Merrylands (B)88 Development Pty Ltd

Site 2, 4 Terminal Place, 4A Terminal & Gladstone Street, Merrylands

Acoustic DA Assessment

Author	Fu Siong Hie, B.Eng, MAAS Principal Consultant
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1 Introduction

The following report has been prepared by Acouras Consultancy on behalf of Merrylands (B)88 Development Pty Ltd to assess the potential for noise impact associated with the Site 2, 4 Terminal Place, 4A Terminal & Gladstone Street, Merrylands. The residential development will include:

- Six (6) levels of basement carpark.
- Building B: Residential apartments on ground to level 16.
- Building C: Residential apartments on ground to level 11.
- Building D: Residential apartments on ground to level 11.

Traffic noise along the Neil Street and the railway noise at Merrylands Station contributes to the surrounding ambient noise levels. The site location is shown in Figure 1.

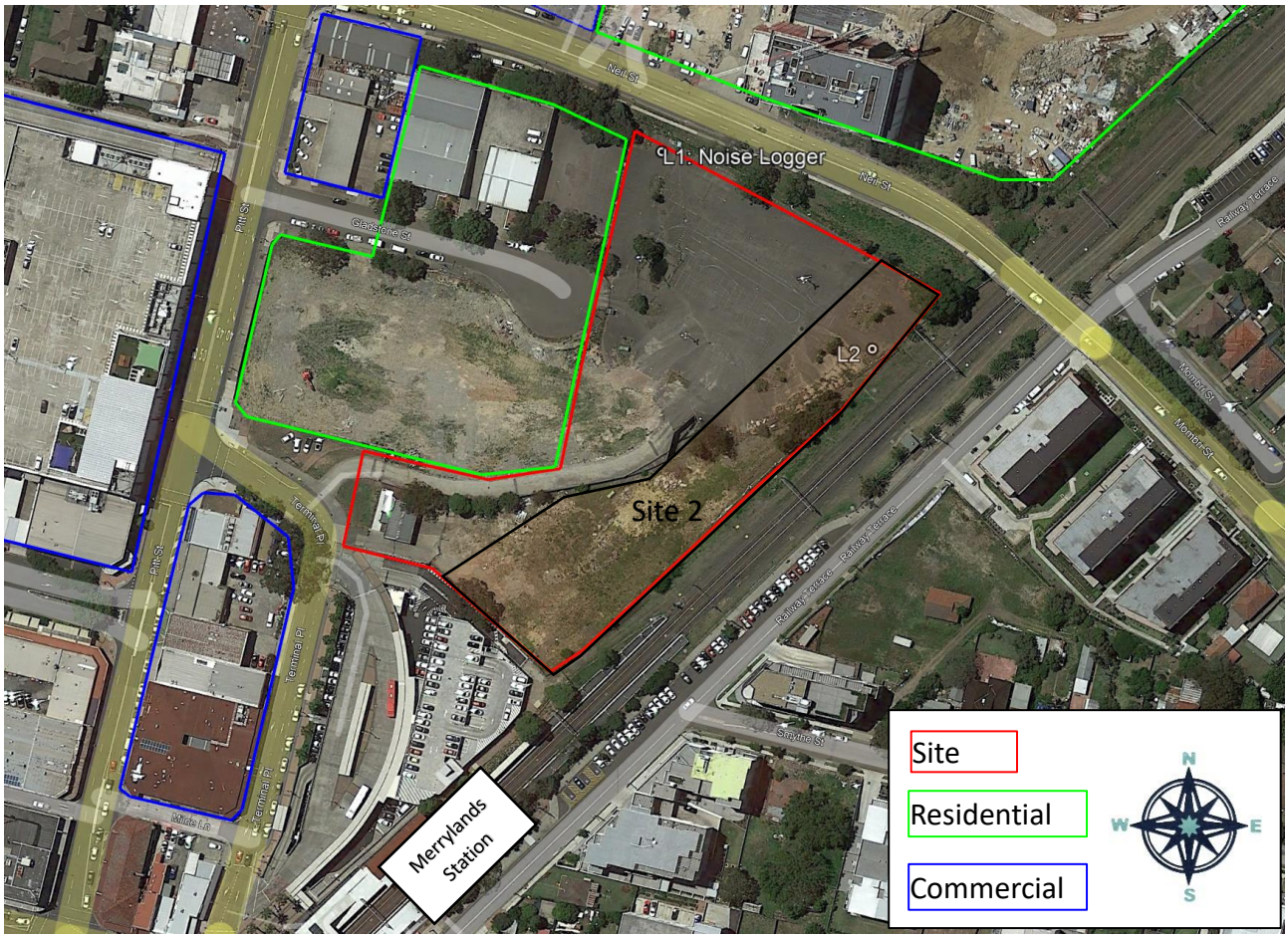


Figure 1 – Site Location, Nearest Residents and Noise Logger Position

2 Noise Criteria

The following standards and guidelines are applicable to this project:

- NSW Department of Planning "Development Near Rail Corridors and Busy Roads".
- Cumberland Development Control Plan (DCP) Part B 'Development in Residential Zones'.
- NCC/BCA Part F5.
- NSW EPA "Noise Policy for Industry" (NPfI).
- NSW EPA "Road Noise Policy" (RNP).
- NSW EPA "Assessing Vibration: a technical guideline".
- Australian standard AS/NZS 2107-2016: Acoustics – Recommended design sound levels and reverberation times for building interiors.
- Australian standard AS 1055.1-1997: Acoustics – Description and measurement of environmental noise - General procedures.

2.1 Internal Noise Levels

The Cumberland DCP (Part B) recommends the following:

> *C13. For development adjacent to rail corridor, or major road corridor with an annual average daily traffic volume of more than 40,000 vehicles, applicants must consult State Environmental Planning Policy (Infrastructure) 2007 and the relevant NSW guidelines. Where acoustic reports are required by the SEPP and Guidelines, the building is to be designed and detailed to comply with the recommendations of that report.*

In the Department of Planning guideline and the SEPP Clause 87 (rail) and 102 (road) requires that if the development is for the purpose of a building for residential use, the consent authority must be satisfied that appropriate measures will be taken to ensure that the following L_{Aeq} levels are not exceeded.

Table 1— Development near Rail Corridors and Busy Roads – Interim Guideline

Residential Space	Internal Noise Criteria
in any bedroom in the building	35dB(A) at any time 10pm–7am
anywhere else in the building (other than a garage, kitchen, bathroom or hallway)	40dB(A) at any time

Mitigation measures are based on having windows and external doors closed. If internal noise levels with windows or doors open exceed the criteria by more than 10dBA, the design of the ventilation for these rooms should be such that occupants can leave windows closed, if they so desire, and also to meet the ventilation requirements of the Building Code of Australia.

The Australian Standard AS 3671-1989 'Acoustics - Road traffic noise intrusion -building siting and construction' provides guidance on the design but is limited as is refers to the Australian Standard AS 2107. Australian Standard AS 2107 – 2016 'Acoustic – Recommended Design Sound Levels and Reverberation Times for Building Interiors' to provide the recommended design sound levels for different areas of occupancy in buildings. Table 2 presents the recommended internal design noise levels in accordance with AS 2107 – 2016.

Table 2— Recommended Internal Design Noise Levels (AS/NZS 2107)

Type of occupancy/activity	Design sound level ($L_{Aeq,t}$) range
Apartment common areas, corridors, lobbies (e.g. foyer, lift lobby)	45 to 50
Small retail stores (general)	< 50
Common rooms	40 to 45
Enclosed Carparks	< 65

2.2 Railway Vibration Criteria

The proposed development is located within 60m of the nearest railway corridor, therefore vibration levels such as the intermittent vibration emitted by trains should be assessed in accordance with the criteria given in the EPA/DECC "Assessing Vibration: a technical guideline (2006)". Human comfort is normally assessed with reference to the above British Standard or Australian Standard AS 2670.2 1990. When assessing intermittent vibration, the vibration dose value (VDV) is used to determine the vibration energy received over the daytime and night-time periods. Acceptable values of vibration dose are presented in Table 3.

Table 3 – Acceptable vibration dose values for intermittent vibration ($m/s^{1.75}$)

Location	Daytime (7.00 am to 10.00 pm)		Night-time (10.00 pm to 7.00 am)	
	Preferred value	Maximum value	Preferred value	Maximum value
Residence	0.20	0.40	0.13	0.26

2.3 Sound Insulation Requirement (Part F5 NCC/BCA)

For sound transmission and insulation between sole occupancy units (SOU) within the same development, walls and floors to be constructed in accordance with requirements of Part F5 of the Building Code of Australia (BCA). Sound insulation requirements are summarised in Table 4.

Table 4 - NCC Part F5 Requirements (Class 2 or 3)

Building Element	Minimum NCC Part F5 Requirements
Sound Insulation Rating of Walls (Class 2 or 3)	
Walls between separate sole occupancy units.	Rw + Ctr 50 (airborne)
Walls between wet areas (bathrooms, sanitary compartment, laundry or kitchen) and a habitable room (other than kitchen) in adjoining apartments.	Rw + Ctr 50 (airborne) & of discontinuous construction
Walls between sole occupancy unit and stairway, public corridors, public lobby or the like or parts of a different classification.	Rw 50 (airborne)
Walls between a plant room or lift shaft and a sole occupancy unit.	Rw 50 (airborne) & of discontinuous construction
Sound Insulation Rating of Floors (Class 2 or 3)	
Floors between sole occupancy units or between a sole occupancy unit and plant room, lift shaft, stairway, public corridor, public lobby or the like.	Rw + Ctr 50 (airborne) & Ln,w + CI < 62 (impact)
Apartment Entry Doors (Class 2 or 3)	
A door incorporated in a wall that separates a sole-occupancy unit from a stairway, public corridor, public lobby or the like.	Rw 30 (airborne)
Services (Class 2, 3 or 9c)	
If a storm water pipe, a duct, soil, waste or water supply pipe including a duct or pipe that is located in a wall or floor cavity serves or passes through more than one sole occupancy unit must be separated:	
if the adjacent room is a habitable room (other than a kitchen); or	Rw + Ctr 40
if the room is a kitchen or non-habitable room	Rw + Ctr 25

Construction Deemed to Satisfy

The forms of construction must be installed as follows:

(a) Masonry—Units must be laid with all joints filled solid, including those between the masonry and any adjoining construction.

(b) Concrete slabs—Joints between concrete slabs or panels and any adjoining construction must be filled solid.

(c) Sheeting materials—

(i) if one layer is required on both sides of a wall, it must be fastened to the studs with joints staggered on opposite sides; and

(ii) if two layers are required, the second layer must be fastened over the first layer so that the joints do not coincide with those of the first layer; and

(iii) joints between sheets or between sheets and any adjoining construction must be taped and filled solid.

(d) Timber or steel-framed construction—perimeter framing members must be securely fixed to the adjoining structure and—

(i) bedded in resilient compound; or

(ii) the joints must be caulked so that there are no voids between the framing members and the adjoining structure.

(e) Services—

(i) Services must not be chased into concrete or masonry elements.

(ii) A door or panel required to have a certain Rw + Ctr that provides access to a duct, pipe or other service must—

(A) not open into any habitable room (other than a kitchen); and

(B) be firmly fixed so as to overlap the frame or rebate of the frame by not less than 10 mm, be fitted with a sealing gasket along all edges and be constructed of—

(aa) wood, particleboard or blockboard not less than 33 mm thick; or

(bb) compressed fibre reinforced cement sheeting not less than 9Â mm thick; or

(cc) other suitable material with a mass per unit area not less than 24.4 kg/m^2

(iii) A water supply pipe must—

(A) only be installed in the cavity of discontinuous construction; and

(B) in the case of a pipe that serves only one sole-occupancy unit, not be fixed to the wall leaf on the side adjoining any other sole-occupancy unit and have a clearance not less than 10 mm to the other wall leaf.

(iv) Electrical outlets must be offset from each other—

(A) in masonry walling, not less than 100 mm; and

(B) in timber or steel framed walling, not less than 300 mm.

2.4 Noise Survey and Project Specific Limits

An unattended noise survey was carried out at the site to measure the background and ambient noise levels. Noise monitoring was conducted between Tuesday 21st to Tuesday 28th June 2022. The noise measurements positions are shown in Figure 1:

- Location 1 – Unattended noise monitor.
- Location 2 – Attended railway noise and vibration.

Measurements were conducted using the following equipment:

- SVAN 977C Type 1 Real time Analyser/Noise Logger. Serial No. 98078.
- SVAN 958A Type 1 Real time Analyser/Noise and Vibration. Serial No. 36624.
- SVAN SV30A Type 1 Sound Level Calibrator. Serial No. 31830.

Noise monitoring was conducted in general accordance with Australian standard AS 1055.1-1997: Acoustics-Description and measurement of environmental noise-General procedures.

The noise analyser was calibrated immediately before and after measurements were taken with no discernible differences between these two recorded levels. The sound analyser is Type 1 and complies with Australian standard AS1259.2: 1990.

During the monitoring period any adverse weather condition have been excluded. The noise logger results are presented in Appendix C.

2.4.1 Traffic Noise Levels

Table 5 presents a summary of the measured traffic noise level impacting the development site. The site is dominated by traffic on Neils Street, Pitt Street is located approximately 120-180m from the development site.

The Traffic noise levels are based on measurements taken from the unattended noise logger located (L1) adjacent to Neil Street.

Table 5 – Measured Traffic Noise Levels, dBA

Noise Logger Location	Source	Period	Average L_{eq}	Highest L_{eq} 1hr
L1	Neil Street	Day (07:00-22:00)	61	67
		Night (22:00-07:00)	54	58

2.4.2 Railway Noise Results

To assess the noise impact from rail vehicle movements both day and night period, attended measurements (L2) were taken of at least 20 pass-bys. In our observations, the noise and vibration from the movement railway vehicles was generally not detectable above he ambient noise and vibration levels. The following formula has been applied to determine the $L_{Aeq(T)}$ for each period as shown in Table 6.

$$L_{Aeq(T)} = 10\log_{10}\frac{1}{T}\sum_{i=1}^{N}\left(n_i \times 10^{\left(\frac{LAE_i}{10}\right)}\right)$$

Table 6 – Railway Vehicle Noise Levels, dBA

Location	Period	Average	Highest
L2	Day (07:00-22:00)	$L_{eq(15hr)}$ 61	L_{eq1hr} 63
	Night (22:00-07:00)	$L_{eq(9hr)}$ 58	L_{eq1hr} 59

2.4.3 Project Noise Limits for Residential Development

For the operation of mechanical equipment, Cumberland DCP (Part B) recommends the following:

> *C12. Air conditioners, swimming pool pumps and the like are not to exceed 5dba above background noise levels and should not be audible from habitable rooms of neighbouring dwellings.*

For the purpose of the assessment, the background noise level has been determined using the RBL in accordance with the procedures as set out in the NSW EPA noise policy.

Table 7 presents a summary of the measured background noise level and the allowable intrusive noise limit for the residential apartments with the development.

Table 7—Background Noise Levels and Council DCP Noise Limits, dBA (Residential)

Location	Time Period	Existing Noise Levels		DCP Noise Limits, $L_{eq(15min)}$
		$L_{eq\ (period)}$	RBL	
L1	Day	62	55	60
	Evening	58	50	55
	Night	54	40	45

2.4.4 EPA Noise Policy for Industry Noise Criteria

Table 8 presents a summary of the measured background noise level from the unattended noise logged (L1) and the allowable intrusive noise limit for the commercial and retail tenancies within the development based on the requirements of the NSW EPA "Noise Policy for Industry" (NPfI). The amenity criteria are based on a suburban receiver.

Table 8—Background Noise Survey and EPA NPfI Project Limits, dBA

Receiver	Time Period	Existing Noise Levels		NSW EPA NPfI			Project Noise Trigger Level $L_{eq(15min)}$
		L_{eq} (period)	RBL	ANL	Project ANL[1] $L_{eq(15min)}$	Intrusiveness Criteria, $L_{eq(15min)}$	
Residential	Day	62	55	55	53	60	**53**
	Evening	58	50	45	43	55	**43**
	Night	54	40	40	38	45	**38**
Commercial	All	-	-	-	-	-	**65**

During detailed design stage, the design and selection of the mechanical equipment (such as fans, pumps, A/C condensers etc) required to service the proposed development will be required to achieve the EPA noise limits as presented in the table above.

[1] Project ANL is recommended ANL minus 5 dB(A) and plus 3 dB(A), to convert from a period level to a 15-minute level.

2.5 Traffic Noise Generation

The development the potential to generate increased traffic noise along Pitt Street will be assessed in accordance with the NSW EPA Road Noise Policy (RNP). Table 9 sets out the assessment criteria for residences to be applied to particular types of project, road category and land use.

Table 9— Road traffic noise assessment criteria for residential land uses

Road Category	Type of project/land use	Assessment Criteria - dBA	
		Day (7am-10pm)	Night (10pm-7am)
Freeway/ arterial/ sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments.	$L_{Aeq, (15\ hour)}$ 60 (external)	$L_{Aeq, (9\ hour)}$ 55 (external)
Local roads	Existing residences affected by additional traffic on existing local roads generated by land use developments	$L_{Aeq, (1\ hour)}$ 55 (external)	$L_{Aeq, (1\ hour)}$ 50 (external)

For existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding 'no build option'.

3 Assessment and Recommendations

3.1 Façade Glazing Requirements

Acoustic glazing for the apartments are given in Table 10 are required to reduce noise impact on the internal occupants and should result in noise levels within such units in accordance with the Department of Planning Noise Guidelines, SEPP and AS/NZS 2107.

Table 10 – Schedule of Window and Glazing (R_w)

Level	Facade	Space	Glazing Thickness	Minimum R_w (Glazing+Frame)
		Building B		
G-15	North (Neil St) & East	Living & Beds	10.38mm laminated	32
		Winter Garden	6.38mm laminated	30
	South & West	Living & Beds	6.38mm laminated	30
		Winter Garden	6.38mm laminated	30
		Building C & D		
G	All	Retail	6.38mm laminated	30
All	East	Living & Beds	10.38mm laminated	32
		Winter Garden	6.38mm laminated	30
	North, South & West	Living & Beds	6.38mm laminated	30
		Winter Garden	6.38mm laminated	30

All other non-habitable spaces, such as bathrooms and laundries require minimum 6mm monolithic glass (Rw 28). All Windows/doors should be well sealed (air tight) when closed with good acoustic seals around the top and bottom sliders. Mohair seals are not considered to be acoustic seals.

3.2 Building Façade Construction

To provide sufficient acoustic attention of noise, the general external construction of the proposed building would need to be constructed as detailed in Table 11.

Table 11 – External Façade Construction (R_w)

Building Element	Proposed Construction	Minimum R_w
External Wall	Masonry or cavity brick	45
Roof and ceiling	Concrete with a plasterboard cavity ceiling	45

3.3 Separation Between Commercial and Residential

The wall partition and floor slab separating the retail/commercial space and the residential apartment is to be of solid masonry/concrete construction with a minimum sound insulation performance of Rw + Ctr 50 for airborne noise.

At this stage, the activities of the future tenant that have the potential to create noise is not known. Any operation of the retail/commercial space is to comply with the EPA noise guidelines and the any other relevant Council consent conditions related to the use.

A separate DA assessment would be submitted prior to occupation detailing proposed use and to ensure that any potential noise impacting the amenity of the adjoining residence is protected.

3.4 Mechanical Services

At the DA stage, the design and selection of mechanical equipment has not been selected or finalised. Typically, based on similar sized residential projects we would expect the following noise control measures to be implemented:

- Carpark exhaust/supply fans located in the basement:
  - Exhaust and supply fans operate with a VSD and CO sensor.
  - Provide acoustic attenuators to the supply and discharge of the fans.
  - Noise emission levels would be controlled to achieve less than 38dBA (night time limit) at the boundary and at the nearest residence would be inaudible.
- Stair Pressurisations fans located on the roof:
  - Install acoustic attenuators or internally lined ducts to the supply and discharge of the fans.
  - The operation of the fans is limited to the emergency and test modes.
- Apartment outdoor A/C condenser:
  - Single outdoor condenser for each apartment located on the balcony.
  - Typical residential condenser has a noise level of approximately SPL 50-55dBA at 1m. It is estimated that these A/C units would be inaudible at the boundary and at the nearest affected receivers.

Following the DA approval of the proposed development, during the Construction Certification Stage a detail assessment of all mechanical plant and equipment will be conducted to ensure compliance with the EPA INP and DCP noise criteria.

3.5 Railway Vibration Measurement Results

On-site measurements were conducted on Tuesday 21st June 2022 to determine the tactile vibration amplitude due to train pass-bys. Measurements of at least 10 train-pass-by events and background levels were recorded.

From the measured vibration levels, the eVDV in Table 12 indicates a low probability of adverse comment during the daytime or night time. The measured vibration levels are below the base vibration curve for residential development during the day and night, as shown in Figure 2 and unlikely that there will be complaints. Based on these results, there is no further requirement to treat the rail vibration impacts.

Table 12 – eVDV of Ground Vibration Measurements of Rail Pass-by

Time	eVDV	Adverse Comment
Day	0.001	Low Probability
Night	0.001	Low Probability

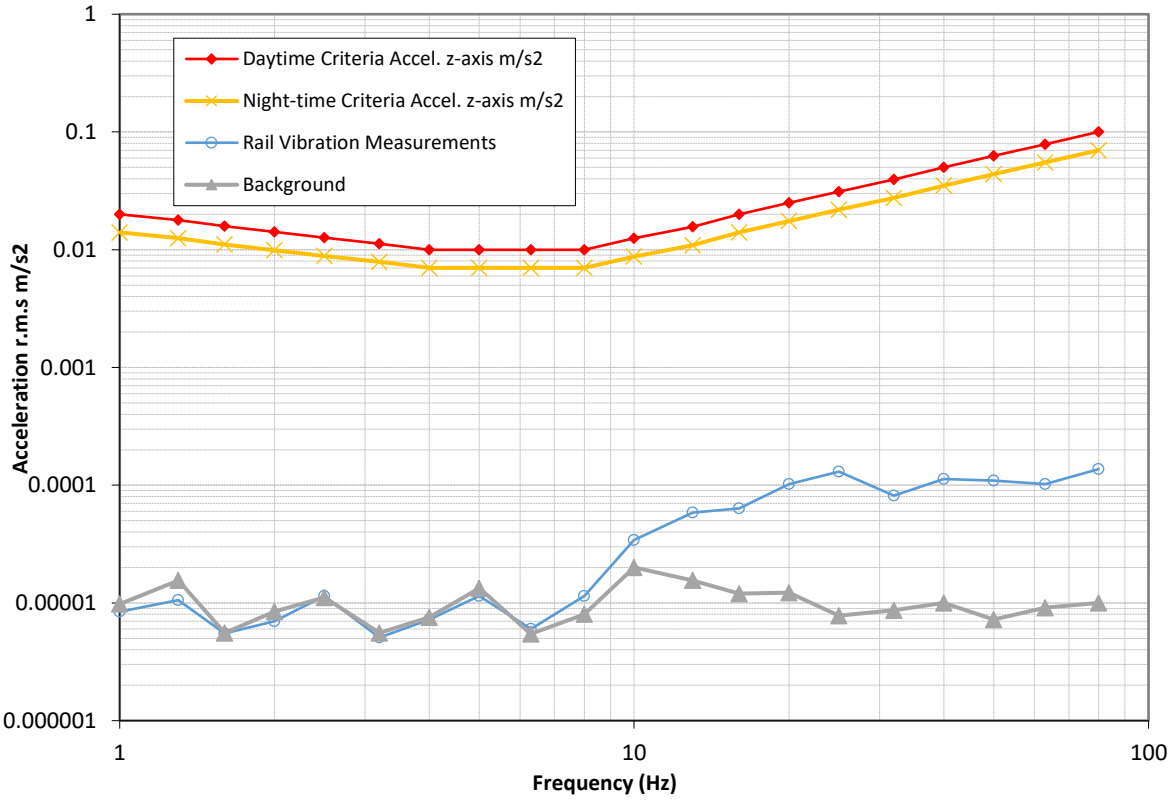


Figure 2 –Railway Train Vibration RMS Acceleration (Daytime)

4 Conclusion

An acoustic assessment of the proposed development has been carried out in accordance with the requirements of Cumberland Council DCP, NSW Department of Planning and Australian Standards.

An environmental noise survey of the site has been conducted and the noise limiting criteria for mechanical plant/equipment noise emission has been determined based on Council DCP and the EPA NPfI. The noise limits for the operation of mechanical equipment (such as fans, pumps, A/C condensers etc) associated with the development are presented in Table 7 and Table 8 . From our noise survey of the site, Table 5 summaries the traffic noise level and Table 6 the railway noise impacting the development site.

Construction for glazing, external walls and the roof/ceiling systems have been provided to achieve the internal noise criteria and are detailed in Section 3.1 and Section 3.2 based on the impact of road traffic and railway noise.

An assessment of railway vibration levels has been conducted accordance with the Department of Planning guidelines and EPA criteria. Section 3.5 details the assessment and results indicate there is a “low probability” of impact.

Providing the recommendations in this report are implemented, the noise from the proposed development is predicted to comply with acoustic requirements of the Cumberland Council DCP, NSW Department of Planning and relevant Australian Standards.

Appendix A – Acoustic Terminology

Decibel, dB: A dimensionless unit which denotes the ratio between two quantities that are proportional to power, energy or intensity. One of these quantities is a designated reference by which all other quantities of identical units are divided. The sound pressure level in decibels is equal to 10 times the logarithm (to the base 10) of the ratio between the pressure squared divided by the reference pressure squared. The reference pressure used in acoustics is 20 micro Pascals.

A-WEIGHTING: A measure of sound pressure level designed to reflect the response of the human ear, which does not respond equally to all frequencies. To describe sound in a manner representative of the human ear's response it is necessary to reduce the effects of the low and high frequencies with respect to medium frequencies. The resultant sound level is said to be A-weighted, and the units are in decibels (dBA). The A-weighted sound level is also called the noise level.

Sound Pressure Level, L p (dB), of a sound: 20 times the logarithm to the base 10 of the ratio of the r.m.s. sound pressure to the reference sound pressure of 20 micro Pascals. Sound pressure level is measured using a microphone and a sound level meter, and varies with distance from the source and the environment.

Ambient Noise/Sound: All noise level present in a given environment, usually being a composite of sounds from many sources far and near. Traffic, HVAC, masking sound or even low-level background music can contribute to ambient level of noise or sound.

Percentile Level - L 90 , L 10 , etc: A statistical measurement giving the sound pressure level which is exceeded for the given percentile of an observation period, e.g. L 90 is the level which is exceeded for 90% of a measurement period. L 90 is commonly referred to as the "background" sound level.

Background Noise (L 90): The sum total of all unwanted residual noise generated from all direct and reflected sound sources in a space that can represent an interface to, or interfere with good listening and speech intelligibility.

Rating Background Level – RBL: Method for determining the existing background noise level which involves calculating the tenth percentile from the L A90 measurements. This value gives the Assessment Background Noise Level (ABL). Rating Background Level is the median of the overall ABL.

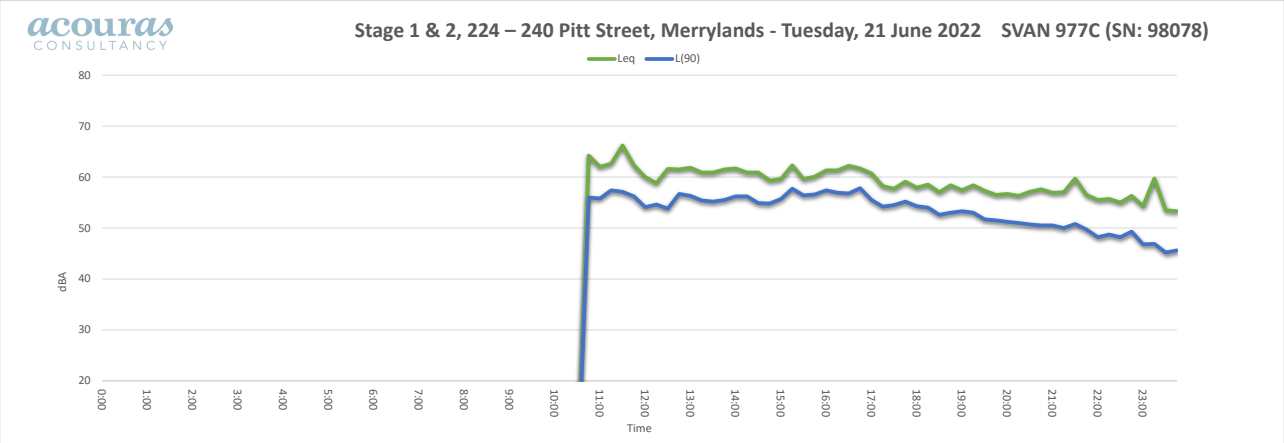
L AEQ,T : Equivalent continuous A-weighted sound pressure level. The value of the A-weighted sound pressure level of a continuous steady sound that, within a measurement time interval T, has the same A-weighted sound energy as the actual time-varying sound.

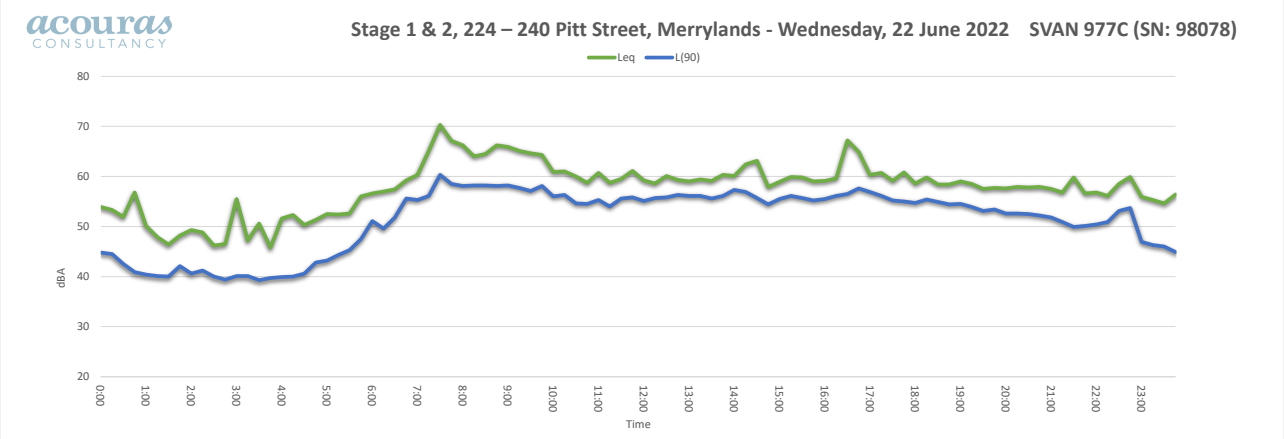
Appendix B – Architectural Drawings

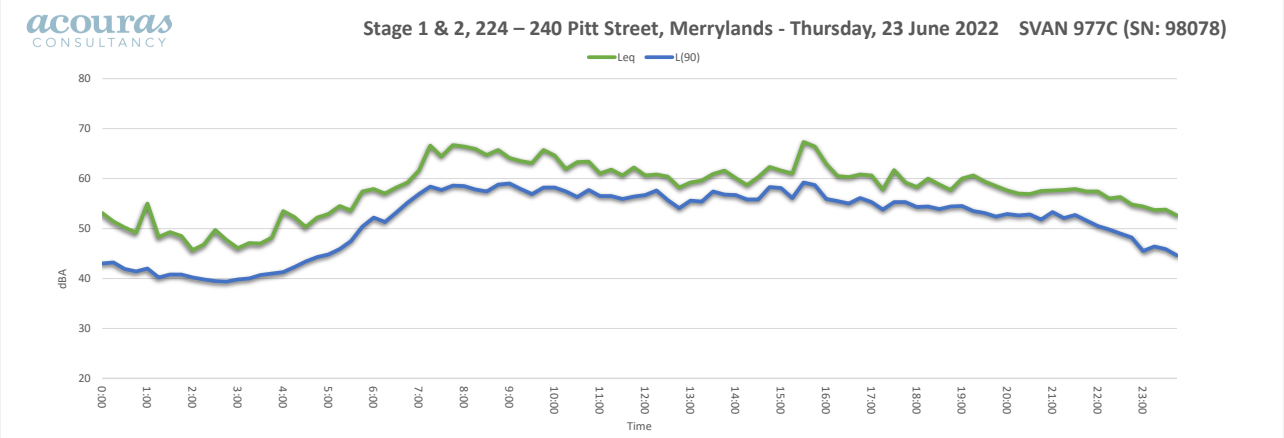
This assessment was based on the following architectural drawings provided by PTW.

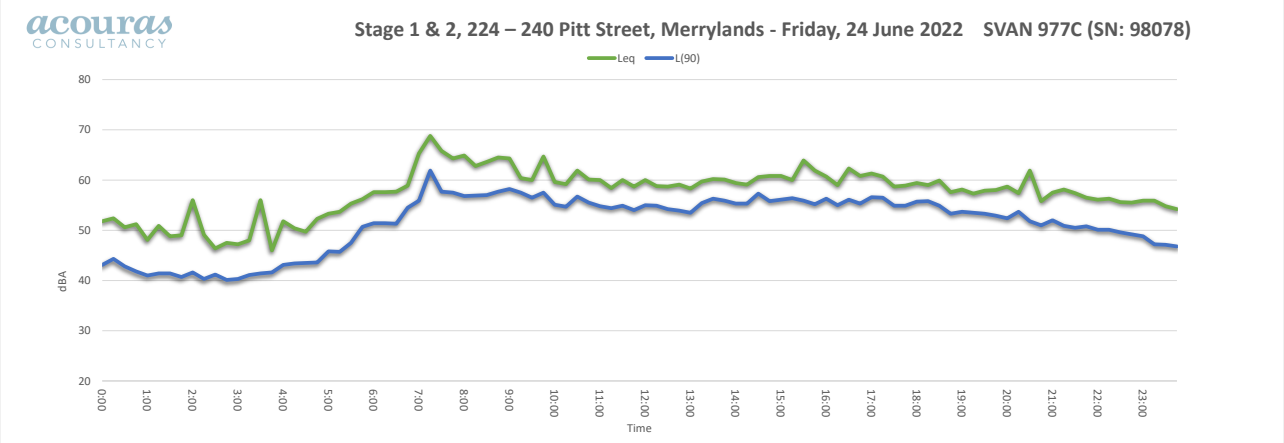
Drawing	Issue	Date	Description
DA-B-00-1002	A	09.12.2022	Site Plan
DA-B-01-0300	A	09.12.2022	Site Analysis Plan
DA-B-10-0070	A	09.12.2022	Basement 06 Plan
DA-B-10-0080	A	09.12.2022	Basement 02-05 Plan
DA-B-10-0090	A	09.12.2022	Basement 01 Plan
DA-B-10-1000	A	09.12.2022	Ground Floor Plan
DA-B-10-1100	A	09.12.2022	Level 01 Plan
DA-B-10-1200	A	09.12.2022	Level 02-03 Plan
DA-B-10-1300	A	09.12.2022	Level 04-07 Plan
DA-B-10-1400	A	09.12.2022	Level 08-10 Plan
DA-B-10-1500	A	09.12.2022	Level 11 Plan
DA-B-10-1600	A	09.12.2022	Level 12 Plan
DA-B-10-1700	A	09.12.2022	Level 13-15 Plan
DA-B-10-1800	A	09.12.2022	Level 16 Plan
DA-B-10-0901	A	09.12.2022	Roof Plan
DA-B-20-0100	A	09.12.2022	Building B- North-West & North-East
DA-B-20-0200	A	09.12.2022	Building B- South-East & South-West
DA-B-20-0300	A	09.12.2022	Building C- North-West & North-East
DA-B-20-0400	A	09.12.2022	Building C- South-East & South-West
DA-B-20-0500	A	09.12.2022	Building D- North-West
DA-B-20-0600	A	09.12.2022	Building D- North-East
DA-B-20-0700	A	09.12.2022	Building D- South-East
DA-B-20-0800	A	09.12.2022	Building D- South-West

Appendix C – Noise Logger Results





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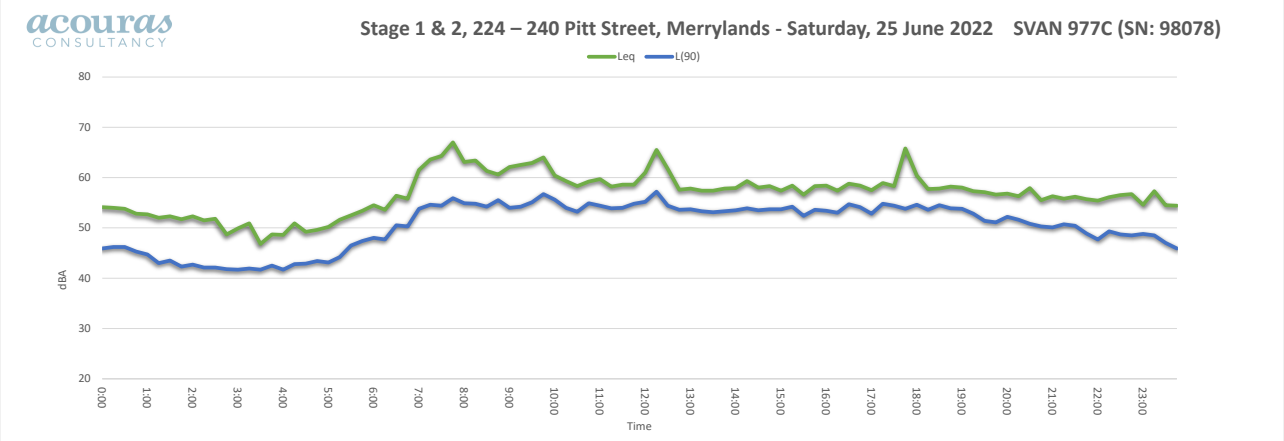
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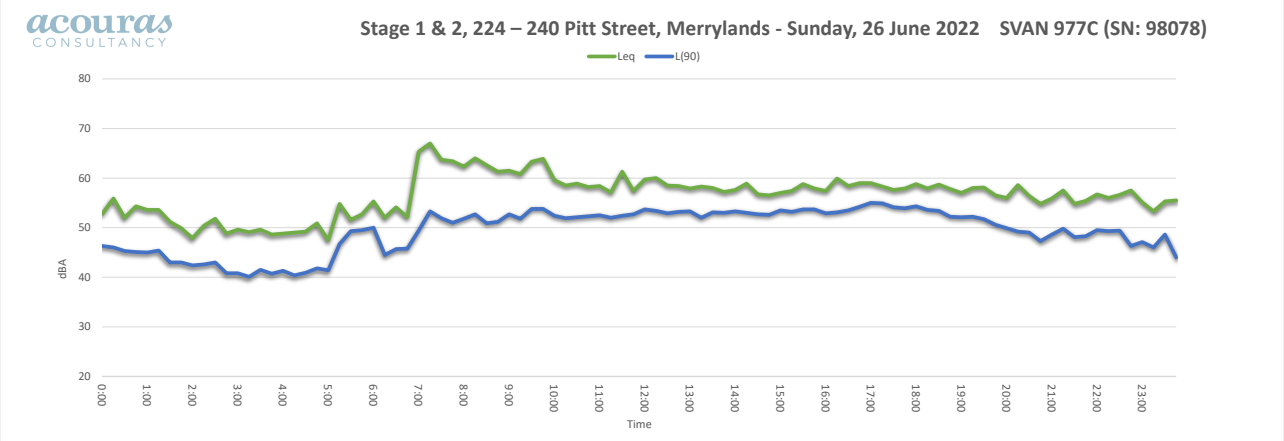
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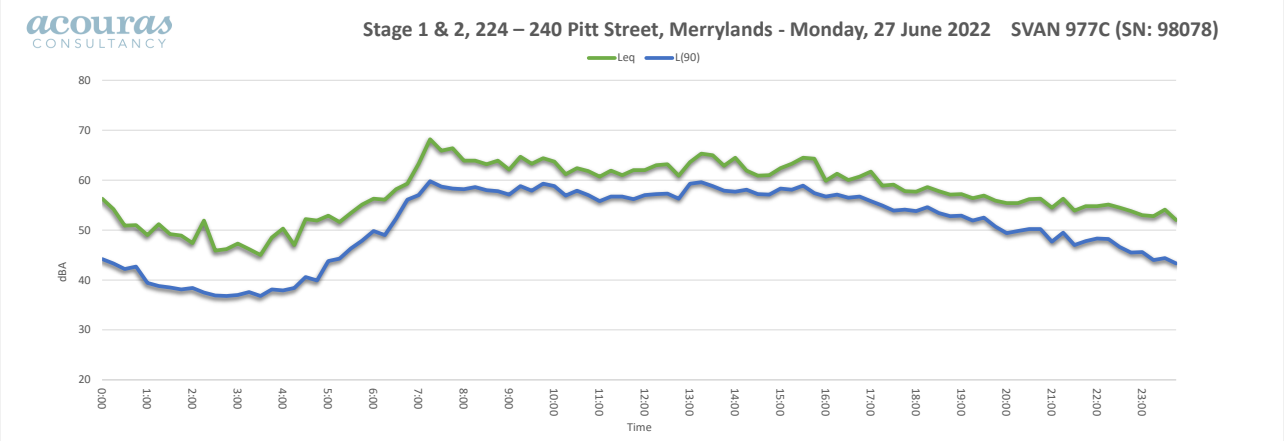
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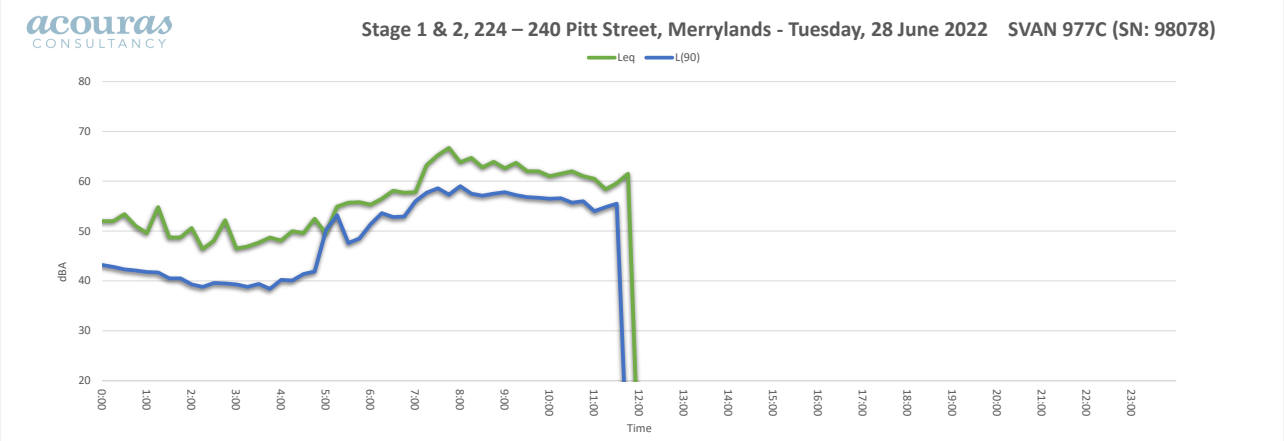
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