48 New Orleans Crescent, Maroubra – DA Acoustic Assessment

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1 INTRODUCTION

Pulse White Noise Acoustics Pty Ltd (Pulse White Noise Acoustics) has been engaged to undertake an acoustic assessment for the proposed residential dwellings to be located at 48 New Orleans Crescent, Maroubra NSW 2035.

This assessment will address the following:

- Potential surrounding environmental noise intrusion and vibration impacts on the development (i.e., traffic noise from Fitzgerald Avenue, New Orleans Crescent, and Yorktown Parade.
- Noise emissions to nearby receivers from the operation of the base building services (i.e., electrical, and mechanical services.) and noise of vehicles associated with the development.

This report will discuss the relevant acoustic criteria which has been adopted as well as the outcome of the acoustic assessment.

A glossary of acoustic terminology used in the acoustic assessment, is included in Appendix A.

1.1 Proposed Development

The proposed development site is located at 48 New Orleans Crescent, Maroubra, located ~60 m south of the Fitzgerald Avenue.

The site location is relation to the surrounding receivers, is shown in Figure 1 below. The project site is surrounded by residential receivers and is located within a medium density residential (R3) area as per the NSW Planning Portal Spatial Viewer.

1.2 Relevant Guidelines

Acoustic criteria which have been adopted in this assessment include requirements from the local and state authorities and in the absence of any applicable criteria from these bodies, Australian and International Standards will be utilised.

1.3 Site Layout

The project site is located at 48 New Orleans Crescent, Maroubra NSW 2035 which is defined as a medium density (R3) area as described in the NSW Planning ePlanning Spatial Viewer Zoning Maps.

The nearest sensitive receivers to the site and the measurement locations have been identified in Figure 1 below.

Receiver 1: Single storey residential development along the northern boundary of the site at 50New Orleans Crescent, Maroubra NSW 2035.

Receiver 2: Single storey residential dwelling located along the southern boundary of the site at 90 Yorktown Parade, Maroubra NSW 2035.

Receiver 3: Two storey residential dwelling located along the western boundary of the site at 88 Yorktown Parade, Maroubra NSW 2035.

Figure 1 Site Map, Measurement Locations and Surrounding Receivers – Sourced from SixMaps.

2 NOISE DESCRIPTORS & TERMINOLOGY

Environmental noise constantly varies in level with time. It is therefore necessary to measure environmental noise in terms of quantifiable time periods and statistical descriptors. Typically, environmental noise is measured over 15-minute periods and relevant statistical descriptors of the fluctuating noise are determined to quantify the measured level.

Noise (or sound) consists of minute fluctuations in atmospheric pressure capable of detection by human hearing. Noise levels are expressed in terms of decibels, abbreviated as dB or dB(A), the A indicating that the noise levels have been frequency weighted to approximate the characteristics of normal human hearing. Because noise is measured using a logarithmic scale, 'normal' arithmetic does not apply, e.g. adding two sources of sound of an equal value results in an increase of 3dB (i.e. 60 dBA + 60 dBA = 63 dBA). A change of 1 dB or 2 dB in the level of a sound is difficult for most people to detect, whilst a 3 dB – 5 dB change corresponds to a small but noticeable change in loudness. A 10 dB change roughly corresponds to a doubling or halving in loudness.

The most relevant environmental noise descriptors are the LAeq, LA1, LA10 and LA90 noise levels. The LAeq noise level represents the "equivalent energy average noise level". This parameter is derived by integrating the noise level measured over the measurement period and is equivalent to a level that would have been experienced had the fluctuating noise level remained constant during the measured time period.

The LA1, LA10 and LA90 levels are the levels exceeded for 1%, 10% and 90% of the sample period. These levels are sometimes thought of as the typical maximum noise level, the average repeatable maximum and average repeatable minimum noise levels, respectively.

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

3 EXISTING NOISE ENVIRONMENT

This section of the report details the acoustic survey which has been undertaken at the site for the purpose of obtaining existing background noise levels, as well as noise levels incident on the future building façades.

3.1 Unattended Noise Monitoring

As part of this assessment an acoustic survey of the existing acoustic environment at the site and surrounding receivers was undertaken. The survey included long-term unattended noise logging between the 12th of July and the 13th of July 2023. Note: the unattended noise logger was damaged during the noise survey period, hence the reduced amount of nose logging data presented in Appendix B: Unattended Noise Logging Results. Despite this, since the meteorological conditions were favourable for the duration of the survey, and based on previous experience with similar developments within the area we are confident that the measured background noise levels are representative of the local noise environment, and therefore the provided acoustic recommendations will achieve the relevant noise criteria.

Data affected by adverse meteorological conditions and by spurious and uncharacteristic events have been excluded from the results, and also excluded from the data used to determine the noise emission criteria. Meteorological information has been obtained from the Sydney Airport AMO (ID 066037).

Noise logging was undertaken on the site using a SVAN 971 type noise monitor (serial number 61521). Calibration of the logger was checked prior to and following the measurements. Drift in calibration did not exceed ±0.5 dB. All equipment carried appropriate and current NATA (or manufacturer) calibration certificates.

The unattended noise monitor was located near the western boundary of the project site, within the rear yard of the project site, as can be identified in Figure 1. The purpose of noise monitoring at this location was to characterise the existing background noise level at the proposed development. This monitor was also used to establish criteria for noise emissions (i.e., to determine the noise level representative of the nearest noise sensitive receiver locations to the proposed development).

Charts presenting summaries of the measured daily noise data are attached to this report in Appendix B. The charts present each 24-hour period and show the L_{A1}, L_{A10}, L_{Aeq} and L_{A90} noise levels for the corresponding 15-minute periods. This data has been filtered to remove periods affected by adverse weather conditions based on weather information.

3.1.1 Results in accordance with the NSW *EPA Noise Policy for Industry (NPI) 2017* (RBL's)

In order to assess the potential noise impacts of the development on nearby sensitive receivers the measured background noise data was processed in accordance with the Environmental Protection Authority (EPA) *Noise Policy for Industry* (NPI).

The Rating Background Noise Level (RBL) is the background noise level used for assessment purposes at the nearest potentially affected receiver. It is the 90th percentile of the daily background noise levels during each assessment period, being day, evening and night. RBL levels $L_{A90\ (15minute)}$ and L_{Aeq} noise levels are presented in Table 1.

Data affected by adverse meteorological conditions and by spurious and uncharacteristic events has been excluded from the results, and also excluded from the data used to determine the noise emission criteria. Meteorological information has been obtained from the Sydney Airport AMO (ID 066037).

Table 1 Measured Ambient Noise Levels corresponding to the NPI's Assessment Time Periods

Measurement Location	Daytime[1] 7:00 am to 6:00 pm		Evening[1] 6:00 pm to 10:00 pm		Night-time[1] 10:00 pm to 7:00 am	
	L_{A90}[2] (dBA)	L_{Aeq}[3] (dBA)	L_{A90}[2] (dBA)	L_{Aeq}[3] (dBA)	L_{A90}[2] (dBA)	L_{Aeq}[3] (dBA)
48 New Orleans Crescent, Maroubra (Western side) – See Figure 1.	39	56	39	56	31	49

Note 1: For Monday to Saturday, Daytime 7:00 am – 6:00 pm; Evening 6:00 pm – 10:00 pm; Night-time 10:00 pm – 7:00 am. On Sundays and Public Holidays, Daytime 8:00 am – 6:00 pm; Evening 6:00 pm – 10:00 pm; Night-time 10:00 pm – 8:00 am

Note 2: The L_{A90} noise level is representative of the "average minimum background sound level" (in the absence of the source under consideration), or simply the background level.

Note 3: The L_{Aeq} is the energy average sound level. It is defined as the steady sound level that contains the same amount of acoustical energy as a given time-varying sound.

3.1.2 Results in accordance with the NSW EPA *Road Noise Policy (RNP) 2011*

The measured ambient noise level in accordance with the NSW EPA Road Noise Policy (RNP) 2011 are provided in Table 2.

Table 2 Measured Ambient Noise Levels corresponding to the EPA Road Noise Policy (RNP) 2011 Time Periods

Measurement Location	Measured Noise Level	
	Daytime[1] 7:00 am to 10:00 pm	Night-time[1] 10:00 pm to 7:00 am
	L_{Aeq}[1] (dBA)	L_{Aeq}[1] (dBA)
48 New Orleans Crescent, Maroubra (Western side) – See Figure 1.	56	49

Note 1: The L_{Aeq} is the energy average sound level. It is defined as the steady sound level that contains the same amount of acoustical energy as a given time-varying sound.

4 ACOUSTIC CRITERIA

The acoustic criteria which have been adopted for this assessment are outlined below. All criteria have been separated into the relevant assessment type, these are: *Noise Intrusion Criteria* (Assessment of building envelope), *Noise Emission Criteria* (Assessment of noise to surrounding receivers) and *Acoustic Separation Criteria* (Assessment of acoustic privacy within the building).

4.1 Noise Intrusion Criteria

External noise intrusion into the building will generally be via the building envelope (External wall, glazing or external roof). The design of the building envelope should be such that the requirements listed below are achieved.

4.1.1 Randwick Local Environmental Plan 2012 (LEP)

A review of the current Randwick Council Local Environmental Plan 2012 (LEPs), the document does not contain any applicable numerical building envelope acoustic criteria for residential developments. As such in the absence of any applicable requirements, objectives listed in Australian/New Zealand 2107:2016 Acoustics - Recommended design sound levels and reverberation times for building interiors standard will be adopted.

4.1.2 Randwick Development Control Plan (DCP) 2013

A review of the current Randwick Council Development Control Plan (DCP) 2013 the document does not contain any applicable numerical building envelope acoustic criteria for residential developments. As such in the absence of any applicable requirements, the following will be adopted:

- Australian/New Zealand 2107:2016 Acoustics - Recommended design sound levels and reverberation times for building interiors.

4.1.3 Australian / New Zealand Standard AS/NZS 2107:2016 Acoustics - Recommended design sound levels and reverberation times for building interiors - (AS/NZS 2107:2016)

In relation to design internal noise levels, standard AS/NZS 2107:2016 recommends a range with lower and upper levels (rather than "satisfactory" and "maximum" internal noise levels) for building interiors based on room designation and location of the development relative to external noise sources. This change has occurred due to the fact that sound levels below 'satisfactory' could be interpreted as desirable, but the opposite may in fact be the case. Levels below those which were listed as 'satisfactory' can lead to inadequate acoustic masking resulting in loss of acoustic isolation and speech privacy.

The levels for areas relevant to this development are given in Table 3 below. In this report we will confine our recommendations to dBA levels, however, where the background noise appears to be unbalanced, standard AS/NZS 2107:2016 provides direction in terms of suitable diagnostic tools that can be used to assess the spectrum distribution of the background noise.

Section 6.18 of standard AS/NZ 2107:2016 notes that the presence of discrete frequencies or narrow band signals may cause the sound level to vary spatially within a particular area and be a source of distraction for occupants. Where this occurs, the sound level shall be determined as the highest level measured in the occupied location(s).

If tonal components are significant characteristics of the sound within a measurement time interval, an adjustment shall be applied for that time interval to the measured A-weighted sound pressure level to allow for the additional annoyance. If the background sounds include spectral imbalance, then the RC (Mark II) levels indicated in Table 3 should be referenced (see also Appendix D of AS/NZ 2107:2016 for additional guidance).

Table 3 Recommended design sound levels as per standard AS/NZS 2107:2016

Type of Occupancy/Activity	Design sound level range ($L_{Aeq,t}$)
Residential Buildings – Houses and apartments in suburban areas or near minor roads	
Apartment common areas (e.g., foyer, lift lobby, corridors)	45 to 50
Living areas	30 to 40
Sleeping areas (night time)	30 to 35
Work areas	35 to 45
Washrooms and toilets (anytime)	45 to 55

Generally, where the final noise levels are within +/- 2 dB of the specified level given above, the design criteria will be considered met. Both the upper and lower limits will need to be satisfied especially where privacy is important or where noise intrusion to be avoided.

4.1.4 Project Airborne Noise Requirements

Based on the details included in the section above, the project internal noise levels requirements are summarised in Table 4 below.

Table 4 Project Airborne Internal Noise Level Requirements

Room Type	Internal Environmental Noise Levels (Traffic and Airborne Train Noise) – dBA $L_{Aeq\ (period)}$
Residential Buildings	
Apartment common areas (e.g., foyer, lift lobby, corridors)	50 dBA $L_{Aeq\ (period)}$
Living areas	40 dBA $L_{Aeq\ (24\text{-}hour)}$
Sleeping areas (night time)	35 dBA $L_{Aeq\ (9\text{-}hour)}$
Work areas	45 dBA $L_{Aeq\ (period)}$
Washrooms and toilets (anytime)	50 dBA $L_{Aeq\ (period)}$

4.2 Noise Emission Criteria (Operational Criteria)

Noise emissions from the operation of the site impacting on the adjacent land users are outlined below.

4.2.1 Randwick Development Control Plan (DCP) 2013

Following a review of the current Randwick Development Control Plan (DCP) 2013, we note that the document does not contain any applicable numerical acoustic criteria for the assessment of noise emissions from mechanical plant for developments of this kind. As such, in the absence of any applicable requirements, objectives listed in the NSW EPA Noise Policy for Industry (NPfI) 2017 below will be adopted.

4.2.2 NSW EPA Noise Policy for Industry (NPI) 2017

In NSW, the control of noise emissions is the responsibility of Local Governments and the NSW Environment Protection Authority (NSW EPA).

The *Noise Policy for Industry* (NSW NPI) which provides a framework and process for determining external noise criteria for the assessment of noise emission from industrial developments. The NSW NPI criteria for industrial noise sources have two components:

- Controlling the intrusive noise impacts for residents and other sensitive receivers in the short term.

- Maintaining noise level amenity of particular land uses for residents and sensitive receivers in other land uses.

4.2.2.1 Intrusive Noise Impacts (Residential Receivers)

The NSW NPI states that the noise from any single source should not intrude greatly above the prevailing background noise level. Industrial noises are generally considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (L_{Aeq}), measured over a 15-minute period, does not exceed the background noise level measured in the absence of the source by more than 5 dB(A). This is often termed the Intrusiveness Criterion.

The 'Rating Background Level' (RBL) is the background noise level to be used for assessment purposes and is determined by the methods given in the NSW NPI. Using the rating background noise level approach results in the intrusiveness criterion being met for 90% of the time. Adjustments are to be applied to the level of noise produced by the source that is received at the assessment point where the noise source contains annoying characteristics such as tonality or impulsiveness.

4.2.2.2 Protecting Noise Amenity (All Receivers)

To limit continuing increase in noise levels, the maximum ambient noise level within an area from industrial noise sources should not normally exceed the acceptable noise levels specified in Table 2.2 of the NSW NPI. That is, the ambient L_{Aeq} noise level should not exceed the level appropriate for the particular locality and land use. This is often termed the 'Background Creep' or Amenity Criterion.

The amenity assessment is based on noise criteria specified for a particular land use and corresponding sensitivity to noise. The cumulative effect of noise from industrial sources needs to be considered in assessing the impact. These criteria relate only to other continuous industrial-type noise and do not include road, rail or community noise. If the existing (measured) industrial-type noise level approaches the criterion value, then the NSW NPI sets maximum noise emission levels from new sources with the objective of ensuring that the cumulative levels do not significantly exceed the criterion.

Project amenity noise level for industrial developments is specified as the recommended amenity noise level (Table 2.2 of the NPI) minus 5 dB(A). To standardise the time periods for the intrusiveness and amenity noise levels, this policy assumes that the $L_{Aeq,15min}$ will be taken to be equal to the $L_{Aeq,period}$ + 3 decibels (dB).

Where the resultant project amenity noise level is 10 dB or more lower than the existing industrial noise level, the project amenity noise levels can be set at 10 dB below existing industrial noise levels.

4.2.2.3 Area Classification

The NSW NPI characterises the "**Suburban Residential**" noise environment as an area that has the following characteristics:

> *An acoustical environment that:*
>
> - *An area that has local traffic with characteristically intermittent traffic flows or with some limited commerce or industry. This area often has the following characteristics:*
>
> - *Evening ambient noise levels defined by the natural environment and human activity.*

Figure 2 is obtained from the NSW Planning ePlanning Spatial Viewer Zoning Maps and shows the land zoning map of the proposed development and the nearest sensitive receivers.

Figure 2 NSW Planning ePlanning Spatial Viewer Zoning Maps

As shown above, the site and its nearest surrounding receivers are located in an area defined as R3 (medium density residential). The most appropriate zoning for the site and its surrounding receivers is therefore *Suburban Residential*.

For residential receivers located within a suburban residential area, the recommended amenity criteria are shown in Table 5 below.

When the existing noise level from industrial noise sources is close to the recommended "Amenity Noise Level" (ANL) given above, noise from the new source must be controlled to preserve the amenity of the area in line with the requirements of the NSW NPI.

Table 5 NSW NPI – Recommended L_{Aeq} Noise Levels from Noise Sources

Type of Receiver	Indicative Noise Amenity Area	Time of Day[1]	Recommended Amenity Noise Level ($L_{Aeq, period}$)[2] (dBA)
Residence	Urban	Day	55
		Evening	45
		Night	40

Note 1: For Monday to Saturday, Daytime 7:00 am – 6:00 pm; Evening 6:00 pm – 10:00 pm; Night-time 10:00 pm – 7:00 am. On Sundays and Public Holidays, Daytime 8:00 am – 6:00 pm; Evening 6:00 pm – 10:00 pm; Night-time 10:00 pm – 8:00 am.

Note 2: The L_{Aeq} is the energy average sound level. It is defined as the steady sound level that contains the same amount of acoustical energy as a given time-varying sound.

4.2.2.4 Project Specific NPI Noise Emission Criteria

The intrusive and amenity criteria for industrial noise emissions, derived from the measured data at the logger location toward the western boundary of the site, are presented in Table 6. These criteria are nominated for the purpose of determining the operational noise limits for mechanical plant associated with the development which can potentially affect noise sensitive receivers.

For each assessment period, the lower (i.e., the more stringent) of the amenity or intrusive criteria are adopted, which are shown in bold text in Table 6.

Table 6 External noise level criteria in accordance with the NSW NPI (dBA)

Location	Time of Day [1]	Project Amenity Noise Level, $L_{Aeq, period}$ [2]	Measured $L_{A90, 15\ min}$ (RBL) [3,4]	Measured $L_{Aeq, period}$ Noise Level	Intrusive $L_{Aeq, 15\ min}$ Criterion for New Sources	Amenity $L_{Aeq, 15\ min}$ Criterion for New Sources
Residential Receivers	Day	50	39	56	**44**	53
	Evening	40	39	56	**44**	49[5]
	Night	35	31	49	**36**	42[5]

Note 1: For Monday to Saturday, Daytime 7:00 am – 10:00 pm; Night-time 10:00 pm – 7:00 am. On Sundays and Public Holidays, Daytime 8:00 am – 10:00 pm; Night-time 10:00 pm – 8:00 am.

Note 2: The L_{Aeq} is the energy average sound level. It is defined as the steady sound level that contains the same amount of acoustical energy as a given time-varying sound.

Note 3: L_{A90} Background Noise or Rating Background Level.

Note 4: Project Noise Trigger Levels are shown in bold and underlined.

Note 5: Project amenity noise level has been adjusted based on existing traffic noise levels as per section 2.4.1 of the NSW EPA NPI.

4.2.2.5 Maximum Noise Level Event Assessment

The EPA's *Noise Policy for Industry* (NPfI) includes suitable criteria for the assessment of potential sleep awakening events, which have been used as the basis of this report. The policy requires the following:

> ***2.5 Maximum noise level event assessment***
>
> *The potential for sleep disturbance from maximum noise level events from premises during the night-time period needs to be considered. Sleep disturbance is considered to be both awakenings and disturbance to sleep stages.*
>
> *Where the subject development/premises night-time noise levels at a residential location exceed:*
> - *LAeq,15min 40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or*
> - *LAFmax 52 dB(A) or the prevailing RBL 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.*

Based on the measured noise levels outlined in section 3.1 the resulting maximum noise level event requirements are:

- 31 dBA $L_{A90\ (10pm\text{-}7am)}$ + 5 dBA = **36 dBA $L_{Aeq(15\text{-}mins)}$**, which is less than 40 dBA and therefore the 40 dBA will be adopted.
- 31 dBA $L_{A90\ (10pm\text{-}7am)}$ + 15 dBA = **46 dBA $L_{AFMax)}$**, which is less than 52 dBA and therefore the 52 dBA will be adopted.

4.2.3 NSW DECCW – NSW Road Noise Policy (RNP) 2011

For existing residences and other sensitive land uses affected by additional traffic on existing roads, the NSW Road Noise Policy states that for noise associated with increased road traffic generated by land use developments, any increase in the total traffic noise level should be limited to 2 dB during both day and night-time periods. An increase of 2 dB represents a minor impact that is considered barely perceptible to the average person.

4.3 Acoustic Separation Criteria

Acoustic separation between apartments/dwellings within the development must comply with the requirements listed below.

4.3.1 National Construction Code (NCC) & Building Code of Australia (BCA) 2022

The Building Code of Australia (BCA) is a uniform set of technical provisions for the design and construction of buildings and other structures throughout Australia. The BCA is produced and maintained by the Australian Building Codes Board (ABCB) and given legal effect through the Building Act 1975. The National Construction Code (NCC) comprises the Building Code of Australia and the Plumbing Code of Australia (the Plumbing Code of Australia is given legal effect through the Plumbing and Drainage Act 2002 (Qld)) and is published in three volumes. Volumes one and two relate to the BCA.

Part F7 of Volume One of the BCA / NCC provides the Sound Transmission and Insulation requirements for Class 2 or 3 buildings. These requirements are summarised in the section below:

4.3.1.1 Summary of BCA Acoustic Requirements

A summary of the acoustic requirements of the NCC 2022 for Class 2 or 3 buildings is given in Table 7 below.

Table 7 NCC 2022 Sound Insulation Requirements

Construction	2022 NCC	
	Laboratory performance requirements	**Verification method**
Walls between sole occupancy units	$R_w + C_{tr}$ not < 50	$D_{nT,w} + C_{tr}$ not < 45
Walls between a bathroom, sanitary compartment, laundry or kitchen in one sole occupancy unit and a habitable room (other than a kitchen) in an adjoining unit	$R_w + C_{tr}$ not < 50 and Must have a minimum 20 mm cavity between two separate leaves	$D_{nT,w} + C_{tr}$ not < 45 "Expert Judgment" Comparison to the "Deemed to satisfy" Provisions
Walls between sole occupancy units and a plant room or lift shaft	R_w not < 50 and Must have a minimum 20 mm cavity between two separate leaves[1]	$D_{nT,w}$ not < 45
Walls between sole occupancy units and a stairway, public corridor, public lobby or the like, or parts of a different classification	R_w not < 50	$D_{nT,w}$ not < 45
Door assemblies located in a wall between a sole-occupancy unit and a stairway, public corridor, public lobby or the like	R_w not < 30	$D_{nT,w}$ not < 25
Floors between sole-occupancy units or between a sole-occupancy unit and a plant room, lift shaft, stairway, public corridor, public lobby or the like, or parts of a different classification	$R_w + C_{tr}$ not < 50 $L_{n,w}$ not > 62	$D_{nT,w} + C_{tr}$ not < 45 $L'_{nT,w}$ not > 62
Soil, waste, water supply and stormwater pipes and ductwork to habitable rooms	$R_w + C_{tr}$ not < 40	N/A
Soil, waste, water supply and stormwater pipes and ductwork to kitchens and other rooms	$R_w + C_{tr}$ not < 25	N/A
Intra-tenancy Walls	There is no statutory requirement for airborne isolation via intra-tenancy walls.	

5 BUILDING ACOUSTIC ASSESSMENT

In addressing all the criteria shown above, preliminary façade acoustic treatments based on the external levels from surrounding roads and other environmental noise sources as discussed in section 2 above are provided below.

5.1 Building Envelope Assessment

5.1.1 Glazing Recommendations

The recommended sound transmission loss requirement required to satisfy the specified internal noise level criteria outlined above are summarised in Table 8 below.

Table 8 In-principle Glazing Recommendations

Level	Façade Orientation	Space	Minimum Glazing System Rating Requirements	Indicative Construction
Ground Floor to Level 2	North	Sleeping areas	Rw (C;Ctr): 35 (0;-3)	Doors and windows with 6.38 mm laminated glass.
		Living areas	Rw (C;Ctr): 31 (0;-3)	Doors and windows with 6.38 mm laminated glass.
		Washrooms, laundry & toilets	Rw (C;Ctr): 27 (0;-3)	4mm Float Glass
	East	Sleeping areas	Rw (C;Ctr): 31 (0;-3)	Doors and windows with 6.38 mm laminated glass.
		Living areas	Rw (C;Ctr): 31 (0;-3)	Doors and windows with 6.38 mm laminated glass.
		Washrooms, laundry & toilets	Rw (C;Ctr): 27 (0;-3)	4mm Float Glass
	South	Sleeping areas	Rw (C;Ctr): 31 (0;-3)	Doors and windows with 6.38 mm laminated glass.
		Living areas	Rw (C;Ctr): 31 (0;-3)	Doors and windows with 6.38 mm laminated glass.
		Washrooms, laundry & toilets	Rw (C;Ctr): 27 (0;-3)	4mm Float Glass
	West	Sleeping areas	Rw (C;Ctr): 31 (0;-3)	Doors and windows with 6.38 mm laminated glass.
		Living areas	Rw (C;Ctr): 31 (0;-3)	Doors and windows with 6.38 mm laminated glass.
		Washrooms, laundry & toilets	Rw (C;Ctr): 27 (0;-3)	4mm Float Glass

Please note for windows, this performance is not only subject to the glazing selection but also to the construction of the window frame and the frame seal selection. Therefore, it is recommended that the window manufacturer should confirm that the required sound insulation can be achieved. It is anticipated that the window system should comprise Q-Lon (or equivalent) or fin seals with deep C channels as part of the window track **(i.e., Performance levels outlined above need to be achieved with glazed panels + frame + seals).**

A detailed review of the glazing assessment should be conducted during the design phase of the project.

5.1.2 External Wall Construction

External wall constructions will be constructed from either a solid dense construction (i.e. like a masonry or concrete) or light weight cladding systems. In the event the external wall is constructed from a solid dense construction as summarised above, no further acoustic upgrading is required.

However, in the event the external walls are constructed from a lightweight cladding system, the following construction is recommended.

Table 9 Recommended light wight external wall constructions

Location	Occupancy Area [1]	External Lining	Studwork System	Internal Lining
All Facades	Sleeping areas	Proposed Architectural Cladding	Studwork + 75 mm thick 14kg/m^3 glasswool insulation	1 x 13mm layers of Standard Plasterboard.
	Living areas			
	Washrooms, laundry & toilets			1 x 13mm layers of Standard Plasterboard **OR** 1 x 6mm Fibre Cement Sheeting

Note 1: Recommended constructions are identical for each level.

Note 2: These are preliminary selections will be confirmed in the detailed design stage once the layouts and façade orientations are approved.

5.1.3 External Roof Construction

The following constructions for a light-weight roof system are recommended.

Table 10 Recommended light weight external roof construction

Location	Occupancy Area [1]	External Lining	Studwork System	Internal Lining
All Areas	Sleeping areas	Proposed metal sheeting	Roof truss + 75mm thick 14k g/m^3 glasswool insulation	1 x 13mm layers of Standard Plasterboard.
	Living areas			
	Washrooms, laundry & toilets			1 x 13mm layers of Standard Plasterboard

Note 1: These are preliminary selections will be confirmed in the detailed design stage once the layouts and façade orientations are approved.

If penetrations through any external skin are required, all gaps remaining in the penetration are to be filled with an acoustic grade sealant which provides an equal or better performance to the system being penetrated. These are preliminary recommendations and should be confirmed in the detailed design stage once the layouts and façade orientations are approved.

5.2 Noise from Engineering Services

At this stage of the project, the exact locations of key plant items, and the selection of items to be installed, have not been selected. As such, a detailed assessment of noise associated with engineering services cannot be undertaken.

All future plant and equipment are to be acoustically treated to ensure the noise levels at all surrounding receivers and internal receivers comply with noise emission and intrusion criteria detailed within this report. Experience with similar projects indicates that it is both possible and practical to treat all mechanical equipment such that the relevant noise levels are achieved. Examples of the possible acoustic treatments to mechanical equipment includes the following:

- Supply and Exhaust Fans – location of fans within the building and treated using internally lined ductwork or acoustic silencers.

- General supply and exhaust fans – general exhaust and supply fans such as toilet, kitchen, lobby and other small mechanical fans can be acoustically treated using acoustic flex ducting or internally lined ducting.

- Residential Condensers – The project may include external residential condenser units which will likely be located on the roof-top or individually balconies. Providing condenser equipment is selected using suitable noise level data, then acoustic treatments can be implemented such as screening and treatment to exhaust to ensure that the relevant noise emission criteria will be achieved.

Details of the required mechanical services equipment and acoustic treatments to ensure the relevant noise level criteria is achieved will be provided as part of the CC submission of the project.

Experience with similar projects indicates that the acoustic treatment of whatever mechanical equipment is to be installed on the project is both possible and practical, in order to meet the relevant criteria at surrounding receivers, as well as the relevant noise intrusion criteria for internal receivers within the development.

5.3 Noise from Additional Vehicles on Surrounding Road Network

Noise impacts from the increase in vehicle movements along New Orleans Crescent, Yorktown Parade, and Fitzgerald Avenue are to be assessed in accordance with the NSW EPA Road Noise Policy (RNP) 2011.

A peak hour increase proposed for the number vehicles associated with the development will not exceed a 2 dB increase at a residential receiver as summarised in the NSW EPA RNP to be barely perceptible to the average person and therefore considered acoustically acceptable.

5.4 Construction Noise & Vibration Assessment

As the project is still in a planning phase, a detailed construction noise and vibration cannot be undertaken at this stage as there several unknown variables.

As such it is recommended that a DA Condition be implemented requiring that a detailed Construction Noise Vibration Management Plan (CNVMP) be prepared prior to the issue of a Construction Certificate. The plan should be undertaken based on the noise and vibration objectives outlined in the NSW EPA guideline *Interim Construction Noise Guideline (ICNG) 2009.*

6 CONCLUSION

Pulse White Noise Acoustic Pty Ltd (PWNA) has been engaged to undertake an acoustic assessment of the proposed residential development at 48 New Orleans Crescent, Maroubra. The conclusions of this assessment are outlined in the following sections.

Minimum acoustic performances and associated indicative constructions for the building envelope have been provided in section 5.1 of this report. The recommended treatments have been provided to ensure compliance with the objectives presented in 4.

To control noise impacts at external and internal receivers, recommended indicative treatments for major engineering services have been provided in Section 6.2. From our review we have formulated the following opinion:

- At this stage of the project the exact selections/locations of plant items are not known. A preliminary assessment, however, has been carried out using our experience with similar types of developments and the typical plant items installed. Experience with similar projects indicates that the acoustic treatment of the likely mechanical equipment to be installed on the project is both possible and practical, in order to meet the relevant criteria at surrounding receivers, as well as the relevant noise intrusion criteria for internal receivers within the development.

- It is recommended that, prior to the issue of a Construction Certificate (CC), a detailed acoustic assessment is undertaken to ensure all cumulative noise from engineering services comply with the requirements as listed in this report.

An assessment of the impacts associated with the number of vehicles on surrounding public roads around the site predicted the impact to be less than 2 dB and therefore is compliant with the NSW EPA RNP.

it is recommended that a DA Condition be implemented requiring that a detailed Construction Noise Vibration Management Plan (CNVMP) be prepared prior to the issue of a Construction Certificate. The plan should be undertaken based on the noise and vibration objectives outlined in the NSW EPA guideline *Interim Construction Noise Guideline (ICNG) 2009.*

Regards,

Matthew Furlong
Principal Acoustic Engineer
PULSE WHITE NOISE ACOUSTICS PTY LTD

APPENDIX A: ACOUSTIC GLOSSARY

The following is a brief description of the acoustic terminology used in this report:

Ambient Sound	The totally encompassing sound in a given situation at a given time, usually composed of sound from all sources near and far.
Audible Range	The limits of frequency which are audible or heard as sound. The normal ear in young adults detects sound having frequencies in the region 20 Hz to 20 kHz, although it is possible for some people to detect frequencies outside these limits.
Character, acoustic	The total of the qualities making up the individuality of the noise. The pitch or shape of a sound's frequency content (spectrum) dictate a sound's character.
Decibel [dB]	The level of noise is measured objectively using a Sound Level Meter. The following are examples of the decibel readings of every day sounds; 0 dB the faintest sound we can hear 30 dB a quiet library or in a quiet location in the country 45 dB typical office space. Ambience in the city at night 60 dB Martin Place at lunch time 70 dB the sound of a car passing on the street 80 dB loud music played at home 90 dB the sound of a truck passing on the street 100 dB the sound of a rock band 115 dB limit of sound permitted in industry 120 dB deafening
dB(A)	*A-weighted decibels* The ear is not as effective in hearing low frequency sounds as it is hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter. The sound pressure level in dB(A) gives a close indication of the subjective loudness of the noise.
Frequency	Frequency is synonymous to *pitch*. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.
Loudness	A rise of 10 dB in sound level corresponds approximately to a doubling of subjective loudness. That is, a sound of 85 dB is twice as loud as a sound of 75 dB which is twice as loud as a sound of 65 dB and so on
LMax	The maximum sound pressure level measured over a given period.
LMin	The minimum sound pressure level measured over a given period.
L1	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L10	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L90	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L_{90} noise level expressed in units of dB(A).
Leq	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.
dB (A)	'A' Weighted overall sound pressure level
Sound Pressure Level, LP dB	A measurement obtained directly using a microphone and sound level meter. Sound pressure level varies with distance from a source and with changes to the measuring environment. Sound pressure level equals 20 times the logarithm to the base 10 of the ratio of the rms sound pressure to the reference sound pressure of 20 micro Pascals.

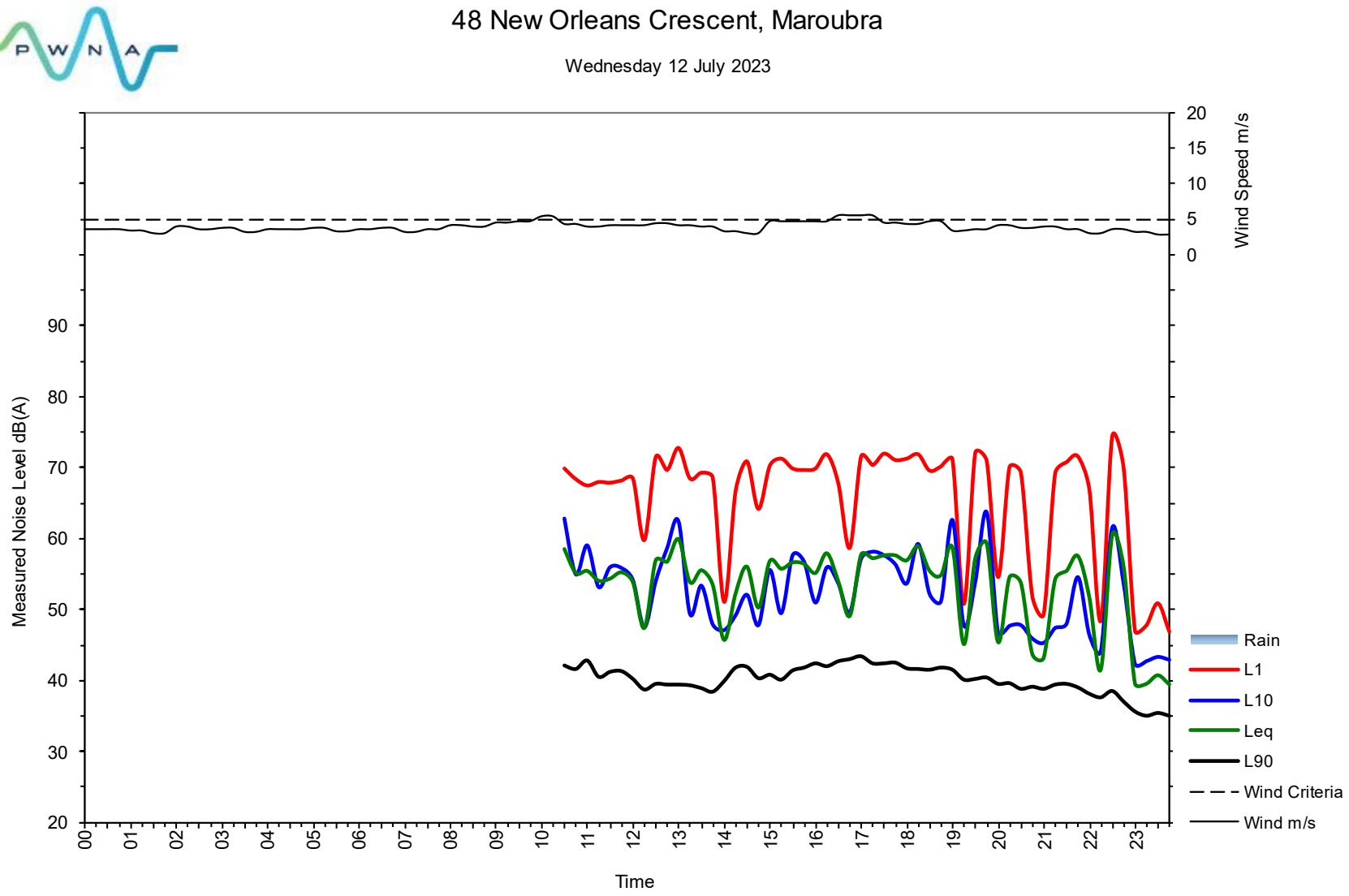
Sound Power Level, Lw dB	Sound power level is a measure of the sound energy emitted by a source, does not change with distance, and cannot be directly measured. Sound power level of a machine may vary depending on the actual operating load and is calculated from sound pressure level measurements with appropriate corrections for distance and/or environmental conditions. Sound power levels is equal to 10 times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power of 1 picoWatt

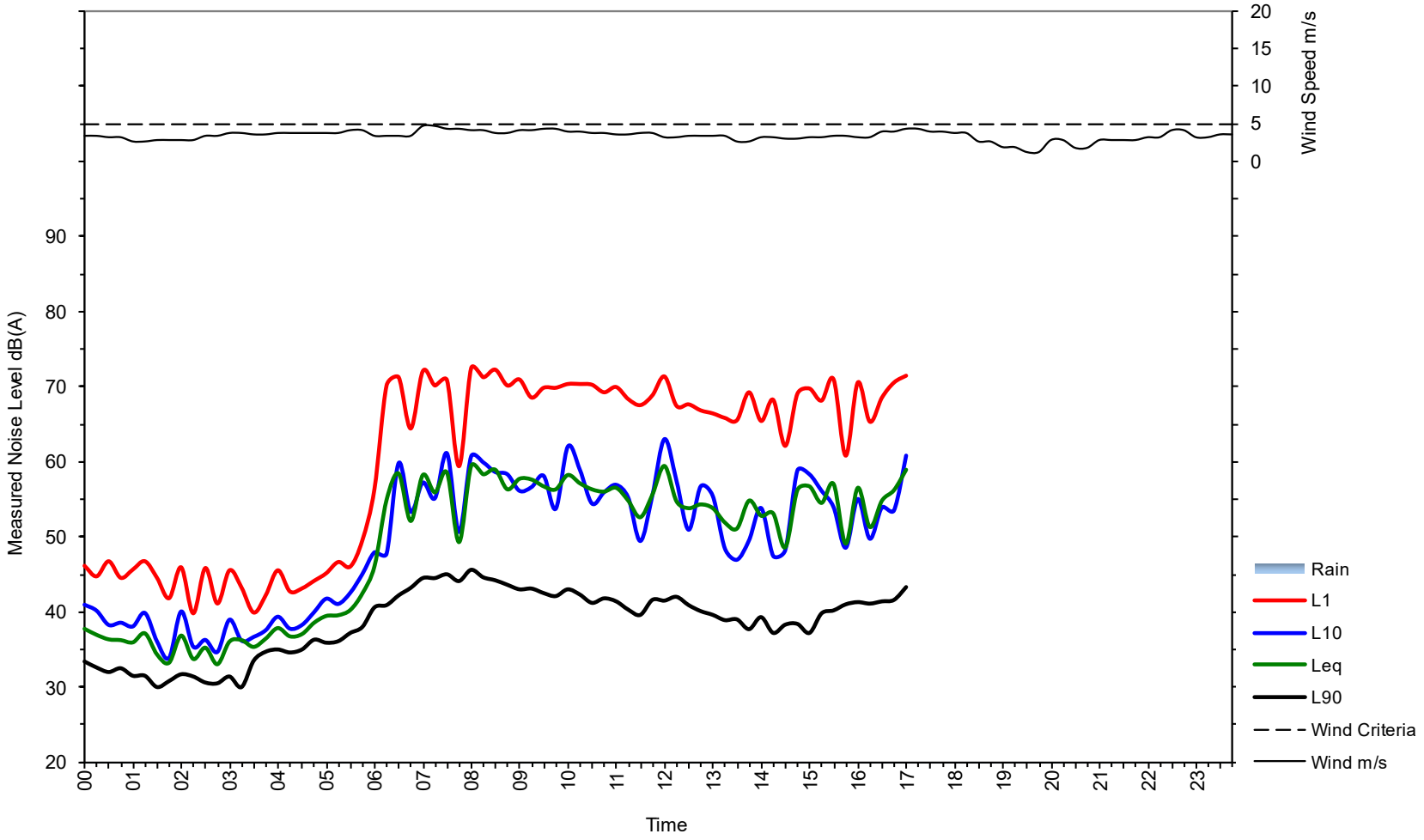
APPENDIX B: UNATTENDED NOISE LOGGING RESULTS

Weather Station: Sydney Airport AMO, NSW

Weather Station ID: 066037

Coordinates: 33.9465°S 151.1731 °E 6 m AMSL


48 New Orleans Crescent, Maroubra
Wednesday 12 July 2023
Measured Noise Level dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s


48 New Orleans Crescent, Maroubra
Thursday 13 July 2023
Measured Noise Level dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s