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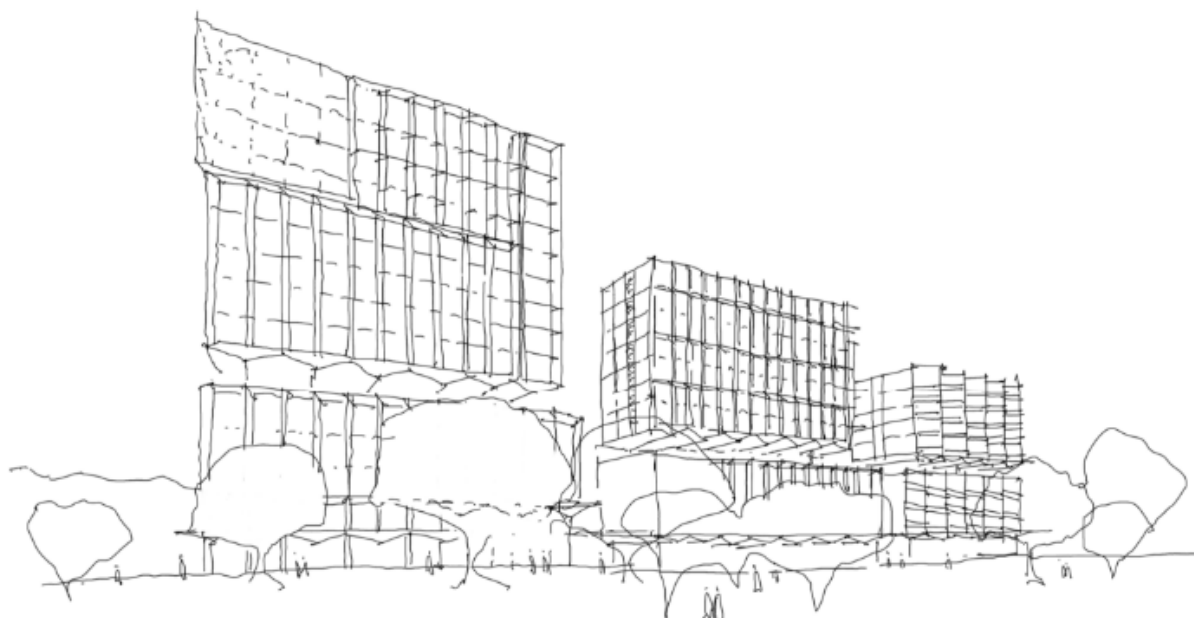
# UNSW N13 Barker Street Student Accommodation

## Noise and Vibration Impact Assessment

Prepared for UGNU Project Management

Reference: N13-AC-DA-R0001

03 | 27 November 2025



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# 1. Introduction

This Noise and Vibration Impact Assessment (NVIA) is submitted to the Department of Planning, Housing and Infrastructure (DPHI) on behalf of the University of New South Wales (UNSW) (the Applicant), to support a State Significant Development Application (SSDA) for the development of three (3) buildings comprising on-campus student accommodation at 39 Barker Street, Kensington.

The project has been identified by the NSW Housing Delivery Authority (HDA) as a key development to help accelerate the delivery of well-located, diverse and affordable housing in metropolitan Sydney. The HDA considered and recommended to the Minister that the project be declared SSD under section 4.36(3) of the EP&A Act on 2 May 2025. Following this recommendation, the Minister declared the project as SSD on 13 May 2025 under the State Significant Development Declaration Order 2025 (No 7).

Specifically, the proposed works include the following:

- Site preparation and early works, including demolition of existing structures.
- Construction of 3 on-campus student accommodation buildings, delivering 732 beds across 5 colleges and self-catered apartments, together with 30 beds across non-student residences (Dean's apartments and short-stay accommodation), communal services and shared amenities.
- Reconfiguration of Southern Drive, including its partial closure and redirection to the western boundary of the site, to provide driveway access into the campus.
- Associated landscaping (including tree removal and transplanting) and public domain works; and
- Augmentation of physical infrastructure and utilities, as required.

For a detailed description of the proposed development, refer to the Environmental Impact Statement (EIS) prepared by Beam Planning, and the Architectural Drawings prepared by Bates Smart.

## 1.1 The site

The site is located at 39 Barker Street, Kensington within the City of Randwick Local Government Area (LGA). It is legally identified as part Lot 3 in DP1264172 and is situated along the southern boundary of the UNSW Kensington Campus.

The site has a frontage of 143m along Barker Street and extends 50m into the UNSW campus (including Southern Drive). The site is currently occupied by the Barker Street student housing apartments containing 260 beds and ranging between 3-5 storeys. An aerial image of the site is shown below in Figure 1.



**Figure 1: Aerial image of the site**

The site is surrounded by a mix of educational, residential, active recreation receivers and a childcare centre. Some receivers are located within the UNSW campus with the nearest receiver locations being across Barker Street to the South.

The nearest receivers to the proposed development are listed in Table 1 and their relative location is shown in Figure 2. To support planning approval requirements, this noise and vibration impact assessment focuses on sensitive receiver locations external to the university campus (i.e. R2-R4 and CC1).

**Table 1: Noise and vibration sensitive receivers**

Receiver ID	Receiver Name
Off campus	
R2	Barker Street residential properties to the west of Harbourne Road
R3	Barker Street residential properties between Harbourne Road and the Kingsford Early Learning Centre
R4	Barker Street residential properties east of the Kingsford Early Learning Centre
CC1	Kingsford Early Childhood Centre
On campus	
R1	Shalom College (UNSW student Accommodation)
EDU1	Newton and Old Main Building (UNSW School of Physics Building)
EDU2	Rupert Myers Building (UNSW School of Optometry)
AR1	Village Green (UNSW Sports Oval)
PR1	Physics Lawn



**Figure 2: Project site and surrounding sensitive receivers**

### 1.1.1 Existing acoustic environment

Attended and unattended noise monitoring has been undertaken at the site to quantify the prevailing acoustic environment. Further reference is made to historical noise monitoring data<sup>1</sup> obtained on the site during previous schemes for the project. Table 2 summarises long term ambient and background noise levels measured on site.

**Table 2: Unattended noise monitoring results**

Monitor	Time of day	Rating background noise level $dBL_{A90}(\text{period})$	Ambient noise level $dBL_{Aeq}(\text{period})$
L1: Barker Street	Day (7:00 AM to 6:00 PM)	52	65 <sup>1</sup>
	Evening (6:00 PM to 10:00 PM)	48	62 <sup>1</sup>
	Night (10:00 PM to 7:00 AM)	42	59 <sup>1</sup>
L2: Village Green	Day (7:00 AM to 6:00 PM)	50 <sup>2</sup>	55 <sup>1</sup>

<sup>1</sup> Acoustic Logic UNSW - N13 Barker Street Student Accommodation Schematic Design 20240921.1.

Monitor	Time of day	Rating background noise level dBL <sub>A90(period)</sub>	Ambient noise level dBL <sub>Aeq(period)</sub>
	Evening (6:00 PM to 10:00 PM)	50 <sup>2</sup>	54 <sup>1</sup>
	Night (10:00 PM to 7:00 AM)	50 <sup>2</sup>	53 <sup>1</sup>
L3: Passive Recreation	Day (7:00 AM to 6:00 PM)	52	58
	Evening (6:00 PM to 10:00 PM)	53	58
	Night (10:00 PM to 7:00 AM)	51	54
<p>Notes:</p> <p>1. Extrapolated from noise monitoring graphs within Acoustic Logic UNSW - N13 Barker Street Student Accommodation Schematic Design 20240921.1.</p> <p>2. Consistent noise levels measured across all time periods representative of local ambient noise on campus.</p>			

**Table 3 Octave attended noise measurement results**

Measurement	Octave band centre frequency – Hz (dB)							Notes
	63	125	250	500	1k	2k	4k	
A01 – Intersection of Barker Street and Southern Drive	75	73	73	64	59	56	58	Traffic entering and leaving UNSW via Southern Drive, Mixed traffic from Barker Street
A02 – Barker Street	64	62	61	63	59	53	47	Traffic along Barker Street. Buses arriving and departing at nearby bus stop.

## 1.2 Relevant SEARS

This Noise and Vibration Impact Assessment addresses the following relevant Secretary's Environmental Assessment Requirements (SEARs) set out in the table below.

**Table 4: Environmental assessment requirements**

Issue and assessment requirements	Supporting documentation
<p>10. Noise and Vibration</p> <p>Provide a noise and vibration impact assessment prepared in accordance with the relevant NSW Environment Protection Authority (EPA) guidelines.</p> <p>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.</p>	Noise and vibration impact assessment

## 2. Acoustic criteria

### 2.1 Relevant standards, guidelines and regulations

The following have been used to develop acoustic criteria for the project:

#### Local Guidelines and Policies

- Randwick City Council Development Control Plan (2013) [2]

#### NSW Government Guidelines and Policies

- NSW Department of Planning, Secretary's Environmental Assessment Requirements (SEARs) [3]
- NSW Department of Planning, Development Near Rail Corridors and Busy Roads – Interim Guideline (2008) [4]
- NSW Environmental Protection Authority – Noise Policy for Industry (October 2017) [5]
- NSW EPA Interim Construction Noise Guideline (ICNG) [6]
- NSW State Environmental Planning Policy – Transport and Infrastructure (2021) [7]
- NSW Road Noise Policy (March 2011) [8]
- NSW Department of Environment and Conservation, Assessing Vibration: A technical guideline (February 2006) [9]
- NSW Department of Planning & Environment – SEPP 65 Apartment Design Guide (2015) [10]

#### Australian and International Standards

- Australian Building Codes Board – National Construction Code (2022) [11]
- AS/NZS 2107:2016 Acoustics – Recommended design sound levels and reverberation times for building interiors. [12]
- AS2436 – Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites [13]
- AS/NZS 1668-1:2015 – The use of ventilation and air conditioning in buildings, Part 1: Fire and smoke control in buildings. [14]
- BS5228.1 – Code of Practice for Noise and Vibration Control on Construction and Open Sites – Noise [15]
- BS 6472 – 1:2008 – Guide to evaluation of human exposure to vibration in buildings – Part 1: Vibration sources other than blasting. [16]
- BS 7835 – 1:1990 – Evaluation and measurement for vibration in buildings – Part 1: Guide for measurement of vibrations and evaluation of their effects on people in buildings [17]
- BS 7385 – 2:1993 – Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from groundborne vibration [18]
- DIN 4150 – 3:1999 Structural vibration – Part 3: Effects of vibration on structures (Schwingungen im Bauwesen – Teil 3: Einwirkungen von Erschütterungen auf Bauwerke)

- ISO 9613 – 2:2024 – Acoustics – Attenuation of sound during propagation outdoors, Part 2: Engineering method for the prediction of sound pressure levels outdoors [19]
- T/SP/SSW/22 – Specification for Safe Working in the Vicinity of National Grid High Pressure Gas Pipelines and Associated Installations: Requirements for Third Parties [20]
- TfNSW Construction Noise and Vibration Strategy (CNVS) – TfNSW Infrastructure & Services Division [21]

## 2.2 Operational assessment criteria

### 2.2.1 Building services noise criteria

Building services noise emissions from the development are assessed against the NSW EPA Noise Policy for Industry (NPI) [5]. The NPI is primarily concerned with controlling intrusive noise impacts in the short-term for residences and maintaining long-term noise level amenity for residences and other land uses.

The NPI sets out the procedure to determine the project noise trigger levels relevant to an industrial development. The project noise trigger level is a level that, if exceeded would indicate a potential noise impact on the community and so ‘trigger’ a management response.

**Table 5: NPfI Project specific noise levels**

Receiver	Time Period	Project Specific Noise Levels $L_{Aeq,15min}$		
		Intrusive Noise Trigger Levels	Project Amenity Noise Level (PANL)	Project Noise Trigger Level
All residences	Day (7:00 AM to 6:00 PM)	57	58	57
	Evening (6:00 PM to 10:00 PM)	53	50	50
	Night (10:00 PM to 7:00 AM)	47	47	47
Commercial	When in operation	N/A	63	63
Industrial	When in operation	N/A	68	68
School classroom – internal	Noisiest 1-hour period when in use	N/A	38 (internal) <sup>1</sup>	38 (internal) <sup>1</sup>
Notes:				
1. In the case where existing schools are affected by noise from existing industrial noise sources, the acceptable $L_{Aeq}$ noise level may be increased to 40 dB $L_{Aeq(1hr)}$ .				

#### 2.2.1.1 Sleep disturbance

The NSW NPI recommends the following screening criteria for the assessment of potential sleep disturbance, for the period between 10 pm and 7 am:

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

As the former is equivalent to the intrusive noise trigger levels at night, the  $L_{Amax(night)}$  parameter has been assessed, as it provides an additional and alternative assessment.

### 2.2.1.2 Modifying factors

Table C1 of the NPI sets modifying factor corrections for annoying noise characteristics such as tonality, dominant low frequency, intermittency or irregularity.

When assessing low frequency impacts, an initial screening test is first undertaken by evaluating whether the difference in noise levels in C-weighted and in A-weighted are 15 dB or more at the receivers, which identifies the potential for an unbalanced spectrum in which case further assessment is required.

### 2.2.2 Road traffic noise criteria

Increased traffic generated on the surrounding road network due to either construction activities or by the operation of the development is assessed in accordance with the NSW EPA Road Noise Policy (RNP) [8].

Regarding the application of the assessment, the RNP states:

*In assessing feasible and reasonable mitigation measures, an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person.*

In addition, where an increase of greater than 2 dB is expected, Table 3 of the RNP sets out the assessment criteria for particular types of project, road category and land use and is reproduced in Table 6.

**Table 6: Road traffic criteria for traffic generating development - residential receivers**

Road category	Type of project / land use	Assessment criteria – dB(A)	
		Day (7:00am-10:00pm)	Night (10:00pm-7:00am)
Freeway/arterial/sub-arterial roads	Existing residences affected by additional traffic on existing freeways / arterial / sub-arterial roads generated by land use developments	$L_{Aeq,(15\text{ hour})}$ 60 (external)	$L_{Aeq,(9\text{ hour})}$ 55 (external)

### 2.2.3 Noise intrusion criteria

The primary noise source impacting the site is road traffic. Reference is made to criteria in the NSW State Environmental Planning Policy (Transport and Infrastructure) 2021 ('TISEPP') [7] and the associated NSW Department of Planning 'Development Near Rail Corridors and Busy Roads – Interim Guideline' [4].

Table 7 presents the TISEPP internal noise criteria for residential premises.

**Table 7: TISEPP noise criteria for new residential development**

Room	Location	$L_{Aeq, 15hr}$ Day 7am – 10pm	$L_{Aeq 9hr}$ Night 10pm – 7am
Bedrooms	Internal	- 1	35
Other habitable rooms <sup>2</sup>	Internal, windows closed	40	40

Room	Location	L <sub>Aeq, 15hr</sub> Day 7am – 10pm	L <sub>Aeq 9hr</sub> Night 10pm – 7am
Notes:			
1. TISEPP does not provide a noise intrusion criteria for the bedroom during daytime.			
2. Anywhere else in the residential accommodation (other than a garage, kitchen, bathroom, hallway, etc)			

In accordance with the Interim Guideline, the TISEPP applies only to roads with an AADT greater than 20,000 vehicles.

## 2.3 Construction assessment criteria

### 2.3.1 Construction noise criteria

The NSW EPA Interim Construction Noise Guideline (ICNG) [6] provides construction management noise levels above which all 'feasible and reasonable' work practices should be applied to minimise the construction noise impact.

The determination of noise management levels for residential receivers is outlined in Table 8 with the project specific levels summarised in

Table 9. Noise management levels for other sensitive receivers are presented Table 10.

**Table 8: Construction noise management levels at residential receivers**

Time of day	Management level 1 L <sub>Aeq</sub> (15 min)	How to apply
Recommended standard hours: Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays or public holidays	Noise affected RBL + 10dB	The noise affected level represents the point above which there may be some community reaction to noise.  Where the predicted or measured L <sub>Aeq</sub> (15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level.  The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected ≥75dBA	The highly noise affected level represents the point above which there may be strong community reaction to noise.  Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account:  • times identified by the community when they are less sensitive to noise (such as before and after school for

<b>Time of day</b>	<b>Management level 1</b> <b>L<sub>Aeq</sub> (15 min)</b>	<b>How to apply</b>
		works near schools, or mid-morning or mid-afternoon for works near residences  • if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours <sup>2</sup>	Noise affected RBL + 5dB	A strong justification would typically be required for works outside the recommended standard hours.  The proponent should apply all feasible and reasonable work practices to meet the noise affected level.  Where all feasible and reasonable practices have been applied and noise is more than 5dBA above the noise affected level, the proponent should negotiate with the community.  For guidance on negotiating agreements see section 7.2.2 of the ICNG.

**Table 9: Noise Management Levels at residential receivers**

<b>NCA</b>	<b>Highly noise affected<sup>1</sup></b>	<b>Noise Management Level dBL<sub>Aeq</sub>(15 min)</b>			
		<b>Standard construction hours<sup>2</sup></b>	<b>Outside of standard hours<sup>4</sup></b>		
			<b>Day<sup>3</sup></b>	<b>Evening<sup>3</sup></b>	<b>Night<sup>3</sup></b>
Residential receivers across Barker Street	75	62	57	53	47

**Notes:**

1. In accordance with the ICNG, the highly noise criteria affected applies to residential properties only
2. Standard construction hours presented in Table 8.
3. The ICNG defines day, evening and night time periods as:
  - Day: the period from 7 am to 6 pm Monday to Saturday; or 8 am to 6 pm on Sundays and Public Holidays.
  - Evening: the period from 6 pm to 10 pm.
  - Night: the remaining period.
4. Outside standard hours are defined as:
  - Day: Sundays and public holidays 8 am to 6 pm, Saturday 7 am to 8 am and 1 pm to 6 pm.
  - Evening: Monday to Saturday 6 pm to 10 pm, Sunday and public holidays – 6 pm to 10 pm.
  - Night: Monday to Saturday 12 am to 7 am and 10 pm to 12 am.
  - Sundays and public holidays 12 am to 8 am and 10 pm to 12 am.

**Table 10: Noise Management Levels at other noise sensitive land uses**

Land use	Where objective applies	Noise Management level dB <sub>L</sub> Aeq(15 min) <sup>1</sup>
Active recreation areas	External noise level	65
Educational institutions <sup>2</sup>	Internal noise level	65 <sup>2</sup>
Commercial premises	External noise level	70
Notes:		
1. Noise management levels apply when properties are in use.		
2. Educational institutions inclusive of Childcare have an internal noise level of 45 dB(A). External targets have been derived based on attenuation through a typical closed window.		

### 2.3.2 Construction vibration criteria

#### 2.3.2.1 Human comfort

The NSW EPA’s Assessing Vibration – A Technical Guideline [9] provides vibration criteria for maintaining human comfort within different space uses. The guideline recommends ‘preferred’ and ‘maximum’ weighted vibration levels for both continuous vibration sources, such as steady road traffic and continuous construction activity, and for impulsive vibration sources. The weighting curves are obtained from BS 6472-1:2008 [16].

For intermittent sources (e.g. passing heavy vehicles, impact pile driving, intermittent construction), the guideline uses the vibration dose value (VDV) metric to assess human comfort effects of vibration. VDV considers both the magnitude of vibration events and the number of instances of the vibration event. Intermittent events that occur less than 3 times in an assessment period (either day, 7 am to 10 pm, or night, 10 pm to 7 am) are counted as ‘impulsive’ sources for the purposes of assessment.

As noted in the Guideline, situations exist where vibration above the preferred values can be acceptable, particularly for temporary disturbances, such as a construction or excavation projects. Notwithstanding, the recommended vibration limits for maintaining human comfort in residences and other relevant receiver types are given for continuous/impulsive and intermittent vibration in Table 11 and Table 12 respectively.

**Table 11: Preferred and maximum weighted root-mean-square (rms) values for continuous and impulsive vibration acceleration (m/s<sup>2</sup>) 1-80 Hz**

Location	Period	Preferred Values		Maximum Values	
		z-axis	x- and y-axes	z-axis	x- and y-axes
Continuous Vibration					
Critical areas <sup>1</sup>	Day- or Night-time	0.005	0.0036	0.01	0.0072
Residences	Daytime 0700-2200h	0.010	0.0071	0.020	0.014
	Night-time 2200-0700h	0.007	0.005	0.014	0.010

Location	Period	Preferred Values		Maximum Values	
		z-axis	x- and y-axes	z-axis	x- and y-axes
Offices, schools, educational institutions and places of worship	Day- or Night-time	0.020	0.014	0.040	0.028
Impulsive Vibration					
Critical areas <sup>1</sup>	Day- or Night-time	0.005	0.0036	0.01	0.0072
Residences	Daytime 0700-2200h	0.30	0.21	0.60	0.42
	Night-time 2200-0700h	0.10	0.071	0.20	0.14
Offices, schools, educational institutions and places of worship	Day- or Night-time	0.64	0.46	1.28	0.92
1. Criteria for sensitive areas are only indicative, and have been provided as guidance to acceptable vibration levels for the use of sensitive equipment.					

**Table 12: Acceptable vibration dose values for intermittent vibration (m/s<sup>1.75</sup>)**

Location	Daytime 0700-2200 h		Night-time 2200-0700 h	
	Preferred Value	Maximum Value	Preferred Value	Maximum Value
Critical areas <sup>1</sup>	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Notes:				
1. Criteria for sensitive areas are only indicative, and there may be a need to assess intermittent vibration against impulsive or continuous criteria.				

### 2.3.2.2 Building damage

Potential structural or cosmetic damage to buildings as a result of vibration is typically assessed in accordance with British Standard 7385 Part 2-1993 [18] and/or German Standard DIN4150-3 [22]. British Standard 7385 Part 1: 1990 [17], defines different levels of structural damage as:

*Cosmetic - The formation of hairline cracks on drywall surfaces, or the growth of existing cracks in plaster or drywall surfaces; in addition, the formation of hairline cracks in mortar joints of brick/concrete block construction.*

*Minor - The formation of large cracks or loosening of plaster or drywall surfaces, or cracks through bricks/concrete blocks.*

*Major - Damage to structural elements of the building, cracks in supporting columns, loosening of joints, splaying of masonry cracks, etc.*

Table 1 of BS7385-2 sets limits for the protection against cosmetic damage, however the following guidance on minor and major damage is provided in Section 7.4.2 of the Standard:

#### *7.4.2 Guide values for transient vibration relating to cosmetic damage*

*Limits for transient vibration, above which cosmetic damage could occur are given numerically in Table 1 and graphically in Figure 1 [not reproduced]. In the lower frequency region where strains associated with a given vibration velocity magnitude are higher, the guide values for the building types corresponding to line 2 are reduced. Below a frequency of 4 Hz, where a high displacement is associated with a relatively low peak component particle velocity value a maximum displacement of 0.6 mm (zero to peak) should be used.*

*Minor damage is possible at vibration magnitudes which are greater than twice those given in Table 1, and major damage to a building structure may occur at values greater than four times the tabulated values.*

Within DIN4150-3, damage is defined as “any permanent effect of vibration that reduces the serviceability of a structure or one of its components” (p.2). The Standard also outlines:

*“that for structures as in lines 2 and 3 of Table 1, the serviceability is considered to have been reduced if*

- *cracks form in plastered surfaces of walls;*
- *existing cracks in the building are enlarged;*
- *partitions become detached from loadbearing walls or floors.*

*These effects are deemed ‘minor damage.’ (DIN4150.3, 1990, p.3)*

While the DIN Standard defines the above damage as 'minor', the description aligns with BS7385 cosmetic damage, rather than referring to structural failures.

British Standard BS7385-2 [18] is based on peak particle velocity and specifies damage criteria for frequencies within the range 4–250 Hz, and a maximum displacement value below 4 Hz is recommended. Table 13 sets out the BS7385 criteria for cosmetic, minor and major damage. Regarding heritage buildings, British Standard 7385 Part 2 (1993, p.5) notes that “a building of historical value should not (unless it is structurally unsound) be assumed to be more sensitive”.

**Table 13: BS 7385-2 structural damage criteria**

Group	Type of structure	Damage level	Peak component particle velocity, mm/s <sup>1</sup>		
			4 Hz to 15 Hz	15 Hz to 40 Hz	40 Hz and above
1	Reinforced or framed structures	Cosmetic	50		
		Minor <sup>2</sup>	100		

Group	Type of structure	Damage level	Peak component particle velocity, mm/s <sup>1</sup>		
			4 Hz to 15 Hz	15 Hz to 40 Hz	40 Hz and above
	Industrial and heavy commercial buildings	Major <sup>2</sup>	200		
2	Un-reinforced or light framed structures Residential or light commercial type buildings	Cosmetic	15 to 20	20 to 50	50
		Minor <sup>2</sup>	30 to 40	40 to 100	100
		Major <sup>2</sup>	60 to 80	80 to 200	200

Notes:

1. Peak Component Particle Velocity is the maximum Peak particle velocity in any one direction (x, y, z) as measured by a tri-axial vibration transducer.
2. Minor and major damage criteria established based on British Standard 7385 Part 2 (1993) Section 7.4.2

All levels relate to transient vibrations in low-rise buildings. Continuous vibration can give rise to dynamic magnifications that may require levels to be reduced by up to 50%.

### 2.3.2.3 Buried services

DIN 4150-2:1999 [22] sets out guideline values for vibration effects on buried pipework and reproduced in Table 14 below.

**Table 14: Guideline values for short-term vibration impacts on buried pipework**

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

Notes:

For gas and water supply pipes within 2m of buildings, these limits should be applied. Consideration must also be given to pipe junctions with the building structure as potential significant changes in mechanical loads on the pipe must be considered.

In addition, specific limits for vibration affecting high-pressure gas pipelines is provided in the UK National Grid's Specification for Safe Working in the Vicinity of National Grid High Pressure Gas Pipelines and Associated Installations – Requirements for Third Parties (report T/SP/SSW/22, UK National Grid, Rev 10/06, October 2006) [20]. This specification states that no piling is allowed within 15 m of a pipeline without an assessment of the vibration levels at the pipeline. The PPV at the pipeline is limited to a maximum level of 75 mm/s, and where PPV is predicted to exceed 50 mm/sec the ground vibration is required to be monitored.

Other services that may be encountered include electrical cables and telecommunication services such as fibre optic cables. While these may sustain vibration velocity levels from between 50 mm/s and 100 mm/s, the connected services such as transformers and switchgear may not. Where

encountered, site specific vibration assessment in consultation with the utility provider should be carried out.

### 2.3.2.4 Sensitive equipment

As people can perceive floor vibration at levels well below those likely to cause damage to typical building contents, the effect of vibration on building content is typically not assessed separately. However, some scientific equipment (e.g. electron microscopes and microelectronics manufacturing equipment) can require more stringent objectives than those applicable to human comfort.

Where vibration sensitive scientific and/or medical instruments are in use within an identified vibration sensitive receiver, objectives for the satisfactory operation of the instrument should be sourced from manufacturer’s data. Where manufacturer’s data is not available, generic vibration criterion (VC) curves as published by the Society of Photo-Optical Instrumentation Engineers [23] or the ASHRAE Chapter 49 [24] may be adopted, as presented in Figure 3 and Table 15. Baseline vibration levels could also be measured to inform the establishment of appropriate criteria.

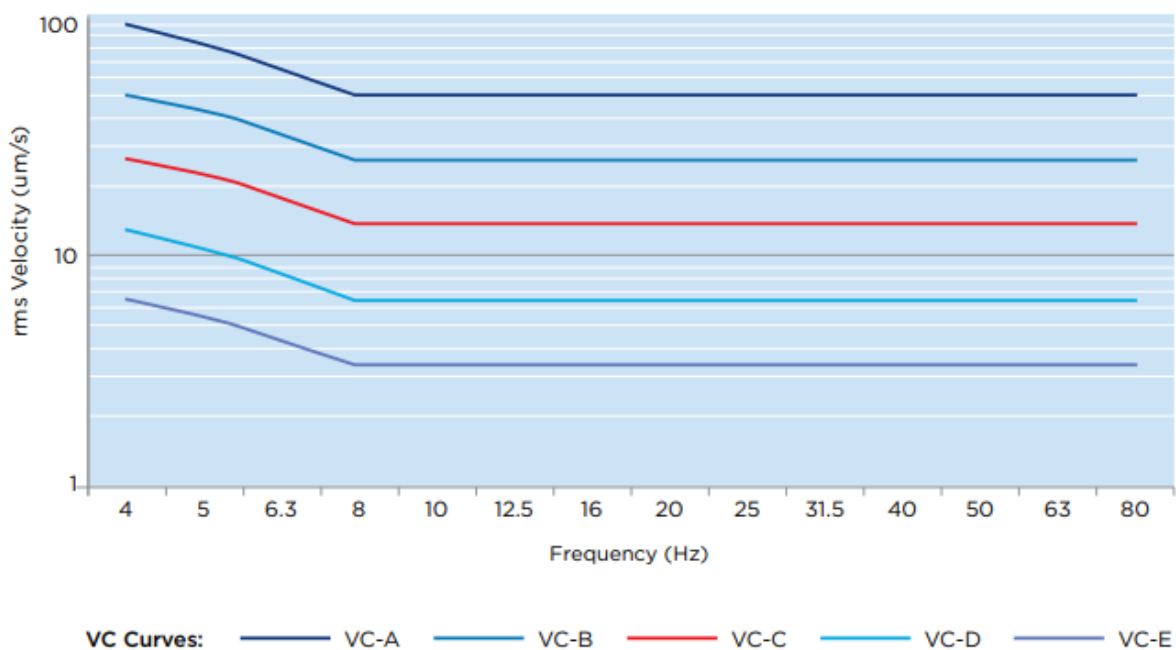


Figure 3: Vibration Criterion (VC) curves - (rms)

Table 15: Application and interpretation of the generic Vibration Criterion (VC) curves (as defined in the CNVS)

Criterion Curve	Max Level (m/sec, rms) <sup>1</sup>	Detail size (micron) <sup>2</sup>	Description of use
VC-A	50	8	Adequate in most instances for optical microscopes to 400X, microbalances, optical balances, proximity and projection aligners, etc.

Criterion Curve	Max Level (m/sec, rms) <sup>1</sup>	Detail size (micron) <sup>2</sup>	Description of use
VC-B	25	3	An appropriate standard for optical microscopes to 1000X, inspection and lithography equipment (including steppers) to 3 micron line widths.
VC-C	12.5	1	A good standard for most lithography and inspection equipment to 1 micron detail size.
VC-D	6	0.3	Suitable in most instances for the most demanding equipment including electron microscopes (TEMs and SEMs) and E-Beam systems, operating to the limits of their capability.
VC-E	3	0.1	A difficult criterion to achieve in most instances. Assumed to be adequate for the most demanding of sensitive systems including long path, laser-based, small target systems and other systems requiring extraordinary dynamic stability.
<p>Notes:</p> <ol style="list-style-type: none"> <li>As measured in one-third octave bands of frequency over the frequency range 8 to 100 Hz.</li> <li>The detail size refers to the line widths for microelectronics fabrication, the particle (cell) size for medical and pharmaceutical research, etc. The values given consider the observation that the vibration requirements of many items depend upon the detail size of the process.</li> </ol>			

It is noted that the EDU1 Newton and Old Main Buildings and EDU2 Ruperts Myers Building (locations shown in Figure 2) currently house vibration-sensitive equipment, the vibration criteria for which ranges between VC-I and VC-A, depending on the vibration frequency, and is particularly sensitive to vibration at low frequencies. Whilst not a specific planning requirement as these receivers are located on the UNSW Campus, the sensitivity of these receivers is expected to drive much of the mitigation and management measures required for the development due to their inherent sensitivity. These measures will inherently benefit other receiver locations surrounding the development.

## 3. Operational assessment

### 3.1 Building services

Building services equipment selections for the development have not been finalised at this early stage of design. During ongoing design of the development, building services equipment will be selected and provided with noise and vibration attenuation measures as required to meet the project criteria summarised in Section 2.2.1.

Standard engineering noise control and mitigation measures are expected to be sufficient and may include the following:

- Specification of maximum sound power levels for all items of plant as part of the project documentation.
- Use of attenuators to control fan noise.
- Acoustic louvres to control noise from plantroom ventilation openings.
- Vibration isolators to reduce vibration input to the building structure.
- Acoustic screens around external plant, where required.
- Incorporation of sound absorptive treatments in plantroom spaces.

#### 3.1.1 Heat pumps

The current mechanical strategy is to house 15 centralised heat pump modules at the roof level of Building A to service the Buildings A, B, and C. Being the most significant noise producing building services element, a preliminary acoustic model has been completed to predict noise emission to the nearest noise sensitive receiver locations. This rooftop plant area is expected to be surrounded by a louvred wall to the height of the heat pumps.

Preliminary results indicate that 2 metre high acoustic louvres enclosing the roof top plant area on the north, west and southern sides are required to maintain noise emissions to within target acoustic criteria at the nearest receivers.

Resulting noise contours based on these preliminary equipment selections and incorporation of the acoustic louvre are presented for reference in Figure 4.

The preliminary assessment indicates that installation of acoustic louvres brings noise predictions to within 1 dB of night-time criteria with all heat pumps operational. It is noted that these predictions are based on preliminary selections and will need to be refined as the design progresses and further details become available.

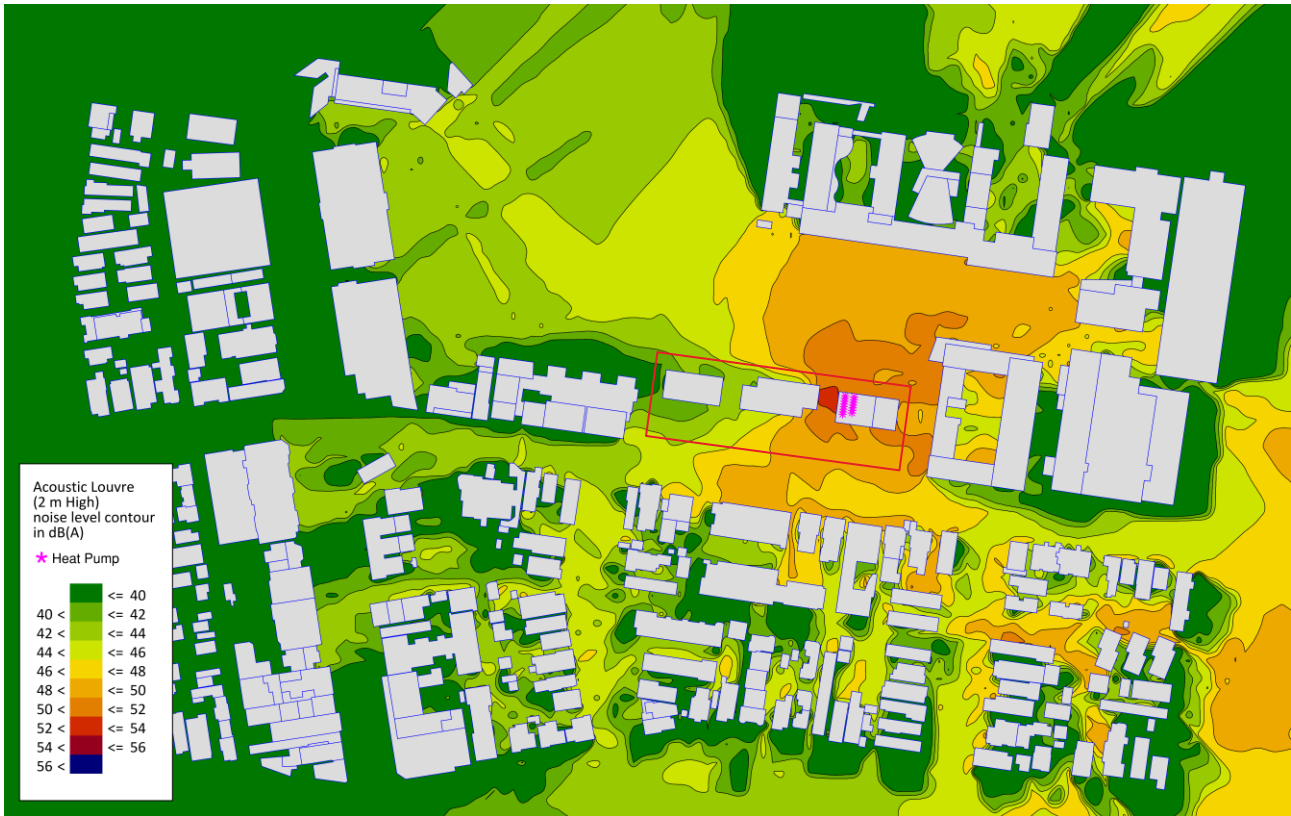


Figure 4: Building A roof top heat pumps noise emission contour – 2m high acoustic louvres

### 3.1.2 Emergency generators

Emergency power generation requirements will be provided via mobile generators as and when required. As maintenance will be conducted off site, there are no specific criteria that are required to be met during normal operation.

## 3.2 Outdoor communal terraces

Communal outdoor terrace areas are proposed at Level 4 of Block A and Level 3 of Block B and C. These are depicted in Figure 5.



Figure 5: Communal outdoor terrace areas Level 3 and 4

The proposed use of the outdoor areas is occasional use by tenants for small scale congregation and socialising. Specific events or amplified music will not be permitted as a base operational function of the development. On this basis, operational noise emissions to neighbouring noise sensitive receiver locations is expected to be well within the operational criteria summarised in Table 5.

### 3.3 Road traffic generation

The existing site is currently used for student accommodation with only minor increases to servicing requirements expected based on increased density. The N13 Barker Street College development incorporates no provision for additional parking or vehicular access above and beyond the existing operation of the university campus.

The intention to close of Southern Drive is also expected to marginally reduce vehicle activity in the immediate vicinity of the development. Additional vehicle activity will be limited to service / delivery / waste vehicles for the development which will occur infrequently throughout the week. Therefore no assessment has been undertaken of operational road traffic on the basis that no significant increase is expected as a result of the development.

### 3.4 Noise intrusion

The roads surrounding the development are not arterial roads; a road traffic assessment is therefore not required under the Randwick DCP [2].

The busiest road surrounding the development is Barker Street. JMT Consulting has advised that Barker Street currently carries 1,200 vehicles during peak hour or ~10,000 vehicles between 7am-6pm. It is expected, therefore, that the AADT for Barker Street is less than 20,000. In accordance with the Interim Guideline, the TISEPP applies only to roads with an AADT greater than 20,000 vehicles.

### 3.5 Operational vibration

Operational activities associated with the development are likely to have negligible impact on the surrounding buildings with respect to vibration.

### 3.6 Sound separation

Sound separating elements will be designed to satisfy the requirements of the National Construction Code.

The National Construction Code Series (NCC) 2022 [11] acoustic provisions for Class 2 and 3 buildings are summarised in Table 16 below.

**Table 16: Class 2/3 Minimum sound insulation performance requirements**

Item		Acoustic requirement	
Occupancy	Other side of partition	NCC requirements	
		Airborne	Impact
WALLS			
Enclosed habitable room <sup>1</sup>	Enclosed habitable room <sup>1</sup>	$R_w + C_{tr} \geq 50$	-
	Wet area <sup>3</sup>	$R_w + C_{tr} \geq 50$	Discontinuous construction

Item		Acoustic requirement	
	Combined Living/Dining/Kitchen	$R_w + C_{tr} \geq 50$	Discontinuous construction
Wet area <sup>3</sup>	Wet area <sup>3</sup>	$R_w + C_{tr} \geq 50$	-
	Combined Living/Dining/Kitchen	$R_w + C_{tr} \geq 50$	Discontinuous construction
Combined Living/Dining/Kitchen	Combined Living/Dining/Kitchen	$R_w + C_{tr} \geq 50$	Discontinuous construction
Any separating wall of the occupancy	Plant room, Lift shaft	$R_w + C_{tr} \geq 50$	Discontinuous construction
	Public corridors & stairs, Lobby or Foyer	$R_w \geq 50^4$	-
	Area of different BCA classification	$R_w \geq 50$	-
<b>FLOORS</b>			
Enclosed habitable room <sup>1</sup>	Enclosed habitable room <sup>1</sup>	$R_w + C_{tr} \geq 50$	$L_{nT,w} \leq 62$
	Wet area <sup>3</sup>	$R_w + C_{tr} \geq 50$	$L_{nT,w} \leq 62$
Wet area <sup>3</sup>	Enclosed Habitable room <sup>1</sup>	$R_w + C_{tr} \geq 50$	$L_{nT,w} \leq 62$
	Wet area <sup>3</sup>	$R_w + C_{tr} \geq 50$	$L_{nT,w} \leq 62$
Combined Living/ Dining/ Kitchen	Combined Living/ Dining/Kitchen	$R_w + C_{tr} \geq 50$	$L_{nT,w} \leq 62$
Plant room, lift shaft, stairway, public corridor, public lobby or the like, or parts of a different classification	Sole-occupancy unit	$R_w + C_{tr} \geq 50$	$L_{nT,w} \leq 62$
<b>INTERNAL SERVICES</b>			
Ducts, stormwater, water supply soil and waste pipes <sup>5</sup>	Habitable space of a sole occupancy unit	$R_w + C_{tr} \geq 40$	-
	Non-habitable space of a sole occupancy unit	$R_w + C_{tr} \geq 25$	-
<p>Notes:</p> <ol style="list-style-type: none"> <li>Enclosed habitable rooms include enclosed spaces such as bedrooms but not combined kitchens opening into living and dining rooms.</li> <li>Private hallways, stairs and entries inside apartment and studies are considered habitable spaces.</li> <li>Wet areas include bathrooms, en-suites, and laundries.</li> <li>Where a door is incorporated in a wall, the door assembly shall have an <math>R_w</math> not less than 30.</li> <li>Where the duct, soil, waste or water supply pipe, serves or passes through more than one sole-occupancy unit.</li> </ol>			

## 4. Construction assessment

### 4.1 Work hours

Construction works will be undertaken within the hours outlined in Table 17, in accordance with ICNG [11] standard hours of construction

**Table 17: Proposed Hours of Construction**

Day	Standard construction hours
Monday to Friday	7.00 am to 6:00 pm
Saturdays	8.00 am to 1:00 pm
Sundays or Public Holidays	No construction

In some additional cases, after-hours permits may be sought from the relevant authorities where special requirements exist, for example oversized deliveries.

### 4.2 Construction activities

The construction phases used as the basis of this assessment are outlined in Table 18.

**Table 18: Construction phases**

Construction phase	Duration
Site Establishment + Services + Demolition	2 months
Piling + Foundations	1.5 months
Construction	17 months
Civil and Landscaping	3 months

At this early stage of development, specific construction methodologies and equipment are yet to be defined. To facilitate assessment, assumed construction equipment has been compiled based on typical construction activities and is provided in Table 19.

Equipment sound power levels have been determined by reference to AS2436 [6], DEFRA [11], and Arup's measurement database. The equipment has been assumed to operate concurrently however equipment sound power levels have been adjusted according to its usage in a worst case 15-minute period, and penalty corrections for impulsive noise characteristics.

The locations of equipment have been based on the locations of the construction works around the renewal site.

**Table 19: Construction equipment usage and associated sound power levels (L<sub>w</sub>)**

Plant item	Sound power level - L <sub>w</sub> , dB(A)	Penalty <sup>1</sup> , dB	% of use in worst case 15 mins	Standard construction hours				
				Site Establishment	Demolition and Services	Bulk/detailed excavation and piling	Construction	Civil and Landscaping
				Number of plant items to be used in worst 15 min period				
Concrete Agitator Truck	111	0	100	1	-	-	-	-
Concrete Pump	109	0	50	-	-	-	-	1
Concrete Pump Truck	113	0	100	-	-	-	2	-
Crane (Mobile)	113	0	100	1	-	-	2	-
Crane (Tower)	105	0	100	-	-	-	2	-
Excavator (10t)	100	0	100	1	-	-	-	-
Excavator (15t)	101	0	100	-	-	1	-	-
Excavator (30t) + hydraulic hammer	122	5	100	-	3	-	-	-
Excavator (6t)	95	0	100	-	-	-	-	1
Excavator (6t) + hydraulic hammer	115	5	100	1	1	-	-	-
Hand Tools (Electric)	110	0	100	1	-	-	1	-

Plant item	Sound power level - L <sub>w</sub> , dB(A)	Penalty <sup>1</sup> , dB	% of use in worst case 15 mins	Standard construction hours				
				Site Establishment	Demolition and Services	Bulk/detailed excavation and piling	Construction	Civil and Landscaping
				Number of plant items to be used in worst 15 min period				
Loader - Skidsteer (Bobcat) (1/2t)	107	0	100	-	-	-	-	1
Lorry with Lifting Boom	105	0	100	-	-	-	2	-
Piling (Bored)	111	0	50	-	-	1	-	-
Roller (Smooth-drum)	107	0	100	1	-	-	-	-
Truck (>20 Tonne)	107	0	100	-	2	1	1	-
Total sound power level (L <sub>w</sub> ) – dBA				117	128	111	120	111
<p>Note</p> <p>1. Piling method dependent on ground conditions, yet to be determined, bored piling assumed due to vibration sensitive equipment requirements discussed in Section 2.3.2.4.</p>								

## 4.3 Construction noise assessment

### 4.3.1 Construction noise assessment methodology

Construction noise has been modelled using SoundPLAN 9.1 in accordance with ISO 9613-2 [19] algorithms. The model included:

- Construction noise sources listed in Section 4.2;
- Surrounding buildings, ground terrain and absorption; and
- Receivers listed in Section 1.1.

Noise emissions have been modelled on the following assumptions:

- Equipment, staging and durations are based on typical scenarios.
- Construction areas have been derived based on the latest architectural site plans.
- The location of equipment will be spread evenly across the site.

### 4.3.2 Construction noise prediction results

Predicted construction noise levels at surrounding noise sensitive receivers along with the relevant NML for the intended working hours are presented in Table 20.

**Table 20: Predicted construction noise levels**

Receiver	Classification	NML	Construction phase				
			Site Establishment & Services	Demolition	Piling & Foundations	Construction	Civil and Landscaping
Off Campus							
CC1	Childcare	65	70	<b>81</b>	64	74	64
R2 <sup>2</sup>	Residential	62	66	<b>77</b>	60	70	60
R3 <sup>3</sup>	Residential	62	73	<b>84</b>	67	<b>76</b>	67
R4 <sup>4</sup>	Residential	62	70	<b>81</b>	64	73	64
On Campus							
R1 <sup>1,5</sup>	Residential	62	<b>79</b>	<b>90</b>	73	<b>82</b>	73
EDU1 <sup>5</sup>	Educational	65	68	<b>79</b>	62	72	62
EDU2 <sup>5</sup>	Educational	65	72	<b>83</b>	67	<b>76</b>	67
Notes:							
1. Represents the worst affected receiver on the eastern façade of Shalom college adjacent to the construction site boundary.							
2. Represents the worst affected receiver along the northern façade of the Barker Street residential properties to the west of Harbourne Road.							

Receiver	Classification	NML	Construction phase				
			Site Establishment & Services	Demolition	Piling & Foundations	Construction	Civil and Landscaping
3. Represents the worst affected receiver along the northern façade of the Barker Street residential properties between Harbourne Road and the Kingsford Early Learning Centre.							
4. Represents the worst affected receiver along the northern façade of the Barker Street residential properties east of the Kingsford Early Learning Centre.							
<ul style="list-style-type: none"> <li>• Levels shaded in grey indicate a notional exceedance of NMLs based on the worst-case assumptions noted above.</li> <li>• Levels in <b>BOLD RED</b> represent 'highly affected' noise levels of 75dBA or above.</li> </ul>							
5. Receiver on campus							

Exceedances of noise management levels are anticipated at nearby residential receivers external to the university campus during all stages of construction with the exception of R2 and CC1 during piling, foundations, and civil and landscaping. This is on the basis that bored piling will be required as a construction methodology to minimise impacts to vibration sensitive equipment on campus.

The most significant exceedances are expected during demolition of the existing buildings, with all receivers having the potential to experience 'highly affected' noise levels. These exceedances are predominantly due to the proposed use of multiple 30t excavators.

It is noted that all predictions are considered to be representative of worst case conditions and times within each construction phase. This is due to the fact that acoustic modelling conservatively assumes that the noisiest piece of construction equipment is located at the closest site boundary location to each sensitive receiver location. During construction, plant and equipment will move through the construction area as the development progresses, changing noise impacts in relation to the nearby individual sensitive receivers. The noise levels experienced at a particular location will rise and fall in accordance with the varying offset distance of the works, the intensity and location of construction activities, the intervening terrain and structure and the type of equipment used. It is unlikely that all construction equipment will be operating at their maximum sound levels simultaneously. In any given period, typically construction equipment would be used with maximum sound levels for only a brief amount of time and at other times the equipment may emit lower sound levels carrying out activities.

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. Where the predicted  $L_{Aeq(15min)}$  noise level is greater than the noise management levels all feasible and reasonable work practices should be applied as discussed in the following section.

#### 4.3.3 Construction noise mitigation and management measures

Indicative noise reduction for different noise mitigation measures relevant to construction activities for the project have been obtained from the guidance of AS2436 - Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites [13] and BS5228.1 - Code of Practice for Noise and Vibration Control on Construction and Open Sites – Noise [15]. these are summarised below in Table 21 for reference.

**Table 21: Indicative noise reduction provided by noise mitigation measures**

Construction equipment	Noise mitigation measure	Indicative noise reduction	Source
Jackhammer	Muffler and screen	20 dBA	Table C2, AS2436:2010
Compressor, Cement mixers, Hand-held tools	Screening	5 dBA	Table C3, AS2436:2010
Excavators/loaders, Trucks, Mobile cranes, Asphalt paver, Bulldozers, Road graders, Rollers/compactors	Residential-grade silencer	10 dBA	Table C2, AS2436:2010 Table B1, BS5228.1:2009
Excavator with hammer attachment	Residential-grade silencer, Screening of hammer attachment	15 dBA	Table C2, AS2436:2010
Piling impact	Resilient pad (dolly) between pile and hammerhead	10 dBA	Table B1, BS5228.1:2009

Table 22 provides a summary of the potential project specific community consultation measures depending on the extent of NML exceedances. This table has been informed by the Construction Noise and Vibration Strategy (CNVS) and should be reviewed and refined for the development of the Construction Noise and Vibration Management Plan (CNVMP) for the project to be developed by the contractor.

**Table 22: Indicative community consultation measures**

Construction hours	Receiver perception	Above NML	Management Measures <sup>1,2,3,4</sup>
Standard hours (day)	Noticeable	< NML (compliant)	-
	Clearly audible	< NML + 10	-
	Moderately intrusive	< NML + 20	N
	Highly intrusive	> NML + 20	N
	Highly noise affected	> 75 dBA	N, SN, RP
Outside standard hours (night) <sup>5</sup>	Noticeable	< NML (compliant)	-
	Clearly audible	< NML + 10	N
	Moderately intrusive	< NML + 20	N, SN
	Highly intrusive	> NML + 20	N, SN, AA, RP
	Highly noise affected	> 75 dBA	N, SN, AA, RP
Notes:			
1. N: Notifications (such as letter box drops)			
2. SN: Specific notifications such as individual briefings or phone call			

Construction hours	Receiver perception	Above NML	Management Measures <sup>1,2,3,4</sup>
3. AA: Alternative accommodation 4. RP: Respite Period 5. No works outside of standard hours is proposed. Management measures are for information only.			

## 4.4 Construction traffic

Construction-related road traffic is a temporary source of noise that should be assessed and managed, particularly concerning heavy vehicles accessing the site. To minimise disturbance to the neighbouring community, truck arrivals and departures should be scheduled outside peak traffic hours and, wherever possible, during times that are less sensitive to noise.

Detailed construction traffic volumes are not yet available and will need to be derived once more specific constructability information is available. JMT consulting have provided the following information in lieu of more detailed input data being available:

- Assume up to 50 construction vehicles per day or 6 vehicles during the busiest hour
- Access would be via Barker Street to / from the west only (i.e. via Anzac Parade).
- Barker Street currently carries 1,200 vehicles during peak hour or ~10,000 vehicles between 7am-6pm

Based on the above figures and assumptions, the expected relative increase in road traffic noise levels above normal daytime road activity is expected to be less than 1 dB, which is below the threshold for traffic noise increase screening criteria as discussed in Section 2.2.2.

All contractors and subcontractors should be informed about the importance of noise-conscious driving when traveling to and from the construction site. To manage noise from construction traffic, the following measures should be implemented:

- Staging truck arrivals to prevent queuing and idling on public streets.
- Directing vehicles to arrive and depart via designated routes that minimize the use of local roads.
- Reducing the need for reversing to limit the use of reversing alarms (“beepers”) and/or using quieter alarms (e.g., quacker alarms).
- Minimising engine braking and avoiding unnecessary noise from slamming doors, loud radios, shouting, or the use of truck horns for signalling.

The contractor will also need to evaluate cumulative noise impacts as part of the Construction Noise and Vibration Management Plan (CNVMP). Coordination with other contractors and projects in the area will be necessary if construction activities occur simultaneously.

## 4.5 Vibration

As a guide, the recommended minimum working distances for vibration intensive plant in Table 23 (which has been derived from the TfNSW CNVS [21]) provide an indication of the possibility of impact due to vibration generating plant and equipment onto nearby receivers. While the minimum working distances are indicative only and will vary depending on the item of plant and local geotechnical conditions, if a receiver is located within the minimum working distance, vibration monitoring might be required, and equipment selection and/or method of construction might have to be reviewed.

**Table 23: Recommended minimum working distances (m) for vibration generating plant**

Plant item	Rating / description	Minimum working distance (m)			
		Cosmetic damage – screening criteria			Human response
		Industrial and heavy commercial buildings BS 7385 Line 1 -25 mm/s (See note 2)	Residential and light commercial buildings BS 7385 Line 2 - 7.5 mm/s (See note 2)	Structures unsound DIN 4150 Line 3 – 3 mm/s	
Vibratory roller	< 50 kN (~ 1 to 2t)	2 m	5 m	11 m	15 m to 20 m
	< 100 kN (~ 2 to 4t)	2 m	6 m	13 m	20 m
	< 200 kN (~ 4 to 6t)	5 m	12 m	26 m	40 m
	< 300 kN (~ 7 to 13t)	6 m	15 m	31 m	100 m
	> 300 kN (~ 13 to 18t)	8 m	20 m	40 m	100 m
	> 300 kN (> 18t)	10 m	25 m	50 m	100 m
Hydraulic hammer – Small	300 kg / 5 to 12t excavator	1 m	2 m	5 m	7 m
Hydraulic hammer – Medium	900 kg / 12 to 18t excavator	3 m	7 m	15 m	23 m
Hydraulic hammer – Large	1600 kg / 18 to 34t excavator	9 m	22 m	44 m	73 m
Piling – Vibratory	Sheet piles	9 m	22 m	44 m	73 m
Piling – Bored	≤ 800 mm	1 m (nominal)	2 m	5 m	10 m
Piling – Hammer	12t down force	6 m	15 m	30 m	50 m

Plant item	Rating / description	Minimum working distance (m)			
		Cosmetic damage – screening criteria			Human response
		Industrial and heavy commercial buildings BS 7385 Line 1 -25 mm/s (See note 2)	Residential and light commercial buildings BS 7385 Line 2 - 7.5 mm/s (See note 2)	Structures unsound DIN 4150 Line 3 – 3 mm/s	
Jackhammer	Hand-held	1 m (nominal)	1 m (nominal)	3 m	5 m
Mechanised bored tunnelling works (Tunnel Boring Machine, Horizontal Directional Drilling, Micro-tunnelling) <sup>1</sup>	-	1 m to 5 m	2 m to 12 m	4 m to 24 m	6 m to 35 m

Notes:

1. Based on TRL document using Godio et al formula, equation 24.
2. Where vibration might give rise to resonant responses in structures.

The safe working distances presented are indicative and will vary depending on the particular item of plant and local geotechnical conditions. They apply to cosmetic damage of typical buildings under typical geotechnical conditions.

The contractor will be required to manage vibration as well as noise and make use of best practice in the management of vibration using simple and practicable techniques such as avoiding dropping heavy items.

Where vibration intensive works are required within the minimum working distances outlined in Table 23, vibration monitoring at the nearest potential affected building should be considered, where real-time alerts can be generated when measured vibration levels exceed criteria.

#### 4.5.1 Vibration sensitive equipment

Whilst not a requirement of the planning submission, it should be noted that nearby buildings including the Old main building (EDU1, School of Physics) and Ruperts Myers Building (EDU2, School of Optometry) on campus currently house vibration sensitive equipment that has the potential to be adversely affected by construction of the N13 Barker Street Colleges project. It is expected that the sensitivity of these receivers will significantly influence construction methodologies with lower vibration intensive approaches being favoured. This will inherently result in a mutual benefit to other nearby sensitive receivers.

The successful contractor will need to proactively engage with the university and stakeholders early to determine and agree detailed procedures for both construction methodologies and communications. A detailed Construction Noise and Vibration

Management Plan will be required to document agreed procedures. To ensure ongoing compliance with the construction vibration requirements, it is recommended that the following be explored:

- An open line of communication should be maintained with UNSW to provide feedback regarding construction impacts, including meetings with stakeholders and the builder.
- The contractor should submit regular records to enable UNSW to coordinate precinct and campus management.
- Notification should be provided to the university well in advance of any anticipated periods of extensive vibration-intensive work. The notification period should be agreed upon in consultation with the university.
- Vibration-intensive construction activities, such as the use of compactors, should not be conducted near vibration-sensitive receivers to ensure that the vibration criteria are not exceeded in those areas.
- Wherever feasible, relocation of vibration sensitive equipment should be explored. In lieu of this being possible, the use of sensitive equipment should be scheduled outside of intensive construction vibration activities.
- Vibration monitors should be installed within buildings housing vibration sensitive equipment for the duration of construction stages containing vibration intensive works.

## 5. Conclusion

This Noise and Vibration Impact Assessment has been undertaken to evaluate the environmental noise and vibration emissions associated with the proposed N13 development within the UNSW Barker Street, Kingsford campus. The assessment includes both construction and operational phases.

Construction noise has been assessed against the noise criteria established in accordance with the ICNG, the assessment parameters include the indicative equipment and staging are informed by the *N13 Barker Street Construction Methodology* provided by NGNU. The assessment demonstrates that, while significant exceedances are predicted to off campus sensitive receiver locations during certain construction activities, particularly demolition, these impacts are temporary and will fluctuate as works progress. The modelling adopts conservative assumptions, ensuring that worst-case scenarios are considered. All feasible and reasonable mitigation measures should be implemented to minimise impacts on nearby sensitive receivers, and incorporated into a detailed construction noise and vibration management plan once a contractor has been appointed and more detailed information becomes available.

Minimum safe working distances have been summarised for various vibration intensive construction equipment. Where works are anticipated within these screening radii, project specific measures will be required to be detailed within a construction noise and vibration management plan to mitigate and manage impacts. It is noted that vibration sensitive equipment at nearby on-campus receivers will likely be a primary driving factor in selecting construction practices that minimise construction vibration.

Construction traffic has been analysed based on preliminary assumptions from the traffic engineer, with no significant increase in existing road traffic noise levels being expected. Similarly, no significant increase in operational traffic is expected due to the development.

Detailed building services information is not available at this early stage of development. Notwithstanding, a preliminary operational noise assessment has been conducted to rooftop heat pumps. Preliminary acoustic advice has been incorporated into the mechanical design to reduce environmental noise impacts and demonstrate compliance with the relevant NPI noise emission requirements. The acoustic design will continue to be reviewed and refined as the project develops and more details become available.

It is recommended that this project be approved for development on the basis of the assessment outcomes and consideration of feasible and reasonable mitigation and management measures summarised within this noise and vibration impact assessment.

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