening	Night-time	Morning	Night-time	Morning
NCA1	Commercial	70	n/a	70[2]	70[2]	70[2]	70[2]	n/a[3]	n/a[3]
NCA2	Residential	72	75	67	62	55	57	65	67
	Commercial	70	n/a	70[2]	70[2]	70[2]	70[2]	n/a[3]	n/a[3]
NCA3	Residential	72	75	67	62	55	57	65	67
NCA4	Residential	64	75	59	55	47	49	57	59
	Educational	72[4]	n/a	65[2,4]	65[2,4]	65[2,4]	65[2,4]	n/a[3]	n/a[3]
NCA5	Residential	60	75	55	55[5]	51	53	61	63

Note 1: The standard construction hours are as per SSD-8925 consent condition C7 (See **Table 5**).

Note 2: Criteria is only applicable when receiver is in use.

Note 3: Sleep disturbance criteria does not apply to this receiver type.

Note 4: An external criterion of 72 dBA has been set for Sydney Secondary College. The ICNG sets an internal level of 45 dBA and 27 dB external to internal transmission loss is measured (for further detail see **Appendix D**).

Note 5: These values have been lowered to be no greater than the applicable OOH daytime NML, based on the approach for determining RBLs in the NPfI.

5.3 Construction Vibration Guidelines

The effects of vibration on buildings can be divided into the following main assessment categories:

- Those in which the occupants or users of the building are inconvenienced or possibly disturbed ('tactile vibration')
- Those where a building's contents may be affected (for example, the operation of vibration sensitive equipment such as microscopes in hospitals)
- Vibration affecting the buildings and structures in terms of their susceptibility to damage ('structural damage').

5.3.1 Human Comfort Vibration

The Department of Environment and Conservation's (DEC) *Assessing Vibration: a technical guideline* (2006) 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 VDV is dependent upon the level and duration of the vibration event, as well as the number of events occurring during the daytime or night-time period.

The VDVs recommended in the guideline for vibration that is intermittent nature are presented in **Table 8**.

Table 8 Preferred and Maximum Vibration Dose Values for Intermittent Vibration

Building Type	Vibration Dose Value ($m/s^{1.75}$)	
	Preferred	Maximum
Residential Daytime	0.20	0.40
Residential Night-time	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80

Note: Daytime is 7:00 am to 10:00 pm and night-time is 10:00 pm to 7:00 am.

5.3.2 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 senstive critical instruments or manufacturing processes should be sourced from manufacturer's data and/or other published objectives.

5.3.3 Structural Damage Vibration

Structural damage vibration limits are based on Australian Standard AS 2187: Part 2-2006 *Explosives - Storage and Use - Part 2: Use of Explosives* and British Standard BS 7385 Part 2-1993 *Evaluation and measurement for vibration in buildings Part 2*. These standards provide frequency-dependent vibration limits related to cosmetic damage, noting that cosmetic damage is very minor in nature, is readily repairable and does not affect the structural integrity of the building.

The recommended vibration limits from BS 7385 for transient vibration for minimal risk of cosmetic damage to residential and industrial buildings are shown in **Table 9**. The vibration guide values are at the base of the building.

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

Line	Type of Building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
		4 Hz to 15 Hz	15 Hz and Above
1	Reinforced or framed structures. Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
2	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

5.3.4 General Vibration Screening Criterion

The guide values in **Table 9** 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 may need to be reduced by up to 50%.

Rock breaking / hammering activities are considered to have the potential to cause dynamic loading in some structures (eg residences) and it is therefore appropriate to reduce the transient values by 50%.

For construction activities involving intermittent vibration sources such as rock breakers, 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) monitoring should be performed during construction. At these locations a more detailed analysis of the building structure, vibration source, dominant frequencies and dynamic characteristics of the structure would be undertaken to determine the applicable safe vibration level.

5.3.5 Heritage

Heritage buildings should be considered on a case by case basis. A heritage listed structure should not (unless it is structurally unsound) be assumed to be more sensitive to vibration resulting in application of the 7.5 mm/s screening criterion. Where a historic building is deemed to be sensitive to damage from vibration (following inspection), a more conservative superficial cosmetic damage criterion based on DIN 4150 should be applied.

6 Construction Noise and Vibration Assessment

6.1 Predicted Noise Levels

Predicted Construction noise levels for each NCA listed in **Table 2** are contained in the CNVMP and are reproduced in **Table 10** and **Table 11**. Note that these noise levels are for the most highly-impacted receiver within each Noise Catchment Area. Full noise maps showing impacts across every NCA for each modelled construction scenario are shown in **Appendix B**.

Table 10 Predicted Construction Noise Levels During Standard Construction hours (L_{Aeq}, dBA)

NCA	NML Standard Construction Hours	Noise Level for most highly impacted receiver within NCA for each construction scenario (refer Table 3)										
		Stage – 1[4]	1A	1B[3]	2A	2B[3]	3A	3B[3]	3C	4A[5]	4B[5]	5[5]
NCA1	70 (commercial)	63	67	77 - 69	67	78	66	65	63	65	65	53
NCA2	72	70	69 - 73	73	64	72	67	67	64	79 - 86	78 - 84	69
	70 (commercial)	72	74 - 78	87	79	84	70	69	74	81 - 75	81	61
NCA3	72	66	78	87	74 - 75	87	74	73 - 74	72	79 - 99	77 - 91	83
NCA4	64	67	72	80 - 75	69 - 70	80 - 84	67 - 68	68 - 69	65	68 - 63	68 - 70	57
	72[1] (educational)	74	77 - 79	86 - 84	75 - 78	87 - 93	74 - 76	75 - 79	72	74	73 - 74	62
NCA5	60	49	61 - 61	75 - 71	60 - 60	78 - 80	64	62	57	61	61 - 62	47

Note 1: Educational NML Criteria is only applicable when receiver is in use.

Note 2: Green shaded cells indicated predicted noise levels exceed the daytime NMLs at this NCA.

Note 3: These activities are only to occur during "high impact" (rock breaking, etc) standard hours as per SSDA Condition C7 (refer **Table 5**)

Note 4: Stage 1 predictions are calculated with 2.4m hoarding around the perimeter of the site and up along the Glebe foreshore (see **Figure 3**)

Note 5: These activities have only been indicatively assessed at this stage and will be subject to a more detailed assessment (including an update to this CNVMP) once more specific details are known about the works.

Table 11 Predicted Construction Noise Levels Outside Standard Construction Hours (L_{Aeq}, dBA)

NCA ID	Period	NML	Construction Stage		
			5	6A	6B
NCA1	Evening	70	53	-[3]	-[3]
	Night	70	53	-[3]	-[3]
NCA2	Evening	62	69	-[3]	-[3]
	Night	55	69	-[3]	-[3]
NCA3	Evening	62	82	-[3]	-[3]

NCA ID	Period	NML	Construction Stage		
			5	6A	6B
	Night	55	82	-[3]	-[3]
NCA4	Evening	55	57	-[3]	-[3]
	Night	47	57	-[3]	-[3]
	Evening	65[1]	62	-[3]	-[3]
	Night	65[1]	62	-[3]	-[3]
NCA5	Evening	55	47	-[3]	-[3]
	Night	51	47	-[3]	-[3]

Note 1: Educational NML Criteria is only applicable when receiver is in use.

Note 2: Green shaded cells indicated predicted noise levels exceed the Evening and Night NMLs at this receiver.

Note 3: See Appendix B and C of SLR's HV Feeder CNVMP Addendum.

6.1.1 Sleep Disturbance at Residential NCAs

Residential receivers that are predicted to be exposed to noise levels that may cause an awakening reaction are shown in **Table 12**.

Table 12 Predicted Sleep Disturbance at Residential NCAs

NCA ID	Construction Scenario ($L_{Amax\ External}$ Noise Level dBA)		
	5	6A	6B
NCA2	Yes	-[1]	-[1]
NCA3	Yes	-[1]	-[1]

Note 1: See Appendix B and C of SLR's HV Feeder CNVMP Addendum.

7 Mitigation

The ICNG acknowledges that due to the nature of construction works it is inevitable that there will be impacts where construction is near to sensitive receivers. Examples of potential mitigation and management measures which could be applied to the project to minimise the impacts are provided below.

7.1 Standard Mitigation

The CNVS contains a number of standard measures for mitigating and managing construction impacts on development projects. Whilst it is acknowledged that this project is not a road project, the mitigation measures are considered suitable for consideration for all forms of construction works.

The measures are shown in **Table 13** and should be applied where feasible and reasonable to minimise the impacts from the works as far as practicable.

Table 13 Recommended Standard Mitigation and Management Measures

Action Required	Applies To	Details
Management Measures		
Implementation of any project specific mitigation measures required.	Airborne noise	Implementation of any project specific mitigation measures required.
Implement community consultation or notification measures.	Airborne noise Ground-borne noise & vibration	Notification detailing work activities, dates and hours, impacts and mitigation measures, indication of work schedule over the night time period, any operational noise benefits from the works (where applicable) and contact telephone number. Where possible, notifications should be given well in advance of works (3 to 6 months) and should be a minimum of 7 calendar days prior to the start of works. For projects other than maintenance works more advanced consultation or notification may be required. Website (If required) Contact telephone number for community Email distribution list (if required) Community drop in session (if required by approval conditions).
Site inductions	Airborne noise Ground-borne noise & vibration	All employees, contractors and subcontractors are to receive an environmental induction. The induction must at least include: • all project specific and relevant standard noise and vibration mitigation measures • relevant licence and approval conditions • permissible hours of work • any limitations on high noise generating activities • location of nearest sensitive receivers • construction employee parking areas • designated loading/unloading areas and procedures • site opening/closing times (including deliveries) • environmental incident procedures.
Behavioural practices	Airborne noise	No swearing or unnecessary shouting or loud stereos/radios on site. No dropping of materials from height, throwing of metal items and slamming of doors.
Verification	Airborne noise Ground-borne noise & vibration	A noise monitoring program should be carried out for the duration of works in accordance with the Construction Noise and Vibration Management Plan and any approval and licence conditions.
Attended vibration measurements	Ground-borne vibration	Where required attended vibration measurements should be undertaken at the commencement of vibration generating activities to confirm that vibration levels are within the acceptable range to prevent cosmetic building damage.
Update Construction Environmental Management Plans	Airborne noise Ground-borne noise & vibration	The CEMP must be regularly updated to account for changes in noise and vibration management issues and strategies.
Building condition surveys	Vibration Blasting	Undertake building dilapidation surveys on all buildings located within the buffer zone prior to commencement of activities with the potential to cause property damage
Source Controls		
Construction hours and scheduling.	Airborne noise Ground-borne noise & vibration	Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods.

Action Required	Applies To	Details
Construction respite period during normal hours and out-of-hours work	Ground-borne noise & vibration Airborne noise	Respite Offers should be considered made where there are high noise and vibration generating activities near receivers. As a guide work should be carried out in continuous blocks that do not exceed 3 hours each, with a minimum respite period of one hour between each block. The actual duration of each block of work and respite should be flexible to accommodate the usage of and amenity at nearby receivers.
Equipment selection.	Airborne noise Ground-borne noise & vibration	Use quieter and less vibration emitting construction methods where feasible and reasonable. For example, when piling is required, bored piles rather than impact-driven piles will minimise noise and vibration impacts. Similarly, diaphragm wall construction techniques, in lieu of sheet piling, will have significant noise and vibration benefits. Ensure plant including the silencer is well maintained.
Plant noise levels.	Airborne-noise	Noise generating equipment will be regularly checked and effectively maintained, including checking of hatches/enclosures regularly to ensure that seals are in good condition and doors close properly against seals
Use and siting of plant.	Airborne-noise	The offset distance between noisy plant and adjacent sensitive receivers is to be maximised. Plant used intermittently to be throttled down or shut down. Noise-emitting plant to be directed away from sensitive receivers. Only have necessary equipment on site.
Plan worksites and activities to minimise noise and vibration.	Airborne noise Ground-borne vibration	Locate compounds away from sensitive receivers and discourage access from local roads. Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site. Where additional activities or plant may only result in a marginal noise increase and speed up works, consider limiting duration of impact by concentrating noisy activities at one location and move to another as quickly as possible. Very noisy activities should be scheduled for normal working hours. If the work cannot be undertaken during the day, it should be completed before 11:00 pm. Where practicable, work should be scheduled to avoid major student examination periods when students are studying for examinations such as before or during Higher School Certificate and at the end of higher education semesters. If programmed night work is postponed the work should be re-programmed and the approaches in this guideline apply again.
Reduced equipment power	Airborne noise Ground-borne vibration	Use only the necessary size and power
Non-tonal and ambient sensitive 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 and for any out of hours work. Consider the use of ambient sensitive alarms that adjust output relative to the ambient noise level.

Action Required	Applies To	Details
Minimise disturbance arising from delivery of goods to construction sites.	Airborne noise	Compounds and worksites will be designed to promote one-way traffic and minimise the need for vehicle reversing. Where practicable, work compounds, parking areas, and equipment and material stockpiles will be positioned away from noise-sensitive locations and take advantage of existing screening from local topography. Select site access points and roads as far as possible away from sensitive receivers. Dedicated loading/unloading areas to be shielded if close to sensitive receivers. Delivery vehicles to be fitted with straps rather than chains for unloading, wherever possible. Avoid or minimise these out of hours movements where possible.
Engine compression brakes	Construction vehicles	Limit the use of engine compression brakes at night and in residential areas. Ensure vehicles are fitted with a maintained Original Equipment Manufacturer exhaust silencer or a silencer that complies with the National Transport Commission's 'In-service test procedure' and standard.
Path Controls		
Shield stationary noise sources such as pumps, compressors, fans etc.	Airborne noise	Stationary noise sources should be enclosed or shielded where feasible and reasonable whilst ensuring that the occupational health and safety of workers is maintained. Appendix D of AS 2436:2010 lists materials suitable for shielding.
Shield sensitive receivers from noisy activities.	Airborne noise	Where practicable, work compounds, parking areas, and equipment and material stockpiles will be positioned away from noise-sensitive locations and take advantage of existing screening from local topography.
Receptor Control		
Structural surveys and vibration monitoring	Ground-borne vibration	Pre-construction surveys of the structural integrity of vibration sensitive buildings may be warranted. At locations where there are high-risk receptors, vibration monitoring should be conducted during the activities causing vibration.

7.2 Main Works Project Specific Mitigation

A number of identified noise sensitive receivers within the NCAs are predicted to experience high noise levels due to specific equipment being utilised throughout the construction period. The principal cause of the exceedances are impact piling activities.

From discussions with Multiplex and the piling contractor "SMC Marine Pty Ltd", a number of potential mitigation measures for piling activities have been identified in **Table 14**.

Table 14 Impact Piling Mitigation Measures

Location	Mitigation Measure	Potential Reduction	Feasible?	Reasonable?	Discussion
Marine Impact Piling Rig	Replace large impact piling rig with smaller / quieter equipment	-15 dBA	No	N/A (unfeasible)	Not Adopted. Smaller piling rigs and auger / screw piling methods were investigated but found not to be capable of structurally securing piles to the required depth. Large hammer required to embed piles at least 2m into rock and achieved adequate compression and tension capacities.
Marine Impact Piling Rig	Employ full Junttan Noise Control package	-10 dBA	Yes	No Unreasonable program impacts	Not Adopted. Not considered reasonable to employ as due to number of changes in piling equipment for each pile, overall program for piling would double from 8 months to 16 months. This would not only have large project impacts but also prolong the impact duration to surrounding receivers significantly.
Marine Impact Piling Rig	Employ Junttan Noise Control Jacket	Up to -5 dBA	Yes	Yes	Adopted. Considered feasible and reasonable. This will reduce noise impacts from this major noise source by up to 5 dB compared to those shown in **Table 4.**
Land Impact Piling Rig	Where possible employ auger piling	-12 dBA	Yes	Yes	Adopted. Considered feasible and reasonable. Auger piling to be used where possible. This is included in predictions in **Table 4.**

It is noted that many of the noise level exceedances have limited mitigation measures that can be applied due to the type of activities occurring through the construction period.

SLR recommend the implementation of 2.4 m high hoarding around the perimeter of the construction site and along the Glebe Foreshore as a mitigation measure during Stage 1 demolition construction works. Refer to **Figure 3** for location in comparison to the construction site.

SLR also recommend the implementation of 2.4 m high hoarding around the perimeter of the construction site along the Glebe Foreshore as a mitigation measure during Stage 1 main building construction works. Refer to **Figure 4** for location in comparison to the construction site.

Figure 3 Stage 1 Demolition – 2.4m Hoarding Layout

Figure 4 Main Building Layout

SLR recommends consideration of the Transport of NSW 2018 Construction Noise and Vibration Strategy (CNVS), which provides further guidance on appropriate noise mitigation options depending on the level of exceedance predicted (refer **Table 15**).

Table 15 Recommended Triggers for Additional Mitigation Measures – Airborne Noise

Time Period	dB(A) above RBL	dB(A) above NML	Addition Mitigation Measures Type[1]
Standard Hours: Mon - Fri (7am – 5:30pm), Sat (8am – 1pm), Sun/Pub Holiday (Nil)			
Noticeable	5 to 10	0	-
Clearly Audible	10 to 20	< 10	-
Moderately Intrusive	20 to 30	10 to 20	PN, V
High Intrusive	> 30	> 20	PN, V
75dB(A) or greater	-	-	PN, V, SN
OOHW Period 1: Mon – Fri (5:30pm – 10pm), Sat (7am – 8am & 1pm – 10pm), Sun/Pub Holiday (8am – 6pm)[2]			
Noticeable	5 to 10	< 5	-
Clearly Audible	10 to 20	5 to 15	PN
Moderately Intrusive	20 to 30	15 to 25	PN, V, SN, RO
High Intrusive	> 30	> 25	PN, V, SN, RO, RP, DR
OOHW Period 2: Mon – Saturday (10pm – 12am & 12am – 7am), Sun/Pub Holiday (12am – 7am & 6pm – 12am)			
Noticeable	5 to 10	< 5	PN
Clearly Audible	10 to 20	5 to 15	PN, V
Moderately Intrusive	20 to 30	15 to 25	PN, V, SN, RP, DR
High Intrusive	> 30	> 25	PN, V, SN, AA, RP, DR

Note 1: PN = Project notification
V = Verification monitoring
RP = Respite period
AA = Alternative accommodation
SN = Specific notification, individual briefings, or phone call
DR = Duration reduction
RO = Project specific respite offer

Note 2 Respite periods and duration reduction are not applicable when works are carried out during OOHW Period 1 Day only (i.e Saturday 6:00 am –7:00 am & 1:00 pm-6:00 pm, Sundays / Public Holidays 8:00 am-6:00 pm).

In terms of duration, the most significant exceedances in the NML are those highlighted in **Table 10** of standard hours works. To manage these impacts, in line with the framework in **Table 15**, the following measures are recommended to be employed:

- Verification monitoring:
  - Monitoring is required under the development consent condition B79 (J), which addresses this measure. See **Section 9** for further details.
  - SLR has conducted in-situ attended noise and vibration monitoring of the following:
    - Noise and vibration measurements to verify noise level emissions from select mobile equipment. See **Appendix C** for further details of some of the verification measurements that have been undertaken.
    - Facade noise reduction testing at the school demountable classrooms and the school hall. See **Appendix D** for further details.

- Project Notification:
  - Notification is also required under development consent condition B79 (I). SLR recommends that a single letterbox drop to all receivers within the impacted NCA's is to occur at the beginning of the project outlining the expected impacts – with information to an online portal which may contain any updates as the project progresses. This Project Notification should also include information that further Specific Notifications may follow to residents most impacted prior to certain works.
- Specific Notification:
  - SLR recommend that specific notification is deemed to be appropriate where during standard construction hours the predicted noise at noise sensitive receivers exceed 75 dB(A), as per the framework in **Table 15**. Notification need only be made to receivers predicted to be exceeding the 75 dB(A) noise level, not the entire NCA. Notification should be made prior to the commencement of each activity which include information on the type of work and what time of day it will be occurring (including any respite periods in line with DA approved hours) as well as the expected duration / programmed completion for the work.

At this stage, construction scenario 5 has only been indicatively assessed. Notwithstanding the predicted out-of-hours impacts are provided in **Table 11**, management and mitigation measures outlined as per the framework in **Table 15** should be employed. Noting that in particular where roadworks are in close (<10m) proximity to residents, impacts may fall in to the "Moderately Intrusive" or "Highly Intrusive" categories so management measures such as the following will likely be required:

- Respite Period / Duration Reduction: works should be limited to two night-time periods and/or three evenings within any one week: works over two consecutive nights should be followed by a five day break. The number of evenings/nights per week can be increased where respite periods are counterproductive, however impacted receivers must be consulted and evidence of community support for the Duration Reduction must be provided as justification for the Duration Reduction.
- Alternative Accommodation: Where impacts cannot be reduced, duration reductions and other respite are not feasible, this measure may be considered on a case-by-case basis.

Condition C5 notes regarding permitted works outside of standard hours that:

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

The CNVS states that where emergency works requiring OOHW are to occur, it may be suitable to commence an immediate community notification strategy. The strategy may include door-knock visits to impacted sensitive receivers, distribution of project contact cards and post-emergency specific notifications.

7.3 Outside of Working Hours (OOHW) Project Specific Mitigation

In addition to the standard and project specific mitigation measures outlined in **Section 7.1** and **Section 7.2** above, a range of project specific mitigation measures have been developed below for Out of Hours Work (OOHW) to help address additional impacts of specific work activities.

7.3.1 11kV Feeder Construction

SLR has been engaged by Multiplex to undertake a Construction Noise Management Plan (CNVMP) for the proposed 11 kV feeder works, SLR Report Reference "610.30264.00500-R01-v1.0 HV Feeder Works Construction Noise and Vibration Management Plan" (11kV Feeder CNVMP) which form part of the broader New Sydney Fish Market development. These works are planned to start at just north of the intersection of Great Western Highway and Bridge and progress north-east towards the corner of Wentworth Park Road and Bridge Road.

The 11kV Feeder CNVMP addresses the potential noise impacts associated with these construction works and outlines mitigation and management measures to be employed.

The nearest receivers to the project in all noise catchment areas are predicted to be subject to 'Highly Intrusive' worst-case noise impacts, particularly when noisy equipment such as rock breakers or concrete saws are in use near to receivers. There would often be periods when works are in distant parts of the construction area which would result in construction noise levels being much lower than the worst-case levels predicted. There would also be times when no equipment is in use and no impacts occur.

Certain works would require lane closures and would be required to occur outside Standard Construction Hours to minimise potential traffic disruption. The impacts during these evening and night-time works are predicted to be increased due to more stringent criteria during these time periods.

The Interim Construction Noise Guideline (ICNG) acknowledges that due to the nature of construction work, noise and vibration impacts may be inevitable where construction activities are near to sensitive receivers. Accordingly, the project shall implement a noise mitigation strategy, as detailed in the 11kV Feeder CNVMP, to help minimise impacts to these receivers.

This strategy will centre around appropriate 'standard' and 'additional' mitigation measures as defined in the Construction Noise and Vibration Strategy (CNVS). Further, the provision of respite forms a key component of this strategy, by limiting works within an impacted zone to 2 consecutive nights per week.

The assessment in **Section 3.3** and **Section 4.1.1** in the 11kV Feeder CNVMP indicates that construction of the 11kV Feeder is expected to exceed the sleep disturbance screening criterion and highly intrusive criterion at multiple receivers. SLR have deemed it reasonable and feasible to adopt the CNVS sleep disturbance mitigation to assist in mitigating the impact on these receivers while the 11kV Feeder is under construction. Therefore, SLR has recommended the following project specific mitigation for the 11kV Feeder construction:

- When works within an impacted zone are undertaken for 2 consecutive nights, night works for the next two nights of that week shall:
  1. occur a minimum of 250m from that previous work location for Scenario 2 works.
  2. occur a minimum of 400m from that previous work location for Scenario 1 & 3 works.
- Implementation of various mitigation measures as defined in the Construction Noise and Vibration Strategy (CNVS), including specific notification, project notification, verification monitoring, duration reduction and project specific respite offers.
- It is noted that given the high density of residential receivers along the construction route, alternative accommodation would not be considered a reasonable and feasible mitigation measure for the 11kV Feeder Construction works.

The provision of respite periods by rotating works sequentially across different construction zones is considered a reasonable and feasible approach to mitigate impacts for individual receiver locations.

7.3.2 Modification 9 Concreting Works

SLR has been engaged by Multiplex to undertake a Construction Noise and Vibration Assessment for Modification 9, regarding construction hours during concreting and cofferdam dewatering works, which form part of the broader New Sydney Fish Market development. These works are planned to be undertaken across the whole site. This assessment is provided in **Appendix H**.

The Modification allows limited construction activities associated with major slab pours to continue until 8:00 pm on weekday evenings, on no more than a total of 35 occasions between November 2022 and June 2023. During this extended period, activities would typically only comprise slab finishing works using helicopter floats and hand tools but may also include concrete deliveries and slab finishing with vibrators. The Modification also allows cofferdam dewatering activities at all hours. The proposed changes to construction hours are summarised in **Appendix H**.

The assessment addresses the potential noise impacts from concreting works associated with these construction works and outlines mitigation and management measures to be employed. These works are proposed to occur Monday to Friday between 5:30 pm to 8:00 pm. It also addresses potential noise impacts from the dewatering pumps which will operate continuously, at all hours.

The Interim Construction Noise Guideline (ICNG) acknowledges that due to the nature of construction work, noise and vibration impacts may be inevitable where construction activities are near to sensitive receivers. Accordingly, the project shall implement a noise mitigation strategy, as detailed in the CNVMP, to help minimise impacts to these receivers.

This strategy will centre around appropriate ‘standard’ and ‘additional’ mitigation measures as defined in the Construction Noise and Vibration Strategy (CNVS).

The assessment included in **Appendix H** indicates that construction of the concreting works exceeds the evening NML where concreting works occur at the west and east concreting works areas. Therefore, SLR recommend the following project specific mitigation for the concreting works during the evening period:

- All standard measures listed in **Table 13**.
- For the slab finishing works: implementation of mitigation measures as defined in the Construction Noise and Vibration Strategy (CNVS), specifically the project notification mitigation measure.
- For the dewatering works: installation of hoardings around the perimeter of the pontoons supporting the dewatering pumps (with the exception of the side of the pontoon facing the cofferdam).

8 Vibration Mitigation Measures

8.1.1 Minimum Working Distances for Vibration Intensive Works

Minimum working distances for typical vibration intensive construction equipment are provided in the CNVS and are summarized in **Table 16**. The minimum working distances are for both cosmetic damage (from BS 7358) and human comfort (from the NSW EPA Vibration Guideline) and are based on empirical data which suggests that where works are further from receivers than the quoted minimum distances then impacts are not considered likely.

Table 16 Recommended Minimum Working Distances from Vibration Intensive Equipment

Plant Item	Rating / Description	Minimum Distance	
		Cosmetic Damage (BS 7385)	Human Response (NSW EPA Guideline)
Vibratory Roller	< 50 kN (Typically 1-2t)	5 m	15 m to 20 m
	< 100 kN (Typically 2-4t)	6 m	20 m
	< 200 kN (Typically 4-6t)	12 m	40 m
	< 300 kN (Typically 7-13t)	15 m	100 m
	> 300 kN (Typically 13-18t)	20 m	100 m
	> 300 kN (Typically > 18t)	25 m	100 m
Small Hydraulic Hammer	300 kg - 5 to 12t excavator	2 m	7 m
Medium Hydraulic Hammer	900 kg - 12 to 18t excavator	7 m	23 m
Large Hydraulic Hammer	1600 kg - 18 to 34t excavator	22 m	60 m
Vibratory Pile Driver	Sheet piles	2 m to 20 m	20 to 100 m
Pile Boring	≤ 800 mm	2 m (nominal)	4 m
Jackhammer	Hand held	1 m (nominal)	2 m

The safe working distances for building damage should always be complied with. The distances are noted as being indicative and will vary depending on the particular item of plant and local geotechnical conditions. They apply to addressing the risk of cosmetic (e.g minor or easily reparable) damage of typical buildings under typical geotechnical conditions.

Where vibration intensive works are required to be undertaken within the specified safe working distances, vibration monitoring should be undertaken to ensure acceptable levels of vibration are satisfied.

In relation to human comfort, the safe working distances relate to continuous vibration. For most construction activities, vibration emissions are intermittent in nature and for this reason, higher vibration levels, occurring over shorter periods are allowed.

The following vibration mitigation measures will be implemented by the construction contractor:

- Relocate any vibration generating plant and equipment to areas within the site in order to lower the vibration impacts.

- Investigate the feasibility of rescheduling the hours of operation of major vibration generating plant and equipment to times when vibration levels are less likely to impact nearby vibration sensitive receivers.
- Minimise consecutive works in the same locality (if applicable).
- Schedule a minimum respite period of at least 30 minutes before activities commence which are to be undertaken for a continuous 4-hour period.

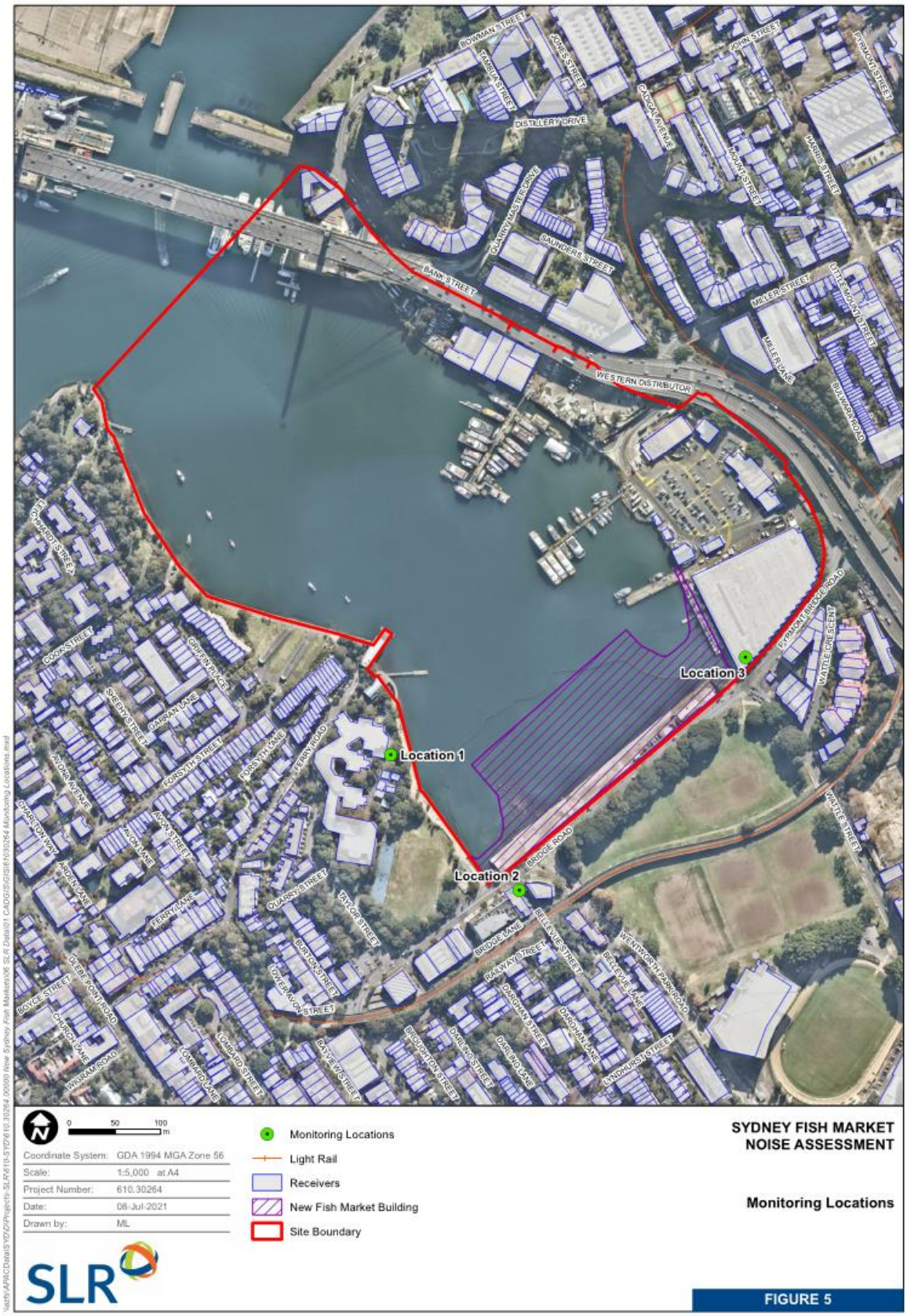
9 Noise and Vibration Monitoring

9.1 Monitoring Methodology

The broad approach to monitoring is recommended to be as follows:

- 3 x long-term real-time noise monitors to be established in the approximate locations shown in **Figure 5** for the 24 month duration of the project.
- Supplementary attended noise measurements when required such as on the commencement of any high-impact activities.
- Vibration monitoring to be undertaken on the commencement of any high-impact activities. Unattended vibration monitoring to be undertaken for the first 2 months of piling activity, and then the need for continued monitoring be re-assessed based on measured results.

Figure 5 Noise Monitoring Locations



9.1.1 Noise Monitoring

Long term noise monitoring will be undertaken at locations representative of the three closest, potentially most affected residences using statistical noise loggers as approximately indicated in **Figure 5**. This equipment is to be real-time enabled with an online portal, allowing the project team to investigate the noise impacts of work either at as it happens or immediately afterward. Notifications (SMS / email) of exceedances in the established trigger levels will be enabled.

This monitoring would be supplemented by attended monitoring (where necessary) in order to differentiate between construction noise sources and other sources (such as road traffic) and also in order to observe and identify any abnormally noisy equipment or operations.

During attended monitoring, typical maximum noise levels associated with particular operations and/or plant items will be noted. Extraneous noise events such as road traffic noise will be excluded from the results or highlighted in accompanying notes.

Noise monitoring will be undertaken by SLR and reported Monthly. Equipment and methods will comply with AS 1055:2018. The statistical parameters to be measured will be the L_{Amin}, L_{A90}, L_{A10}, L_{A1}, L_{Amax} and L_{Aeq} evaluated over consecutive 15 minute periods.

9.1.2 Vibration Monitoring

Structural vibration monitoring (where necessary) will be carried out for a period of two months at the beginning of the predicted impacts to determine the vibratory impacts of impact piling within close proximity of the piling works.

Vibration monitoring locations and durations be determined when a detailed impact piling program is developed prior to commencement. As part of the monitoring strategy, SLR recommend that the noise and vibration monitors installed have SMS capability so as to alert the Multiplex immediately of any/all criteria breaches.

A single geophone mounting plate would be installed within close proximity to the construction activities. The monitoring locations would be on a stiff part of the structures (at the foundations) on the side of the structures adjacent to the subject excavation works, in accordance with BS 7385: Part 2:1993.

Based on the foregoing information, the nominated site control vibration criteria are presented in **Table 17** together with the minimal risk of cosmetic damage criterion from BS 7385.

Table 17 Nominated Site Control Vibration Criteria (ie Operator Warning and Halt Levels)

Structure	Site Control Criteria	
	Operator Warning Level	Operator Halt Level
Nearest Potentially Affected	6 mm/s	8 mm/s

Exceedance of the “Operator Warning Level” does not require activity to cease but rather alerts the construction contractor to proceed with caution at reduced force or load.

An exceedance of the “Operator Halt Level” requires the construction contractor to implement an alternative excavation technique.

The vibration monitoring equipment will be downloaded on a weekly basis by SLR.

Weekly reports of the measured vibration levels and their likely impacts would be prepared by SLR and distributed by the Project Manager.

Attended vibration monitoring will, if required, be conducted by SLR. Attended vibration monitoring (structural damage and/or human comfort) will also be carried out in response to complaints or to structural damage criterion exceedances. This monitoring will provide direct feedback to the operators in order to allow appropriate modification of construction techniques.

9.2 Non-Compliance and Corrective Action

Where the noise and/or vibration monitoring identifies non-compliance with the relevant criteria, the construction contractor will plan and carry out corrective action.

The corrective action may involve supplementary monitoring in order to identify the source of the non-conformance and may involve modification of the construction techniques or programme to avoid any recurrence or minimise its adverse effects.

Corrective actions will be conducted in accordance with Multiplex's Project Management Plan and/or Construction Environmental Management Plan.

9.3 Community Consultation Communications Strategy

Community consultation will, if required, be undertaken via the construction contractor, including:

- Advising the community of work to be undertaken.
- Consultation with the community to avoid works during high sensitivity periods (e.g. Sydney Secondary College Blackwattle Bay School exam periods).
- Recording and managing any complaints.

These and other elements of the community consultation will be addressed under the relevant procedures for the subject works.

Community consultation will be conducted in accordance with Multiplex Community Communications Strategy.

9.4 Complaint Handling

The construction contractor will adopt the following protocol for handling complaints. This protocol is intended to ensure that the issues are addressed and that appropriate corrective action is identified and implemented as necessary:

- In accordance with the Multiplex Community Communications Strategy, complainants are to have access to a website address and a 1800 number to address their concerns and complaints with the ongoing works.
- The construction contractor will record all verbal, telephone and email complaints in writing and will forward all complaints to the Project Manager, together with details of the circumstance leading to the complaint and all subsequent actions.

- Complaints received by the Project Manager will, as an initial step, be referred to the construction contractor. The construction contractor will respond as described above.
- The Project Manager will investigate the complaint in order to determine whether a criterion exceedance has occurred or whether noise and/or vibration have occurred unnecessary.
- If excessive or unnecessary noise and/or vibration have been caused, corrective action will be planned and implemented by the construction contractor
- Complainants will be informed by the Project Manager that their complaints are being addressed, and (if appropriate) that corrective action is being taken.
- Follow up monitoring or other investigations will be carried out by the Project Manager and the construction contractor to confirm the effectiveness of the corrective action.
- Complainants will be informed of the implementation of the corrective action that has been taken to mitigate the adverse effects.
- Complaints will be handled in accordance with Multiplex Community Communications Strategy.

Appendix A:

Acoustic Terminology

1. Sound Level or Noise Level

The terms 'sound' and 'noise' are almost interchangeable, except that 'noise' often refers to unwanted sound.

Sound (or noise) consists of minute fluctuations in atmospheric pressure. The human ear responds to changes in sound pressure over a very wide range with the loudest sound pressure to which the human ear can respond being ten million times greater than the softest. The decibel (abbreviated as dB) scale reduces this ratio to a more manageable size by the use of logarithms.

The symbols SPL, L or LP are commonly used to represent Sound Pressure Level. The symbol LA represents A-weighted Sound Pressure Level. The standard reference unit for Sound Pressure Levels expressed in decibels is 2 x 10^{-5} Pa.

2. 'A' Weighted Sound Pressure Level

The overall level of a sound is usually expressed in terms of dBA, which is measured using a sound level meter with an 'A-weighting' filter. This is an electronic filter having a frequency response corresponding approximately to that of human hearing.

People's hearing is most sensitive to sounds at mid frequencies (500 Hz to 4,000 Hz), and less sensitive at lower and higher frequencies. Different sources having the same dBA level generally sound about equally loud.

A change of 1 dB or 2 dB in the level of a sound is difficult for most people to detect, whilst a 3 dB to 5 dB change corresponds to a small but noticeable change in loudness. A 10 dB change corresponds to an approximate doubling or halving in loudness. The table below lists examples of typical noise levels.

Sound Pressure Level (dBA)	Typical Source	Subjective Evaluation
130	Threshold of pain	Intolerable
120	Heavy rock concert	Extremely noisy
110	Grinding on steel	
100	Loud car horn at 3 m	Very noisy
90	Construction site with pneumatic hammering	
80	Kerbside of busy street	Loud
70	Loud radio or television	
60	Department store	Moderate to quiet
50	General Office	
40	Inside private office	Quiet to very quiet
30	Inside bedroom	
20	Recording studio	Almost silent

Other weightings (eg B, C and D) are less commonly used than A-weighting. Sound Levels measured without any weighting are referred to as 'linear', and the units are expressed as dB(lin) or dB.

3. Sound Power Level

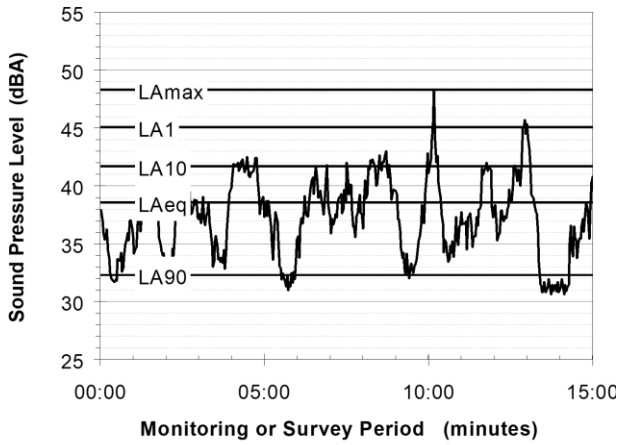
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or LW, or by the reference unit 10^{-12} W.

The relationship between Sound Power and Sound Pressure is similar to the effect of an electric radiator, which is characterised by a power rating but has an effect on the surrounding environment that can be measured in terms of a different parameter, temperature.

4. Statistical Noise Levels

Sounds that vary in level over time, such as road traffic noise and most community noise, are commonly described in terms of the statistical exceedance levels LAN, where LAN is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the LA1 is the noise level exceeded for 1% of the time, LA10 the noise exceeded for 10% of the time, and so on.

The following figure presents a hypothetical 15 minute noise survey, illustrating various common statistical indices of interest.



Of particular relevance, are:

LA1 The noise level exceeded for 1% of the 15 minute interval.

LA10 The noise level exceeded for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.

LA90 The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.

LAeq The A-weighted equivalent noise level (basically, the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.

5. Frequency Analysis

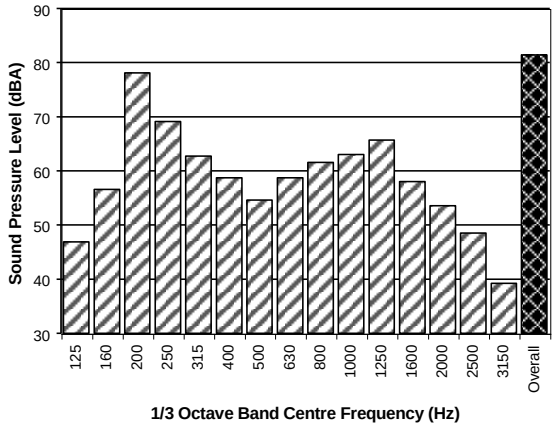
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal.

The units for frequency are Hertz (Hz), which represent the number of cycles per second.

Frequency analysis can be in:

- Octave bands (where the centre frequency and width of each band is double the previous band)
- 1/3 octave bands (three bands in each octave band)
- Narrow band (where the spectrum is divided into 400 or more bands of equal width)

The following figure shows a 1/3 octave band frequency analysis where the noise is dominated by the 200 Hz band. Note that the indicated level of each individual band is less than the overall level, which is the logarithmic sum of the bands.



6. Annoying Noise (Special Audible Characteristics)

A louder noise will generally be more annoying to nearby receivers than a quieter one. However, noise is often also found to be more annoying and result in larger impacts where the following characteristics are apparent:

- **Tonality** - tonal noise contains one or more prominent tones (ie differences in distinct frequency components between adjoining octave or 1/3 octave bands), and is normally regarded as more annoying than 'broad band' noise.
- **Impulsiveness** - an impulsive noise is characterised by one or more short sharp peaks in the time domain, such as occurs during hammering.
- **Intermittency** - intermittent noise varies in level with the change in level being clearly audible. An example would include mechanical plant cycling on and off.
- **Low Frequency Noise** - low frequency noise contains significant energy in the lower frequency bands, which are typically taken to be in the 10 to 160 Hz region.

7. Vibration

Vibration may be defined as cyclic or transient motion. This motion can be measured in terms of its displacement, velocity or acceleration. Most assessments of human response to vibration or the risk of damage to buildings use measurements of vibration velocity. These may be expressed in terms of 'peak' velocity or 'rms' velocity.

The former is the maximum instantaneous velocity, without any averaging, and is sometimes referred to as 'peak particle velocity', or PPV. The latter incorporates 'root mean squared' averaging over some defined time period.

Vibration measurements may be carried out in a single axis or alternatively as triaxial measurements (ie vertical, longitudinal and transverse).

The common units for velocity are millimetres per second (mm/s). As with noise, decibel units can also be used, in which case the reference level should always be stated. A vibration level V, expressed in mm/s can be converted to decibels by the formula 20 log (V/Vo), where Vo is the reference level (10^{-9} m/s). Care is required in this regard, as other reference levels may be used.

8. Human Perception of Vibration

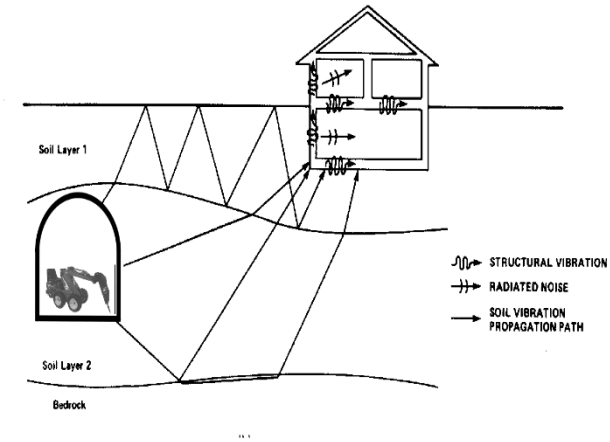
People are able to 'feel' vibration at levels lower than those required to cause even superficial damage to the most susceptible classes of building (even though they may not be disturbed by the motion). An individual's perception of motion or response to vibration depends very strongly on previous experience and expectations, and on other connotations associated with the perceived source of the vibration. For example, the vibration that a person responds to as 'normal' in a car, bus or train is considerably higher than what is perceived as 'normal' in a shop, office or dwelling.

9. Ground-borne Noise, Structure-borne Noise and Regenerated Noise

Noise that propagates through a structure as vibration and is radiated by vibrating wall and floor surfaces is termed 'structure-borne noise', 'ground-borne noise' or 'regenerated noise'. This noise originates as vibration and propagates between the source and receiver through the ground and/or building structural elements, rather than through the air.

Typical sources of ground-borne or structure-borne noise include tunnelling works, underground railways, excavation plant (eg rockbreakers), and building services plant (eg fans, compressors and generators).

The following figure presents an example of the various paths by which vibration and ground-borne noise may be transmitted between a source and receiver for construction activities occurring within a tunnel.



The term 'regenerated noise' is also used in other instances where energy is converted to noise away from the primary source. One example would be a fan blowing air through a discharge grill. The fan is the energy source and primary noise source. Additional noise may be created by the aerodynamic effect of the discharge grill in the airstream. This secondary noise is referred to as regenerated noise.

Appendix B:

CNVMP Grid Noise Maps

Appendix B contents here

Appendix C:

Attended Mobile Plant Measurements

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Multiplex Global (Multiplex) to conduct attended noise measurements on site during test piling and stage 1 construction early works to verify predicted noise levels at nearby receivers identified in **Table 2**.

This acoustic review is based on acoustic benchmark testing conducted on 8, 9, 17, 21, 23, 24 and 25 June 2021.

Methodology

Acoustic performance benchmark testing has been undertaken in close proximity of select mobile plant being utilised across various stages of the construction program.

The equipment used for the benchmark test is summarized in **Table C1** below.

Table C1 Equipment List

Type	Manufacturer	Model	Serial Number
Sound Level Meter	Brüel & Kjær	2270	3029485
Vibration level Meter	Instantel	Minimate Series III	12591

The sound level meter (SLM) used in the testing was designed to comply with the requirements of Australian Standard AS/NZS IEC 61672.1:2019 - *Electroacoustics—Sound level meters, Part 1: Specifications* and carried appropriate and current National Association of Test Authorities (NATA) calibration certificates. The calibration of the SLM was checked both before and after the test and was found to be within acceptable limits.

Results Summary

Noise

The attended noise measurements obtained in close proximity of mobile plant operations were used to determine the actual in-situ sound power level (SWL) of selected mobile plant. The purpose of these requested works is to verify predicted noise levels at nearby receivers during construction works of the New Sydney Fish Market. The following equipment was measured:

- Impact hammer (Junttan HHX-300)
- Rock breaker w/ 50t excavator
- Concrete saw
- Setting up Impact Piling Rig (vibratory attachment)
- Extracting existing wooden piles (vibratory attachment)

Results from the attended noise measurements is summarized below **Table C2**.

Table C2 Attended Mobile Plant Results

Item	Centre Band Frequency, Hz Plant Maximum Sound Power Level (SWL dBA)								Total dBA
	63	125	250	500	1000	2000	4000	8000	
Impact hammer (Junttan HHX-300)	92	104	115	127	132	132	133	123	138[1,2]
Rock breaker w/ 50t excavator	93	102	107	114	116	118	117	107	127[1]
Concrete saw	98	108	115	112	108	111	114	110	120[1]

Item	Centre Band Frequency, Hz Plant Maximum Sound Power Level (SWL dBA)								Total dBA
	63	125	250	500	1000	2000	4000	8000	
Setting up Impact Piling Rig	106	114	112	113	115	115	103	94	120
Extracting existing wooden piles	87	105	103	105	108	109	115	113	119

Note 1: 5 dB correction applied for a impulsive noise correction, as per Section 4.5 of the NSW Interim Construction Guideline 2009.

Note 2: Maximum source operation time is approximately 7.5 minutes per 15 minute period so an on-time correction has been applied.

Vibration

The overall Vibration Dose Values (VDV) vibration levels measured across the test piling period on 1st July at monitoring locations 1 and 2 (refer **Figure C1**) are included in **Table C3**.

Table C3 Summary of Maximum Vibration Levels

Site Activity	Monitoring Location	Approximate Distance from Piling Works	Analysis Period	On-time During this period	Measured Maximum Peak Component Particle Velocity (mm/s)	VDV (m/s^1.75) During On-Time Only	VDV over 8-hour period
Vibration Piling	1	60 metres	10 Minutes	100%	0.9 mm/s	0.007	0.018
	2	100 metres			0.7 mm/s	0.0014	0.004
Impact Piling	1	60 metres	40 Minutes	13.5%	1.4 mm/s	0.035	0.065
	2	100 metres			0.8 mm/s	0.022	0.041

For the assessment of human comfort, the measured VDVs versus distance and the criteria set out in **Table C3**.

It can be seen above in **Table C3** that on the site measurements conducted on 1 July 2021 are compliant with the human comfort criteria in **Table 8** for commercial, residential and educational building types.

Figure C1 Vibration monitoring locations

Appendix D:

In-situ Receiver Façade Noise Performance Testing

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Multiplex Global (Multiplex) to provide advice relating to the sound insulation performance of the demountable teaching rooms and auditorium hall at Sydney Secondary College Blackwattle Bay Campus located on Taylor Street, Glebe.

This acoustic review is based on acoustic benchmark testing conducted on 20 May 2021.

Acoustic Benchmarking

Methodology

Acoustic performance benchmark testing has been undertaken in the demountable teach rooms and auditorium hall that are located on the foreshore of Blackwattle Bay.

The equipment used for the benchmark test is summarized in **Table D1** below.

Table D1 Equipment List

Type	Manufacturer	Model	Serial Number
Sound Level Meter	Brüel & Kjær	2270	3029485
Signal Generator	NTI	MR PRO	0917
Loud Speaker	JBL	EON615	15043136748

The sound level meter (SLM) used in the testing was designed to comply with the requirements of Australian Standard AS/NZS IEC 61672.1:2019 - *Electroacoustics—Sound level meters, Part 1: Specifications* and carried appropriate and current National Association of Test Authorities (NATA) calibration certificates. The calibration of the SLM was checked both before and after the test and was found to be within acceptable limits.

Results Summary

Results from the sound insulation measurements are shown in **Table D2**.

Table D2 Sound Insulation Measurements Results

Measurement I.D.	Partition	Receiving room	Sound Insulation dB D_W
T1	Glazed room front	Demountable Teaching room 1	27
T2	Glazed room front	Demountable Teaching room 2	30
T3	Brick Façade	Hall audience space	27

Appendix E:

Modification 5: HSC Respite Periods 2021

Appendix E contents here

Appendix F:

Modification of Development Consent 7

Sediment Capping and Glebe Island Associated Works

Introduction

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Multiplex to undertake a noise impact assessment of the proposed Sediment Capping works to be completed on the main work site and the works proposed at Glebe Island to assist sediment capping works related to the overarching new Sydney Fish Markets project. This assessment has been prepared to accompany the SSD-8925-MOD-7 application.

In consultation with Multiplex, SLR understands that there is no neighbouring construction related activities in the area of the New Sydney Fish Market Project.

Sediment Capping Works

SLR understands that Multiplex originally proposed a construction methodology to conduct the Sediment Capping works and have since proposed an alternative methodology. This section aims to compare the noise levels between the originally proposed methodology with the current proposed construction methodology.

As part of the alternative methodology, Multiplex have advised the following equipment to be in operation during the proposed works:

- Road trucks
- Excavators
- Generator
- Hand drill (drill rig)
- Pumps

Comparison of Sediment Capping Methodologies

A comparison between the primary noise generating equipment utilised in a previously proposed sediment capping works methodology and the currently proposed methodology has been outlined in **Table F1**

Table F1 Comparison of Sediment Capping Methodologies

Construction Stage	Equipment	Sound Power Level (dBA)	Combined Scenario Sound Power Level (dBA)
Previous Basement Construction Methodology	Metal Grinder	114	116
	Rattle Guns	110	
	Welders	97	
	Cranes	100	
Currently Proposed Sediment Capping Methodology	Road trucks	104	109
	Excavators	107	
	Generator	90	
	Hand drill (drill rig)	94	
	Pumps	90	

As shown in the table above, the overall noise level of the currently proposed methodology is less than the previously proposed methodology.

Glebe Island Works

Nearest Receivers

The nearest sensitive receivers are residential properties to the north and south. The nearest receivers are shown in **Figure F1** and **Table F2**.

Table F2 Surrounding Sensitive Receivers

ID	Address	Type	Distance (m)	Direction
R01	32A Refinery Drive, Pyrmont	Residential	270	SE
R02	34 Refinery Drive, Pyrmont	Residential	290	SE
R03	7 Waite Ave, Balmain	Residential	470	N
R04	13 Donnelly Street, Balmain	Residential	490	N
R05	26 Donnelly Street, Balmain	Residential	560	NW
R06	9 Rosebery Place, Balmain	Residential	470	NW

Figure F1 Nearest Receivers and Previous Logging Locations

Existing Noise Environment

In the absence of relevant recent noise logging data, background noise levels have been extracted from the SLR Noise Report as part of the approved 2013 REF and for the Balmain (east) – Grafton Street NCA, from the intrusiveness criteria presented in the 'White Bay Cruiser Terminal – Operational Environmental Management Plan – Cruise Operations', dated 1 March 2013. Due to the elapsed time since these measured noise levels, they are considered conservative, as noise levels have likely increased in the area since monitoring has taken place.

These background noise levels have been presented in **Table F3.**

Table F3 Previously Measured Background Noise Levels (March 2013)

ID	Address	Measured Noise Levels (dBA)		
		Background Noise (RBL)		
		Day	Evening	Night
L01	Balmain – Batty Street	51	49	42
L02	Pyrmont – Refinery Drive	50	49	47

Noise levels from L02 are applicable to receivers in the south (R01-R02) and noise levels from L01 are applicable to receivers in the north (R03-R06).

Assessment Noise Criteria

The Interim Construction Noise Guideline (ICNG) approach for determining NMLs at residential receivers is shown in **Section 5.1 (Table 6)** above.

The Construction noise management levels are provided below in **Table F4**.

Table F4 Construction Noise Management Levels

Receiver Type	Noise Management Level ($L_{Aeq(15minute)}$ – dBA)				Sleep Disturbance Screening Criteria
	Standard Construction Hours	Out of Hours			
	Daytime	Daytime[1]	Evening	Night-time	
R01-R02 (L02)	60	n/a	n/a	n/a	n/a
R03-R06 (L01)	61	n/a	n/a	n/a	n/a

Note 1: This refers to the period on Saturday between 7am – 8am and 1pm – 6pm, on Sunday and public holidays between 8am – 6pm.

Construction Hours

For the construction of the New Sydney Fish Market the SSD-8925 development consent conditions have adopted construction hours within the ICNG standard construction hours. Additionally, SSD-8925 stipulates that certain activities may only be conducted during certain periods of the approved construction hours. The approved construction hours are reproduced below in **Table F5**. It is assumed that these works will occur during the approved standard construction hours only.

Table F5 Construction Hours

Day	Activity Type	Approved Construction Hours
Monday to Friday	Standard Construction Activities	7 am to 5:30 pm
	Rock breaking, rock hammering, sheet piling, pile driving, and similar activities	9 am to 12 pm 1 pm to 5 pm
Saturdays	Standard Construction Activities	7:30 am to 3:30 pm
	Rock breaking, rock hammering, sheet piling, pile driving, and similar activities	9 am to 1 pm
Sundays or Public Holidays	All activities	No construction

Construction Noise Assessment

Construction Noise Sources

As per the construction methodology provided by Multiplex, the construction noise sources **Table F6** have been modelled as part of this assessment. A worst case scenario has been modelled, assuming all equipment is running concurrently.

Table F6 Construction Noise Sources

Equipment	Sound Power Level (dBA)	Quantity
Front End Loaders	104	2
Truck and Dog Deliveries	107	1
Bob Cats	97	2
Excavator (Komatsu SSA6D125E-7)	107	1
Hopper Barge Idling	90	1

Construction Noise Predictions

To quantify noise levels from the construction activities a computer noise prediction model using the ISO-9613 algorithms was developed using SoundPLAN software.

Noise predictions from the proposed construction works have been predicted to the nearest receivers during the daytime and are summarised in **Table F7**.

Table F7 Predicted Construction Noise Levels

Receiver Location	Noise Level $L_{Aeq(15minute)}$ (dBA)			Compliance
	Noise Management Level – Standard Daytime	Predicted	Exceedance	
R01	60	50	-	Yes
R02	60	52	-	Yes
R03	61	44	-	Yes
R04	61	48	-	Yes
R05	61	43	-	Yes
R06	61	45	-	Yes

According to the above predictions, noise levels from construction noise at Glebe Island are expected to be compliant with the project specific Noise Management Levels at all receivers.

Port Authority Mitigation Measures

Port Authority have provided a number of standard mitigation measures for works at Glebe Island. These measures have been listed below.

1. Mobile plant will use non tonal 'squawker' reversing alarms where practical subject to compliance with work health and safety requirements.
2. Truck movements will be organised to minimise the need for trucks to reverse.
3. All machinery and equipment associated with the proposed activity is to be maintained in accordance with manufacturer's requirements.
4. The site operator will be required to implement a mobile plant driver awareness program covering:
    I. judicious use of the throttle during lifting as well as travel;
    II. minimising the idling of forklifts and trucks on site; and
    III. Immediate reporting and repair of any machinery defects which may cause /excess noise generation.
5. Noise level monitoring of the first gypsum shipment will be undertaken to verify the assumptions of this REF. Should excessive noise levels and/or noise complaints be noted, further mitigation measures will be considered and implemented where feasible.

Should noise from ongoing operations result in complaints from neighbouring sensitive receivers, existing noise mitigation measures will be reviewed and further mitigation measures will be investigated and implemented as deemed appropriate to alleviate the impact.

Multiplex have committed to ensure compliance with all of the above measures and the standard project mitigation measures reproduced above in **Section 7.1**. In addition, Multiplex are not proposing to use a grab bucket excavator attachment in this methodology as per advice from Port Authority to assist to further in reducing noise emissions.

Construction Vibration Criteria

Project specific Construction Vibration Criteria is provided in **Section 5.3** above.

Noise Mitigation Measures

Standard noise mitigation measures are proposed to be applied where reasonable and feasible. See **Section 7.1** for the standard noise mitigation measures**.**

Vibration Mitigation Measures

Standard vibration mitigation measures (offset distances) are provided in **Section 8**.

SLR understands the equipment proposed for the MOD 7 works are not identified as vibration intensive equipment in **Table 16**. Therefore, SLR does not consider a detailed vibration impact assessment is required for the proposed MOD 7 works.

Conclusion

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Multiplex to undertake a noise impact assessment of the proposed Sediment Capping works and the works proposed at Glebe Island to assist sediment capping works related to the overarching new Sydney Fish Markets project. This memorandum has been prepared to accompany the SSD-8925-MOD-7 application.

In consultation with Multiplex SLR understands that there is no neighbouring construction related activities in the area of the New Sydney Fish Market Project.

Table F1 shows that the overall noise level of the current proposed methodology is expected to be quieter than the originally proposed methodology.

Table F7 shows that all noise level predictions for the Glebe Island works comply with the project Noise Management Levels at the nearby noise sensitive receivers.

Appendix G:

Modification 8: HSC Respite Periods 2022

For the construction of the New Sydney Fish Market the SSD-8925 development consent conditions have adopted construction hours within the ICNG standard construction hours. Additionally, SSD-8925 stipulates those certain activities may only be conducted during certain periods of the approved construction hours. The approved construction hours are reproduced below in **Table G1**.

Table G1 Construction Hours

Day	Activity Type	Approved Construction Hours
Monday to Friday	Standard Construction Activities	7 am to 5:30 pm
	Rock breaking, rock hammering, sheet piling, pile driving, and similar activities	9 am to 12 pm 1 pm to 5 pm
Saturdays	Standard Construction Activities	7:30 am to 3:30 pm
	Rock breaking, rock hammering, sheet piling, pile driving, and similar activities	9 am to 1 pm
Sundays or Public Holidays	All activities	No construction

The works will however occur contemporaneously with the HSC examination periods at Sydney Secondary College (SSC), which will occur during the period of 12 October 2022 to 4 November 2022 (inclusive). Multiplex has proactively engaged with SSC to adjust the timing and duration of each block of work to accommodate the HSC exam timetable: the proposed respite periods (i.e when rock breaking, rock hammering, sheet piling, pile driving and similar activities will not occur) during examination periods are reproduced in **Table G2**.

Table G2 Proposed Respite Periods during HSC Examination Period at Sydney Secondary College

Date	Respite Period		Total Respite Hours
	Morning	Afternoon	
Wednesday, 12 October 2022	9:35 am - 12:30 pm	1:40pm - 5:00pm	6 hours, 5 minutes
Thursday, 13 October 2022	9:10am - 11:30am	1:40pm - 5:00pm	5 hours, 40 minutes
Friday, 14 October 2022	9:10am - 12:30pm	1:40pm - 5:00pm	6 hours, 40 minutes
Monday, 17 October 2022	9:10am - 12:30pm	1:40pm - 5:00pm	6 hours, 40 minutes
Tuesday, 18 October 2022	9:10am - 12:30pm	1:40pm - 5:00pm	6 hours, 40 minutes
Wednesday, 19 October 2022	9:10am - 12:30pm	1:40pm - 5:00pm	6 hours, 40 minutes
Thursday, 20 October 2022	9:05am - 12:30pm	1:35pm - 5:00pm	6 hours, 50 minutes
Friday, 21 October 2022	9:10am - 12:30pm	1:40pm - 5:00pm	6 hours, 40 minutes
Monday, 24 October 2022	9:10am - 11:40am	1:40pm - 5:00pm	5 hours, 50 minutes
Tuesday, 25 October 2022	9:10am - 12:30pm	1:35pm - 4:40pm	6 hours, 25 minutes
Wednesday, 26 October 2022	9:15am - 12:30pm	1:35pm - 5:00pm	6 hours, 40 minutes
Thursday, 27 October 2022	9:10am - 12:30pm	1:40pm - 5:00pm	6 hours, 40 minutes
Friday, 28 October 2022	9:10am - 11:30am	1:40pm - 5:00pm	5 hours, 40 minutes
Monday, 31 October 2022	9:10am - 12:30pm	1:40pm - 5:00pm	6 hours, 40 minutes
Tuesday, 1 November 2022	9:10am - 12:30pm	1:40pm - 3:30pm	5 hours, 10 minutes
Wednesday, 2 November 2022	9:10am - 12:30pm	1:40pm - 5:00pm	6 hours, 40 minutes
Thursday, 3 November 2022	9:10am - 12:30pm	1:40pm - 4:30pm	6 hours, 0 minutes

Date	Respite Period		Total Respite Hours
	Morning	Afternoon	
Friday, 4 November 2022	9:10am - 12:30pm	1:40pm - 3:30pm	5 hours, 10 minutes

It is noted that the total respite hours in **Table G2** are greater than the cumulative respite hours of 3.5 hours per day presented in **Table G1** and that the adjustment of respite hours is in accordance with the source mitigation measures for the project presented in **Table 13**. As the cumulative respite hours per day are greater than the current hours, this suggests that the amenity of other noise sensitive receivers would not be adversely impacted, provided the required notifications are completed in advance of the works.

Appendix H:

Modification 9: Extended Construction Hours

Introduction

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Multiplex to undertake a noise impact assessment of the proposed extended construction hours for:

- Concreting works to be completed on the main work site
- The use of the dewatering pumps for the temporary cofferdam

This assessment has been prepared to satisfy the SSD-8925-MOD-9 conditions of approval, specifically:

- Condition B79 and;
- Condition C4 (d)

Construction Hours

For the construction of the New Sydney Fish Market the SSD-8925 development consent conditions have adopted construction hours within the ICNG standard construction hours. Additionally, SSD-8925 stipulates those certain activities may only be conducted during certain periods of the approved construction hours and MOD 9 has added Condition C4 (d), which also notes that maintenance and monitoring of the dewatering of the temporary cofferdam may be undertaken outside of these hours. The approved construction hours are reproduced below in **Table H1**.

Table H1 Construction Hours

Day	Activity Type	Approved Construction Hours
Monday to Friday	Standard Construction Activities	7 am to 5:30 pm
	Rock breaking, rock hammering, sheet piling, pile driving, and similar activities	9 am to 12 pm 1 pm to 5 pm
Saturdays	Standard Construction Activities	7:30 am to 3:30 pm
	Rock breaking, rock hammering, sheet piling, pile driving, and similar activities	9 am to 1 pm
Sundays or Public Holidays	All activities	No construction

Condition C2A is also partially reproduced below:

> *"… on no more than 35 days construction is permitted between the hours of 5:30 pm to 8:00 pm Mondays to Fridays inclusive for slab finishing works."*

During the slab finishing works, activities would typically only comprise using helicopter floats and hand tools, but may also include concrete deliveries and slab finishing with vibrators.

For the dewatering works, dewatering pumps are proposed to be located at three locations on the perimeter of the cofferdam wall; these are shown on an aerial photograph in **Figure H1**. The dewatering pumps need to operate continuously to be effective: water will flow back into the cofferdam while the dewatering pumps are not operating. Consequently any lengthy respite periods would result in the dewatering becoming redundant.

Figure H1 Locations of Dewatering Pumps

The proposed changes to construction hours for both the slab finishing works and the dewatering activities are summarised in **Table H2** below.

Table H2 Proposed Out of Standard Construction Hours Extension

Day	Activity Type	Proposed Out of Standard Construction Hours Extension
Monday to Friday	Concrete truck delivery, concrete pumping and slab finishing works using vibrators and/or helicopter floats.	5:30 pm to 8:00pm
	Dewatering works	All hours
Saturday	All activities except dewatering works	No extension
	Dewatering works	All hours
Sundays or Public Holidays	All activities except dewatering works	No construction
	Dewatering works	All hours

Assessment Noise Criteria

Criteria for the proposed extended construction hours is highlighted in **Section 5.2**, **Section 5.3** and **Table 15** of the CNVMP which are adopted for these works.

Construction Noise Assessment – Slab Finishing Works

Table H3 shows the sound power levels of the equipment proposed for the worst-case scenario of the slab finishing works, which would involve concrete deliveries and slab finishing with vibrators. Works will usually be limited to helicopter floats and hand trowels and would therefore have reduced noise impacts in comparison to this worst-case scenario.

Table H3 Construction Noise Levels – Slab Finishing Works

Equipment	Sound Power Level (dBA)
Road truck	104
Concrete Truck (pumping Concrete)	112
Helicopter Float	106
Generator	89
Hand Tools	102
Concrete Pump	110
Concrete Pencil Vibrator	110

Construction Noise Predictions

To quantify noise levels from the construction activities a computer noise prediction model using the ISO-9613 algorithms was developed using SoundPLAN software.

Multiplex have advised that all concreting equipment would enter through Gate 1 for the western concreting area (Scenario 1) and Gate 5 for the eastern concreting area (Scenario 1). Noise predictions for the proposed construction works have been predicted to the nearest receivers during the evening period and are summarised in **Table H4** below.

Table H4 Construction Noise Levels – Slab Finishing Works

NCA#	Receiver Category	Noise Level $L_{Aeq(15minute)}$ (dBA)/ Mitigation		
		NML – OOHW Evening	West Concreting Area	East Concreting Area
NCA1	Commercial	70 (when in use)	60 / -	64 / -
NCA2	Residential	62	62 / -	**74 / CA (PN)**
	Commercial	70 (when in use)	63 / -	**79 / CA (PN)**
NCA3	Residential	62	**72 / CA (PN)**	65 / N (-)
NCA4	Residential	55	**62 / CA (PN)**	60 / N (-)
	Education	65 (when in use)	**75 / CA (PN)**	67 / N (-)
NCA5	Residential	55	40 / -	**63 / CA (PN)**

Note 1: PN = Project notification; SN = Specific notification, individual briefings, or phone call; V = Verification monitoring; DR = Duration reduction; RP = Respite period; RO = Project specific respite offer; AA = Alternative accommodation

Note 2: N = Noticeable; CA = Clearly Audible; MI = Moderately Intrusive

Note 3: **Bold** text indicates predicted noise levels above the noise management level

Table H4 shows that the predicted noise levels from Scenario 1 (Evening works) are 'Clearly Audible' at the nearest residential receivers in NCA2, NCA3, NCA4 and NCA5. This triggers the 'Project Notification' additional mitigation measure of the CNVS, which is detailed in **Table 15**.

Construction Noise Assessment – Dewatering Works

An aerial photograph showing the proposed locations of the dewatering pumps is shown in **Figure H1**. The corresponding sound power levels are provided in **Table H5**.

Table H5 Construction Noise Levels – Dewatering Works

Equipment	Sound Power Level (dBA)
Dewatering Pump D150R	100
Dewatering Pump PAS150	100
Dewatering Pump D200 (Diesel SuperSilent)	101

SLR verified the sound power levels of the D150R pump on 18 January 2023. The other sound power levels are based on the manufacturer sound power levels.

The types of pumps that are assumed at the pumping locations shown in Figure are also detailed in **Table H6**.

Table H6 Construction Noise Levels – Dewatering Works

Pumping Location	Equipment	Qty
1	Dewatering Pump D150R	2
2 & 3	Dewatering Pump PAS150	1
	Dewatering Pump D200	1
	Dewatering Pump D150R	1

Construction Noise Predictions

To quantify noise levels from the construction activities a computer noise prediction model using the ISO-9613 algorithms was developed using SoundPLAN software.

As the dewatering pumps are expected to operate continuously, noise predictions for the proposed construction works have been predicted to the nearest receivers during the most sensitive night-time period and are summarised in **Table H7** below. Predictions have been made for two separate scenarios:

- One scenario with no mitigation in place ('no hoarding')
- One scenario with 1 m hoardings mounted on the perimeter of the pontoons supporting the dewatering pumps, not including the side of the pontoon facing the cofferdam[1] ('with hoarding').

Table H7 Construction Noise Levels – Dewatering Works

NCA#	Receiver Category	Noise Level $L_{Aeq(15minute)}$ (dBA)/ Mitigation		
		NML – OOHW Night	No Hoarding	With Hoarding
NCA1	Commercial	70 (when in use)	45 / -	43 / -
NCA2	Residential	55	55 / -	53 / -
	Commercial	70 (when in use)	60 / -	57 / -
NCA3	Residential	55	**56 / N (PN)**	53 / -
NCA4	Residential	47	**49 / CA (PN)**	47 / -
	Education	65 (when in use)	56 / -	52 / -
NCA5	Residential	51	42 / -	42 / -

Note 1: PN = Project notification; SN = Specific notification, individual briefings, or phone call; V = Verification monitoring; DR = Duration reduction; RP = Respite period; RO = Project specific respite offer; AA = Alternative accommodation

Note 2: N = Noticeable; CA = Clearly Audible; MI = Moderately Intrusive

Note 3: **Bold** text indicates predicted noise levels above the noise management level

The results in **Table H7** demonstrate that for the 'no hoarding' scenario, exceedances of the night-time NML's are observed at the worst-case representative residential receivers in NCA3 and NCA4. For the 'with hoarding' scenario, no exceedances of the night-time NMLs are predicted.

Management Measures

The Interim Construction Noise Guideline (ICNG) acknowledges that due to the nature of construction work, noise and vibration impacts may be inevitable where construction activities are near to sensitive receivers. Accordingly, the project shall implement a noise mitigation strategy, as detailed in the CNVMP, to help minimise impacts to these receivers.

This strategy will centre around appropriate 'standard' and 'additional' mitigation measures as defined in the Construction Noise and Vibration Guideline (CNVS).

Key mitigation measures include:

- All standard measures listed in **Table 13**.

[1] It is not feasible to put hoarding on this face as the dewatering pump hoses would need to penetrate this to access the cofferdam.

- For the slab finishing works: implementation of mitigation measures as defined in the Construction Noise and Vibration Strategy (CNVS), specifically the project notification mitigation measure.
- For the dewatering works: installation of hoardings around the perimeter of the pontoons supporting the dewatering pumps (with the exception of the side of the pontoon facing the cofferdam). The hoardings should be at least 1 m high and break the line of sight between the pumps and the sensitive receivers surrounding the site.

Conclusion

The assessment indicates that exceedances of the relevant criteria are predicted:

- **Table H4** shows that predicted noise levels from the slab finishing works (during the evening period) are 'Clearly Audible' at the nearest residential receivers in NCA2, NCA3, NCA4 and NCA5.
- **Table H7** also shows that predicted noise levels from the dewatering works will exceed the night-time NMLs in NCA3 and NCA4 if there is no mitigation installed. With hoardings installed on the perimeter on the pontoons supporting the dewatering pumps (with the exception of the side of the pontoon facing the cofferdam), no exceedances of the night-time NMLs are predicted.

Key mitigation measures proposed are:

- All standard measures listed in **Table 13**.
- For the slab finishing works: implementation of mitigation measures as defined in the Construction Noise and Vibration Strategy (CNVS), specifically the project notification mitigation measure.
- For the dewatering works: installation of hoardings around the perimeter of the pontoons supporting the dewatering pumps (with the exception of the side of the pontoon facing the cofferdam).

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