ADP
Consulting : Engineering

HNSW – Mowbray Road – Lane Cove North, NSW

Noise and Vibration Impact Assessment

Prepared for: Homes NSW

Project No: SYD3088
Date: 25 September 2024
Revision: 01

Project:	HNSW – Mowbray Road – Lane Cove North, NSW
Location:	618 – 622 Mowbray Road Lane Cove NSW, 2066
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Project Team	
Client / Principal	Homes NSW Trading as New South Wales Land and Housing Corporation
Architect	DKO

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1. Introduction

This noise and vibration impact assessment has been prepared by ADP Consulting on behalf of Homes NSW for a State Significant Development Application (SSD-71687208) for the construction of a five-storey residential flat building with a total of 86 social and affordable housing apartments at 618-624 Mowbray Rd and 25-29 Mindarie Street Lane Cove North.

The purpose of this noise and vibration impact assessment is to assess noise emissions from the development, noise intrusion to the development and to address the Secretary's Environmental Assessment Requirements (SEARs) for the project issued on 18 June 2024

The site is located at 618-624 Mowbray Rd and 25-29 Mindarie Street Lane Cove North, in the Lane Cove Local Government Area (LGA).

The site has a total site area of 4,198 square metres (sqm) and has frontages to Mowbray Road to the north, Kullah Parade to the east and Mindarie Street to the south. Refer to Figure 1.

The site currently contains seven single-storey dwellings which are currently unoccupied. It is one of the final remaining sites to be developed within the Mowbray Precinct, an area of new residential flat buildings located along Mowbray Road with recent five-storey apartment buildings located to the east and west of the site.

The site is located opposite Mindarie Park, which includes children's playgrounds, recreation areas and access to walking paths in Lane Cove National Park. Mowbray Public School is located to the north of the site on Mowbray Road.

The site is accessible by public transport with services that run along Mowbray Road with frequent services to Chatswood and Sydney CBD.

1.1 Project background

This Noise and Vibration Impact Assessment accompanies an Environmental Impact Statement (EIS) in support of a State Significant Development Application (SSDA) for 'Mowbray Road, Lane Cove North, Affordable Housing' at 618-624 Mowbray Road & 25-29 Mindarie Street Lane Cove within Lane Cove.

The purpose of this report is to provide an assessment of noise and vibration impacts on nearby receivers in accordance with NSW Environment Protection Authority (EPA) guidelines. The report addresses noise and vibration impacts from the construction works and the operation of the proposed development.

1.2 Response to SEARs

This Noise and Vibration Impact Assessment is required by the Secretary's Environmental Assessment Requirements (SEARS) for Application number SSD-71687208, which states:

12. Noise and Vibration

- *Provide a noise and vibration assessment prepared in accordance with the relevant NSW Environment Protection Authority (EPA) guidelines. The assessment must detail construction and operational noise and vibration impacts on nearby sensitive receivers and structures and outline the proposed management and mitigation measures that would be implemented.*

The following table outlines the SEARS requirement that is relevant to acoustics, and lists areas of the report that the requirements are satisfied.

Table 1 Table SEARS and Relevant References

SEARs Item	Report References
12 – Noise and Vibration	> Relevant NSW EPA guidelines: – Section 5.2 and 5.3 for operational and construction noise and vibration criteria > Details of assessment methodology: – Section 7 and 8 for operational and construction noise and vibration emission assessments > Details of proposed management and mitigation measures: – Section 6, 7 and 8.4 for operational and construction noise and vibration mitigation requirements. – Summary of requirements in Section 9

1.3 Scope of Assessment

The following procedure outlines the scope of assessment with respect to the above acoustic aspects and relevant policies and guidelines:

> Review the proposed development plans to identify acoustic and vibration related aspects of the operation of the redevelopment.

> Identify nearby noise and vibration sensitive receivers.

> Conduct noise level monitoring to quantify the existing acoustic environment at relevant surrounding receiver locations to set project targets in accordance with relevant policy.

> Identify where further input to the project design is required and identify in-principle mitigation or management methods for the control of noise and vibration.

2. Referenced drawings, codes, and standards

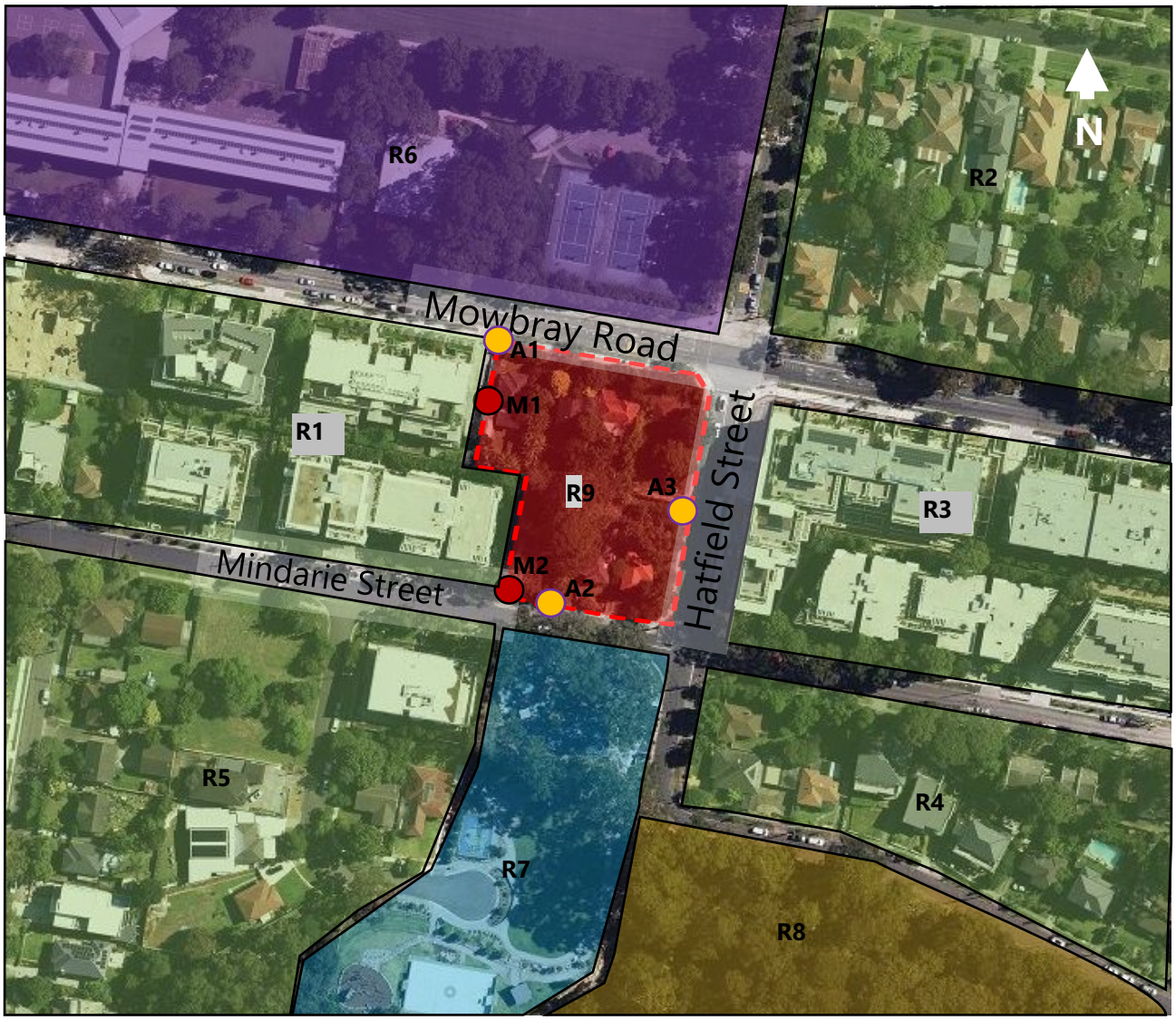
The following drawings, conditions, guidelines, standards, regulatory requirements, and other project-specific information has been referenced in preparing this report:

- NSW Environment Protection Authority, "*NSW Noise Policy for Industry*," (NPfI) NSW Environment Protection Authority, Sydney, 2017
- Department of Environment, Climate Change and Water NSW, "*NSW Road Noise Policy*," NSW Environmental Protection Authority, Sydney, 2011.
- NSW Department of Planning, "*Development Near Rail Corridors and Busy Roads - Interim Guideline*,"(the Interim Guideline) NSW Department of Planning, Sydney, 2008.
- NSW Government *Cumulative Impact Assessment Guidelines for State Significant Projects*, , October 2022.
- Australian/ New Zealand Standard – *Recommended design sound levels and reverberation times for building interiors* (AS/NZS 2107).
- AS/NZS 1668.1:2015 *The use of ventilation and air conditioning in buildings Part 1: Fire and smoke control in buildings* (AS/NZS 1668.1).
- NSW Department of Environment and Climate Change NSW, "*Interim Construction Noise Guideline*," (ICNG), Sydney, 2009.
- NSW Environment Protection Authority, *Draft Construction Noise Guideline* dated November 2020
- AS 2436:2016 *Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites*
- Department for Environment Food and Rural Affairs (United Kingdom) *Noise Database for Prediction of Noise on Construction and Open Sites,* 2005.
- NSW Department of Environment and Conservation "*Assessing Vibration: A technical guideline*," Sydney, 2006.
- Australian Standard AS2670.2:1990 *Evaluation of Human Exposure to Whole-Body Vibration Part 2: Continuous and Shock-Induced Vibration in Buildings* (1 to 80 Hz) (AS 2670.2).
- DIN 4150-3 (1992-02) *Structural vibration – Effects of vibration on structures*.
- BS 7385.2:1993 *Evaluation and Measurement for Vibration in Buildings Part 2: Guide to Damage Levels from Ground-borne Vibration* (BS 7385.2:1993).
- Dept of Environment and Conservation (DEC) NSW *Assessing Vibration: A Technical Guideline* (AVTG) 2006.

3. Site Description

The project site is located at 618-624 Mowbray Road & 25-29 Mindarie Street, Lane Cove North NSW 2066. The project site and surrounding features, including nearby noise sensitive receivers, and potential noise sources, is presented in Figure 1. The following sections describe the nearby features.

Figure 1 Aerial photo of subject site map (resourced from SIX Maps)



- Proposed development location
- M1-M2: Long-term noise monitoring locations
- A1-A3 Attended noise measurement location
- R1-R5: Nearest residential noise sensitive receivers
- R6: Nearest educational noise sensitive receivers
- R7: Active recreational noise sensitive receivers
- R8: Passive recreational noise sensitive receivers
- R12: Future apartments within proposed development

3.1 Noise sensitive receivers

Based on site survey and investigations, the most affected noise-sensitive receivers were identified, shown in Figure 1.

- Residential receivers:
  - R1 – Apartment building comprising dwellings directly west of the development.
  - R2 – Dwellings across Mowbray Road / Hatfield Street to the north-east.
  - R3 – Apartment building comprising dwellings across Hatfield Street. east of the development
  - R4 – Dwellings across Mindarie / Hatfield Streets to the southeast.
  - R5 - Dwellings across Mindarie Street to the south-west.
  - R9 – The apartments within the development itself
- Educational facilities, including:
  - R6 – Mowbray Public School to the north, across Mowbray Road
- Active Recreation:
  - R7 – Mindarie Park to the south.
- Passive Recreation:
  - R81 –Stringybark Creek area to the south, beyond Mindarie Park.

3.2 Noise sources

Based on site surveys and project details, the acoustic environment around the project site is primarily affected by local traffic noise on the surrounding roads as identified in Figure 1.

The development itself will introduce noise sources, including:

- Services plant and equipment,
- Deliveries and loading dock,
- Waste collection
- Activity from retail and commercial premises.

4. Existing Acoustic Environment

The acoustic environment around the project site is dominated by local traffic noise. Acoustic monitoring was undertaken in July 2024 to quantify the existing noise environment and inform the applicable environmental noise limits that twill apply to noise emission from the site.

The following sections describe the noise measurement methodology and results.

4.1 Noise measurement equipment

The following instrumentation was used for noise measurements:

- Bruel and Kjaer 2250 Integrating Sound Level Meter (S/N: 3011318).
- Bruel and Kjaer Sound calibrator Type 4231 (S/N: 3018299).
- 2 x Noise Sentry NSRT MK3 Sound Level Meter Data Loggers, Type 1.

Equipment is laboratory calibrated in accordance with Australian National Standards and certified within the last two years. Equipment was also field calibrated prior to and after noise surveys. Calibration drift was found to be less than 0.2dB during measurements, therefore no adjustments for instrument drift during the measurement period were warranted.

4.2 Attended traffic noise measurements

An attended traffic noise measurement was undertaken at the northwest corner of the proposed development on the 9th of July 2024 at Location A1 shown in Figure 1, approximately 2m from Mowbray Road kerb, at a height of 1.5m above ground level, with a 180-degree review of Mowbray Road. Weather was clear and fine during the measurement period (i.e., no rain or wind) however the streets were slightly wet from previous rain periods.

Table 2 below presents the results of the attended traffic noise measurements.

Table 2 Attended noise measurement results, dB(A)

dB(A)	**dB(A)**
$L_{eq,15min}$	$L_{A90,\ 15min}$
69	53

4.3 Long-term unattended noise monitoring

Long-term background and traffic noise monitoring was conducted from 2 to 9 July 2024 at Locations M1 and M2 (refer to Figure 1), as described below:

- **Location M1**: the microphone was positioned at rooftop level, however due to the terrain elevation in this area, approximately equivalent in height to Mowbray Road. approximately 20 metres from Mowbray Road.

  M1 results will be used to quantify traffic noise intrusion to the proposed development from Mowbray Road, and to quantify background noise levels for determining noise emission criteria for noise sensitive receivers located along Mowbray Road.

- **Location M2**: the noise monitor was installed at fence height level at the southwest corner of the proposed development, approximately 7 metres from Mindarie Street.

  M2 results will be used to quantify traffic noise intrusion to the proposed development from the south, and to quantify background noise levels for determining noise emission criteria for noise sensitive receivers located along Mindarie Street.

Background noise levels were corrected for meteorological conditions (wind above 5m/s and/or rain), as required by section 3.4 of the EPA Noise Policy for Industry.

Background noise (L_{A90}) as well as equivalent continuous sound levels (L_{Aeq}) representing traffic noise as per Road Noise Policy (RNP) at locations M1 and M2 are summarised in Table 3 – 5 below.

Table 3 Background noise level results, dB(A) at Location M1 (Mowbray Road)

Noise Measurement	**Daytime** (7am – 6pm)	**Evening** (6pm – 10pm)	**Night-time** (10pm – 7am)
Average– L_{Aeq}	52	60	57
Rating Background Level (RBL) – L_{A90}	51	45	38

Table 4 Traffic noise levels, dB(A) at Location M1 (Mowbray Road)

Measurement Location	**Daytime** (7am – 10pm)	**Night-time** (10pm – 7am)
Location M1	63dB $L_{Aeq\ (1\text{-}hr)}$	58 $L_{Aeq\ (1\text{-}hr)}$
	61dB $L_{Aeq\ (15\text{-}hr)}$	55dB $L_{Aeq\ (9\text{-}hr)}$

Table 5 Background noise level results, dB(A) at Location M2 (Mindarie Street)

Noise Measurement	**Daytime** (7am – 6pm)	**Evening** (6pm – 10pm)	**Night-time** (10pm – 7am)
Location M2			
Average– L_{Aeq}	49	44	42
Rating Background Level (RBL) – L_{A90}	32	33	30

Table 6 Traffic noise monitoring levels, dB(A) at Location M2 (Mindarie Street)

Measurement Location	**Daytime** (7am – 10pm	**Night-time** (10pm – 7am)
Location M2	50dB $L_{Aeq\ (1\text{-}hr)}$	47dB $L_{Aeq\ (1\text{-}hr)}$
	47dB $L_{Aeq\ (15\text{-}hr)}$	40dB $L_{Aeq\ (9\text{-}hr)}$

5. Criteria

5.1 Noise & Vibration Intrusion Criteria

External noise sources that influence the internal noise levels include local road traffic and noise sources associated with the development itself. Noise sources associated with the development include services plant and equipment, including hydraulics services, HVAC, electrical equipment and plant areas.

Internal mechanical services noise are not assessed as part of the SSDA.

This section presents internal noise and vibration criteria for the proposed development, including applicable policies standards and guidelines and a summary of criteria.

5.1.1 State Environmental Planning Policy (Transport and Infrastructure) 2021

Clause 2.120 of the *State Environmental Planning Policy (Transport and Infrastructure)* 2021 (SEPP), specifies indoor noise level requirements for residential developments. The following are stated:

> *(1) This section applies to development for any of the following purposes that is on land in or adjacent to the road corridor for a freeway, a tollway or a transitway or any other road with an annual average daily traffic volume of more than 20,000 vehicles (based on the traffic volume data published on the website of TfNSW) and that the consent authority considers is likely to be adversely affected by road noise or vibration—*
>
> *(a) residential accommodation,*
> *(b) a place of public worship,*
> *(c) a hospital,*
> *(d) an educational establishment or centre-based child care facility.*

SEPP also states the following:

> *(3) If the development is for the purposes of residential accommodation, the consent authority must not grant consent to the development unless it is satisfied that appropriate measures will be taken to ensure that the following L_{Aeq} levels are not exceeded—*
>
> *(a) in any bedroom in the residential accommodation—**35 dB(A) at any time between 10 pm and 7 am,***
> *(b) anywhere else in the residential accommodation (other than a garage, kitchen, bathroom or hallway)—**40 dB(A) at any time.***

Based on Traffic Volume Maps for Transport and Infrastructure SEPP (Map 12B) this development does not require an assessment of road traffic noise intrusion as it does not front a road with an AADT of more than 20,000.

5.1.2 Development Near Rail Corridors and Busy Roads – Interim Guideline (NSW Dept of Planning)

The *Development Near Rail Corridors and Busy Roads – Interim Guidelines* (Interim Guidelines) nominate noise criteria for noise intrusion to developments from adjacent rail and road corridors. The following sections outline the guideline's internal noise level criteria.

Airborne Noise

Section 3.6.1 and Table 3.1 of the Interim Guideline specifies internal noise criteria for different areas of occupancy. Noise levels are summarised below.

Table 7 Interim Guidelines Internal Noise criteria (from Table 3.1 of Interim Guideline)

Residential Buildings **Type of Occupancy**	**Noise Level, dBA**	**Time period**
Sleeping areas (Bedrooms/ Hotel Rooms)	35	Night-time (10pm – 7am)
Other Habitable areas (Excluding wet areas, hallways and garages)	40	At any time

Per Section 3.5 of the Interim Guideline, as the site does not front a road with an AADT of more than 40,000 vehicles, and assessment of road traffic noise intrusion is not required.

Ground borne noise

Section 3.6.2 of the Interim Guideline requires the following with regards to the assessment of ground-borne noise.

> *"Generally, ground borne noise is associated more closely with rail operations than roads. Where buildings are constructed over or adjacent to land over tunnels, ground-borne noise may be present without the normal masking effect of airborne noise. In such cases, residential buildings should be designed so that the 95th percentile of train pass-bys complies with a ground-borne L_{Amax} noise limit of 40dBA (daytime) or 35dBA (night-time) measured using the "slow" response time setting on a sound level meter".*

The site is not located in the vicinity of any rail corridors or road tunnels.

5.1.3 AS/NZS 2107:2016 – Recommended internal noise levels for building interiors

Indoor background noise levels in terms of Sound Pressure Level (SPL) deemed acceptable to the majority of reasonable occupants are published in AS/NZS 2107. We have summarised the recommended indoor noise levels for the proposed development in Table 8.

The following noise limits apply to continuous sources of outdoor noise (e.g. road traffic, rooftop plant) as well as sources internal to the proposed development (including sleeping and habitable areas) such as plant and equipment, but not noise associated with occupants.

Table 8 AS2107:2016 Recommended internal design sound levels

Type of occupancy	**Design sound level, $L_{eq,T}$, dB(A)**
Houses and apartments in inner city areas , entertainment districts or near major roads	
Apartment common areas (foyer, lift lobby)	45 – 50

Type of occupancy	Design sound level, $L_{eq,T}$, dB(A)
Living areas	35 – 45
Sleeping areas (night-time)	35 – 40

5.1.4 AS2760.2 & BS 6472 - Internal vibration requirements

Limits for vibration of the building structure potentially affecting human comfort have been derived from AS 2670.2 and BS 6472. The standards propose maximum vibration levels in terms of baseline curves and multiplication factors. For the purpose of minimising the disturbing perceptibility of vibration within the occupied areas of this development, Table 9 specifies appropriate limits for floor vibration.

Table 9 Internal vibration limits

Type of occupancy	Time	Continuous vibration limits: r.m.s. acceleration (m/s^2) Preferred / maximum	Impulsive vibration limits: r.m.s. acceleration (m/s^2) Preferred / maximum	Intermittent vibration limits: Vibration Dose Value VDV ($m/s^{1.75}$) Preferred / maximum
Residences	Day	0.010 / 0.020	0.300 / 0.600	0.20 / 0.40
	Night	0.007 / 0.014	0.100 / 0.200	0.13 / 0.26
Offices, retail, circulation / other occupied ventilated space	Day or night	0.020 / 0.040	0.640 / 1.280	0.40 / 0.80

5.2 Operational Noise Emission Criteria

Noise emissions from the operation of the proposed development to noise sensitive receivers shall be assessed to ensure compliance with noise emission criteria presented in this section. Noise emission restrictions apply to mechanical plant and equipment systems. These must be planned, designed, and installed to include suitable sound attenuation, vibration isolation, and other necessary acoustic treatments.

The following sections outline the applicable policies, standards and guidelines that apply to environmental noise emission, and a summary of applicable environmental noise criteria.

5.2.1 Noise Policy for Industry, EPA NSW

The NPfI requires compliance with specific *project noise trigger levels* which provide a benchmark or objective for assessing a proposal or site. The project noise trigger level is not a mandatory requirement but rather indicates a potential noise impact on the community, and so 'trigger' a management response; for example, further investigation of mitigation measures.

The *project trigger levels* are determined from the lower (that is, the more stringent) value of the project *intrusiveness noise level* and *project amenity noise level*. The NPfI also includes the application of modifying factors for undesirable noise characteristics such as tonality or impulsiveness, up to a maximum of 10dB.

Noise intrusiveness

The NPfI states that the intrusiveness of an industrial noise source may generally be considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (represented by the L_{Aeq} descriptor), measured over a 15-minute period, does not exceed the background noise level (L_{A90}) measured in the absence of the source by more than 5dB.

The relevant noise intrusiveness levels applicable to this project are shown the Tables below.

Table 10 Noise intrusiveness noise levels – receivers along Mowbray Road

Time of operation	**Background noise Level dB(A)L_{90}**	**Intrusiveness criteria, $L_{Aeq,15min}$ (Background+5dB)**
Day (7am to 6pm)	51	56
Evening (6pm to 10pm)	45	50
Night (10pm to 6am)	38	43

Table 11 Noise intrusiveness noise levels – All other receivers

Time of operation	**Background noise Level dB(A)L_{90}**	**Intrusiveness criteria, $L_{Aeq,15min}$ (Background+5dB)**
Day (7am to 6pm)	32	37
Evening (6pm to 10pm)	33	38
Night (10pm to 6am)	30	35

Amenity noise levels

The NPfI describes methodology to limit gradual increases in noise levels from the introduction of new noise sources in an area, sometimes referred to as 'background noise creep'.

The *recommended amenity noise levels* represent the objective for total industrial noise at a receiver location, whereas the *project amenity noise level* represents the objective for noise from this project. The *project amenity noise level* for industrial developments = *recommended amenity noise level* (Table 2.2) minus 5 dB(A). 3 dB is then added to convert from an L_{Aeq}, period to $L_{Aeq,\ 15min}$.

The *project amenity noise level* for developments in areas of high traffic (such as the subject site) = $L_{Aeq,\ perdio\ (traffic)}$ minus 15 dB(A). A site is a 'high traffic project' if traffic noise is identified as the dominant noise source,

existing traffic noise levels are 10 dB or more above the recommended amenity noise levels and it is highly unlikely traffic noise levels will decrease in future.

NPfI Table 2.2 specifies amenity noise levels in for different types of receivers. The relevant *recommended amenity noise levels* and *project amenity noise levels* applicable to this project are shown in the Table below.

Table 12 Recommended amenity noise levels and project amenity noise levels – Receivers along Mowbray Road

Receiver	**Time of operation**	**Recommended amenity noise levels[1], $L_{Aeq, period}$**	**Project amenity noise levels $L_{Aeq, 15min}$**
Residential (Receivers along Mowbray Road)	Day (7am to 6pm)	60	65
	Evening (6pm to 10pm)	50	48[2]
	Night (10pm to 6am)	45	45[2]
Residential (all other receivers)	Day (7am to 6pm)	60	58
	Evening (6pm to 10pm)	50	48
	Night (10pm to 6am)	45	43
School classroom – internal	Noisiest 1-hour period (internal)	35	-
Active recreation area (e.g. school playground)	When in use	55	-

Note 1: Table 2.1 of the NPfI has four categories of residential areas: rural, suburban, urban and urban/industrial. The nearest noise sensitive residential receivers around the proposed development are considered as "urban".

Note 2: High Traffic Noise project amenity noise levels are based on traffic noise levels minus 15

Modifying Factors

Undesirable characteristics such as tonality, low frequency, impulsiveness and intermittency, adjustments (as per Fact Sheet C of the NPfI) shall be assessed. These modifying factors include a 5dB penalty for each undesirable characteristic. A maximum penalty of 10dB for 2 or more undesirable characteristics applies.

Sleep Disturbance

NPfI establishes sleep disturbance criteria for residential noise sensitive receivers for noise events during the night period. The sleep disturbance criteria are summarised below:

- $L_{Aeq,15min}$ 40 dB(A) or prevailing RBL plus 5dB, whichever is greater, and/or
- L_{AFmax} 52 dB(A) or prevailing RBL plus 15dB, whichever is greater.

Table 13 Sleep disturbance criteria

Receivers	Night-time level dB(A) L_{90}	Sleep disturbance level
Residential Receivers Along Mowbray Road	38	$L_{Aeq,15min}$ dB(A) 43 L_{AFmax} dB(A) 53
Residential Receivers All others	30	$L_{Aeq,15min}$ dB(A) 40 L_{AFmax} dB(A) 52

Summary of NPfI environmental noise criteria

A summary of noise emission criteria that applies at residential receivers from the use of the proposed development is presented in the following tables.

The 'project trigger levels' are the most stringent noise criteria that apply in each instance; i.e., they are expected to be the 'driving' criteria

Table 14 Noise emission criteria – Receivers along Mowbray Road

Time of operation	Intrusiveness criteria, $L_{Aeq,15min}$	Project amenity noise levels (high traffic noise) $L_{Aeq,15min}$	Project trigger levels, $L_{Aeq,15min}$
Day (7am to 6pm)	56	65	56
Evening (6pm to 10pm)	50	48	48
Night (10pm to 6am)	43	45	43 53 dB(A) $L_{Fmaxsleep}$ disturbance)

Table 15 Noise emission criteria – All other receivers

Time of operation	Intrusiveness criteria, $L_{Aeq,15min}$	Project amenity noise level (high traffic noise), $L_{Aeq,15min}$	Project trigger levels, $L_{Aeq,15min}$
Day (7am to 6pm)	37	58	37
Evening (6pm to 10pm)	38	48	38

Night (10pm to 6am)	35	43	35 52 dB(A) L_{Fmax} (sleep disturbance)

The following table presents amenity noise levels for non-residential sensitive receivers as specified in the NPfI.

Table 16 Noise emission criteria – non-residential receivers

Receiver	Time of day	Project noise level, L_{Aeq}, dB
School classroom – internal	Noisiest 1-hour period (internal)	35
Active recreation area (e.g. school playground)	When in use	55
Passive recreation area	When in use	50

5.3 Construction Noise Emission Criteria

The *Draft Construction Noise Guideline* dated 2020 was produced by EPA to replace the *Interim Guideline* dated 2009, and sets out a framework for the management of construction noise through feasible and reasonable mitigation measures. The key objective of the guideline is to ensure that noise impacts from construction are kept to a minimum.

5.3.1 Draft Construction Noise Guideline

The framework outlines the following steps:

- Identify sensitive land uses and construction hours.
- Select the assessment method between a qualitative assessment and a quantitative assessment. A quantitative assessment involves a simplified procedure appropriate for noise sources unlikely to cause significant noise impacts, while a quantitative assessment predicts noise from activities at noise sensitive receivers and is typically needed for major construction projects that require an Environmental Impact Assessment. *A quantitative assessment is suitable to the subject Rozelle Village project*.
- For a quantitative assessment, the procedures in Section 5 of the guideline should be followed to predict construction noise levels; the predicted levels should be compared against the relevant noise management levels set out in Tables 3, 4 and 6 of the Guideline, to identify feasible and reasonable mitigation.

Section 5.3 of the Guideline presents Noise Management Levels (NMLs) for airborne noise at residences and provides supplementary mitigation measures. These are presented in the following Table.

- The 'noise affected' level represents the point above which there may be some community reaction to noise.
- The 'highly noise affected' level represents the point above which there may be strong community reaction to noise.

Table 17 Noise management levels to residences (Tables 3 and 4 of the EPA Draft Construction Noise Guideline)

Time of Day	Management level, $L_{Aeq\ (15\ min)}$	How to apply

Recommended Standard Hours Monday to Friday: 7:00am to 6:00pm Saturday 8:00am to 1:00pm No work on Sundays or public Holidays	Noise affected level RBL* + 10 dB	Where the predicted or measured $L_{Aeq, 15min}$ is greater than the noise affected management level, the proponent shall apply all feasible and reasonable work practices to meet this level. As a matter of good practice, noise should be reduced as far as reasonably practicable. The proponent should notify all potentially impacted residents.
	Highly noise affected level 75 dB(A)	Where noise is above the highly noise affected management level, all feasible and reasonable mitigation shall be applied as well as engagement with the consent authority or regulator to identify other measures to manage noise impacts. Where appropriate, engagement with the community is encouraged to determine the preferred mitigation approach, such as: > negotiated agreements and/or respite periods to restrict work activity. > identification of times when the community is less sensitive to noise, including options for longer periods of construction in exchange for restrictions on construction times.
Outside recommended standard hours:	Noise affected level: RBL + 5 dB	Strong justification is required for works outside the recommended standard hours. The proponent shall apply all feasible and reasonable work practices to meet the noise affected management level. Where this cannot be met, residual impacts should be quantified, and potentially impacted residents notified. The supplementary mitigation described in Table 5 of the Guideline must also be considered, subject to the application notes in Section 5.4.
	Highly noise affected level 65 dB(A)	The highly noise affected management level represents the point above which the supplementary mitigation described in Table 5 must be considered, subject to the application notes in Section 5.4. The proponent must justify the selection of feasible and reasonable mitigation, including the supplementary mitigation, with emphasis on consultation with the community and the consent authority or regulator, and community views on work scheduling and respite periods, as described in Section 5.4.

5.3.2 Summary of Construction Noise Criteria

Using the methodology outlined above and Rating Background Levels determined in Section 4, Noise Management Levels for all receivers is presented below.

Table 18 Residential Noise Management Levels

Time of Day	Land Use	Noise Management Level $L_{Aeq\ (15\ min)}$ dB(A)	
		Noise affected	Highly noise affected

Recommended standard hours: Monday to Friday: 7:00am to 6:00pm Saturday 8:00am to 1:00pm No work on Sundays or public Holidays	**Residential** Receivers along Mowbray Road	61	75
	Residential All other recievers	59	75
Outside of recommended standard hours*	**Residential** Receivers along Mowbray Road	42	65
	Residential All other recievers	37	65

Section 5.5 of the Guideline also presents noise management levels for airborne noise for other than residential noise sensitive receivers. A summary is presented in the following table for assessment in Section 8..

Table 19 Non-Residential Noise Management Levels

Receiver	When to apply	Noise Management Level $L_{Aeq\ (15\ min)}$ dB(A)
Classrooms at schools and other educational institutions	When in use	45 (internal)

5.4 Construction Vibration Emission Criteria

EPA Draft Construction Noise Guideline does not include criteria for vibrations generated from construction works. These should be measured and assessed in accordance with *Assessing Vibration: A Technical Guideline* (AVTG) (Dept of Environment and Conservation (DEC) NSW 2006).

The criteria outlined in the guideline is based on BS 6472-1992. Sources of vibration are defined as either 'Continuous', 'Impulsive' or 'Intermittent'.

Vibration can be assessed in the following categories:

- Human comfort
- Structural damage
- Ground-borne noise

5.4.1 Human Comfort

Human comfort due to exposure to vibrations is dependent on duration and magnitude. Vibration assessed for human comfort can be classified as continuous, impulsive, or intermittent and can enter the body along different orthogonal axes, i.e. x-axis (back to chest), y-axis (right side to left side), or z-axis (foot to head).

The AVTG refers to BS6472:1992 for human comfort criteria, which are outlined in the following sections.

5.4.1.1 Continuous and Impulsive Vibrations

Allowable magnitudes for continuous and impulsive exposure to building vibration (summarised from Table 2.2 of AVTG) with respect to human response are presented in the following table.

Table 20 Continuous and impulsive vibration criteria, m/s^2

Location	Time of Construction	Preferred (rms)		Maximum (rms)	
		z-axis	x & y-axis	z-axis	x & y-axis
Continuous vibration					
Residences	Day (7am – 10pm)	0.010	0.0071	0.020	0.014
	Night (10pm – 7am)	0.007	0.005	0.014	0.010
Offices, commercial, educational institutions, and places of worship	All times	0.020	0.014	0.040	0.028
Impulsive vibration					
Residences	Day (7am – 10pm)	0.30	0.21	0.60	0.42
	Night (10pm – 7am)	0.10	0.071	0.20	0.14
Offices, commercial, educational institutions, and places of worship	All times	0.64	0.46	1.28	0.92

5.4.1.2 Intermittent Vibrations

The VDV criteria recommended in AVTG are summarised in Table 21. To quantify the cumulative effects of several vibration events based on human exposure due to duration and magnitude, the Vibration Dose Value (VDV) descriptor is used.

Table 21 Acceptable vibration dose values (VDV), $m/s^{1.75}$

Location	Time of Construction	Preferred (rms)	Maximum (rms)
Residences	Day (7am – 10pm)	0.20	0.40
	Night (10pm – 7am)	0.13	0.26
Offices, commercial, educational institutions, and places of worship	All times	0.40	0.80

5.4.2 Structural Damage

5.4.2.1 Non-Heritage Buildings

BS 7385.2:1993 sets structural damage limits during both the excavation and construction phases.

The vibration limits in buildings associated with cosmetic damage in BS7385.2:1993 for non-heritage buildings are summarised in the Table below. Heritage buildings have not been identified in the vicinity of the proposed development.

Table 22 Transient vibration guide values for cosmetic damage for non-heritage buildings

Type of Building	Peak component particle velocity in frequency range of predominant pulse	
	4Hz to 15Hz	15Hz and above
Reinforced or framed structures Industrial and heavy commercial buildings	50mm/s at 4Hz and above	
Unreinforced or light framed structures Residential or light commercial type buildings	15mm/s at 4Hz increasing to 20 mm/s at 15Hz	20mm/s at 15Hz increasing to 50mm/s at 40Hz and above
	At frequencies below 4Hz, a maximum displacement of 0.6mm (zero to peak) should not be exceeded	

5.4.3 Ground-Borne Noise

Ground-borne noise is generated by vibrations through the ground affecting structures through activities such as rock breaking or excavations. The EPA *Draft Construction Noise Guideline* states that noise management actions should be implemented (which may include community consultation and respite) when the following levels are exceeded:

- Evening (18:00-22:00) – Internal: $L_{Aeq\ 15min}$ – 40 dB(A)
- Night-time (22:00-07:00) – Internal: $L_{Aeq\ 15min}$ – 35 dB(A)

There are no criteria presented in the ICNG for ground-borne noise during the day-time hours (7:00am-6:00pm), when it is expected that construction work will take place. Therefore, we recommend that ground-borne noise levels in the adjacent buildings do not exceed the levels presented in Table 23 during the day-time period. These recommendations are in accordance with the internal noise levels adopted from AS/NZS 2107:2016 for use under construction intrusion noise conditions for consistency.

Table 23 Daytime ground-borne noise criteria

Type of receiver	**Type of room**	**Ground borne noise, $L_{Aeq,\ 15min}$ dB(A)**
Residential	Any	45
Commercial, educational institutions and places of worship	General office areas / meeting rooms / classrooms	45

6. Noise Intrusion Assessment

Although a road traffic noise intrusion assessment is not strictly required under the SEPP/NSW DoP requirements, noise intrusion from traffic noise was assessed to ensure adequate acoustic amenity for the future residents of the development. The road traffic noise intrusion assessment is based on the long-term unattended noise monitoring data and attended traffic noise measurements presented in Sections 4.2 and 4.3.

This section presents building envelope treatment recommendations for compliance with the internal noise criteria presented in Section 5, including:

- *Development Near Rail Corridors and Busy Roads – Interim Guideline* (NSW Dept of Planning).
- AS/NZS 2107:2016 – *Recommended internal noise levels for building interiors*
- *State Environmental Planning Policy (Transport and Infrastructure)* 2021

The glazing types and building envelope recommendations comply with the internal noise criteria.

Assessment of road traffic noise intrusion was undertaken considering:

- Traffic noise measurements
- Distance from noise sources (and measurement position) to building
- Orientation of windows with respect to the noise source,
- Barrier effects or shielding (where applicable),
- Total area of glazing or other building element, and
- Expected room absorption characteristics.

The following sections outline the design requirements for the building envelope elements.

6.1 Glazing

Based on measured existing noise levels and the internal noise level criteria, the following glazing types would be required for the proposed development:

- Windows or doors to rooms located along the northmost façade: Minimum of 10.38mm laminated glass.
- All other windows or doors: minimum glazing thickness of 6mm float glass.

Thicker or double-glazing may be required for thermal, structural or safety purposes. Where thicker is required, this will also be acoustically acceptable.

Where double-glazing is required for windows on the northern façade, this should be a minimum of 6.38 mm laminate glass/12 mm air gap/6.38 mm laminate glass.

Less thick double-glazing will be acceptable for all other facades.

Any openable windows and external doors are required to be fitted with acoustic-type seals.

6.2 External walls

External constructions will generally need to achieve a minimum R_w value of 45. This rating is typically achievable with either masonry or lightweight façade systems.

7. Operational Emission Assessment

This section presents a noise emission assessment of noise associated with the operation of the proposed development.

Risk of vibration from the proposed development is expected to only affect the development itself from building services plant and equipment. and controlled through design of suitable vibration isolation during plant and equipment selection and design development. Operational vibration emission is therefore not assessed further in this report.

7.1 Services plant and equipment - Noise

Services plant and equipment shall be assessed against the Noise Policy for Industry environmental noise criteria outlined in 5.2.1.

Assuming services systems are designed in coordination with an acoustic consultant and the above items are addressed, the proposed development is capable of complying with operational noise and vibration criteria. Conventional acoustic treatments, such as the following, should allow the development to achieve compliance with noise emission controls as outlined in Section 5.2 of this report

- Selection of plant and equipment with consideration to the noise output.
- If required, air intake and exhaust ductwork serving internal areas, and ventilation for internal plant rooms shall include acoustic attenuators and acoustic louvres as required.
- Air intake and exhaust ductwork serving internal areas, and ventilation for internal plant rooms shall include acoustic attenuators and acoustic louvres as required.
- Speed controllers, if used, should be of good quality and compatible with the motor model. Poor quality controllers can result in significant increase in motor noise.
- Selection of low noise fans, allowance for smooth airflow conditions in ductwork, use of attenuators and lined duct work while minimising regenerated noise at bends, take-offs and transitions.
- As a worst-case scenario, an acoustic barrier and/or enclosures to plant and exhaust systems that are located externally or on the rooftop may be required. If required, the barrier or enclosure shall be of a solid material with no gaps and shall typically extend to the height of the plant items.

A detailed review of noise from mechanical plant servicing the development should be conducted in the detailed design phase of the project once specific mechanical system details are selected by the mechanical contractor.

During the ongoing design of the development, equipment shall be selected and provided with noise and vibration attenuation measures as required to meet noise and vibration criteria. Noise mitigation treatment will likely include:

- Specification of maximum sound power levels for plant and equipment as part of the project documentation
- Attenuators to control fan noise
- Acoustic louvres to control noise from plant room ventilation

- Vibration isolators to reduce vibration to the building structure and beyond (see the following Section)
- Acoustic screens to external plant where required, and
- Sound absorptive treatments in plant room spaces.

7.2 Services Plant and Equipment – Vibration

Risk of vibration from the building services plant and equipment is expected to only affect he development itself and shall be controlled through design of suitable vibration isolation during plant and equipment selection and design development.

Assuming services systems are designed in coordination with an acoustic consultant and the above items are addressed, the proposed development is capable of complying with operational noise and vibration criteria.

The following allowances shall be made for in the design:

- Support points for major plant items should be structurally rigid. Mid span areas of floor slab should be avoided where practical. Ideally columns, thick structural slabs or very strong beams (local stiffening) should be provided in such cases.
- For major plant items such as chillers, cooling towers and diesel generators, plant and associated motor and drive assemblies should be mounted on rigid integral steel chassis or concrete inertia bases (in accordance with ASHRAE).
- Vibration isolation for rotating plant should have an isolation efficiency greater than 90%.
- All penetrations to plant rooms should be properly dimensioned, packed and sealed. Main services ducts and pipes to have their own individual penetrations, with suitable spacing to allow good sealing
- Table 24 schedules typical vibration isolation for major plant and equipment.
- Allowances of approximately nominally 50mm should be provided between vibrating equipment and building structure.

Table 24 Indicative vibration isolation for plant and equipment

Equipment	Minimum deflection based on equipment location, mm				
	Base	Slab on grade	Up to 6m span	6-9m span	9-12m span
Axial fans, plenum fans, cabinet fans and centrifugal inline fans					
<560mm diameter	None	6.4	19	19	19
>600mm diameter (<500Pa SP)	Steel base	<300RPM (64) >300RPM (19)	<300RPM (89) >300RPM (38)	<300RPM (89) >300RPM (64)	<300RPM (89) >300RPM (64)
>600mm diameter (>500Pa SP)	Inertia base	<300RPM (64) >300RPM (38)	<300RPM (89) >300RPM (38)	<300RPM (89) >300RPM (38)	<300RPM (89) >300RPM (64)
Propeller fans					
Wall mounted	None	6.4	6.4	6.4	6.4
Roof/ceiling mounted	None	6.4	6.4	38	38
Compressors and pumps					

Equipment	Minimum deflection based on equipment location, mm				
	Base	Slab on grade	Up to 6m span	6-9m span	9-12m span
Tank mounted horizontally	None	19	19	38	38
Large reciprocating	Inertia base	19	19	38	38
Ducted rotating equipment					
Small fans (<300L/s)	None	12.7	12.7	12.7	12.7
Boxes (>300L/s)	None	19	19	19	19

7.3 Carpark and loading docks

The proposed loading dock and carpark will be located within the internal areas of the Ground levels of the proposed development; however, these spaces will include an open area to the facades for ventilation.

To control noise from the use of these spaces, the use of the loading dock shall be restricted to during the Day period, i.e., between 7:00am to 6:00pm, expect as required by the council to conduct their weekly waste collection.

8. Construction Noise & Vibration Assessment

This section presents a construction noise and vibration assessment for the proposed SSDA development. The proposed construction works will include some excavation and typical construction activities.

8.1 Construction Methodology

- **Piling & Excavation**
  - Soil and potential sandstone are expected to be excavated using conventional hydraulic excavators, and possibly with some ripping.
  - A large dozer, rock breaker and rock saws are expected to be required for trimming the rock excavation.
- **Construction**
  - Hoarding to site perimeter.
  - Pouring concrete foundations and suspended post-tensioned slabs.
  - Installing window wall and pre-cast concrete façade.
  - The fit-out and fit off of the residential apartments
  - Installation of soft and hard landscaping
  - General trucks entering and exiting from Loftus Street
  - 2-3 tower electric cranes.
  - High pressure concrete stationary pumps, alimaks, materials hoist, forklifts and electric hand tools

8.2 Construction noise assessment

An assessment of the construction noise and vibration levels been undertaken with respect to Noise Management Levels (NMLs). Noise emissions from the proposed construction works were calculated at the most affected façade of all nearest noise sensitive receivers.

Outcomes include some expected 'Noise Affected' receivers and 'Highly Noise Affected' receivers, per the ICNG definitions:

- The 'noise affected' level represents the point above which there may be some community reaction to noise.
- The 'highly noise affected' level represents the point above which there may be strong community reaction to noise.

Results show that construction noise is predicted to exceed 'highly noise affected' levels during standard hours for residential receivers.

The relevant authority (consent, determining or regulatory) may therefore require respite periods by restricting the hours that the very noisy activities can occur to times identified by the community as less

sensitive to noise, such as before or after school times. Similarly, the community may be prepared to accept a longer period of construction in exchange for restrictions on construction times.

In general, construction works are temporary in nature therefore potential noise impact on the community and the surrounding environment will not be permanent or continuous. However, where the predicted noise level is greater than the noise management levels all feasible and reasonable work practices should be applied, however it is unlikely mitigation measures would reduce the received noise levels below the noise management levels in all cases.

As this work is undertaken within standard construction hours, if after implementing all 'feasible and reasonable' controls noise levels the site still exceeds the noise affected level, the ICNG does not require any further action – since there is no further scope for noise mitigation.

Where risk of Noise Affected or Highly Noise Affected receivers is predicted, the contractor shall prepare a detailed Construction Noise and Vibration Management Plan (CNVMP) as outlined below.

The layout and operation of equipment on site are subject to change, therefore this assessment is provided as a guide to where acoustic mitigation or consideration is more likely to be required.

8.3 Construction Vibration Assessment

8.3.1 Vibration Buffer Distances

Buffer distances can be used to indicate safe distances of activities from adjacent buildings to meet vibration criteria. Indicative best-practice buffer distances are presented in the following Table. At this stage the equipment for construction have not been finalised and the buffer distances are intended as a guide for the contractor.

Table 25 Vibration buffer distances, day period

Criterion	Descriptor		Handheld jack-hammer	Rock-breaker			Rotary cutter
				Light (300kg)	Medium (900kg)	Heavy (1600kg)	
Tactile vibration – residential	VDV & rms	Continuous	10m	25m	35m	55m	5m
		Impulsive	< 1m	1m	5m	20m	< 1m
Tactile vibration – commercial	VDV & rms	Continuous	5m	10m	20m	40m	2m
		Impulsive	< 1m	< 1m	5m	15m	< 1m
Cosmetic damage	Peak particle velocity		< 1m	2m	7m	22m	< 1m

8.3.2 Vibration Assessment

The vibration buffer distances in the section above and the distance to the nearest sensitive receiver locations (as close as 10 metres to nearest residential and commercial locations) indicates the potential for excavation work to result in vibration impacts upon some off-site receivers.

During development of the detailed Construction Noise and Vibration Management Plan an investigation of vibration impact upon existing buildings on the subject site and on nearby sensitive receivers should take place. It is expected that vibration monitoring will be required under the CNVMP.

8.4 Construction Noise and Vibration Recommendations

This section presents recommendations to mitigate the potential noise and vibration impacts from the proposed development construction works. The mitigation measures are intended to represent 'feasible and reasonable' mitigation measures suitable for implementation during construction of the project.

8.4.1 Construction Noise and Vibration Management Plan

For all construction works, the contractor would be expected to prepare a detailed Construction Noise and Vibration Management Plan (CNVMP). This plan should include but not be limited to the following:

- Roles and responsibilities
- Noise and vibration sensitive receiver locations
- Areas of potential impact
- Mitigation strategy
- Noise and Vibration Monitoring methodology
- Community engagement strategy.

General guidance on the control of construction noise and vibration impacts relevant to this study are discussed in the following sections, which may be used when developing the specific CNVMP.

8.4.2 General Noise and Vibration Controls

The following general management controls should be implemented:

- The scheduling of construction activities should be undertaken to reasonably minimise noise impacts to all surrounding land uses.
- In this regard, highly noise intrusive works should not take place prior to 8am where noise levels would significantly exceed the noise criteria at residential receivers. This would typically apply to hammering operations and use of excavators within 50m of a residence.
- Additionally, a respite period is to be implemented where excavator mounted hydraulic hammering works are required and will generate noise levels exceeding the highly noise affected levels.
- The recommended hours for use of excavator mounted hydraulic hammering:
  - Monday to Friday: 9am – 12pm and 2pm – 5pm.
  - Saturday: 4 hours between the hours of 9am – 12pm and 2pm – 5pm.
- The above hours may be modified in consultation with the surrounding receivers (in particular with residential receivers 2, 3, 9) to minimise impact while not reducing the overall allowable hours per day.
- It would be advantageous to conduct as much of the 'noisy' works as possible during school holidays, when the Educational Receivers are closed.
- Notification to receivers immediately bounding the site should be undertaken (via flyer or similar), informing occupiers of the expected duration of the noisy activities should be undertaken.
- Where reasonable and feasible, pulverisers and other non-percussive methods should be used to demolish concrete structures (where proposed).
- Prior to the commencement of any activity likely to generate significant ground vibration (typically hammering and dropping of objects), attended vibration monitoring is to be undertaken to establish "safe" working distances from the structures around the site (and the historical structures in particular).

- Attended noise measurements shall be conducted at the surrounding properties, at the beginning of the demolition works, to quantify the level of noise typically emitted from the site and confirm the predictions/respite periods applied.
- Materials handling/vehicles:
  - Trucks and forklifts in general use on site are to use a non-tonal reversing beacon where possible (subject to OH&S requirements) to minimise potential disturbance of surrounding receivers.
  - Trucks, trailers and delivery vehicles are to turn off engines when idling to reduce noise impacts (unless required for concrete pumping or similar).
- Complaints handling:
  - An afterhours contact number is displayed outside of the building site, so that in the event that surrounding development believes that a noise breach is occurring, they may contact the site.
- The noise and vibration management plan should be reviewed and revised as appropriate by the contractor carrying out the work to ensure it is relevant to the work methods selected and the programme adopted.

Equipment Selection

Equipment mitigation measures (developed from AS 2436 *Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites* (AS2436)) shall be considered to reduce noise emission from construction equipment.

Where practicable, alternative methods be employed to reduce the impacts of the construction, i.e. using saws instead of jackhammers near adjacent structures where vibrations are easily transferable, such as in bedrock.

Table 26 Equipment mitigation measures from AS2436:2010

Equipment Plant	Possible Remedies
Handheld Pneumatic Jack Hammer Handheld Demolition Saws (if used)	Tool muffler or silencer Dampened bit Enclosure barrier Maintain saw sharpness
5-tonne excavator (with hammer attachment)	Engine exhaust silencer Portable acoustic enclosure Tool muffler or silencer Dampened bit
Concrete pump	Enclosure barrier where feasible and reasonable Letterbox dropping for dates of pouring Acoustic silencer on engine

Plant Operation

Careful selection and maintenance of plant equipment will minimised noise impact on nearby sensitive receivers.

The following are some techniques for quiet and efficient plant operation:

- Where practical, undertake the noisiest works during the recommended standard hours.
- Turn off plant at times that it is not being used.
- Examine, and implement where feasible and reasonable, alternative work practices which generate less air-borne and ground-borne noise – for example:
  - use electric equipment instead of diesel or petrol-powered equipment
  - use sawing methods that reduce ground-borne noise
- Examine, and implement where feasible and reasonable, the use of silenced equipment and noise shielding around stationary plant (such as generators).
- Ensure plant is regularly maintained, and repair or replace equipment that becomes noisy.
- Arrange the work site to minimise the use of movement alarms on vehicles and mobile plant.
- Locate noisy plant away from potentially noise affected neighbours or behind barriers, such as sheds or walls.
- Ensure that the site foreman or representative is trained in taking noise measurements and logs noisy activities during construction at the closest affected receivers and on site.

Barriers

A solid barrier may be required to be installed around the perimeter of the construction site to control construction noise. The most noise sensitive receivers are the residential receivers to the north (R2) and to the west (R1). A barrier along the northern and eastern site boundaries can reduce the noise emission levels by up to 15dB, during excavation and construction of the first level of the proposed development. Acoustic barriers or hoardings may also be strategically placed around noisy equipment, such as hand-held pneumatic jackhammers and hand-held demolition saws (if used)

Worker Conduct

Workers should also be involved in noise mitigation through the following methods:

- Regularly train workers and contractors (such as at toolbox talks) to use equipment in ways to minimise noise. Avoid dropping materials from a height.
- Avoid the use of radios and stereos outdoors.
- Avoid the overuse of public address systems.
- Avoid shouting and minimise talking loudly and slamming vehicle doors.
- Turn off all plant and equipment when not in use.

8.4.3 Strategy for Commencing New Construction Activity

The following process should be followed when commencing new construction activities:

STEP 1 – Identify the noise source activity.

STEP 2 – Determine the resultant noise level at the receiver location, ore review vibration buffer distances.

STEP 3 – Determine if the noise/ vibration level at the receiver is compliant with the objectives criteria.

- If compliant, proceed with the activity.
- If not compliant, find an alternative construction process.
  - In case of adopting an alternative construction process, evaluate if it is compliant with the noise/ vibration objectives.

- If compliant, proceed with the activity.
- If not compliant, evaluate the use of acoustic shielding between the receiver and the noise source.
    - If compliance can be achieved with shielding, proceed with the activity.
    - If compliance is not achieved with shielding, install acoustic silencing devices.
        - If levels after shielding comply, proceed with the activity.
        - If levels after shielding still do not comply, then relocate the activity.
            - If relocation complies, proceed.
            - If relocation non-compliant, then consult affected parties to determine agreement under which activity can proceed. After agreement, proceed with the activity.

8.4.4 Community Consultation

Section C2 of the *Draft Construction Noise Guideline* states:

"The proponent should ensure those affected by the work are informed about the project, including:

- *When the work will take place and its expected duration.*
- *The likely noise impact of the work without understanding its effect.*
- *Any work activities or equipment that will be particularly noisy or noticeable.*
- *Mitigation measures to manage noise impacts, including complaints handling procedures."*

"Any notification should be provided before and during construction through an appropriate method, within reasonable timeframes and commensurate to the risk of noise impact. Where appropriate, information should also be provided on a site information board displayed in a prominent location with the name and contact details of the organisation responsible for the site. Include:

- *after-hours contact details, including a contact phone number and email address for enquiries and complaints.*
- *basic information on the conditions of approval, such as the hours of work*
- *contact details for the consent authority responsible for regulating environmental issues, such as the local council or the EPA Environment Line".*

"A complaints procedure can be a helpful tool to manage community concerns and may be required as part of a project consent, approval or licence. Proponents should:

- *Provide a prompt response to complaints.*
- *Ensure complaint handling staff have a good knowledge of the project and its environmental and noise management procedures.*
- *Provide feedback to the complainant on the actions taken to investigate and address noise problems.*
- *Maintain a register of complaints to include o the name of the person making the complaint.*
    - *the date and time the complaint was made.*
    - *a description of the complaint o action taken to respond to and address the complaint.*

8.4.5 Complaints Handling

The following recommendations should be put in place to respond to complaints:

- Site staff with the displayed complaints phone number will be informed of current and upcoming works and the relevant contacts for these works.
- Respond to complaints in a prompt and responsive manner
- Once a complaint is received, undertake and assess noise measurements accordingly.
- Where there are complaints about noise from an identified work activity, review and implement, where feasible and reasonable, actions additional to those described above to minimise noise output.

8.4.6 Specific Vibration Recommendations

It is the contractor's responsibility to ensure that the vibration levels do not exceed the criteria in Section 5.3 .

Dilapidation Reports

We recommend that dilapidation reports be prepared on the adjacent and surrounding buildings prior to project commencement. This should be done to achieve an understanding of the structural integrity of the buildings in question, and to assess any impacts that vibration from construction activities may have on nearby receivers.

Vibration Monitoring

Vibration buffer distances scheduled in Table 25 indicate that the proposed construction activities associated with heavy equipment may exceed the Vibration Criteria in Section 5.4. In these instances, we recommend that vibration monitoring be undertaken to observe and identify when the vibration limits are at risk of exceedance (particularly during excavation and piling works).

It is recommended that vibration monitors be installed at the boundary of the nearest residential receiver to the north-west (Receiver R2) and at the mixed-use receivers to the east (Receiver R9).

The vibration monitors should be set up to inform site staff of risks of exceeding the limits The monitors may be relocated to a different monitoring location depending on the proximity of the nearest vibration intensive excavation activity. As further information is provided by the contractors, the above monitoring methodology may be revised accordingly.

Monitoring equipment should be configured in such a way so that alarms are triggered at a level below the values described in Section 5.4.

9. Summary of Mitigation Measures

Based on the assessments and recommendations in this report, the following measures are recommended to mitigation the identified noise and vibration impacts of the development.

Table 27 Summary of Noise Control Requirements

No.	Item	Detail of control requirement
Operational Noise and Vibration Emission		
1	Mechanical plant and equipment	Plant and equipment shall be treated to comply with NPfI per Section 5.2.1. at all surrounding receivers. Treatments include the use of acoustically lined ductwork and ductwork configurations, acoustic louvres, enclosures, barriers or attenuators. Appropriate vibration isolators to control vibration to the building structure and beyond. Details of requirements in Section 7.1.
Noise and Vibration to Development		
2	Mechanical plant and equipment	Plant and equipment shall be treated to comply with NPfI per Section 5.2.1. at sensitive areas of the development. Treatments include the use of acoustically lined ductwork and ductwork configurations, acoustic louvres, enclosures, barriers or attenuators. Appropriate vibration isolators to control vibration to the building structure and beyond. Details of requirements in Section 7.1.
4	Road traffic noise	Internal noise criteria can be readily achieved with a sealed façade. The acoustic requirements and specifications of the building envelope are outlined in Section 6.
Construction Noise & Vibration		
5	Noise & Vibration Management Plan	A Construction Noise and Vibration Management Plan shall be prepared, specifying the actual equipment to be used and will include updated estimates of the likely levels of noise and the scheduling of activities. The CNMVP shall include details of community consultation, complaints handling and strategies for monitoring noise and vibration. Further detail in Section 8.4.1

6	Scheduling	Schedule of construction activities shall be undertaken to minimise noise and vibration to receivers during more sensitive times. Further detail in Section 8.4.2
7	Equipment	Use quieter or less vibration emitting plant and equipment, or methods where feasible and reasonable. Further detail in Section 8.4.2
8	Respite	Consider respite periods when undertaken particularly noisy activity such as hydraulic hammering works.
9	Monitoring	Noise and vibration monitoring shall be undertaken in accordance with the developed CNMVP.

10. Conclusion

This report presents a noise and vibration impacts assessment for the proposed Mowbray Road, Lane Cove development at 618-624 Mowbray Rd & 25-29 Mindarie St, Lane Cove North NSW 2066.

The assessment was prepared in accordance with the Secretary's Environmental Assessment Requirements (SEARS – SSD-71687208) and relevant NSW Environment Protection Authority (EPA) guidelines.

This assessment has investigated the following items and has concluded:

10.1 Operational noise

Noise criteria were established for operational noise emissions, which include services plant and equipment and use of the loading dock.

The assessment concluded that the proposed development can satisfy the relevant noise standards policies and guidelines.

The use of the loading dock shall be restricted to between 7:00am and 6:00pm expect as required by the council to conduct their weekly waste collection.

Further detailed acoustic assessment shall be undertaken during the detailed design phases of the project to ensure acoustic criteria compliance is maintained.

10.2 Impacts to the development

Detailed design information for the proposed development is not yet available, however, internal noise criteria are expected to be able to be achieved readily with standard construction methodologies and a sealed façade.

Detailed designs and requirements for the building envelope shall be determined during the Detailed Design phases of the project.

10.3 Construction noise and vibration

Construction noise and vibration management for receivers that are predicted to be noise-affected or highly noise affected is required.

11. Glossary

Airborne sound

The sound emitted directly from a source into the surrounding air, such as speech, television or music.

Ambient sound

Of an environment: the all-encompassing sound associated with that environment, being a composite of sounds from many sources, near and far. This is normally taken to be the L_{Aeq} value.

Assessment Background Level

(of NPfI) ABL is the single-figure background level representing each assessment period: Day, evening and night (that is, three assessment background levels are determined for each 24-hour period of the monitoring period).

Background noise level

The average of the lowest levels of the noise levels measured in an affected area in the absence of noise from occupants and from unwanted external ambient noise sources. Usually the L_{A90} value represents the background noise level.

Day

Referred to as the period between 7am and 6pm for Monday to Saturday and 8am to 6pm for Sundays and Public Holidays.

dB(A)

Unit of acoustic measurement weighted to approximate the sensitivity of human hearing to sound frequency.

Decibel scale

The decibel scale is logarithmic in order to produce a better representation of the response of the human ear. Therefore, a 3 dB increase in the sound pressure level corresponds to a doubling in the sound energy. It is generally accepted that a 10 dB increase in the sound pressure level corresponds to a perceived doubling in loudness.

Examples of decibel levels of common sounds are as follows:

- 0 dB(A) Threshold of human hearing
- 30 dB(A) A quiet country park
- 40 dB(A) Whisper in a library
- 50 dB(A) Open office space
- 70 dB(A) Inside a car on a freeway

- 80 dB(A) Outboard motor
- 90 dB(A) Heavy truck pass-by
- 100 dB(A) Jackhammer / Subway train
- 110 dB(A) Rock Concert
- 115 dB(A) Limit of sound permitted in industry
- 120 dB(A) 747 take off at 250 metres

Evening

- Referred to as the period between 6pm and 10pm for Monday to Sunday and Public Holidays.

Frequency

The repetition rate of the cycle measured in Hertz (Hz). The frequency corresponds to the pitch of the sound. A high frequency corresponds to a high-pitched sound and a low frequency to a low-pitched sound.

Intrusive noise

(of NPfI) Refers to noise that intrudes above the background level by more than 5 decibels.

L_{90}, L_{10}, etc

A statistical measurement giving the sound pressure level which is exceeded for the given percentile of a measurement period (i.e. L_{90} is the level which is exceeded for 90 percent of a measurement period). L_{90} is commonly referred to as a basis for measuring the background sound level.

$L_{Aeq,T}$

The equivalent continuous A-weighted sound pressure level. The value of the A-weighted sound pressure level of a continuous steady sound that, within a measurement time interval T, has the same A-weighted sound energy as the actual time-varying sound.

L_{Amax}

The maximum sound pressure level measured over the measurement period.

L_{Amin}

The minimum sound pressure level measured over the measurement period.

Night

Referred to as the period between 10pm and 7am for Monday to Saturday and 10pm to 8am for Sundays and Public Holidays.

Project Noise Trigger Levels

Target noise levels for a particular noise-generating facility. The are based on the most stringent of the project intrusiveness noise level or the project amenity noise level.

Rating background level (RBL)

The overall background level on each day, evening and night periods for the entire length of noise monitoring.

Reverberation

The persistence, after emission by the source has stopped, of a sound field in an enclosure.

R_w

Weighted Sound Reduction Index. Expressed in a single number (dB), it describes the airborne sound insulation performance of a building element.

Sound isolation

A reference to the degree of acoustical separation between two spaces. Sound isolation may refer to sound transmission loss of a partition or to noise reduction from any unwanted noise source. The term 'sound isolation' does not specify any grade or performance quality and requires the units to be specified for any contractual condition.

Sound pressure level, L_p, dB of a sound

A measurement obtained directly obtained using a microphone and sound level meter. Sound pressure level varies with distance from a source and with changes to the measuring environment. Sound pressure level equals 20 times the logarithm to the base 10 of the ratio of the R.M.S. sound pressure to the reference sound pressure of 20 micro Pascals.

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