

Aspire, Stages 2 & 3, Penrith

Noise Impact Assessment - Stages 2 & 3

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1 INTRODUCTION

Acoustic Logic Consultancy (ALC) have been engaged to conduct an acoustic assessment of potential noise impacts associated with the proposed mixed-use development to be constructed at Aspire, Stages 2 & 3, 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 impacts from the use of the basement carpark entry/exit ramps and garbage collection;
- Noise emissions from the mechanical plant to service the base building; and
- Noise and vibration generated by construction activities of project site.

ALC 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 Turner architectural drawings, see details below.

Table 1 – Architectural Drawing List

Architect	Drawing Number	Drawing Title	Date	Revision
Turner	DA-110-010	General Arrangement Plans Basement 01	08.03.19	P8
	DA-110-020	General Arrangement Plans Ground Level		P15
	DA-110-030	General Arrangement Plans Level 01		P11
	DA-110-040	General Arrangement Plans Level 02		P6
	DA-110-050	General Arrangement Plans Level 03		P6
	DA-110-060	General Arrangement Plans Level 04		P6
	DA-110-070	General Arrangement Plans Roof		P7
	DA-112-010	Building C Basement Level		P5
	DA-112-020	Building C Ground Level		P12
	DA-112-030	Building C Level 1		P10
	DA-112-040	Building C Level 2		P7
	DA-112-050	Building C Level 3		P7
	DA-112-060	Building C Level 4		P7
	DA-112-070	Building C Roof		P1
	DA-112-110	Building D + E Basement Level		P6
	DA-112-120	Building D + E Ground Level		P12
	DA-112-130	Building D + E Typical Levels		P7
	DA-112-140	Building D + E Level 4		P8
	DA-112-210	Building F Basement Level		P5
	DA-112-220	Building F Ground Level		P8
	DA-112-230	Building F Levels 1&2		P8
	DA-112-240	Building F Level 3		P8
	DA-112-250	Building F Level 4		P7
	DA-112-260	Building F Roof Plan		P1
	DA-112-310	Building G Basement Level		P6
	DA-112-320	Building G Ground Level		P10
	DA-112-330	Building G Level 1		P8
	DA-112-340	Building G Level 2		P8
	DA-112-350	Building G Level 3		P8
	DA-112-360	Building G Level 4		P7
	DA-112-370	Building G Roof Plan		P1

Table 2 – Architectural Drawing List (Cont.)

Architect	Drawing Number	Drawing Title	Date	Revision
Turner	DA-250-010	Site Elevations	08.03.19	P5
	DA-250-020	Site Elevations		P5
	DA-251-010	Building C Elevations		P6
	DA-251-015	Building C Elevations		P6
	DA-251-020	Building D Elevations		P6
	DA-251-030	Building E Elevations		P6
	DA-251-040	Building F Elevations		P6
	DA-251-050	Building G Elevations		P6
	DA-350-010	Site Sections		P4
	DA-351-010	Façade Section 1		P3
	DA-351-020	Façade Section 2		P3
	DA-360-010	Ramp Sections		P3

2 SITE DESCRIPTION

The proposed mixed-use development is located at Aspire, Stages 2 & 3, Penrith on the corner of Ransley street and Retreat Drive. The development consists of the following;

Stage 2A

- Building C (Two five storey towers).

Stage 2B

- Building D (One four Storey and One five storey tower).
- Building E (Two four Storey towers).

Stage 3

- Building F (One four Storey and One five storey tower).
- Building G (One four Storey and One five storey tower).

One level of basement parking is provided for each stage and is as follows below:

- Stage 2A consists of seventy-six residential, sixteen visitor and sixteen disabled car parking spaces;
- Stages 2B consists of ninety-two residential, twenty visitor and twenty-seven disabled car parking spaces; and
- Stage 3 consists of one-hundred and forty-one residential, twenty-seven visitor and eighteen disabled car parking spaces.

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

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

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

- Receiver 1 - Aspire, Stage 1 mixed-use development located at 1 Retreat Drive, Penrith to the South East. Receiver is multi-storey.
- Receiver 2 - Residential receiver located at 61 Retreat Drive, Penrith to the East. Residential receivers are double storey.
- Receiver 3 - Hardi Aged Care located at 57 Retreat Drive, Penrith to the East. Receiver is single storey.
- Receiver 4 - Mount view Retreat Retirement Village located at 37 Mulgoa Road, Penrith to the North-East. Receivers are double storey.
- Receiver 5 - Commercial receiver located at 123 Mulgoa Road, Penrith to the South.

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

Stage 2 & 3 Project Site

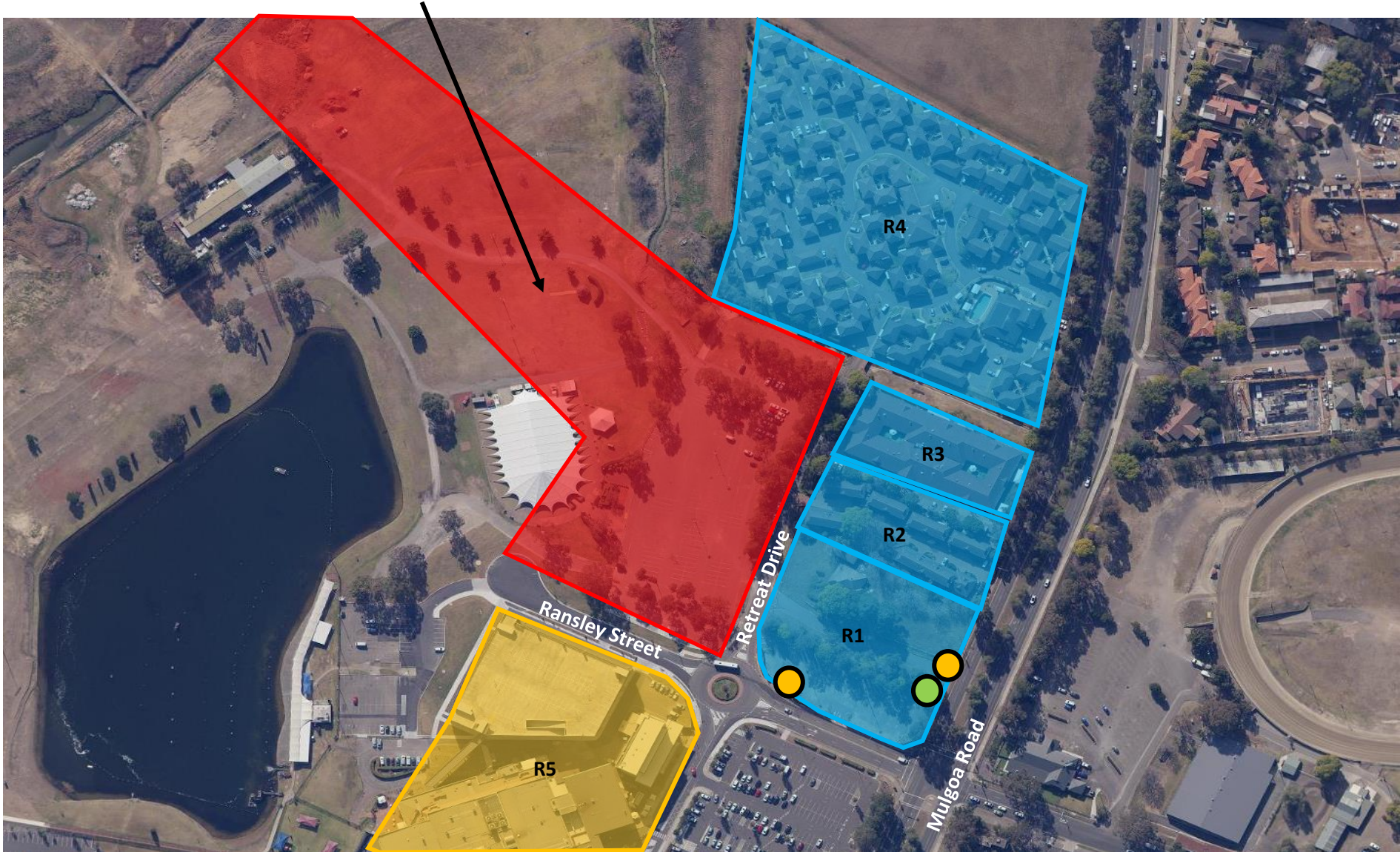


Figure 1: Site Survey and Monitoring Positions
Sourced from Six Maps

- Unattended Noise Monitor
- Attended Noise Measurement

- Residential Receiver
- Commercial Receiver

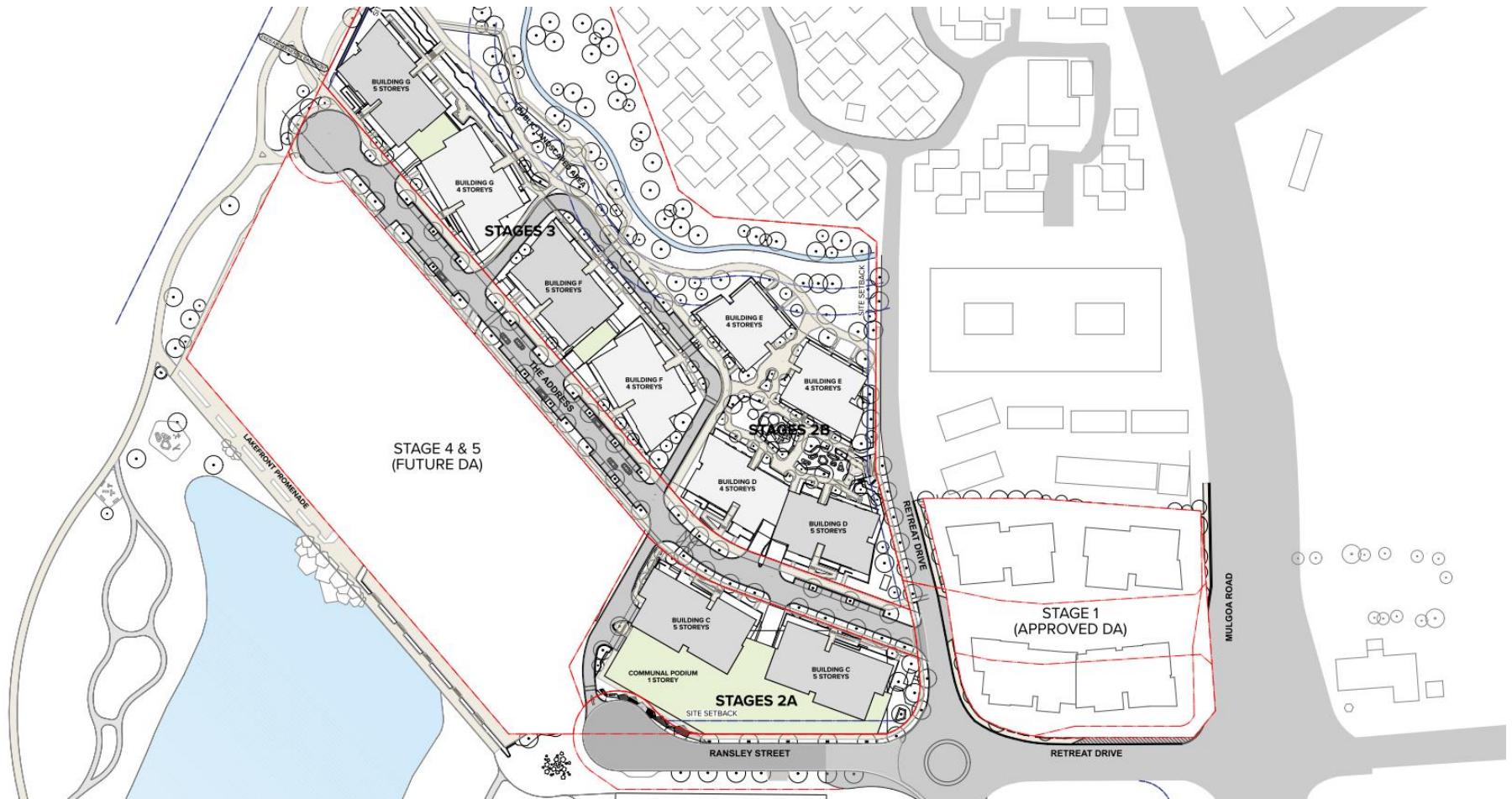


Figure 2: Site Staging Plan

3 ENVIRONMENTAL NOISE DESCRIPTORS

Environmental noise constantly varies. Accordingly, it is not possible to accurately determine prevailing environmental noise conditions by measuring a single, instantaneous noise level.

To accurately determine the environmental noise a 15-minute measurement interval is utilised. Over this period, noise levels are monitored on a continuous basis and statistical and integrating techniques are used to determine noise description parameters.

In analysing environmental noise, three-principle measurement parameters are used, namely L_{10} , L_{90} and L_{eq} .

The L_{10} and L_{90} measurement parameters are statistical levels that represent the average maximum and average minimum noise levels respectively, over the measurement intervals.

The L_{10} parameter is commonly used to measure noise produced by a particular intrusive noise source since it represents the average of the loudest noise levels produced by the source.

Conversely, the L_{90} level (which is commonly referred to as the background noise level) represents the noise level heard in the quieter periods during a measurement interval. The L_{90} parameter is used to set the allowable noise level for new, potentially intrusive noise sources since the disturbance caused by the new 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.

The L_{eq} parameter represents the average noise energy during a measurement period. This parameter is derived by integrating the noise levels measured over the 15-minute period. L_{eq} is important in the assessment of environmental noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of environmental noise.

4 EXISTING ACOUSTIC ENVIRONMENT

Acoustic monitoring was conducted at the site to establish the background noise levels which will be used as basis for this assessment.

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

Unattended noise monitoring was conducting using one Acoustic Research Laboratories Pty Ltd 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.

4.1.2 Measurement Location

An unattended noise monitor was installed on the eastern boundary of the stage 1 project site, nearest to Mulgoa Road. 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

Unattended noise monitoring was conducted from Tuesday, 20th November 2018 to Tuesday, 27th November 2018.

4.1.4 Measured Background Noise Levels

The background noise levels established from the unattended noise monitoring are detailed in the table below.

4.1.5 Unattended Noise Measurements

NSW EPA's RBL assessment procedure requires determination of background noise level for each day (the ABL) then the median of the individual days as set out for the entire monitoring period.

Appendix 1 provides the results of the unattended noise monitoring. Weather affected data was excluded from the assessment. The processed Rating Background Noise Levels (lowest 10th percentile noise levels during operation time period) are presented in the table below.

Table 3 – Unattended Noise Monitor – Rating Background Noise Level

Date	Measured Rating Background Noise Level dB(A)L ₉₀		
	Day (7am-6pm)	Evening (6pm-10pm)	Night (10pm-7am Next Day)
Tuesday, 20 th November 2018	-	46	-
Wednesday, 21 st November 2018	54	48	38
Thursday, 22 nd November 2018	58	52	39
Friday, 23 rd November 2018	56	51	44
Saturday, 24 th November 2018	51	50	37
Sunday, 25 th November 2018	48	48	40
Monday, 26 th November 2018	54	46	36
Tuesday, 27 th November 2018	-	-	35
Median	54	48	38

4.1.6 Summarised Rating Background Noise Levels

Summarised rating background noise levels are presented below.

Table 4 - Summarised Rating Background Noise Level

Location	Time of day	Rating Background Noise Level dB(A)L _{90(period)}
Stage 1 Project Site	Day (7am-6pm)	54
	Evening (6pm-10pm)	48
	Night (10pm-7am)	38

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:

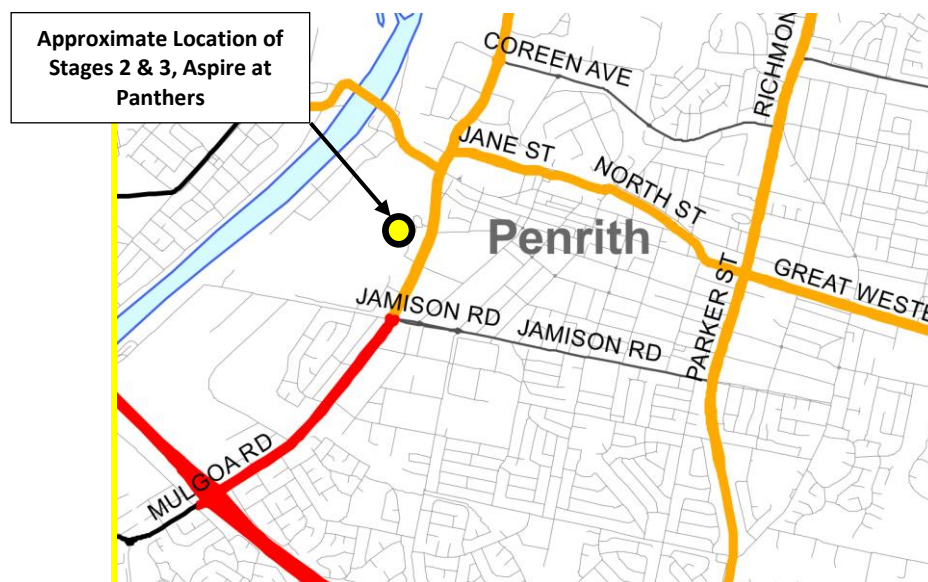
“The following provides an overall summary of the assessment procedure to meet the requirements of clauses 87 and 102 of the Infrastructure SEPP. The procedure covers noise at developments for both Road and Rail.

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.



TRAFFIC VOLUME MAPS FOR NOISE ASSESSMENT FOR BUILDING ON LAND ADJACENT TO BUSY ROADS

LEGEND	
—	Mandatory under clause 102 of the Infrastructure SEPP (Freeways, tollways, transitways and >40,000 AADT)
—	Recommended (> 20,000 and < 40,000 AADT)
—	Local Roads
—	Regional Roads
—	State Roads

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	50dB(A)

5.1.5 Summary of Criteria

The governing project criteria is presented in the Table 6 below based on requirements above.

Table 6 – Summary of Internal Noise Level Criteria

Space/Activity Type	Internal Traffic Noise Criteria dB(A) _{Leq(period)}
Bedroom	35dB(A) _{Leq(9hour)}
Living Space	40dB(A) _{Leq(15hour)}
Bathrooms, Ensuites, Laundry	45dB(A) _{Leq(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 and long term 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 conducted using one Acoustic Research Laboratories Pty Ltd 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:

- **Location 1:** Mulgoa Road, noise measurements had a 180° view of Mulgoa Road and were 3m from the kerb.
- **Location 2:** Ransley Street, noise measurements had a 180° view of Ransley Street and were 3m from the kerb.

Long Term Measurement Location:

Unattended Traffic Noise Measurements: An unattended noise monitor was installed on the Eastern Boundary of the stage 1 project site, approximately 9m from the Mulgoa Road kerb. For a detailed location refer to Figure 1. See Figure 4 below for a photo of the unattended noise monitor installed on the project site.



Figure 4: Unattended Noise Monitor Installed on the stage 1 project site

5.2.1.3 Measurement Period

Unattended noise monitoring was conducted from Tuesday, 20th November 2018 to Tuesday, 27th November 2018.

Attended noise measurements were undertaken between the hours of 3:30pm and 5:00pm on Tuesday, 20th November 2018.

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 – Unattended Noise Monitor - Traffic Noise Measurements

Date	Measured Traffic Noise Level dB(A) _{Leq}	
	Day (7am-10pm)	Night (10pm-7am)
Tuesday, 20 th November 2018	-	63
Wednesday, 21 st November 2018	67	64
Thursday, 22 nd November 2018	68	63
Friday, 23 rd November 2018	67	61
Saturday, 24 th November 2018	67	61
Sunday, 25 th November 2018	66	63
Monday, 26 th November 2018	68	63
Tuesday, 27 th November 2018	-	-
Logarithmic Average	67	62

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) _{Leq}
Mulgoa Road (See Figure 1) 3m from kerb 180° view of the road	3:30pm – 5:00pm Tuesday, 20 th November 2018	73dB(A)
Ransley Street (See Figure 1) 3m from kerb 180° view of the road		62dB(A)

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 – Measured Existing 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) $L_{eq}(9hour)$
Mulgoa Road (See Figure 1) 3m from kerb 180° view of the road	73dB(A) $L_{eq}(15hour)$	68dB(A) $L_{eq}(9hour)$ *
Ransley Street (See Figure 1) 3m from kerb 180° view of the road	62dB(A) $L_{eq}(15hour)$	57dB(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 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:

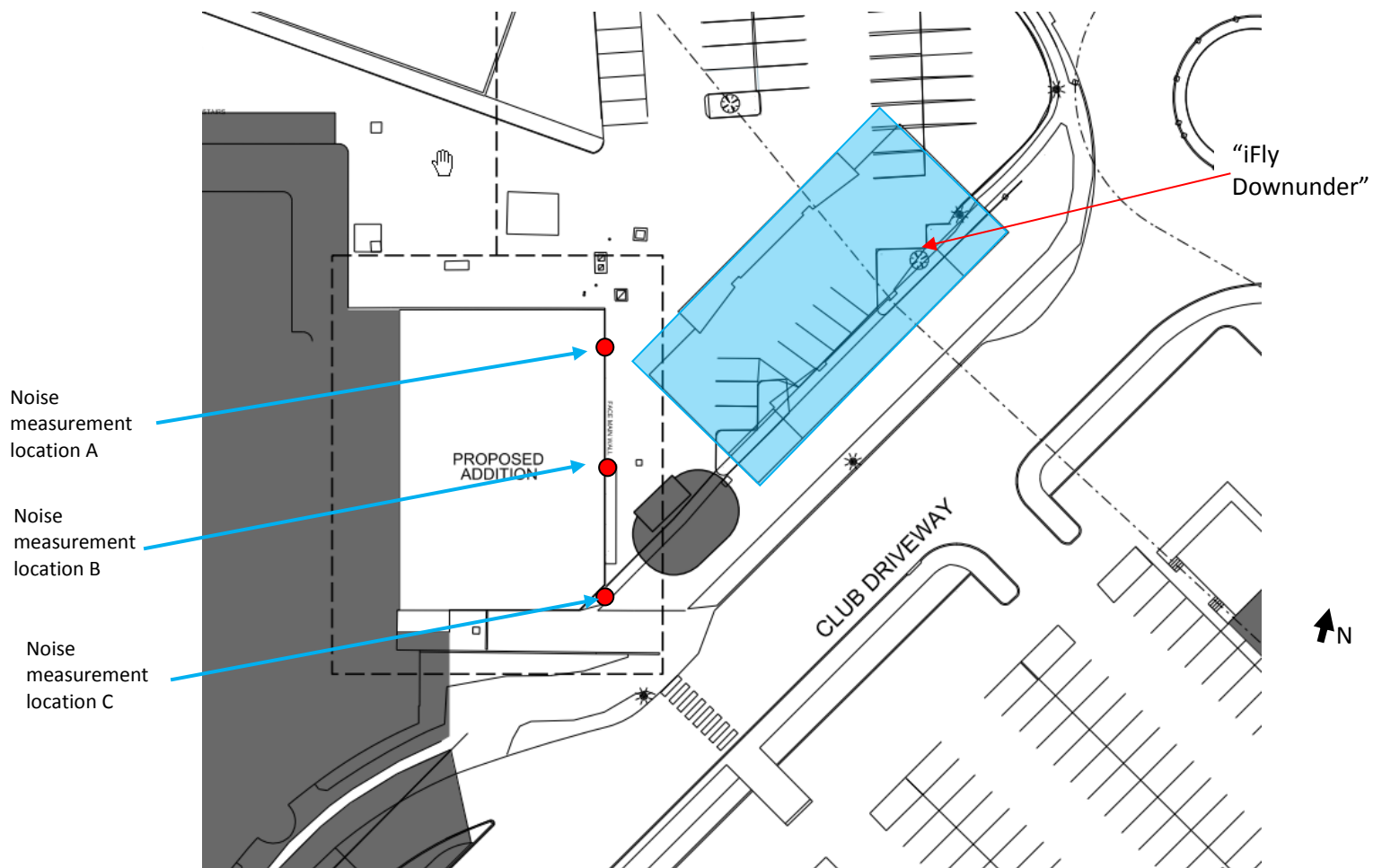


Figure 5: Site Map and Noise Measurement Locations

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 2 & 3 development was assessed using the measured and predicted noise levels above.

Calculations were undertaken taking into account 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-Ion 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.

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

Building	Façade	Level	Space	Recommended Construction	Acoustic Seals	
Stage 2A Building C	North (The Address)	All	Living Room	6.38mm Laminated	Yes	
			Bedroom	6.38mm Laminated		
	South (Ransley Street)		Living Room	6.38mm Laminated		
			Bedroom	10mm Float		
	East (Mulgoa Road)	Ground	Retail	6mm Float		
		All	Living Room	10mm Float		
			Bedroom	6.38mm Laminated		
	West	All	Living Room	6.38mm Laminated		
			Bedroom	6.38mm Laminated		
		Ground	Retail	6mm Float		
	Stage 2B Building D	North	All	Living Room		6.38mm Laminated
				Bedroom		6.38mm Laminated
South		Living Room		6.38mm Laminated		
		Bedroom		6.38mm Laminated		
East (Retreat Drive)		Living Room		6.38mm Laminated		
		Bedroom		6.38mm Laminated		
West		Living Room		6mm Float		
		Bedroom		6mm Float		
Stage 2B Building E	North	All	Living Room	6.38mm Laminated		
			Bedroom	6.38mm Laminated		
	South		Living Room	6.38mm Laminated		
			Bedroom	6.38mm Laminated		
	East (Retreat Drive)		Living Room	6.38mm Laminated		
			Bedroom	6.38mm Laminated		
	West		Living Room	6mm Float		
			Bedroom	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).

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

Building	Façade	Level	Space	Recommended Construction	Acoustic Seals
Stage 3 Building F	North	All	Living Room	6.38mm Laminated	Yes
			Bedroom	6.38mm Laminated	
	South (The Address)		Living Room	6.38mm Laminated	
			Bedroom	6.38mm Laminated	
	East		Living Room	6.38mm Laminated	
			Bedroom	6.38mm Laminated	
	West		Living Room	6mm Float	
			Bedroom	6mm Float	
Stage 3 Building G	North	All	Living Room	6.38mm Laminated	
			Bedroom	6.38mm Laminated	
	South (The Address)		Living Room	6.38mm Laminated	
			Bedroom	6.38mm Laminated	
	East		Living Room	6.38mm Laminated	
			Bedroom	6.38mm Laminated	
	West		Living Room	6mm Float	
			Bedroom	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).

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
6mm Float	29
6.38mm Laminated	31
10mm Float	33

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).

The eastern facade of Buildings C, D and E can have their windows open, however; in order to achieve suitable internal noise levels; windows located on this façade will need to be closed.

Although windows on the façades can be openable, the required internal noise level is only achieved when the windows are closed. Should any supplementary fresh air (ventilation system or other) be required, it should be acoustically designed to ensure that the acoustic performance of the acoustic treatments outlined above are not reduced and does not exceed 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	Intrusiveness Noise Level Criteria dB(A) $L_{eq}(15min)$
Nearby Residences	Day (7am-6pm)	59
	Evening (6pm-10pm)	53
	Night (10pm-7am)	43

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 NSW EPA noise policy for industry sets out acceptable noise levels for various localities. Table 2.2 on page 11 of the policy indicates 3 categories to distinguish different residential areas. They are rural, suburban, urban. This site is categorised by suburban receivers.

For the purposes of this condition:

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

The project amenity noise level is calculated by taking the recommended amenity noise level (as presented in table 2.2 on page 11 of the policy), subtracting 5dB(A) and then adding 3dB(A) to convert from $L_{Aeq, period}$ to a $L_{Aeq, 15\text{ minute}}$ descriptor. The project amenity noise level criteria are presented in the table below.

Table 17 – Project Amenity Noise Level Criteria

Location	Period/Time	Project Amenity Noise Level Criteria dB(A) $L_{eq(15min)}$
Nearby Residences – Suburban Receiver	Day (7am-6pm)	53
	Evening (6pm-10pm)	43
	Night (10pm-7am)	38
Commercial	When in use	63

6.1.2.3 Project Noise Trigger Level

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. The project noise trigger levels are presented in the table below.

Table 18 – Project Noise Trigger Level Criteria

Location	Period/Time	Project Noise Trigger Level Criteria dB(A) _{Leq(15min)}
Nearby Residences	Day (7am-6pm)	53
	Evening (6pm-10pm)	43
	Night (10pm-7am)	38
Commercial	When in use	63

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 19 – Sleep Arousal Criteria

Location	Background Noise Level (10pm-7am)	Sleep Arousal Criteria dB(A)
Nearby Residents	38dB(A) _{L90}	43dB(A) _{Leq(15min)} 53dB(A) _{LMaxF}

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 GARBAGE COLLECTION

6.3.1 Proposed turntable locations

There are three proposed garbage collection turntables within the development. One within the ground floor of Building C and one in each basement of Buildings D & E and Building G. See figures 6,7 & 8 below for the proposed layouts of the collection turntables.

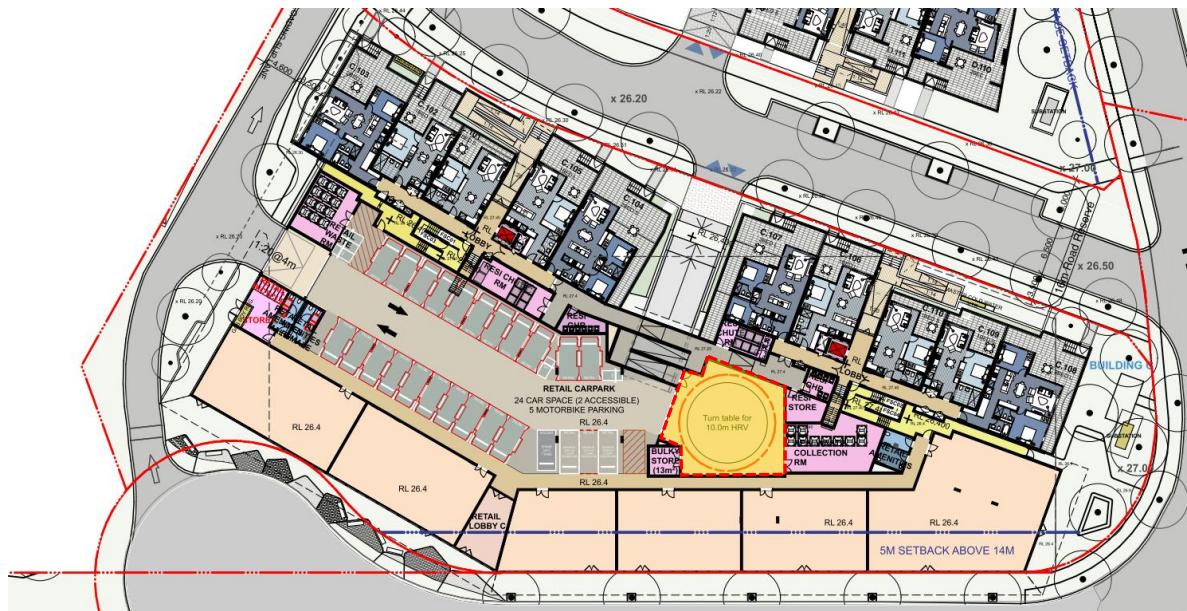


Figure 6: Stage 2A, Building C (Ground Floor Plan)


 = Proposed Location of Garbage Turntable



Figure 7: Stage 2B, Buildings D & E (Basement)

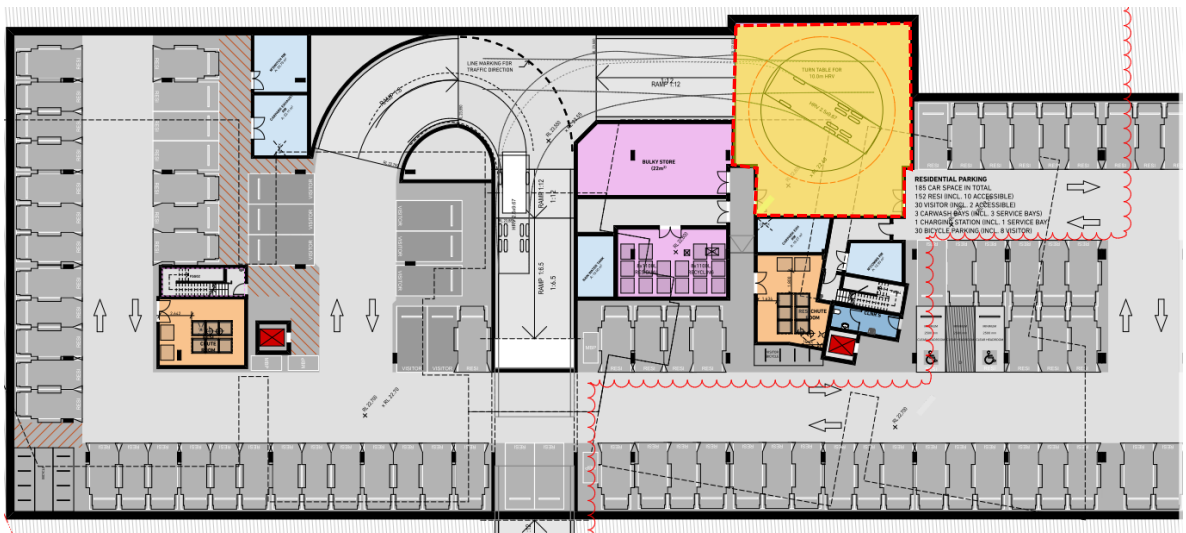



Figure 8: Stage 3, Building G (Basement)

 = Proposed Location of Garbage Turntable

6.3.2 Noise Sources

The potential noise sources associated with the garbage collection are listed in table below along with the noise emission levels. The emission levels have been obtained from noise monitoring carried out at similar facilities. Noise measurements were obtained using a Norsonics SA 110 with (serial number 24692) or CEL-593 Type 1 sound level analysers (serial number C1. T 116962), set to fast response. The sound level analysers were calibrated before and after the measurements using a Rion NC-73 calibrator. No significant drift was recorded.

Assessment has been based on rigid trucks up to 8.8m in length and operation during day time only.

Table 20 - Garbage Collection Noise Data

Noise Source	Sound Power Level dB(A)	Type of Noise Source
Truck Idle	99	Quasi-Steady
Trucks Manoeuvring	103	Intermittent

6.3.3 Predicted Noise Levels - Day Time Only

The noise levels to the nearest noise receivers were calculated based on the noise emission levels provided in table above. These levels were corrected for:

- Distance between the noise source and receiver, barrier or directivity effects (when present) and topography.

A worst case 15-minute noise level based on the following for the receivers near the garbage collection turntables/entry and exit ramps:

- One Long Rigid Truck arrives during a 15-minute period.
- Long Rigid Truck idling for 20 seconds upon arrival or departure.

The predicted noise to the nearest receiver is summarised below:

Table 21 - Predicted Noise Levels from Garbage Collection (dB(A)_{Leq, 15min})

Building	Receiver Location	Predicted External Noise Level $L_{eq, 15min}$ dB(A)	Predicted Internal Noise Level with windows closed $dB(A)_{Leq, 15 min}$	Internal Noise Criteria $dB(A)_{Leq}$	Comply?
C	C.103 Bedroom	53	≤30*	35	Yes
D	D.112 Bedroom	64	35*		Yes
G	G.1.07 Bedroom	67	35*		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.

6.4 BASEMENT CARPARK ENTRY/EXIT RAMPS

The traffic noise from the proposed car park entry/exit ramps 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 drive way are presented in the table below:

Table 22- Predicted Noise Levels from Basement Car Park Entry/Exit Ramps

Building	Receiver Location	Predicted External Noise Level $L_{eq, 15min}$ dB(A)	Predicted Internal Noise Level with windows closed $dB(A)_{Leq, 15 min}$	Internal Noise Criteria $dB(A)_{Leq}$	Comply?
C	C.107 Bedroom	60	30*	35	Yes
	C.104 Bedroom	61	≤30*		Yes
D	D.112 Bedroom	58	≤30*		Yes
G	G.1.07 Bedroom	62	31*		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.

6.4.1 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.

6.5 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 Table 17 above.

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 - Aspire, Stage 1 mixed-use development located at 1 Retreat Drive, Penrith to the South East. Receiver is multi-storey.
- Receiver 2 - Residential receiver located at 61 Retreat Drive, Penrith to the East. Residential receivers are double storey.
- Receiver 3 - Hardi Aged Care located at 57 Retreat Drive, Penrith to the East. Receiver is single storey.
- Receiver 4 - Mount view Retreat Retirement Village located at 37 Mulgoa Road, Penrith to the North-East. Receivers are double storey.
- Receiver 5 - Commercial receiver located at 123 Mulgoa Road, Penrith to the South.

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)_{Leq(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)_{Leq(15min)} at nearby residences.

Table 23 – Construction Noise Management Levels to Residential Receivers

Location	“Noise Affected” Level - dB(A) _{Leq(15min)}	“Highly Noise Affected” Level - dB(A) _{Leq(15min)}
Residential Receivers (Day Time)	BG + 10dB(A) = 64	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) _{Leq (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 demolition/excavation/construction activities are presented in the table below.

Table 25 – Summarised Noise Management Levels

Location	Management Level dB(A)_{Leq} (15 min)
Residential Receivers	“Noise Affected” Level - 64 “Highly Noise Affected” Level - 75
Commercial Receivers	70

7.3 CONSTRUCTION NOISE EMISSION ASSESSMENT

Detailed demolition, 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/s²) 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 Aspire, Stages 2 & 3, 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.

Please contact us should you have any further queries.

Yours faithfully,

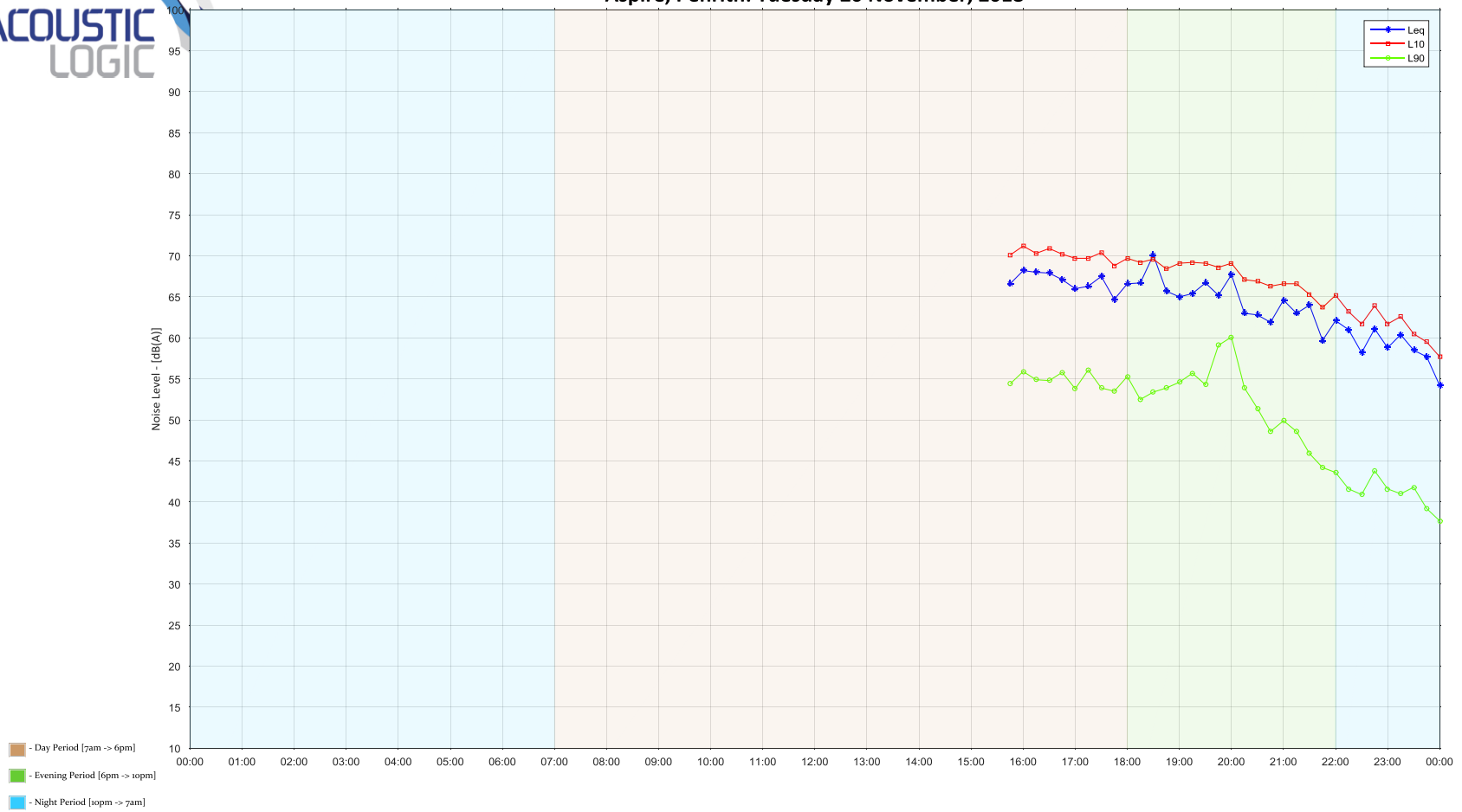


Acoustic Logic Consultancy Pty Ltd
Shane Nichols

APPENDIX 1 – UNATTENDED NOISE MONITORING DATA

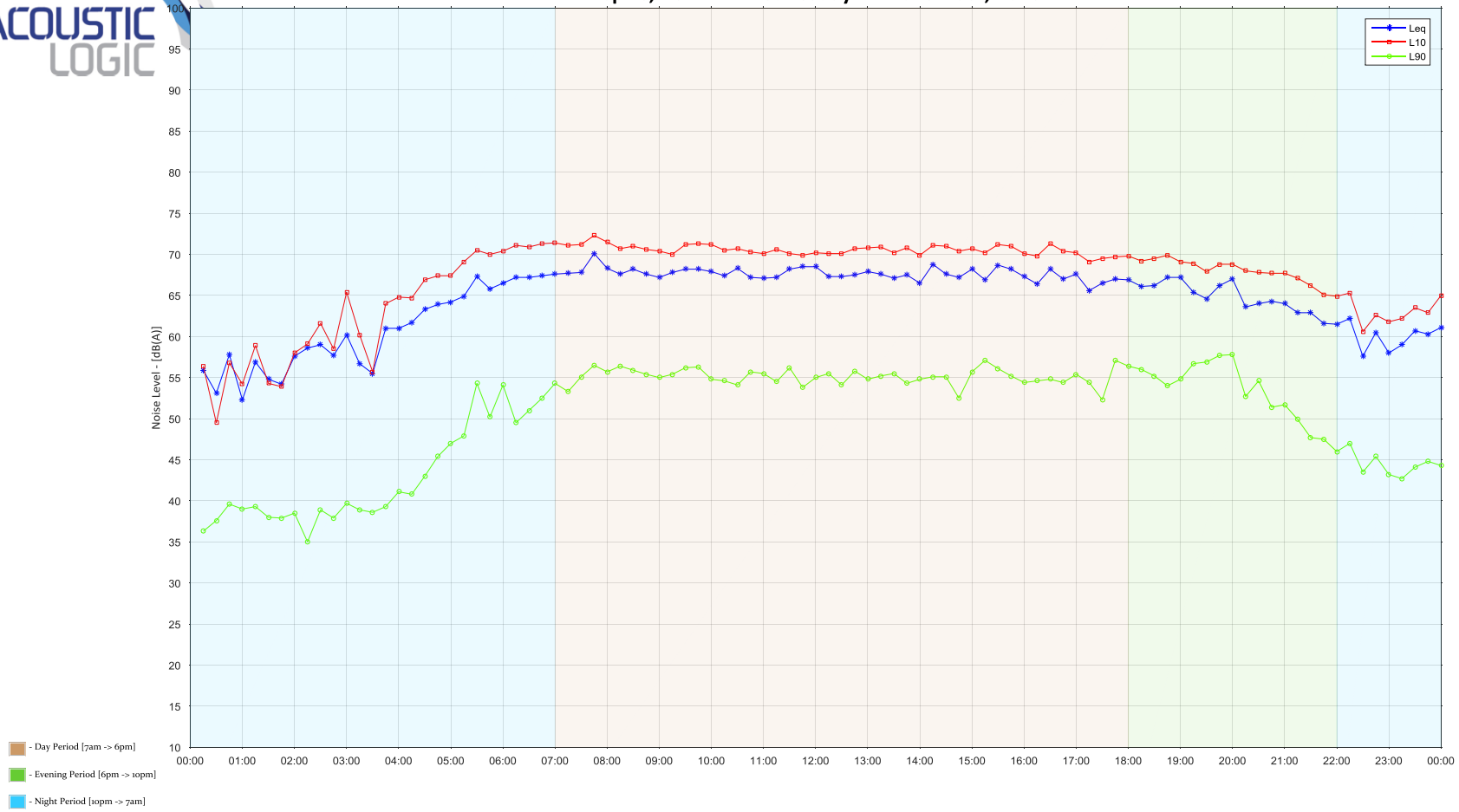


Aspire, Penrith: Tuesday 20 November, 2018



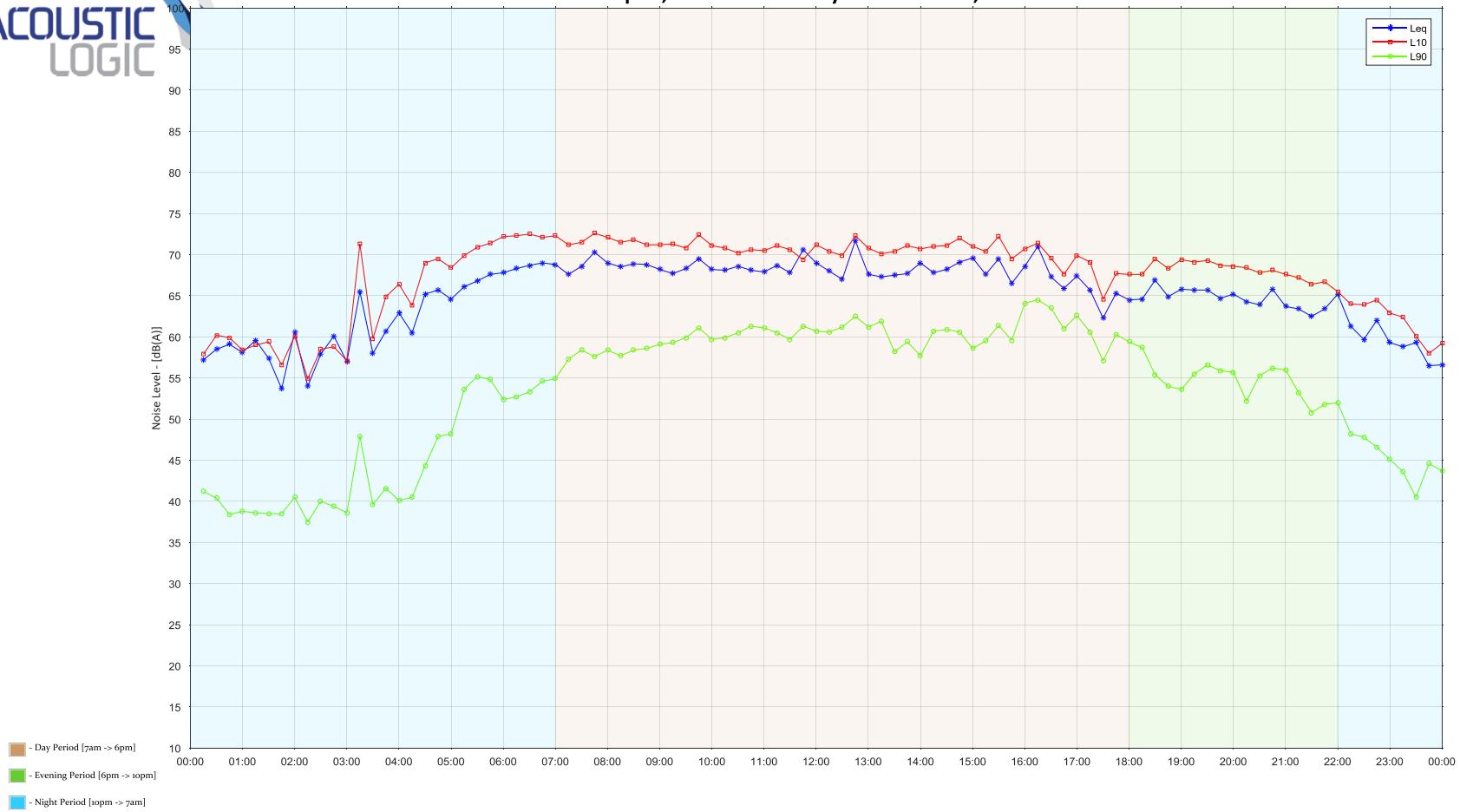


Aspire, Penrith: Wednesday 21 November, 2018



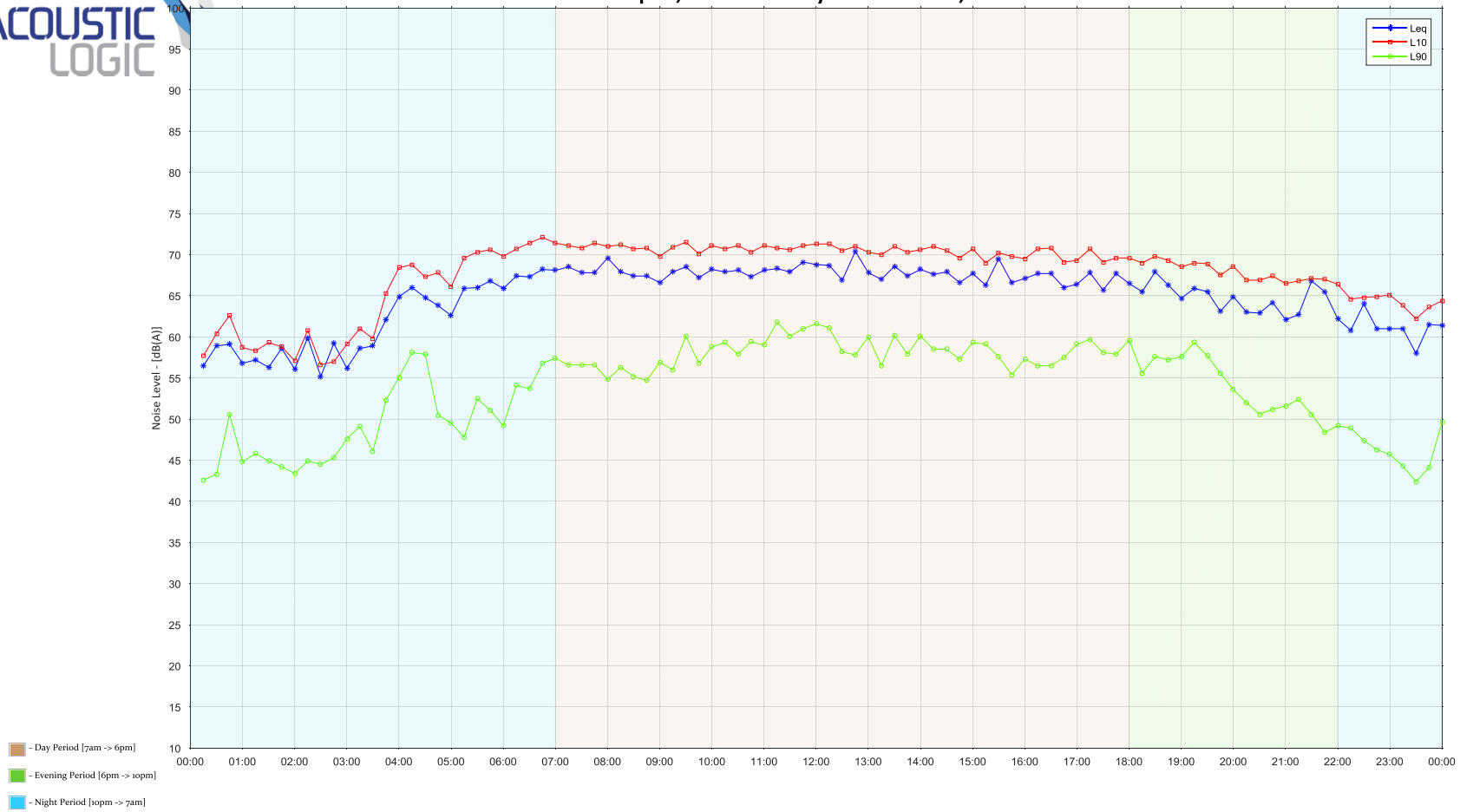


Aspire, Penrith: Thursday 22 November, 2018

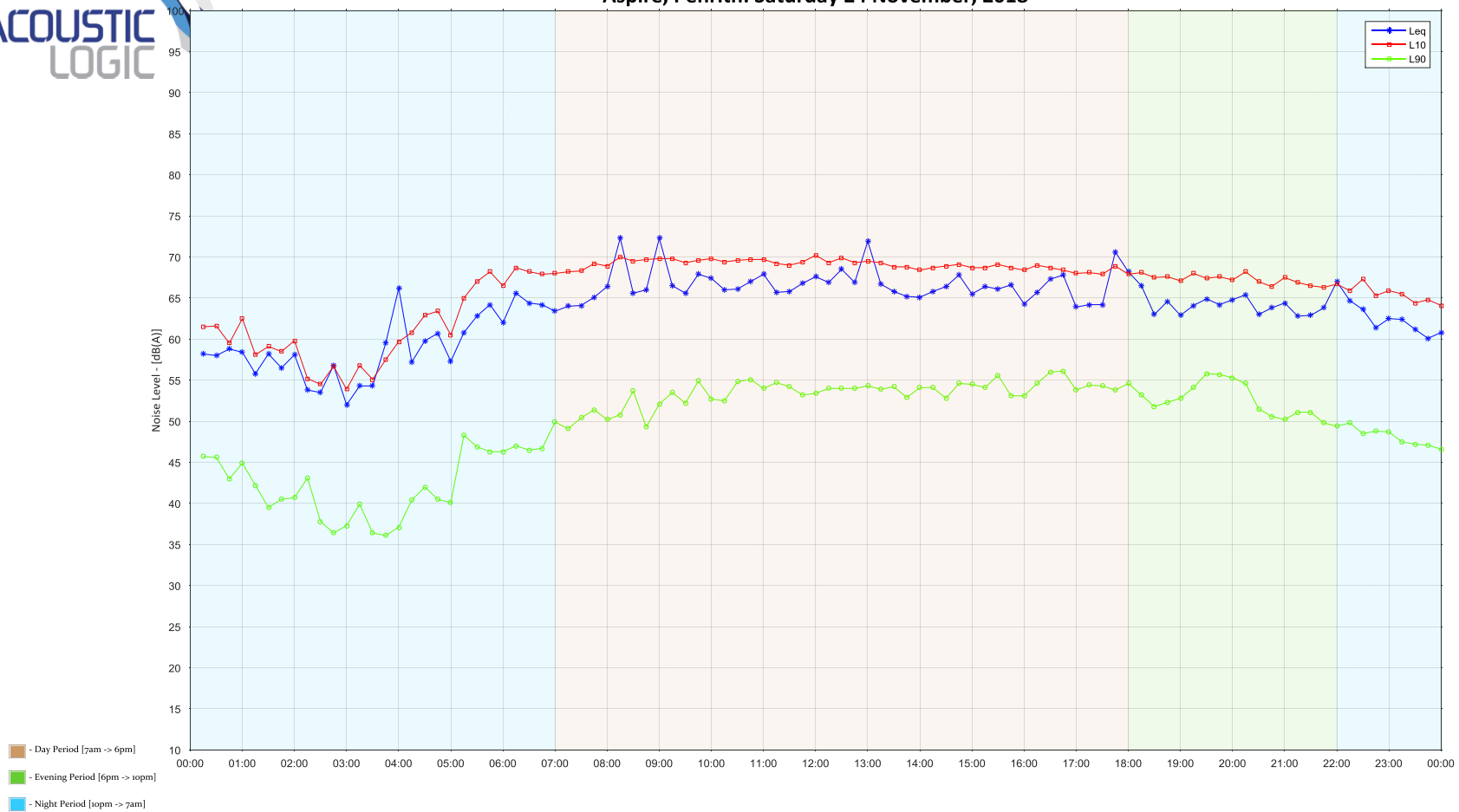




Aspire, Penrith: Friday 23 November, 2018

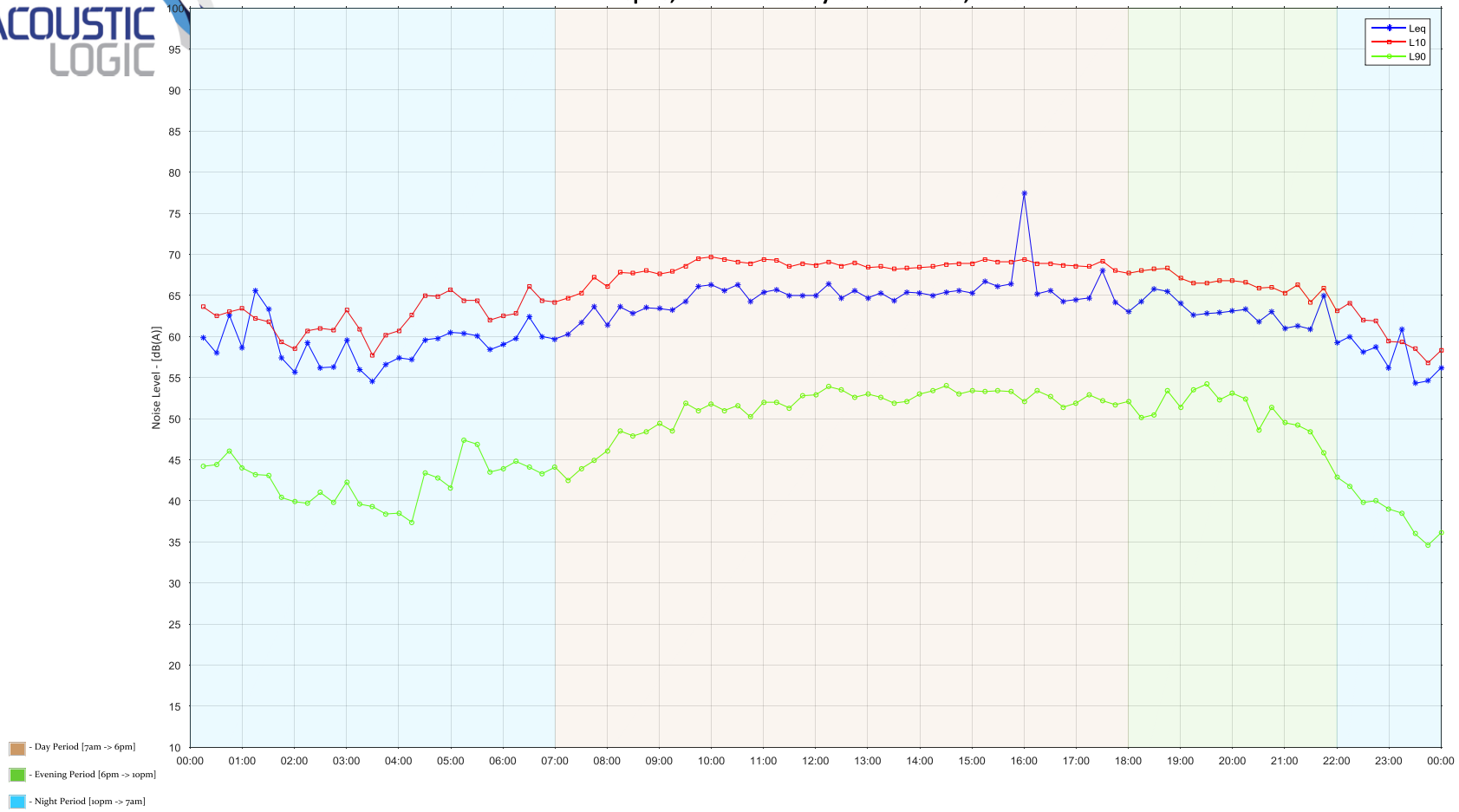


Aspire, Penrith: Saturday 24 November, 2018



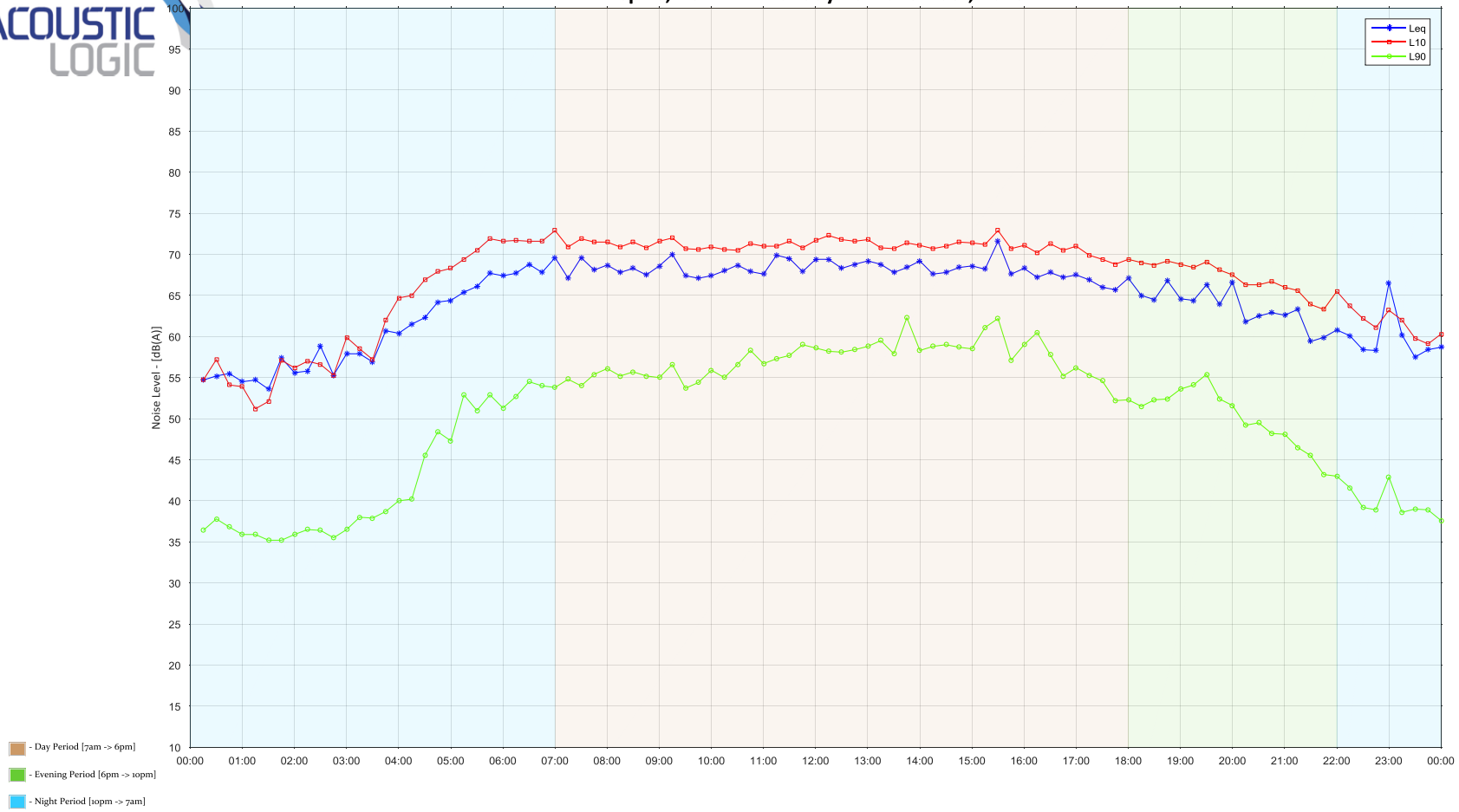


Aspire, Penrith: Sunday 25 November, 2018





Aspire, Penrith: Monday 26 November, 2018





Aspire, Penrith: Tuesday 27 November, 2018

