

## HICKSON ROAD UPGRADE WORKS - STAGE 3 & 4

BARANGAROO, NSW

CONSTRUCTION NOISE & VIBRATION IMPACT ASSESSMENT

RWDI # 2400023

23 February 2026

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## DOCUMENT CONTROL

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## GLOSSARY OF ACOUSTIC TERMS

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

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

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

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

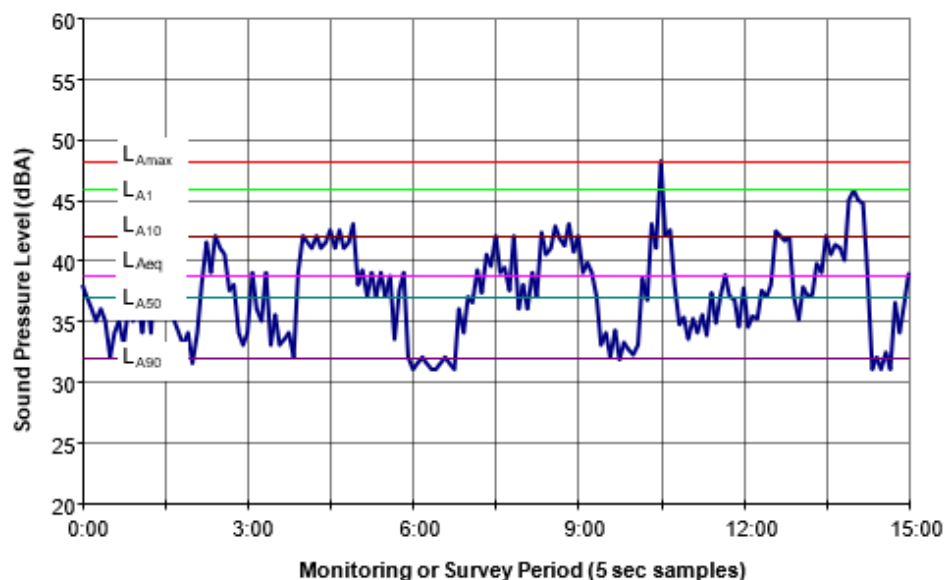
**$L_{A90}$**  – The  $L_{A90}$  level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the  $L_{A90}$  level for 10% of the time. This measure is commonly referred to as the background noise level.

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

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

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

Typical Graph of Sound Pressure Level vs Time





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## INTRODUCTION

This Construction Noise and Vibration Impact Assessment (CNVIA) has been prepared by RWDI Australia Pty Ltd on behalf of Infrastructure NSW (INSW) to assess the potential environmental impacts that could arise from the Hickson Road upgrade and refurbishment works (the activity) along parts of Hickson Road, Barangaroo.

This report has been prepared to assess the potential for construction noise and vibration impacts from the proposal, and the recommended management measures. This report accompanies a Review of Environmental Factors (REF) that seeks approval for the Hickson Road upgrade and refurbishment which involves the following works:

- Adjustment to horizontal geometry of the existing Hickson Road, enabling the provision of:
  - Additional short term parking bays along the western side of the roadway;
  - A new two-way separated cycleway along the eastern edge of the roadway;
- Provision of two (2) un-signalised pedestrian crossings along Hickson Road, creating a pedestrian connection to Hickson Park and Central Barangaroo;
- Adjustments to two (2) existing un-signalised pedestrian crossing intersections along Waterman's Quay and Barton Street respectively;
- Installing of a formal left turn slip lane into Waterman's Quay from the north-bound approach on Hickson Road ;
- Constructing new footpaths on the western and eastern sides of Hickson Road to match the already completed footpath works to the north and south of the existing extent of proposed works;
- Provision of permeable paving to accommodate existing trees;
- Landscaping works including the establishment of low-median planting between the eastern edge of the road carriageway and eastern footpath and installation of additional medium sized trees along both the eastern and western footpaths and within the landscape medians;
- Relocation and augmentation of utilities where necessary, including electrical, gas, water and telecommunications;
- Final roadworks, including kerb and gutters, road and footpath pavements, signage, lighting and line marking;
- Installation of new stormwater drainage pit and pipe infrastructure, including a trunk drainage line running adjacent Barton Street to an existing outlet to Sydney Harbour;
- Ancillary works for the project including, but not limited to, road furniture, tie-in works, earthworks, adjustments to existing stormwater drainage infrastructure and flood mitigation works

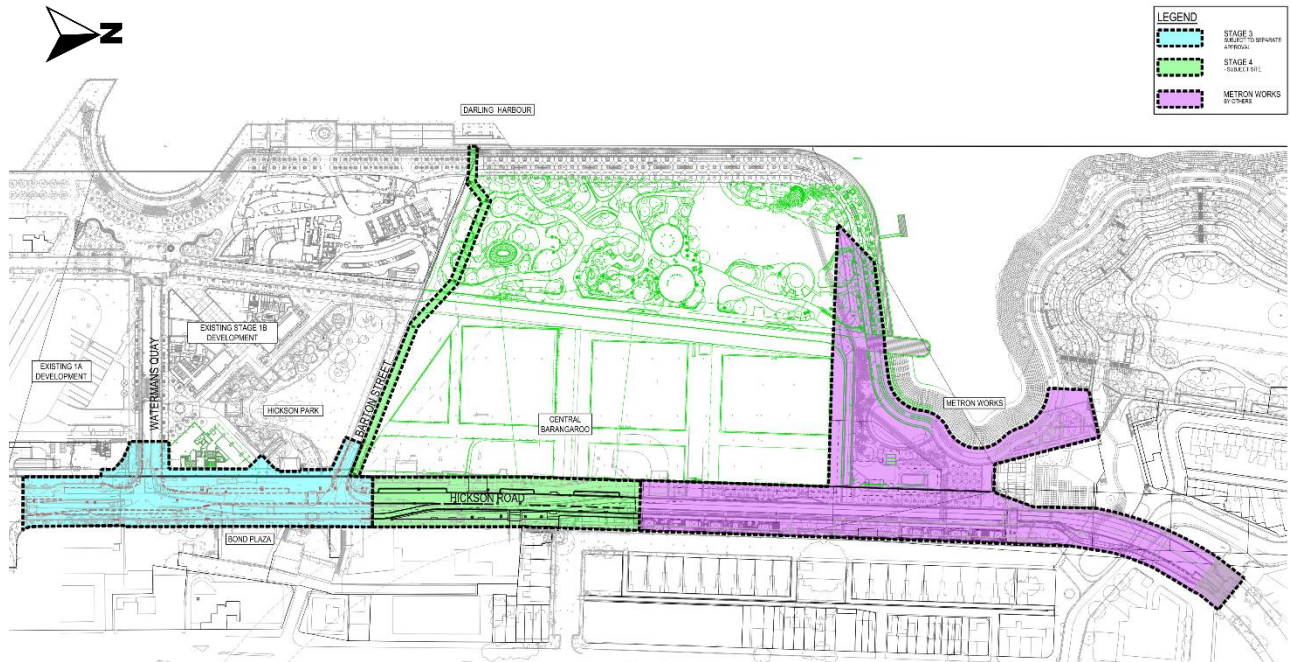
The REF prepared by Ethos Urban provides a full description of the proposed works.

The purpose of the works is principally to ease congestion and improve safety. No change in light or heavy vehicle volumes is associated with the proposal which would impact operational traffic volumes. This assessment has been undertaken in accordance with the following policies and guidelines:

- *Interim Construction Noise Guideline (ICNG, DECC, 2009);*
- *Construction Noise and Vibration Guideline (CNVG, TfNSW, 2024);*
- *German Standard DIN 4150, Part 3: Structural Vibration in Buildings: Effects on Structures (DIN 4150-3, 1999);*
- *Assessing Vibration: A Technical Guideline (DEC, 2006);*

- *Evaluation and Measurement for Vibration in Buildings Part 2 (British Standard 7385: Part 2-1993) (BS 7385); and*
- *Sydney Metro Underground Corridor Protection Technical Guidelines – July 2025.*

The location of the Stage 3 and 4 is shown in **Figure 1-1**.



**Figure 1-1: Location and extent of Stage 3 and stage 4 works**

The following high-level conclusions are discussed in detail in this report:

- Exceedances to both the Noise Management Levels and Highly Noise Affected Level are predicted for some residential and commercial receivers during both Stage 3 and 4 of the works;
- Several residential and commercial receivers are potentially within the safe working screening distance for vibration impacts, depending on equipment selection;
- The Sydney Metro tunnel is beyond the safe working distance for cosmetic damage according to the criteria outlined in the *Sydney Metro Underground Corridor Protection Technical Guidelines – July 2025*;
- The extent and nature of potential impacts are considered to be moderate to sensitive receivers in the vicinity of the construction footprint, and will have short term impacts on the locality, community and the environment;
- Potential impacts however, can be appropriately mitigated or managed to ensure that there is minimal effect on the surrounding community. These recommendations are outlined in **Section 6** of this report, and should be incorporated into the contractors CNVMP for the proposal;
- There is the potential for concurrent construction works to occur on the subject site as well as the site immediately to the west of Stage 4:
  - Cumulative noise impacts should be considered once schedules and equipment selection are finalised for each site; and
  - Adverse vibration impacts due to simultaneous operation are unlikely, assuming both sites manage safe working distances between vibration intensive plant and sensitive receivers.

# EXISTING ENVIRONMENT

## 2.1 Representative Receivers

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The sensitive receivers considered in this assessment include mixed use, residential, commercial, hotel and active recreation receivers located on Hickson Road and on surrounding streets. Receivers at a greater setback from the works are likely to be less affected, and have not been included in this assessment.

**Table 2-1** and **Figure 2-1** present the representative receiver groups considered in this assessment. In addition, the Sydney Metro underground rail corridor is located approximately 30 metres below the Stage 4 works.

**Table 2-1: Representative Receiver Details**

Receiver	Receiver Type	Address
R1	Residential	31-85 Kent Street, Sydney
R2	Residential	2-80 High Street, Millers Point
R3	Residential	26-92 Kent Street, Millers Point
H4	Hotel	87 Kent Street, Millers Point – The Langham Hotel
A5	Active Recreation	94 Kent Street, Millers Point – Kent Street Tennis Court
R6	Residential	3-9 High Street, Millers Point
R7	Residential	115-121 Kent Street, Millers Point
M8	Mixed Use	170 Kent Street, Millers Point
R9	Residential	Agar Steps, Millers Point
R10	Residential	114 Kent Street, Millers Point
C11	Commercial	124-134 Kent Street, Millers Point – Glover Cottages
C12	Commercial	30 Hickson Road
C13	Mixed Use	123-155 Kent Street, Sydney
M14	Commercial	36 Hickson Road, Barangaroo
M15	Residential	38 Hickson Road, Millers Point
M16	Commercial	153-185 Kent Street, Sydney
C17	Commercial	187-207 Kent Street, Sydney
H18	Hotel	219 Kent Street, Sydney – Napoleon on Kent
M19	Mixed Use	International Towers, 100-300 Barangaroo Avenue, Barangaroo
M20	Mixed Use	One Sydney Harbour Towers
M21	Commercial and Hotel	1 Barangaroo Ave, Barangaroo – Crown Casino

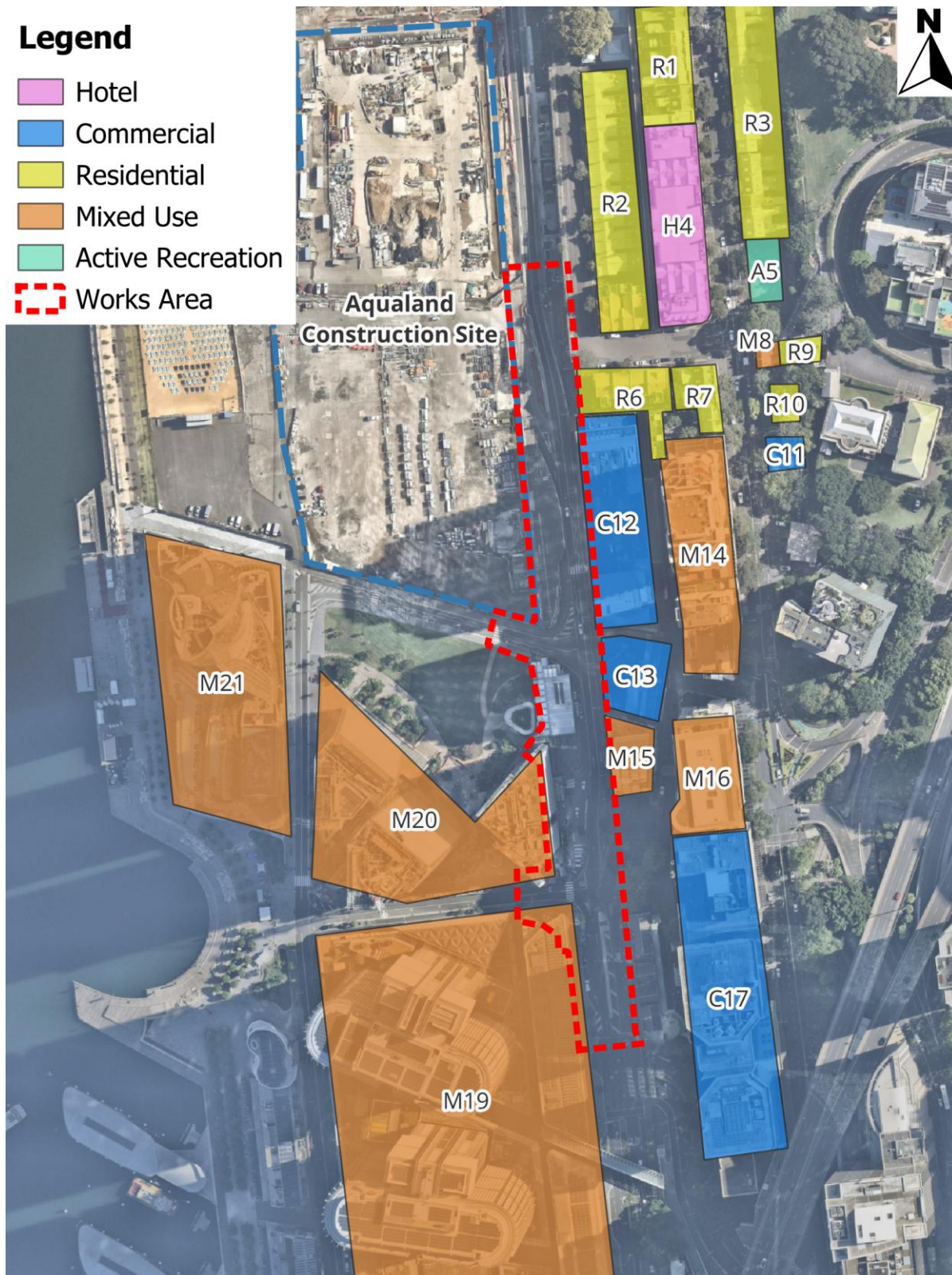


Figure 2-1: Site Plan and Representative Receivers



### 2.1.1 Heritage Receivers

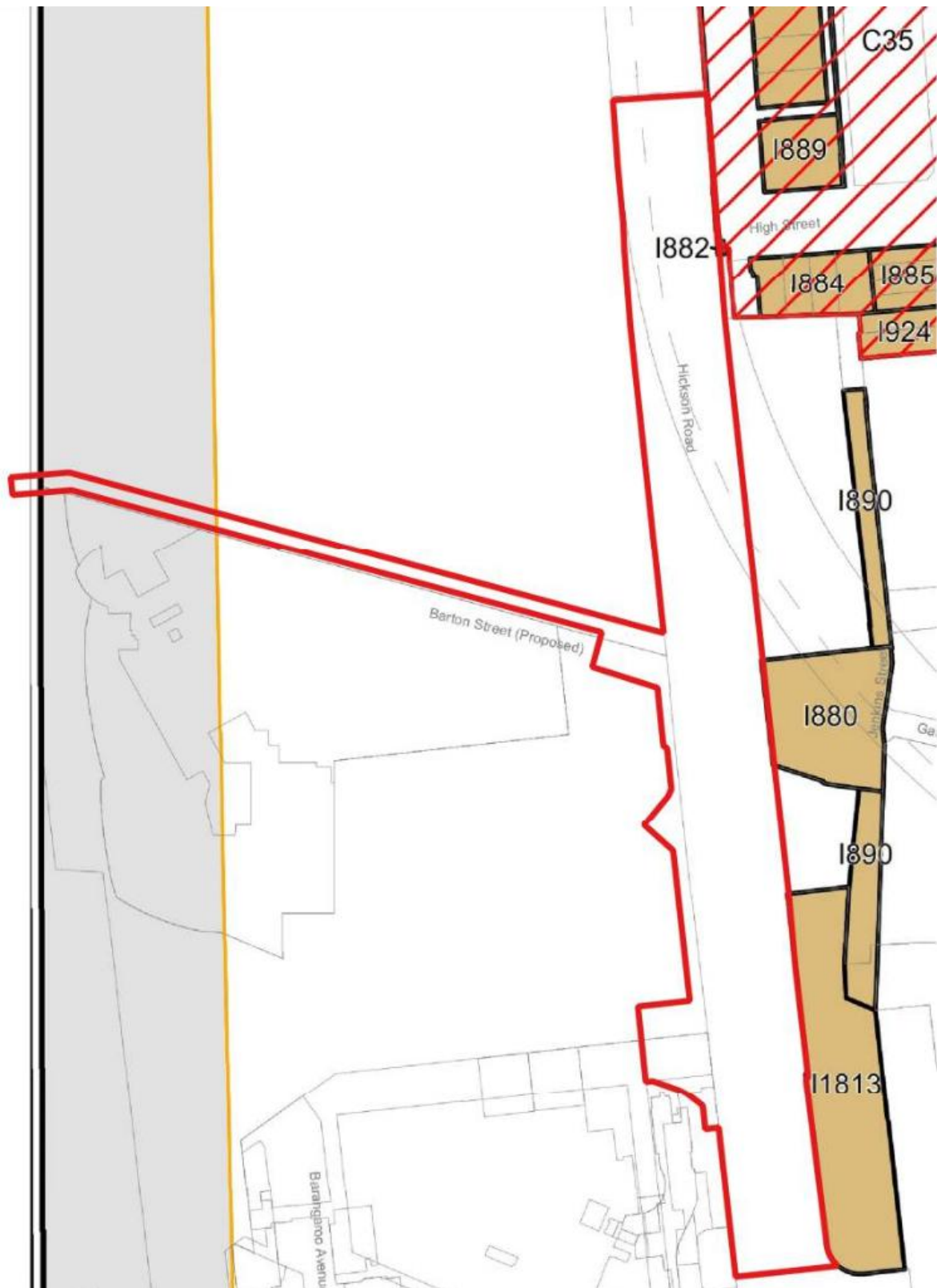
Some receivers have been identified as heritage sites according to either the City of Sydney Local Environment Plan or the State Heritage Register, as described in the *Historical Archaeological Assessment & Impact Statement* prepared for the site (the heritage report) (Casey & Lowe, November 2025).

**Table 2-2** lists the heritage receivers included in the heritage report. **Figure 2-2** and **Figure 2-3** have been reproduced from Sections 2.1 and 2.2 of the heritage report, showing the relative location of the receivers from the works area.

**Table 2-2: Heritage Receiver Details**

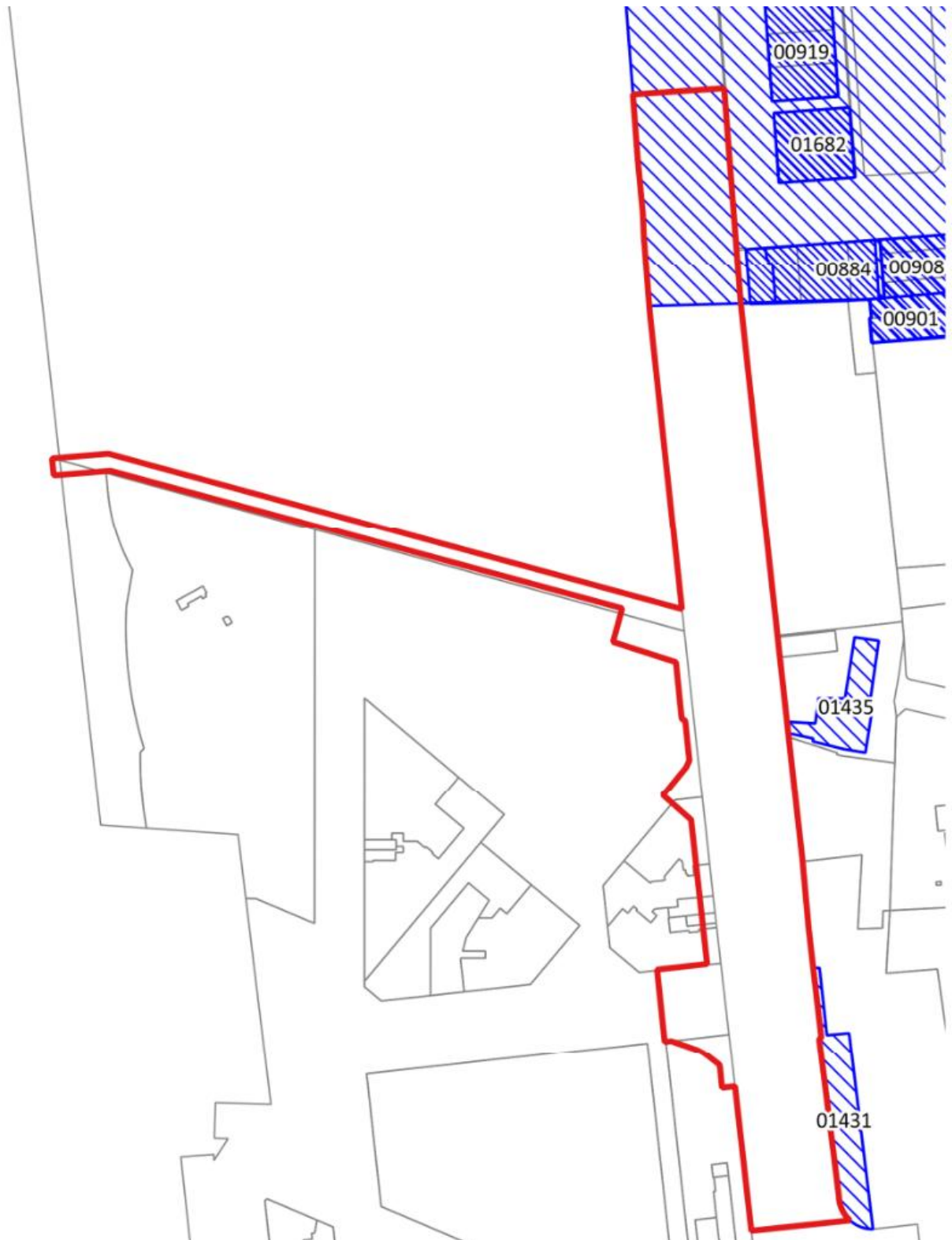
Authority	Item No.	Address	Property Description
LEP	1880	36 Hickson Road	Lot 12, DP 1065410
	1882	High Street	Lot 2, DP 869022
	1884	3-9 High Street	Lot 18, DP 773849
	1885	3-9 High Street	Lot 18, DP 773849
	1889	74-80 High Street	Lot 11, DP 739194
	1890	Jenkins Street	-
	1924	123-125 Kent Street	Lot 22, DP 773847
	I1813	201-217 Kent Street	Remains of bond store
	C35	Millers Point	-
State Heritage Register	SHR 01682	-	Millers Point & Dawes Point Village Precinct
	SHR 00884	-	Millers Point Conservation Area
	SHR 01435	36-38 Hickson Road	MSB Stores Complex
	SHR 01431	-	Grafton Bond Store and Sandstone Wall

Source: *Historical Archaeological Assessment & Impact Statement* (Casey & Lowe, November 2025).



**Figure 2-2: Heritage Receivers CoS LEP**

Source: *Historical Archaeological Assessment & Impact Statement* (Casey & Lowe, November 2025).



**Figure 2-3: Heritage Receivers State Heritage Register**

Source: *Historical Archaeological Assessment & Impact Statement* (Casey & Lowe, November 2025).

## 2.2 Background Noise Levels

Due to ongoing construction works in the area, unattended monitoring data has been adopted from the *Noise and Vibration Management Sub-Plan Barangaroo Stage 1* (LendLease, Document No: H010106LLC004, Rev G, 13/05/2013).

This noise monitoring was conducted in 2013, however conducting noise monitoring during periods of construction does not accurately represent the background noise level of an area, and is likely to result in criteria which do not accurately reflect impacts to amenity caused by construction work. Additionally, it is anticipated that the use of data from 2013 will result in criteria that are conservative, as it is expected that the ambient noise level within the city will have increased over this period of time.

Data has been sourced for three locations relevant to the assessment, as shown in **Figure 2-4**. The measured noise levels are summarised in **Table 2-3**.

**Table 2-3: Summary of Measured Background Noise Levels**

ID	Background Monitoring Location	RBL (dBA) <sup>1</sup>			
		Daytime 7-6pm	Evening 6-10pm	Night Time 10pm-7am	Saturday 7am-5pm
L1	3 High Street, Millers Point <sup>1</sup>	47	44	41	45
L2	Level 4, The Bond 30-38 Hickson Road <sup>2</sup>	53	53	49	51
L3	Middle of Barangaroo Precinct <sup>3</sup>	52	50	45	50

Note 1: Logger location 5 from *Noise and Vibration Management Sub-Plan Barangaroo Stage 1*.

Note 2: Logger location 1 from *Noise and Vibration Management Sub-Plan Barangaroo Stage 1*.

Note 3: Logger location 2 from *Noise and Vibration Management Sub-Plan Barangaroo Stage 1*.

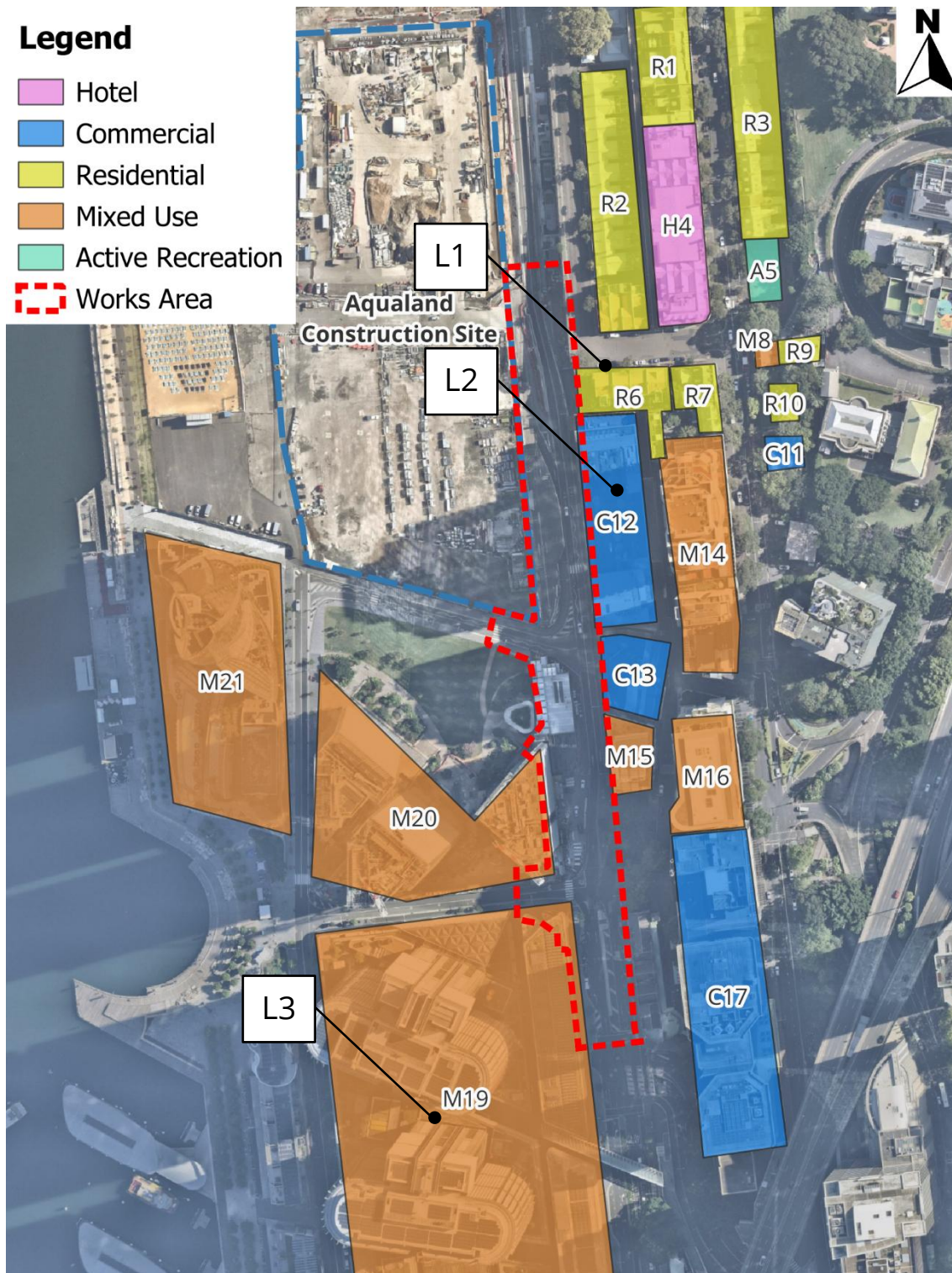


Figure 2-4: Unattended Noise Monitoring Locations

## NOISE AND VIBRATION GOALS

### 3.1 Construction Noise Criteria

#### 3.1.1 NSW Interim Construction Noise Guideline (ICNG)

3

The NSW EPA *Interim Construction Noise Guideline (ICNG)* requires Project-specific Noise Management Levels (NMLs) to be established for noise affected receivers. In the event construction noise levels are predicted to be above the NMLs, all feasible and reasonable work practices are investigated to minimise noise emissions.

Having investigated all feasible and reasonable work practices, if construction noise levels are still predicted to exceed the NMLs then the potential noise impacts would be managed via site-specific construction noise management plans, to be prepared in the detailed design phase.

**Table 3-1** presents the application of the *ICNG* noise management levels for residential receivers.

**Table 3-1: Construction Noise Management Levels – Residences**

Time	NML	How to Apply
<b>Recommended Standard Hours:</b> Mon to Fri: 7am – 6pm Sat: 8am – 1pm Sun/Public Holidays: No Work	Noise Affected RBL+10 dB	The noise affected level represents the point above which there may be some community reaction to noise. <ul style="list-style-type: none"> <li>Where the predicted or measure <math>L_{Aeq}</math> is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level.</li> <li>The proponent should also inform all potentially affected residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.</li> </ul>
	Highly Noise Affected 75 dBA	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours the very noisy activities can occur, taking into account: <ol style="list-style-type: none"> <li>Times identified by community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning, mid-afternoon for works near residences).</li> <li>If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.</li> </ol>

Time	NML	How to Apply
Outside recommended standard hours	Noise affected RBL + 5dB	<ul style="list-style-type: none"> <li>A strong justification would typically be required for works outside the recommended standard hours.</li> <li>The proponent should apply all feasible and reasonable work practices to meet the noise affected level.</li> <li>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.</li> </ul>

In addition, the following construction noise management levels are recommended for other receivers and areas, applicable when in use:

- Commercial premises: external  $L_{Aeq,15min}$  70 dBA
- Active recreation: external  $L_{Aeq,15min}$  65 dBA

### 3.1.2 Project-Specific Construction Noise Management Levels

Based on the above, **Table 3-2** presents the applicable noise management levels for construction activities at surrounding receivers.

For the purpose of assessment, the daytime, evening and night time RBLs from **Section 2.2** have been used to establish construction NMLs for all residences. Mixed use receivers and hotel receivers have been conservatively assessed against a residential criterion.

**Table 3-2: Project-Specific Construction Noise Management Levels**

Receivers	Background Noise Monitor	Noise Affected Noise Management Levels (NMLs)				Highly Noise Affected NML
		$L_{Aeq,15min}$ dBA				
		Day Standard <sup>1</sup>	Day OOH <sup>2</sup>	Evening OOH <sup>3</sup>	Night OOH <sup>4</sup>	
R1-R3, R6-R7, M8, R9-R10, H4	L1	57	49	46	50	75
M14-M16	L2	63	58	54	56	
M19-M21	L3	62	55	50	55	
All Commercial	NA	70	70	70	70	NA
All Active Recreation	NA	65	65	65	65	NA

Note: 1: Standard Hours (Monday to Friday 7am to 6pm Saturday 8am to 1pm, no work on Sundays or Public Holidays)

Note 2: Day OOH (Saturday 1pm-6pm, Sunday or Public Holidays 7am-6pm).

Note 3: Evening OOH (6pm-10pm).

Note 4: Night OOH (10pm-7am).



### 3.1.3 Construction Traffic Noise

The proposal will require vehicle movements from site associated with delivery and removal of materials, as well as movement of site equipment and staff.

Guidance for the assessment of traffic noise to sensitive receivers is set out in the EPA’s *Road Noise Policy* (RNP). The RNP criteria apply to traffic generated by construction activities.

**Table 3-3** summarises the road traffic noise criteria relevant to the proposal, applicable to residential receivers.

**Table 3-3 Road Traffic Noise Criteria - Residences**

Type of Project/Land Use	Assessment Criteria	
	Day (7 am – 10 pm) dB	Night (10 pm – 7 am) dB LAeq, 1hour
Existing residences affected by additional traffic on existing freeways / arterial / sub-arterial roads generated by land use development	LAeq, 15hour 60 (external)	LAeq, 9hour 55 (external)

The RNP is generally applicable to operational noise aspects, and construction traffic is non-permanent.

Further guidance is sourced from the CNVG, which states “an initial screening test should first be applied by evaluating whether noise levels will increase by more than 2dBA due to construction traffic or a temporary reroute due to a road closure. Where increases are 2dBA or less then no further assessment is required.”

Where construction traffic levels result in an increase of more than 2 dB, a more detailed investigation would be required.

## 3.2 Vibration Criteria

When assessing potential vibration impacts from construction activities there are two components that require consideration:

- Human exposure to vibration; and
- Building damage from vibration.

Construction work is generally considered an intermittent source of vibration.

### 3.2.1 Human Exposure to Vibration

*Assessing Vibration: A Technical Guideline* provides guidance for assessing human exposure to vibration. The publication is based on British Standard BS 6472:1992 *Guide to Evaluation of Human Exposure to Vibration in Buildings (1 Hz to 80 Hz)* (BS 6472, 1992). Intermittent vibration is assessed by the Vibration Dose Value (VDV) which is based on the weighted root mean quartic (rmq) acceleration in each component.

**Table 3-4** sets out VDV values as specified by *Assessing Vibration: A Technical Guideline*.

**Table 3-4: Human Comfort Vibration Goals – VDV (m/s<sup>1.75</sup>)**

Place	Day (7am – 10pm)		Night (10pm – 7am)	
	Preferred	Maximum	Preferred	Maximum
Residences	0.20	0.4	0.13	0.26

### 3.2.2 Building Damage from Vibration

There are currently no Australian Standards or guidelines to provide guidance on assessing the potential for building damage from vibration. It is common practice to derive goal levels from international standards.

Transport for NSW typically refer to British Standard BS 7385-2:1993 *Evaluation and Measurement for Vibration in Buildings – Part 2: Guide to Damage Levels from Groundborne Vibration* (BS 7385-2) for residential and commercial buildings. **Table 3-5** summarises the levels specified in BS 7385-2:1993.

The criteria presented in the *Sydney Metro Underground Corridor Protection Technical Guidelines* is based on this standard.

**Table 3-5: Vibration Guide Values for Cosmetic Damage**

Guideline Values for Velocity – mm/s		
Type of Building	PCPV in frequency range of predominant pulse	
	4 to 15 Hz	15 Hz and above
<b>Reinforced or framed structures. Industrial and heavy commercial buildings.</b>	50mm/s at 4 Hz and above	
<b>Unreinforced or light framed structures. Residential or light commercial type buildings.</b>	15mm/s at 4 Hz increasing to 20mm/s at 15 Hz	20mm/s at 15 Hz increasing to 50mm/s at 40 Hz and above

Note 1: Values referenced to are at the base of the building.

Note 2: The values refer to the peak component particle velocity (PCPV).

Note 3: At frequencies < 4 Hz, a maximum displacement of 0.6mm (zero to peak) should not be exceeded.

In addition to the tabulated values dependant on dominant frequency, BS 7385 states:

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

Because the dominant frequency of vibration cannot be determined with certainty at this stage and to allow measurement with equipment more readily available, a screening goal of 12.5 mm/s is recommended (independent of frequency) for any nearby, non-heritage listed building.

It is noted that impacts from vibration will be governed by perception (human comfort).

Guidance for other structures, such as industrial and heritage items, is presented in the German standard DIN 4150-3:2016 *Structural Vibration in Buildings: Effects on Structures* (DIN 4150-3). As stated in BS 7385, heritage buildings and structures should not be assumed to be more sensitive to vibration, unless structurally unsound.

### 3.3 Safe Working Distances

Transport for NSW's *Construction Noise and Vibration Guideline (CNVG)* provides safe working distances for typical items of vibration intensive plant for cosmetic damage (refer BS 7385) and human comfort (refer *Assessing Vibration – A Technical Guideline*). The empirical data has also been extrapolated to provide screening distances per DIN 4150-3 criteria for heritage structures. Safe working distances are presented in **Table 3-6**.

**Table 3-6: Recommended Safe Working Distances for Vibration Intensive Plant**

Plant Item	Approx. Size / Weight / Model	Minimum Distance		
		Cosmetic Damage (BS 7385)	Cosmetic Damage (DIN 4150-3)	Human Response (NSW EPA Guideline)
Vibratory Roller	1-2 tonnes	5 m	14 m	15 m to 20 m
	2-4 tonnes	6 m	16 m	20 m
	4-6 tonnes	12 m	33 m	40 m
	7-13 tonnes	15 m	41 m	100 m
	13-18 tonnes	20 m	54 m	100 m
	> 18 tonnes	25 m	68 m	100 m
Small Hydraulic Hammer	300 kg (5t to 12t excavator)	2 m	5 m	7 m
Medium Hydraulic Hammer	900 kg (12t to 18t excavator)	7 m	19 m	23 m
Large Hydraulic Hammer	1600 kg (18 to 34t excavator)	22 m	60 m	73 m
Pile Driver – Vibratory	Sheet Piles	2 m to 20 m	50 m	100 m
Piling Rig – Bored	≤ 800 mm	2 m (nominal)	5 m	7 m
Piling Rig – Hammer	12 t down force	15 m	32 m	50 m
Jackhammer	Handheld	1 m (nominal)	14 m	Avoid contact with structure

The CNVG notes that the identified safe working distances 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.

In relation to human comfort (response), the safe working distances relate to continuous vibration. For most construction activities, vibration emissions are intermittent in nature and for this reason; higher vibration levels occurring over shorter periods may be considered tolerable.



# CONSTRUCTION NOISE ASSESSMENT

## 4.1 Construction Hours

It is understood that as far as practicable all works will be undertaken during standard construction hours:

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- Monday to Friday 7.00am to 6.00pm
- Saturday 7.00am to 5.00pm

It is noted that the City of Sydney (CoS) Construction Noise Code regards standard construction hours to extend to 7.00pm on weekdays, commencing from 8.00am on Saturday. The Code is applicable to part of Stage 3 only; it is expected that hours would be confirmed with Council prior to commencement.

Occasional works may be required during nights, Sundays, or public holidays, where dictated by authority requirements or for worker or public safety. Any out-of-hours works should be undertaken in accordance with the Interim Construction Noise Guideline (ICNG) subject to a separate application.

Prior consultation should be given to the community of any works proposed to be undertaken outside standard construction hours.

## 4.2 Construction Noise Assessment

### 4.2.1 Noise Levels for Equipment

The proposal would be constructed progressively with activities occurring concurrently and at different times depending on the activity.

The proposed construction equipment, as advised by Lendlease, is set out in **Table 4-1**. Associated sound power levels for the identified plant have been sourced based on RWDI’s experience with similar projects.

To provide a conservative assessment, one worst case modelling scenario has been assessed for the purpose of this report.

**Table 4-1: Assumed Construction Equipment used during Works**

Equipment Used	Equipment Sound Power Level dBA	Predicted Total $L_{Aeq,15min}$
Hydraulic Excavators - 5T to 40T	110	120
Up to 20t excavators with hammer for demolition of concrete pavements	122	
Vibrating or smooth drum rollers	107	
Graders	110	
Water cart	107	
Rigid and articulated trucks	109	

Equipment Used	Equipment Sound Power Level dBA	Predicted Total $L_{Aeq,15min}$
Concrete saw / Road cutting saw	118	
Line marking machine	108	
Bitumen sprayer	106	
Asphalt paver	114	
Road profiler	114	
Trucks with boom lift and mobile crane	98	
30 tonne trucks for delivering asphalt and concrete	109	
Electric and fuel powered hand tools	100	

The sound power levels for the individual plant items are worst-case levels representative of the equipment operating at maximum capacity. In practice, not all plant items would operate at maximum capacity at the same time and therefore the activity sound power levels modelled have been adjusted by -5 dB to reflect this. This adjustment is consistent with RWDI experience on similar projects.

## 4.2.2 Construction Noise Modelling

Construction noise emissions from the works have been modelled using the CadnaA (Version 2025) acoustic noise prediction software. Factors that are addressed in the noise modelling are:

- Equipment noise level emissions and location;
- Screening from structures;
- Receiver locations;
- Ground topography;
- Noise attenuation due to geometric spreading;
- Ground absorption; and
- Atmospheric absorption.

## 4.2.3 Construction Noise Predictions

Noise emissions would impact different receivers to various degrees as construction progresses across the Stage 3 and 4 footprints. Works are proposed to be undertaken during ICNG Standard Hours only; works outside Standard Hours are presented for information only, and would be subject to a separate application, as discussed in **Section 4.1**.

Based on the equipment adopted in **Section 4.2.1**, worst case construction noise levels have been predicted for each receiver. Noise levels for Stage 3 and Stage 4 are provided in **Table 4-2** and **Table 4-3** respectively.

Levels which exceed the standard hours Noise Management Level (NML) are shown in bold. Levels which exceed the Highly Noise Affected Level applicable to residential receivers are shown in red.

**Table 4-2 Construction Noise Predictions Stage 3 – L<sub>Aeq,15min</sub> dBA**

Receiver	Predicted worst case noise level L <sub>Aeq,15min</sub> dBA	Noise Affected Noise Management Levels (NMLs)				Highly Noise Affected Level
		Day Standard	Day OOH	Eve OOH	Night OOH	
R1	47	57	49	46	50	75
R2	<b>58</b>	57	49	46	50	75
R3	34	57	49	46	50	75
H4	<b>54</b>	57	49	46	50	75
A5	33	65	65	65	65	NA
R6	56	57	49	46	50	75
R7	33	57	49	46	50	75
M8	36	57	49	46	50	75
R9	37	57	49	46	50	75
R10	37	57	49	46	50	75
C11	35	70	70	70	70	NA
C12	<b>85</b>	70	70	70	70	NA
C13	<b>82</b>	70	70	70	70	NA
M14	<b>76</b>	63	58	54	56	75
M15	<b>88</b>	63	58	54	56	75
M16	<b>76</b>	63	58	54	56	75
C17	<b>77</b>	70	70	70	70	NA
H18	67	70	70	70	70	NA
M19	<b>77</b>	62	55	50	55	75
M20	<b>81</b>	62	55	50	55	75
M21	<b>68</b>	62	55	50	55	75

**Table 4-3 Construction Noise Predictions Stage 4 – L<sub>Aeq,15min</sub> dBA**

Receiver	Predicted worst case noise level L <sub>Aeq,15min</sub> dBA	Noise Affected Noise Management Levels (NMLs)				Highly Noise Affected Level
		Day Standard	Day OOH	Eve OOH	Night OOH	
R1	53	57	49	46	50	75
R2	<b>79</b>	57	49	46	50	75
R3	46	57	49	46	50	75
H4	<b>70</b>	57	49	46	50	75
A5	47	65	65	65	65	NA
R6	<b>78</b>	57	49	46	50	75
R7	69	57	49	46	50	75
M8	66	57	49	46	50	75
R9	61	57	49	46	50	75

Receiver	Predicted worst case noise level L <sub>Aeq,15min</sub> dBA	Noise Affected Noise Management Levels (NMLs)				Highly Noise Affected Level
		Day Standard	Day OOH	Eve OOH	Night OOH	
R10	59	57	49	46	50	75
C11	53	70	70	70	70	NA
C12	84	70	70	70	70	NA
C13	70	70	70	70	70	NA
M14	73	63	58	54	56	75
M15	70	63	58	54	56	75
M16	57	63	58	54	56	75
C17	53	70	70	70	70	NA
H18	58	70	70	70	70	NA
M19	62	62	55	50	55	75
M20	70	62	55	50	55	75
M21	67	62	55	50	55	75

The assessment of construction noise impacts indicates that noise levels from worst case construction activities are predicted to exceed noise management levels at the nearest sensitive receivers to the works areas.

During Stage 3, there is the potential for exceedances to the NMLs at residential receivers within M14, M15, M19, M20 and M21. Residential receivers within M15 and M20 are expected to be Highly Noise Affected.

Exceedances to the NMLs are also predicted for commercial receivers C12, C13 and C17, however as these buildings will have fixed façades, the impact to acoustic amenity will be lesser than at residential premises.

During Stage 4, there is the potential for exceedances to the NMLs at residential receivers R2, R6, R7, R9, R10, and residential dwellings within M8, M14, M15, M19, M20, and M21 and hotel receiver H4. Residential receivers R2 and R6 are expected to be Highly Noise Affected.

Significant exceedances to the NML are also predicted for commercial receiver C12, however as this building will have a fixed façade, the impact to acoustic amenity will be lesser than at residential premises, despite the high noise level.

The noise levels predicted in this report are very conservative, with noise sources modelled to operate simultaneously and constantly over any construction period. In reality, noise impacts are expected to be lower than predicted, as levels fluctuate in intensity and proximity to sensitive receivers. Works would be progressive and expected to occur intermittently, so the indicated noise levels and associated exceedances would not occur continuously over the duration of the proposal.

As a result of the predicted exceedances of construction noise levels, noise management and mitigation measures should be applied, as discussed in **Section 6**.



#### 4.2.4 Construction Traffic Noise

During construction of the proposal, heavy vehicles would be required for the delivery of materials and equipment, and light vehicles would transport workers to and from the site. Additional road traffic may impact receivers along the proposed transport routes, being Barton Street, Hickson Road and Watermans Quay.

A doubling of road traffic numbers would result in a 3 dB increase in road noise and a 60 per cent increase in traffic is required to increase traffic noise levels by 2 dB.

Given the existing traffic volumes on roads in the study area, including traffic from surrounding construction works, any increase in levels due to construction traffic is expected to be marginal.

It is expected that any impacts would be managed as part of the Construction Traffic Management Plan for the proposal.

## CONSTRUCTION VIBRATION ASSESSMENT

Certain construction activities would require the use of vibration intensive equipment that may affect the nearest sensitive receivers. The most vibration intensive plant nominated as part of the work are the use of vibratory rollers and excavators with large hydraulic hammers.

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Safe working distance for the vibration intensive equipment are presented in **Table 3-6**. As equipment types have not been finalised at this stage, this section assumes the potential for use of the worst-case equipment as presented in **Table 3-6**.

The safe working distances for the most vibration intensive equipment (Vibratory Roller >18t) are presented in **Figure 5-1** and **Figure 5-2**, alongside heritage receivers per the LEP and State Heritage Register respectively (refer to **Section 2.1**).

Assuming use of an excavator with a large hydraulic hammer, or a vibratory roller >18t, up to seven representative receivers are located within the recommended safe working distances and are at risk of structural damage (R2, R6, C12, C13, M15, M19, M20). The majority of identified receivers are at risk of exceeding human comfort levels.

Where a smaller vibratory roller be used, the impacts on surrounding sensitive receivers expected to be significantly decreased. Alternatively, the use of a non-vibratory roller would eliminate the risk of cosmetic building damage from this activity.

It is noted that the vibration sensitivity of buildings would depend upon multiple factors, including specific ground features, structural design and building condition and exposure period; where identified within relevant safe working distances does not necessarily mean that building damage would occur, and should be confirmed in subsequent investigations.

A number of heritage items are located within the safe working distances for vibratory rollers >18 tonnes. The vibration sensitivity of these structures should be determined by a qualified acoustic specialist prior to the commencement of construction as the BS 7385 states that 'a building of historical value should not (unless it is structurally unsound) be assumed to be more sensitive'.

The Sydney Metro tunnel is beyond the safe working distances for BS 7385, noting that these distances are conservative when considering propagation of vibration into the ground rather than across the surface.

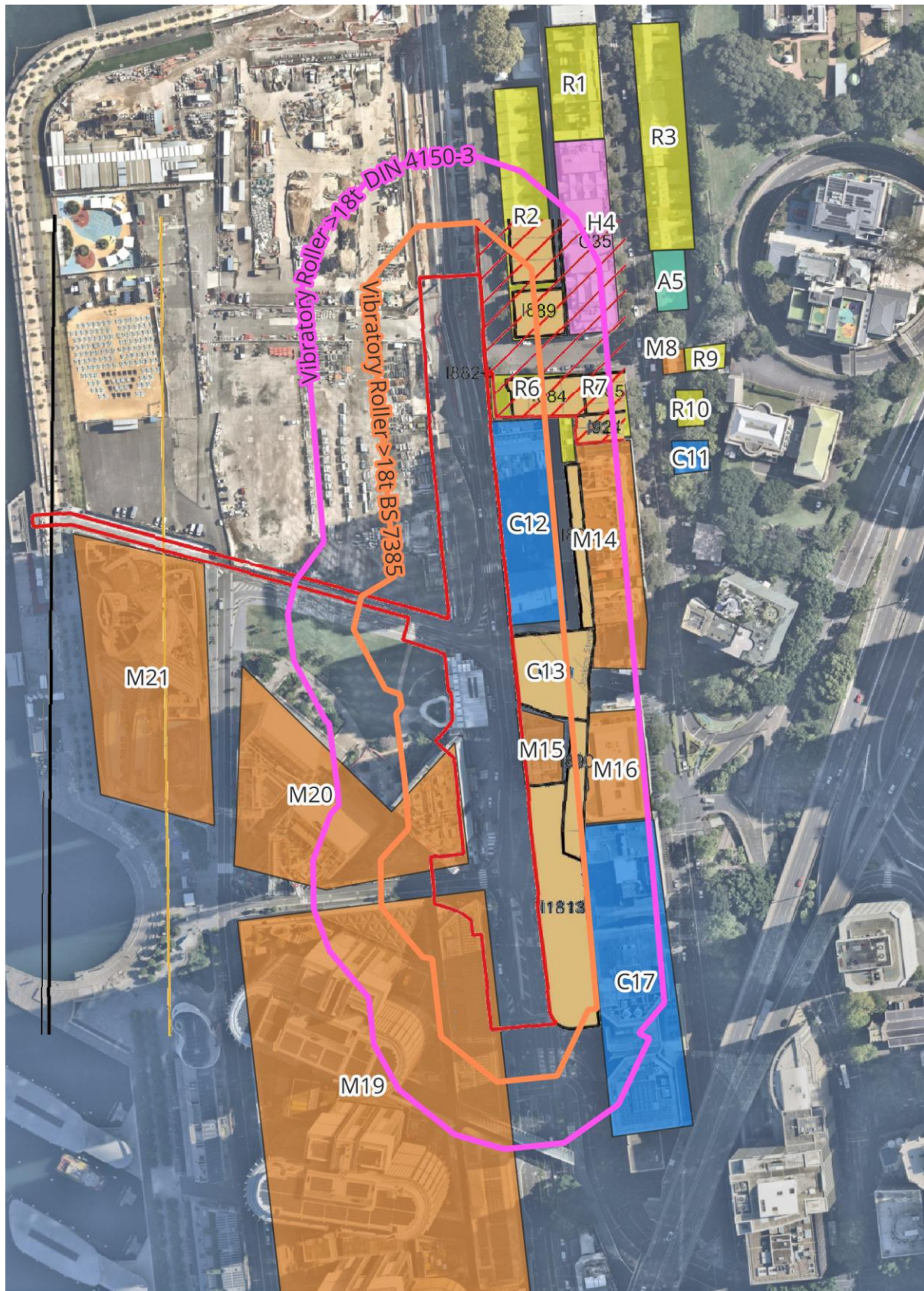


Figure 5-1: Safe working distances, Vibratory Roller >18t, LEP Heritage Overlay

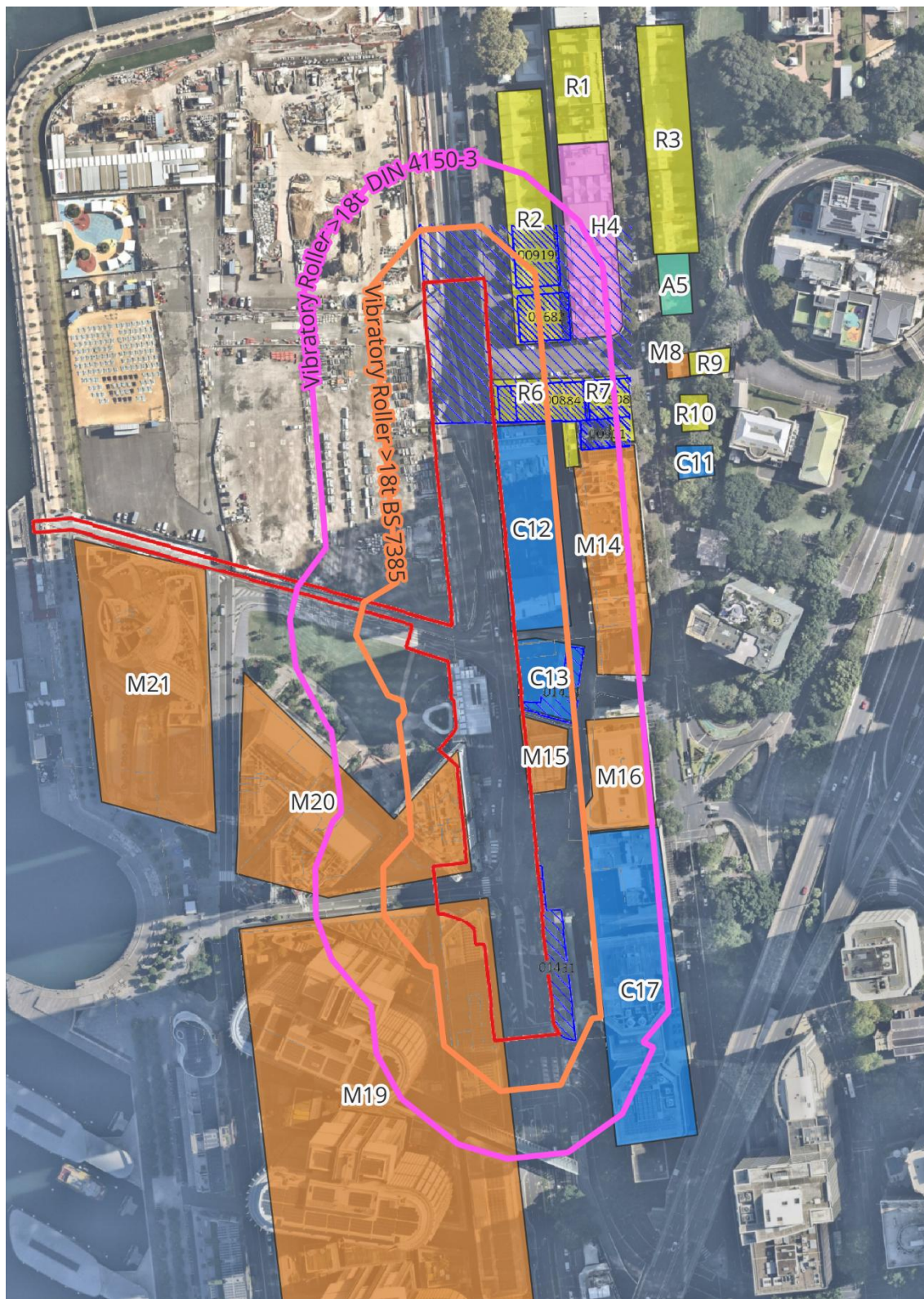


Figure 5-2: Safe working distances, Vibratory Roller >18t, Heritage Register Overlay

Typical vibration mitigation measures are recommended in Section 6.2.

# CONSTRUCTION NOISE AND VIBRATION MANAGEMENT AND MITIGATION

## 6.1 Construction Noise

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Given that exceedances of the Noise Management Levels (NMLs) and Highly Noise Affected Level are predicted, reasonable and feasible mitigation measures should be implemented in accordance with the ICNG to minimise impacts.

A number of noise mitigation measures are included herein that should be employed as feasible and reasonable. These are considered as standard mitigation measures and should be incorporated into the contractor’s Construction Noise and Vibration Management Plan (CNVMP).

### 6.1.1 Standard mitigation and management procedures

**Table 6-1** outlines a range of measures which should be generally applied throughout the works where reasonable and feasible. These should be included in the contractor’s CNVMP. Note that control of noise at the source is generally the most effective strategy.

**Table 6-1: Construction Noise Management Options**

Source Controls	
<b>Scheduling</b>	Perform noisy work such as jack hammering during less sensitive time periods.
<b>Equipment Restrictions</b>	Select low-noise plant and equipment. Ensure equipment has quality mufflers installed.
<b>Substitute Methods</b>	Where practicable use smaller/lower capacity plant in reference to the safe working distances identified in <b>Table 3-6</b> .
<b>Limit Equipment on Site</b>	Only have necessary equipment on site.
<b>Limit Activity Duration</b>	Where possible, concentrate noisy activities at one location and move to another as quickly as possible.
<b>Site Access</b>	Vehicle movements outside construction hours, including loading and unloading operations, should be minimised and avoided where possible.
<b>Equipment Maintenance</b>	Ensure equipment is well maintained and fitted with adequately maintained silencers.
<b>Reduced Equipment Power</b>	Use only necessary size and power.
<b>Quieter Work Practices</b>	Implement worksite induction training, educating staff on noise sensitive issues and the need to make as little noise as possible.
<b>Reversing Alarms</b>	Consider alternatives, such as manually adjustable or ambient noise sensitive types (“smart” reversing alarms).
Path Controls	
<b>Noise Barriers</b>	Consider installing temporary construction noise barriers. Locate equipment to take advantage of the noise barriers provided by existing site features and structures, such as storage sheds.
<b>Enclosures</b>	Install noise-control kits for noisy mobile equipment and shrouds around stationary plant, as necessary.

Source Controls	
Increased Distance	Locate noisy plant as far away from noise-sensitive receptors as possible.
Receptor Controls	
Consultation	<p>Community consultation, information, participation and complaint responses are essential aspects of all construction noise management programs. They typically involve:</p> <ul style="list-style-type: none"> <li>• A community information program before construction and/or high-risk activities are commenced. This usually involves a leaflet distribution and direct discussions and negotiations with affected residents, explaining the type, time and duration of expected noise emissions.</li> <li>• Residents must be notified at least five working days before works commence.</li> <li>• The involvement of affected residents in the development of acceptable noise management strategies.</li> <li>• A nominated community liaison officer with a contact telephone number.</li> <li>• A complaints hotline.</li> <li>• Timely responses to complaints, providing information on planned actions and progress towards the resolution of concerns.</li> </ul>

## 6.1.2 Additional Mitigation Measures

After standard noise mitigation measures have been applied, noise levels may still exceed noise management levels. Where exceedances remain, the contractor should consider implementing the approaches summarised in Appendix C of the CNVG where feasible and reasonable. This document outlines a number of additional mitigation measures, as listed in **Table 6-2**.

**Table 6-2: Additional Mitigation Measures**

Measure	Abbreviation
Notification (letterbox drop or equivalent)	N
Specific Notifications	SN
Phone Calls	PC
Individual Briefings	IB
Respite Offers	RO
Respite Period 1	R1
Respite Period 2	R2
Duration Respite	DR
Alternative Accommodation	AA

The triggers for additional mitigation are presented in **Table 6-3**.

**Table 6-3: Triggers for Additional Mitigation Measures – Airborne Noise**

Predicted LAeq(15 minute) airborne noise level at receiver			Additional mitigation measures	
Perception	dBA above RBL	dBA above NML	Type <sup>1</sup>	Mitigation levels <sup>2</sup>
<b>All hours</b>				
	75 dBA or greater		N, V, PC, RO	HNA
<b>Standard Hours: Mon – Fri (7 am – 6 pm), Sat (8 am – 1 pm), Sun/Public Holiday (No work)</b>				
Noticeable	5 to 10	0	–	NML



Predicted LAeq(15 minute) airborne noise level at receiver			Additional mitigation measures	
Perception	dBA above RBL	dBA above NML	Type <sup>1</sup>	Mitigation levels <sup>2</sup>
Clearly Audible	10 to 20	<10	-	NML
Moderately Intrusive	20 to 30	10 to 20	N, V	NML+10
Highly Intrusive	>30	>20	N, V	NML+20

During long term works or at fixed sites the additional mitigation measures above may become less effective. In these situations, at-receiver noise mitigation may be considered where feasible and reasonable if options for at source noise mitigation and management measures have been exhausted.

## 6.2 Construction Vibration

As discussed in **Section 5**, a number of receivers are located within the worst case recommended safe working distances for cosmetic damage and human comfort, as set out in **Table 3-6**.

Where vibration generating activities are required within the nominated safe working distances, it is recommended that plant selection be reviewed to minimise the potential for impact, where feasible and reasonable. This includes reducing the following:

- The size of the roller/hydraulic hammer;
- The rollers vibratory settings;
- Periods of continuous operation; or
- Any combination of the above.

Where less vibration intensive equipment cannot be used, construction works should not proceed unless attended vibration measurements are undertaken at commencement, to ensure vibration levels comply with the maximum vibration levels set out in this report.

Where a risk of cosmetic damage is identified, property inspections must be undertaken and vibration monitoring should be conducted, to warn plant operators when vibration levels are approaching the cosmetic damage objective.

Alternative construction methods with lower source vibration levels should be used for works in proximity to structurally sensitive heritage receivers.

In practice, it is usually found that vibration impacts can be largely controlled by virtue of the progressing works, that is, the vibratory rollers and hammers would not remain in static locations for prolonged periods of time, but would typically move around the works areas, thereby limiting the vibration dose received by individual receivers.

## 6.3 Cumulative Impacts

Cumulative noise and vibration impacts can occur where construction of the proposal has the potential to result in combined impacts with other approved or proposed projects in the area.

There is a development proposed for 53-59 Hickson Road (referred to as the 'Aqualand Construction Site' in **Figure 2-1**), the construction of which could overlap with the construction works undertaken as part of Hickson



Road Stage 3 and Stage 4. There are two SSD submissions for the site, one with a duration of 8 months, and one 28 months.

Details of the timing of the construction are unknown at this stage, however if works occur concurrently with the Hickson Road Upgrade, there is the potential for increased noise levels at nearby sensitive receivers.

These impacts would be limited to the simultaneous duration of the proposed works.

It is recommended that potential construction noise impacts be further investigated once more detailed information on construction equipment and timing is available. It is expected that noise impacts from both projects would be managed by implementation of CNVMPs to ensure the potential for adverse impacts is minimised.

Construction vibration impacts are not anticipated to be significantly affected by simultaneous construction on the Aqualand site, assuming both sites manage safe working distances between vibration intensive plant and sensitive receivers.

## CONCLUSION

RWDI have been engaged by Lendlease and INSW to undertake a Construction Noise and Vibration Impact Assessment for the Hickson Road Upgrade Stage 3 and 4. The findings of this assessment are as follows.

### 7.1 Construction Noise

Exceedances to both the Noise Management Levels and Highly Noise Affected Level are predicted for some residential and commercial receivers during Stages 3 and 4 of the Hickson Road Upgrade.

In accordance with the ICNG, all feasible and reasonable work practices should be employed in order to limit the extent of construction noise impacts. Noise mitigation measures have been outlined in **Section 6.1**.

It is recommended that details of noisy works should be provided to residents prior to commencement, including letterbox drops. If noise complaints are received, they should be immediately investigated and where appropriate, noise monitoring should be undertaken at the locations concerned to determine compliance with the determined construction noise management levels. Reasonable and feasible measures would then need to be implemented to reduce any noise impacts.

Impacts from construction traffic are expected to be minor and readily managed by implementation of recommendations outlined in the Construction Traffic Management Plan for the proposal.

### 7.2 Construction Vibration

Ground vibration impacts have been assessed to determine potential impacts against the human comfort and building damage criteria outlined in both the AVaTG and the CNVG. Based on the findings of this assessment, a number of vibration mitigation measures have been outlined in **Section 6.2**.

It is recommended to select plant to ensure that the recommended safe working distances for cosmetic damage, as set out in **Table 3-6** are maintained. Where vibration generating works are required within the nominated safe working distances, it is recommended that pre-construction vibration trials are undertaken on site to confirm that the use of vibration-generating plant can comply with the maximum vibration levels set out in **Section 3.2** at the closest structures.

### 7.3 Closing

Based on the identification of potential issues associated with construction noise and vibration, and an assessment of the nature and extent of the impacts of the proposed development, it is determined that:

- The extent and nature of potential impacts are considered to be moderate to sensitive receivers in the vicinity of the construction footprint, and will have short term impacts on the locality, community and the environment;
- Potential impacts however, can be appropriately mitigated or managed to ensure that works are low risk, assuming works are limited to standard hours and recommended mitigation measures are implemented. These recommendations are outlined in **Section 6** of this report, and should be incorporated into the contractor's CNVMP for the proposal.



## STATEMENT OF LIMITATIONS

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This report entitled *Hickson Road Upgrade Works - Stage 3 and 4 – Construction Noise & Vibration Impact Assessment*, dated 26 November 2025 was prepared by RWDI Australia (“RWDI”) for Lendlease Pty Ltd (“Client”). The findings and conclusions presented in this report have been prepared for the Client and are specific to the project described herein (“proposal”). The conclusions and recommendations contained in this report are based on the information available to RWDI when this report was prepared. Because the contents of this report may not reflect the final design of the Project or subsequent changes made after the date of this report, RWDI recommends that it be retained by Client during the final stages of the project to verify that the results and recommendations provided in this report have been correctly interpreted in the final design of the Project.

The conclusions and recommendations contained in this report have also been made for the specific purpose(s) set out herein. Should the Client or any other third party utilize the report and/or implement the conclusions and recommendations contained therein for any other purpose or project without the involvement of RWDI, the Client or such third party assumes any and all risk of any and all consequences arising from such use and RWDI accepts no responsibility for any liability, loss, or damage of any kind suffered by Client or any other third party arising therefrom.

Finally, it is imperative that the Client and/or any party relying on the conclusions and recommendations in this report carefully review the stated assumptions contained herein and to understand the different factors which may impact the conclusions and recommendations provided.

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