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SSDA Noise and Vibration Impact Assessment

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1 INTRODUCTION

This Noise and Vibration Impact Assessment has been prepared by Acoustic Logic on behalf of Conquest in support of the State Significant Development Application (SSDA) to be submitted to the NSW Department for Planning, Housing and Infrastructure, for the proposed re-development of the subject site at 19A Evans Avenue, Eastlakes.

This SSDA (SSD-90572458) seeks consent for the construction of a mixed-use development comprising of a 2-storey podium with ground floor and second floor speciality retail and commercial tenancies, four 17 and 18-storey residential envelopes above the proposed ground level with communal open space on the rooftop, and 4 basement levels with a total of 1223 car parking spaces. The proposal includes a total number of 877 dwellings, inclusive of 74 affordable dwellings, market housing and Build-to-Rent dwellings. The proposal will include stratum and strata subdivision at 19A Evans Avenue, Eastlakes.

This Noise and Vibration Impact Assessment has been prepared to address the *Planning Secretary's Environmental Assessment Requirements* (SEARs) issued by the Department of Planning, Housing and Infrastructure (DPHI) for SSDA SSD-90572458, with specific SEAR(s) identified in the table below.

Table 1 – SEARs Requirement

Item	Requirement
10. Noise and Vibration	Provide a noise and vibration impact assessment prepared in accordance with the relevant NSW Environment Protection Authority (EPA) guidelines. The assessment must detail construction and operational noise and vibration impacts on nearby sensitive receivers and structures and outline the proposed management and mitigation measures that would be implemented. The Noise Assessment should also provide recommendations for suitable noise mitigation measures for future residents of this development from existing noise emitters including the commercial uses proposed and aircraft spaces.

This assessment addresses the impacts of construction and operational noise for this project. Noise and vibration levels at the site have been measured using EPA recommended methodologies. The predicted likely impacts have been assessed using criteria established using the following policies and guidelines:

- EPA Guidelines
- NSW Department of Planning
- Bayside Council DCP

Where required, complying controls and mitigation have been determined to prevent adverse amenity impacts. This report has been prepared for the sole purpose of a State Significant Development Application (SSDA) and should not be used or relied on for any other purpose.

2 REFERENCED DOCUMENTS

The following planning instruments and guidelines have been used in the assessment:

- NSW Environmental Protection Authority (EPA)'s document – *'Noise Policy for Industry 2017 (NPfI)'*.
- NSW EPA's document – *'Road Noise Policy 2011 (RNP) 2011'*
- NSW EPA's document – *'Noise Guide for Local Government 2023 (NGLG)'*
- NSW Department of Planning and Environment's document – '*State Environmental Planning Policy (SEPP) (Infrastructure)*".
- NSW Department of Planning and Environment's document – '*Developments near Rail Corridors or Busy Roads – Interim Guideline*'.
- NSW Department of Environment and Conservation's document – *'Assessing Vibration: A Technical Guideline 2006)'*
- Bayside Council document – *'Bayside Development Control Plan 2022 (DCP)'*.
- Bayside Council document – *'Bayside Local Environmental Plan 2021 (LEP)'*

The assessment is based on the following drawings, reports and other information:

- Bayside Council, '*Request for Advice – SEARs, SSD-90572458 – Eastlakes Shopping Centre, 19A Evans Avenue Eastlakes NSW 2018'*, dated 25 August 2025.
- Planning Secretary's Environmental Assessment Requirements (SEARs), SSD-90572458, '*Redevelopment of Eastlakes Shopping Centre'*, dated 8 September 2025.
- Pulse Acoustic Consultancy report – *'2019-10-14 Modification Acoustic Assessment – Eastlakes Town Centre, South Site – October 2019',* dated 14 October 2019.
- Paragon Engineering *report – 'Construction Noise and Vibration Impact Assessment & Management Plan "Early Works" SSDA, 19A Evans Ave, Eastlakes NSW 2018'*, dated 31 March 2026, Revision B.
- Transport Impact Assessment by PTC Consultants, titled *'Eastlakes Shopping Centre SSD-90572458 Conquest Transport Impact Assessment*', dated 27 May 2026.
- Architectural Drawings by DKO Architecture, titled *'Mixed-use Development: 19A Evans Ave Eastlake NSW 2018',* Revision A, dated 18/05/2026.

3 SITE DESCRIPTION AND THE PROPOSAL

3.1 EXISITING SITE DESCRIPTION AND NEAREST RECEIVERS

The project site is located at 19A Evans Avenue, Eastlakes (Lot 30 DP1246820). The site is bound by Evans Avenue to the north, Barber Avenue to the south and east, and the Jack Mundey Reserve to the west of the site.

It is proposed to construct a new multi-storey mixed-use development which will include basement carparking, retail and commercial tenancies, a childcare centre and residential towers.

An aerial of the site is provided in Figure 1 below, also illustrating the nearest sensitive receivers used in this noise assessment.

Figure 1 – Aerial site map indicating the noise catchment areas.
(Source: SixMaps 2026)

The following table lists the nearest sensitive receivers surrounding the site.

Table 2 – Sensitive Receivers

Receiver	Land Use	Description
R1	Residential	Residential receivers located at 10 & 12 Evans Avenue, Eastlakes
R2	Residential	Residential receivers located at 14 Evans Avenue, Eastlakes
R3	Mixed-Use	Mixed-use receivers located at 279 Gardeners Road, Eastlakes
R4	Residential	Residential receivers located at 16 Evans Avenue, Eastlakes
R5	Mixed-Use	Mixed-use receivers located at 16D Evans Avenue, Eastlakes
R6	Residential	Residential receivers located at 18 Evans Avenue and 193 Gardeners Road, Eastlakes
R7	Residential	Residential receivers located at 32 & 34 Barber Avenue, Eastlakes
R8	Residential	Residential receivers located at 28 & 30 Barber Avenue, Eastlakes
R9	Residential	Residential receivers located at 10 St Helena Parade and 22, 24 & 26 Barber Avenue, Eastlakes
R10	Residential	Residential receivers located at 18 & 20 Barber Avenue, Eastlakes
R11	Residential	Residential receivers located at 1, 3 & 5 Longworth Avenue, Eastlakes
R12	Active Recreation	Jack Mundley Reserve, located to the west of the site

3.2 MEASURED ENVIRONMENTAL NOISE LEVELS

Pulse Acoustic Consultancy and Paragon Engineering conducted unattended noise monitoring was conducted from between 8 October 2018 to 26 October 2018 (NL1 & NL2) and 23 August 2025 to 26 August 2025 (NL3). The monitors were located at 16 Evans Avenue, 234 Gardeners Road and 19A Evans Avenue, Eastlakes respectively. More information on monitoring can be found in the Pulse Acoustic Consultancy report (October 2019) and the Paragon Engineering Construction Noise and Vibration Impact Assessment & Management Plan (31 March 2026, Revision B).

A summary of the unattended noise monitoring results is presented in Table 3 below.
Table 4 outlines the measured operational road traffic noise levels.

Table 3 – Background Noise Monitoring Results

Noise Logger No.	Rating Background Level, L_{A90} dB(A)		
	Day (7am – 6pm)	Evening (6 pm – 10pm)	Night (10 pm – 7am)
NL1	53	47	45
NL2	58	51	41
NL3	44	43	40

Table 4 – Operational Road Traffic Noise Monitoring Results

Noise Logger No.	Day dB(A)$L_{eq\ (11\ hour)}$	Evening dB(A)$L_{eq\ (4\ hour)}$	Night dB(A)$L_{eq\ (9\ hour)}$
NL1	64	58	59
NL2	69	63	62
NL3	59	55	47

Figure 2 – Unattended noise monitoring locations.

4 OPERATIONAL NOISE EMISSION ASSESSMENT

An assessment of operational noise has been conducted and is presented below. The following noise sources are assessed:

- Noise emissions from mechanical plant (in principle).
- Noise emissions from articulated trucks entering and exiting the loading dock for inbound deliveries.
- Noise emissions from articulated trucks manoeuvring in the loading dock.
- Noise emissions from pallet jacks manoeuvring in the loading dock.
- Noise emissions from passenger vehicles entering the two basement carparks.
- Childcare noise assessment (in principle).
- Use of communal open spaces.

4.1 NOISE EMISSION CRITERIA

4.1.1 NSW EPA Noise Policy for Industry (NPfI) 2017

The following table summarises the trigger levels applying at each of the identified "most impacted" receivers. These have been determined based on the NPfI methodology described above and the measured rating background noise levels.

Noise emission from the operation of the development should comply with the project trigger noise levels at nearby sensitive receivers.

Table 5 – Project Specific Noise Levels

Receiver(s)	Time of day	RBL ($L_{A90, 15min}$)	Intrusive Criteria ($L_{A90, 15min}$)	Project Amenity Noise Levels dB(A) $L_{eq(15min)}$	Project trigger noise level (L_{Aeq}) [2]	Max Event
R1-R2 R4-R6	Day	53	58	58	58	n/a
	Evening	47	52	48	48	n/a
	Night	45	50	43	43	50 L_{eq} 60 L_{max}
R3	Day	58	63	58	58	n/a
	Evening	51	56	48	48	n/a
	Night	41	46	43	43	46 L_{eq} 56 L_{max}
R7-R11	Day	44	49	53	49	n/a
	Evening	43	48	43	43	n/a
	Night	40	45	38	38	45 L_{eq} 55 L_{max}
Commercial	When in Use	-	-	65	65	n/a
Active Recreation (R12)	When in Use	-	-	55	55	n/a

Note:

1. *Day is defined as 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays.*
   Evening is defined as 6pm to 10pm Monday to Sunday and Public Holidays.
   Night is defined as 10pm to 7am Monday to Saturday and 10pm to 8am Sundays and Public Holidays.
2. *Project trigger noise levels are determined by taking the lowest of the intrusiveness criteria and project amenity noise levels.*

4.1.2 Bayside Council DCP

The Bayside Council DCP states the following:

> ***3.13 Development in areas subject to aircraft noise and affected by Sydney Airport's prescribed airspace***
>
> ***C2.*** *Development on land within an ANEF affected area (ANEF 20+) must be designed and constructed in accordance with the relevant Australian Standard and other guidelines issued by relevant agencies and authorities.*
>
> ***C3.*** *Development on land within an ANEF affected area (ANEF 20+) is to be supported by a Noise Impact Assessment demonstrating indoor design sound levels in AS 2021—2000 can be achieved.*
>
> ***3.14.2 Acoustic Privacy – Residential***
>
> ***C5.*** *An Acoustic Report demonstrating compliance with relevant acoustic standards is to be submitted as part of a development application for new residential developments in locations that are exposed to high levels of external noise, including (but not limited to): a. Aircraft noise from Sydney Airport; b. Road noise from main roads such as Princes Highway, Botany Road and The Grand Parade; or c. Adjoining land uses such as industrial, Port Botany port land and port related infrastructure (i.e. Port Botany Rail Line and Foreshore Road).*
>
> ***C9.*** *Buildings that are exposed to high levels of external noise are designed and constructed in accordance with AS3671 – Acoustics – Road Traffic Noise Intrusion, AS2107 – Recommended Design Sound Levels and Reverberation Times for Building Interiors, and AS 2021-2000 – Acoustics- Aircraft noise intrusion – Building siting and construction.*
>
> ***3.14.3 Acoustic Privacy – Non – Residential***
>
> ***C1.*** *A development application for a new building or for a change of use of an existing building, for a non-residential use that is likely to generate external noise, must be accompanied by a Noise Impact Assessment. Bayside Development Control Plan 2022 \| Adopted 22 March 2023. Effective 10 April 2023. 148 Objective Control This report must be prepared by a suitably qualified acoustic consultant that demonstrates compliance with relevant controls and standards within state planning policies and NSW EPA guidelines (e.g. EPA Noise Policy for Industry 2017).*
>
> ***C2.*** *Where a Noise Impact Assessment is required, it is to identify: a. relevant noise criteria based on the POEO (Noise Control) Regulations 2017 guidelines & Council's Noise Criteria; b. all sources of noise; and c. noise emission levels. It must then outline proposed measures to mitigate the impacts of noise generated by the new development on other activities in the vicinity. It should take into account Approved Methods for measurement and Analysis of Environmental Noise in NSW (EPA 2022).*
>
> ***C5.*** *For noise sensitive land uses, an Acoustic Report, including recommended noise attenuation measures and any separation distances, must be prepared by a suitably qualified acoustic consultant and submitted with the development application to demonstrate that the relevant acoustic standards can be achieved. Noise sensitive non-residential land uses include, but are not limited to, child care centres, educational establishments, nursing homes and hospitals.*
>
> ***C8.*** *Buildings that are exposed to high levels of external noise are designed and constructed in accordance with AS3671 – Acoustics – Road Traffic Noise Intrusion, AS2107 – Recommended Design Sound Levels and Reverberation Times for Building Interiors, and AS 2021-2000 – Acoustics- Aircraft noise intrusion – Building siting and construction.*

An assessment of aircraft noise intrusion, road traffic noise intrusion, and operational noise emission were carried out to satisfy these requirements.

4.2 HOURS OF OPERATION

The proposed operating hours for the retail tenancies and the supermarket are between 8:00am to 7:00pm Monday to Sunday.

4.3 OPERATIONAL NOISE SOURCES

4.3.1 Mechanical Plant

Mechanical plant noise emission will be generated by the following sources:

- Carpark ventilation fans located in plantrooms on each basement level.
- Hot water plant and mechanical condensers located on the rooftop.
- Supermarket plant room located on Level 2
- Commercial plant room located on Level 4

Plant selections have not been made at the time of this report. A detailed mechanical assessment is recommended to be conducted at CC stage when plant has been finalised to ensure compliance with criteria.

The following indicative selections for heat pumps and air conditioning were used to conduct the mechanical plant noise emission assessment. AL assumes 6 heat pumps are located at each of the designated 'hot water plant' areas on the rooftop.

Table 6 – Mechanical Plant Sound Pressure Levels, dB(A) at 1m

Item		Octave Band Centre Frequency, Hz							
		63	125	250	500	1k	2k	4k	8k
Rooftop Condensers (29 + 5 units)	Daikin RXYMQ5B2VM	59	58	56	52	48	43	39	34

Note:

1. Noise data provided is for a single unit

Table 7 – Mechanical Plant Sound Pressure Levels, dB(A) at 3m

Item		Octave Band Centre Frequency, Hz							
		63	125	250	500	1k	2k	4k	8k
Heat Pump	Rheem 95501600	40	48	50	53	53	52	48	41

Note:

1. Noise data provided is for a single unit

4.3.1.1 Vehicles (Carpark and Loading Dock)

The following noise emission data for vehicle-related noise sources measured by this office have been used for the assessment. Note that the sound power level below has been adjusted for a tonality penalty per Factsheet C of the Noise Policy for Industry for a reverse beacon, typical of large articulated vehicles. This noise emission level has been obtained from noise measurements carried out at a similar loading dock facility.

The following noise level data for vehicle-related noise sources have been used for the assessment. These noise levels have been taken from measurements conducted by this office.

Table 8 – Sound Power Levels of Typical Automotive Movements Within the Site

Item	Sound Power Level, dB(A)
Car Travelling at 10km/h	84 L_{eq}
Pallet Jack Operation	92 L_{eq}
Truck Manoeuvring @ 10km/h (small rigid trucks)	90 L_{eq}
Truck Manoeuvring @ 10km/h (medium rigid trucks/ semi-trailers)	95 L_{eq}
Truck Manoeuvring @ 10km/h (heavy rigid trucks)	100 L_{eq}
Truck Reversing @ 5km/h (heavy rigid trucks)	*105 L_{eq}

*A 5 dB(A) penalty has been applied for the reversing beacon.

4.3.2 Modelling methodology

Noise levels have been predicted at the receiver locations using SoundPlan™ 9.1 modelling software implementing the ISO 9613-2:2024 "Acoustics – Attenuation of Sound During Propagation Outdoors – Part 2: General Method of Calculation" noise propagation standard.

Noise enhancing meteorological effects have been adopted as recommended by the NPfI, noting that the ISO 9613 modelling approach assumes that all receivers are 'downwind' (i.e., that noise enhancing wind and temperature conditions are in effect at all times).

Ground absorption was conservatively calculated with a ground factor of 0 for all areas except for localised lawns and greenery with a ground factor of 0.6 as recommended in *Engineering Noise Control* (Bies & Hanson).

4.3.3 Modelled Operational Scenarios

The following information provided by the Transport Impact Statement by PTC Consultants, as well as assumptions made by this office, are features of the existing operational noise SoundPlan model:

4.3.3.1 Daytime Operational Scenario (7am – 6pm)

- Loading Dock:
    - AL assumes that in a worst case 15-minute period, within the Loading Dock, there will be:
    - 2 HRV movement
    - 1 MRV movement
    - 1 SRV movement
    - 1 Pallet Jack operating for up to 5 mins
- Retail Basement Carpark:
    - AL assumes that in a worst case 15-minute period, through the entrance/exit to the basement carpark, there will be 73 passenger vehicle movements
- Residential Basement Carpark:
    - AL assumes that in a worst case 15-minute period, through the entrance/exit to the basement carpark, there will be 35 passenger vehicle movements
- Vehicle movements have been calculated based on the assumption that cars entering, exiting and manoeuvring around the carpark will be driving at 10km/h. Trucks reversing and pallet jacks will move at 5km/h.

4.3.3.2 Evening Operational Scenario (6pm – 10pm)

- Loading Dock:
    - AL assumes that in a worst case 15-minute period, within the Loading Dock, there will be:
    - 1 HRV movement
    - 1 MRV
    - 1 SRV movement
    - 1 Pallet Jack operating for up to 5 mins
- Retail Basement Carpark:
    - AL assumes that in a worst case 15-minute period, through the entrance/exit to the basement carpark, there will be 56 passenger vehicle movements
- Residential Basement Carpark:
    - AL assumes that in a worst case 15-minute period, through the entrance/exit to the basement carpark, there will be 28 passenger vehicle movements
- Vehicle movements have been calculated based on the assumption that cars entering, exiting and manoeuvring around the carpark will be driving at 10km/h. Trucks reversing and pallet jacks will move at 5km/h.

4.3.3.3 Nighttime Operational Scenario (10pm – 7am)

- The loading dock will not be operational during this time.
- The supermarket and retail premises will not be operational during this time.
- Residential Basement Carpark:
    - AL assumes that in a worst case 15-minute period, through the entrance/exit to the basement carpark, there will be 8 passenger vehicle movements
- Vehicle movements have been calculated based on the assumption that cars entering, exiting and manoeuvring around the carpark will be driving at 10km/h.

4.3.4 Modelling Results

Table 9 below presents the results of the operational noise modelling. Operational noise contours are presented in Appendix C.

Table 9 – Predicted Operational Noise Emission

Receiver	Usage	Maximum Predicted External Noise Levels (dB(A) $L_{eq(15mins)}$)				Project Noise Objective (dB(A) $L_{eq\ 15min}$)	Compliance?
		Mechanical Plant	Carpark	Loading Dock	Cumulative		
Daytime Operation							
R1	Residential	27	37	17	39	58	Yes
R2	Residential	25	44	<10	44	58	Yes
R3	Mixed-Use	27	37	<10	39	58	Yes
R4	Residential	25	45	<10	45	58	Yes
R5	Mixed-Use	31	40	<10	41	58	Yes
R6	Residential	25	32	20	32	58	Yes
R7	Residential	28	27	31	31	49	Yes
R8	Residential	30	20	38	39	49	Yes
R9	Residential	31	34	46	46	49	Yes
R10	Residential	31	40	36	40	49	Yes
R11	Residential	26	29	21	29	49	Yes
R12	Active Recreation	25	43	27	43	55	Yes
Evening Operation							
R1	Residential	27	37	16	37	48	Yes
R2	Residential	25	43	<10	43	48	Yes
R3	Mixed-Use	27	37	<10	36	48	Yes
R4	Residential	25	44	<10	44	48	Yes
R5	Mixed-Use	31	39	<10	39	48	Yes
R6	Residential	25	31	18	31	48	Yes
R7	Residential	28	23	29	30	43	Yes
R8	Residential	30	19	37	37	43	Yes
R9	Residential	31	33	**45**	**45**	43	Marginal
R10	Residential	31	39	34	39	43	Yes
R11	Residential	26	28	20	28	43	Yes
R12	Active Recreation	25	42	25	42	55	Yes
Night Operation							

R1	Residential	27	18	-	27	43	Yes
R2	Residential	25	<10	-	25	43	Yes
R3	Mixed-Use	27	<10	-	27	43	Yes
R4	Residential	25	<10	-	25	43	Yes
R5	Mixed-Use	31	<10	-	31	43	Yes
R6	Residential	25	<10	-	26	43	Yes
R7	Residential	28	<10	-	28	38	Yes
R8	Residential	30	14	-	30	38	Yes
R9	Residential	31	28	-	31	38	Yes
R10	Residential	31	34	-	34	38	Yes
R11	Residential	26	19	-	26	38	Yes
R12	Active Recreation	25	34	-	34	55	Yes

Predicted noise emission from the proposed development at R9 is expected to exceed the established criteria by up to 2 dB due to the loading dock operation. The following are noted with regards to noise emission from the loading dock:

- Predicted noise levels are a worst-case scenario and noise levels will generally be lower than those presented.
- Reasonable and feasible mitigation in the form of acoustically absorptive finishes have been incorporated into the acoustic modelling
- The exceedance is up to 2 dB. In accordance with the NPfI, a residual noise of 2 dB or less above the Project Noise Trigger Level after reasonable and feasible mitigation has been applied is considered negligible.

Predicted noise emission from the proposed operational scenarios is therefore considered acceptable.

4.3.5 Communal Outdoor Spaces

There are communal spaces located on Levels 4, 14, 17 and 18 of the proposed development. There is no quantitative criteria for noise emissions from the use of outdoor communal spaces in residential development, however it is noted that the following design features have been incorporated into the architectural and landscape designs to limit noise emission from these areas to neighbouring properties:

- The size and landscaping of communal areas will limit the number of individuals that can assemble in these areas thereby limiting the noise generated by the spaces.

- The height of the rooftop communal spaces in combination with the increased setback from the boundaries and parapets, will provide significant shielding of noise to neighbouring residential properties.

4.4 PRELIMINARY CHILDCARE NOISE EMISSION ASSESSMENT

Key features of the proposed childcare are summarised below:

- Operation hours of 6:00am – 6:30pm Monday to Friday.
- Proposed basement car parking with 9 vehicle spaces.
- Covered play area.
- Maximum capacity for 75 children.

The major external noise sources intruding into the proposes development will be from vehicle movements Barber Avenue.

4.4.1 Bayside Development Control Plan (DCP) 2022

The Bayside DCP 2022 has no specific requirements for childcare noise emissions, but the following is noted in Section 6.8, C1:

> *All development is to be assessed against the provisions of Chapter 3 of the State Environmental Planning Policy (Transport and Infrastructure) 2021 and the NSW Child Care Planning Guideline.*

4.4.2 NSW Child Care Planning Guideline 2021

The NSW Child Care Planning Guideline 2021, lists the following relevant considerations for childcare noise emissions:

C22

A new development, or development that includes alterations to more than 50 per cent of the existing floor area, and is located adjacent to residential accommodation should:

- *provide an acoustic fence along any boundary where the adjoining property contains a residential use. An acoustic fence is one that is a solid, gap free fence*
- *ensure that mechanical plant or equipment is screened by solid, gap free material and constructed to reduce noise levels e.g. acoustic fence, building, or enclosure.*

C23

A suitably qualified acoustic professional should prepare an acoustic report which will cover the following matters:

- *identify an appropriate noise level for a child care facility located in residential and other zones*
- *determine an appropriate background noise level for outdoor play areas during times they are proposed to be in use*
- *determine the appropriate height of any acoustic fence to enable the noise criteria to be met*

C25

An acoustic report should identify appropriate noise levels for sleeping areas and other non-play areas and examine impacts and noise attenuation measures where a child care facility is proposed in any of the following locations:

- *on industrial zoned land*
- *where the ANEF contour is between 20 and 25*
- *along a railway or mass transit corridor, as defined by State Environmental Planning Policy (Infrastructure) 2007*
- *on a major or busy road*
- *other land that is impacted by substantial external noise.*

4.4.3 Road Traffic Noise Assessment

The NSW Department of Planning *'Development near Rail Corridors or Busy Roads – Interim Guideline'* was used to assess the impact of noise from adjacent road and rail corridors on noise sensitive development such as educational institutions including childcare centres. Table 3.1 of the interim guideline recommends a maximum noise level within childcare centres of 40 dB(A) $L_{eq,1hr}$.

The Association of Australian Acoustical Consultants 'AAAC *Guideline for Childcare Centre Acoustic Assessment 2020'* provides the following external noise criteria.

Table 10 – Project Internal Noise Level Criteria

Source	Receiver	Criteria	DNRCBR – IG Criteria
Barber Avenue	Sleeping Areas	35 dB(A) $L_{Aeq(1\ hour)}$	40 dB(A) $L_{Aeq(1\ hour)}$
	Indoor Play Areas	40 dB(A) $L_{Aeq(1\ hour)}$	40 dB(A) $L_{Aeq(1\ hour)}$
	Outdoor Play Areas	55 dB(A) $L_{Aeq(1\ hour)}$	n/a

Road traffic noise levels in outdoor play area are expected to comply with the Outdoor Play Area criteria of 55 dB(A).

Noise intrusion recommendations have been provided to attenuate noise from surrounding road traffic. These are discussed in Section 6.4.

4.4.4 Noise Emissions Assessment

A noise emission assessment has been carried out to ensure noise emitted from the proposed childcare centre is in accordance with the applicable criteria. This assessment reviews noise emissions associated with the following indoor and outdoor play areas.

The noise emission assessment has been assessed in accordance with the following documents:

- Association of Australasian Acoustical Consultants (AAAC) – '*Guideline for Childcare Centre Acoustic Assessment 2020*'.
- NSW Environmental Protection Authority (EPA) – *'Noise Policy for Industry (NPfI) 2017'*.

4.4.4.1 AAAC - Guideline for Child Care Centre Acoustic Assessment, Version 3.0, 2020

Section 3.2 of the guideline states the following regarding noise criteria to residential receptors:

> *"3.2.1 Outdoor Play Area*
>
> *Base Criteria – With the development of child care centres in residential areas, the background noise level within these areas can at certain times, be low. Thus, a base criterion of a contributed $L_{eq,15min}$ 45 dB(A) for the assessment of outdoor play is recommended in locations where the background noise level is less than 40 dB(A).*
>
> *Background Greater Than 40 dB(A) – The contributed $L_{eq,15min}$ noise level emitted from an outdoor play and internal activity areas shall not exceed the background noise level by more than 5 or 10 dB at the assessment location, depending on the usage of the outdoor play area. AAAC members regard that a total time limit of approximately 2 hours outdoor play per morning and afternoon*

period should allow an emergence above the background of 10 dB (ie background +10 dB if outdoor play is limited to 2 hours in the morning and 2 hours in the afternoon).

Up to 4 hours (total) per day – If outdoor play is limited to no more than 2 hours in the morning and 2 hours in the afternoon, the contributed $L_{eq,15\ minute}$ noise level emitted from the outdoor play shall not exceed the background noise level by more than 10 dB at the assessment location.

More than 4 hours (total) per day – If outdoor play is not limited to no more than 2 hours in the morning and 2 hours in the afternoon, the contributed $L_{eq,15\ minute}$ noise level emitted from the outdoor play area shall not exceed the background noise level by more than 5 dB at the assessment location.

Other Noise Emission

The cumulative $L_{eq,15\ minute}$ noise emission level resulting from the use and operation of the child care centre, with the exception of noise emission from outdoor play discussed above, shall not exceed the background noise level by more than 5 dB at the assessment location as defined above. This includes the noise emission resulting from:

- *Indoor play*
- *Mechanical plant*
- *Drop off and pick up*
- *Other activities/ operations (not including outdoor play).*

3.2.3 Sleep Disturbance

The noise impact of staff arrivals, setup, cleaning or other on-site activities prior to 7am or during night-time hours should be assessed at nearby residential premises. The L_{Amax} noise level emitted from vehicles arriving and parking, depending on the requirements of the state or territory where the centre is located shall not exceed the background noise level by more than 15 dB outside the nearest habitable room window."

Section 3.3 of the guideline states the following regarding noise criteria to commercial receptors:

The cumulative Leq,15min noise level emitted from the use and operation of the child care centre shall not exceed 65 dB(A), from all activities (including outdoor play), when assessed at the most affected point on or within any commercial property boundary.

Section 3.4 of the guideline states the following regarding noise criteria to other sensitive receptors:

Where appropriate, assessment should include consideration of noise emission to other sensitive uses including schools, hospitals, places of worship and parks (active and passive). Depending on the requirements of the state or territory where the centre is located, in the absence of applicable noise criteria for such a sensitive use, the cumulative Leq,15min noise level emitted from the use and operation of the child care centre shall not exceed 65 dB(A), from all activities (including outdoor play), when assessed at the most affected point on or within the sensitive property boundary, and shall not exceed 45 dB(A) internally, with windows or doors of the sensitive receiver open.

4.4.4.2 Summarised Noise Emission Criteria

The following table presents the noise emission objectives for the proposed childcare centre.

Table 11 – Childcare Noise Emission Criteria

Receiver		Source	Time Period	Residential Receiver Criteria dB(A) $L_{Aeq(15min)}$ -AAAC
R1	Residential	All sources	Day	58
R2	Residential	All sources	Day	58
R3	Mixed-Use	All sources	Day	63
R4	Residential	All sources	Day	58
R5	Mixed-Use	All sources	Day	58
R6	Residential	All sources	Day	58
R7	Residential	All sources	Day	49
R8	Residential	All sources	Day	49
R9	Residential	All sources	Day	49
R10	Residential	All sources	Day	49
R11	Residential	All sources	Day	49
R12	Active Recreation	All sources	Day	65

Note:

1. Other sources include indoor play, mechanical plant, drop-off and pick-up and other activities not including outdoor play.

4.4.5 Assumptions Adopted in Outdoor Play Assessment

Noise emissions from outdoor play activities are predicted using the Sound Power Level recommended by AAAC Guideline for Child Care Centre Acoustic Assessment Version 3.0 (2020) which are reproduced below:

Table 12 – AAAC Sound Power Levels for Children

Number and Age of Children (Active Play)	Sound Power Levels (dB) at Octave Band Centre Frequencies (Hz)								
	Total dB(A)	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
10 Children – 3 to 6 years	**87**	64	70	75	81	83	80	76	72

Note:

1. For simplicity, based upon a review of World Health Organization (WHO) data, a single recommended source height of 1 metre is suggested as the source heights [for children].

In line with the AAAC Guideline, the above sound power levels with an adjustment of -6 dB apply for children involved in passive play.

General SoundPlan modelling assumptions are described in Section 4.3.2.

4.4.6 Modelling Results

4.4.6.1 Outdoor Play Area Noise

The outdoor play scenario noise has been predicted based on the following information and assumptions:

- Outdoor areas modelled as an area source with 75 x 3-6 year old children all engaged in active play.
- Children are evenly distributed over the whole area of each zone.
- Outdoor play occurs only between 7:00am – 6:00pm Monday to Friday.
- A solid wall 3m high from the finished floor level surrounds the outdoor play area. This must be of solid construction and free of air gaps.

Table 13 – Predicted Noise Emission from Outdoor Play

Receiver	Usage	Maximum Predicted External Noise Levels (dB(A) $L_{eq(15mins)}$)	Criteria Day (dB(A) $L_{eq\ 15min}$)	Compliance?
R1	Residential	19	58	Yes
R2	Residential	19	58	Yes
R3	Mixed-Use	19	63	Yes
R4	Residential	22	58	Yes
R5	Mixed-Use	34	58	Yes
R6	Residential	39	58	Yes
R7	Residential	49	49	Yes
R8	Residential	40	49	Yes
R9	Residential	30	49	Yes
R10	Residential	19	49	Yes
R11	Residential	14	49	Yes
R12	Active Recreation	20	65	Yes

4.4.6.2 Indoor Play Area Noise

Indoor play was modelled using 75 children aged 3-6 years old, engaged in active play. Internal layouts have not yet been determined, but indicative glazing to control noise emission/intrusion is presented in Section 6.4. The operator is responsible for ensuring the fitout of the childcare centre will result in compliance with the established project noise emission objectives.

4.4.6.3 Outstanding Childcare Noise Assessment Items

The following items could not be assessed at SDDA stage due to insufficient design detail. It is recommended that assessments addressing these items be carried out by a suitably qualified acoustic consultant prior to the issue of a Construction Certificate (CC).

Mechanical Plant – Plant type, location and operational schedules are not yet determined. The CC assessment shall demonstrate compliance with the criteria in Section 4.4.4.1, noting that the night-time criterion (LAeq,15min ≤ Background +5 dB(A)) is the most stringent. Indicative mitigation measures include location of plant away from the eastern façade, acoustic screening and selection of low-noise rated equipment.

Early Morning Staff Arrivals – Staff arrivals prior to 7:00 am fall within the nighttime assessment period. The CC assessment shall demonstrate compliance with the sleep disturbance criterion (LAmax ≤ Background +15 dB(A)) and night LAeq,15min criterion (Background +5 dB(A)) at all sensitive receivers.

4.5 OPERATIONAL NOISE MITIGATION MEASURES

Noise mitigation measure recommendations are presented as follows:

- Loading Dock:
    - Engines should be turned off during loading and unloading movements, thus effectively having no idling noise during the loading and unloading operations.
    - Deliveries should be managed as to not generate unnecessary levels of noise emissions on adjacent impacted receivers.
    - Trucks are to minimise the usage of air brakes as much as practicable.
    - The soffit of carpark/loading dock ramp is to have an acoustically absorbent finish achieving a minimum NRC 0.9. Suitable products to achieve this include Martini Absorb Soffit XHD 50.
- Plant
    - Detailed plant selection has not been undertaken at this stage and assessment is for indicative feasibility only.
    - For all other plant, such as fans, satisfactory levels will be achievable through appropriate plant selection, location and if necessary, standard acoustic treatments such as duct lining, acoustic silencers and enclosures.
    - It is recommended that a review and detailed design of all mechanical plant associated with the site be undertaken prior to the issue of a construction certificate to confirm plant noise levels meet the noise emission requirements detailed in Section 4.1. Any review of mechanical plant noise should take into consideration the operational noise levels from the site, such that the cumulative noise does not exceed the Project Noise Trigger Levels.
- Childcare
    - Predicted noise emission from the childcare outdoor play area has been assessed assuming a 3.0 m solid acoustic barrier surrounding the play area (see Figure 3). The barrier is required as a mitigation measure to achieve compliance with the applicable noise criteria at the nearest sensitive receivers (R6 – R8); without the barrier, predicted noise levels exceed the established criteria.
    - The design and specification of the acoustic barrier, including material selection, construction details and connection to the building structure, is to be confirmed at detailed design stage. The barrier shall be designed and constructed in accordance with the following minimum requirements:
        - Minimum height of 3.0 m above the play area floor level
        - Solid construction with no gaps
        - All joints, penetrations and connections to be sealed to prevent flanking transmission
    - It is recommended that a suitably qualified acoustic consultant review the detailed barrier design and location prior to construction to confirm compliance with the noise criteria established in this assessment.

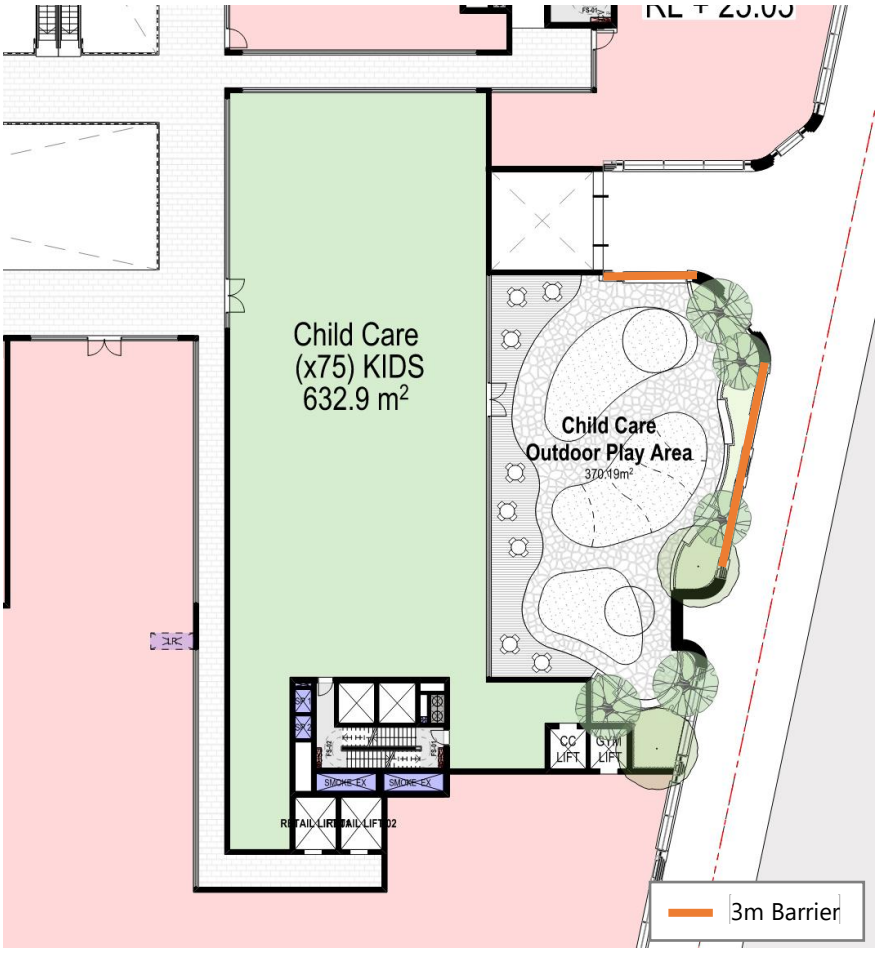


Figure 3 – Barrier Location for the child care outdoor play area

5 TRAFFIC NOISE GENERATION ASSESSMENT

5.1 TRAFFIC GENERATION - NSW EPA ROAD NOISE POLICY 2011

For land use developments with the potential to create additional traffic on public streets the development should comply with the EPA *Road Noise Policy*. Noise levels generated by traffic should not exceed the noise levels set out in the table below when measured at a nearby property.

Table 14 – Criteria for Traffic Noise Generated by New Developments

Road Type	Time of day	Permissible Noise Generation
Freeway / Arterial / Sub Arterial Roads (Gardeners Road, Southern Cross Drive)	Day (7am to 10pm)	60 dB(A) $L_{eq(15hr)}$
	Night (10pm to 7am)	55 dB(A) $L_{eq(9hr)}$
Local Roads (Evans Avenue, Barber Avenue, Racecourse Place, Mascot Drive)	Day (7am to 10pm)	55 dB(A) $L_{eq(1hr)}$
	Night (10pm to 7am)	50 dB(A) $L_{eq(1hr)}$

However, if existing noise levels exceed those in the table above, Section 3.4 of the Road Noise Policy is applicable, which requires noise impacts to be reduced through feasible and reasonable measures. However, in determining what is feasible/reasonable, the Policy notes that an increase of less than 2 dB(A) is a minor impact and would be barely perceptible.

According to the Transport Impact Statement by PTC Consultants (May 2026), the proposed development is anticipated to result in the following net generation:

Table 15 – Net Trip Generation Summary

Component	AM Peak Trips	PM Peak Trips	Saturday Peak Trips
Residential	140	110	N/A
Retail	106	222	291
Total net trips	**246**	**332**	**291**

The increase in traffic noise levels as a result of additional vehicle movements from the proposed developed is predicted to comply with the relevant criteria presented in this section, as the noise increase on nearby roads is considered to be less than 2 dB(A) during peak periods. Therefore, no further assessment is required, in accordance with the RNP.

6 NOISE INTRUSION ASSESSMENT

6.1 AIRCRAFT NOISE INTRUSION ASSESSMENT

Aircraft noise impacts from Sydney Kingsford International and Domestic Airport have been assessed using Australian Standard AS2021:2015 'Acoustics–Aircraft noise intrusion–Building siting and construction'.

6.1.1 Site Evaluation

The acceptability of aircraft noise exposure is assessed using Australian Standard AS2021:2015 *'Acoustics–Aircraft noise intrusion–Building siting and construction'*. The standard provides criteria to assess whether noise exposure is consistent with the proposed land use for the site.

Site aircraft noise exposure is assessed using the Australian Noise Exposure Forecast System (ANEF). ANEF was developed to provide a rating system that reflects actual human response to the following factors: the frequency of aircraft movements overhead, the noise level and duration of individual aircraft movements, and the time of the day in which they occur.

The Sydney Airport 2039 ANEF contour map indicates the project site is located between the ANEF 20 and 25 contours. Therefore, the proposed site is considered to be "conditionally acceptable" provided the building is constructed so that internal noise levels from aircraft flyovers are limited to those recommended in AS2021.

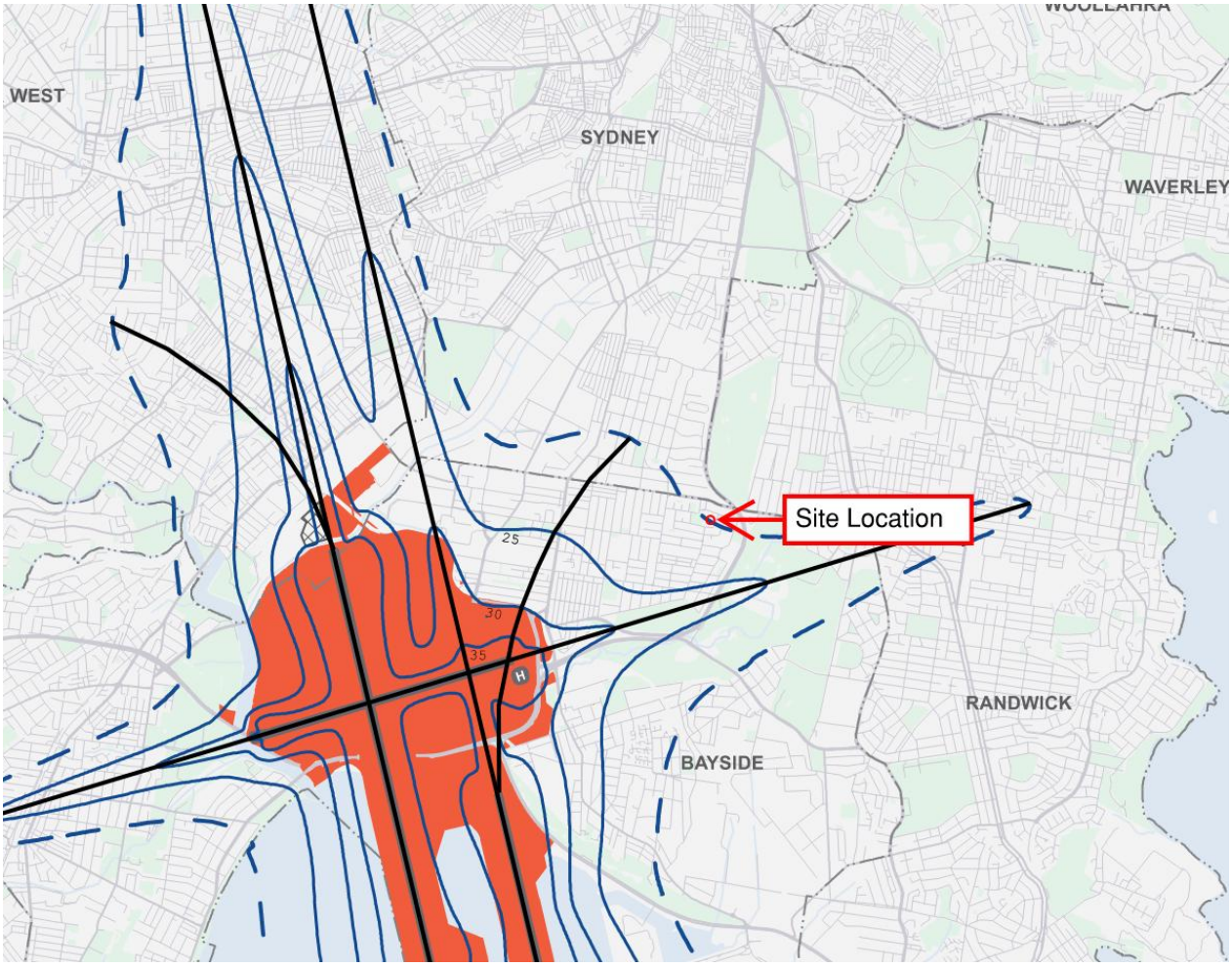


Figure 4 – ANEF Site Map

AS2021 stipulates design internal noise levels for residential buildings. These levels are summarised in the table below. These will be used to assess aircraft noise intrusion and the treatment needed to comply.

Table 16 – Indoor Design Sound Levels for Aircraft Noise Reduction Assessment

Activity	Indoor Design Sound Level from Aircraft Flyover
Bedrooms	50 dB(A)($L_{max,s}$)
Living Spaces	55 dB(A)($L_{max,s}$)
Bathrooms, toilets, laundries	60 dB(A)($L_{max,s}$)

6.1.2 External Aircraft Noise Levels

Aircraft noise levels at the site were determined using AS2021. The standard provides aircraft landing and taking off noise levels for locations near airports based on the site location relative to the runways.

Based on the distance from the site to the runways, the flight path, and the site elevation, AS2021 predicts that the loudest typical aircraft movement will be from a A330 aircraft departing to the east from the east-west runway. The noise level at the site as indicated by the standard is 79 dB(A)Lmax. This noise level will be used to predict the resultant internal noise levels.

6.1.3 Internal Noise Level Calculation

Internal noise levels will primarily be due to noise transmission through the roof, windows, and doors as these are typically, relatively light building elements that offer less resistance to the transmission of sound.

Noise transmission through each of the external elements have been calculated based on the external noise level and spectral characteristics, building element area exposed to aircraft noise, the absorption characteristics of the rooms and the noise reduction performance of the building elements. The cumulative noise level in each space was determined by adding the contributions from each of the transmission paths.

6.1.4 Complying Mitigation

6.1.5 Building Envelope

External walls constructed will not require any acoustic upgrading to achieve the acoustic requirements. For light-weight materials, the following complying constructions are provided.

Table 17 – Complying External Light Weight Wall Construction

Space	Internal Lining	Stud System	External Lining
All bedrooms	2x10mm Plasterboard	Minimum of 90mm timber stud with 75mm thick 11kg/m^3 glasswool insulation in cavity	9mm Fibre-cement cladding
All living rooms & bathrooms	1x10mm Plasterboard	Minimum of 90mm timber stud with 75mm thick 11kg/m^3 glasswool insulation in cavity	9mm Fibre-cement cladding

6.1.6 Glazed Windows and Doors

The following standard construction is recommended to comply with the project noise objectives. Aluminium framed/sliding glass doors and windows will be satisfactory provided they meet the following criteria. All external windows and doors listed are required to be fitted with Q-lon type acoustic seals. **(Mohair Seals are unacceptable**).

The complying constructions are listed in Table 18 below. Thicker glazing may be required for structural, safety or other purposes. Where it is required to use thicker glazing than scheduled, this will also be acoustically acceptable.

Table 18 – Complying Glazing Constructions

Space	Facade	Glazing Construction	Minimum R_w of Installed Window	Acoustic Seals
All bedrooms	All facades	12.38mm laminated	37	Yes
All living rooms	All facades	10.38 mm laminate	35	Yes
Commercial tenancies	All facades	6.38mm laminated	31	Yes

It is recommended that only window systems having test results indicating compliance with the required ratings obtained in a certified laboratory be used where windows with acoustic seals have been recommended. In addition to complying with the minimum scheduled glazing thickness, the R_w rating of the glazing fitted into open-able frames and fixed into the building opening should not be lower than the values listed in the table above for all areas. This will require the use of acoustic seals around the full perimeter of open-able frames and the frame will need to be sealed into the building opening using a flexible sealant.

In the event that any penetrations are required through the external skin, an acoustic grade sealant should be used to minimise all gaps.

6.1.6.1 Use of Insulated Glass Units (Double Glazing)

Where single glazing has been recommended in Table 19**Error! Reference source not found.**, the following IGU's can be used in place of tabled single glazing.

Table 19 – Double Glazing Substitutions

Single Glazing Assembly	Equivalent IGU	Minimum R_w of Installed Window
6.38mm laminated	8/16AG/8 OR 6/12/6.38	35/31
10.38mm laminated	6/12AG/10.38 or 8/12/8.38	40/35
12.38mm laminated	8/12AG/11.52	42/38

6.1.6.2 Ventilation Requirements

AS2021:2015 requires the installation of ventilation or air conditioning where aircraft noise exposure exceeds ANEF 20. The required internal noise levels can only be achieved with closed external windows and doors. An alternative outside air supply system or air conditioning complying with AS1668.2 must be installed to all spaces required to be assessed.

Noise emitted to the property boundaries by any ventilation system shall comply with Council requirements.

6.2 ROAD TRAFFIC NOISE INTRUSION CRITERIA

6.2.1 NSW Department of Planning and Environment – *State Environmental Planning Policy (Transport and Infrastructure) 2021*

Clause 2.120 of SEPP Transport and Infrastructure states the following with regards to residential development adjacent to busy roads:

> *"**2.120** - Impact of road noise or vibration on non-road development*
>
> *(1) This section applies to development for any of the following purposes that is on land in or adjacent to the road corridor for a freeway, a tollway or a transitway or any other road with an annual average daily traffic volume of more than 20,000 vehicles (based on the traffic volume data published on the website of TfNSW) and that the consent authority considers is likely to be adversely affected by road noise or vibration—*
>
> *(a) residential accommodation,*
>
> *(b) a place of public worship,*
>
> *(c) a hospital,*
>
> *(d) an educational establishment or centre-based childcare facility.*
>
> *(2) Before determining a development application for development to which this section applies, the consent authority must take into consideration any guidelines that are issued by the Planning Secretary for the purposes of this section and published in the Gazette.*
>
> *(3) If the development is for the purposes of residential accommodation, the consent authority must not grant consent to the development unless it is satisfied that appropriate measures will be taken to ensure that the following LAeq levels are not exceeded—*
>
> *(a) in any bedroom in the residential accommodation—35 dB(A) at any time between 10 pm and 7 am,*
>
> *(b) anywhere else in the residential accommodation (other than a garage, kitchen, bathroom or hallway)—40 dB(A) at any time.*
>
> *(3A) Subsection (3) does not apply to a building to which State Environmental Planning Policy (Housing) 2021, Chapter 3, Part 7 applies.*
>
> *(4) In this section, freeway, tollway and transitway have the same meanings as they have in the Roads Act 1993."*

Based on Clause 2.120, Gardeners Road, within a 100m radius of the site, is estimated to carry an annual average daily traffic volume of more than 40,000 vehicles. Therefore, the project site will be assessed based on the requirements of Clause 2.120 Item 1 above.

6.2.2 NSW Department of Planning and Environment – *Development Near Rail Corridors and Busy Roads – Interim Guideline*

Section 3.5 of the NSW Department of Planning's 'Development near Rail Corridors and Busy Roads (DNCBR)' states:

> *"The following provides an overall summary of the assessment procedure to meet the requirements of clauses 87 and 102," (SEPP Infrastructure 2007, superseded by Clauses 2.100 and 2.120 in SEPP Infrastructure and Transport 2021,) "of the Infrastructure SEPP. The procedure covers noise at developments for both Road and Rail.*
>
> *If the development is for the purpose of a building for residential use, the consent authority must be satisfied that appropriate measures will be taken to ensure that the following L_{Aeq} levels are not exceeded:*
>
> - *in any bedroom in the building: 35dB(A) at any time 10pm-7am;*
> - *anywhere else in the building (other than a garage, kitchen, bathroom or hallway): 40dB(A) at any time."*

Furthermore, the guideline also states that:

> *"If internal noise levels with windows or doors open exceed the criteria by more than 10dB(A), the design of the ventilation for these rooms should be such that occupants can leave windows closed, if they so desire, and also to meet the ventilation requirements of the Building Code of Australia."*

With windows open, the allowable internal noise goal is permitted to be 10dB(A) higher than when the windows are closed. The occupants should be able to *"leave their windows closed, if they so desire, and also meet the ventilation requirements of the Building Code of Australia (BCA)."* Acoustic Logic note that the requirements of DNRCBR do not explicitly require natural ventilation to be met in tandem with internal noise criteria, noting that rooms should be designed to be able to have windows closed, whilst concurrently meeting the ventilation requirements imposed by the BCA.

6.2.3 Summarised Internal Noise Criteria

As the development is located adjacent to a road corridor defined under Clause 2.120 of SEPP Infrastructure and Transport, the requirements of DNCBR govern the internal noise requirements of the project site. A summary of the projects internal noise level criteria incorporating the relevant legislative requirements are detailed in the table below.

Table 20 – Summarised Internal Noise Level Criteria for Residential Apartments

Document	Scenario	Time of Day	Space Type	Internal Noise Level dB(A)
NSW Planning *Development Near Rail Corridors and Busy Roads – Interim Guideline*	Windows and Doors Closed	Anytime (24hrs)	Living Rooms	40 $L_{eq,\ (15hr)}$
		Night (10pm – 7am)	Bedrooms	35 $L_{eq,\ (9hr)}$
	Windows and Doors Open (Or Ventilation Devices)	Anytime (24hrs)	Living Room	50 $L_{eq,\ (15hr)}$
		Night (10pm – 7am)	Bedroom	45 $L_{eq,\ (9hr)}$

6.3 TRAFFIC NOISE INTRUSION ASSESSMENT

An assessment of noise impact has been undertaken using the following methodology:

- Windows Closed Noise Levels

Windows closed noise levels were calculated to the centre of the room using the predicted octave band façade incident external noise levels and, for each façade element, correcting for the exposed area, octave band sound transmission loss and room sound power to pressure correction. The room noise level was calculated by accumulating all significant noise paths.

Envelope performance requirements to comply with the noise criteria stipulated in Section 6.2.3 have been assessed.

- Windows Open Noise Levels

"Windows open" noise levels have been calculated by subtracting 10 dB(A) from the façade incident noise level, as promulgated by Table 7 in the NSW Road Noise Policy. The noise reduction assumes the open area of window is equivalent to 5% of the room floor area.

The rooms that will exceed the DNRCBR "windows open" noise level are nominated in Section 6.2.3. These rooms should be provided with a supplementary ventilation that will allow the windows to be closed and still comply with the ventilation requirements of the BCA.

6.4 RESULTS

6.4.1 Complying Mitigation and Controls

The measured noise levels have been used as a basis for predicting noise levels inside the development. The modelling indicates that mitigation of noise impacts is needed to achieve compliance with the nominated assessment criteria.

Treatment and controls indicated for the proposed development to comply with the nominated assessment criteria are shown in Section 6.1.5 - 6.1.6.

7 CONSTRUCTION NOISE AND VIBRATION ASSESSMENT

7.1.1 Construction Management Levels

7.1.1.1 Residential Receivers

Residential noise management levels are based on the "rating background noise level" ("**RBL**") applicable to the receivers. RBL's are typically determined by measuring the ambient noise environment using the methodology in the EPA NPfI. The measurements, analysis and RBL's determined for this project are summarised in Section 0.

The ICNG construction noise management levels are summarised in the following table, along with how they should be used to manage impacts.

Table 21 – Construction Noise Management Levels

Management Level $L_{Aeq,(15min)}$[1]	**How to Apply**
Noise affected Management Level ("**NML**") RBL + 10dB	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq\ (15\ min)}$ 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 75 dB(A)	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.

Notes:

1. Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence. Noise levels may be higher at upper floors of the noise affected residence.

7.1.1.2 Other Land Uses

For other land uses, the management levels are absolute noise levels, independent of the prevailing noise environment, so monitoring of the prevailing environment is not generally required for these uses. The ICNG construction noise management levels for uses other than residential dwellings are summarised in the following table.

Table 22 – Construction Noise Management Levels – Non-Residential Uses

Land Use	Management Level, $L_{Aeq\ (15min)}$ (applies for times when properties are being used)
Commercial and Retail Outlets	70 (external)[1]
Industrial Premises	75 (external)[1]
Other Businesses	Project by project basis, consider maximum noise level recommended in AS 2107 for similar occupancies.[1]
Classrooms at schools and other educational institutions	45 (Internal noise level)
Hospital wards and operating theatres	45 (Internal noise level)
Places of worship	45 (Internal noise level)
Active recreation areas (characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion)	65 (External noise level)
Passive recreation areas (characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation)	External noise level 60 dB(A)
Community centres	Depends on the intended use of the centre. Refer to the recommended 'maximum' internal levels in AS2107 for specific uses.

Notes:

1. Noise levels apply at the most affected occupied point of the premises. For other occupancies, noise levels are applied at the most affected point within 50m of the area boundary. Internal noise levels are assessed at the centre of an occupied room. Where internal noise levels cannot be measured, external noise levels may be used, with the equivalent external noise level determined using an appropriate external to internal noise reduction.

7.1.1.3 Project Specific Noise Management Levels

The project specific NML's for the most impacted receivers are summarised in the following table using the objectives tabled above and the adopted RBL's.

Table 23 – Noise Management Levels for Most Impacted Receivers

Receiver(s)	Usage	RBL ($L_{A90, 15min}$)	NML dB(A) L_{eq}	HANML dB(A) L_{eq}
R1	Residential	53	63	75
R2	Residential	53	63	75
R3	Mixed-Use	58	68	75
R4	Residential	53	63	75
R5	Mixed-Use	53	63	75
R6	Residential	53	63	75
R7	Residential	44	54	75
R8	Residential	44	54	75
R9	Residential	44	54	75
R10	Residential	44	54	75
R11	Residential	44	54	75
R12	Active Recreation	-	65	-

7.2 WORKS DESCRIPTION

The previous buildings on site have been demolished as of late 2025. Accordingly, demolition has not been assessed as part of this construction noise assessment. Indicative construction stages and equipment for the remaining works are shown in Table 24.

7.2.1 Source Noise Data

In this section, typical equipment/processes anticipated to be used during the construction of the project site are outlined in the table below with A-weighted sound power levels. The equipment list is prepared based on our experience with similar projects. Typically, the most significant sources of noise or vibration generated during a construction project will be demolition and excavation.

Table 24 – Sound Power Levels of Equipment

Equipment /Process	Typical Sound Power Level dB(A)
Bulk Excavation	
30t Excavator with hydraulic hammer	122[3]
30t Excavator	110[3]
Truck	110
Piling & Retention	
Bored Piling Rig	112
Anchoring/shotcrete	110
Franna Crane	98[2]
Construction Stage	
Tower Crane	113[2]
Concrete Pump	110
Concrete Truck	110
Trucks	110
Powered Hand Tools (Electric)	95[2]
Diesel Generator	103
Hoist	85

Notes:

1. *Equipment operating 25% of the time*
2. *Equipment operating 50% of the time*
3. *Equipment operating 75% of the time*

The noise levels presented in the above table are derived from the following sources, namely:

- On-site measurements.
- Table A1 of Australian Standard 2436-2010.
- Data held by this office from other similar studies.

Noise levels take into account correction factors (for tonality, intermittency where necessary).

7.2.2 Proposed Hours of Work

According to the *'Acoustic and Vibration Management'* Section of the currently approved MP09_0146, condition D19 states the following regarding construction hours for noise-generating activities:

Condition D19
The development is to be constructed to meet the requirements the following construction noise requirements: c) Time Restrictions Monday to Friday 07:00am to 06:00pm Saturday 07:00am to 01:00pm No Construction to take place on Sundays or Public Holidays

It is envisaged that construction scope and staging would be further refined in subsequent stages of the development approval and documented (along with additional impacts or considerations) within a *Construction Environmental Management Plan*.

7.2.3 Methodology

Noise from the loudest typical construction activities for all stages of works have been predicted to the nearest most affected sensitive receivers.

Predictions take into account:

- The distance between the noise source and the receiver.
- The screening effect provided by any building structure or building shell, if applicable. In particular, noise from works proposed during the fit-out stages when the building shell will screen these activities from the surrounding sensitive receivers.

7.2.4 Predicted Noise Impacts

Construction noise emissions to nearest development depend on the activities being undertaken at the time, and where on the site the activities occur.

Worst-case noise levels of equipment at the surrounding receivers have been predicted based on the following inputs.

- The plant sound power levels indicated in these have been corrected for estimated typical operation duty indicated in the table using 10 x log(% duty/100).
- Corrections for source to receiver distance attenuation.
- Barrier or directivity attenuation where present.
- Source heights – 1m above the ground/building level of the noise source location, unless noted otherwise.

The maximum predicted noise levels for each construction scenario for each noise catchment area are presented in Table 25.

Table 25 – Worse-Case Predicted Construction Noise Impacts (Scenario 1 – Bulk Excavation)

Receiver	Usage	Predicted Level dB(A) L_{eq}	Construction Noise Management Level dB(A) L_{eq}	Highly Affected Noise Management Level dB(A) L_{eq}
R1	Residential	70-78	63	75
R2	Residential	75-85	63	75
R3	Mixed-Use	67-79	68	75
R4	Residential	77-86	63	75
R5	Mixed-Use	77-87	63	75
R6	Residential	75-86	63	75
R7	Residential	85-87	54	75
R8	Residential	84-87	54	75
R9	Residential	85-87	54	75
R10	Residential	70-85	54	75
R11	Residential	67-69	63	75
R12	Active Recreation	71-92	65	-

Table 26 – Worse-Case Predicted Construction Noise Impacts (Scenario 2 – Piling & Retention)

Receiver	Usage	Predicted Level dB(A) L_{eq}	Construction Noise Management Level dB(A) L_{eq}	Highly Affected Noise Management Level dB(A) L_{eq}
R1	Residential	65-70	63	75
R2	Residential	68-75	63	75
R3	Mixed-Use	60-71	68	75
R4	Residential	69-78	63	75
R5	Mixed-Use	74-80	63	75
R6	Residential	69-78	63	75
R7	Residential	77-78	54	75
R8	Residential	73-79	54	75
R9	Residential	72-77	54	75
R10	Residential	62-74	54	75
R11	Residential	60-62	63	75
R12	Active Recreation	63-84	65	-

Table 27 – Worse-Case Predicted Construction Noise Impacts (Scenario 3 – Construction Stage)

Receiver	Usage	Predicted Level dB(A) L_{eq}	Construction Noise Management Level dB(A) L_{eq}	Highly Affected Noise Management Level dB(A) L_{eq}
R1	Residential	62-70	63	75
R2	Residential	68-77	63	75
R3	Mixed-Use	60-71	68	75
R4	Residential	70-78	63	75
R5	Mixed-Use	70-81	63	75
R6	Residential	60-79	63	75
R7	Residential	74-79	54	75
R8	Residential	70-80	54	75
R9	Residential	71-77	54	75
R10	Residential	63-75	54	75
R11	Residential	60-62	63	75
R12	Active Recreation	64-85	65	-

7.2.5 Discussion of Predicted Results

The analyses indicates that noise emissions are expected to exceed the recommended construction noise levels during all construction stages. Assessing mitigation for general construction activities is presented in Section 8.

Noise impacts on nearby development will be dependent on the activity and where on the site the activity is undertaken. Piling works are the loudest activity in this assessment. Work close to the site boundaries will have the greatest impact on nearby receivers.

Noise impacts can be minimised using the following:

- Selection of equipment and process.
- Location of static plant.
- Use of screens or enclosures and erection of hoarding (typically only feasible for static plant).
- Scheduling of noisy activities and provision of respite periods.
- During preparation of the construction program (CC stage), acoustic review of proposed construction activities and plant/methods should be undertaken to identify work items likely to exceed Noise Management Levels.
- For those activities likely to generate high noise levels, the analysis should identify where on the site are the areas likely to result in high noise levels. This will then assist in determining the likely time period for which high noise levels will occur.
- Identify feasible acoustic controls or management techniques (use of screens, scheduling of noisy works, notification of adjoining land users, respite periods) when excessive levels may occur.
- For activities where acoustic controls and management techniques still cannot guarantee compliant noise levels, implement a notification process whereby nearby development is made aware of the time and duration of noise intensive construction processes.

Through adoption of the above, noise impacts on nearby development can be suitably managed to prevent excessive impact.

7.3 CONSTRUCTION VIBRATION ASSESSMENT

7.3.1 Construction Vibration Objectives

7.3.1.1 Amenity Management

Vibration goals for the amenity of nearby land users are those recommended by the EPA document *Assessing Vibration: A technical guideline*. These levels (extracted from Tables 2.2 and 2.4 of the guideline) are presented in the following table for various types of vibration:

Table 28 – (Table 2.2 Assessing Vibration: A Technical Guideline) – Preferred and Maximum Weighted RMS Values for Continuous and Impulsive Vibration Acceleration (m/s2) 1-80Hz

Location	Assessment Period [1]	Preferred values		Maximum Values	
		z-axis	x- and y-axes	z-axis	x- and y-axes
Continuous Vibration					
Residences	Daytime	0.010	0.0071	0.02	0.014
	Night-time	0.007	0.005	0.014	0.010
Offices, schools, educational institutions and places of worship	Day or night-time	0.020	0.014	0.040	0.028
Workshops	Day or night-time	0.04	0.029	0.080	0.058
Impulsive Vibration					
Residences	Daytime	0.30	0.21	0.60	0.42
	Night-time	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
Workshops	Day or night-time	0.64	0.46	1.28	0.92

NOTE:

1. Daytime is 7:00am to 10:00pm and night-time is 10:00pm to 7:00am.
2. Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. There may be cases where sensitive equipment or delicate task require more stringent criteria than the human comfort criteria specified above. Stipulation of such criteria is outside the scope of this policy, and other guidance documents (e.g. relevant standards) should be referred to. Source: BS6472-1992.

Table 29 – (Table 2.4 Assessing Vibration: A technical guideline) – Acceptable Vibration Dose Values for Intermittent Vibration (m/s1.75)

Location	Daytime[1]		Night-time[1]	
	Preferred value	Maximum Value	Preferred value	Maximum Value
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
Workshops	0.80	1.60	0.80	1.60

NOTE:

1. Daytime is 7:00am to 10:00pm and night-time is 10:00pm to 7:00am.
2. Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. These criteria are only indicative, and there may be a need to assess intermittent values against the continuous or impulsive criteria for critical areas. Source: BS6472-1992.

7.3.1.2 Structure Borne Vibration (Damage Criteria)

German Standard DIN 4150-3 (2016) provides a guideline for acceptable levels of vibration velocity in building foundations, to assess the effects of vibration on structures. The table give guidance on the maximum accepted values of velocity at the foundation and in the plane of the highest floor of various types of buildings, to prevent any structural damage.

The table following lists the peak particle velocity, which is the maximum absolute value of the velocity signals for the three orthogonal components. This is measured as a maximum value of any of the three orthogonal component particle velocities when measured at the foundation, and the maximum levels measured in the x- and y-horizontal directions in the plane of the floor of the uppermost storey.

It is noted that if measured vibration levels do not exceed the guidelines listed in the following table, damage that will reduce the serviceability of the building will not occur, and if damage to the building does occur, it is assumed that the damage is related to other causes. Furthermore, the DIN4150-3 guideline states the following regarding the limits presented in Table 1 of the standard:

"Exceeding the guideline values does not necessarily lead to damage. Should they be exceeded, however, further investigations may be necessary, such as determining and evaluating the stresses as detailed in 4.3 and 4.4.".

Table 30 – Table 1 – DIN 4150-3 (2016)) – Guideline Values for Vibration Velocity, $v_{i,max}$, for Evaluating the Effects of Short-Term Vibration on Structures

	TYPE OF STRUCTURE	Guideline values for $v_{i,max}$ in mm/s				
		Foundation, all directions, i = x, y, z, at a frequency of			Topmost floor, horizontal direction, i = x, y	Floor slabs, vertical direction, i = z
		1Hz to 10Hz	10Hz to 50Hz	50Hz to 100Hz [(a)]	All Frequencies	All Frequencies
L/C	1	2	3	4	5	6
1	Buildings used for commercial purposes, industrial buildings, and buildings of similar design	20	20 to 40	40 to 50	40	20
2	Residential buildings and buildings of similar design and/or occupancy	5	5 to 15	15 to 20	15	20
3	Structures that, because of their particular sensitivity to vibration, cannot be classified under lines 1 and 2 **and** are of great intrinsic value (e.g. listed buildings) buildings that are under a preservation order)	3	3 to 8	8 to 10	8	20[(b)]

NOTE:

Even if guideline values as in line 1, columns 2 to 5, are complied with, minor damage cannot be excluded.

a. At frequencies above 100 Hz, the guideline values for 100 Hz can be applied as minimum values.

b. b It may be necessary to lower the guideline value markedly to prevent minor damage

7.3.2 Vibration Sources

Piling, vibratory rollers and the hydraulic hammer have been identified as potentially producing significant ground vibration. The remaining activities are not expected to produce significant ground vibration and/or are sufficiently separated from sensitive receivers. Vibration from these activities is expected to be significantly below amenity or damage risk management levels at all receivers.

7.3.3 Assessment of Vibration

A precise assessment of vibration emissions from the proposed works is not possible due to the large number of unknowns including the actual equipment employed, how it is operated, site conditions, etc.

In the absence of any specific equipment the generic minimum safe working distances presented in Table 31 should be used with caution for guidance. It is noted that the vibrating roller distances are based on asphalting road works and are not applicable to earthworks as the vibration frequencies are considerably lower leading to a greater safe-work distance requirement. Empirical formulae by Hiller and Crabb will be used in lieu.

Should the types and models of the plant and equipment be available then vibration levels may be predicted at the nearest and most affected receivers by using the published generic formulae, source levels or historical data as found in:

- BS 5228-2:2009+A1:2014
- ISO 4866:2010
- FTA Transit Noise and Vibration Impact Assessment Manual (2018)
- Caltrans Transportation and Construction Vibration Guidance Manual (2020)
- Construction Vibrations 2nd Edition (Dowding, 2000)

Regardless of the method used site vibration levels from machinery and processes should be verified on site as soil conditions may be different from the basis sources.

The assessment of building and soil settlement or the liquefaction of soils under induced vibration is outside the scope of typical vibration standards such as DIN 4150-3 and expert advice is to be sought from a Geotechnical Engineer.

8 MITIGATION MEASURES

8.1 NOISE AND VIBRATION MANAGEMENT PLAN

The project specific noise and vibration management plan should be implemented to manage noise and vibration impacts. The Plan should be revised as the works proceed in response to changing or latent conditions and to incorporate the results of additional analysis, monitoring or modified work practices implemented to minimise impacts.

The management plan has been prepared in accordance with ICNG guideline and includes:

- Identification of sensitive receivers and applicable noise and vibration management levels
- A description of the main noise or vibration producing activities, processes and equipment that will be employed and an indicative construction programme.
- Proposed construction hours.
- A prediction of likely noise/vibration levels at the most impacted receivers.
- The assessment and recommendation of mitigation methods to be applied where the predicted levels exceed the management levels, as indicated below.
- A monitoring plan including the type and extent of monitoring, reporting procedures.
- Recommended management procedures including complaints handling, response to monitoring exceedances, reporting, site training, etc.
- Community liaison.

8.2 NOISE AND VIBRATION MONITORING, REPORTING AND RESPONSE PROCEDURES

Noise and vibration monitoring may either consist of manned and/or unmanned measurements. Active monitoring may be undertaken during the construction work phase of the project if required in the event complaints are received from neighbours.

In the event that complaints are received from neighbours the following process should be considered:

1. Assessing impacts and determining the offending plant/equipment/process and.
2. Locating the plant/equipment/process further away from the affected receiver(s) if possible.
3. Implementing additional acoustic treatment in the form of localised barriers, silencers etc.
4. Selecting alternative equipment/processes

Where monitoring is required and indicates exceedances of the predicted noise impacts immediate action should be taken to identify any further controls as required to reduce noise emissions so that the noise limits are complied with. Monitoring of the activities following the implementation of these additional controls will be undertaken to confirm compliance.

8.2.1 Reporting Requirements

The following is an example of reporting which may be kept on site;

1. A register of complaints received/communication with the local community shall be maintained and kept on site with information as detailed below.
2. Where noise/vibration complaints require noise/vibration monitoring, results from monitoring shall be retained on site at all times.
3. Any noise exceedances occurring including, the actions taken and results of follow up monitoring.
4. A report detailing complaints received and actions taken shall be presented.
5. All monitoring and reporting shall be conducted in conjunction with the conditions of consent.

8.2.2 Response Procedures

Complaints associated with noise and vibration generated by site activities shall be recorded on a Noise Complaint Form. The person(s) responsible for complaint handling and contact details for receiving of complaints shall be established on site prior to construction works commencing. A sign shall be displayed at the site indicating the Site Manager and the general public and their contact telephone number

If a noise complaint is received the complaint should be recorded on a Noise Complaint Form. The complaint form may list:

- The name and address of the complainant (if provided).
- The time and date the complaint was received.
- The nature of the complaint and the time and date the noise was heard.
- The name of the employee who received the complaint.
- Actions taken to investigate the complaint, and a summary of the results of the investigation.
- Indicate what operations were occurring on site at the time of the complaint.
- Required remedial action, if required
- Validation of the remedial action.
- Summary of feedback to the complainant.

8.3 NOISE AND VIBRATION MANAGEMENT AND CONTROL

The flow chart that follows illustrate the process followed to assess construction activities prior to the start of work on site, and for the ongoing investigation of noise and vibration impacts during the construction period.

8.3.1 General Noise Control Methods

The determination of appropriate additional noise control measures will be dependent on the particular activities and the construction equipment and plant identified as requiring future acoustic treatments to those already identified in this report. This section provides an outline of available methods which have previously been used on similar construction sites and may be possible on this site.

8.3.1.1 Selection of Alternate Appliance or Process

Where a particular activity or plant and equipment is found to generate noise levels that exceed the management levels, it may be possible to select an alternative approach or plant and equipment. For example; the use of excavator mounted hydraulic hammers of the site may potentially generate high levels of noise. By carrying this activity by using concrete saws or smaller plant here practical, construction noise levels and/or length of exposure to construction noise levels may be reduced.

8.3.1.2 Acoustic Barriers

The placement of barriers at the source is generally only effective for static plant. Placing barriers at the source cannot effectively attenuate equipment which is on the move or working in rough or undulating terrain.

The degree of noise reduction provided by barriers is dependent on the amount by which the line of sight can be blocked by the barrier. If the receiver is totally shielded from the noise source reductions of up to 15 dB(A) can be affected. Where only partial obstruction of line of sight occurs, noise reductions of 5 to 8 dB(A) may be achieved. Where the barrier does not obstruct line of sight, generally no noise reduction will occur.

Barriers are used to provide shielding and do not act as an enclosure. The material they are constructed from should have a noise reduction performance which is approximately 10dB(A) greater than the maximum reduction provided by the barrier screening. In this case, the use of a material such as 15mm plywood (or equivalent material) would be acceptable for the barriers.

8.3.1.3 Silencing Devices

Where construction methodologies or plant and equipment permit, investigate the use of silencing devices. These may take the form of engine shrouding, or special industrial silencers fitted to exhausts, for example.

8.3.1.4 Treatment of Specific Equipment

In certain cases, it may be possible to specially treat a piece of equipment to dramatically reduce the sound levels emitted.

8.3.1.5 Establishment of Site Practices

This involves the formulation of work practices to reduce noise generation. This includes, for example, investigating the possibility of locating fixed plant items as far as possible from residents, rotating plant and activities to provide respite to receivers, scheduling activities after the construction of buildings that will screen receivers, avoiding noise sensitive periods for receivers, identify “safe” working distances, etc.

8.3.1.6 Vibration Management

The following principles should be considered to manage adverse vibration impacts identified:

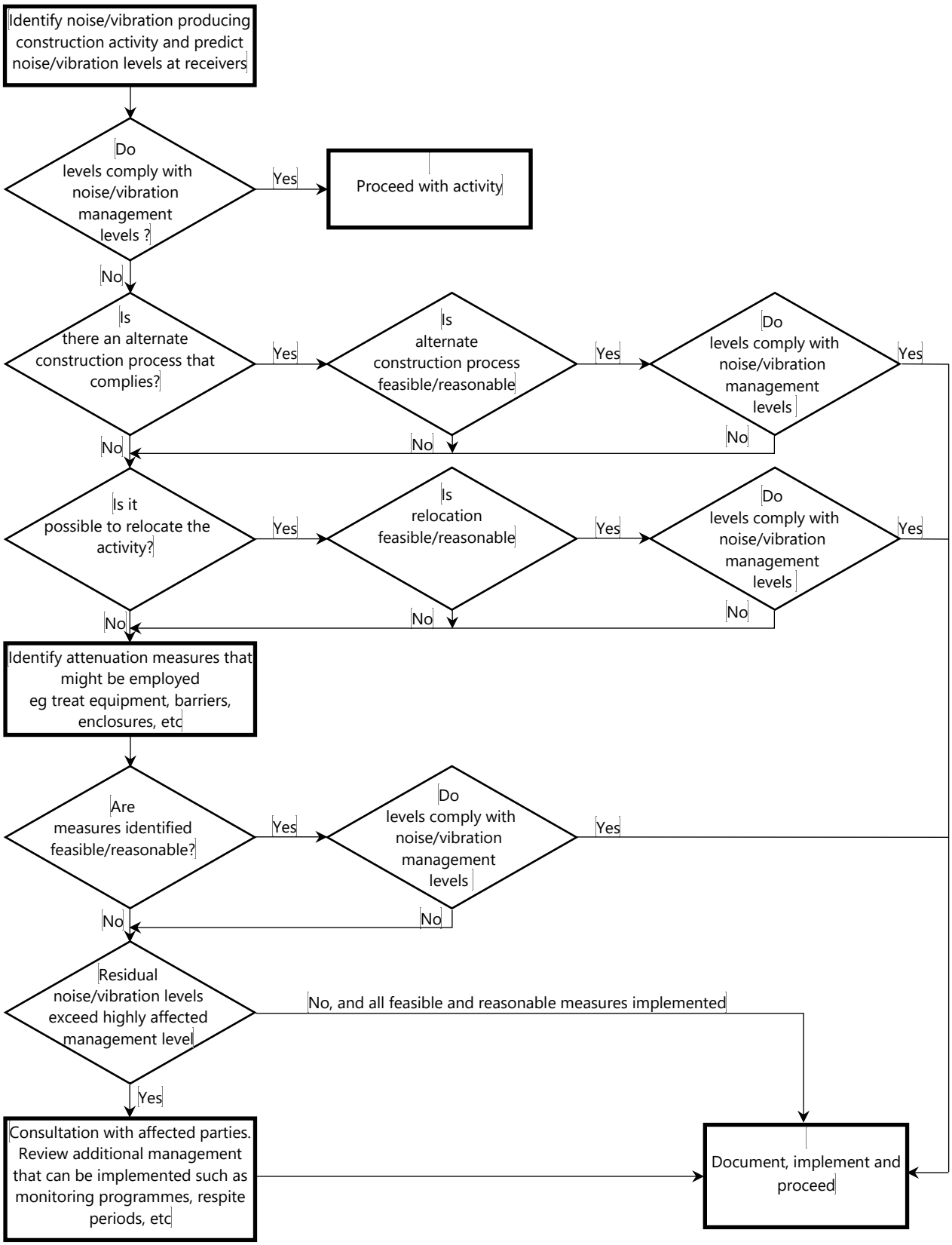
- Obtaining separate structural or specialist advice for critical or fragile structures as to the level of damage risk.
- Selection of processes that minimise structure and ground vibration – generally avoiding percussive methods.
- Use smallest plant that is able to efficiently undertake the work activity.
- Lay vibration absorbing mats to cushion impacts from falling debris.
- Application of vibration dampening pads to metal surfaces subject to impacts.
- When demolishing, cut control joints in structures to form vibration "breaks", or work away from sensitive receiver locations to form natural vibration breaks in propagation path.
- Monitoring of structures using attended and/or unattended monitors with alarms.
- Time scheduling works to minimise amenity impacts.
- Communicating with affected receivers.
- Identify "safe" working distances to sensitive receivers/structures for various activities by conducting site simulation tests and limiting activities within those distances to those that are not likely to exceed vibration goals. Vary locations/equipment/techniques used as determined by the simulation testing. The following table provides an initial guide to working distances that should be confirmed by site measurement.

Table 31 – Recommended Base Minimum Working Distances for Vibration Intensive Plant From Sensitive Receivers

Plant item	Rating / Description	Minimum Working Distance			
		Cosmetic Damage			Human Response
		Light-Framed Structure (BS 7385)	Residential Structures (DIN 4150)	Heritage and Other Sensitive Structures (DIN 4150)	NSW EPA's Vibration Guideline
Vibratory Roller	< 50 kN (Typically 1-2 tonnes)	5 m	18.5	14 m	15m
	< 100 kN (Typically 2-4 tonnes)	6 m	17.8	16 m	20 m
	< 200 kN (Typically 4-6 tonnes)	12 m	43	33 m	40 m
	< 300 kN (Typically 7-13 tonnes)	15 m	51.5	41 m	100 m
	> 300 kN (Typically 13-18 tonnes)	20 m	-	54 m	100 m
	> 300 kN (> 18 tonnes)	25 m	-	68 m	100 m
Small Hydraulic Hammer	(300 kg - 5 to 12t excavator)	2 m	-	5 m	7 m
Medium Hydraulic Hammer	(900 kg – 12 to 18t excavator)	7 m	-	19 m	23 m
Large Hydraulic Hammer	(1600 kg – 18 to 34t excavator)	22 m	-	60 m	73 m
Vibratory Pile Driver	Sheet piles	20 m	-	50 m	100 m
Pile Boring	≤ 800 mm	2 m (nominal)	-	5 m	7 m
Jackhammer	Hand held	1 m (nominal)	-	2 m	3 m
Profiler	Wirtgen W210	4 m	-	-	-
Asphalt Paver	Vogele Super 1800-3	1 m	-	-	-
Steel Drum Roller	Hamm HD70 (Oscillating Mode)	2 m	-	-	-
Steel Drum Roller	Hamm HD70 (Static Mode)	1 m	-	-	-

8.3.1.7 Notification

Notification of affected receivers of the progress of works, particularly when short-term activities likely to create higher noise levels occur, can in many cases minimise community reaction.



Noise and Vibration Management Flow Chart

9 SUMMARY OF MITIGATION

A summary of recommended mitigation measures in presented in Table 32.

Table 32 – Summary of Mitigation Measures

Stage	Mitigation Measure	Report Section
Design	To control operational noise emission from the proposed development the following mitigation measures are proposed: • Acoustic design to be undertaken during CC for all mechanical plant to be installed and appropriate acoustic treatments incorporated, where required, to meet the noise emission objectives presented in Section 0. • Acoustic treatment to the soffit of the loading dock entry/exit. • Acoustic barrier design and specifications to surround the childcare outdoor play area are to be confirmed at detailed design stage.	4
Design	To control traffic noise intrusion to the proposed development the following mitigation measures are proposed: • Appropriate building envelope construction including minimum glazing thicknesses as outlined in Section 6.1.5 and 6.1.6 of this report. • Provision of alternative ventilation as outlined in Section 0 of this report.	6
Construction	Quiet work methods/technologies • As much as practical, use of quieter excavation methods should be adopted such as ripping, and slow pressure and speed of boring drill if ground conditions permit. • Excavation is to be conducted through the use of an excavator with a bucket where feasible as this would be the quietest excavation method. Ripping techniques should also be adopted when operating close to structures in the event that vibration management levels are exceeded. • Concrete pump trucks should generally be located within the bounds of the site.	8.1, 8.2 & 8.3

Stage	Mitigation Measure	Report Section
Construction	For the activities identified as potentially exceeding recommended construction noise levels, the most effective mitigation investigation strategy is likely to be: • Select the quietest plant/activity available (or retrofit acoustic treatment to the plant such as residential class mufflers) to minimise any risk of exceeding the recommended construction noise levels. • If any residual exceedances, investigate the use of additional barriers to screen the affected receivers. Barriers should be constructed (or otherwise provided using site sheds, hoardings, etc) along the eastern and western boundary of the site. The barriers should be generally imperforate and constructed of plywood, or other similar material. It is noted it may not be practical to install a barrier to the site access gate to the site. If any remaining residual significant exceedances, investigate time restrictions (e.g. avoiding loud early morning works at the residences) and respite periods and notify affected receivers when works likely to exceed the recommended construction noise levels is likely to occur.	8.1, 8.2 & 0
Construction	Contractors/sub-contractors should be made aware of the requirements to minimise noise and vibration emissions and other requirements of the Project Construction Noise and Vibration Management Plan and include allowances in their methodologies, management, costs, etc in their tender.	8.1, 8.2 & 8.3

10 CONCLUSION

This report summarises the potential noise and vibration impact undertaken for the proposed development. Construction impacts have been assessed.

Noise emissions have been assessed with reference to the requirements of the following documents:

- NSW Environmental Protection Authority document – "*Noise Policy for Industry (NPfI) 2017"*.
- NSW Environmental Protection Authority document – "*Road Noise Policy (2011)."*
- NSW Environmental Protection Authority document – *"Interim Construction Noise Guideline"*

With the provision of acoustic mitigation measures outlined in this report, noise emission from the operation of plant within the proposed development will comply with the project noise objectives established in accordance with the above documents.

Noise and vibration emissions during construction should be assessed and managed in accordance with the EPA "Interim Construction Noise Guideline", as indicated in Section 0 of this report.

We trust this information is satisfactory. Please contact us should you have any further queries.

Yours faithfully,

Acoustic Logic Pty Ltd
Grace Wright

APPENDIX A – ABBREVIATIONS AND DEFINITIONS

The following abbreviations and definitions are used in this noise impact assessment.

dB	Decibels - unit for the measurement of sound
dB(A)	A-weighted decibels. Unit of measurement for broadband sound with the A-frequency weighting applied to approximate human loudness perception to sounds of different pitch.
L_{eq}	Energy, time averaged sound level
L_{max}	Maximum sound pressure level, fast response
L_{90}	Sound level exceeded for 90% of the measurement period
R_w	Frequency weighted sound reduction index.
NRC	Average absorption co-efficient for the octave bands with centre frequencies of 250Hz to 2 kHz inclusive.
Day	For noise emissions assessment - the period from 7 am to 6 pm (Monday to Saturday) and 8 am to 6 pm (Sundays and public holidays). For transportation noise - the period from 7 am to 10 pm
Evening	Refers to the period from 6 pm to 10 pm.
Night	The period from 10 pm to 7 am (Monday to Saturday), and 10 pm to 8 am (Sundays and public holidays). For transportation noise - the period from 10 pm to 7am
Project Trigger Level	Target receiver noise levels for a particular noise-generating facility.
Assessment Background Level (ABL)	A-weighted background noise level representative of a single period. (Calculated in accordance with NPfI unless noted otherwise)
Rating Background Level (RBL)	The overall, single-figure A-weighted background level representing each assessment period (day/evening/night) over the whole monitoring period. (Calculated in accordance with NPfI unless noted otherwise)

APPENDIX B – ENVIRONMENTAL NOISE EMISSION TARGETS

Project specific assessment trigger levels have been determined for each noise source applying at the identified potentially most impacted receivers.

B.1 NPFI TRIGGER LEVELS

The NPfI requires noise impacts at residential receivers to be assessed in 3 ways:

- Whether the emitted noise is unreasonably loud relative to ambient background noise. (which the EPA calls the "intrusiveness" trigger level).
- Whether the noise emitted is unreasonably loud in an absolute sense, and consistent with surrounding land use and environment. ("amenity" trigger level)
- For night noise emissions, whether discrete noise events are likely to adversely impact sleep ("maximum noise level" trigger levels).

For other receiver types only the amenity trigger level is relevant.

B.2 INTRUSIVENESS

The $L_{eq,15min}$ descriptor is used for the intrusiveness trigger level, and is set at a level that is 5dB(A) above the rating background noise level.

B.3 AMENITY

Table 2.2 of the NPfI (repeated below) sets out acceptable noise levels for various receiver types.

There are 3 categories of residential receivers - rural, suburban, urban. The nearest residential receivers to the subject site are categorised as "urban" receivers. Categories for non-residential uses are also indicated in the table.

The NPfI typically requires project amenity noise levels to be calculated in the following manner:

$$L_{Aeq,15min} = \textit{Recommended Amenity Noise Level} - 5\ dB(A) + 3\ dB(A)$$

NPfI Table 2.2: Amenity Noise Levels			
Receiver	*Noise Amenity Area*	*Time of Day*	*Recommended Amenity Noise Level L_{Aeq}*
Residential	*Rural*	*Day*	*50*
		Evening	*45*
		Night	*40*
	Suburban	*Day*	*55*
		Evening	*45*
		Night	*40*
	Urban	*Day*	*60*
		Evening	*50*
		Night	*45*
Hotels motels caretakers' quarters holiday accommodation permanent resident caravan parks	*See column 4*	*See column 4*	*5 dB(A) above the recommended amenity noise level for a residence for the relevant noise amenity area and time of day*
School classroom – internal	*All*	*Noisiest 1-hour period when in use*	*35 (see notes for table)*
Hospital ward internal external	*All* *All*	*Noisiest 1-hour* *Noisiest 1-hour*	*35* *50*
Place of worship – internal	*All*	*When in use*	*40*
Area specifically reserved for passive recreation (e.g. national park)	*All*	*When in use*	*50*
Active recreation area (e.g. school playground golf course)	*All*	*When in use*	*55*
Commercial premises	*All*	*When in use*	*65*
Industrial premises	*All*	*When in use*	*70*
Industrial interface (applicable only to residential noise amenity areas)	*All*	*All*	*Add 5 dB(A) to recommended noise amenity area*

NOTE:

The recommended amenity noise levels refer only to noise from industrial sources. However, they refer to noise from all such sources at the receiver location, and not only noise due to a specific project under consideration. The levels represent outdoor levels except where otherwise stated.

Types of receivers are defined as follows:

- Rural residential – see Table 2.3
- Suburban residential – see Table 2.3
- Urban residential – see Table 2.3
- Industrial interface – an area that is in close proximity to existing industrial premises and that extends out to a point where the existing industrial noise from the source has fallen by 5 dB or an area defined in a planning instrument. Beyond this region the amenity noise level for the applicable category applies. This category may be used only for existing situations (further explanation on how this category applies is outlined in Section 2.7)
- Commercial – commercial activities being undertaken in a planning zone that allows commercial land uses
- Industrial – an area defined as an industrial zone on a local environment plan; for isolated residences within an industrial zone the industrial amenity level would usually apply.

Time of day is defined as follows:

- 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 periods.

(These periods may be varied where appropriate, for example, see A3 in Fact Sheet A.)

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 $L_{Aeq(1hr)}$.

B.3.1 NOISE CHARACTERISTIC MODIFYING FACTORS

Where applicable, the emitted intrusive noise level should be modified (increased or decreased) to account for characteristics such as tonality, low frequency, duration, etc according to NPfI Fact Sheet C.

B.3.2 MAXIMUM NOISE LEVEL ASSESSMENT

The purpose of this assessment is to identify whether discrete, nighttime noise events have the potential to produce adverse sleep impacts.

Section 2.5 of NPfI recommends the following procedure to assess the potential for adverse sleep disturbance.

Where the subject development/ premises night-time noise levels at a residential location exceed:

- *$L_{eq(15min)}$ 40 dB(A) or the prevailing RBL (L_{90}) plus 5 dB, whichever is the greater, and/or*
- *L_{max} 52 dB(A) or the prevailing RBL (L_{90}) plus 15 dB, whichever is the greater,*

a detailed maximum noise level event assessment should be undertaken.

The detailed assessment should cover the maximum noise level, the extent to which the maximum noise level exceeds the rating background noise level, and the number of times this happens during the night-time period. Some guidance on possible impact is contained in the review of research results in the NSW Road Noise Policy.

Other factors that may be important in assessing the extent of impacts on sleep include:

- *how often high noise events will occur*
- *the distribution of likely events across the night-time period and the existing ambient maximum events in the absence of the subject development*
- *whether there are times of day when there is a clear change in the noise environment (such as during early-morning shoulder periods)*
- *current scientific literature available at the time of the assessment regarding the impact of maximum noise level events at night.*

Maximum noise level event assessments should be based on the L_{AFmax} descriptor on an event basis under 'fast' time response. The detailed assessment should consider all feasible and reasonable noise mitigation measures with a goal of achieving the above trigger levels.

B.3.3 SUMMARY NPFI TRIGGER LEVELS

The following table summarises the trigger levels applying at each of the identified "most impacted" receivers. These have been determined based on the NPfI methodology described above and the measured rating background noise levels.

Table 33 – Project Specific Noise Levels

Receiver(s)	Time of day	RBL ($L_{A90, 15min}$)	Intrusive Criteria ($L_{A90, 15min}$)	Project Amenity Noise Levels dB(A) $L_{eq(15min)}$	Project trigger noise level (L_{Aeq}) [2]	Max Event
R1-R2 R4-R6	Day	53	58	58	58	n/a
	Evening	47	52	48	48	n/a
	Night	45	50	43	43	50 L_{eq} 60 L_{max}
R3	Day	58	63	58	58	n/a
	Evening	51	56	48	48	n/a
	Night	41	46	43	43	46 L_{eq} 56 L_{max}
R7-R11	Day	44	49	53	49	n/a
	Evening	43	48	43	43	n/a
	Night	40	45	38	38	45 L_{eq} 55 L_{max}
Commercial	When in Use	-	-	65	65	n/a
Active Recreation (R12)	When in Use	-	-	55	55	n/a

Note:

1. *Day is defined as 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays.*
   Evening is defined as 6pm to 10pm Monday to Sunday and Public Holidays.
   Night is defined as 10pm to 7am Monday to Saturday and 10pm to 8am Sundays and Public Holidays.
2. *Project trigger noise levels are determined by taking the lowest of the intrusiveness criteria and project amenity noise levels.*

APPENDIX C – OPERATIONAL NOISE CONTOURS

19A Evans Avenue, Eastlakes

Mechanical Plant Operation

Prepared by: Grace Wright
Date: 29/05/2026

Noise Level
L_{eq}
in dB(A)

25 - 30
30 - 35
35 - 40
40 - 45
45 - 50
50 - 55
55 - 60
60 - 65
65 - 70
>= 70

ACOUSTIC LOGIC

19A Evans Avenue, Eastlakes

Carpark Operation (Day)

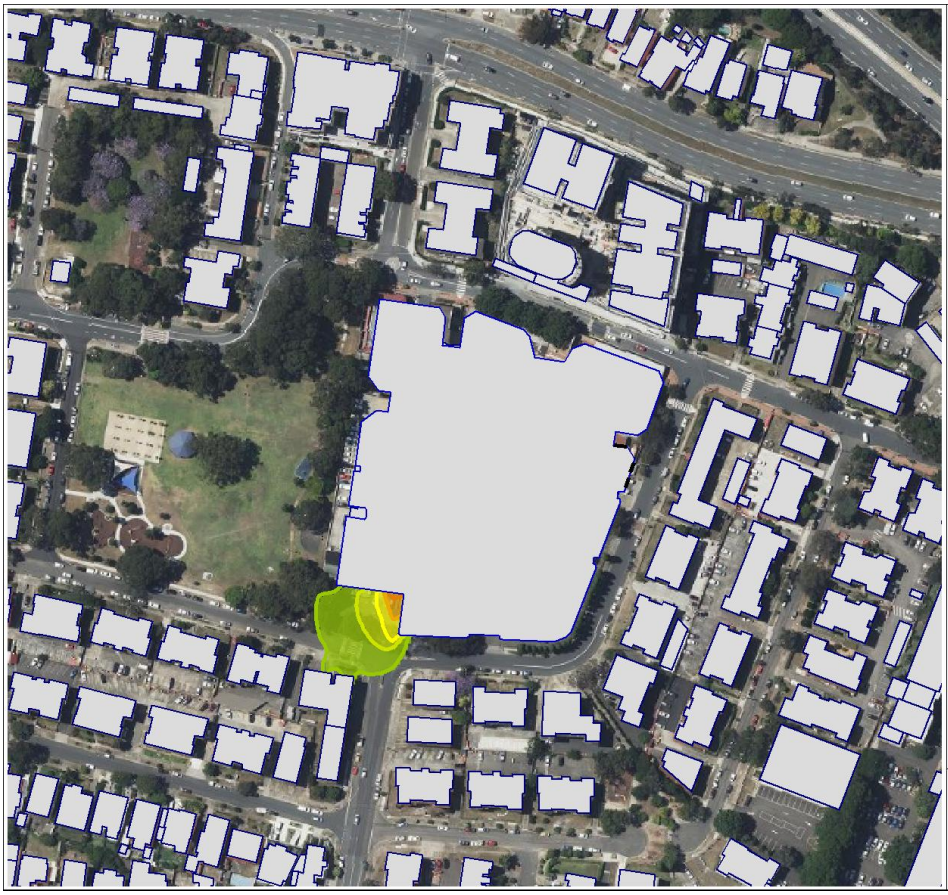
Prepared by: Grace Wright
Date: 28/05/2026

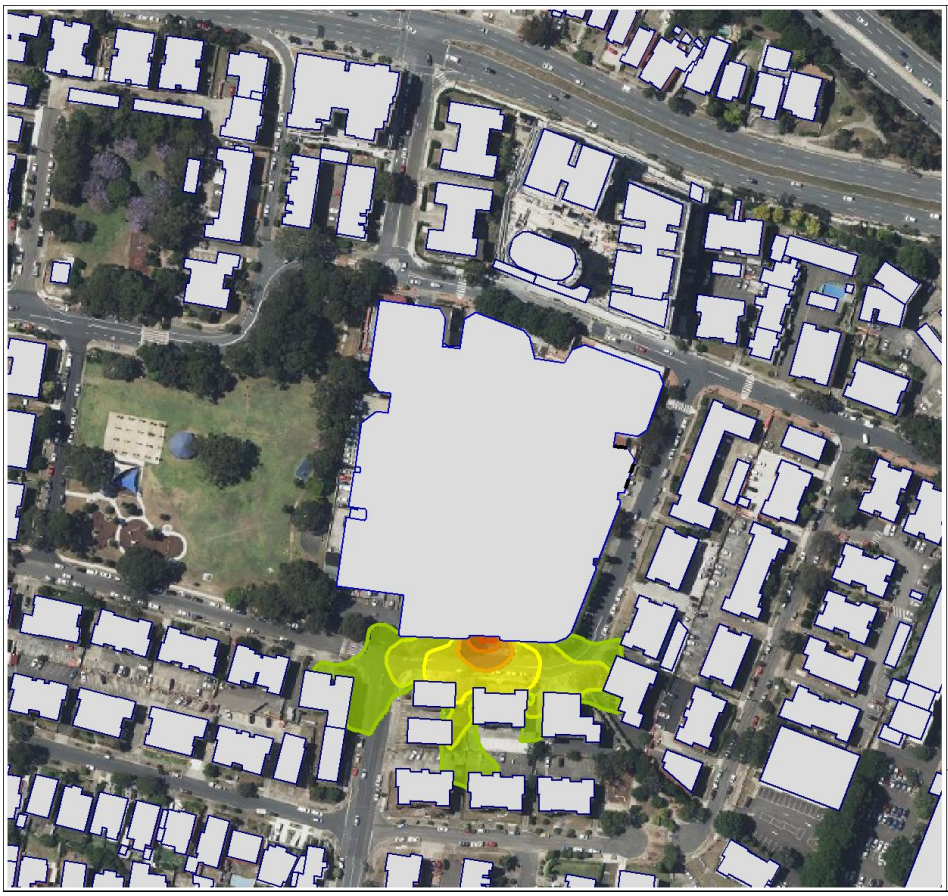
Noise Level
L_{eq}
in dB(A)

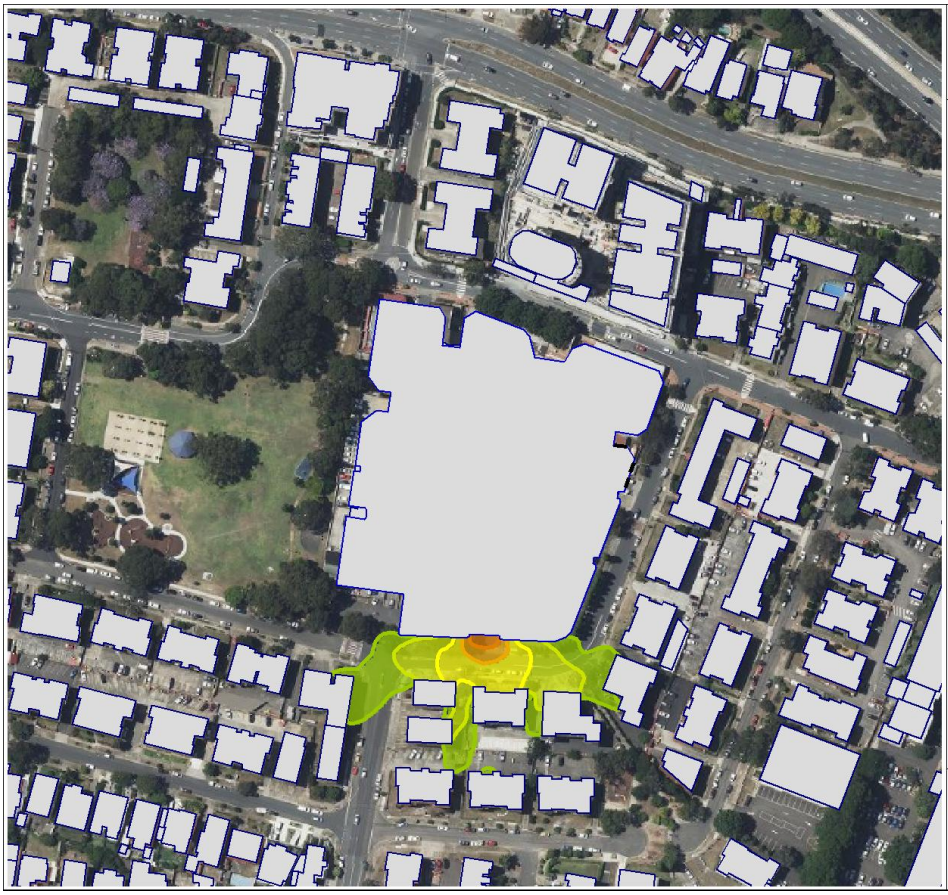
35 - 40
40 - 45
45 - 50
50 - 55
55 - 60
60 - 65
65 - 70
70 - 75
75 - 80
>= 80

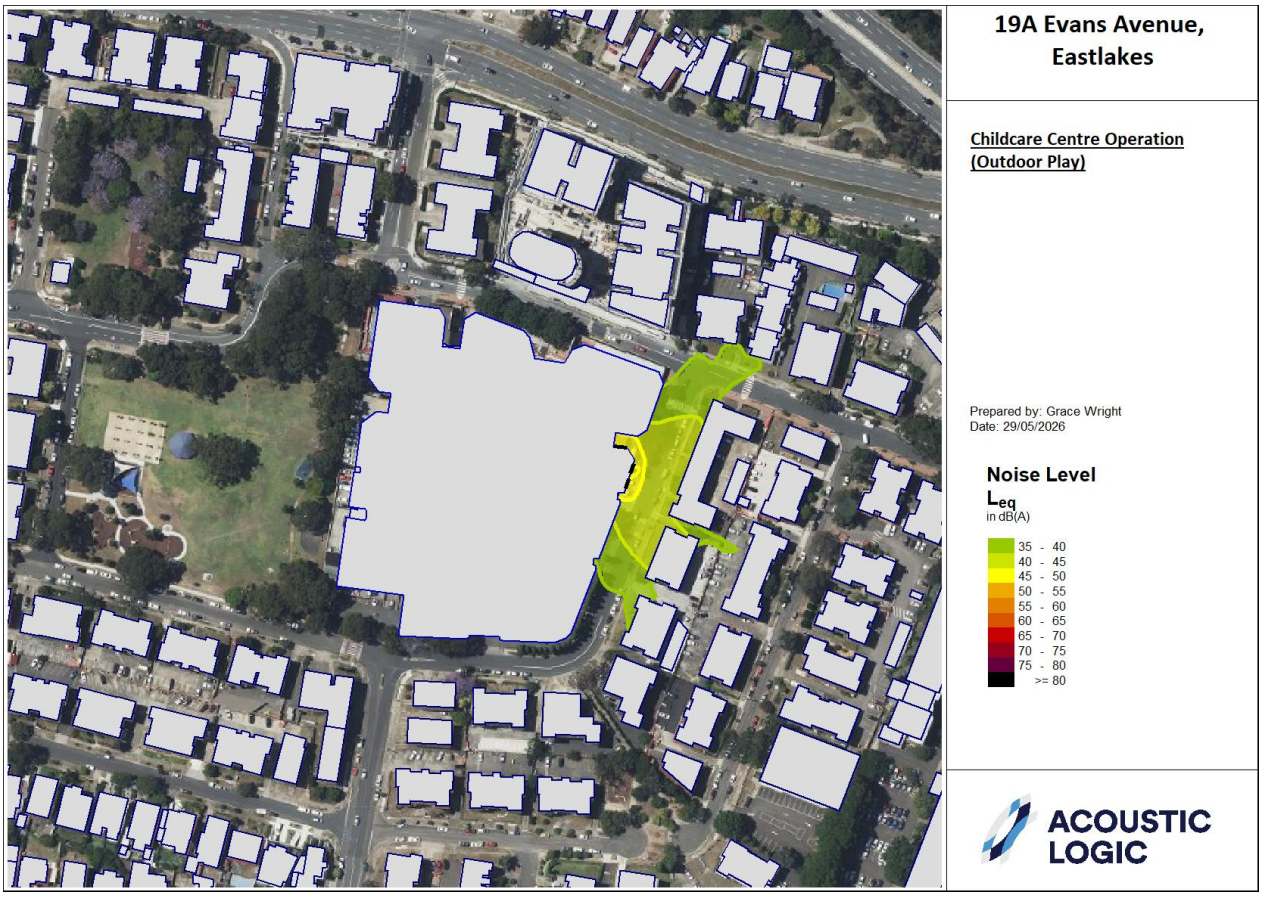
ACOUSTIC LOGIC


19A Evans Avenue,
Eastlakes
Carpark Operation (Evening)
Prepared by: Grace Wright
Date: 28/05/2026
Noise Level
Leq
in dB(A)
35 - 40
40 - 45
45 - 50
50 - 55
55 - 60
60 - 65
65 - 70
70 - 75
75 - 80
>= 80
ACOUSTIC
LOGIC

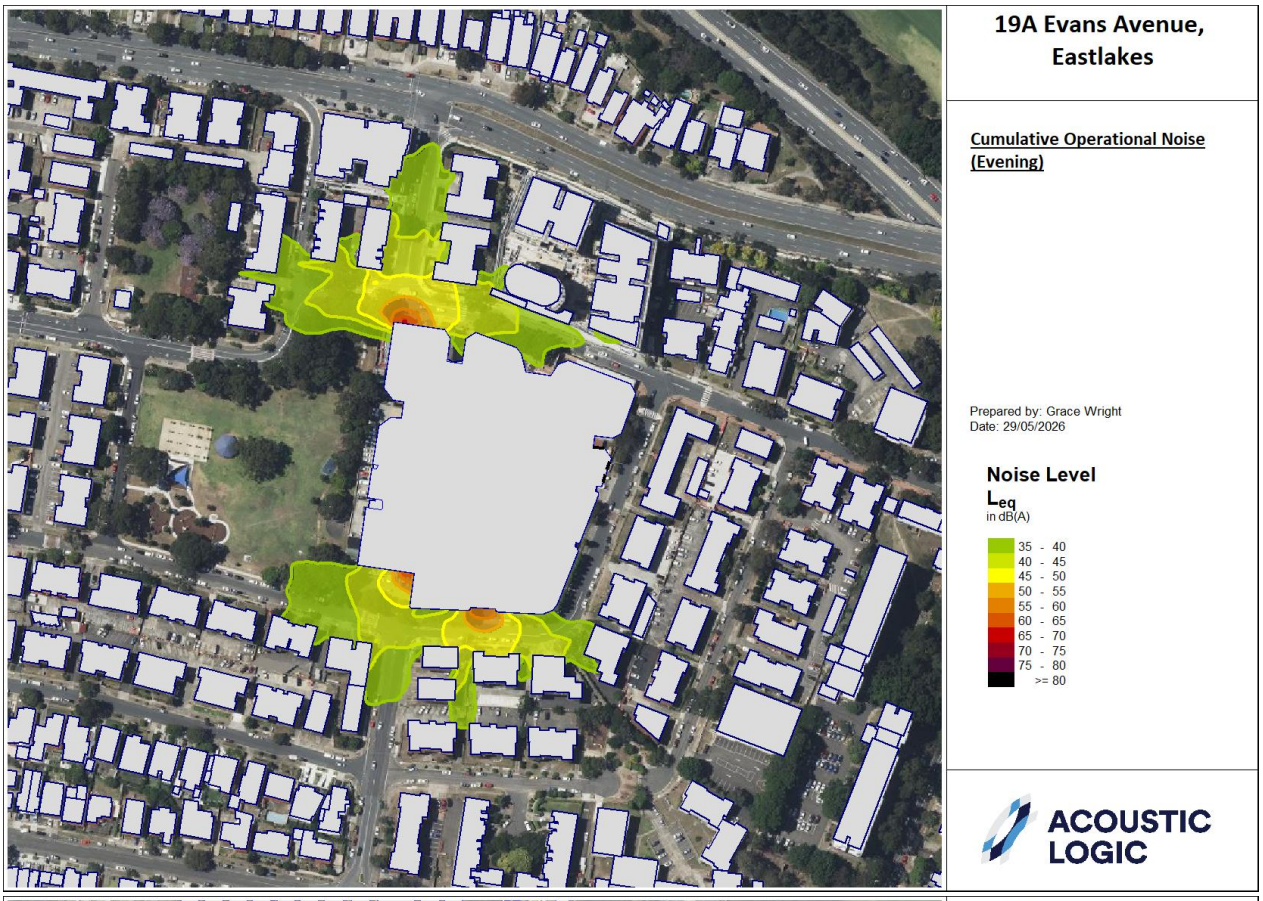

19A Evans Avenue,
Eastlakes
Carpark Operation (Night)
Prepared by: Grace Wright
Date: 28/05/2026
Noise Level
Leq
in dB(A)
35 - 40
40 - 45
45 - 50
50 - 55
55 - 60
60 - 65
65 - 70
70 - 75
75 - 80
>= 80
ACOUSTIC
LOGIC


19A Evans Avenue,
Eastlakes
Loading Dock Operation (Day)
Prepared by: Grace Wright
Date: 28/05/2026
Noise Level
Leq
in dB(A)
35 - 40
40 - 45
45 - 50
50 - 55
55 - 60
60 - 65
65 - 70
70 - 75
75 - 80
>= 80
ACOUSTIC
LOGIC


19A Evans Avenue,
Eastlakes
Loading Dock Operation (Evening)
Prepared by: Grace Wright
Date: 28/05/2026
Noise Level
Leq
in dB(A)
35 - 40
40 - 45
45 - 50
50 - 55
55 - 60
60 - 65
65 - 70
70 - 75
75 - 80
>= 80
ACOUSTIC
LOGIC

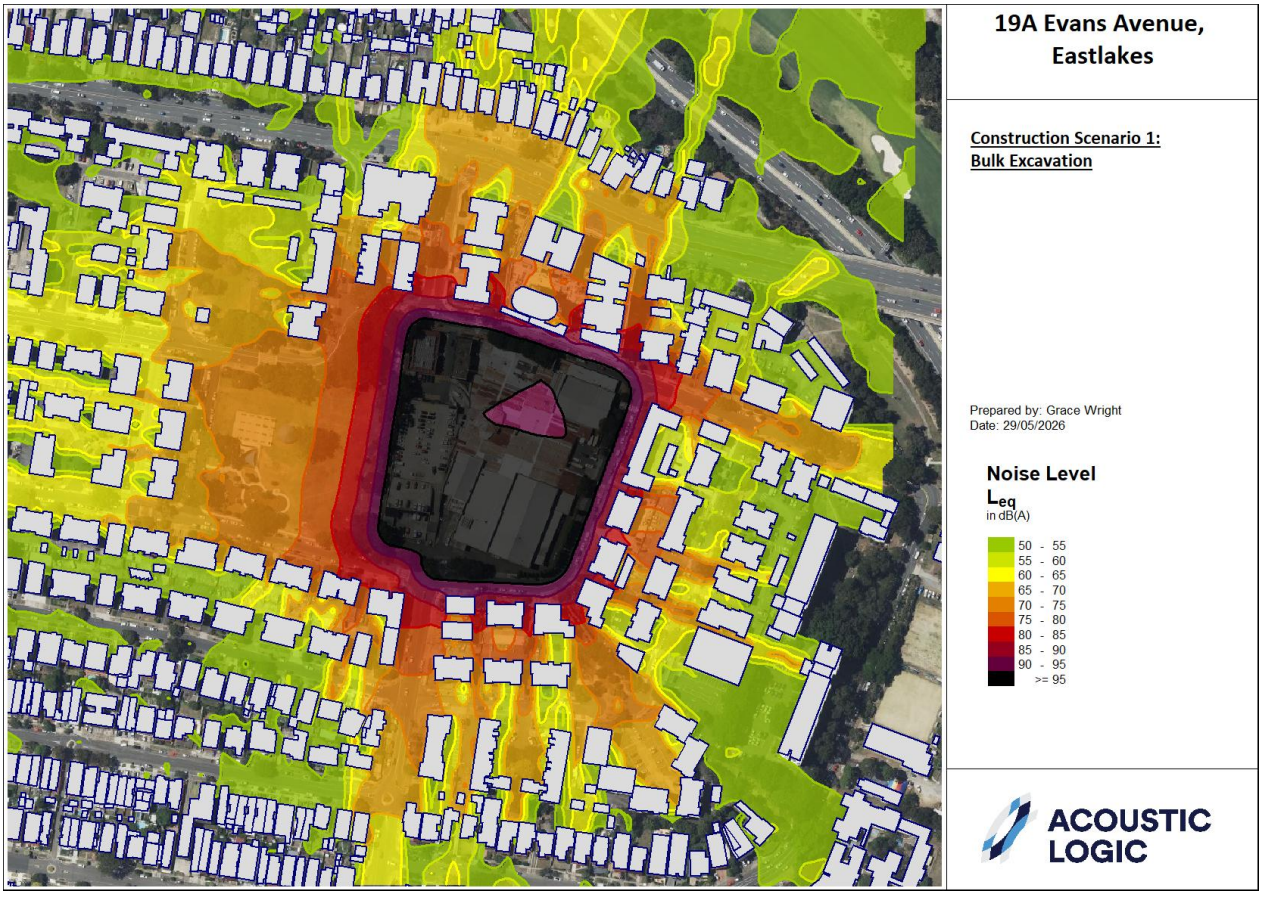

19A Evans Avenue, Eastlakes
Childcare Centre Operation (Outdoor Play)
Prepared by: Grace Wright
Date: 29/05/2026
Noise Level
Leq
in dB(A)
35 - 40
40 - 45
45 - 50
50 - 55
55 - 60
60 - 65
65 - 70
70 - 75
75 - 80
>= 80
ACOUSTIC LOGIC

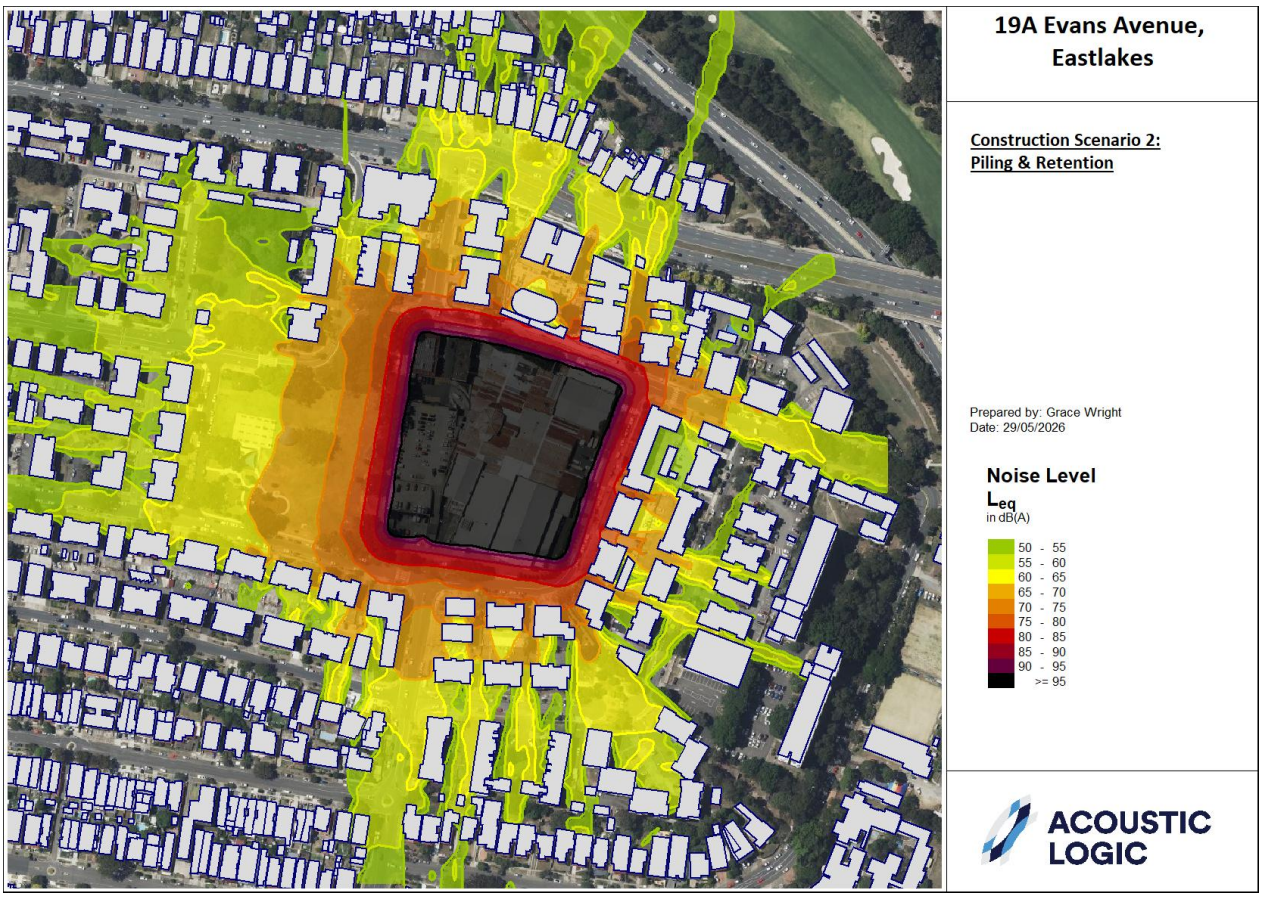

19A Evans Avenue, Eastlakes
Cumulative Operational Noise (Day)
Prepared by: Grace Wright
Date: 29/05/2026
Noise Level
Leq
in dB(A)
35 - 40
40 - 45
45 - 50
50 - 55
55 - 60
60 - 65
65 - 70
70 - 75
75 - 80
>= 80
ACOUSTIC LOGIC

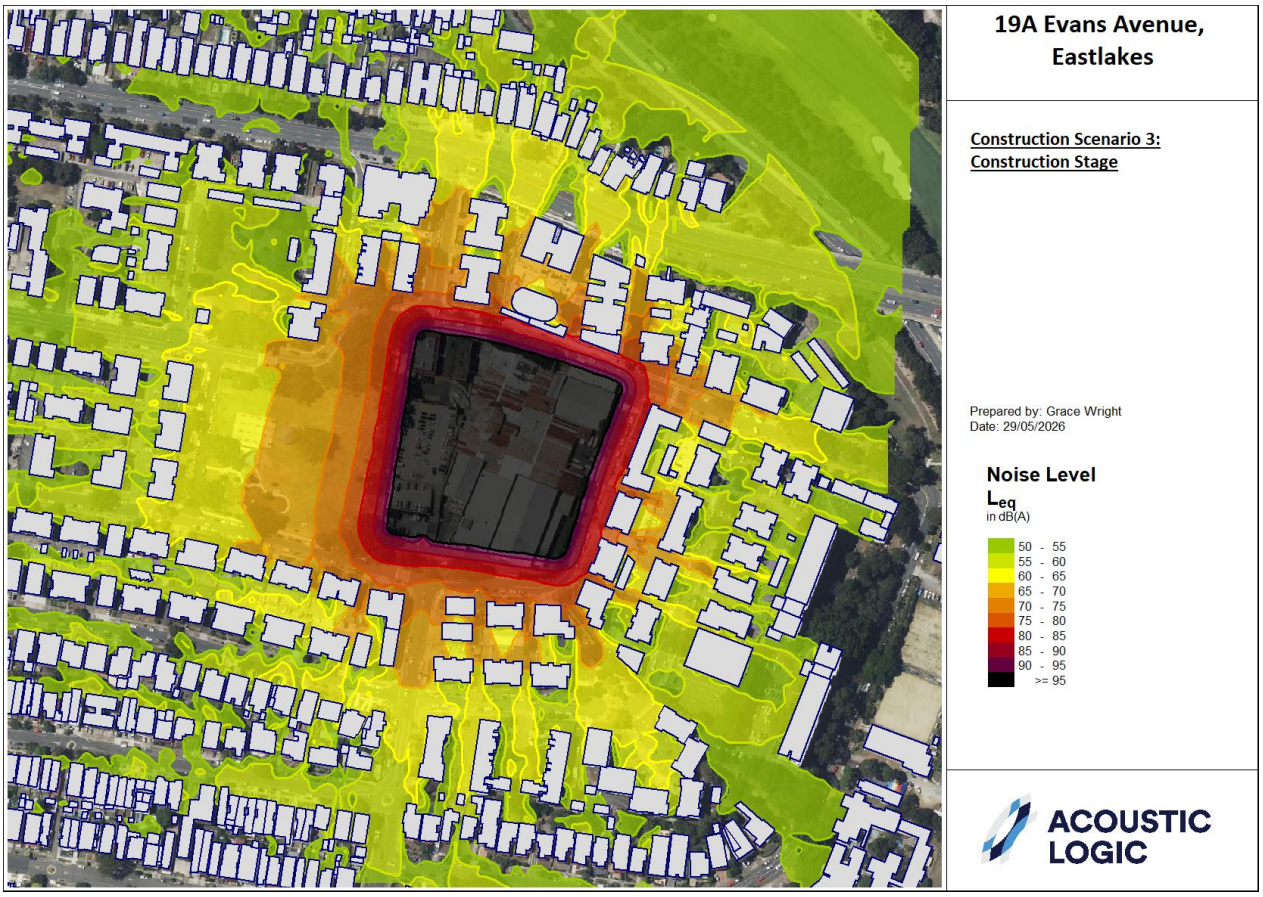

19A Evans Avenue, Eastlakes
Cumulative Operational Noise (Evening)
Prepared by: Grace Wright
Date: 29/05/2026
Noise Level
Leq
in dB(A)
35 - 40
40 - 45
45 - 50
50 - 55
55 - 60
60 - 65
65 - 70
70 - 75
75 - 80
>= 80
ACOUSTIC LOGIC


19A Evans Avenue, Eastlakes
Cumulative Operational Noise (Night)
Prepared by: Grace Wright
Date: 29/05/2026
Noise Level
Leq
in dB(A)
35 - 40
40 - 45
45 - 50
50 - 55
55 - 60
60 - 65
65 - 70
70 - 75
75 - 80
>= 80
ACOUSTIC LOGIC

APPENDIX D – CONSTRUCTION NOISE CONTOURS






19A Evans Avenue,
Eastlakes
Construction Scenario 3:
Construction Stage
Prepared by: Grace Wright
Date: 29/05/2026
Noise Level
Leq
in dB(A)
50 - 55
55 - 60
60 - 65
65 - 70
70 - 75
75 - 80
80 - 85
85 - 90
90 - 95
>= 95
ACOUSTIC
LOGIC