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ESQ Stage 4 & 5, Penrith

DA Acoustic Assessment

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TABLE OF CONTENTS

1 INTRODUCTION

Acoustic Logic have been engaged to conduct an acoustic assessment of potential noise impacts associated with the proposed mixed-use development to be constructed at Stages 4 & 5, Penrith.

This document addresses noise impacts associated with the following:

- Traffic noise impacts from Mulgoa Road;
- Traffic noise impacts from Ransley Street;
- Operational noise from the iFly downunder commercial development;
- Noise emissions from proposed retail and commercial tenancies;
- Noise emissions from the mechanical plant to service the base building;
- Noise and vibration generated by construction activities of project site;
- Noise emissions from the use of the rooftop communal outdoor spaces, gym and pool areas.

AL have utilised the following documents and regulations in the noise assessment of the development:

- Penrith Development Control Plan 2014;
- NSW Department of Planning and Environment's document – 'Developments near Rail Corridors or Busy Roads – Interim Guideline 2008';
- NSW Department of Planning and Environment's document – 'State Environmental Planning Policy (SEPP) (INFRASTRUCTURE) 2007";
- Australian and New Zealand AS/NZS 2107:2016 'Recommended design sound levels and reverberation times for building interiors';
- NSW Department of Environment and Heritage, Environmental Protection Authority document – 'Noise Policy for Industry (NPfI) 2017'; and
- NSW Interim Construction Noise Guideline.

This assessment has been conducted using the '*ESQ Stage 4_5*' preliminary architectural plans provided by Turner and dated 15/10/2021.

Table 1 – Architectural Drawing List

Architect	Drawing Number	Drawing Title	Date	Revision
Turner	DA-110-006	General Arrangement Plans Basement 02	15.10.2021	00
	DA-110-007	General Arrangement Plans Basement 01		
	DA-110-008	General Arrangement Plans Ground Level		
	DA-110-010	General Arrangement Plans Level 01		
	DA-110-020	General Arrangement Plans Level 02		
	DA-110-030	General Arrangement Plans Level 03		
	DA-110-040	General Arrangement Plans Level 04		
	DA-110-050	General Arrangement Plans Level 05		
	DA-110-060	General Arrangement Plans Level 06		
	DA-110-070	General Arrangement Plans Level 07		
	DA-110-080	General Arrangement Plans Level 08		
	DA-110-090	General Arrangement Plans Level 09		
	DA-110-100	General Arrangement Plans Level 10		
	DA-110-110	General Arrangement Plans Level 11		
	DA-110-120	General Arrangement Plans Level 12		
	DA-110-130	General Arrangement Plans Level 13		
	DA-110-140	General Arrangement Plans Roof Level		
	DA-111-008	Bldg H Ground Level		
	DA-111-010	Bldg H Level 01-03		
	DA-111-020	Bldg H Level 04-05		
	DA-112-008	Bldg K Ground Level		
	DA-112-010	Bldg K Level 01-03		
	DA-112-020	Bldg K Level 04-05		
	DA-113-010	Bldg J Level 01-03		
	DA-113-020	Bldg J Level 04-05		
	DA-113-030	Bldg J Level 06-08		
	DA-113-040	Bldg J Level 09-10		
	DA-114-010	Bldg L Level 01-02		
	DA-114-020	Bldg L Level 03-04		
	DA-114-030	Bldg L Level 05-06		
	DA-114-040	Bldg L Level 07-13		

Table 2 – Architectural Drawing List (Cont.)

Architect	Drawing Number	Drawing Title	Date	Revision
Turner	DA-114-050	Bldg L Level 141	15.10.2021	00
	DA-250-001	Building H Elevations		
	DA-250-005	Building J Elevations		
	DA-250-010	Building K Elevations		
	DA-250-015	Building L East/South Elevations		
	DA-250-016	Building West/North Elevations		
	DA-310-101	Section AA BB		
	DA-310-101	Section CC DD EE		
	DA-770-012	GFA Diagrams Ground Floor to Level 03		
	DA-770-013	GFA Diagrams Level 04 to Level 07		
	DA-770-014	GFA Diagrams Level 08 to Level 13		

2 SITE DESCRIPTION

The proposed mixed-use development is located at ESQ Stages 4 & 5, Penrith, to the north-west of Ransley Street and west of Retreat Drive. The development consists of the following.

Stage 4

- Building K (five storey tower).
- Building L (13-storey tower).
- Ground floor retail tenancies.

Stage 5

- Building H (five storey tower).
- Building J (10-storey tower).
- Ground floor retail tenancies.

Ground level parking consists of:

- Stage 4: 76 Retail parking bays (70 standard + 6 disabled).
- Stage 5: 88 Residential parking bays and 4 car wash bays including:
    - 34 standard and 2 disabled visitor parking spaces.
    - 47 standard residential parking spaces.

Two levels of basement parking are provided for Stage 4 and one level of basement parking is provided for stage 5 and is as follows below:

- Stage 4 & 5 Retail: consists of 116 standard parking and three (3) disabled parking spaces.
- Residential parking breakdown is shown in the table below.

Table 3 -Residential Parking Summary

Parking	Stage 4 Residential	Stage 5 Residential
Standard	200	204
Disabled	17	18
Bicycle	32	36
Visitor	30	34
Disabled Visitor	2	2
Visitor Bicycle	8	9
Motorbike	4	4
Carwash bays	4	4
EV Charing Bay	2	2

Acoustic investigation has been carried out by this office in regards to the developments surrounding the site, which have been detailed below:

- Peach Tree Creek to the north-west, further are residential dwellings;
- Mountain View Retreat Retirement Village to the East;
- Hardi Aged Care and Residential dwellings to the East; and
- Public carpark, iFLY downunder and Panthers Rugby Leagues Club to the South/South-East.

The nearest residential and commercial noise receivers around the project site include:

- **Receiver 1 -** Mount view Retreat Retirement Village located at 37 Mulgoa Road, Penrith to the east. Receivers are double storey.
- **Receiver 2 -** Hardi Aged Care located at 57 Retreat Drive, Penrith to the East. Receiver is single storey.
- **Receiver 3 -** Residential receiver located at 61 Retreat Drive, Penrith to the East. Residential receivers are double storey.
- **Receiver 4 -** Aspire, Stage 1 mixed-use development located at 1 Retreat Drive, Penrith to the south-east. Receiver is multi-storey.
- **Receiver 5 -** Commercial receiver located at 123 Mulgoa Road, Penrith to the South.
- **Receiver 6 –** Future mixed-use development with residential and retail receivers at Stage 2A, 2B & 3 as detailed in Figure 2 below.

A site map, measurement description and surrounding receivers are presented in Figure 1 below.

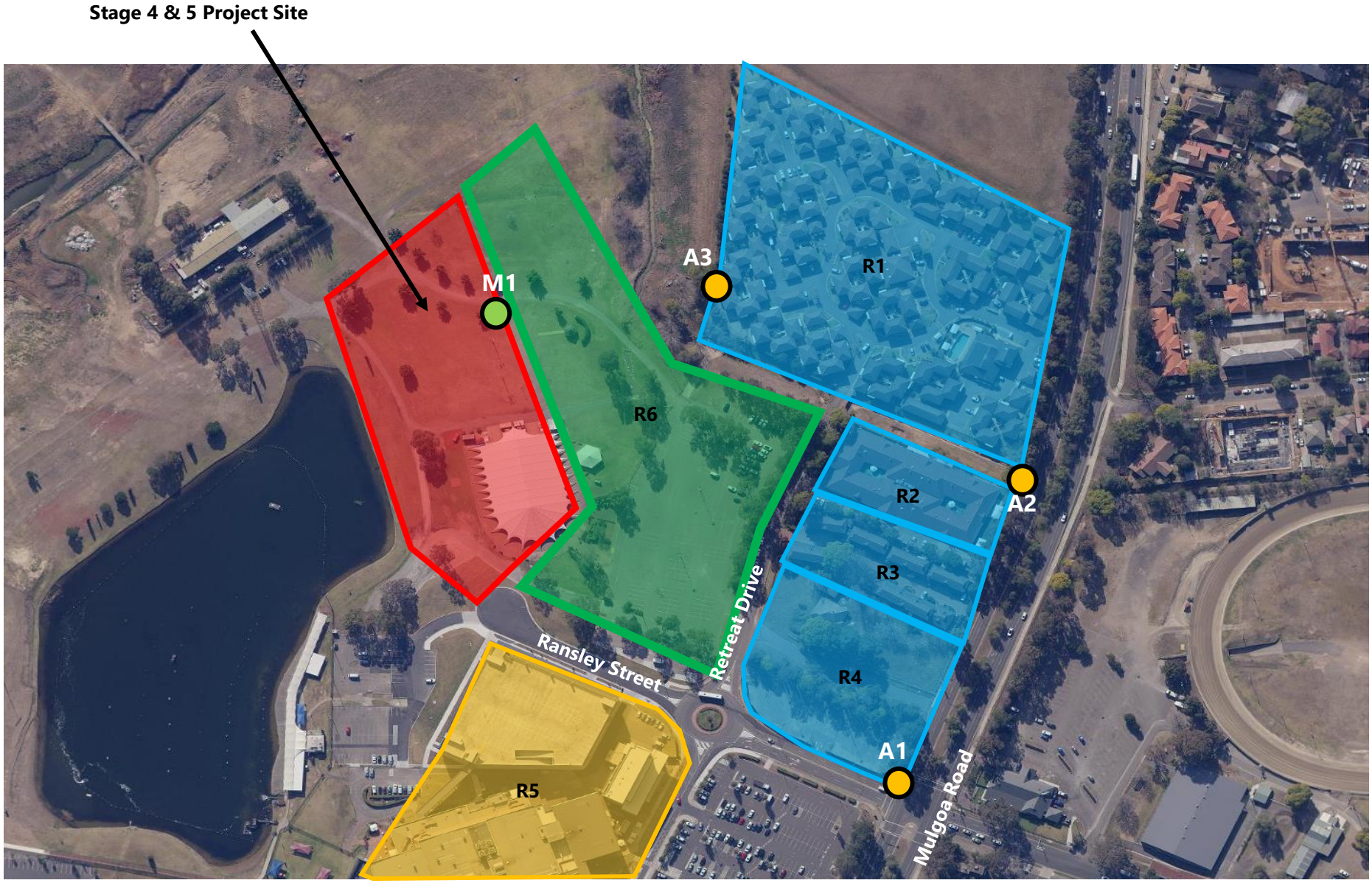

Figure 1: Site Survey and Monitoring Positions Sourced from Six Maps

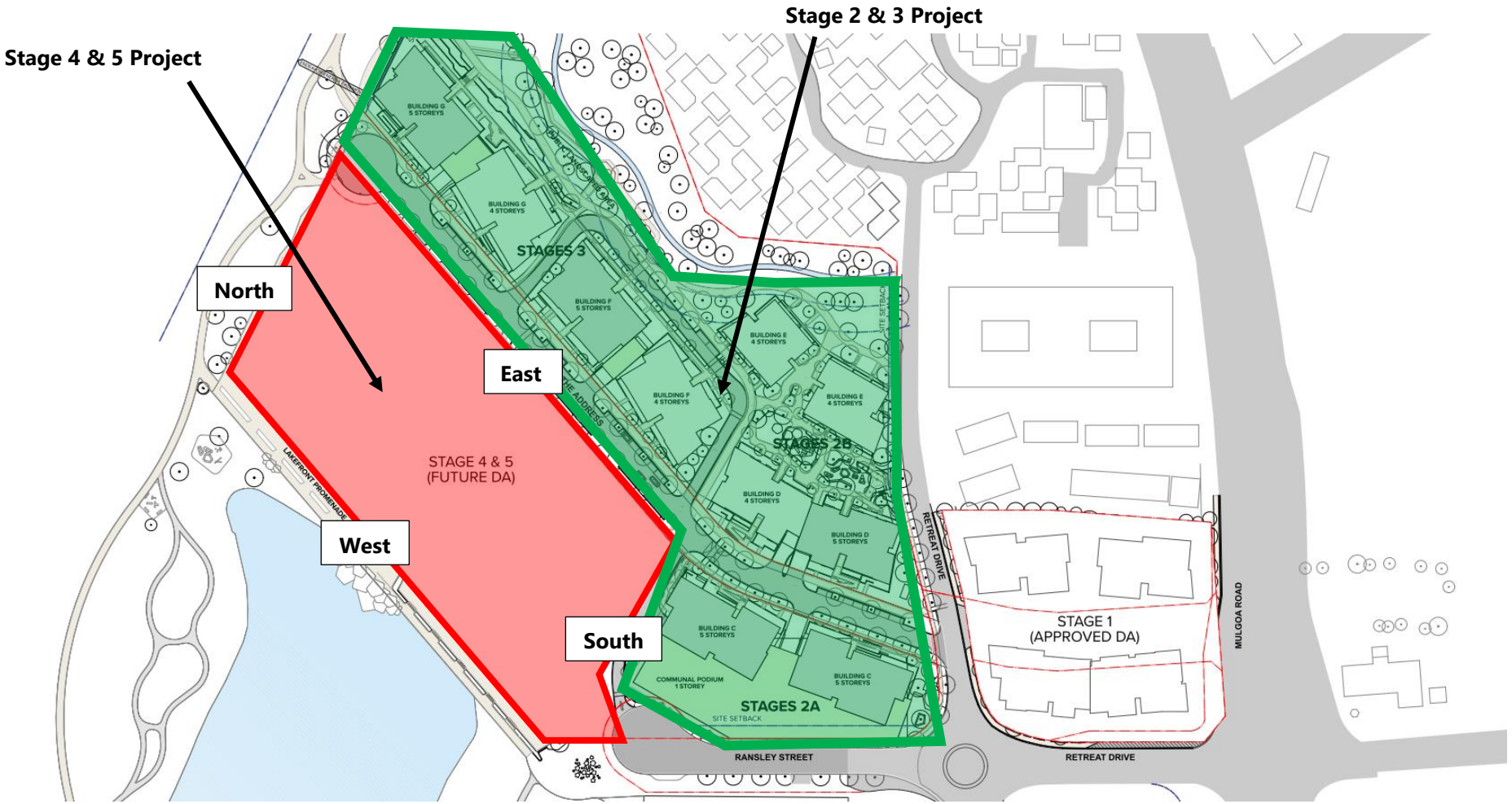

Figure 2: Site Staging Plan and Orientations

3 NOISE DESCRIPTORS

Environmental noise constantly varies in level from moment to moment, so it is not possible to accurately determine prevailing noise conditions by measuring a single, instantaneous noise level.

To quantify environmental noise, a 15-minute measurement interval is typically utilised. Noise levels are monitored continuously during this period, and then statistical and integrating techniques are used to characterise the noise being measured.

The principal measurement parameters obtained from the data are:

L_{eq} - represents the average noise energy during a measurement period. This parameter is derived by integrating the noise levels measured over the measurement period. L_{eq} is important in the assessment of noise impact as it closely corresponds with how humans perceive the loudness of time-varying noise sources (such as traffic noise).

L_{90} – This is commonly used as a measure of the background noise level as it represents the noise level heard in the typical, quiet periods during the measurement interval. The L_{90} parameter is used to set noise emission criteria for potentially intrusive noise sources since the disturbance caused by a noise source will depend on how audible it is above the pre-existing noise environment, particularly during quiet periods, as represented by the L_{90} level.

L_{10} is used in some guidelines to measure noise produced by an intrusive noise source since it represents the average of the loudest noise levels produced at the source. Typically, this is used to assess noise from licenced venues.

L_{max} is the highest noise level produced during a noise event, and is typically used to assess sleep arousal impacts from short term noise events during the night. It is also used to assess internal noise levels resulting from aircraft and railway ground vibration induced noise.

L_1 is sometimes used in place of L_{max} to represent a typical noise level from a number of high level, short term noise events.

4 EXISTING ACOUSTIC ENVIRONMENT

NSW EPA's Rating Background Noise Level (RBL) assessment procedure requires determination of background noise level for each day (the ABL), and the median of the individual days is the RBL for the entire monitoring period.

Appendix A in this report present results of unattended noise monitoring conducted at the project site. Weather affected data was excluded from the assessment. The processed RBL (lowest 10th percentile noise levels during operation time period) are presented in Table 4 below.

4.1 BACKGROUND NOISE LEVELS

Background noise levels which will be used as a basis for this assessment are detailed in the following sections.

4.1.1 Measurement Equipment

Equipment used consisted of a Rion NL-42 noise logger. The logger was set to A-weighted fast response and was programmed to store 15-minute statistical noise levels throughout the monitoring period. The monitor was calibrated at the start and end of the monitoring period using a Rion NC-73 calibrator. No significant drift was noted. Noise monitoring data is provided in Appendix A.

4.1.2 Measurement Location

An unattended noise monitor was installed on the northern boundary of the stage 4 & 5 project site, with the nearest residential receivers to the east (R1-R4). For a detailed location refer to Figure 1. See Figure 4 below for a photo of the installed unattended noise monitor.

4.1.3 Measurement Period

Noise monitoring was conducted between Thursday 21st to Thursday 28th October 2021. Supplementary attended noise measurements were undertaken between the hours of 12pm and 1pm on the 21st October 2021.

4.1.4 Summarised Rating Background Noise Levels

Summarised rating background noise levels for the project site and immediate surroundings are presented below.

Table 4 - Measured Rating Background Noise Levels

Location	Time of day	Rating Background Noise Level dB(A)$L_{90(period)}$
M1 Stage 4 & 5 Project Site	Day (7am-6pm)	39
	Evening (6pm-10pm)	38
	Night (10pm-7am)	33

5 EXTERNAL NOISE INTRUSION ASSESSMENT

Site investigation indicates that the major external noise sources around the project site include:

- Traffic noise impacts from Mulgoa Road;
- Traffic noise impacts from Ransley Street; and
- Operational noise from iFly Downunder.

5.1 NOISE INTRUSION CRITERIA

A noise intrusion assessment has been conducted based off the requirements of the following acoustic noise criteria/standards;

- Penrith Development Control Plan 2014;
- NSW Department of Planning and Environment's Document – 'Developments near Rail Corridors or Busy Roads – Interim Guideline';
- NSW Department of Planning and Environment's document – 'State Environmental Planning Policy (SEPP) (INFRASTRUCTURE) 2007"; and
- Australian and New Zealand AS/NZS 2107:2016 'Recommended design sound levels and reverberation times for building interiors'.

5.1.1 Penrith Development Control Plan 2014

12.1. Road Traffic Noise

C. Controls

1) Road traffic noise criteria including sensitive land uses

a) Council will not grant consent to development, particularly residential development, including subdivisions, unless the impact of traffic noise from freeway, arterial, designated or collector roads complies with the standards and guidelines for road traffic noise prepared by the relevant State Government authorities or agencies, as well as relevant Australian Standards.

b) Council will not grant consent to development for sensitive land uses unless it complies with the provisions and standards for road traffic noise prepared by the relevant State Government authorities or agencies, as well as relevant Australian Standards.

c) Sensitive land uses subject to road traffic noise criteria referred to in b) above include educational establishments (including schools), places of public worship, hospitals, and passive and active recreation areas.

Noise Impact Statements - Specific Requirements

a) Where a site is likely to be affected by unacceptable levels of road traffic noise, the applicant is required to provide a Noise Impact Statement prepared by a qualified acoustic consultant in accordance with the requirements set out in the DA Submission Requirements Appendix of this DCP.

b) The Noise Impact Statement should demonstrate acoustic protection measures necessary to achieve an indoor environment meeting residential standards, in accordance with EPA and Department of Planning Criteria, as well as relevant Australian Standards.

5.1.2 NSW Department of Planning and Environment's Document – *'Developments near Rail Corridors or Busy Roads – Interim Guideline'* (Traffic Noise Intrusion)

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

"The following provides an overall summary of the assessment procedure to meet the requirements of clauses 87 and 102 of the Infrastructure SEPP. The procedure covers noise at developments for both Road and Rail.

If the development is for the purpose of a building for residential use, the consent authority must be satisfied that appropriate measures will be taken to ensure that the following L_{Aeq} levels are not exceeded:

- *in any bedroom in the building: 35dB(A) at any time 10pm-7am*
- *anywhere else in the building (other than a garage, kitchen, bathroom or hallway): 40dB(A) at any time."*

5.1.3 NSW Department of Planning and Environment's document – *'State Environmental Planning Policy (SEPP) (INFRASTRUCTURE) 2007'* (Traffic Noise Intrusion)

RTA Map No. 9 of the traffic volume maps referenced by the SEPP (INFRASTRUCTURE) on the RTA website (see below), classifies the section of Mulgoa Road the development is located adjacent to as a road where a noise intrusion assessment is recommended under clause 102 of the SEPP Infrastructure 2007. See RTA average annual daily road traffic volume map number 9 and the approximate location of the site below.

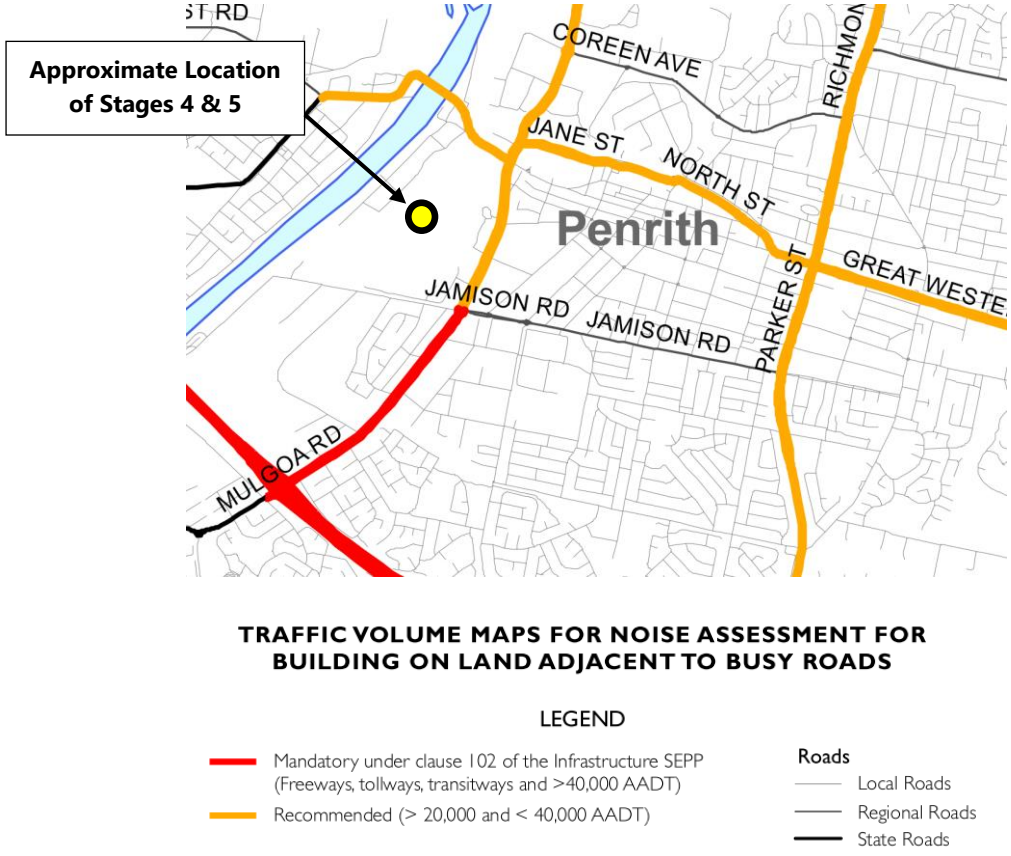

Figure 3 – RTA Map No. 9 and Approximate Location of Proposed Development

Clause 87 - Impact of rail noise or vibration on non-rail development

(1) This clause applies to development for any of the following purposes that is on land in or adjacent to a rail corridor and that the consent authority considers is likely to be adversely affected by rail noise or vibration:

(a) a building for residential use,

(b) a place of public worship,

(c) a hospital,

(d) an educational establishment or child care centre.

(3) If the development is for the purposes of a building for residential use, the consent authority must not grant consent to the development unless it is satisfied that appropriate measures will be taken to ensure that the following L_{Aeq} levels are not exceeded:

(a) in any bedroom in the building--35 dB(A) at any time between 10.00 pm and 7.00 am,

(b) anywhere else in the building (other than a garage, kitchen, bathroom or hallway) - 40 dB(A) at any time.

Clause 102

- *If the development is for the purpose of a building for residential use, the consent authority must be satisfied that appropriate measures will be taken to ensure that the following L_{Aeq} levels are not exceeded:*
  - *in any bedroom in the building: 35dB(A) at any time 10pm-7am*
  - *anywhere else in the building (other than a garage, kitchen, bathroom or hallway): 40dB(A) at any time."*

5.1.4 Australian and New Zealand AS/NZS 2107:2016 *'Recommended design sound levels and reverberation times for building interiors'* (Traffic Noise Intrusion)

Australian Standard AS 2107-2016: Recommended design sound levels and reverberation times for building interiors specifies allowable internal noise levels for internal spaces within residential and commercial buildings. Table 1, in Section 5 of AS 2107-2016, gives the following maximum internal noise levels for commercial buildings and residential buildings near major roads.

Table 5 – Recommended Design Sound Levels

Space /Activity Type	Recommended Maximum Design Sound Level dB(A) $L_{eq(Period)}$
Living Areas	40-45dB(A)$L_{eq(when\ in\ use)}$
Sleeping Areas	35-40dB(A)$L_{eq(10pm-7am)}$
Bathrooms, Ensuites, Laundry	45dB(A)$L_{eq(when\ in\ use)}$
Retail/Commercial	50dB(A)

5.1.5 Summary of Criteria

The governing project criteria is presented in the table below based on requirements above.

Table 6 – Summary of Internal Noise Level Criteria

Space/Activity Type	Internal Traffic Noise Criteria dB(A)$L_{eq(period)}$
Bedroom	35dB(A)$L_{eq(9hour)}$
Living Space	40dB(A)$L_{eq(15hour)}$
Bathrooms, Ensuites, Laundry	45dB(A)$L_{eq(When\ in\ use)}$
Retail	50dB(A)

5.2 EXTERNAL NOISE MEASUREMENTS

This section of the report details noise measurements conducted at the site to establish traffic noise levels impacting the development.

5.2.1 Noise Measurements

Short term attended and long term unattended noise measurements have been carried out by this office.

5.2.1.1 Measurement Equipment

- **Short term noise measurements:** Attended short term measurements of traffic noise were undertaken by this office, to supplement the unattended noise monitoring. Measurements were conducted using a Norsonic 140 Sound Analyser. The analyser was set to fast response and calibrated before and after the measurements using a Norsonic Sound Calibrator type 1251. No significant drift was noted.

- **Long term noise measurements:** Unattended noise monitoring was conducting using one Rion NL-42 noise logger. The logger was programmed to store 15-minute statistical noise levels throughout the monitoring period. The equipment was calibrated at the beginning and the end of each measurement using a Rion NC-73 calibrator; no significant drift was detected. All measurements were taken on A-weighted fast response mode.

5.2.1.2 Measurement Locations

Short Term Measurement Locations:

Attended Traffic Noise Measurements were conducted in two locations, see below for a detailed description:

- **A1:** Corner of Mulgoa Road and Ransley Street. Noise measurements had a 180° view of Mulgoa Road and were 3m from the kerb.
- **A2:** Mulgoa Street, noise measurements had a 180° view of Mulgoa Street and were 4m from the kerb.

Long Term Measurement Location:

An unattended noise monitor was installed relative to the northern boundary of the Stage 4 & 5 project site to capture the ambient noise levels. For a detailed location refer to Figure 1. This monitor is representative of background noise levels experienced by residences surrounding the site, namely R1-R4 & R6.

Figure 4: Unattended Noise Monitor Installed on The Stage 4 & 5 Project Site

5.2.1.3 Measurement Period

Unattended noise monitoring was conducted from Thursday, 21st October to Thursday, 28th October 2021.

Attended noise measurements were undertaken between the hours of 12:00pm and 1:00pm on Thursday, 21st October 2021.

5.2.1.4 Measured Traffic Noise Levels

Attended and Unattended noise measurements have been summarised below for each location.

5.2.1.5 Unattended Traffic Noise Monitoring

The following table presents the results of the unattended traffic noise monitoring.

Table 7 – Summarised Unattended Traffic Noise Monitoring Data

Location	Measured Traffic Noise Level dB(A)L_{eq}	
	Day (7am-10pm)	**Night (10pm-7am)**
M1 ESQ Stage 4 & 5, Penrith	51	47

5.2.1.6 Attended Traffic Noise Measurements

Attended traffic noise measurements are detailed below.

Table 8 – Attended Traffic Noise Measurements

Location	Time of Measurement	Measured Noise Level dB(A)L_{eq}
A1 (See Figure 1) 3m from kerb 180° view of the road	12:00pm – 1:00pm Thursday, 21st October 2021	75
A2 (See Figure 1) 4m from kerb 180° view of the road		76

5.2.1.7 Summarised External Noise Levels

The existing traffic noise levels listed in the tables below were determined based on the unattended noise monitoring and attended noise measurement data.

Table 9 – Predicted Traffic Noise Levels

Location	Summary of Measured Existing Traffic Noise Levels	
	Daytime (7am-10pm) dB(A)$L_{eq(15hour)}$	**Night time (10pm-7am) dB(A)$L_{eq(9hour)}$**
A1 (See Figure 1) 3m from kerb 180° view of the road	75dB(A)$L_{eq(15hour)}$	71dB(A)$L_{eq(9hour)}$*
A2 (See Figure 1) 4m from kerb 180° view of the road	76dB(A)$L_{eq(15hour)}$	72dB(A)$L_{eq(9hour)}$*

*Adjusted based off the unattended noise monitoring.

5.3 NOISE INTRUSION FROM IFLY DOWNUNDER COMMERCIAL DEVELOPMENT

The following operational information of *"iFly Downunder"* has been provided previously to this office:

- The facility will run 24 hours every day;
- 80% of the day time period (7am to 6pm) – Fan will be running at 45% to 55% capacity;
- 20% of the day time period (7am to 6pm) – Fan will be running at 85% to 90% capacity; and
- Fan will not run over 90% capacity any time.

For a detailed site map and noise measurement locations, refer to Figure 5 below:

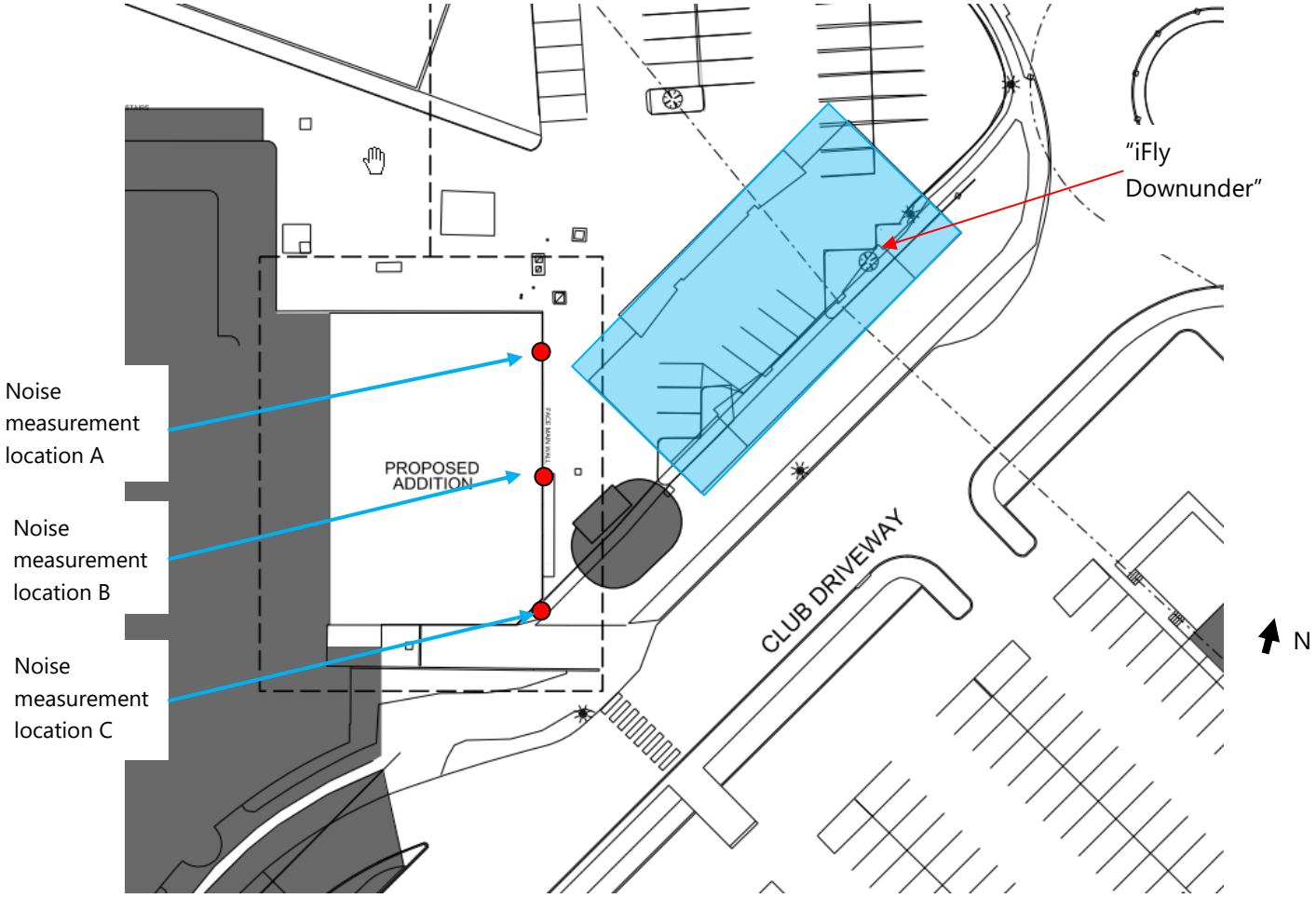

Figure 5: Site Map and Noise Measurement Locations

5.3.1 iFly Downunder Noise Measurements

Noise measurements for "iFly Downunder" activities were carried out on 2nd May 2014. Noise measurements were obtained using a Norsonic type SA140 Sound Analyser. The analyser was set to fast response and calibrated before and after the measurements using a Norsonics Sound Calibrator type 1251. No significant drift was noted.

Noise measurements were carried out on Level 1 along the eastern façade of administration building. Detailed measurement locations have been indicated in Figure 5 above.

Fan, chiller and other related mechanical equipment within "iFly Downunder' were running at 55%, 85% and 100% capacity during the test. Detailed measurement results for each location have been summarised below:

Operation 1-55% Capacity

Table 10 –Measured Noise Level of 55% Operation Capacity dB(A) L_{eq}

Location	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	A-Weight
A	60	61	59	56	54	50	43	30	59
B	63	62	58	54	52	48	42	30	57
C	61	61	60	58	56	51	45	34	60

Operation 2-85% Capacity

Table 11 –Measured Noise Level of 85% Operation Capacity dB(A) L_{eq}

Location	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	A-Weight
A	64	68	64	61	59	58	48	37	65
B	64	69	60	57	55	52	43	32	60
C	64	64	61	59	57	56	47	35	62

Operation 3-100% Capacity

Table 12 –Measured Noise Level of 100% Operation Capacity dB(A) L_{eq}

Location	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	A-Weight
A	65	70	70	65	61	62	50	43	68
B	66	65	64	60	56	55	45	36	62
C	66	64	64	62	59	59	48	38	65

5.4 NOISE INTRUSION ANALYSIS

External noise intrusion into the proposed stage 4 & 5 development was assessed using the measured and predicted noise levels above.

Calculations were undertaken, accounting for the orientation of windows, barrier effects *(where applicable)*, the total area of glazing, facade transmission loss and room sound absorption characteristics. In this way, the likely interior noise levels can be predicted.

5.5 RECOMMENDED CONSTRUCTIONS

5.5.1 Glazed Windows and Doors

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

Thicker glazing may be required for structural, safety or other purposes. Where it is required to use thicker glazing than scheduled, this will also be acoustically acceptable.

The recommended constructions are listed in the tables below. **Note that façade orientations are to be referenced as detailed in Figure 2 above.**

Table 13 - Minimum R_w of Glazing (with Acoustic Seals)

Location	Façade	Level	Space	Recommended Construction	Acoustic Seals
Stage 4 Building K	East	All	Living Room	10mm Float	Yes
			Bedroom		
	West (Ransley Street)		Living Room	6.38mm Laminated	
			Bedroom		
	South (Retreat Drive & Mulgoa Road)		Living Room	10mm Float	
			Bedroom		
	North		Living Room	6mm Float	
			Bedroom		
Stage 4 Building L	East	Ground-Level 5	Living Room	6mm Float	
			Bedroom		
		Level 6 – Level 13	Living Room	10.38mm Laminated	
			Bedroom		
	West (Ransley Street)	All	Living Room	10.38mm Laminated	
			Bedroom		
	South (Retreat Drive & Mulgoa Road)		Living Room	10.38mm Laminated	
			Bedroom		
	North		Living Room	6mm Float	
			Bedroom		
Stage 4 Building L & K	All	Ground	Retail	4mm Float	
		All	Study	6mm Float	

Note: All apartments with view of the basement and ground level carpark entry/exit ramps must be minimum 10mm Float (Minimum R_w 33 with acoustic seals). Refer to Figure 2 for façade orientation.

Table 14 - Minimum R_w of Glazing (with Acoustic Seals)

Building	Façade	Level	Space	Recommended Construction	Acoustic Seals
Stage 5 Building H	East	All	Living Room	10mm Float	Yes
			Bedroom		
	West (Ransley Street)		Living Room	6mm Float	
			Bedroom		
	South (Retreat Drive & Mulgoa Road)		Living Room		
			Bedroom		
	North		Living Room		
			Bedroom		
Stage 5 Building J	East	Ground - Level 5	Living Room	6mm Float	
			Bedroom		
		Level 6 – Level 10	Living Room	10mm Float	
			Bedroom		
	West (Ransley Street)	All	Living Room	10.38mm Laminated	
			Bedroom		
	South (Retreat Drive & Mulgoa Road)		Living Room	6.38mm Laminated	
			Bedroom		
	North		Living Room	6mm Float	
			Bedroom		
Stage 5 Building H & J	All	Ground	Retail	4mm Float	
		All	Study	6mm Float	

Note: All apartments with view of the basement carpark entry/exit ramps must be minimum 10mm Float (Minimum R_w 33 with acoustic seals). Refer to Figure 2 for façade orientation.

It is recommended that only window systems having test results indicating compliance with the required ratings obtained in a certified laboratory be used where windows with acoustic seals have been recommended.

In addition to complying with the minimum scheduled glazing thickness, the R_w rating of the glazing fitted into open-able frames and fixed into the building opening will require the use of acoustic seals around the full perimeter of open-able frames and the frame will need to be sealed into the building opening using a flexible sealant.

Table 15 - Minimum R_w of Glazing (with Acoustic Seals)

Glazing Assembly	Minimum R_w of Installed Window
4mm Float	27
6mm Float	29
6.38mm Laminated	31
10mm Float	33
10.38mm Laminated	35

5.5.2 External Wall Construction

External walls will be constructed from concrete or masonry elements, this proposed structure will not require any further acoustic upgrading.

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

5.5.3 External Roof & Ceiling Construction

External roof will be constructed from concrete or masonry elements, this proposed structure will not require any further acoustic upgrading.

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

5.5.4 Entry Doors

External opening entry doors shall have glazing thicknesses equal to those recommended in section 5.5.1 "*Recommended Glazing Construction*" and are to have Raven RP10 to the top and sides, and Raven RP38 to the underside of the door.

5.5.5 Mechanical Ventilation

With respect to natural ventilation of the dwelling, the NSW Department of Planning document "Development near Busy Roads and Rail Corridors - Interim Guideline" dictates that:

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

With windows open, the allowable internal noise goal is permitted to be 10dB(A) higher than when the windows are closed (i.e. – allowable level in bedrooms becomes 45dB(A), and 50dB(A) in living rooms).

For **Building H:**

- The northern, southern, and western façades will achieve compliance with the DNRCBR 'windows open' noise levels without supplementary ventilation.
- The eastern façade is predicted to be marginal with the 'windows open' noise level in bedrooms and comply in other habitable areas.

For **Building J:**

- The northern façade will achieve compliance with the DNRCBR 'windows open' noise levels without supplementary ventilation
- The eastern façade between ground floor and level 5 will achieve compliance with the DNRCBR 'windows open' noise levels without supplementary ventilation
- The southern façade is predicted to be marginal with the 'windows open' noise level in bedrooms and comply in other habitable areas.

For **Building K & L:**

- The northern façades are predicted to be marginal with the 'windows open' noise level in bedrooms and comply in other habitable areas.

For all remaining facades of Buildings J, K & L, the required internal noise level **cannot** be achieved with windows open. Therefore, supplementary fresh air (via ventilation systems or other) is required. These systems should be acoustically designed to ensure that the acoustic performance of the acoustic treatments outlined above are not reduced and does not excel Council criteria for noise emissions to nearby properties.

6 NOISE EMISSION ASSESSMENT

The noise emissions from the project site shall comply with the requirements of the following:

- Penrith Development Control Plan 2014; and
- NSW Department of Environment and Heritage, Environmental Protection Authority document – 'Noise Policy for Industry (NPfI) 2017'.

6.1 NOISE CRITERIA

6.1.1 Penrith Development Control Plan 2014

The Penrith Development Control Plan 2014 document does not contain any explicit noise criteria for noise emissions. Therefore; the NSW EPA Noise Policy for Industry criteria will be adopted.

6.1.2 NSW EPA document – *'Noise Policy for Industry (NPfI) 2017'*

The NSW EPA Noise Policy for Industry (NPfI) 2017, has two criteria which need to be satisfied; namely the Intrusiveness noise level criteria and the Project amenity noise level criteria. The project noise trigger level is then established based on the lower of the intrusiveness and project amenity levels.

Noise levels are to be assessed at the property boundary or nearby dwelling, or at the balcony or façade of an apartment.

6.1.2.1 Intrusiveness Noise Level Criteria

The guideline is intended to limit the audibility of noise emissions at residential receivers and requires that noise emissions measured using the L_{eq} descriptor do not exceed the background noise level by more than 5dB(A). Where applicable, the intrusive noise level should be penalised (increased) to account for any annoying characteristics such as tonality.

Background noise levels adopted are presented in Section 4.1.6. Noise emissions from the site should comply with the noise levels presented below when measured at nearby property boundary.

Table 16 – Intrusiveness Noise Level Criteria

Location	Period/Time	Background Noise Level dB(A) L_{90}	Intrusiveness Noise Emission Goal dB(A) $L_{eq(15min)}$ Background + 5dB
Nearby Residences	Day (7am-6pm)	39	44
	Evening (6pm-10pm)	38	43
	Night (10pm-7am)	33	38

6.1.2.2 Project Amenity Noise Level Criteria

The guideline is intended to limit the absolute noise level from all noise sources to a level that is consistent with the general environment.

The EPA's NPI sets out acceptable noise levels for various localities. The recommended noise amenity area is based upon the measured background noise levels at the sensitive receiver. Based on the measured background noise levels detailed in Section 4.1.4. the Noise Policy for Industry suggests the adoption of the 'suburban' categorisation.

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

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

The amenity levels appropriate for the receivers surrounding the project site are presented below.

Table 17 - Amenity Noise Emission Goals

Type of Receiver	Time of day	Recommended Noise Level dB(A)$L_{eq(period)}$	Project Amenity Noise Level dB(A)$L_{eq(15\ minute)}$
Residential – Suburban	Day	55	53
	Evening	45	43
	Night	40	38
Commercial	When in use	65	63

The NPfI 2017 defines:

- Day as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays;
- Evening as the period from 6pm to 10pm.
- Night as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sundays and Public Holidays.

6.1.3 Sleep Arousal Criteria

Potential sleep arousal impacts should be considered for noise generated before 7am or after 10pm.

Short duration, intermittent noise events (such as cars driving by) are typically assessed for potential sleep disturbance.

Potential impacts are assessed using the recommended procedure in the NSW EPA Noise Policy for Industry. As recommended in the policy, when assessing potential sleep arousal impacts, a two-stage test is carried out:

- Step 1 - An assessment should be conducted to determine if noise levels at a residential location during the night time period (10pm-7am) exceed:
  - $L_{Aeq,\ 15min}$ 40dB(A) or the prevailing RBL (rating background noise level) plus 5 dB, whichever is greater, and/or
  - L_{AFmax} 52 dB(A) or the prevailing RBL plus 15 dB, whichever is greater.

The policy does not explicitly state where noise impacts should be assessed within the residential location. For the purposes of this assessment, noise impacts will be assessed at the location immediately outside a resident's bedroom window. If the noise events are compliant with this criterion, then sleep arousal impacts are unlikely and no further analysis is needed. This is consistent with the Noise Guide for Local Government. The criteria is set out below.

Table 18 – Sleep Arousal Criteria

Receiver	Rating Background Noise Level (Night) dB(A)L_{90}	Emergence Level
R1 – R4 Night (10pm – 7am)	33 dB(A) L_{90}	40 dB(A)$L_{eq, 15min}$; 52 dB(A)L_{Fmax}

6.1.4 Summarised Noise Emission Criteria

The project noise trigger level (as outlined in section 2.1 of the policy) is the lower of the intrusiveness and project amenity noise levels. Applicable noise limits are bolded in the table below.

Table 19 – Noise Emission Criteria (Residents Surrounding Project Site)

Time Period	Assessment Background Noise Level dB(A)L_{90}	Project Amenity Criteria dB(A) L_{eq}	Intrusiveness Criteria $L_{eq(15min)}$	NPfI Criteria for Sleep Disturbance
Day	39	53	**44**	N/A
Evening	38	**43**	**43**	N/A
Night	33	**38**	**38**	40 dB(A)$L_{eq, 15min}$; **52 dB(A)L_{AFmax}**

6.2 MECHANICAL PLANT NOISE

Detailed plant selection has not been undertaken at this stage, as plant selections have not been determined. Detailed acoustic review should be undertaken at CC stage to determine acoustic treatments to control noise emissions to satisfactory levels. Satisfactory levels will be achievable through appropriate plant selection and location and, if necessary, standard acoustic treatments such as duct lining, acoustic silencers and enclosures.

Noise emissions from all mechanical services to the closest residential receivers should comply with the requirements of section 6.1.

6.3 GROUND CARPARKS AND LOADING ENTRANCES/EXITS

The traffic noise from the proposed car parks and loading entrances/exits has been predicted based on the assumptions listed below.

- A maximum of 25 vehicle movements within a 15-minute period.
- Vehicles drive in/out at 10km/hour speed with typical sound power level 84dB(A) measured by this office.

The predicted noise levels to the nearest apartments within project site facing the driveway are presented in the table below:

Table 20- Predicted Noise Levels from Ground Car Park Entry/Exit Ramps

Building	Receiver Location	Predicted External Noise Level $L_{eq,\ 15min}$ dB(A)	Predicted Internal Noise Level with windows closed dB(A)$L_{eq,\ 15\ min}$	Internal Noise Criteria dB(A)Leq	Comply?
H	H.G04 & H.G05 Bedroom	62	30*	35	Yes
	H.105 Bedroom	60	≤30*		Yes
K	K.G04 & K.G05 Bedroom	59	≤30*		Yes
	K.G08 Bedroom	52	<20*		Yes

*Internal noise levels have been predicted based on the glazed area being 10mm Float (Minimum R_w 33 with acoustic seals). Apartments can have their windows open, however; in order to achieve suitable internal noise levels; windows will need to be closed. Ventilation for habitable areas of the apartments shall be considered.

6.3.1 Basement Carpark Entry Door

Any automatic carpark doors shall be vibration isolated from the building structure to prevent door operation from being audible within occupied spaces. Doors shall be panel lift. Roller doors are not permitted.

In addition, as a minimum suitable rubber isolating element equal to Embelton NRD mounts shall be used where the motors are fixed to the structure and Teflon guides install in all rails. Ensure that door panels do not rattle, and the smooth operation of any door guides, rollers, etc is smooth. Door motors shall be fitted with a soft start/stop controller to minimise noise while the door shall be stopped approximately 5 mm from the slab/ground to ensure the base of the door does not contact the concrete surface.

6.4 CAFÉ/RETAIL TENANCIES

There is currently no operator or fit out plans available at this stage. A separate DA report is recommended once the detailed operation/floor plan layouts are ready. Notwithstanding; the noise emissions from the operation of Cafe/Retail tenancies shall satisfy the noise criteria listed in Section 6.1.4 above.

6.5 BUILDING STAGE 4 – LEVEL 13 GYMNASIUM

6.5.1 Gym Noise and Vibration

The proposed pavilion servicing a gym/massage/yoga area is to be located on level 13 of Building L along the north-western façade of the building.

As gym activities have the potential to generate noise and vibration throughout the building structure, appropriate acoustic treatments are required to be adopted and installed to mitigate any disturbance to occupants within surrounding apartments.

Typically, noise and vibration are generated from activities such as weights being dropped or high impact activities such as slam ball activities or pin loaded weight machines being used. To mitigate noise and vibration transfer through the building structure, the floor finish should be minimum Regupol FX75 and the gym is not to operate during night-time (10pm-7am). All pin loaded weight machines are to be vibration isolated by Embelton NXS-17 springs fitted between the weight machine structure and bottom of the weight plate stack.

As detailed gym equipment and activity selections are not available at this stage, detailed analysis should be undertaken at CC stage to determine acoustic treatments to specific gym equipment and activities.

6.6 STAGE 4 & 5 – POOLS AND SPAS

6.6.1 Pool and Spa Noise and Vibration

Two proposed pool areas are to be located on the podium level of Stage 4 & 5 along the western and south-eastern façades of the development. An additional pool and sauna area are located on the penthouse floor on level 13 of Building L along the south-western and eastern façades respectively.

SOU spa areas are located along the western and southern façades of Building L between levels 7 and 12 inclusive.

Pool and spa activities generate vibration in the building structure which, if left untreated, would cause annoyance to the occupants of apartments surrounding the pool and spa areas. To prevent this, a resilient isolation support system is required to isolate the pool and spa from the building structure.

As detailed design and information relating to the proposed construction methodology of the pools and spas are not available at this stage, it is recommended that detailed analysis of the vibration isolation system be reviewed at CC stage once the design and construction of the pool and spa systems are finalised.

6.7 ROOFTOP COMMUNAL OPEN SPACES

Noise generated by usage of the communal open spaces in buildings J and L on level 6 is assessed in this section.

The rooftop communal open space is located on Level 6 of Building J and L. It includes amenities, a kitchen and seating areas. See Figure 6 below for an aerial layout of the proposed open space.

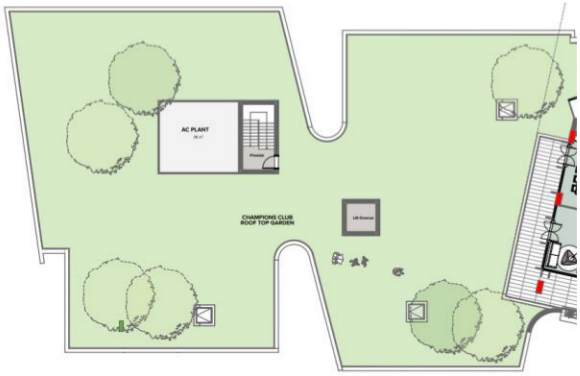

Figure 6 - Building J (top) and L (bottom) Level 6 Communal Open Spaces

6.7.1 Patron Noise

The main noise source from the use of the communal roof terrace would be patron speech, with a sound power level of 77 dB(A) L_{10} per patron based on AL measurements.

Noise from patrons utilising the communal roof terrace has been predicted to the nearest receivers. The noise level predicted at each receiver is based on a total of 25 patrons with up to 1 in 2 people talking at any one time.

Table 21 – L_{10} Sound Power Level Spectrum of Single Patron, dB

	Octave Band Centre Frequency (Hz)									
	31.5Hz	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**	**A-wt dB(A)L_{10}**
Patron Noise (dB(A))	62	62	70	70	76	73	68	59	47	**77**

6.7.2 Background Music Noise

The assessment has been based on noise levels that occur during the worst-case situation. This event would correspond to maximum use periods e.g. Friday, Saturday nights.

Table 22 – Maximum Background Music Noise Level, dB L_{10}

	Octave Band Centre Frequency (Hz)									
	31.5Hz	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1kHz**	**2kHz**	**4kHz**	**8kHz**	**A-wt**
Ambient Music	73	73	65	65	65	66	63	59	52	**70**

6.8 RECOMMENDATIONS

Noise emissions from operation of project site has been analysed and the following acoustic treatments are recommended to ensure that the external noise emissions comply with the criteria this report. Noise emission from plant servicing the project site shall be carried out at CC stage to ensure that the overall noise emission satisfy the requirements in Section 6.1.

Level 6 Communal Open Spaces

- Daytime and Evening Periods (7am-10pm):
  - Up to 25 patrons can use the rooftop communal open space at any one time.
- The rooftop communal open space shall not be used between the hours of 10pm and 7am.
- Management controls shall be implemented to minimise noise levels from usage of the outdoor open space.
- Background music can be played within the outdoor open space between 7am to 10pm to a maximum Sound Pressure Level of 70dB(A) and a sound limiter is to be installed.
- A solid acoustic barrier constructed from timber, fibre cement sheeting, glass or perspex with all gaps sealed should be constructed on the rooftop along the northern and eastern boundaries of Buildings J and L and be a total height between 1.5m - 2.4m. See Figure 7 below for a mark-up and extent of the acoustic barrier.
- It is recommended that any additional acoustic treatments to the outdoor communal spaces be reviewed at CC stage.

Figure 7 – Acoustic Barrier Mark-Up for Building J (top) and Building L (bottom)

7 CONSTRUCTION NOISE AND VIBRATION IMPACTS

7.1 SENSITIVE RECEIVERS

The nearest sensitive receivers in the vicinity of the project site are as follows below:

- **Receiver 1 -** Mount view Retreat Retirement Village located at 37 Mulgoa Road, Penrith to the east. Receivers are double storey.
- **Receiver 2 -** Hardi Aged Care located at 57 Retreat Drive, Penrith to the East. Receiver is single storey.
- **Receiver 3 -** Residential receiver located at 61 Retreat Drive, Penrith to the East. Residential receivers are double storey.
- **Receiver 4 -** Aspire, Stage 1 mixed-use development located at 1 Retreat Drive, Penrith to the south-east. Receiver is multi-storey.
- **Receiver 5 -** Commercial receiver located at 123 Mulgoa Road, Penrith to the South.
- **Receiver 6 –** Adjacent multi-storey residential and retail receivers at Stage 2A, 2B & 3 surrounding the northern and eastern boundaries of the site.

7.2 NOISE MANAGEMENT LEVEL

Establishment of criteria for construction noise requirements will be in accordance with the following documents.

- NSW Environmental Protection Authority 'Interim Construction Noise Guideline'; and
- Australian Standards AS2436:2010 Guide to Noise Control on Construction, Maintenance and Demolition Sites.

7.2.1 NSW EPA Interim Construction Noise Guideline

Given the scale of the proposed works, the "quantitative" assessment procedure, as outlined in the Interim Construction Noise Guideline (ICNG) will be used (as opposed to the simpler "qualitative" assessment method outlined in the guidelines). The quantitative assessment method requires:

- Determination of noise generation management levels (based on background noise levels on site).
- Prediction of operational noise levels at nearby development.
- If necessary, recommendation of noise controls strategies in the event that compliance with noise emission management levels is not possible.

7.2.1.1 At Residential Receivers

EPA guidelines adopt differing strategies for noise control depending on the predicted noise level at the nearest residences:

- *"Noise affected" level*. Where construction noise is predicted to exceed the "noise affected" level at a nearby residence, the proponent should take reasonable/feasible work practices to ensure compliance with the "noise affected level". For residential properties, the "noise affected" level occurs when construction noise exceeds ambient levels by more than 10dB(A)$L_{eq(15min)}$.

- "*Highly noise affected level*". Where noise emissions are such that nearby properties are "highly noise affected", noise controls such as respite periods should be considered. For residential properties, the "highly noise affected" level occurs when construction noise exceeds 75dB(A)$L_{eq(15min)}$ at nearby residences.

Table 23 – Construction Noise Management Levels to Residential Receivers

Location	"Noise Affected" Level - dB(A)$L_{eq(15min)}$	"Highly Noise Affected" Level - dB(A)$L_{eq(15min)}$
Residential Receivers (Day Time)	BG + 10dB(A) = 49	75

7.2.1.2 To Commercial Receivers

Section 4.1.3 *"Commercial and industrial premises"* of the ICGN outlines the following external management noise levels to the most-affected occupied point of the premises:

Table 24 – Noise Management Level for Commercial Premises (ICGN)

Space	Management Level dB(A)$L_{eq\ (15\ min)}$
Offices, Retail Outlets	70

7.2.2 Australian Standard AS2436:2010 "Guide to noise control on construction, maintenance and demolition sites

Australian Standard AS2436 provides guidance on noise and vibration control in respect to construction and demolition sites, and the preparation of noise and vibration management plans, work method statements and impact studies. The Standard states that:

- "Some construction and demolition activities are by their very nature noisy. The authorities responsible for setting noise level criteria for essential works will take note of the constraints imposed by such activities, especially when they are of short duration."
- Construction, demolition and maintenance works pose different problems of noise and vibration control when compared with most other types of industrial activity, since

  (a) they are mainly carried on in the open;

  (b) they are often temporary in nature although they may cause considerable disturbance whilst they last;

  (c) the noise and vibration arise from many different activities and kinds of plant, and their intensity and character may vary greatly during different phases of the work; and

  (d) the sites cannot be separated by planning control, from areas that are sensitive to noise and vibration.

The standard provides advice and guidelines for the prediction of impacts and the methods available to manage impacts. It guideline promulgates feasible and reasonable mitigation strategies and controls, and stakeholder liaison, in the effort to reach a realistic compromise between site activities and impacts on neighbouring properties.

Based on the above, the following procedure will be used to assess noise emissions:

- Predict noise levels produced by typical construction activities at the sensitive receivers.
- Develop a suitable noise criterion based on the NSW Environmental Protection Authority Interim Construction Noise Guideline.
- Adopt management conditions as per AS 2436 in the event of a non-compliance.

7.2.3 Summarised Noise Management Levels

The summarised noise management levels for proposed excavation/construction activities are presented in the table below.

Table 25 – Summarised Noise Management Levels

Location	Management Level dB(A)$L_{eq\ (15\ min)}$
Residential Receivers	"Noise Affected" Level - 49 "Highly Noise Affected" Level - 75
Commercial Receivers	70

7.3 CONSTRUCTION NOISE EMISSION ASSESSMENT

Detailed excavation and construction methodology are not available at this stage, acoustic analysis will be carried out at CC stage based on requirements above to work out noise mitigation solutions.

8 CONSTRUCTION VIBRATION CRITERIA

Vibration criteria for the nearest receivers will be based on the following documents:

- DIN 4150-3 (1999-02); and
- EPA "Assessing Vibration: A technical guideline".

8.1.1 DIN 4150

German Standard DIN 4150-3 (1999-02) provides vibration velocity guideline levels for use in evaluating the effects of vibration on structures. The criteria presented in DIN 4150-3 (1999-02) are presented in the table below.

It is noted that the peak velocity is the absolute value of the maximum of any of the three orthogonal component particle velocities as measured at the foundation, and the maximum levels measured in the x- and y-horizontal directions in the plane of the floor of the uppermost storey.

Table 26 – DIN 4150-3 (1999-02) Safe Limits for Building Vibration

TYPE OF STRUCTURE		PEAK PARTICLE VELOCITY (mms^{-1})			
		At Foundation at a Frequency of			Plane of Floor of Uppermost Storey
		< 10Hz	10Hz to 50Hz	50Hz to 100Hz	All Frequencies
1	Buildings used in commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Lines 1 or 2 and have intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8

8.1.2 Assessing Amenity

Table 2.2 of EPA "Assessing Vibration: A technical guideline" specified the following vibration goal for human comfort:

Table 27 – Preferred and Maximum Weighted RMS Values for Vibration Acceleration (m/s^2) 1-80 Hz

Location	Assessment Period	Preferred Values Z-axis	Preferred Values X & Y-axis	Maximum Values Z-axis	Maximum Values X & Y-axis
Continuous Vibration					
Critical Areas	Day time	0.005	0.0036	0.010	0.0072
Residences	Day time	0.010	0.0071	0.020	0.014
Office	Day time	0.020	0.014	0.040	0.028
Impulsive Vibration					
Critical Areas	Day time	0.005	0.0036	0.010	0.0072
Residence	Day time	0.3	0.21	0.6	0.42
Office	Day time	0.64	0.46	1.28	0.92

Acceptable values for intermittent vibration shall comply with the requirements in Table 2.4 of EPA "Assessing Vibration: A technical guideline" detailed as below.

Table 28 - Acceptable Vibration Dose Values for Intermittent Vibration ($m/s^{1.75}$)

Location	Day time preferred value	Day time maximum value
Critical Areas	0.10	0.20
Residences	0.20	0.40
Office	0.40	0.80

8.1.3 Summarised Recommended Vibration Limits

The summarised vibration criteria are presented in the table below.

Table 29 – Recommended Vibration Limit

Vibration Receiver	Recommended Vibration Limits PPV (mm/s)
Residential Receiver	5
Commercial Receiver	20

9 CONCLUSION

This report presents an acoustic assessment of noise impacts associated with the proposed mixed-use development to be located at ESQ Stage 4 & 5, Penrith.

Provided that the treatments set out in this report are employed, internal noise levels shall comply with the requirements below:

- Penrith Development Control Plan 2014;
- NSW Department of Planning and Environment's document – 'Developments near Rail Corridors or Busy Roads – Interim Guideline 2008';
- NSW Department of Planning and Environment's document – 'State Environmental Planning Policy (SEPP) (INFRASTRUCTURE) 2007"; and
- Australian and New Zealand AS/NZS 2107:2016 'Recommended design sound levels and reverberation times for building interiors'.

External noise emissions criteria have been setup in this report to satisfy the requirements from the following documents;

- Penrith Development Control Plan 2014; and
- NSW Department of Environment and Heritage, Environmental Protection Authority document – 'Noise Policy for Industry (NPfI) 2017'.

Construction noise emission management levels have been setup based on requirements of the NSW Interim Construction Noise Guideline and AS2436:2010 and detailed noise controls are to be determined at CC stage.

Construction vibration limits has been setup in Section 8 based on requirements of DIN 4150, EPA document Assessing Vibration: A technical guideline. Detailed vibration safeguard system will be determined at CC stage.

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

Yours faithfully,

Acoustic Logic Pty Ltd
Hyde Deng

APPENDIX 1 – UNATTENDED NOISE MONITORING DATA