Manly Wharf – Change of Use, Alterations and Additions to Existing Tenancy

DA Acoustic Assessment

Artemus Group

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1 EXECUTIVE SUMMARY

Artemus Group proposes a change of use, alterations and additions to an existing tenancy (24.1) within the Manly Wharf.

This report provides a noise and vibration impact assessment to support the project Development Application. The report has considered both the likely construction and operational impacts from the project and has presented reasonable and feasible management and mitigation measures to ensure the project can achieve the noise and vibration management levels and criteria outlined in this report.

The site is a vacant tenancy identified as tenancy 24.1 (see Figure 1) located within Manly Wharf, East Esplanade, Manly (formally Lot 1 in Deposited Plan 1170245). The site was previously used as an Aldi supermarket until operations ceased in 2022.

The site has an area of 1,429 m^2 within the Manly Wharf interior. The eastern portion of the site is enveloped by the Manly Wharf Hotel, while its northern section is adjacent to Manly Wharf's service areas (e.g. storage, goods lift and corridors). The western portion of the site served as the primary ingress / egress for the Aldi supermarket tenancy.

Background noise logging was undertaken at three locations between Monday 6th May 2024 and Wednesday 15th May 2024. The measurements have been used to establish the projects construction noise management levels and operational project specific noise trigger levels.

A review of meteorological conditions of the local area identified that wind directions are predominantly from receiver to source, which would reduce noise levels rather than increase them. Regardless, this assessment has assessed the influence of adverse weather conditions on noise impacts at all sensitive receiver locations.

1.1 Operational Noise

Project specific noise trigger levels have been developed based on the ambient noise monitoring and the requirements of the EPAs Noise Policy for Industry (NPfI) and NSW Liquor and Gaming typical requirements.

The noise modelling considered patron noise, music noise and building services noise around the site. Patrons and music noise levels were assessed over the worst-case 15 minutes during the late-night trade period. All mechanical plant and equipment will be designed to comply with the relevant noise emissions requirements.

The predicted noise levels identified compliance with the applicable noise criteria is achieved with the inclusion of appropriate noise mitigation measures.

1.2 Operational Road Traffic Noise

This development will generate small amount of additional vehicle traffic on the surrounding road network, which would need to operate on East Esplande, and potentially impact local residential receivers. Operational road traffic noise levels were assessed in accordance with the requirements of the EPAs Noise Policy for Industry.

The predicted noise levels identify that road traffic noise levels currently exceed the RNP noise criteria and will continue to do so in the future. Road traffic noise levels will increase by less than 0.5 dB. An increase in noise of less than 2 or 3 dB is typically considered indiscernible, particularly when the increase in road traffic will be over an estimated 10-year period. The additional road traffic noise impacts are negligible.

1.3 Construction Noise

Construction noise has been assessed in accordance with the EPAs Interim Construction Noise Guideline (ICNG). The ICNG provides assessment procedures for the assessment of noise impacts, with management and mitigation measures and procedures to address potential impacts on sensitive receivers.

Appropriate construction noise management levels have been established based on the measured ambient noise levels in the proximity of the project area.

The project is currently in the early stages of planning, with a high-level understanding of the construction work practices available. Typical construction scenarios including typical equipment were assessed.

The predicted noise impacts identified that a generally compliance with the noise management levels would occur as most of the works are focussed within the building shell.

Construction road noise has also been assessed in accordance with the Road Noise Policy. The background noise monitoring results and the traffic survey identified that existing surrounding road network currently experiences high levels of road traffic. Road traffic noise levels were predicted to increase by less than 1 dB because of the construction activities.

A range of noise management and mitigation measures have been identified to reduce the potential impacts on surrounding sensitive receivers. These recommendations should be incorporated into the contractor's Construction Noise and Vibration Management Plan (CNVMP).

1.4 Construction vibration

The impacts of vibration on human comfort have been assessed against the EPAs Assessing vibration: a technical guideline. This document provides guidance on suitable vibration levels for continuous, intermittent, and impulsive vibration.

The impacts of vibration on structures have been assessed against British Standard BS 7385: Part 2-1993 "Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration" (BSI 1993). This standard provides guidance to protect buildings from cosmetic damage which may result from vibration impacts.

The project is currently in the early planning stage and specific construction equipment is subject to change. Safe working distances have been presented to provide guidance on appropriate typical equipment which could be considered for this project.

Given the location of the site, cosmetic damage associated with exceedances of the applicable vibration criteria is unlikely. However, compliance with the safe working distance presented in this report should be maintained.

A range of vibration management and mitigation measures are presented in this report, for inclusion in the contractor's CNVMP. Vibration monitoring is recommended wherever exceedance of the safe working distances are likely to occur to ensure that the applicable vibration criteria are complied with throughout the construction of the project.

1.5 Summary

This report has identified that with the inclusion of appropriate noise management and mitigation measures, compliance with appropriate construction and operational noise and vibration criteria would be achieved. The mitigation recommendations in this report will be incorporated in the design of the project to ensure noise emitted from the development is appropriately controlled.

2 INTRODUCTION

Pulse White Noise Acoustics Pty Ltd (PWNA) have being engaged to undertake an acoustic assessment as part of the Development Application (DA) for the Change of Use, Alterations and Additions to an existing tenancy (24.1) of the Manly Wharf.

As part of this assessment we have undertaken baseline acoustic surveys to determine the ambient noise level, formulation of relevant acoustic requirements applicable to the proposal, analysis of the likely acoustic impacts and development of acoustic mitigation measures to ensure compliance.

2.1 Relevant Guidelines

Acoustic criteria that have been adopted in this assessment include requirements from the following guidelines or legislative documents:

- Northern Beaches Council (Formerly Manly Council) Local Environmental Plan (LEP) and the Development Control Plan (DCP) 2013.
- NSW EPA Noise Policy for Industry (*NPI*) 2017.
- NSW EPA Road Noise Policy (*RNP*) 2011.
- NSW EPA Interim Construction Noise Guideline (*ICNG*) 2009.
- NSW EPA (formerly, Department of Environment and Climate Change) *Assessing Vibration: a technical guideline 2006 (AV-TG)*.
- Australian Standard AS 2670.2 1990 - *Evaluation of Human Exposure to Whole Body Vibration - Part 2: Continuous and Shock Induced Vibration in Buildings (1 Hz to 80 Hz).*
- British Standard BS 6472 - 2008 - *Evaluation of Human Exposure Vibration in Buildings (1 Hz to 80 Hz); and*
- German DIN 4150: Part 3 – 1999 "*Effects of Vibration on Structure*" (DIN 1999).

2.2 Site Description

The site is a vacant tenancy identified as tenancy 24.1 (see Figure 1) located within Manly Wharf, East Esplanade, Manly (formally Lot 1 in Deposited Plan 1170245). The site was previously used as an Aldi supermarket until operations ceased in 2022.

The site has an area of 1,429m^2 within the Manly Wharf interior. The eastern portion of the site is enveloped by the Manly Wharf Hotel, while its northern section is adjacent to Manly Wharf's service areas (e.g. storage, goods lift and corridors). The western portion of the site served as the primary ingress / egress for the Aldi supermarket tenancy.

Figure 1 The Site – *Source: ACME*

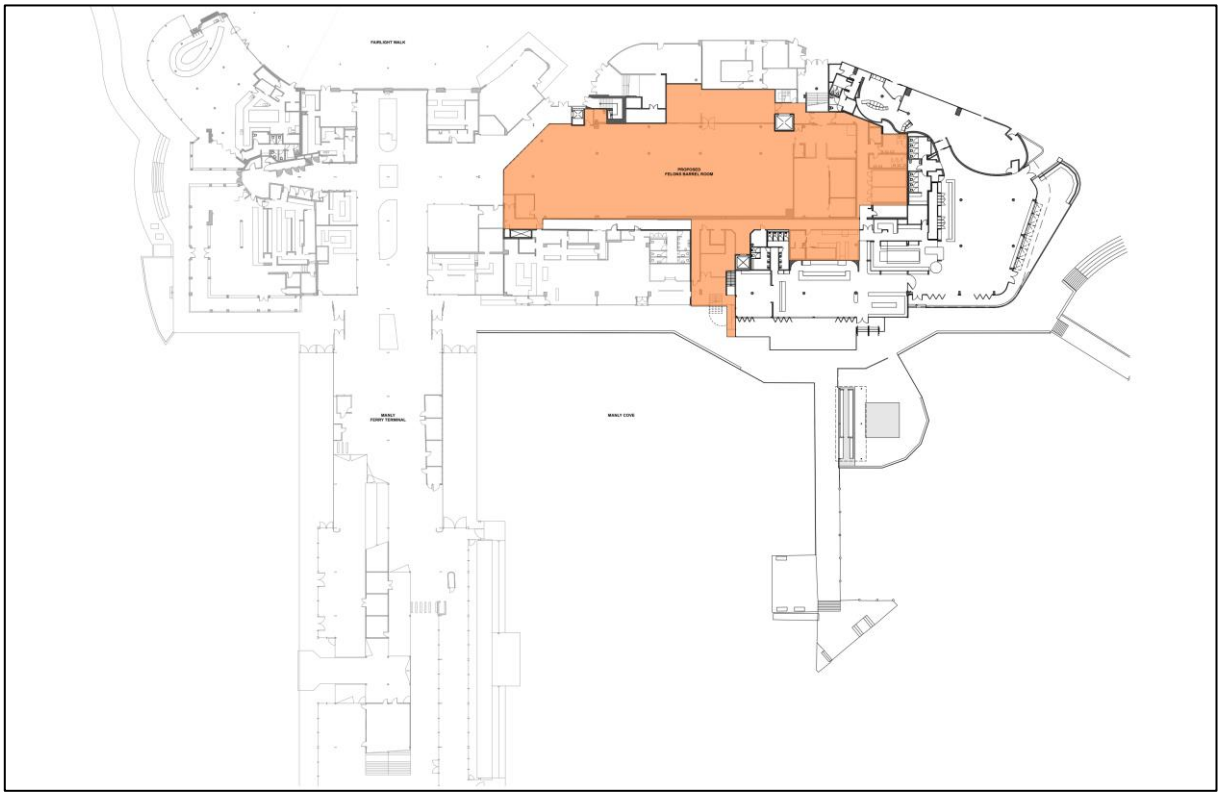


Figure 2 Manly Wharf and surrounds - Source: TMG Developments Pty Ltd

2.3 The Proposal

This section provides a detailed description of the proposed development. This section should be read in conjunction with the attached plans and documentation.

1.1 Summary of proposed development

The proposed development seeks alterations to the existing vacant retail tenancy at Manly Wharf for use as a pub and micro-brewery with ancillary dining and live performance. Key features of the proposed development include:

- change of use of vacant supermarket tenancy to a pub and micro-brewery with ancillary dining and live performance;
- demolition of existing external staircase, office spaces, storage spaces, cool rooms, freezers, supermarket staff toilets and basement public toilets and amenities;
- internal fit-out including two bars, ancillary kitchen, small staff office, new toilets and amenities servicing customers and staff;
- new publicly accessible toilets and amenities servicing the rest of Manly Wharf;
- an internal connection to provide controlled, secondary access for patrons who wish to make their way between the new venue and the existing Manly Wharf Hotel;
- installation of micro-brewing equipment;
- internal fit out works including new wall linings, floor coverings, ceilings and acoustic treatments;
- a new vestibule to provide entry to the premises, with direct connections to the waterside wharf promenade, the basement via both lift and stair, and a secondary access link to the existing Manly Wharf Hotel;
- intermittent and occasional weekend markets inside the new venue, four Saturdays a year during daytime trading hours ;
- hours of operation consistent with the Manly Wharf Hotel:
    - 7am to midnight, Monday to Wednesday and Sunday; and
    - 7am to 1am, Thursday to Saturday.
- A separate liquor license application will seek an extension of the existing Manly Wharf Hotel license to provide for the service of alcohol within the new premises.

1.2 Description of proposed use

The proposed use is primarily a 'pub', while the proposed 'microbrewery' can be characterised as 'light industry'.

An intermittent and occasional weekend market is proposed to be held in the new venue, four Saturdays a year. The markets would be held during daytime trading hours and feature goods from independent stall holders.

The proposed use is not characterised as 'artisan food and drink industry'. Although the development will be manufacturing boutique / artisan drink products, there will not be a designated retail area for its sale on site.

The new venue has been designed to be managed and operated by the one management team in conjunction with Manly Wharf Hotel.

A separate liquor licence application will address requirements for the service of alcohol within the new premises.

1.3 Description of proposed building alterations

All proposed building alterations are within the interior of Manly Wharf, except the reconfiguration of an existing external stair and the new main entry to the new venue.

There are no proposed changes to Manly Wharf's existing floor levels, nor its structure below water level.

All building alterations are described in detail below, with respect to the various proposed internal spaces.

2.3.1 Demolition

Demolition of:

- all remaining supermarket fittings and fixtures within vacant tenancy;
- partition walls to back of house dry and cold storage spaces;
- site offices;
- supermarket staff toilet amenities;
- basement public toilet amenities;
- entry doors to the previous retail space from the internal wharf concourse;
- external staircase; and
- mechanical plant and equipment located on level 1 outdoor area.

2.3.2 Pub

Works and alterations include:

- two separate bars at either end of the space, for service of food and beverages;
- new male, female and accessible toilets to service both staff and patrons, behind the eastern end bar;
- new secondary egress doors to the internal wharf concourse, in the location of the existing roller doors that served as the previous supermarket entry point; and
- back of house area for storage.

2.3.3 Micro-brewery

The proposed micro-brewery is visible from within the proposed pub, and the existing Manly Wharf Hotel. The brewery is within a single space and comprises:

- 144 wooden barrels for ageing beer

- 4 vessel brewhouse hot and cold liquor tanks
- Fermentation tanks
- Cool room
- Processing equipment
- Packaging equipment
- Ancillary plant and equipment.
- Drainage for water management/cleaning

2.3.4 New entry / vestibule

External works mainly located at the existing building entry adjacent the water-side public promenade, include:

- reconfiguration of the existing stair which provides secondary access to a single tenancy on the first floor;
- reconfiguration of existing steps and ramp to the venue to improve the building entry while maintaining equitable access from the public promenade adjacent the water's edge;
- reconfiguration of existing glazing and entry doors to provide new double door entry to a new internal vestibule space;
- refurbishment of the existing lift to provide patrons access from the basement level directly to the vestibule arrival space;
- new internal vestibule to enhance the arrival experience and assist with the management of patrons entering and existing the premises. This space will have direct lift and stair access from the basement public parking and provide access through to the existing Manly Wharf Hotel.

2.3.5 Public Toilets

While the existing public toilets in the basement will be demolished, the remaining portion of the existing tenancy which fronts the internal Manly Wharf concourse will be converted into toilet amenities, accessible to all visitors of Manly Wharf and the general public. Despite this, the frontage will be designed to maintain the active retail edges of the concourse.

2.3.6 Back of House and utility spaces

The proposed new use will be serviced by generous back of house areas for staff, office, storage and maintenance and management of the new premises and the wider Manly Wharf. These facilities include:

- kitchen for food preparation and service, including a freezer, cool room and dry store;
- storage areas;
- office space; and

- mechanical plant in existing external plant room.

2.4 Operational arrangements

This section provides a summary of the proposed operation arrangements in relation to the proposed development. Further detail is provided in the Plan of Management (PoM) included at Appendix D of the SEE.

2.4.1 Hours of operation

The proposed hours of operation are consistent with the trading hours of the existing Manly Wharf Hotel, that is:

- 7am to midnight, Monday to Wednesday and Sunday; and
- 7am to 1am, Thursday to Saturday.

2.4.2 Patron capacity

Capacity for a maximum of 700 patrons within the proposed new premises.

2.4.3 Staffing

An estimated maximum of 20 staff employed at the premises.

2.4.4 Complaints handling

The Plan of Management at Appendix D sets out the approach to dealing with any complaints if received in relation to the use and management of the proposed new premises. In summary this process involves keeping a record of complaints made, and the licensee responding to the complainant in a timely manner.

2.4.5 Safety, Security

The recent change of ownership of Manly Wharf includes a complete refresh of the approach to management and security of the premises. Consistent with their operations in QLD, the new owners will implement an approach of 24 hour security and a 24 hour roster of cleaning services across all part of Manly Wharf under their ownership. Furthermore this security and management team will ensure a proactive and collaborative approach to effective management of area of the wharf and adjacent streets and public spaces that are the responsibility of public authorities and other landowners.

Within the proposed use, safety and security of all will be ensured by staff properly trained to perform these roles and in accordance with all obligations under the development consent and liquor licence. This is set out in further detail in the Plan of Management included at Appendix D of the SEE.

3 SURROUNDING EXTERNAL NOISE RECEIVERS

The nearest sensitive noise receivers to the site are identified below.

Table 1 Receiver Locations

Receiver Number #	Receiver Location	Number of Floors Assumed	Associated Noise Monitor (For the determination of RBLs)
R01	23 Commonwealth Parade, Manly	3	Location 2
R02	13 The Crescent, Manly	3	Location 2
R03	5 Commonwealth Parade, Manly	3	Location 2
R04	87 West Esplanade, Manly	3	Location 2
R05	85 West Esplanade, Manly	4	Location 2
R06	81 West Esplanade, Manly	10	Location 2
R07	77-78 West Esplanade, Manly	3	Location 3
R08	75-76 West Esplanade, Manly	3	Location 3
R09	1-3 Eustace Street, Manly	3	Location 3
R10	54-68 West Esplanade, Manly	6	Location 3
R11	53 East Esplanade, Manly	4	Location 3
R12	46-48 East Esplanade, Manly	3	Location 3
R13	43-45 East Esplanade, Manly	4	Location 3
R14 – A	41-42 East Esplanade, Manly	4	Location 3
R14 – B	41-42 East Esplanade, Manly	3	Location 3
R15	40 East Esplanade, Manly	4	Location 3
R16	39 East Esplanade, Manly	6	Location 3
R17	37-38 East Esplanade, Manly	9	Location 3
R18	35-36 East Esplanade, Manly	8	Location 3
R19	29 East Esplanade, Manly	1	Location 3
R20	2 Victoria Parade, Manly	3	Location 3
R21	27 East Esplanade, Manly	3	Location 3
R22	26 East Esplanade, Manly	3	Location 3
R23	24 East Esplanade, Manly	6	Location 3
R24	19 East Esplanade, Manly	2	Location 3
R25	15 East Esplanade, Manly	3	Location 3
R26	13 East Esplanade, Manly	9	Location 3
R27	9 East Esplanade, Manly	4	Location 1

R28	7 East Esplanade, Manly	4	Location 1
R29	5 East Esplanade, Manly	1	Location 1
R30	Manly 16ft Skiff Sailing Club (Corner East Esplanade &, Stuart Street, Manly)	1	Location 1

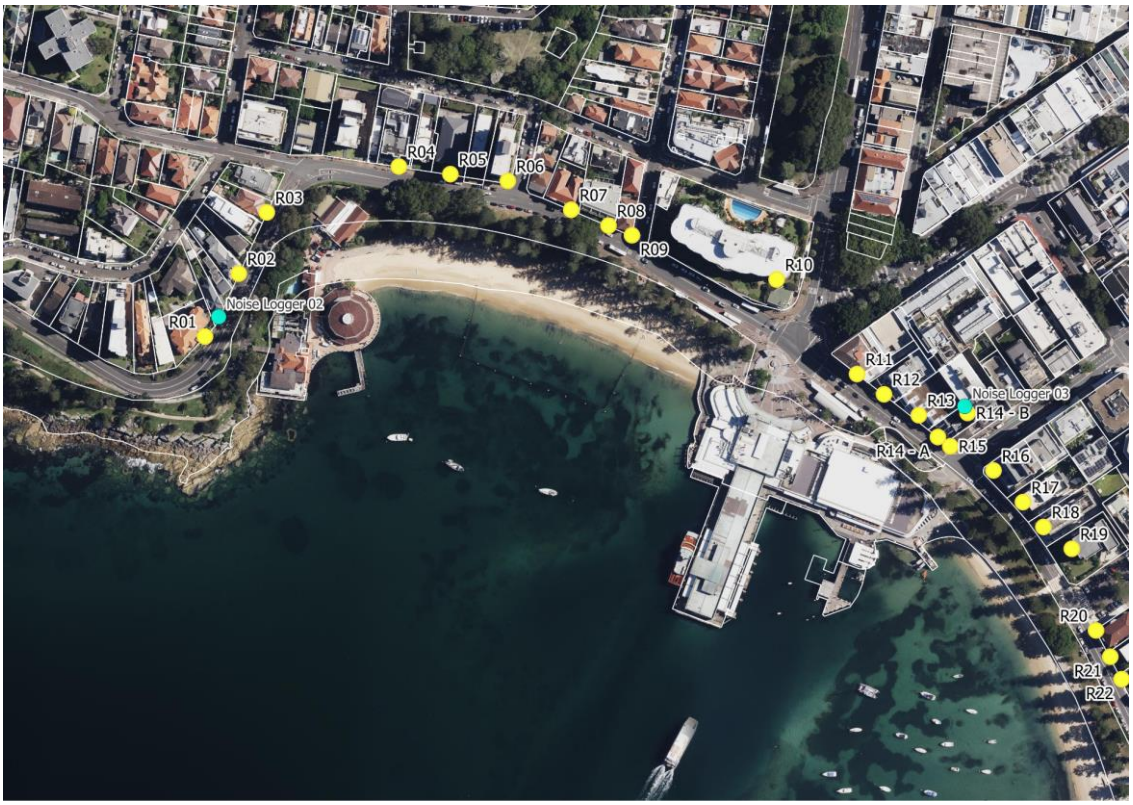
A map showing the site location as well as nearest receivers is provided in below. This figure also shows the location of onsite unattended measurements which were conducted as part of this assessment.

Figure 3 External Receiver Locations (Overview)

Note: A detailed view of the east and west is provided below.

Figure 4 External Receiver Locations (East View)

Figure 5 External Receiver Locations (West View)



4 ACOUSTIC NOISE SURVEY

Measured noise levels from the onsite noise survey are outlined below.

4.1 Unattended Noise Monitoring

Three unattended noise monitors were deployed to the site to survey existing background noise levels as well as ambient L_{Aeq} noise levels.

The monitoring location included three (3) different residential receiver locations around the site. As shown in the figure below, location 01 is a residential dwelling to the east of the Wharf (across the water) along East Esplanade. The second location was conducted directly across the road from the Wharf along the West Esplanade and the third location was along Commonwealth Parade across the water to the west of the site.

Onsite acoustic noise survey was conducted from Monday 6th May 2024 and Wednesday 15th May 2024. All data in the graphs presented in Appendix B, C and D have not been corrected (i.e., raw data is presented).

Instrumentation for the survey comprised of one (1) Rion NL-42 sound level meter (serial number 00396931), a Acoustic Research Laboratories (ARL) nGara Noise Monitor (serial number 87826E) and the third noise monitor was a Norsonic 139 sound level meter (serial number 1393013. Calibration of the monitors were 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.

Due to an equipment malfunction, noise monitor location 01 only recorded a single 15-minute interval and did not record any other results for the monitoring period. Location 02 and 03 successfully recorded noise levels during the monitoring period. To determine resulting rating background noise levels at noise monitor location 01 an attended noise survey was conducted after access was not granted by the resident on a second attempt to re-conduct the noise monitoring, see section 4.2 below.

Charts presenting summaries of the measured daily noise data are attached in Appendix B for location 02 and Appendix C for location 03. The charts present each 24-hour period and show the 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.

Locations of the noise monitors are provided in Figure 6 below.

Based on the unattended noise measurements, the results of the survey have been presented below.

Figure 6 - Project Site Location - Sourced Sixmaps

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

In order to assess the acoustical implications of the development at nearby noise sensitive receivers, the measured background noise data of the logger was processed in accordance with the NSW EPA's Noise Policy for Industry (NPI, 2017).

The Rating Background Noise Level (RBL) is the background noise level used for assessment purposes at the nearest potentially affected receiver. The noise monitor locations were chosen as they are representative locations for key residential areas around the site and are less impacted by other environmental noise such as harbour, road traffic and other venues within the manly area. It is the 90th percentile of the daily background noise levels during each assessment period, being day, evening and night. RBL $L_{A90\ (15minute)}$ and L_{Aeq} noise levels are presented in Table 2

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 Observatory Hill (ID 066214) which is located within 30 km. Levels presented below are processed results with extraneous weather events removed.

Table 2 Measured Ambient Noise Levels corresponding to the NPI's Assessment Time Periods

Measurement Location [4]	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)
Location 01 – East Esplanade (see Figure 6)	- [4]	- [4]	- [4]	- [4]	- [4]	- [4]
Location 02 – Commonwealth Parade (see Figure 6)	51	64	47	62	43	56
Location 03 – West Esplanade (see Figure 6)	55	60	56	59	49	54

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 LA90 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 LAeq 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 4 *As described above, noise monitoring which was conducted at location 01 has an equipment malfunction and did not record extended noise levels.*

Based on analysis of the measured noise levels and onsite observations we note:

- As mentioned above, noise monitoring which was undertaken at location 1 had a malfunction during the initial acoustic survey. Upon discovering the technical error PWNA attempted to re-place the noise monitor to determine RBL's in accordance with the NSW EPA NPI 2017 again, however access was not permitted. As such an attended noise survey was undertaken to supplement the other acoustic surveys as outlined in the NSW EPA NPI 2017.

- Noise monitoring which was undertaken at location 2 is dominated by traffic noise along Commonwealth Parade during the day and evening period. During the night period this starts to become harbour dominated and distant urban dominated as the night period begins and through to early morning period when traffic flows start to begin for the following day.

- Noise levels at location 3 are dominated from existing urban noise from surrounding manly bay, harbour noise, wind noise and surrounding roadways.

4.1.2 Results in accordance with the NSW Department of Planning, Housing and Infrastructure (DPHI) "Road Noise Policy"

In determining the required façade construction for the proposed building in accordance with the internal noise level requirements of Department of Planning, Housing and Infrastructure (DPHI) "Road Noise Policy", measured noise levels are shown based on the time periods defined by the SEPP below.

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.

Table 3 Measured Ambient Noise Levels corresponding to the "Road Noise Policy" Assessment Time Periods

Measurement Location	Daytime [1] 7:00 am to 10:00 pm $L_{Aeq\ (whole\ period)}$ [2] (dBA)	Night-time [1] 10:00 pm to 7:00 am $L_{Aeq\ (whole\ period)}$ [2] (dBA)
Location 1 – East Esplanade (see Figure 6)	- [3]	- [3]
Location 2 – Commonwealth Parade (see Figure 6)	63	56
Location 3 – West Esplanade (see Figure 6)	60	54

Note 1 For Monday to Sunday, Daytime 7:00 am – 10:00 pm; Night-time 10:00 pm – 7:00 am.

Note 2 The LAeq 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 As described above, noise monitoring which was conducted at location 1 has an equipment malfunction and did not record extended noise levels.

4.1.3 1/1 Octave Results

In addition to the overall broadband noise levels identified above, the associated single octave (1/1) noise spectra are provided below.

Table 4 Measured Unattended Noise Monitor Single Octave (1/1) Spectra

Time Period	Parameter [1]	Octave Band Centre Frequency, Hz (dB)									Overall dBA
		31.5	63	125	250	500	1k	2k	4k	8k	
Location 1 – East Esplanade (see Figure 6)											
Day Period: 7:00am to 6:00pm	Measured L_{A90}	- [4]	- [4]	- [4]	- [4]	- [4]	- [4]	- [4]	- [4]	- [4]	- [4]
Evening Period: 7:00am to 6:00pm	Measured L_{A90}	- [4]	- [4]	- [4]	- [4]	- [4]	- [4]	- [4]	- [4]	- [4]	- [4]
Night Period: 10:00pm to 7:00am	Measured L_{A90}	- [4]	- [4]	- [4]	- [4]	- [4]	- [4]	- [4]	- [4]	- [4]	- [4]
Location 2 – Commonwealth Parade (see Figure 6)											
Day Period: 7:00am to 6:00pm	Measured L_{A90}	58	51	54	52	47	45	42	35	25	**51**

Evening Period: 7:00am to 6:00pm	Measured L_{A90}	48	42	48	49	44	41	37	31	20	**47**
Night Period: 10:00pm to 7:00am	Measured L_{A90}	45	41	46	45	40	38	35	28	19	**43**
Location 3 – West Esplanade (see Figure 6)											
Day Period: 7:00am to 6:00pm	Measured L_{A90}	62	55	58	56	51	49	46	39	29	**55**
Evening Period: 7:00am to 6:00pm	Measured L_{A90}	57	51	57	58	53	50	46	40	29	**56**
Night Period: 10:00pm to 7:00am	Measured L_{A90}	51	47	52	51	46	44	41	34	25	**49**

Note 1 *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 2 *The LAeq 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 *For Monday to Saturday, Daytime 7:00 am – 6:00 pm; Evening 6:00 pm – 10:00 pm; Night-time 10:00 pm – 1:00 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 4 *As described above, noise monitoring which was conducted at location 1 has an equipment malfunction and did not record extended noise levels.*

4.2 Attended Noise Survey

In addition to the unattended noise surveys detailed above, onsite attended noise surveys have been undertaken around the site to support the measurements above.

Locations of the attended noise measurements are detailed in the figure above. Noise measurements have been undertaken at ground level along the common boundary to each property.

Attended noise level testing was undertaken using a Bruel and Kjaer 2270 Class 1 Type 1 Sound Level Meter (SLM). The meter was calibrated before and after testing and no significant drift was recorded. The attended and unattended noise locations were selected to obtain suitable noise levels for the assessment of background noise levels ($L_{90\,(t)}$) as well as the impact from traffic movements ($LAeq_{(t)}$).

The attended noise survey was attempted on Sunday 24th May 2024 between 4:30pm and 5:30pm, 9:00am and 10:00pm and 1:00am and 2:00am (following day)

Table 5 Measured Attended Noise Level Measurements – Broadband Levels

Measurement Location	Date and Time		Measured Noise Level (dBA)	
			$L_{A90\,(15\text{-minutes})}$ 1 (dBA)	$L_{Aeq\,(15\text{-minutes})}$ 2 (dBA)
Location A1 – East Esplanade – Behind Manly Yacht Club (see Figure 6)	Sunday 24th May 2024	4:30pm and 5:30pm	50	63
		9:00am and 10:00pm	48	59
	Monday 25th May 2024	1:00am and 2:00am	45	55
	Sunday 24th May 2024	4:30pm and 5:30pm	53	64
		9:00am and 10:00pm	50	57

Location A2 – Commonwealth Parade (see Figure 6)	Monday 25th May 2024	1:00am and 2:00am	46	49
Location A3 – East Esplanade (along Corso) (see Figure 6)	Sunday 24th May 2024	4:30pm and 5:30pm	60	65
		9:00am and 10:00pm	54	59
	Monday 25th May 2024	1:00am and 2:00am	52	58

Note 1 *The LA90 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 2 *The LAeq 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.*

In addition to the overall broadband noise levels identified above, the associated single octave (1/1) noise spectra are provided below.

Table 6 Measured Attended Noise Measurement – Single Octave (1/1) Spectra

Time Period	Parameter [1]	Octave Band Centre Frequency, Hz									Overall dBA
		31.5	63	125	250	500	1k	2k	4k	8k	
Location A1 – East Esplanade – Behind Manly Yacht Club (see Figure 6)											
Sunday 24th May 2024, 4:30pm and 5:30pm	Measured L_{A90}	57	55	51	47	47	45	41	32	20	**50**
Sunday 24th May 2024, 9:00am and 10:00pm	Measured L_{A90}	58	57	51	47	46	44	39	28	17	**48**
Monday 25th May 2024, 1:00am and 2:00am	Measured L_{A90}	60	52	47	44	42	40	36	29	22	**45**
Location A2 – Commonwealth Parade (see Figure 6)											
Sunday 24th May 2024, 4:30pm and 5:30pm	Measured L_{A90}	61	54	57	55	50	48	45	38	28	**53**
Sunday 24th May 2024, 9:00am and 10:00pm	Measured L_{A90}	51	45	51	52	47	44	40	34	23	**50**
Monday 25th May 2024, 1:00am and 2:00am	Measured L_{A90}	48	44	49	48	43	41	38	31	22	**46**
Location 3 – West Esplanade (see Figure 6)											
Sunday 24th May 2024, 4:30pm and 5:30pm	Measured L_{A90}	66	62	60	55	55	55	54	49	40	**60**
Sunday 24th May 2024, 9:00am and 10:00pm	Measured L_{A90}	58	63	59	52	50	50	46	39	25	**54**
Monday 25th May 2024, 1:00am and 2:00am	Measured L_{A90}	57	57	57	51	49	47	44	37	25	**52**

Note 1 *The LA90 noise level is representative of the "average minimum background sound level" (in the absence of the source under consideration), or simply the background level.*

4.3 Summary of Measured Noise Levels

Based on the measured noise levels from both the attended and unattended noise surveys the resulting adopted Rating Background Noise Levels (RBL) for each of the receivers are summarised below.

Locations which included both an attended and unattended noise survey, the unattended noise survey was adopted in lieu of the attended noise survey as they are generally lower noise levels and representative of the existing acoustic environment.

Table 7 Summary of Assumed Rating Background Noise Levels (RBL) including Single Octave (1/1) Spectra for surrounding receivers

Time Period	Parameter [1]	Octave Band Centre Frequency, Hz (dB)									Overall dBA
		31.5	63	125	250	500	1k	2k	4k	8k	
Receivers R01 to R06											
(Based on unattended noise monitor located at ***L02*** (Commonwealth Parade see Figure 6)											
Day Period: 7:00am to 6:00pm	Measured L_{A90}	58	51	54	52	47	45	42	35	25	**51**
Evening Period: 7:00am to 6:00pm	Measured L_{A90}	48	42	48	49	44	41	37	31	20	**47**
Night Period: 10:00pm to 7:00am	Measured L_{A90}	45	41	46	45	40	38	35	28	19	**43**
Receivers R07 to R26											
(Based on unattended noise monitor located at ***L03*** (East Esplanade see Figure 6)											
Day Period: 7:00am to 6:00pm	Measured L_{A90}	62	55	58	56	51	49	46	39	29	**55**
Evening Period: 7:00am to 6:00pm	Measured L_{A90}	57	51	57	58	53	50	46	40	29	**56**
Night Period: 10:00pm to 7:00am	Measured L_{A90}	51	47	52	51	46	44	41	34	25	**49**
Receivers R27 to R30											
(Based on the attended noise survey conducted at ***A1*** (see Figure 6))											
Day Period: 7:00am to 6:00pm	Measured L_{A90}	57	55	51	47	47	45	41	32	20	**50**
Evening Period: 7:00am to 6:00pm	Measured L_{A90}	58	57	51	47	46	44	39	28	17	**48**
Night Period: 10:00pm to 7:00am	Measured L_{A90}	60	52	47	44	42	40	36	29	22	**45**

Note 1 *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 2 *For Monday to Saturday, Daytime 7:00 am – 6:00 pm; Evening 6:00 pm – 10:00 pm; Night-time 10:00 pm – 1:00 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.*

5 NOISE AND VIBRATION CRITERIA

All relevant noise and vibration criteria for the project is presented below. It has been separated into two main components: external noise emission criteria and construction noise/vibration criteria. Each are discussed in detail below.

5.1 External Noise Emission Criteria

5.1.1 Northern Beaches Council (Formerly Manly Council) Local Environmental Plan (LEP) 2013 & Development Control Plan (DCP) 2013

Acoustic requirements relevant to noise emitted from the building are not provided in the Manly Council LEP or DCP documents. Therefore, requirements of the NSW EPA NPI 2017, NSW Liquor and Gaming Acoustic Requirements and NSW EPA RNP 2011 will be adopted. Each is discussed in detail below.

5.1.2 NSW EPA Noise Policy for Industry (NPI) 2017

(Assessment of Building Services & Onsite Vehicles)

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

The NSW EPA has recently released a document titled 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; and
- Maintaining noise level amenity of particular land uses for residents and sensitive receivers in other land uses.

5.1.2.1 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.

5.1.2.2 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 LAeq noise level should not exceed the level appropriate for the 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 LAeq,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 traffic noise level, the project amenity noise levels can be set at 15 dB below existing traffic noise levels (i.e. $L_{Aeq,period(traffic)}$ *minus 15 dBA*).

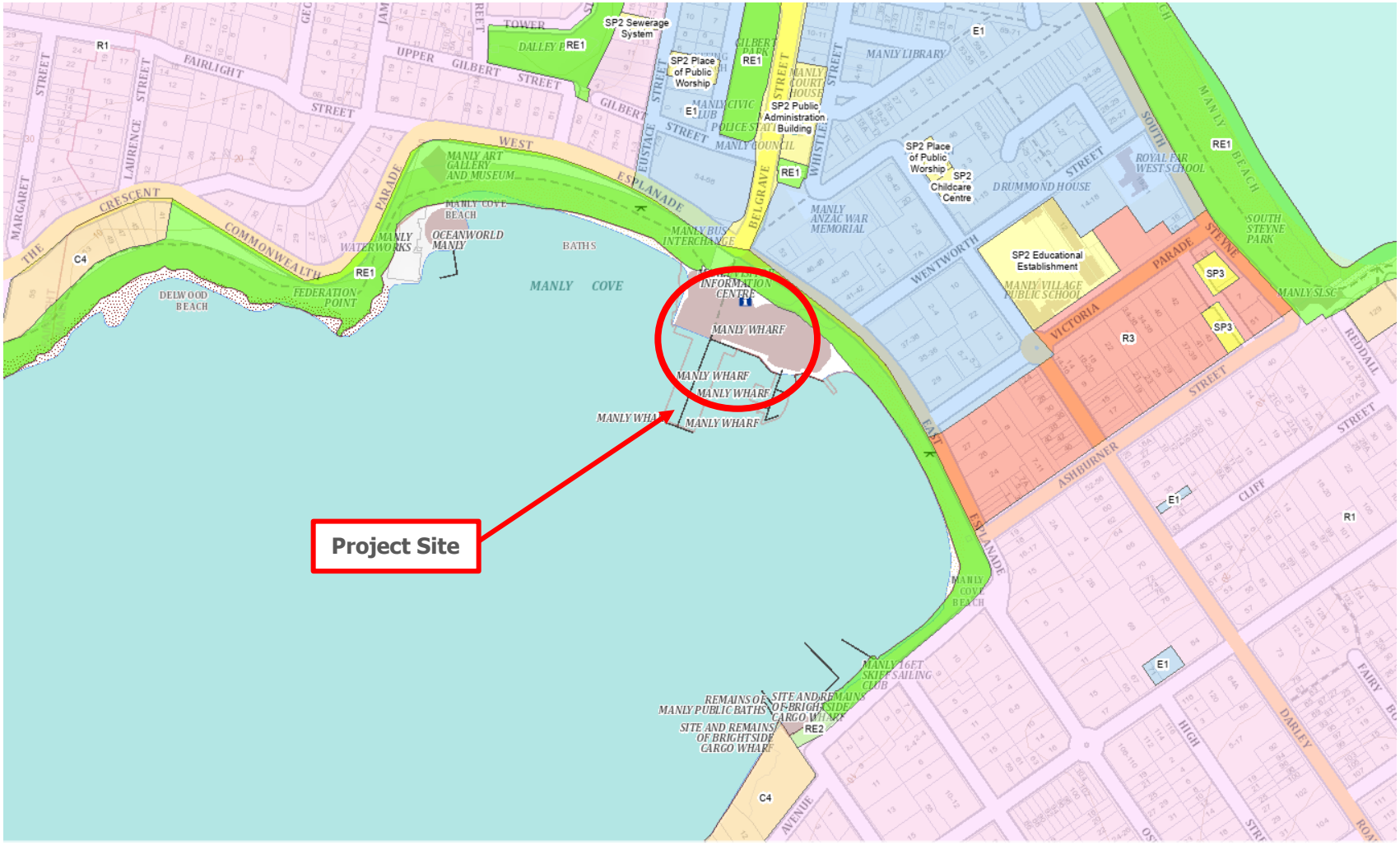
5.1.2.3 Residential Receivers – Area Classification

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

- Urban – an area with an acoustical environment that:
    - Is dominated by 'urban hum' or industrial source noise, where urban hum means the aggregate sound of many unidentifiable, most traffic and/or industrial related sound sources
    - Has through=traffic with characteristically heavy and continuous traffic flows during peak periods.
    - Is near commercial districts or industrial districts.
    - Has any combination of the above.

As shown below, the site and its surrounding receivers are within an area made up of R1, R3, E1 and C4 type developments. Based on classifications, measured ambient noise levels and description and using table 2.3 of the NPI (see below), we believe that the most appropriate classification for the development site is Urban.

Figure 7 – NSW ePlanning Spatial Viewer



As shown above, the nearest surrounding receivers are within an area made up of R1, E1, and R3 type developments (General Residential, Local Centre, and Medium Density Residential respectively). Based on classification of the surrounding land uses and the measured background noise levels, the most appropriate classification is urban.

Figure 8 - NPI Extract - Table 2.3 Determining which of the residential receiver categories applies

Table 2.3: Determining which of the residential receiver categories applies.

Receiver category	Typical planning zoning – standard instrument*	Typical existing background noise levels	Description
Rural residential	RU1 – primary production RU2 – rural landscape RU4 – primary production small lots R5 – large lot residential E4 – environmental living	Daytime RBL <40 dB(A) Evening RBL <35 dB(A) Night RBL <30 dB(A)	**Rural** – an area with an acoustical environment that is dominated by natural sounds, having little or no road traffic noise and generally characterised by low background noise levels. Settlement patterns would be typically sparse. Note: Where background noise levels are higher than those presented in column 3 due to existing industry or intensive agricultural activities, the selection of a higher noise amenity area should be considered.
Suburban residential	RU5 – village RU6 – transition R2 – low density residential R3 – medium density residential E2 – environmental conservation E3 – environmental management	Daytime RBL<45 dB(A) Evening RBL<40 dB(A) Night RBL <35dB(A)	**Suburban** – an area that has local traffic with characteristically intermittent traffic flows or with some limited commerce or industry. This area often has the following characteristic: evening ambient noise levels defined by the natural environment and human activity.
Urban residential	R1 – general residential R4 – high density residential B1 – neighbourhood centre (boarding houses and shop-top housing) B2 – local centre (boarding houses) B4 – mixed use	Daytime RBL> 45 dB(A) Evening RBL> 40 dB(A) Night RBL >35 dB(A)	**Urban** – an area with an acoustical environment that: • is dominated by 'urban hum' or industrial source noise, where urban hum means the aggregate sound of many unidentifiable, mostly traffic and/or industrial related sound sources • has through-traffic with characteristically heavy and continuous traffic flows during peak periods • is near commercial districts or industrial districts • has any combination of the above.

Notes: *As cited in Standard Instrument – Principal Local Environmental Plan, New South Wales Government, Version 15 August 2014. RBL = rating background noise level.

Resultant amenity levels for Urban receivers and other surrounding land uses are shown below.

Table 8 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	60
		Evening	50
		Night	45
Commercial premises	-	When in use	65

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

5.1.2.4 Maximum Noise Level Event (Sleeping Disturbance)

Section 2.5 of the NPI states the following:

> 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:
>
> - $L_{Aeq,15min}$ 40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or
> - L_{AFmax} 52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater,
>
> a detailed maximum noise level event assessment should be undertaken.

As outlined in sections above, the measured rating background noise level during the night hours (10:00pm to 7:00am) were:

- 43 dBA L_{A90} for Receivers R01 to R06.
- 49 dBA L_{A90} for Receivers R07 to R26.
- 45 dBA L_{A90} for Receivers R27 to R30.

Therefore, the resultant RBL + 15 dB is **58 dBA** for receivers R01 to R06, **64 dBA** for receivers R06 to R26 and **60 dBA** for receivers R27 to R30 will be adopted for this assessment.

For the RBL + 5 dB is **58 dBA** for receivers R01 to R06, **54 dBA** for receivers R06 to R26 and **50 dBA** for receivers R27 to R30 will be adopted for this assessment.

5.1.2.5 Project Specific External Noise Emission Criteria

(Assessment of Building Services and onsite vehicle noise)

The intrusive, amenity and maximum noise event criteria for noise emissions, derived from the measured data, are presented in Table 9. These criteria are nominated for the purpose of determining the operational noise limits for building services 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. These are shown in bold text in Table 9.

Table 9 External noise level criteria in accordance with the NSW NPI

Receiver Locations	Time of Day [1]	Project Amenity Noise Level, $L_{Aeq, period}$ [2 4] (dBA)	Measured $L_{A90, 15\ min}$ (RBL) [3] (dBA)	Measured $L_{Aeq, period}$ Noise Level [4] (dBA)	Intrusive $L_{Aeq, 15\ min\ Criterion}$ [4] for New Sources (dBA)	Amenity $L_{Aeq, 15\ min\ Criterion}$ [4 5] for New Sources (dBA)
Receivers R01-R06	Day	55	51	64	**56**	58
	Evening	45	47	62	52	**48**
	Night	40	43	56	48	**43**
Receivers R07-R26	Day	55	55	60	60	**58**
	Evening	45	56	59	~~61~~ (60)[7]	**48**
	Night	40	49	54	54	**43**
Receivers R27-R30	Day	55	50	63	54	**58**
	Evening	45	48	59	53	**48**
	Night	40	45	55	50	**43**
Commercial	When in use	60	-	-	-	**63**

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 – 1:00 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 – 7:00 am.

Note 2 Project Amenity Noise Levels corresponding to "Suburban" areas, equivalent to the Recommended Amenity Noise Levels minus 5 dBA.

Note 3 LA90 Background Noise or Rating Background Level.

Note 4 The LAeq 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 5 According to Section 2.2 of the NSW NPI, the LAeq, 15 minutes is equal to the LAeq, period + 3 dB.

Note 6 Project Noise Trigger Levels are shown in bold.

Note 7 As per Section 2.3 of the NPfI the evening PTNL must not be set greater than the daytime period, as such the PTNL for the evening is to be set as the daytime noise level.

In addition, a maximum noise level criterion as outlined below during the night period (10:00pm to 7:00am) at residential receivers also applies:

5.1.3 NSW Liquor & Gaming Typical Acoustic Requirements

Section 79 of the Liquor Act 2007 provides mechanisms for complaints to be made when `the amenity of local areas is disturbed by the use of licensed premises and registered clubs (including disturbances caused by patrons). These complaints are addressed by the Director of Liquor and Gaming, and in this process they may impose temporary or permanent noise conditions on the licensed venue. Typical noise conditions that are imposed upon licensed premises are as follows:

> *The LA10* noise level emitted from the licensed premises shall not exceed the background noise level in any Octave Band Centre Frequency (31.5 Hz – 8k Hz inclusive) by more than 5 dB between 07:00 am and 12:00 midnight at the boundary of any affected residence.*
>
> *The LA10* noise level emitted from the licensed premises shall not exceed the background noise level in any Octave Band Centre Frequency (31.5 Hz – 8k Hz inclusive) between 12:00 midnight and 07:00 am at the boundary of any affected residence.*

Notwithstanding compliance with the above, the noise from the licensed premises shall not be audible within any habitable room in any residential premises between the hours of 12:00 midnight and 07:00 am.

** For the purposes of this condition, the LA10 can be taken as the average maximum deflection of the noise emission from the licensed premises.*

This is a minimum standard. In some instances the Director may specify a time earlier than midnight in respect of the above condition.

Interior noise levels which still exceed safe hearing levels are in no way supported or condoned by the Director.

Note: NSW Liquor and Gaming criteria does not contain any requirements for commercial or industrial receivers. Noise impacts to these receivers will adopt the broadband criteria outlined in the NSW EPA NPI 2017, see above.

These criteria are applicable to noise emissions from the licensed venue component of the development, excluding noise from mechanical services. For external noise emissions, octave band spectral criteria for each assessment period have been summarised in Table 10 below.

Table 10 Liquor & Gaming NSW – L_{A10} Criteria (external) – Residential Criteria Only

Time Period	Parameter [1]	Octave Band Centre Frequency, Hz									Overall dBA
		31.5	63	125	250	500	1k	2k	4k	8k	
7:00am to 6:00pm	**Receiver R01-R06**										
(Background + 5dBA)	Measured L_{A90} Noise Level	58	51	54	52	47	45	42	35	25	**51**
	Criteria L_{A10}	63	56	59	57	52	50	47	40	30	**56**
	Receiver R07-R26										
	Measured L_{A90} Noise Level	62	55	58	56	51	49	46	39	29	**55**
	Criteria L_{A10}	67	60	63	61	56	54	51	44	34	**60**
	Receiver R27-R30										
	Measured L_{A90} Noise Level	57	55	51	47	47	45	41	32	20	**50**
	Criteria L_{A10}	62	60	56	52	52	50	46	37	25	**55**
6:00pm to 10:00pm	**Receiver R01-R06**										
(Background + 5dBA)	Measured L_{A90} Noise Level	48	42	48	49	44	41	37	31	20	**47**
	Criteria L_{A10}	53	47	53	54	49	46	42	36	25	**52**
	Receiver R07-R26										
	Measured L_{A90} Noise Level	57	51	57	58	53	50	46	40	29	**56**
	Criteria L_{A10}	62	56	62	63	58	55	51	45	34	**61**
	Receiver R27-R30										
	Measured L_{A90} Noise Level	58	57	51	47	46	44	39	28	17	**48**
	Criteria L_{A10}	63	62	56	52	51	49	44	33	22	**53**
	Receiver R01-R06										

10:00pm to 12:00am (midnight)	Measured Noise Level	L_{A90}	45	41	46	45	40	38	35	28	19	**43**
	Criteria L_{A10}		50	46	51	50	45	43	40	33	24	**48**
(Background + 5dBA)	**Receiver R07-R26**											
	Measured Noise Level	L_{A90}	51	47	52	51	46	44	41	34	25	**49**
	Criteria L_{A10}		56	52	57	56	51	49	46	39	30	**54**
	Receiver R27-R30											
	Measured Noise Level	L_{A90}	60	52	47	44	42	40	36	29	22	**45**
	Criteria L_{A10}		65	57	52	49	47	45	41	34	27	**50**
12:00am (Midnight) to 1:00am)	**Receiver R01-R06**											
	Measured Noise Level	L_{A90}	45	41	46	45	40	38	35	28	19	**43**
(Background + 0dBA)	Criteria L_{A10}		45	41	46	45	40	38	35	28	19	**43**
	Receiver R07-R26											
	Measured Noise Level	L_{A90}	51	47	52	51	46	44	41	34	25	**49**
	Criteria L_{A10}		51	47	52	51	46	44	41	34	25	**49**
	Receiver R27-R30											
	Measured Noise Level	L_{A90}	60	52	47	44	42	40	36	29	22	**45**
	Criteria L_{A10}		60	52	47	44	42	40	36	29	22	**45**

5.1.4 NSW EPA (Formerly DECCW) NSW Road Noise Policy (RNP) 2011

(Assessment of Vehicles on Public Roads)

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.

5.2 Construction Noise and Vibration Criteria

5.2.1 Construction Noise Criteria

Relevant construction noise criteria applicable to this project are outlined below.

5.2.1.1 Northern Beaches Council (Formerly Manly Council) Environmental Plan (LEP) 2013 & Development Control Plan (DCP) 2013

Acoustic requirements relevant to construction noise and vibration levels emitted from the site are not provided in the Manly LEP or DCP 2013 documents. Therefore, requirements of the NSW EPA ICNG 2009 will be adopted. Each is discussed in detail below.

5.2.1.2 NSW EPA (Former DECC) Interim Construction Noise Guideline (ICNG) 2009

Noise criteria for construction and demolition activities are discussed in the Interim Construction Noise Guideline (ICNG). The ICNG also recommends procedures to address potential impacts of construction noise on residences and other sensitive land uses. The main objectives of the ICNG are summarised as follows:

- Promote a clear understanding of ways to identify and minimise noise from construction works.
- Focus on applying all "feasible" and "reasonable" work practices to minimise construction noise impacts.
- Encourage construction to be undertaken only during the recommended standard hours unless approval is given for works that cannot be undertaken during these hours.
- Streamline the assessment and approval stages and reduce time spent dealing with complaints at the project implementation stage; and
- Provide flexibility in selecting site-specific feasible and reasonable work practices to minimise noise impacts.

The ICNG contains a quantitative assessment method which is applicable to this project. Guidance levels are given for airborne noise at residences and other sensitive land uses.

The quantitative assessment method involves predicting noise levels at sensitive receivers and comparing them with the Noise Management Levels (NMLs). The NML affectation categories for residential receivers have been reproduced from the guideline and are listed in the table below.

Table 11 NMLs for quantitative assessment at residences

Time of Day	Noise Management Level $L_{Aeq(15minute)}$ [1,2]	How to Apply
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq(15minute)}$ 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 dBA	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: 1. Times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences. 2. If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside the recommended standard hours above	Noise affected RBL + 5 dB	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level.

		Where all feasible and reasonable practices have been applied and noise is more than 5 dB above the noise affected level, the proponent should notify the community.

Note 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.*

Note 2 *The RBL is the overall single-figure background noise level measured in each relevant assessment period (during or outside the recommended standard hours). The term RBL is described in detail in the NSW Industrial Noise Policy (EPA 2000).*

Based on the measured background noise levels summarised in section 4, and the NMLs outlined above, the construction noise criteria to be used in this assessment are listed below.

Additionally, construction requirements to offices, retail outlets is 70 dBA $L_{Aeq\ (15\ minute)}$ (Externally).

Table 12 NMLs as basis for the acoustic assessment

Receiver Types		**NML, dB $L_{Aeq(15minute)}$**	
		Standard Hours **Monday to Friday:** **7:00am to 6:00pm** **Saturday:** **8:00am to 1:00pm**	**Outside Standard Hours** **All hours not listed in the adjacent column.**
Residences (Measured externally)	Receivers R01-R06	NAFL: **61** (RBL (51) + 10dB) HNAL: **75**	RBL + 5dB
	Receivers R07-R26	NAFL: **65** (RBL (55) + 10dB) HNAL: **75**	RBL + 5dB
	Receivers R27-R30	NAFL: **60** (RBL (50) + 10dB) HNAL: **75**	RBL + 5dB
Commercial Receivers		**70**	

Note 1 *The LAeq 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.*

5.2.2 Vibration Criteria

Effects of ground borne vibration on buildings may be segregated into the following three categories:

- Human comfort – vibration in which the occupants or users of the building are inconvenienced or possibly disturbed.
- Effects on building contents – where vibration can cause damage to fixtures, fittings, and other non-building related objects.
- Effects on building structures – where vibration can compromise the integrity of the building or structure itself.

5.2.2.1 Vibration Criteria – Human Comfort

Vibration effects relating specifically to the human comfort aspects of the project are taken from AV-TG. This type of impact can be further categorised and assessed using the appropriate criterion as follows:

- Continuous vibration – from uninterrupted sources.
- Impulsive vibration – up to three instances of sudden impact e.g., dropping heavy items, per monitoring period.
- Intermittent vibration – such as from drilling, compacting or activities that would result in continuous vibration if operated continuously.

Table 13 Continuous vibration acceleration criteria (m/s2) 1 Hz-80 Hz

Location	Assessment period	Preferred Values		Maximum Values	
		z-axis	x- and y-axis	z-axis	x- and y-axis
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night-time	0.007	0.005	0.014	0.010

Table 14 Impulsive vibration acceleration criteria (m/s2) 1 Hz-80 Hz

Location	Assessment period	Preferred Values		Maximum Values	
		z-axis	x- and y-axis	z-axis	x- and y-axis
Residences	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.10	0.071	0.20	0.14

Table 15 Intermittent vibration impacts criteria (m/s1.75) 1 Hz-80 Hz

Location	Daytime		Night-time	
	Preferred Values	Maximum Values	Preferred Values	Maximum Values
Residences	0.20	0.40	0.13	0.26

5.2.2.2 Vibration Criteria – Building Contents and Structure

The vibration effects on the building itself are assessed against international standards as follows:

- For transient vibration: British Standard BS 7385: Part 2-1993 "Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration" (BSI 1993); and
- For continuous or repetitive vibration: German DIN 4150: Part 3 – 1999 "Effects of Vibration on Structure" (DIN 1999).

5.2.2.2.1 British Standard BS 7385 Part 2 - 1993

For transient vibration, as discussed in standard BS 7385 Part 2-1993, the criteria are based on peak particle velocity (mm/s) which is to be measured at the base of the building. These are summarised in Table 16 and illustrated in Figure 9.

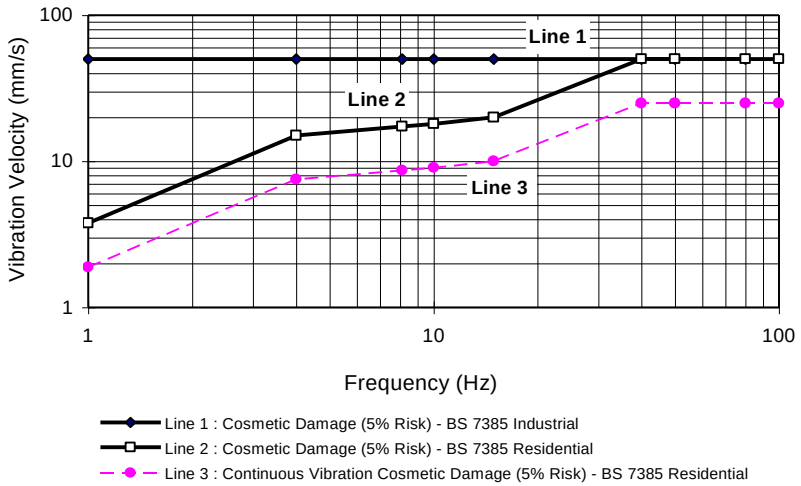
Table 16 Transient vibration criteria as per standard BS 7385 Part 2 – 1993

Line in Figure 9	Type of Building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
		4 Hz to 15 Hz	15 Hz and Above
1	Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
2	Unreinforced or light framed structures Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

Standard BS 7385 Part 2 – 1993 states that the values in Table 16 relate to transient vibration which does not cause resonant responses in buildings.

Where the dynamic loading caused by continuous vibration events is such that it results in dynamic magnification due to resonance (especially at the lower frequencies where lower guide values apply), then the values in Table 16 may need to be reduced by up to 50% (refer to Line 3 in Figure 9).

Figure 9 - BS 7385 Part 2 – 1993, graph of transient vibration values for cosmetic damage



In the lower frequency region where strains associated with a given vibration velocity magnitude are higher, the recommended values corresponding to Line 2 are reduced. Below a frequency of 4 Hz, where a high displacement is associated with the relatively low peak component particle velocity value, a maximum displacement of 0.6 mm (zero to peak) is recommended. This displacement is equivalent to a vibration velocity of 3.7 mm/s at 1 Hz.

The standard also states that minor damage is possible at vibration magnitudes which are greater than twice those given in , and major damage to a building structure may occur at values greater than four times the tabulated values.

Fatigue considerations are also addressed in the standard, and it is concluded that unless the calculation indicates that the magnitude and number of load reversals is significant (in respect of the fatigue life of building materials) then the values in should not be reduced for fatigue considerations.

5.2.2.2.2 German Standard DIN 4150 Part 3 - 1999

For continuous or repetitive vibration, standard DIN 4150 Part 3-1999 provides criteria based on values for peak particle velocity (mm/s) measured at the foundation of the building; these are summarised in Table 17. The criteria are frequency dependent and specific to particular categories of structures.

Table 17 Structural damage criteria as per standard DIN 4150 Part 3 – 1999

Type of Structure	Peak Component Particle Velocity, mm/s			
	Vibration at the foundation at a frequency of			Vibration of horizontal plane of highest floor at all frequencies
	1 Hz to 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz [1]	
Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
Structures that, because of their sensitivity to vibration, do not correspond to those listed in lines 1 and 2 and are of great intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8

5.2.3 Construction Traffic Noise Criteria

For existing residences and other sensitive land uses affected by additional traffic on existing roads, the NSW Road Noise Policy (RNP) 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.

6 OPERATIONAL NOISE EMISSION ASSESSMENT

Assessment of the potential noise emissions from the operation of the proposed pub on the adjacent land uses are outlined below. Noise emissions expected from the operation of the building are mainly from any base building services (mechanical, electrical, hydraulic), vehicle movements and activity noise.

Each major component is discussed in detail below.

6.1 Noise from Engineering Services

Noise associated with the operation of all proposed engineering services whilst onsite must comply with the requirements listed in section 5.1 above. This includes (however not limited to) all mechanical plant (including ventilation systems and air conditioning plant), hydraulic plant (including hot water systems) and electrical systems.

A detailed review of the mechanical services drawings prepared by Integrated Group Services (IGS) has been undertaken and the following advice is provided:

- Kitchen Exhaust Fan (KEF) – 65 dBA (Lw) per unit.
- Air Conditioning Condensers – etc. – 85 dBA (Lw) per unit.
- Toilet Exhaust Fans (TEF) – Bathrooms – 55 dBA (Lw)
- General Ventilation Systems – 65 dBA (Lw) per unit.
- Brewery associated plant systems – 65 dBA (Lw) per unit.

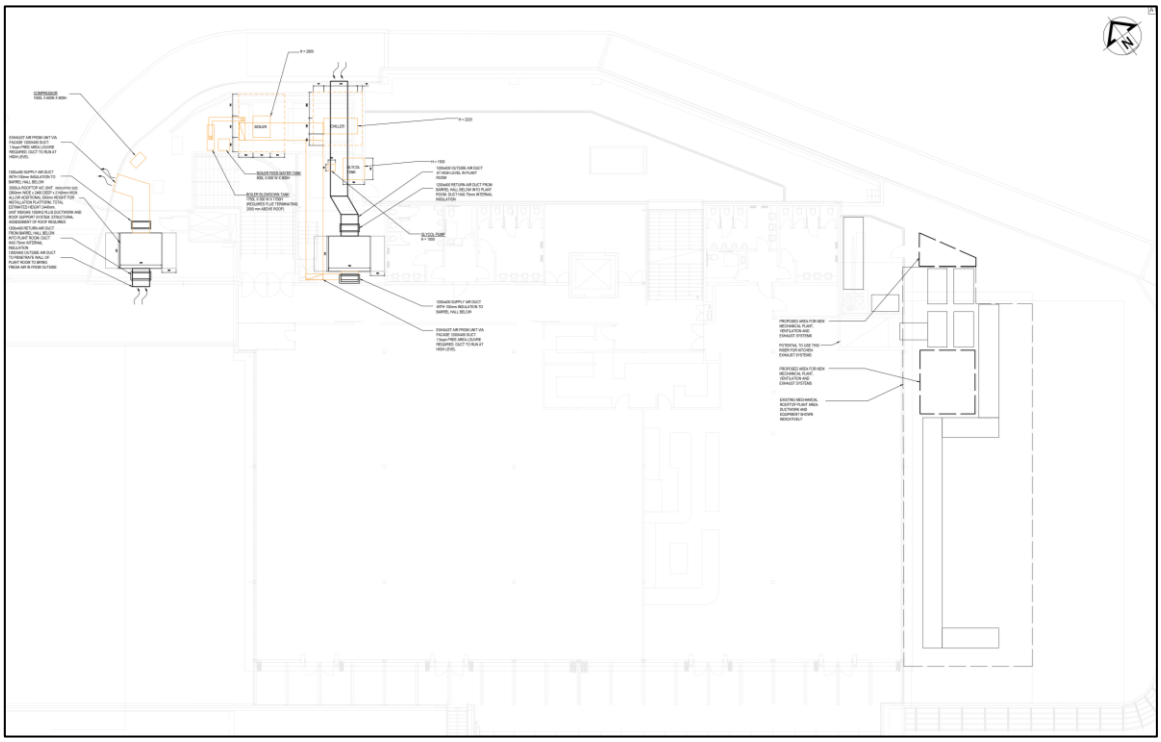
It is anticipated that KEF serving the associated kitchens will vertically discharge through the external roof. From our modelling to achieve compliance at neighbouring properties acoustic treatment to a fan on the discharge (external) side will be required. Further details of the acoustic treatment will be formulated during the detailed design phase.

For toilet exhaust fans exhausting air from bathrooms, it is likely the fan will be installed within the ceiling cavity of the bathrooms and discharge air to the roof via a roof/plant area above the bathrooms. The use of internal acoustic lining and fan vibration isolation will result in compliance. Further details of the acoustic treatment will be formulated during the detailed design phase.

Regarding the roof AC units, two (2) dedicated plant areas are provided. Two split plant areas are provided on level one (1) adjacent to the stair core. From our review of the proposed locations, it is likely acoustic treatment of the plant items will be required.

It is anticipated that general ventilation systems serving general areas will vertically discharge through the external roof. From our modelling to achieve compliance at neighbouring properties acoustic treatment to a fan on the discharge (external) side will be required. Further details of the acoustic treatment will be formulated during the detailed design phase.

Figure 10 Roof Mechanical Drawing – Plant Locations



Further details of the acoustic treatment will be formulated during the detailed design phase once plant selections are made. However, in principle all proposed building services can achieve the site noise emission criteria.

Note: We would recommend a consent condition be imposed which requires a detailed acoustic review of all plant items to be undertaken as part of the Construction Certificate (CC) review.

6.2 Vehicle Movements

Vehicle related noise associated with the proposal is assessed for passenger movements in/out of the site as well as loading dock/waste collection associated with the site via the West Esplanade driveway. Additionally, noise associated with vehicles on NSW public roads are assessed. See below.

6.2.1 Vehicle Noise Data

To quantify the noise level likely to take place with regards to vehicle movements, the noise levels of the relevant vehicles are obtained from previous project experience. Therefore, the sound power levels used in the noise impact assessment are listed in Table 18 below.

Table 18 Sound power levels for vehicular events

Parameter	Octave Band Centre Frequency, Hz								Overall dBA
	63	125	250	500	1k	2k	4k	8k	
Noise Events									
Car movement at 40km/hr on public road	88	86	83	82	83	82	75	70	**88**
Car movement at 10 km/hr within basement	79	77	74	73	74	73	66	61	**79**
Truck movement at 10 km/hr within basement	98	100	98	100	96	91	87	80	**101**

6.2.2 Carpark Acoustic Assessment

Noise associated with passenger vehicles and truck movements (waste and deliveries) within the basement are assessed below. As all activities will be undertaken within the basement and contained within the building envelope of the basement, predicted noise levels are all below the required acoustic requirements, see results below.

6.2.2.1 Assumed Number of Vehicles

Section 3.7 of the JMT Consulting *Transport Assessment Dated 21st July 2024)* states the following:

> 3.7 Traffic impacts
>
> As previously detailed in Sections 3.1 and 3.2 of this document the proposal is not expected to trigger an increase in traffic movements to/from the site. The vast majority of visitors will utilise public transport or walk given the strong public transport access and location of the site within the Manly town centre.
>
> It is also important to recognise that many customers visiting the former Aldi supermarket tenancy would have travelled by car in order to undertake their weekly shopping trip. This is in contrast to the proposed pub and micro-brewery use which will predominantly attract visitors arriving via sustainable forms of transport or taxi/Uber.

6.2.2.2 Assessment of Carpark Noise

A review of the likely noise impacts associated with the movement of vehicles onsite has been undertaken. Based on the number of vehicle movements likely to occur and the distance between the carparking areas and the neighbouring residences we can confirm compliance at neighbouring residential receivers would occur.

6.2.3 Additional Vehicles on Public Roadways

In the assessment of noise from the additional vehicles on surrounding road network an assessment of the additional impacts on surrounding residential receivers has been undertaken using the EPA's Road Noise Policy.

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.

6.2.3.1 Assumed Number of Vehicles

Section 3.7 of the JMT Consulting *Transport Assessment Dated 21st July 2024)* states the following:

3.7 Traffic impacts

As previously detailed in Sections 3.1 and 3.2 of this document the proposal is not expected to trigger an increase in traffic movements to/from the site. The vast majority of visitors will utilise public transport or walk given the strong public transport access and location of the site within the Manly town centre.

It is also important to recognise that many customers visiting the former Aldi supermarket tenancy would have travelled by car in order to undertake their weekly shopping trip. This is in contrast to the proposed pub and micro-brewery use which will predominantly attract visitors arriving via sustainable forms of transport or taxi/Uber.

6.2.3.2 Additional Vehicle Noise Levels (Public Road) Predicted Noise Level

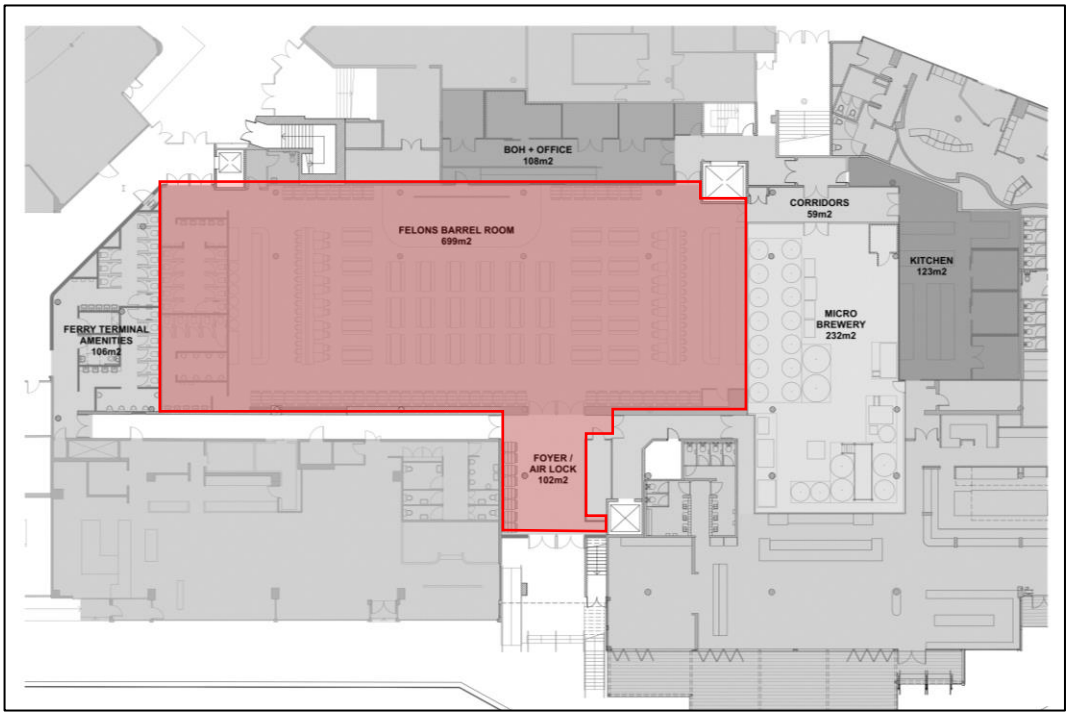
A review of the likely noise impacts associated with additional movement of vehicles on surrounding roadways has been undertaken. Based on the number of vehicle movements likely to occur and the distance between the road and the neighbouring residences we can confirm compliance at neighbouring residential receivers would occur.

6.3 Operational Patron and Music Noise

An assessment of the noise emitted from with the proposed pub has been undertaken. The predicted noise levels in this section are a combination of patron noise and music noise (amplified, live and background). The area in which patrons and these music activities will be undertaken is shown in red below.

All areas which are proposed are within the existing building envelope and do not include any additional or new outdoor areas. As such all future noise will be contained within the venue.

Figure 11 Area of Predicted Noise Levels



6.3.1 Assumed Modelling Parameters

Site operational noise emissions have been calculated using the CONCAWE algorithm. The CONCAWE algorithm has been selected to ensure that noise enhancing weather conditions including temperature inversions and downwind conditions have been appropriately considered in the noise assessment. These effects will have a significant impact on the residential receivers due to the distance of the residential receivers to the site.

CONCAWE provides six meteorological categories, which are different to the Pasquil Stability Category usually referenced. Both adverse wind and temperature inversions fall into CONCAWE Category 6.

The meteorological assessment has assessed a worst-case situation, which entails the calculation of the worst-case weather in all directions for all receivers. The following weather conditions have been included in the assessment, in accordance with the requirements of the NPfI – Fact Sheet D.

Daytime and evening noise enhancing properties:

- 3 m/s wind speeds; and
- Stability category D.

This is equivalent to CONCAWE Meteorological Category 5.

Night-time noise enhancing properties:

- 2 m/s wind speeds; and
- Stability category F.

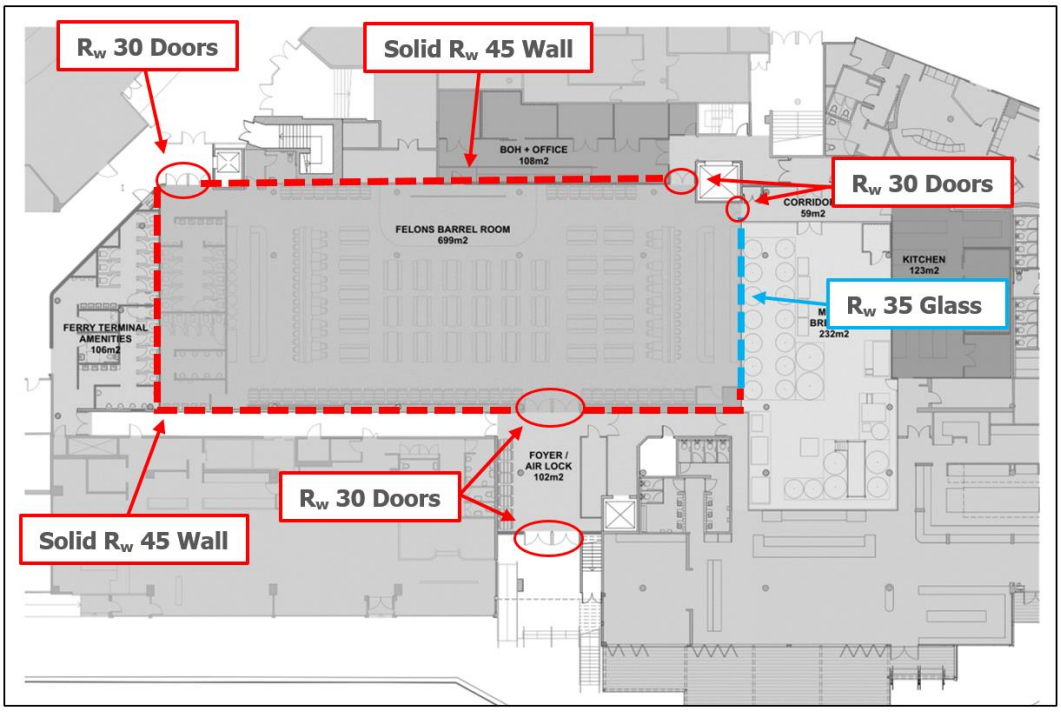
This is equivalent to CONCAWE Meteorological Category 6 (the highest category).

For the purposes of this assessment, we have assumed a person speaking with a raised voice has a Sound Power Level (Lw) of 76 dBA. This has been formulated in accordance with the published noise levels from Klark Teknik (The Audio System Designer Technical Reference, Chapman Partnership). We have also assumed that a worst-case scenario of one (1) in three (3) people would be talking at any one time.

With regards to the assumed noise level within the venue, we anticipate with amplified or live music operating within the space a Sound Pressure Level (SPL) of up to 95 dBA L_{A10} would be likely. This would be the worst-case scenario and has been assumed for the purpose of this assessment. In the event background music or similar is operating this would be less than the assumed 95 dBA L_{A10} referenced above and therefore would be acceptable if compliance is shown below.

Regarding the building envelope constructions which are assumed as part of the breakout noise from the operation of the venue the following has been assumed.

Figure 12 Assumed Building Constructions



In addition to the assumed acoustic performance of the tenancy building envelope above, the contribution through the common floor to the basement and soffit to the space above has been assumed to be a minimum of 150 mm Concrete.

Regarding the operational parameters, these are provided in the introduction, but a summary is also provided below.

- Proposed Patrons (Pub): Maximum of 700
- Proposed number of Staff (Pub): 20
- Opening Hours:
  - 7am to midnight, Monday to Wednesday and Sunday; and
  - 7am to 1am, Thursday to Saturday.

6.3.2 Predicted Licensed Venue Noise Levels

Based on the parameters detailed above, the following predicted noise levels are provided for compliance with the typical Liquor and Gaming NSW acoustic requirements (in 1/1 octaves).

Outlined below are two specific assessments, predicted noise levels during the most stringent Background + 5dBA period (i.e. 10:00pm to 12:00am in all instances – refer to criteria section) and the other is after midnight which is Background + 0dBA (which is between 12:00am and 1:00am as currently proposed on several nights).

Note: As the proposed pub is to be located within the existing building envelope (with minor modifications) operational noise from patrons and music are considerably attenuated due to limited exposed façade elements, compared to other tenancies within the Wharf precinct.

Table 19 Predicted Patron and Music Noise Levels (Background + 5dBA – 10:00pm to 12:00am)

Receiver Location	Parameter	Octave Band Centre Frequency, Hz									Compliance?
		31.5	63	125	250	500	1000	2000	4000	8000	
R01	Predicted L_{A10} Noise Levels	<50	<46	<51	<50	<45	<43	<40	<33	<24	
	L&G NSW criterion	50	46	51	50	45	43	40	33	24	Yes
	Compliance	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
R02	Predicted L_{A10} Noise Levels	<50	<46	<51	<50	<45	<43	<40	<33	<24	
	L&G NSW criterion	50	46	51	50	45	43	40	33	24	Yes
	Compliance	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
R03	Predicted L_{A10} Noise Levels	<50	<46	<51	<50	<45	<43	<40	<33	<24	
	L&G NSW criterion	50	46	51	50	45	43	40	33	24	Yes
	Compliance	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
R04	Predicted L_{A10} Noise Levels	<50	<46	<51	<50	<45	<43	<40	<33	<24	
	L&G NSW criterion	50	46	51	50	45	43	40	33	24	Yes
	Compliance	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
R05	Predicted L_{A10} Noise Levels	<50	<46	<51	<50	<45	<43	<40	<33	<24	
	L&G NSW criterion	50	46	51	50	45	43	40	33	24	Yes
	Compliance	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
R06	Predicted L_{A10} Noise Levels	<50	<46	<51	<50	<45	<43	<40	<33	<24	
	L&G NSW criterion	50	46	51	50	45	43	40	33	24	Yes
	Compliance	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
R07	Predicted L_{A10} Noise Levels	<56	<52	<57	<56	<51	<49	<46	<39	<30	
	L&G NSW criterion	56	52	57	56	51	49	46	39	30	Yes
	Compliance	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	

Receiver Location	Parameter	Octave Band Centre Frequency, Hz									Compliance?
		31.5	63	125	250	500	1000	2000	4000	8000	
R08	Predicted L_{A10} Noise Levels	<56	<52	<57	<56	<51	<49	<46	<39	<30	
	L&G NSW criterion	56	52	57	56	51	49	46	39	30	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
R09	Predicted L_{A10} Noise Levels	<56	<52	<57	<56	<51	<49	<46	<39	<30	
	L&G NSW criterion	56	52	57	56	51	49	46	39	30	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
R10	Predicted L_{A10} Noise Levels	<56	<52	<57	<56	<51	<49	<46	<39	<30	
	L&G NSW criterion	56	52	57	56	51	49	46	39	30	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
R11	Predicted L_{A10} Noise Levels	<56	<52	<57	<56	<51	<49	<46	<39	<30	
	L&G NSW criterion	56	52	57	56	51	49	46	39	30	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
R12	Predicted L_{A10} Noise Levels	<56	<52	<57	<56	<51	<49	<46	<39	<30	
	L&G NSW criterion	56	52	57	56	51	49	46	39	30	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
R13	Predicted L_{A10} Noise Levels	<56	<52	<57	<56	<51	<49	<46	<39	<30	
	L&G NSW criterion	56	52	57	56	51	49	46	39	30	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
R14-A	Predicted L_{A10} Noise Levels	<56	<52	<57	<56	<51	<49	<46	<39	<30	
	L&G NSW criterion	56	52	57	56	51	49	46	39	30	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	

Receiver Location	Parameter	Octave Band Centre Frequency, Hz									Compliance?
		31.5	63	125	250	500	1000	2000	4000	8000	
R14-B	Predicted L_{A10} Noise Levels	<56	<52	<57	<56	<51	<49	<46	<39	<30	
	L&G NSW criterion	56	52	57	56	51	49	46	39	30	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
R15	Predicted L_{A10} Noise Levels	<56	<52	<57	<56	<51	<49	<46	<39	<30	
	L&G NSW criterion	56	52	57	56	51	49	46	39	30	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
R16	Predicted L_{A10} Noise Levels	<56	<52	<57	<56	<51	<49	<46	<39	<30	
	L&G NSW criterion	56	52	57	56	51	49	46	39	30	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
R17	Predicted L_{A10} Noise Levels	<56	<52	<57	<56	<51	<49	<46	<39	<30	
	L&G NSW criterion	56	52	57	56	51	49	46	39	30	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
R18	Predicted L_{A10} Noise Levels	<56	<52	<57	<56	<51	<49	<46	<39	<30	
	L&G NSW criterion	56	52	57	56	51	49	46	39	30	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
R19	Predicted L_{A10} Noise Levels	<56	<52	<57	<56	<51	<49	<46	<39	<30	
	L&G NSW criterion	56	52	57	56	51	49	46	39	30	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
R20	Predicted L_{A10} Noise Levels	<56	<52	<57	<56	<51	<49	<46	<39	<30	
	L&G NSW criterion	56	52	57	56	51	49	46	39	30	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	

Receiver Location	Parameter	Octave Band Centre Frequency, Hz									Compliance?
		31.5	63	125	250	500	1000	2000	4000	8000	
R21	Predicted L_{A10} Noise Levels	<56	<52	<57	<56	<51	<49	<46	<39	<30	
	L&G NSW criterion	56	52	57	56	51	49	46	39	30	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
R22	Predicted L_{A10} Noise Levels	<56	<52	<57	<56	<51	<49	<46	<39	<30	
	L&G NSW criterion	56	52	57	56	51	49	46	39	30	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
R23	Predicted L_{A10} Noise Levels	<56	<52	<57	<56	<51	<49	<46	<39	<30	
	L&G NSW criterion	56	52	57	56	51	49	46	39	30	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
R24	Predicted L_{A10} Noise Levels	<56	<52	<57	<56	<51	<49	<46	<39	<30	
	L&G NSW criterion	56	52	57	56	51	49	46	39	30	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
R25	Predicted L_{A10} Noise Levels	<56	<52	<57	<56	<51	<49	<46	<39	<30	
	L&G NSW criterion	56	52	57	56	51	49	46	39	30	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
R26	Predicted L_{A10} Noise Levels	<56	<52	<57	<56	<51	<49	<46	<39	<30	
	L&G NSW criterion	56	52	57	56	51	49	46	39	30	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
R27	Predicted L_{A10} Noise Levels										
	L&G NSW criterion	65	57	52	49	47	45	41	34	27	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
R28	Predicted L_{A10} Noise Levels	<65	<57	<52	<49	<47	<45	<41	<34	<27	**Yes**

Receiver Location	Parameter	Octave Band Centre Frequency, Hz									Compliance?
		31.5	63	125	250	500	1000	2000	4000	8000	
	L&G NSW criterion	65	57	52	49	47	45	41	34	27	
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
R29	Predicted L_{A10} Noise Levels	<65	<57	<52	<49	<47	<45	<41	<34	<27	
	L&G NSW criterion	65	57	52	49	47	45	41	34	27	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
R30	Predicted L_{A10} Noise Levels	<65	<57	<52	<49	<47	<45	<41	<34	<27	
	L&G NSW criterion	65	57	52	49	47	45	41	34	27	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	

Outlined below the is the assessment before midnight, which is Background + 5dBA.

Table 20 Predicted Patron and Music Noise Levels (Background + 0dBA – 12:00am to 1:00am)

Receiver Location	Parameter	Octave Band Centre Frequency, Hz									Compliance?
		31.5	63	125	250	500	1000	2000	4000	8000	
R01	Predicted L_{A10} Noise Levels	<45	<41	<46	<45	<40	<38	<35	<28	<19	
	L&G NSW criterion	45	41	46	45	40	38	35	28	19	Yes
	Compliance	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
R02	Predicted L_{A10} Noise Levels	<45	<41	<46	<45	<40	<38	<35	<28	<19	
	L&G NSW criterion	45	41	46	45	40	38	35	28	19	Yes
	Compliance	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
R03	Predicted L_{A10} Noise Levels	<45	<41	<46	<45	<40	<38	<35	<28	<19	
	L&G NSW criterion	45	41	46	45	40	38	35	28	19	Yes
	Compliance	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
R04	Predicted L_{A10} Noise Levels	<45	<41	<46	<45	<40	<38	<35	<28	<19	
	L&G NSW criterion	45	41	46	45	40	38	35	28	19	Yes
	Compliance	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
R05	Predicted L_{A10} Noise Levels	<45	<41	<46	<45	<40	<38	<35	<28	<19	
	L&G NSW criterion	45	41	46	45	40	38	35	28	19	Yes
	Compliance	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
R06	Predicted L_{A10} Noise Levels	<45	<41	<46	<45	<40	<38	<35	<28	<19	
	L&G NSW criterion	45	41	46	45	40	38	35	28	19	Yes
	Compliance	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
R07	Predicted L_{A10} Noise Levels	<51	<47	<52	<51	<46	<44	<41	<34	<25	
	L&G NSW criterion	51	47	52	51	46	44	41	34	25	Yes
	Compliance	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	

Receiver Location	Parameter	Octave Band Centre Frequency, Hz									Compliance?
		31.5	63	125	250	500	1000	2000	4000	8000	
R08	Predicted L_{A10} Noise Levels	<51	<47	<52	<51	<46	<44	<41	<34	<25	
	L&G NSW criterion	51	47	52	51	46	44	41	34	25	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
R09	Predicted L_{A10} Noise Levels	<51	<47	<52	<51	<46	<44	<41	<34	<25	
	L&G NSW criterion	51	47	52	51	46	44	41	34	25	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
R10	Predicted L_{A10} Noise Levels	<51	<47	<52	<51	<46	<44	<41	<34	<25	
	L&G NSW criterion	51	47	52	51	46	44	41	34	25	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
R11	Predicted L_{A10} Noise Levels	<51	<47	<52	<51	<46	<44	<41	<34	<25	
	L&G NSW criterion	51	47	52	51	46	44	41	34	25	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
R12	Predicted L_{A10} Noise Levels	<51	<47	<52	<51	<46	<44	<41	<34	<25	
	L&G NSW criterion	51	47	52	51	46	44	41	34	25	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
R13	Predicted L_{A10} Noise Levels	<51	<47	<52	<51	<46	<44	<41	<34	<25	
	L&G NSW criterion	51	47	52	51	46	44	41	34	25	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
R14-A	Predicted L_{A10} Noise Levels	<51	<47	<52	<51	<46	<44	<41	<34	<25	
	L&G NSW criterion	51	47	52	51	46	44	41	34	25	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	

Receiver Location	Parameter	Octave Band Centre Frequency, Hz									Compliance?
		31.5	63	125	250	500	1000	2000	4000	8000	
R14-B	Predicted L_{A10} Noise Levels	<51	<47	<52	<51	<46	<44	<41	<34	<25	
	L&G NSW criterion	51	47	52	51	46	44	41	34	25	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
R15	Predicted L_{A10} Noise Levels	<51	<47	<52	<51	<46	<44	<41	<34	<25	
	L&G NSW criterion	51	47	52	51	46	44	41	34	25	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
R16	Predicted L_{A10} Noise Levels	<51	<47	<52	<51	<46	<44	<41	<34	<25	
	L&G NSW criterion	51	47	52	51	46	44	41	34	25	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
R17	Predicted L_{A10} Noise Levels	<51	<47	<52	<51	<46	<44	<41	<34	<25	
	L&G NSW criterion	51	47	52	51	46	44	41	34	25	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
R18	Predicted L_{A10} Noise Levels	<51	<47	<52	<51	<46	<44	<41	<34	<25	
	L&G NSW criterion	51	47	52	51	46	44	41	34	25	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
R19	Predicted L_{A10} Noise Levels	<51	<47	<52	<51	<46	<44	<41	<34	<25	
	L&G NSW criterion	51	47	52	51	46	44	41	34	25	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
R20	Predicted L_{A10} Noise Levels	<51	<47	<52	<51	<46	<44	<41	<34	<25	
	L&G NSW criterion	51	47	52	51	46	44	41	34	25	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	

Receiver Location	Parameter	Octave Band Centre Frequency, Hz									Compliance?
		31.5	63	125	250	500	1000	2000	4000	8000	
R21	Predicted L_{A10} Noise Levels	<51	<47	<52	<51	<46	<44	<41	<34	<25	
	L&G NSW criterion	51	47	52	51	46	44	41	34	25	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
R22	Predicted L_{A10} Noise Levels	<51	<47	<52	<51	<46	<44	<41	<34	<25	
	L&G NSW criterion	51	47	52	51	46	44	41	34	25	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
R23	Predicted L_{A10} Noise Levels	<51	<47	<52	<51	<46	<44	<41	<34	<25	
	L&G NSW criterion	51	47	52	51	46	44	41	34	25	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
R24	Predicted L_{A10} Noise Levels	<51	<47	<52	<51	<46	<44	<41	<34	<25	
	L&G NSW criterion	51	47	52	51	46	44	41	34	25	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
R25	Predicted L_{A10} Noise Levels	<51	<47	<52	<51	<46	<44	<41	<34	<25	
	L&G NSW criterion	51	47	52	51	46	44	41	34	25	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
R26	Predicted L_{A10} Noise Levels	<51	<47	<52	<51	<46	<44	<41	<34	<25	
	L&G NSW criterion	51	47	52	51	46	44	41	34	25	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
R27	Predicted L_{A10} Noise Levels	<60	<52	<47	<44	<42	<40	<36	<29	<22	
	L&G NSW criterion	60	52	47	44	42	40	36	29	22	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
R28	Predicted L_{A10} Noise Levels	<60	<52	<47	<44	<42	<40	<36	<29	<22	**Yes**

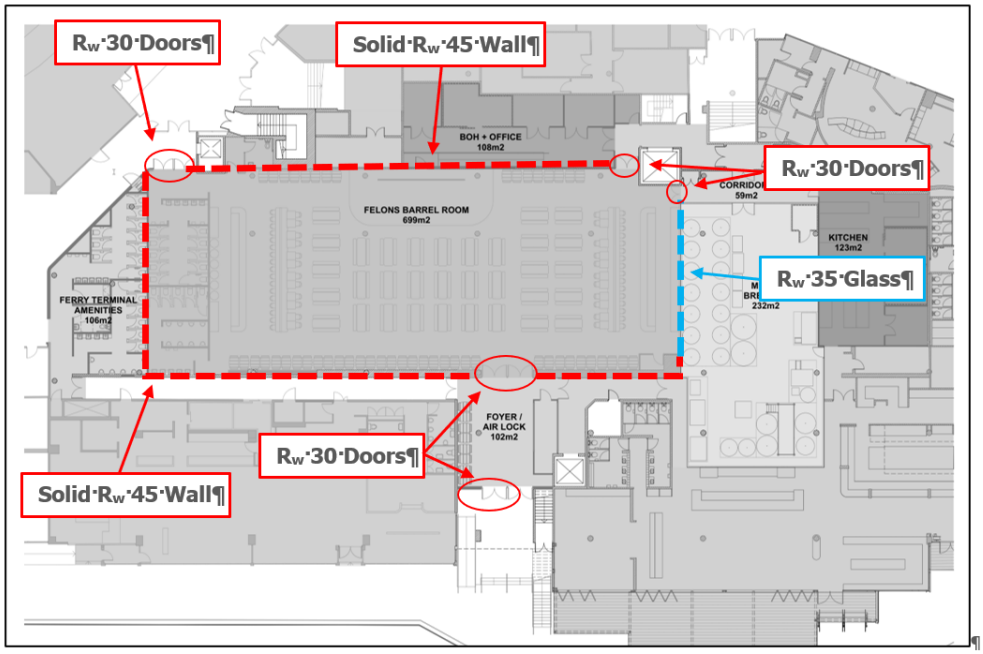
Receiver Location	Parameter	Octave Band Centre Frequency, Hz									Compliance?
		31.5	63	125	250	500	1000	2000	4000	8000	
	L&G NSW criterion	60	52	47	44	42	40	36	29	22	
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
R29	Predicted L_{A10} Noise Levels	<60	<52	<47	<44	<42	<40	<36	<29	<22	
	L&G NSW criterion	60	52	47	44	42	40	36	29	22	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	
R30	Predicted L_{A10} Noise Levels	<60	<52	<47	<44	<42	<40	<36	<29	<22	
	L&G NSW criterion	60	52	47	44	42	40	36	29	22	**Yes**
	Compliance	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	

Outlined below the is the assessment after midnight, which is Background + 0dBA.

6.4 Summary of Acoustic Treatments

Based on the modelling outlined above the following acoustic treatments and or management controls are required to be implemented:

- Operational Hours:
  - 7am to midnight, Monday to Wednesday and Sunday; and
  - 7am to 1am, Thursday to Saturday.
- Patrons:
  - A maximum of 700 patrons within the pub.
- All glazed openings in the façade should be closed when live or amplified music is being played, background music can have the doors open.
- Music within the premise must not exceed 95 dBA L_{A10}(sound pressure level).
- Removal of glass or waste should be done internally and must not be taken after 10:00pm and before 7:00am.
- A contact number must be displayed for the purposes of receiving any complaints if they arrive.
- Signs must be displayed at all exits reminding patrons to be mindful of noise when leaving the premise.
- All recommended acoustic constructions shown below must be installed (which aligns with the acoustic modelling).



On the assumption that the recommendations outlined are incorporated compliance with the acoustic project criteria outlined in section 5 above will be achieved.

7 CONSTRUCTION NOISE AND VIBRATION ASSESSMENT

A preliminary acoustic assessment of the noise and vibrations impact during the alterations and additions of the existing tenancy has been undertaken below.

7.1 Construction Traffic Noise Assessment

From the criteria, it is noted that vehicle numbers on surrounding roads would need to increase by around 60% from existing traffic flows, for a 2 dB increase in road traffic noise to occur. As noted previously, a 2 dB increase in road traffic noise is not considered to be noticeable.

Based on the number of vehicles projected over each of the construction phases, it is concluded that noise impacts from construction traffic is unlikely to have an impact at the nearest affected properties. As a result, no further assessment is required.

7.2 Acoustic Management Procedures

7.2.1 Summary of Management Procedures

Table 21 below summarises the management procedures recommended for airborne noise and vibration impact. These procedures are also further discussed in the report.

Table 21 Summary of mitigation procedures

Procedure	Abbreviation	Description
General Management Measures	GMM	Introduce best-practice general mitigation measures in the workplace which are aimed at reducing the acoustic impact onto the nearest affected receivers.
Project Notification	PN	Issue project updates to stakeholders, discussing overviews of current and upcoming works. Advanced warning of potential disruptions can be included. Content and length to be determined on a project-by-project basis.
Verification Monitoring	V	Monitoring to comprise attended or unattended acoustic surveys. The purpose of the monitoring is to confirm measured levels are consistent with the predictions in the acoustic assessment, and to verify that the mitigation procedures are appropriate for the affected receivers. If the measured levels are higher than those predicted, then the measures will need to be reviewed and the management plan will need to be amended.
Complaints Management System	CMS	Implement a management system which includes procedures for receiving and addressing complaints from affected stakeholders
Specific Notification	SN	Individual letters or phone calls to notify stakeholders that noise levels are likely to exceed noise objectives. Alternatively, contractor could visit stakeholders individually in order to brief them in regard to the noise impact and the mitigation measures that will be implemented.
Respite Offer	RO	Offer provided to stakeholders subjected to an ongoing impact.

Alternative Construction Methodology	AC	Contractor to consider alternative construction options that achieve compliance with relevant criteria. Alternative option to be determined on a case-by-case basis. It is recommended that the selection of the alternative option should also be determined by considering the assessment of on-site measurements (refer to Verification Monitoring above).

The application of these procedures is in relation to the exceedances over the relevant criteria. For airborne noise, the criteria are based on NMLs. The allocation of these procedures is discussed in Section 7.2.2.

For vibration, the criteria either correspond to human comfort, building damage or scientific and medical equipment. The application of these procedures is discussed in Section 7.2.3.

7.2.2 Allocation of Noise Management Procedures

For residences, the management procedures have been allocated based on noise level exceedances at the affected properties, which occur over the designated NMLs. The allocation of these procedures is summarised in Table 21 below.

Table 22 Allocation of noise management procedures – Residential Receivers

Construction Hours	Exceedance over NML (dB)	Management Procedures (see definition above)
Standard Hours Mon – Fri: 7:00 am to 6:00 pm Sat: 8:00 am – 1:00 pm	0 - 3	GMM, CMS, AC
	4 - 10	GMM, CMS, AC, V [1]
	11 - 20	GMM, CMS, PN, AC, V [1]
	≥ 21	GMM, CMS, PN, AC, SN, V [1]
	≥ 75 dBA	GMM, CMS, PN, AC, SN, RO, V [1]
Outside Standard Hours (If applicable)	Specific NMP will be undertaken should this be required.	

Note 1 Verification monitoring to be undertaken upon complaints received from affected receivers.

7.2.3 Allocation of Vibration Management Procedures

Table 23 below summarises the vibration management procedures to be adopted based on exceedance scenarios (i.e., whether the exceedance occurs over human comfort criteria, building damage criteria, or criteria for scientific and medical equipment). Please note these management procedures apply for any type of affected receiver (i.e., for residences as well as non-residential receivers).

Table 23 Allocation of vibration management procedures

Construction Hours	Exceedance Scenario	Management Procedures
Standard Hours Mon – Fri: 7:00 am to 6:00 pm Sat: 8:00 am – 1:00 pm	Over human comfort criteria	GMM, CMS, AC, SN, V [1]
	Over building damage criteria	GMM, CMS, AC, SN, VM, RO, V [1]
Outside Standard Hours (If applicable)	Specific VMP will be undertaken should this be required.	

Note 1 Verification monitoring to be undertaken upon complaints received from affected receivers.

7.3 Site Specific Noise Mitigation Measures

7.3.1 General Comments

The contractor will, where reasonable and feasible, apply best practice noise mitigation measures. These measures shall include the following:

- Maximising the offset distance between plant items and nearby noise sensitive receivers.
- Preventing noisy plant working simultaneously and adjacent to sensitive receivers.
- Minimising consecutive works in the same site area.
- Orienting equipment away from noise sensitive areas.
- Carrying out loading and unloading away from noise sensitive areas.

In order to minimise noise impacts during the works, the contractor will take all reasonable and feasible measures to mitigate noise effects.

The contractor will also take reasonable steps to control noise from all plant and equipment. Examples of appropriate noise control include efficient silencers and low noise mufflers.

The contractor should apply all feasible and reasonable work practices to meet the NMLs and inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels, duration of noise generating construction works, and the contact details for the proposal.

7.3.2 Noise Monitoring

Noise monitoring will not be required unless during the construction works continuous noise complaints are received and will be performed by an acoustical consultant directly engaged by the contractor.

Noise monitoring for the excavation, compaction and construction works should be undertaken using statistical noise loggers. The statistical parameters to be measured should include the following noise descriptors: LA90, LA10 and LAeq. Noise measurements should be conducted over consecutive 15-minute periods.

This monitoring should also be complemented by undertaking attended noise measurements to:

- Differentiate between construction noise sources and other extraneous noise events (such as road traffic and aircraft noise)
- Note and identify any excessive noise emitting machinery or operation.

In the event of any complaints, the noise impact at the affected location should be confirmed by conducting attended noise measurements.

The survey methodology and any equipment should comply with the requirements discussed in Standard AS 1055.1-1997.

7.3.3 Alternate Equipment or Process

Exceedance of the site's NMLs should result in an investigation as to whether alternate equipment could be used, or a difference process could be undertaken.

In some cases, the investigation may conclude that no possible other equipment can be used, however, a different process could be undertaken.

7.3.4 Acoustic Enclosures/Screening

Typically, on a construction site there are three different types of plant that will be used: mobile plant (i.e., excavators, skid steers, etc.), semi mobile plant (i.e., hand tools generally) or static plant (i.e., diesel generators).

For plant items which are static it is recommended that, in the event exceedances are being measured due to operation of the plant item, an acoustic enclosure/screen is constructed to reduce impacts. These systems can be constructed from Fibre Cement (FC) sheeting or, if airflow is required, acoustic attenuators or louvres.

For semi mobile plant, relocation of plant should be investigated to either be operated in an enclosed space or at locations away from a receiver.

With mobile plant it is generally not possible to treat these sources. However, investigations into the machine itself may result in a reduction of noise (i.e., mufflers/attenuators etc).

7.4 Vibration Mitigation Measures

7.4.1 General Comments

As part of the CNVMP, the following vibration mitigation measures should be implemented:

- Any vibration generating plant and equipment is to be in areas within the site in order to lower the vibration impacts.
- Investigate the feasibility of rescheduling the hours of operation of major vibration generating plant and equipment.
- Use lower vibration generating items of construction plant and equipment; that is, smaller capacity plant.
- Minimise conducting vibration generating works consecutively in the same area (if applicable).
- Schedule a minimum respite period of at least 30 minutes before activities commence which are to be undertaken for a continuous 4-hour period.
- Use only dampened rock breakers and/or "city" rock breakers to minimise the impacts associated with rock breaking works.
- Conduct attended measurements of vibration generating plant at commencement of works to validate the indicative safe working distances advised in 7.4.2 and, consequently, to establish safe working distances suitable to the project. Measurements should be conducted at the nearest affected property boundary. These safe working distances should be defined by considering the vibration criteria discussed in Section 5.2.2 (i.e., criteria for structural damage and human comfort).

7.4.2 Safe Working Distances

In order to maintain compliance with the cosmetic damage and human comfort vibration criteria discussed in section 5.2.2, it is recommended that the indicative safe distances listed in Table 24 should be maintained. These indicative safe distances should be validated at the start of construction works by undertaking measurements of vibration levels generated by construction and demolition equipment to be used on site.

If applicable, the criteria for scientific or medical equipment (should any of these exist close to the site) can be more stringent than those required for human comfort. Vibration validating measurements should be conducted at each site to determine the vibration level and potential impact to this sensitive equipment.

Additionally, any vibration levels should be assessed in accordance with the criteria discussed in section 5.2.2. This information should also be included as part of the CNVMP.

Table 24 Recommended indicative safe working distances for vibration intensive plant

Plant	Rating / Description	Safe Working Distances (m)	
		Cosmetic Damage (BS 7385: Part 2 DIN 4150: Part 3)	Human Comfort (AVTG)
Small hydraulic hammer	300 kg, typically 5 – 12 tonnes excavator	2	7
Jackhammer	Hand held	1	Avoid contact with structure and steel reinforcements

7.4.3 Vibration Monitoring

Vibration monitoring will not be required unless during the construction works continuous noise complaints are received and will be performed by an acoustical consultant directly engaged by the contractor.

The monitoring location would be on a stiff part of the structure (at the foundation) on the side of the structure adjacent to the subject demolition and construction works.

The vibration monitoring system will be configured to record the peak vibration levels and to trigger an audible/visual alarm when predetermined vibration thresholds are exceeded. The thresholds correspond to an "Operator Warning Level" and an "Operator Halt Level", where the Warning Level is 75% of the Halt Level. The Halt Level should be determined based on the vibration criteria for building contents and structure.

Exceedance of the "Operator Warning Level" would not require excavation or demolition work to cease, but rather, alerts the site manager to proceed with caution at a reduced force or load.

An exceedance of the "Operator Halt Level" would require the contractor to implement an alternative excavation technique pending further analysis of the vibration frequency content in order to determine any potential exceedance of the criteria.

The vibration monitoring equipment would be downloaded and analysed by the acoustical consultant.

Reports of the measured vibration levels and their likely impacts would be prepared by the acoustical consultant and issued to the contractor.

7.5 Complaints Management System

The Contractor is to establish a communication register for recording incoming complaints. The registration of a particular item will remain open until the complaint has been appropriately dealt with.

All complaints should be investigated by the Contractor in accordance with the procedures outlined in Australia Standard 2436-2010. In addition, the following procedures are an example of the procedures that are to be specifically adopted for complaints relating to noise.

Upon receipt of a complaint the Contractor is to:

- Try to ascertain from the complaint which appliance is causing the problem i.e., inside or outside the site and in what position.
- Establish from the monitoring equipment if the allowable noise levels have been complied with.
- Establish if the appliance positioning has previously been highlighted as a problem area. If not and the noise levels are above the allowable limit, then the equipment and its position shall be noted.
- Move machinery if the allowable levels have been exceeded or take other acoustic remedial action.
- The Site Supervisor is to ensure that a report of any incident is provided to the Project Manager.
- The Project Manager is to provide a report on the incident to the relevant stakeholders.
- The Contractor is to provide a 24-hour telephone contact number and this number is to be prominently displayed on the site.

7.6 Contingency Plans

Contingency plans are required to address noise or vibration problems if excessive levels are measured at surrounding sensitive receivers and/or if justified complaints occur. Such plans could include:

- Stop the onsite works.
- Identify the source of the main equipment within specific areas of the site which is producing the most construction noise and vibration at the sensitive receivers; and
- Review the identified equipment and determine if an alternate piece of equipment can be used or the process can be altered.
- In the event an alternate piece of equipment or process can be used, works can re-commence.
- In the event an alternate piece of equipment or process cannot be determined implement a construction assessment to be performed by a suitably qualified acoustic consultant.

7.7 General Mitigation Measures (Australia Standard 2436-2010)

As well as the above project specific noise mitigation controls, AS 2436-2010 *"Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites"* sets out numerous practical recommendations to assist in mitigating construction noise emissions. Examples of strategies that could be implemented on the subject project are listed below, including the typical noise reduction achieved, where applicable.

7.7.1 Adoption of Universal Work Practices

- Regular reinforcement (such as at toolbox talks) of the need to minimise noise and vibration.
- Regular identification of noisy activities and adoption of improvement techniques.
- Avoiding the use of portable radios, public address systems or other methods of site communication that may unnecessarily impact upon nearby sensitive receivers.
- Where possible, avoiding the use of equipment that generates impulsive noise.

- Minimising the need for vehicle reversing for example (particularly at night), by arranging for one-way site traffic routes.
- Use of broadband audible alarms on vehicles and elevated work platforms used on site.
- Minimising the movement of materials and plant and unnecessary metal-on-metal contact.
- Minimising truck movements.

7.7.2 Plant and Equipment

- Choosing quieter plant and equipment based on the optimal power and size to most efficiently perform the required tasks.
- Selecting plant and equipment with low vibration generation characteristics.
- Operating plant and equipment in the quietest and most efficient manner.

7.7.3 On Site Noise Mitigation

- Maximising the distance between noise activities and noise sensitive land uses.
- Installing purpose-built noise barriers, acoustic sheds and enclosures.

7.7.4 Work Scheduling

- Providing respite periods which could include restricting very noisy activities to time periods that least affect the nearby noise sensitive locations, restricting the number of nights that after-hours work is conducted near residences or by determining any specific requirements.
- Scheduling work to coincide with non-sensitive periods.
- Planning deliveries and access to the site to occur quietly and efficiently and organising parking only within designated areas located away from the sensitive receivers.
- Optimising the number of deliveries to the site by amalgamating loads where possible and scheduling arrivals within designated hours.
- Including contract conditions that include penalties for non-compliance with reasonable instructions by the principal to minimise noise or arrange suitable scheduling.

7.7.5 Source Noise Control Strategies

Some ways of controlling noise at the source are:

- Where reasonably practical, noisy plant or processes should be replaced by less noisy alternatives.
- Modify existing equipment: Engines and exhausts are typically the dominant noise sources on mobile plant such as cranes, graders, excavators, trucks, etc. In order to minimise noise emissions, residential grade mufflers should be fitted on all mobile plant utilised on site.
- Siting of equipment: locating noisy equipment behind structures that act as barriers, or at the greatest distance from the noise-sensitive area; or orienting the equipment so that noise emissions are directed away from any sensitive areas, to achieve the maximum attenuation of noise.

- Regular and effective maintenance.

7.8 Final Assessment and Recommendation

As the project is still in a planning phase, a detailed *Construction Noise* and Vibration Management Plan (CNVMP) cannot be undertaken at this stage as there several unknown variables. As such it is recommended that a DA Condition be implemented recommended that a CNVMP be prepared prior to the issue of a Construction Certificate. The plan should be undertaken based on the noise and vibration objectives outlined above.

8 CONCULSION

Pulse White Noise Acoustics Pty Ltd (PWNA) have being engaged to undertake an acoustic assessment as part of the Development Application (DA) for the Change of Use, Alterations and Additions to an existing tenancy (24.1) of the Manly Wharf for the purposes of a pub and micro brewery, with ancillary dining and live performance.

Based on the detailed acoustic assessment above, we provide the following summary and conclusion:

- To control noise impacts at external receivers, recommended indicative treatments for major engineering services have been provided in section 6.1. From our review, we have recommended the selection of high-performance acoustic treatment to ensure that the operation of the plant items comply with the project criteria. Therefore, 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 (including the roof plant room) comply with the requirements as listed in Section 6.1.

- Detailed acoustic modelling has indicated that noise from the operation of the licensed venue elements of the development will result in compliance with the typically imposed NSW Liquor and Gaming acoustic requirements. To ensure compliance, recommended building and management controls are recommended in this report.

- A review of the proposed loading dock activities associated with the pub development has been undertaken and we have recommended time limited operation of the loading dock.

- 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 dBA and is therefore compliant with the NSW EPA RNP.

- An assessment of the impacts associated with the vehicle movements within the enclosed underground basement has been undertaken and was shown to be compliant with the NSW EPA NPI 2017.

- Prior to the issue of the Construction Certificate it is recommended that a *Construction Noise and Vibration Management Plan (CNVMP)* be undertaken.

This report has identified that with the inclusion of appropriate noise management and mitigation measures, compliance with appropriate construction and operational noise and vibration criteria would be achieved. The mitigation recommendations in this report will be incorporated in the design of the project to ensure noise emitted from the development is appropriately controlled.

If you have any additional questions, please contact us should you have any further queries.

Regards,

Matthew Furlong
Principal Acoustic Engineer
PULSE WHITE NOISE ACOUSTICS PTY LTD

APPENDIX A. APPENDIX TERMINOLOGY

Sound power level	The total sound emitted by a source
Sound pressure level	The amount of sound at a specified point
Decibel [dB]	The measurement unit of sound
A Weighted decibels [dB(A])	The A weighting is a frequency filter applied to measured noise levels to represent how humans hear sounds. The A-weighting filter emphasises frequencies in the speech range (between 1kHz and 4 kHz) which the human ear is most sensitive to, and places less emphasis on low frequencies at which the human ear is not so sensitive. When an overall sound level is A-weighted it is expressed in units of dB(A).
Decibel scale	The decibel scale is logarithmic in order to produce a better representation of the response of the human ear. A 3 dB increase in the sound pressure level corresponds to a doubling in the sound energy. A 10 dB increase in the sound pressure level corresponds to a perceived doubling in volume. Examples of decibel levels of common sounds are as follows:
	0dB(A) Threshold of human hearing 30dB(A) A quiet country park 40dB(A) Whisper in a library 50dB(A) Open office space 70dB(A) Inside a car on a freeway 80dB(A) Outboard motor 90dB(A) Heavy truck pass-by 100dB(A) Jackhammer/Subway train 110 dB(A) Rock Concert 115dB(A) Limit of sound permitted in industry 120dB(A) 747 take off at 250 metres
Frequency [f]	The repetition rate of the cycle measured in Hertz (Hz). The frequency corresponds to the pitch of the sound. A high frequency corresponds to a high pitched sound and a low frequency to a low pitched sound.
Ambient sound	The all-encompassing sound at a point composed of sound from all sources near and far.
Equivalent continuous sound level [L_{eq}]	The constant sound level which, when occurring over the same period of time, would result in the receiver experiencing the same amount of sound energy.
Reverberation	The persistence of sound in a space after the source of that sound has been stopped (the reverberation time is the time taken for a reverberant sound field to decrease by 60 dB)
Air-borne sound	The sound emitted directly from a source into the surrounding air, such as speech, television or music
Air-borne sound isolation	The reduction of airborne sound between two rooms.
Sound Reduction Index [R] *(Sound Transmission Loss)*	The ratio the sound incident on a partition to the sound transmitted by the partition.
Weighted sound reduction index [R_w]	A single figure representation of the air-borne sound insulation of a partition based upon the R values for each frequency measured in a laboratory environment.
C_{tr}	A value added to an R_w or $D_{nT,w}$ value to account for variations in the spectrum.
Energy Equivalent Sound Pressure Level [$L_{A,eq,T}$]	'A' weighted, energy averaged sound pressure level over the measurement period T.
Percentile Sound Pressure Level [$L_{Ax,T}$]	'A' weighted, sound pressure that is exceeded for percentile x of the measurement period T.
Speech Privacy	A non-technical term but one of common usage. Speech privacy and speech intelligibility are opposites and a high level of speech privacy means a low level of speech intelligibility. It should be recognised that acceptable levels of speech privacy do not require that speech from an adjacent room is inaudible.
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
Noise Reduction	The difference in sound pressure level between any two areas. The term "noise reduction" does not specify any grade or performance quality unless accompanied by a specification of the units and conditions under which the units shall apply
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.
Background Sound Low	The average of the lowest levels of the sound levels measured in an affected area in the absence of noise from occupants and from unwanted, external ambient noise sources. Usually taken to mean the LA90 value
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.
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 L90 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.

APPENDIX B. UNATTENDED NOISE MONITOR – LOCATION 02

Weather Station: Sydney Observatory Hill

Weather Station ID: 066214

Co-ordinates: Lat: -33.86 s, Lon: 151.20 E, 44 m Height

Figure 13 Unattended Noise Monitor Photo

15 Commonwealth Parade, Manly

Ambient noise monitoring report

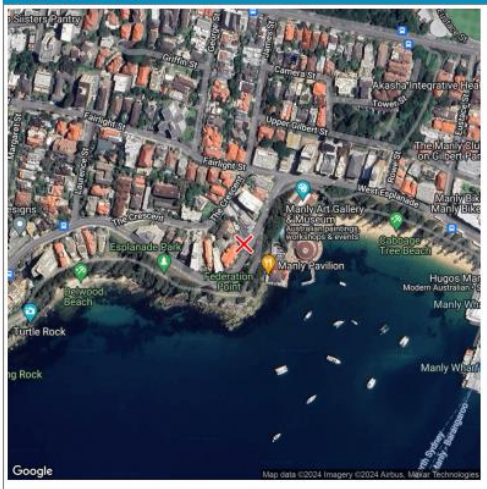
Item	Information
Logger Type	NGARA
Serial number	87826E
Address	15 Commonwealth Parade, Manly
Location	6 E Esplanade, Manly
Facade / free field	Free field
Environment	

Measured noise levels

Logging date	Rating Background Level			$L_{Aeq,period}$		
	Daytime 7am-6pm	Evening 6pm-10pm	Night-time 10pm-7am	Daytime 7am-6pm	Evening 6pm-10pm	Night-time 10pm-7am
Mon 06 May 2024	-	50	-	64	61	55
Tue 07 May 2024	51	45	43	64	62	56
Wed 08 May 2024	50	48	40	65	62	56
Thu 09 May 2024	50	47	41	64	61	56
Fri 10 May 2024	51	51	43	64	63	56
Sat 11 May 2024	51	51	43	65	63	57
Sun 12 May 2024	48	44	44	64	63	56
Mon 13 May 2024	51	44	42	64	60	55
Tue 14 May 2024	-	-	-	64	-	55
Summary	**51**	**47**	**43**	**64**	**62**	**56**

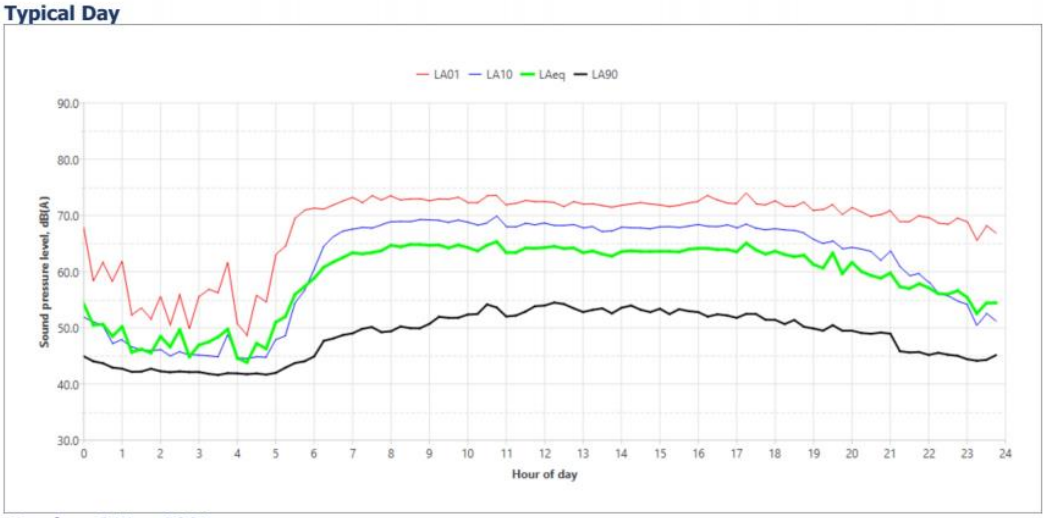
Note: Results with a '-' identify that there were not enough measurements available to correctly calculate the level, in accordance with the Noise Policy for Industry. The data has been excluded either from weather or manual exclusions. See the charts for more information

Logger location

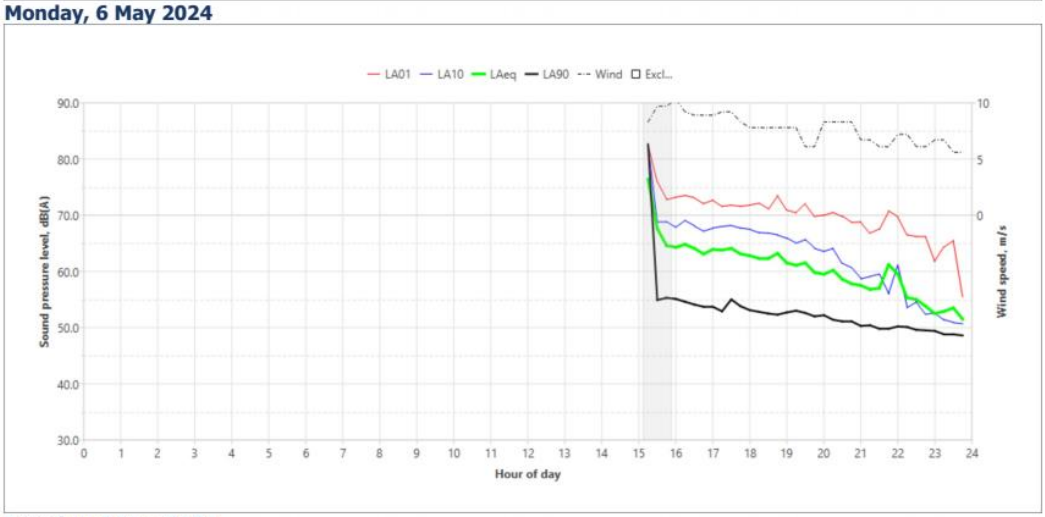


Logger deployment photo

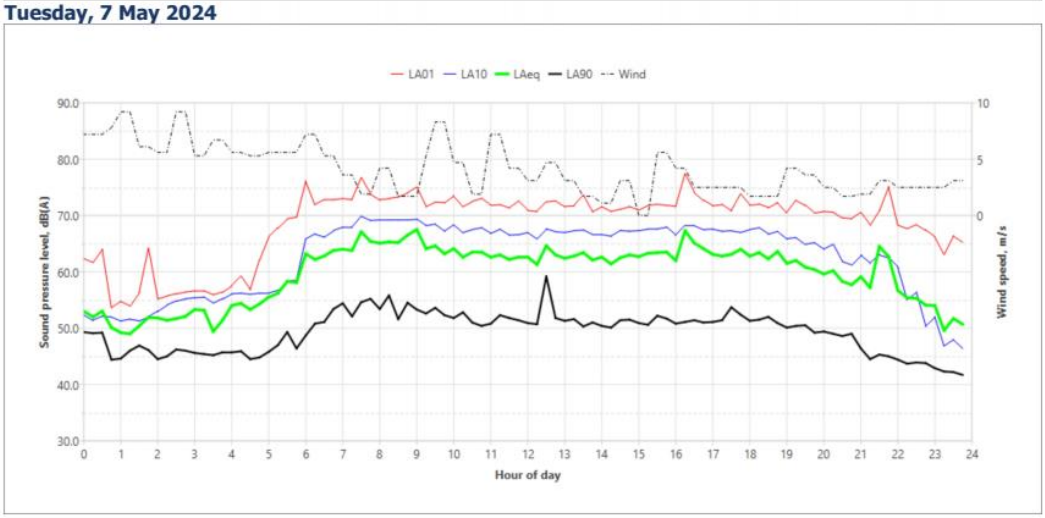
Typical Day



Monday, 6 May 2024



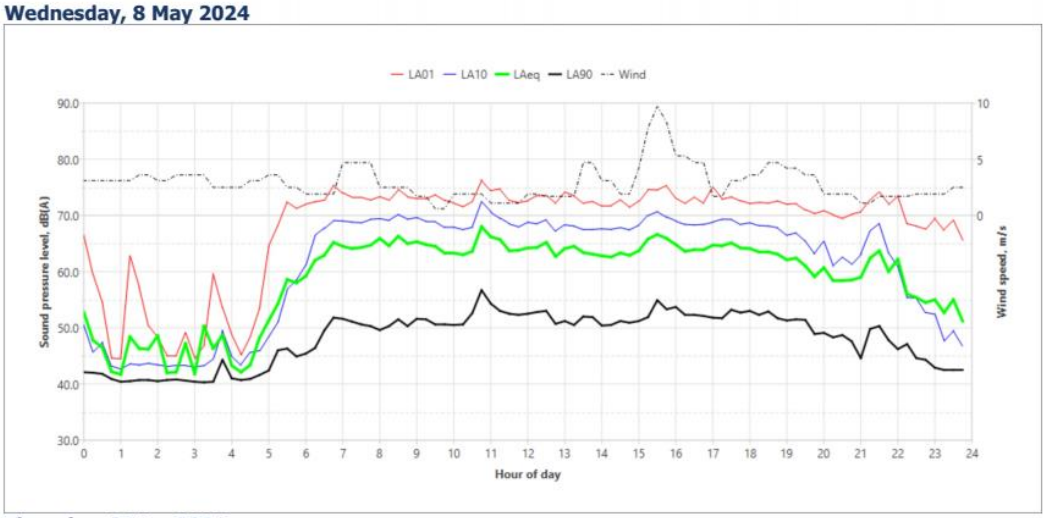
Tuesday, 7 May 2024



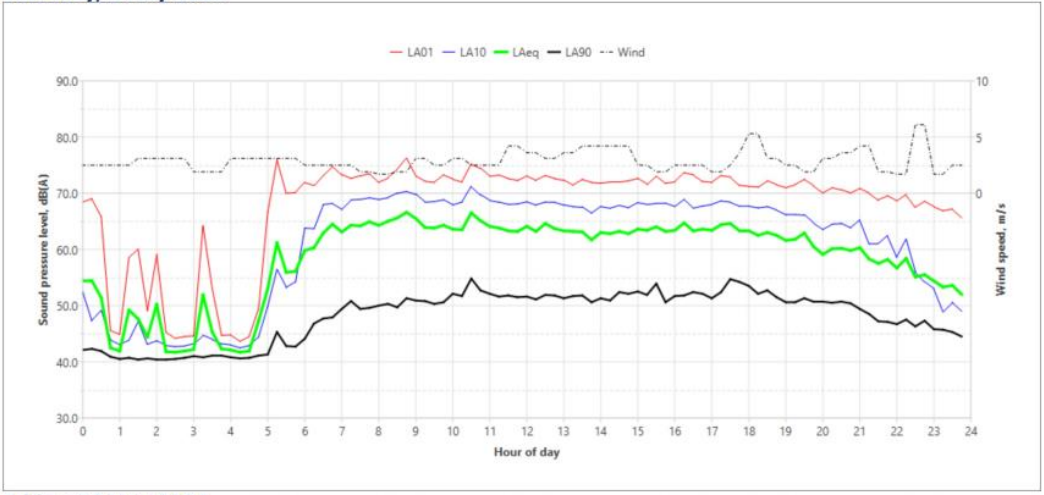
15 Commonwealth Parade, Manly

Page 2

Wednesday, 8 May 2024



Thursday, 9 May 2024



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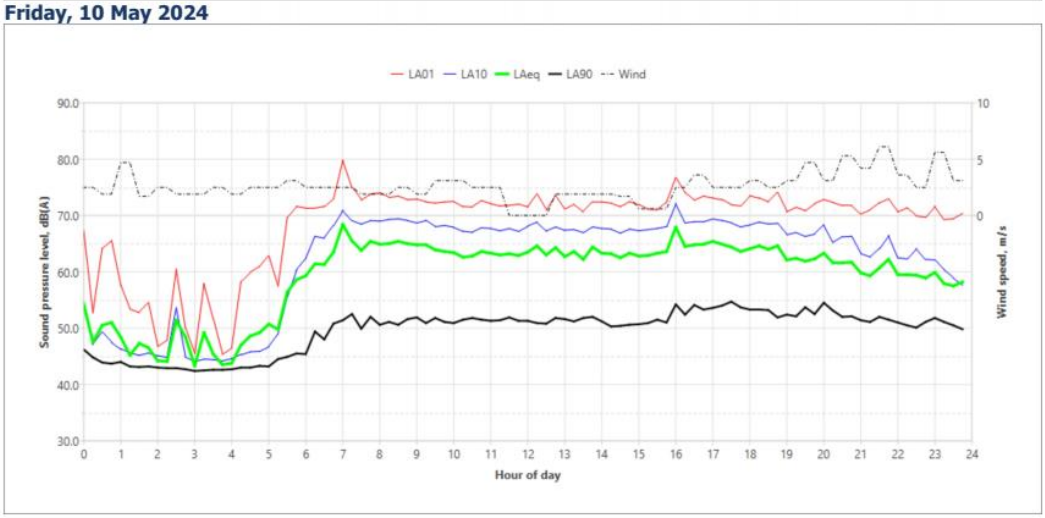

15 Commonwealth Parade, Manly

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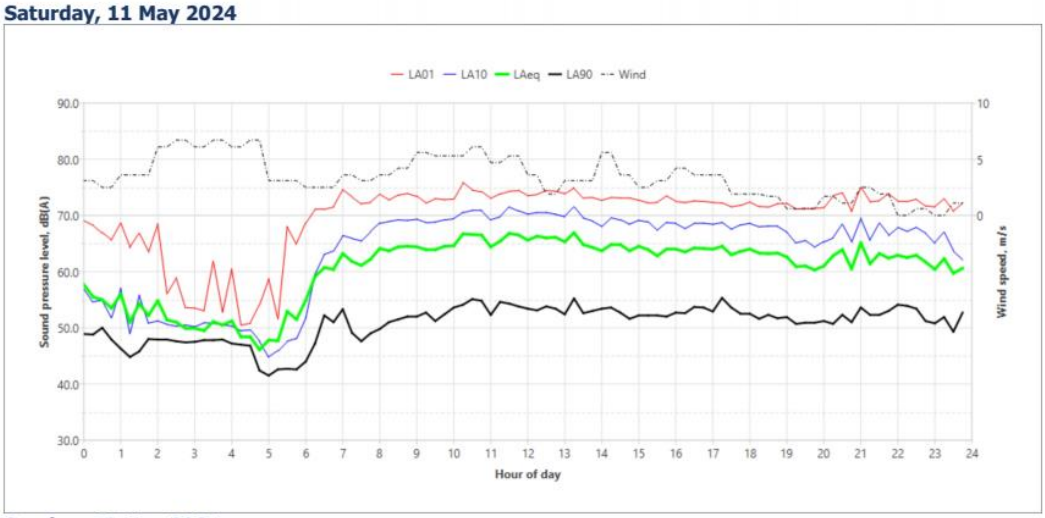
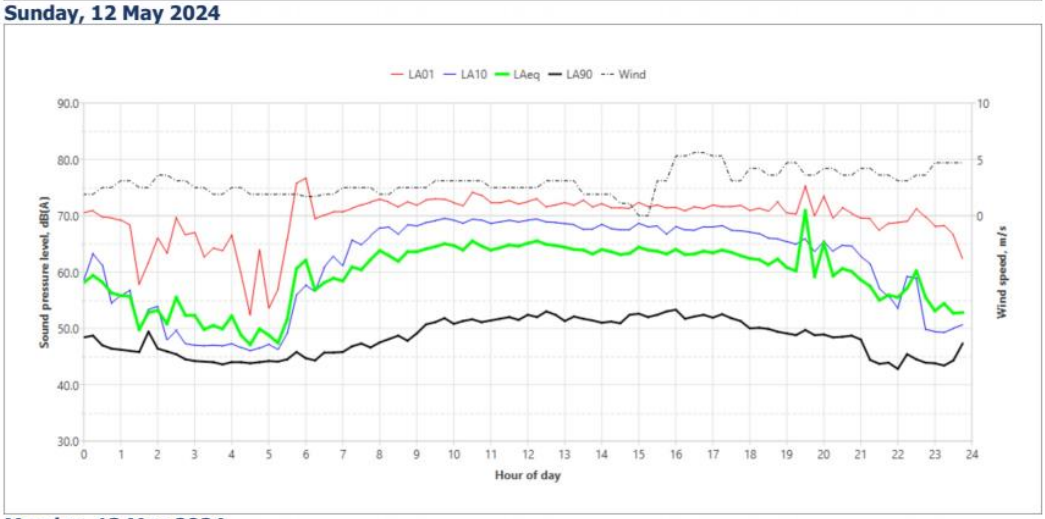
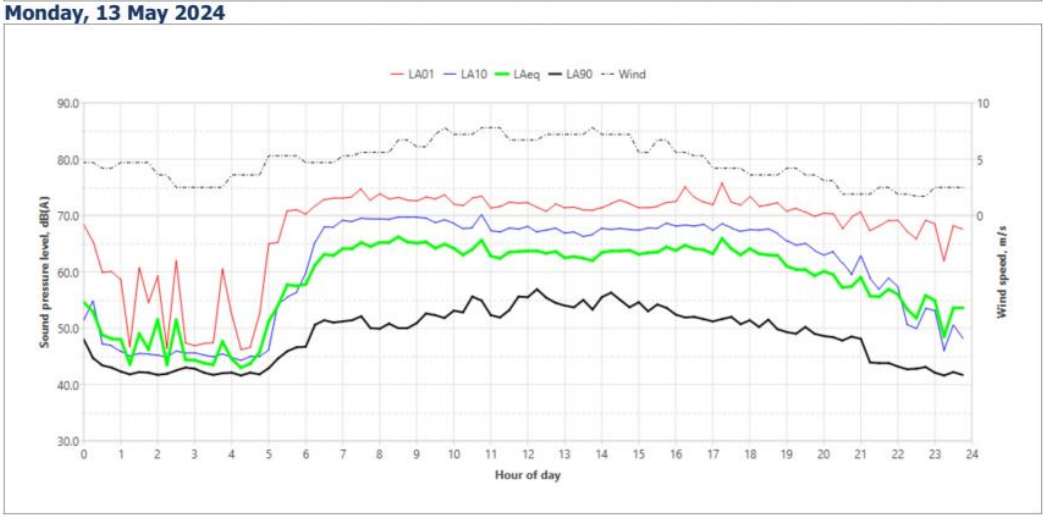
Saturday, 11 May 2024



Sunday, 12 May 2024



Monday, 13 May 2024



15 Commonwealth Parade, Manly

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APPENDIX C. UNATTENDED NOISE MONITOR – LOCATION 03

Weather Station: Sydney Observatory Hill

Weather Station ID: 066214

Co-ordinates: Lat: -33.86 s, Lon: 151.20 E, 44 m Height

Figure 14 Unattended Noise Monitor Photo

42 E Esplanade, Manly

Ambient noise monitoring report

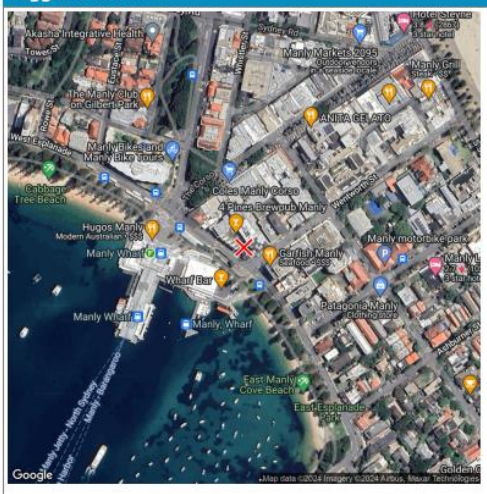
Item	Information
Logger Type	Norsonic
Serial number	1393013
Address	42 E Esplanade, Manly
Location	42 E Esplanade, Manly
Facade / free field	Free field
Environment	

Measured noise levels

Logging date	Rating Background Level			$L_{Aeq,period}$		
	Daytime 7am-6pm	Evening 6pm-10pm	Night-time 10pm-7am	Daytime 7am-6pm	Evening 6pm-10pm	Night-time 10pm-7am
Mon 06 May 2024	-	56	-	61	59	56
Tue 07 May 2024	56	56	52	59	58	55
Wed 08 May 2024	54	57	49	59	59	54
Thu 09 May 2024	54	56	49	59	58	53
Fri 10 May 2024	55	57	49	59	59	54
Sat 11 May 2024	53	58	48	59	61	56
Sun 12 May 2024	54	56	53	59	58	55
Mon 13 May 2024	56	56	50	62	58	54
Tue 14 May 2024	56	56	50	60	58	54
Wed 15 May 2024	-	-	-	59	-	53
Summary	**55**	**56**	**49**	**60**	**59**	**54**

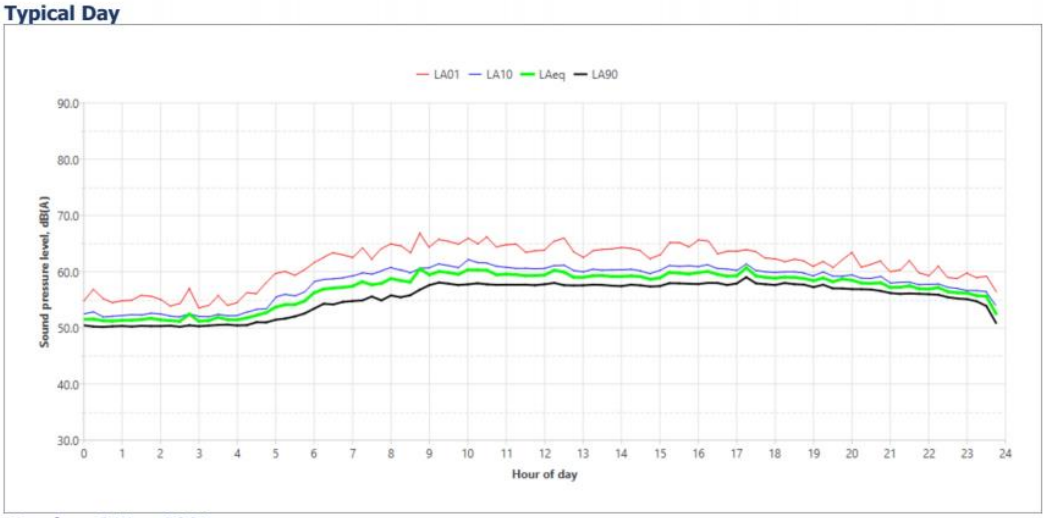
Note: Results with a '-' identify that there were not enough measurements available to correctly calculate the level, in accordance with the Noise Policy for Industry. The data has been excluded either from weather or manual exclusions. See the charts for more information

Logger location



Logger deployment photo

Typical Day



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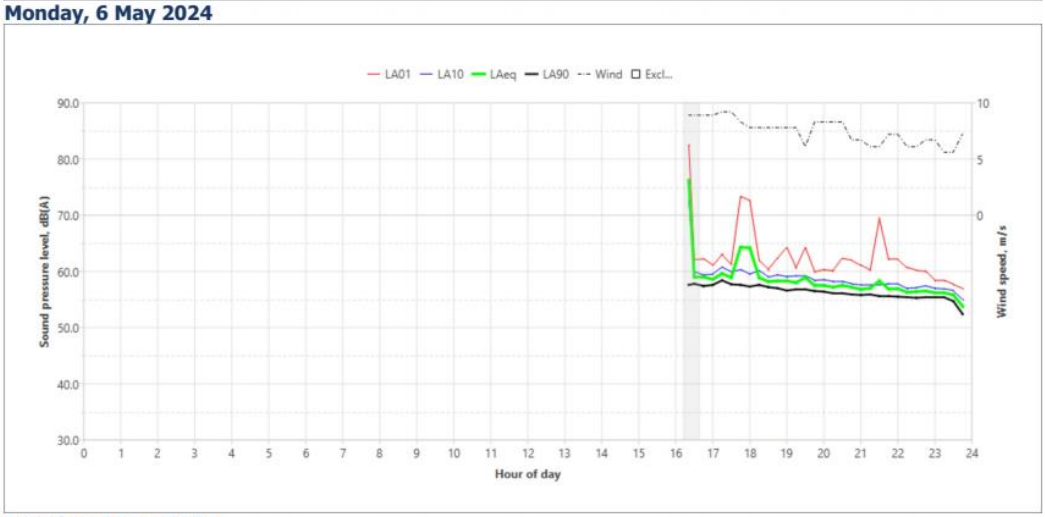
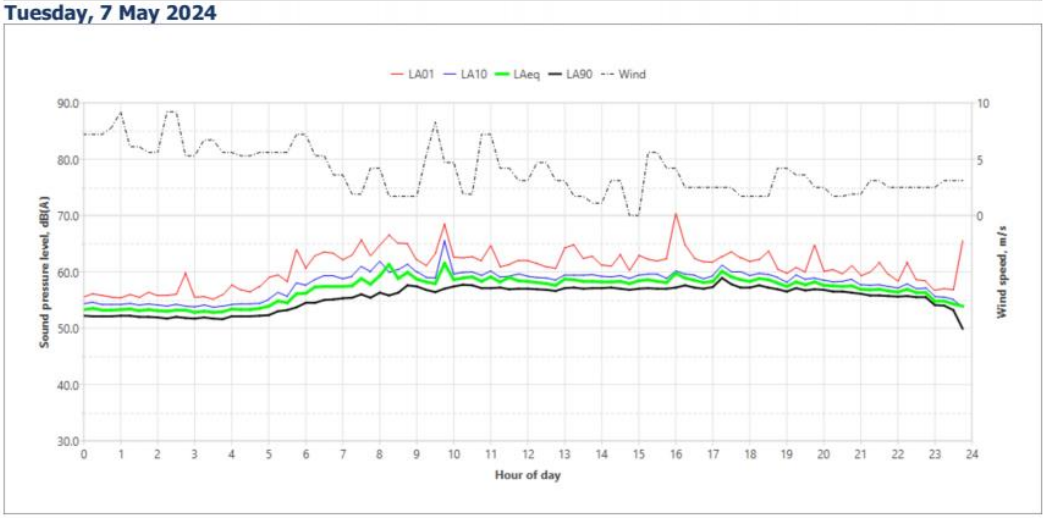


Tuesday, 7 May 2024



42 E Esplanade, Manly

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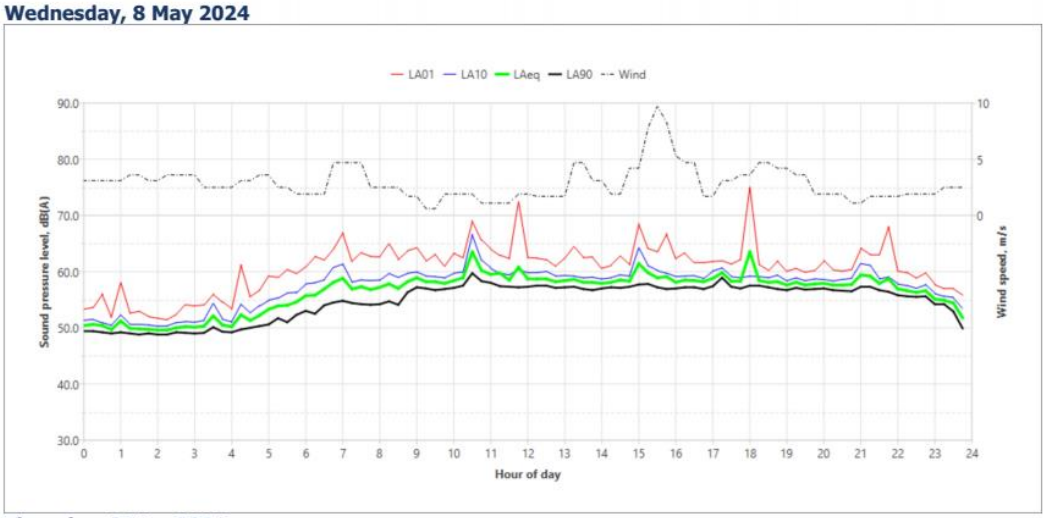
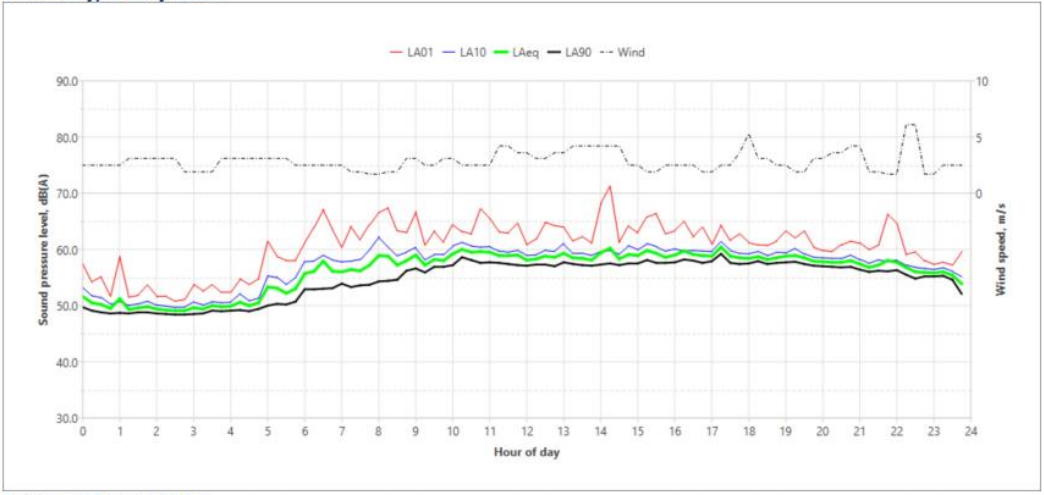
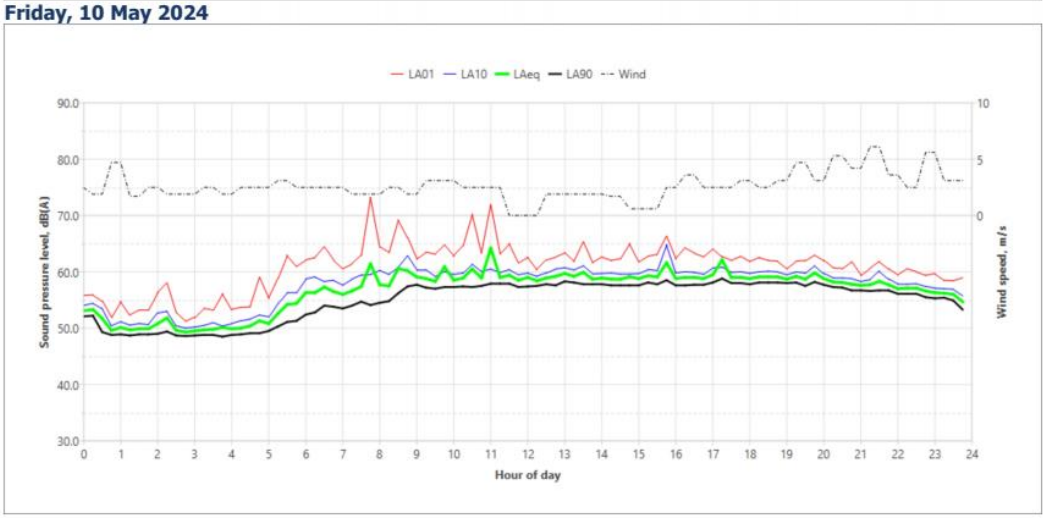
Wednesday, 8 May 2024



Thursday, 9 May 2024



Friday, 10 May 2024



42 E Esplanade, Manly

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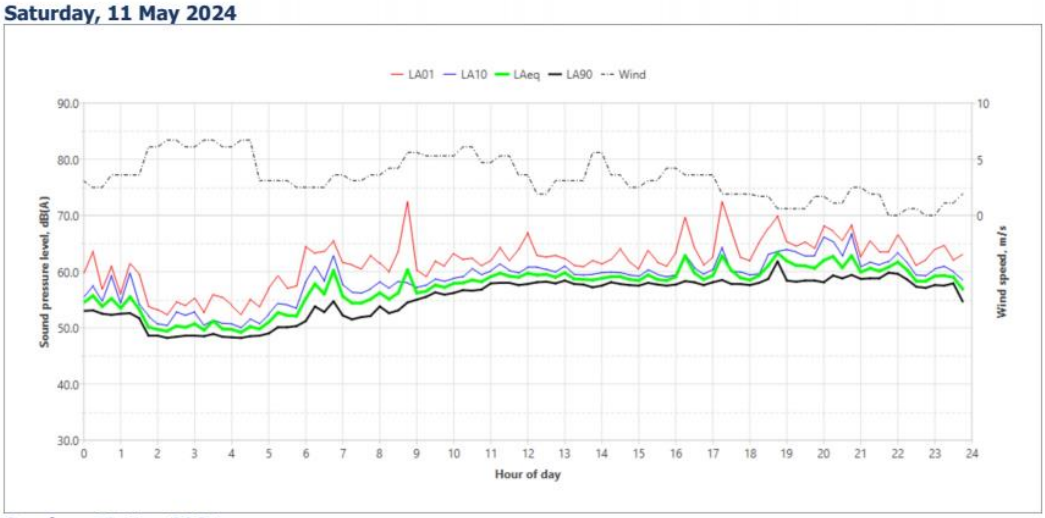
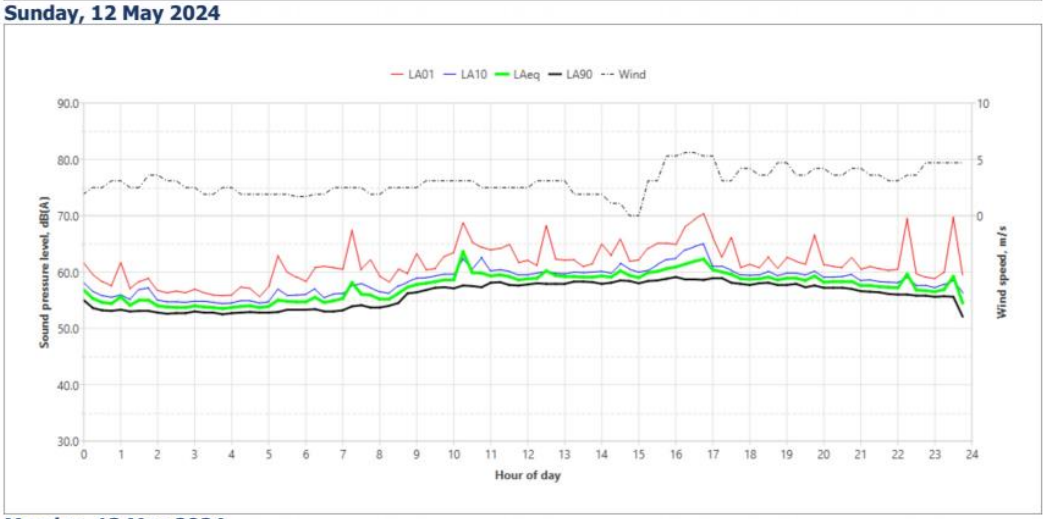
Saturday, 11 May 2024



Sunday, 12 May 2024



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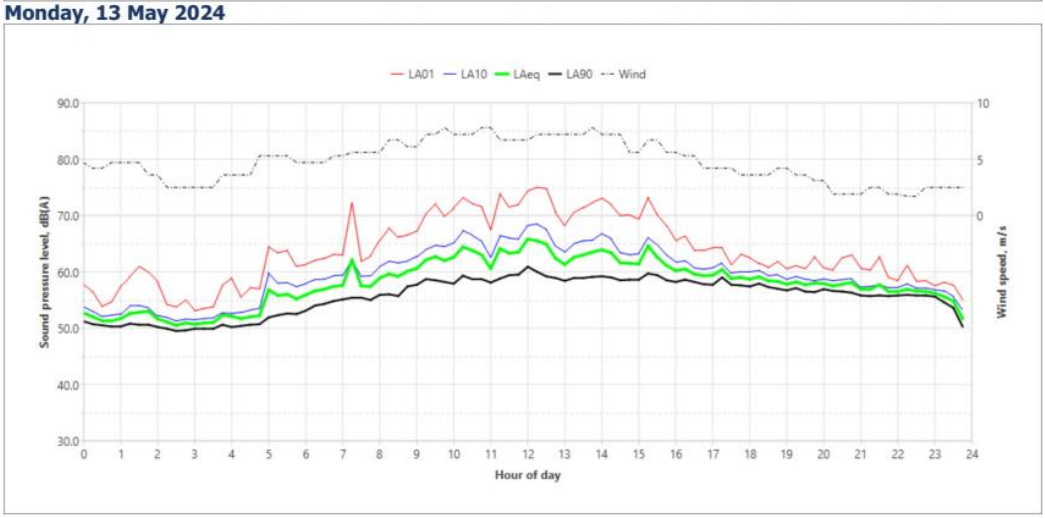

42 E Esplanade, Manly

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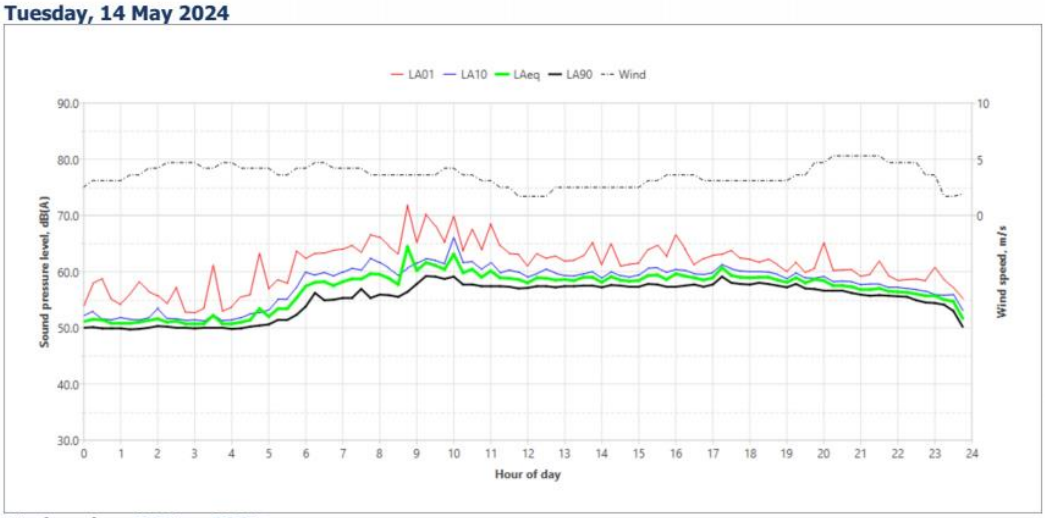
Tuesday, 14 May 2024



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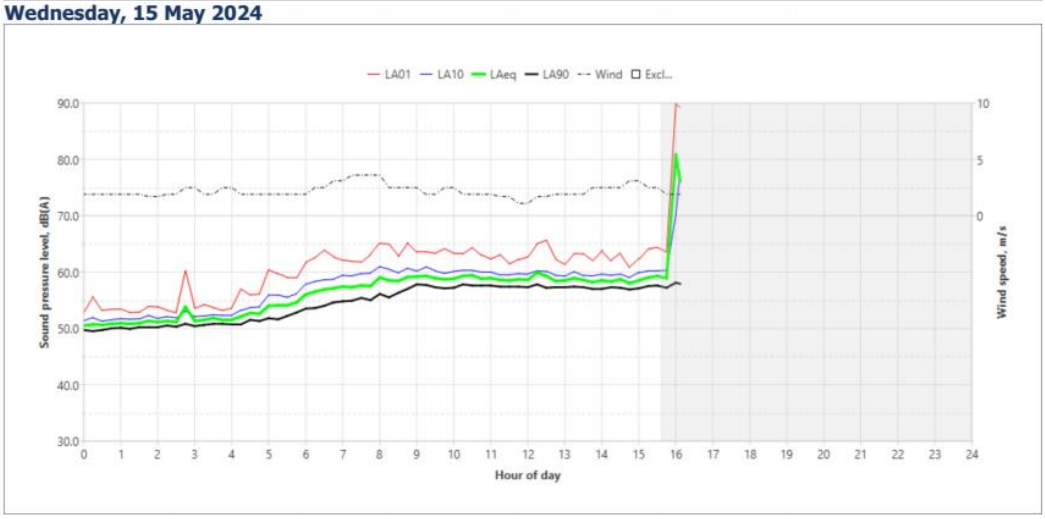

42 E Esplanade, Manly

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APPENDIX D. AUTHOR CIRCUMVIATE – MATTHEW FURLONG

MATTHEW FURLONG

PRINCIPAL ACOUSTIC ENGINEER

Bachelor of Creative Technology (Audio Engineering and Sound Production), JMC Academy

Member of Australian Acoustical Society (MAAS)

UTS Certification Short Course - Acoustics (NSW Fair Trading Approved)

Matthew is an acoustic consultant with over 10 years' experience in acoustic design for various architectural, environmental and infrastructure projects. He has provided services during the conceptual, planning approval, detailed design, design finalisation and IFC, construction, commissioning, and post-construction stages for a range of different projects.

Matthew's key strength is large scale acoustic design and delivery across the residential, commercial, education and healthcare sectors. As an acoustic consultant, he has also contributed his expertise to other development types including cultural and performance art spaces, licensed premises office fitouts, and industrial developments.

0452 414 785
MatthewF@pwna.com.au

SKILL SET:

- Architectural acoustic design
- Building services acoustic design
- Construction and commissioning
- Expert witness & court works
- Environment impact assessments (SSI & SSD)
- Façade acoustic design
- NCC/BCA design and compliance
- New business development
- Team management
- Project management

MAJOR PROJECTS:

Sydney Children's Hospital Stage 1 and Minderoo Children's Comprehensive Cancer Centre (SCH1 & MCCCC)
Client: LCI/NSW HI/John Holland

Western Sydney Airport (WSA)
Client: LCI

Chatswood Education Precinct (Chatswood HS & PS)
Client: Richard Crookes Constructions

Macquarie Park Village (MPV)
Client: Frasers

Crown Casino Sydney
Client: Crown Sydney/Lendlease

PULSE WHITE NOISE ACOUSTICS
Suite 601, L6, 32 Walker St, North Sydney NSW 2060 P 1800 478 573 pwna.com.au

MATTHEW FURLONG
PRINCIPAL ACOUSTIC ENGINEER, PWNA

EXPERIENCE

EDUCATION

- **Schematic, SSDA, Detailed Design, IFC, Construction Carlingford West Public School**
- **Detailed Design, IFC, Construction Cumberland High School**
- Masterplan, Concept, Schematic, SSDA, Design Development Tallawong Station Public School.
- Masterplan, Concept, Schematic and SSDA Tallawong Public School.
- Schematic and SSDA Macquarie Park Public School.
- Detailed Design, IFC and Construction Neutral Bay Public School.
- SSDA and Acoustic Design Meadowbank Education Precinct
- Schematic, SSDA, Detailed Design, IFC, Construction and Commissioning New Primary School in Murrumbateman
- Schematic, SSDA, Detailed Design, IFC, Construction and Commissioning New Primary School in Googong.
- Detailed Design, IFC, Construction and Commissioning at Epping South
- Detailed Design, IFC, Construction and Commissioning at Epping West.
- **Design Finalisation, IFC, Construction and Commissioning Chatswood High School.**
- **Design Finalisation, IFC, Construction and Commissioning Chatswood Public School.**
- Schematic, Planning Pathway Hurlstone Agricultural High School
- Schematic, Planning Pathway Yanco Agricultural High School
- SSDA, Construction (Mech) and Commissioning (Mech) Meadowbank School.
- Construction and Commissioning Meadowbank TAFE Building.
- CNVMP and Construction Services Anzac Park Public School
- CNVMP and Construction Services Alexandria Park Public School (Stage 1)
- **Design Finalisation, IFC, Construction Melonba High School**
- **Design Finalisation, IFC, Construction Melonba Public School**

MATTHEW FURLONG
PRINCIPAL ACOUSTIC ENGINEER, PWNA

RESIDENTIAL

- **Acoustic Design for Crown Casino Sydney.**
- Acoustic Design and Construction Services 130 Elizabeth Street, Sydney (One30Hyde).
- Acoustic Design and Construction Services Trinity Terraces Rosebery.
- Construction Services 1a Coulson Street, Erskinville.
- Construction Services for the Erko Apartments Erskinville.
- Construction Services for the Eve Apartments Erskinville.
- Acoustic Design 54-56 Riley Street and 1 Crown Lane, Darlinghurst.
- Development Application, Acoustic Design and Construction Services New Life Darling Harbour, 495 Harris Street, Ultimo.
- **Development Application, Acoustic Design and Construction Services Meriton Developments (Mascot, Rosebery, Epping, Parramatta, Pagewood, Bondi, Dee Why, Zetland, Waterloo, North Sydney, Sydney, Macquarie Park).**
- Development Application, Acoustic Design and Construction Services Summer Hill Flourmill Stages 1, 2, 3 and 4.
- **Acoustic Design and Construction Services Macquarie Park Village.**
- **Acoustic Design and Construction Services Ryde Gardens.**
- Acoustic Design and Construction Services Tempo Apartments Victoria Road Drummoyne.
- Development Application, Acoustic Design and Construction Services Winston Hills Mall Residential.
- Construction Services Presbyterian Aged Care Paddington.
- Acoustic Design and Construction Services Wahroonga Nursing Home.
- Acoustic Design and Construction Anglicare Castle Hill (ARV).
- Acoustic Design and Construction Cardinal Freeman Village, Ashfield.

MATTHEW FURLONG
PRINCIPAL ACOUSTIC ENGINEER, PWNA

COMMERCIAL

- **Development Application, Acoustic Design and Construction Services Winston Hills Mall Enabling Works.**
- Development Application and Acoustic Design 210-220 George Street Sydney.
- **Acoustic Design and Construction Services 151 Clarence Street, Sydney.**
- Development Application for 390-396 Pitt Street, Haymarket.
- **Acoustic Design and Construction Services Chifley Plaza Internal Works.**
- Development Application 371-375 Pitt Street, Sydney.
- Construction Services Fitout of the Department of Premier and Cabinets.
- Noise Investigations for Transport NSW (Chatswood and Burwood).
- **Schematic Design for Western Sydney Airport – Nancy Warbird (WSA).**
- Schematic Design, Detailed Design, Tender, IFC, Construction Johnson Winter Slattery (JWS) Sydney Office Fitout.
- Schematic Design, Detailed Design, Tender, IFC, Construction UHY Haines Norton Sydney Office Fitout.

CULTURAL AND PERFORMING ART SPACES

- **Acoustic Design and demonstration for the Wintjiri Wiru drone, light and sound show (Uluru).**
- **Acoustic Design for Powerhouse Parramatta.**
- Acoustic Design and construction services for Manning Entertainment Centre.
- Acoustic Design and construction services for Brickworks Sydney Broadcast and Podcast Spaces.
- Acoustic Design and construction services for Channel 9 Sydney Headquarters and Studio Spaces.
- Acoustic Design for Maclean Community Precinct.
- **Commissioning services for Sydney Modern.**
- Acoustic Design for School Infrastructure NSW School Hall and Performing Arts Spaces (including Chatswood Public School, Chatswood High School, Googong Public School, Murrumbateman Public School, Tallawong Station Public School, Tallawong Public School, Melonba Public School, Marsden Park High School, Cumberland High School, Carlingford West Public School, New Primary, Nharala Public School etc).

MATTHEW FURLONG
PRINCIPAL ACOUSTIC ENGINEER, PWNA

- Acoustic Design and Construction for Scientia Project, Monte Sant' Angelo Mercy College.

HEALTH FACILITIES

- **Master Planning, Feasibility, Schematic, SSDA, Detailed Design and IFC for Sydney Children's Hospital Stage 1 & Minderoo Children's Comprehensive Cancer Centre (SCH1/MCCCC), Randwick.**
- Formulation of the new Victorian Health Engineering Guidelines (Acoustics).
- Construction Services for Wagga Wagga Base Hospital Stage 2.
- SSDA and Acoustic Design for Concord Repatriation General Hospital.
- SSDA and Acoustic Design Nepean Public Hospital.
- **CNVMP, Design Finalisation, IFC, Construction Campbelltown Hospital Redevelopment Works.**
- Acoustic Design for Eurobodalla Regional Hospital.

LICENSED PREMISES

- Development Application for The Cauliflower Hotel, Waterloo
- Development Application for Christopher Hanna Salon and Bar, 13-15a Bridge Street, Sydney
- Development Application for the Tilbury Hotel Woolloomooloo.
- Development Application for the Exchange Hotel, Balmain.
- Development Application for the Town Hall Hotel, Balmain.
- Development Application for the Exchange Hotel, Darlinghurst.
- Development Application for 388 George Street, Sydney.
- Development Application for 88 Pitt Street, Sydney.
- Development Application for 92 Pitt Street, Sydney.
- Development Application for Pilu Freshwater.
- **Development Applications for the Redevelopment of Ibis Hotels:**
    - Enfield NSW.
    - Liverpool NSW.
    - Wentworthville NSW.

MATTHEW FURLONG
PRINCIPAL ACOUSTIC ENGINEER, PWNA

- Sydney Airport NSW.
- St Peters NSW.
- Olympic Park NSW.
- Thornleigh NSW.

INDUSTRIAL

- Acoustic design Erskine Park Industrial Area.
- CNVMP, Acoustic Design, IFC and Construction Snackbrands Orchard Hills.
- **CNVMP, Acoustic Design, IFC and Construction Logos Moorebank (Warehouse 6 & 7).**