84-88 Parker Street, Kingswood

DA Acoustic Assessment

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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 medical development to be constructed at the 84-88 Parker Street, Kingswood.

This document addresses noise impacts associated with the following:

- Traffic noise impacts from Parker Street, Great Western Highway and Barber Avenue;
- Train noise impacts from nearby Rail Corridor;
- Noise emissions from base building;
    - Operational Mechanical Noise (in Principle); and
- Construction Noise Impacts (in Principle).

ALC have utilised the following documents and regulations in the assessment of noise emanating from the development:

- Penrith City Council document – *'Penrith City Council Development Control Plan (DCP) 2014'*;
- Australian Standard AS 3671:1989 *'Acoustics—Road traffic noise intrusion—Building siting and construction'*;
- Australian and New Zealand Standard AS/NZS 2107:2016 *'Recommended design sound levels and reverberation times for building interiors'*;
- NSW Health Guideline document – *'Engineering Services Guidelines' 2016;*
- NSW Environmental Protection Authority (EPA) document – *'Noise Policy for Industry (NPfI) 2017'*; and
- NSW Department of Environment document – *'Interim Construction Noise Guidelines (ICNG) 2009'*.

This assessment has been conducted using the Aspect architectural drawings for D.A Submission, see details below.

Table 1-1 – Architectural Sheet Information

Drawing Author	Drawing No.	Drawing Title	Revision	Date
Aspect	A0	Title Sheet	A	31/05/18
	A.00	General Notes	A	
	A.000	Proposed Site Plan	E	
	A.001	Demolition Site Plan	A	
	A.010	Site Locality Plan	A	

Table 1-1 – Architectural Sheet Information (Cont.)

Drawing Author	Drawing No.	Drawing Title	Revision	Date
Aspect	A.100	Podium Floor Plan	I	31/05/18
	A.101	Level 1 Plan	H	
	A.102	Level 2 Plan	H	
	A.103	Level 3 Plan	H	
	A.104	Level 4 Plan	H	
	A.111	Basement Level 1A Plan	F	
	A.112	Basement 1_2A Plan	H	
	A.113	Basement 2_3A Plan	H	
	A.114	Basement 3_4A Plan	H	
	A.130	Fire Egress Floor Plans	A	
	A.140	Proposed Roof Plan	A	
	A.200	Proposed Elevations	G	
	A.201	Proposed Elevations	G	
	A.300	Sections	E	
	A.301	Sections	E	
	A.302	Sections	E	
	A.303	Sections	D	
	A.800	Proposed GFA Plan	G	
	A.900	Perspectives	I	

2 SITE DESCRIPTION / PROPOSED REDEVELOPMENT

Onsite acoustic investigation has been carried out by this office in regard to the surrounding acoustic environment around the proposed development, which has been detailed below:

- An existing open-air carpark along the northern boundary of the site, further the car park is Great Western Highway;
- Nepean Private Hospital located along the eastern boundary of the site;
- Barber Avenue along the southern boundary of the site, further Barber Avenue is the existing Nepean Public Hospital; and
- Parker Street along the western boundary of the site, further Parker Street is existing residential dwellings.

Parker Street and Great Western Highway carries a high volume of traffic. Barber Avenue carries low to medium volume of traffic.

The nearest noise receivers around the project site include:

- Receiver 1 – Existing residential dwellings located to the west of the site across Parker Street located at 15-21 Barber Avenue and 79 Parker Street, Penrith, residential receivers is single storey;
- Receiver 2 – Nepean Private Hospital located along the eastern boundary of the site, situated 1-9 Barber Avenue Kingswood, Private Hospital is a multi-storey building with no operable windows facing the project site; and
- Receiver 3 – Nepean Public Hospital buildings to the south of the site across Barber Avenue, Public Hospital receivers are multi-storey.

A site map, measurement description and surrounding receivers are presented in Figure 2-1 below.

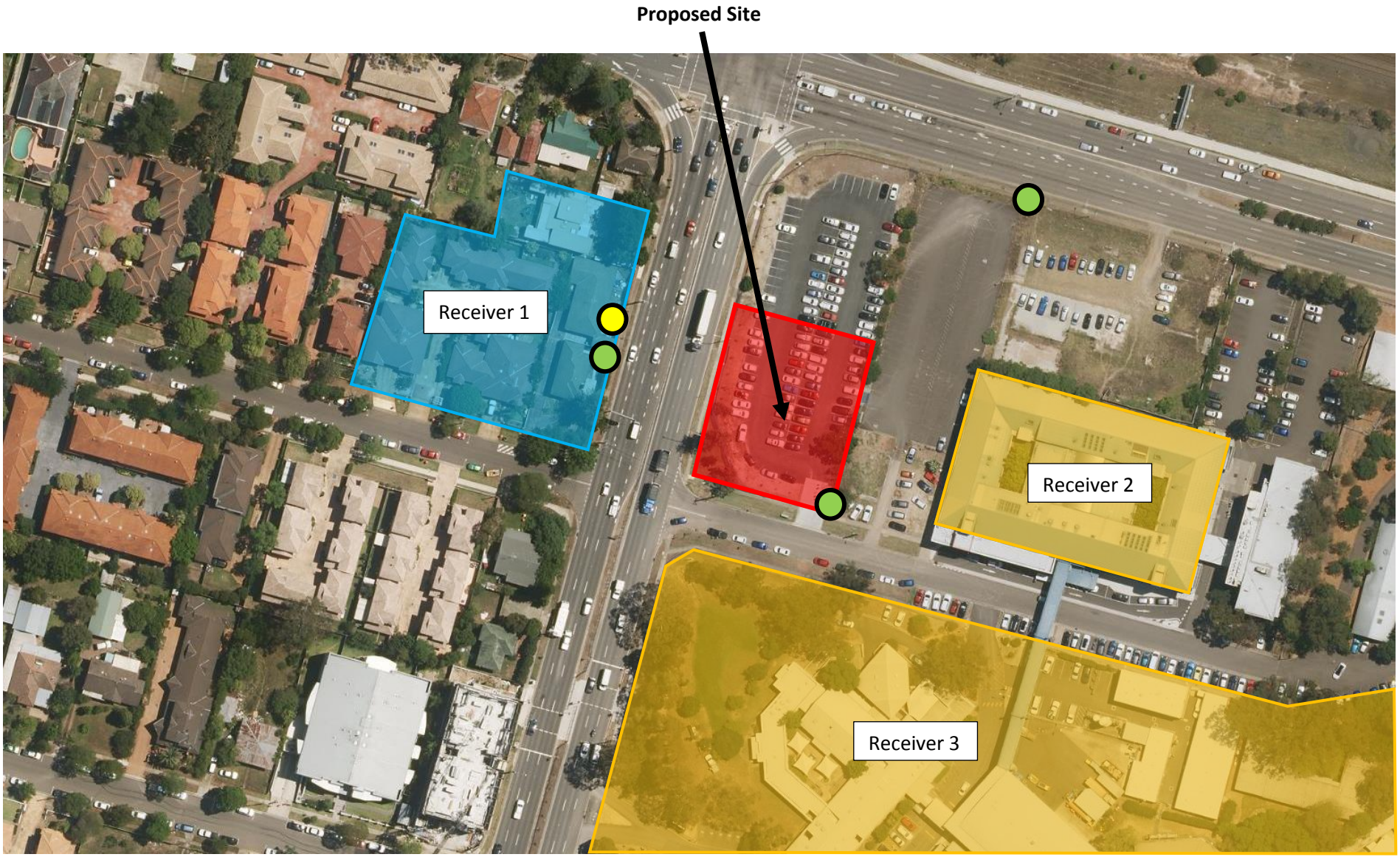


Figure 2-1: Site Survey and Monitoring Positions
Sourced from SixMaps NSW

3 EXISTING ACOUSTIC ENVIRONMENT

The acoustic environment is categorised by moderate, as high noise levels during the day and evening time is affected by traffic movements along surrounding roadways. A lower background noise level during the night period has been measured, as most of the volume of traffic have finished for the day.

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

3.1 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 15-20 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.

3.2 BACKGROUND NOISE LEVELS

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

3.2.1 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.

3.2.2 Measurement Location

An unattended noise monitor was installed along the eastern boundary of 15b Barber Avenue, Penrith, as indicated by figure 1 above.

3.2.3 Measurement Period

Unattended noise monitoring was conducted from Friday 25th May, 2018 to Friday 1st June, 2018.

3.2.4 Measured Background Noise Levels

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

3.2.4.1 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 A – Unattended Noise Monitoring Data provides detailed 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 Table below.

Table 3-1 – Unattended Noise Monitor – Logger Location 1 – Rating Background Noise Level

Date	dB(A)L_{90}		
	Day (7am-6pm)	Evening (6pm-10pm)	Night (10pm-7am Next Day)
Friday, 25th May, 2018	-	49	39
Saturday, 26th May, 2018	53	49	38
Sunday, 27th May, 2018	48	47	38
Monday, 28th May, 2018	54	48	39
Tuesday, 29th May, 2018	54	50	38
Wednesday, 30th May, 2018	55	50	40
Thursday, 31st May, 2018	52	45	38
Friday, 1st June, 2018	-	-	-
Median	**53**	**49**	**38**

3.2.4.2 Summarised Rating Background Noise Levels

Site investigations, attended and unattended noise measurements indicate that the acoustic environment for the project site are as below.

Table 3-2 – Summarised Rating Background Noise Level

Location	Time of day	Rating Background Noise Level (dB(A)$L_{90(Period)}$)
15b Barber Avenue, Penrith (See Figure 1)	Day	53
	Evening	49
	Night	38

4 EXTERNAL NOISE INTRUSION ASSESSMENT

Site investigation indicates that the major external noise sources around project site is traffic noise from surround roads such as Parker Avenue and Great Western Highway and train noise from the nearby rail corridor. Noise intrusion from these sources will be assessed in accordance with criteria nominated section 4.1 of this report.

4.1 NOISE INTRUSION CRITERIA

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

- Penrith City Council document – *'Penrith City Council Development Control Plan (DCP) 2014'*;
- Australian Standard AS 3671:1989 *'Acoustics—Road traffic noise intrusion—Building siting and construction'*;
- Australian and New Zealand Standard AS/NZS 2107:2016 *'Recommended design sound levels and reverberation times for building interiors'*;
- NSW Health Guideline document – *'Engineering Services Guidelines' 2016; and*
- NSW Environmental Protection Authority (EPA) document – *'Road Noise Policy (RNP) 2011'*.

4.1.1 Penrith City Council document – *'Penrith City Council Development Control Plan (DCP) 2014'*

Section C12 Noise and Vibration

12.1. Road Traffic Noise

Section C. Controls

1) Rail noise and vibration

a) The siting and design of developments on land sited on, or within, 80m of an operating rail corridor or land reserved for the construction of a railway line is to address the matters raised in the Development Near Rail Corridors and Busy Roads – Interim Guideline (Department of Planning, 2008) and, where appropriate, incorporate any recommendations into the design of the development.

b) Council will not grant consent to residential development, residential subdivision or other sensitive land uses on land in the vicinity of a rail corridor unless it complies with the relevant standards and criteria set by the EPA and Department of Planning, as well as any relevant Australian Standards.

c) Council will not grant consent to any development which potentially has sensitive occupancies (such as residential, office or laboratory premises) and is proposed to be constructed within 20m of the rail line unless an assessment of the vibration impacts from the rail line has been carried out. This is to be undertaken by a recognised acoustic consultant to demonstrate that the impact of vibration from the rail corridor will not significantly impact upon the future occupants of the development.

d) Sensitive land uses subject to rail noise and vibration criteria referred to in (b) above include educational establishments (including schools), places of public worship, hospitals, nursing homes, mixed use development, offices/workplaces, and passive and active recreation areas.

4.1.2 Australian Standard AS/NZS 3671:1989 *'Acoustics—Road traffic noise intrusion—Building siting and construction'*

Australian Standard AS 3671-1989 notes the following in relation to traffic noise:

- Internal noise levels should be determined in accordance with AS/NZS 2107:2016 'Acoustics – Recommended design sound levels and reverberation times for building interiors'.
- A suitable descriptor should be adopted relevant to the use of the development. As AS2107:2016 adopts the L_{eq} descriptor, ALC shall also use this descriptor.
- AS3671 does not specifically recommend a time interval. On this basis, ALC have adopted the interval used by the EPA Road Noise Policy for main/arterial roads, that being:
    - Day – 7am to 10pm (15 hour); and
    - Night – 10pm to 7am (9 hour).
- ALC have applied the daytime interval to the living areas of the apartment and the night time interval to the bedrooms of the apartment.

Internal noise levels have been selected in accordance with AS 2107:2016.

4.1.3 Australian and New Zealand AS/NZS 2107:2016 *'Recommended design sound levels and reverberation times for building interiors'*

AS2107-2016: 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 AS2107-2016, gives the following maximum internal noise levels for commercial buildings and residential buildings near major roads.

Table 4-1 – Recommended Design Sound Level

Space /Activity Type	Recommended Maximum Design Sound Level dB(A)L_{Aeq}
General Tenancy	45-50

4.1.4 NSW Health Guideline document – 'Engineering Services Guidelines' 2016

13.5.2 Internal Design Noise Levels

Environmental Noise Intrusion

All elements of the building façade will need to be constructed to control external noise entering the building. Sound insulation performance requirements for each element should be nominated based on external noise levels from all noise sources that surround the building.

External elements including, glazing, doors and ventilation openings are generally the weakest elements in an external façade and therefore careful consideration is required in the design and specification to ensure that sufficient sound insulation is provided by the combined performance of a façade.

Environmental noise intrusion should be considered in aggregate with the noise from mechanical services to satisfy the maximum noise levels in Column A of Table 12.

Steady State / Continuous Noise

When assessing environmental noise intrusion from relatively continuous noise sources, such as free flowing road traffic, the facade should be designed to achieve the maximum allowable internal noise levels as given in Column A of Table 12:

The environmental noise intrusion should be considered in aggregate with the noise from mechanical services to satisfy the maximum noise levels in Column A of Table 12.

ACOUSTIC REQUIREMENTS FOR AREAS AFFECTING PATIENT CARE HOSPITALS AND OUTPATIENT FACILITIES								
AREA DESIGNATION	A		B	C	D	E	F	G
	Continuous Internal Noise Levels L_{Aeq} dB		Intermittent Internal Noise Level L_{Amax} dB	Internal Noise Levels Helicopter L_{Amax} dB	Speech Privacy Requirement	Acoustic door(s) likely required?	Impact Sound Isolation L_{nw} dB	Reverberation Time (s) (fully finished)
	Satisfactory	Maximum						
CLINICAL								
Operating Theatre	40	45	50	55	Private	-	55	0.4 - 0.7
Birthing Room or Delivery Suite	45	50	65	65	Confidential	Y	60	0.4 - 0.6
Intensive Care	40	45	50	55	Moderate	-	55	0.4 - 0.7
Patient Room / Single Bed Ward	35	40	50	55	Private	-	50	0.4 - 0.7
Multi Bed Ward	35	40	50	55	Moderate	-	55	0.4 - 0.7
Toilet / En-suite	50	55	75	70	Moderate	-	60	-
Patient Corridor	40	50	65	70	-	-	60	0.4 - 0.6
Counselling / Bereavement / Interview Room	40	45	50	55	Confidential	Y	55	0.4 - 0.6
Consultation Room	40	45	50	55	Confidential	Y	55	0.4 - 0.6
Speech and Language Therapy	35	40	50	55	Moderate	-	55	0.4 - 0.6
Treatment / Medication / Examination Room	40	45	50	55	Confidential	Y	60	0.4 - 0.6
PUBLIC AREAS								
Corridors and Lobby Spaces	40	50	65	70	-	-	60	0.4 - 0.6
Cafeterias / Dining	45	50	70	70	-	-	60	Practicable Reduction
Toilets	45	55	75	70	-	-	-	-
Waiting Rooms, Reception Areas	40	50	65	70	-	-	60	0.4 - 0.6
Multi Faith / Chapel	30	35	50	55	Confidential	Y	50	0.4 - 0.6
STAFF / BACK-OF-HOUSE AREAS								
Meeting Room	35	40	55	60	Private	Y	55	0.6 - 0.8
Board / Conference Room (Large)	30	35	55	60	Private	Y	55	0.6 - 0.8
Open Plan Offices	40	45	65	70	Moderate	-	60	0.4 - 0.6
Private Offices	35	40	55	60	Private	Y	55	0.6 - 0.8
Multi Person Offices	40	45	65	70	Moderate	-	55	0.4 - 0.6
Locker Room	50	55	75	-	Moderate	-	-	-
Rest Room	40	45	65	70	-	-		0.4 - 0.6
Classrooms, Training Rooms	35	40	55	60	Private	Y	55	0.5 - 0.6
Lecture theatre	30	35	55	60	Private	Y	55	Curve 1 of AS2107:2000
Library	40	45	50	60	-	-	55	0.4 - 0.6
Workshops	45	50	75	-	-	-	-	Practicable reduction
Plant Rooms	N/A	<85	75	-	-	-	-	Practicable reduction
Laboratories	45	50	65	65	Moderate	-	60	0.4 - 0.7

TABLE 12: ACOUSTIC REQUIREMENTS

4.2 EXTERNAL NOISE MEASUREMENTS

This section of the report details noise measurements conducted at the site to establish traffic, train and surrounding environmental noise levels impacting the development.

4.2.1 Measurement Equipment

Attended short term measurements of traffic and train noise which 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.

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

4.2.2 Measurement Location

Unattended noise monitoring was undertaken at the following locations around the site:

- Logger Location 1 - One unattended monitor was installed in the eastern boundary of 15b Barber Avenue, Penrith. The noise monitor had an obstructed view of Parker Street. Noise monitor was installed approximately 4m from the kerb.

Attended traffic noise measurements where at the following location:

- Parker Street – Attended traffic noise measurement which was conducted along Parker Street was located along the eastern boundary of 15 Barber Avenue, Penrith. See figure 1 for measurement location. Noise measurement location had a 180° view of Parker Street and was conducted at a distance of 3m from the kerb.
- Great Western Highway – Attended traffic noise measurement which was conducted along Great Western Highway was located along the southern side of the Great Western Highway. See figure 1 for measurement location. Noise measurement location had a 180° view of the Great Western Highway and was conducted at a distance of 3m from the kerb.
- Barber Avenue – Attended traffic noise measurement which was conducted along Barber Avenue was located along the south-eastern corner of the site. See figure 1 for measurement location. Noise measurement location had a 180° view of Barber Avenue and was conducted at a distance of 3m from the kerb.

4.2.3 Measurement Period

Unattended noise monitoring was conducted from Friday 25th May 2018 to Friday 1st June 2018.

Attended noise measurements were undertaken between the hours of 4:30pm and 5:30pm on Monday 28th May 2018.

4.2.4 Measured Traffic & Train Noise Measurements

Attended and unattended noise measurements have been summarised below for all locations.

4.2.4.1 Unattended Noise Monitoring

Results of the unattended noise monitoring conducted around the site has been summarised below in Table 4-2. Further detailed results can be found in Appendix A of this report.

Table 4-2 – Unattended Noise Monitor – Location 1 – Traffic Noise Measurements

Date	Measured Traffic Noise Level dB(A)L_{eq}	
	Day (7am-10pm)	Night (10pm-7am)
Friday, 25th May, 2018	-	59
Saturday, 26th May, 2018	65	57
Sunday, 27th May, 2018	64	61
Monday, 28th May, 2018	65	62
Tuesday, 29th May, 2018	66	62
Wednesday, 30th May, 2018	67	62
Thursday, 31st May, 2018	65	-
Friday, 1st June, 2018	-	-
Logarithmic Average	**65**	**60**

4.2.4.2 Attended Traffic & Train Noise Measurements

Results of the attended noise measurements which were conducted around the project site have been summarised below for each of the measurement locations.

Table 4-3 – Attended Noise Measurements

Location	Time of Measurement	Measured Noise Level dB(A)$L_{eq(15mins)}$
Parker Street (See Figure 1) 3m from kerb 180° view of the road	4:30pm –5:30pm Monday, 28th May, 2018	72
Great Western Highway (See Figure 1) 3m from kerb 180° view of the road		70
Barber Avenue (See Figure 1) 3m from kerb 180° view of the road		59

4.3 NOISE INTRUSION ANALYSIS

Traffic noise intrusion into the proposed development was assessed using the measured traffic noise levels presented in section 4.2 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.

4.4 RECOMMENDED CONSTRUCTIONS

4.4.1 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 Table 4-4 below.

Table 4-4 – Glazing Thickness Requirements

Façade	Glazing Construction	Acoustic Seals
Ground Floor		
Northern Façade	10.38mm Laminate	Yes
Eastern Façade		
Southern Façade		
Western Facade		
Level 1 and up		
All Facades	10.38mm Laminate + 12mm Airgap + 12mm Float	Yes

***Note: Glazing recommendations apply to all levels.**

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 should not be lower than the values listed in Table 4-5 for all rooms. Where nominated, this 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 4-5 - Minimum R_w of Glazing (with Acoustic Seals)

Glazing Assembly	Minimum R_w of Installed Window
10.38mm Laminate	35
10.38mm Laminate + 12mm Airgap + 12mm Float	42

4.4.2 External Roof/Ceiling Construction

External roof construction will be constructed from metal roof sheeting elements; this proposed structure will require the following any further acoustic upgrading. In the event that any penetrations are required thru the external skin, an acoustic sealant should be used to minimise all gaps.

Table 4-6 – External Light Weight Roof Construction

Space	Internal Lining	Truss System	External Lining
Any	1x13mm Plasterboard	Minimum 250mm airgap + 75mm thick 11kg/m^3 glasswool insulation	Sheet Metal

4.4.3 External Wall Construction

External wall construction proposes masonry/concrete elements and light weight cladding. In the event masonry or concrete structures are used, this will not require any further acoustic upgrading. If any penetrations are required thru the external skin, an acoustic sealant should be used to minimise all gaps.

In the event light weight cladding systems are used, the following construction should be adopted.

Table 4-7 – External Light Weight Wall Construction

Space	Internal Lining	Stud System	External Lining
Any	1x13mm Plasterboard	92mm Steel Studwork + 75mm thick 11kg/m^3 glasswool insulation	Architects Cladding System + 1x9mm Fibre Cement Sheeting

5 NOISE EMISSION ASSESSMENT

A noise emission assessment has been carried out to ensure noise emitted from the use of the site is in accordance with the requirements listed below.

5.1 NOISE EMISSION CRITERIA

Noise emissions from the project site will be assessed against the requirements of the following:

- Penrith City Council document – 'Penrith City Council Development Control Plan (DCP) 2014'; and
- NSW Environmental Protection Authority (EPA) document – *'Noise Policy for Industry (NPfI) 2017'.*

These have been detailed below.

5.1.1 Penrith City Council document – *'Development Control Plan (DCP) 2014'*

Penrith City Council Development Control Plan (DCP) 2014 does not contain any specific noise criteria. Therefore, the following criteria below will be adopted.

5.1.2 NSW Environmental Protection Authority (EPA) document – *'Noise Policy for Industry (NPfI) 2017'*

The NPfI provides guidelines for assessing noise impacts from developments. The recommended assessment objectives vary depending on the potentially affected receivers, the time of day, and the type of noise source. The NPfI has two requirements which both have to be complied with, namely an amenity criterion and an intrusiveness criterion.

5.1.2.1 Intrusiveness Criterion

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 not exceed the background noise level by more than 5 dB(A).

Table 5-1 – NPfI Intrusiveness Criteria

Receiver	Time of day	Background Noise Level dB(A)$L_{90(Period)}$	Intrusiveness Criteria (Background + 5dB(A)$_{(Period)}$)
Residential (External)	Day (7am-6pm)	53	58
	Evening (6pm-10pm)	49	54
	Night (10pm-7am)	38	43

5.1.2.2 Amenity Criterion

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 Industrial Noise Policy sets out acceptable noise levels for various land uses. Table 2.2 on page 11 of the policy has four categories to distinguish different residential areas. They are rural, suburban, urban and urban/industrial interface.

For the purposes of a conservative assessment, ALC will assess noise emissions in accordance with the 'Urban' category.

Table 5-2 – NPfI Project Amenity Criteria

Type of Receiver	Time of day	Recommended Project Acceptable Noise Level dB(A)$L_{eq(Period)}$
Residential (Urban) (External)	Day (7am-6pm)	58 (15mins)
	Evening (6pm-10pm)	48 (15mins)
	Night (10pm-7am)	43 (15mins)
Commercial (External)	When in Use	65
Hospital – Ward (Internal)	Nosiest 1-hour	35
Hospital – Ward (External)	Nosiest 1-hour	50

5.1.3 Summarised Plant Noise Emission Criteria

Summary for noise emission criteria for all plant associated with the development has been summarised below.

Table 5-3 – Summary of Noise Emission Criteria (Plant Noise)

Receiver	Time of day	Background Noise Level dB(A)$L_{90(Period)}$	Project Amenity Criteria dB(A)$L_{eq(Period)}$	Intrusiveness Criteria Background + 5dB(A)$_{(period)}$
Residential Receivers (External)	Day (7am-6pm)	48	58	53
	Evening (6pm-10pm)	47	48	52
	Night (10pm-7am)	38	43	43
Commercial (External)	When in Use	N/A	65	N/A
Hospital – Ward (Internal)	Nosiest 1-hour	N/A	35	N/A
Hospital – Ward (External)	Nosiest 1-hour	N/A	50	N/A

5.2 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 plant to the closest residential receiver should comply with the noise emission criteria in Section 5.1.3.

6 CONSTRUCTION NOISE ASSESSMENT

The following section presents the preliminary assessment of construction noise activity to be undertaken on the site as a part of this development. As detailed methodology is not currently unknown general assumptions based on our previous experience has been assumed. A revised construction noise/ vibration management plan is recommended to be undertaken once a detailed construction methodology is known.

6.1 NOISE MANAGEMENT LEVEL

The noise emission from the construction of project site shall satisfy the requirements of the following documents:

- NSW Department of Environment document – *'Interim Construction Noise Guidelines (ICNG) 2009'*; and
- Australian Standard AS2436-2010 – *"Guide to noise and vibration control on construction, demolition and maintenance sites"*.

6.1.1 NSW Department of Environment document – *'Interim Construction Noise Guidelines (ICNG) 2009'*

The following sections present the construction noise criteria for residential and commercial receivers.

6.1.1.1 Residential Receivers

The following tables shows the noise criteria for residential receivers

Time of day	Management level $L_{Aeq\ (15\ min)}$ *	
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. • Where the predicted or measured $L_{Aeq\ (15\ min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. • The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. • Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: 1. times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences 2. if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.

6.1.1.2 Commercial Receivers

The following extract shows the noise criteria for commercial receivers

4.1.3 Commercial and industrial premises

Due to the broad range of sensitivities that commercial or industrial land can have to noise from construction, the process of defining management levels is separated into three categories. The external noise levels should be assessed at the most-affected occupied point of the premises:

- industrial premises: external $L_{Aeq\ (15\ min)}$ 75 dB(A)
- offices, retail outlets: external $L_{Aeq\ (15\ min)}$ 70 dB(A)
- other businesses that may be very sensitive to noise, where the noise level is project specific as discussed below.

Examples of other noise-sensitive businesses are theatres and child care centres. The proponent should undertake a special investigation to determine suitable noise levels on a project-by-project basis; the recommended 'maximum' internal noise levels in AS 2107 *Acoustics – Recommended design sound levels and reverberation times for building interiors* may assist in determining relevant noise levels (Standards Australia 2000).

The proponent should assess construction noise levels for the project, and consult with occupants of commercial and industrial premises prior to lodging an application where required.

During construction, the proponent should regularly update the occupants of the commercial and industrial premises regarding noise levels and hours of work.

6.1.1.3 Hospital Wards

The following tables shows the noise criteria for hospital receivers

Table 3: Noise at sensitive land uses (other than residences) using quantitative assessment

Land use	Management level, $L_{Aeq\ (15\ min)}$ (applies when properties are being used)
Classrooms at schools and other educational institutions	Internal noise level 45 dB(A)
Hospital wards and operating theatres	Internal noise level 45 dB(A)
Places of worship	Internal noise level 45 dB(A)
Active recreation areas (characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion)	External noise level 65 dB(A)
Passive recreation areas (characterised by contemplative activities that generate little noise and where benfefits are compromised by external noise intrusion, for example, reading, meditation)	External noise level 60 dB(A)
Community centres	Depends on the intended use of the centre. Refer to the recommended 'maximum' internal levels in AS2107 for specific uses.

6.1.2 Requirements of Australian Standard AS:2436-1981

- *Australian Standard 2436-1981 "Guide to Noise Control on Construction Maintenance and Demolition Site". In particular, the requirements stipulated in Section 3 of the standard will be followed.*

Section 3 of AS 2436 states that care shall be taken in applying criteria that normally would be used to regulate noise emitted from industrial, commercial and residential premises to construction,

particularly for those activities which are transitory and of short duration. For the control and regulation of noise from construction sites AS2436 nominates the following:

- That a reasonable suitable noise criterion is established.
- That all practicable measures be taken on the treatment site to regulate noise emissions, including, the siting of potentially noisy static processes on parts of the site where they can be shielded, selecting less noisy processes, and if required regulating construction hours if required.
- The undertaking of noise monitoring where non-compliance occurs to assist in the management and control of noise emission from the building site.

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

- Predict noise levels produced by typical construction activities at the sensitive receivers.
- If noise levels exceed noise goal at sensitive receiver locations, investigate and implement all practical and cost effective techniques to limit noise emissions.
- If the noise goal is still exceeded after applying all practical engineering controls to limit noise emissions, investigate management and other techniques to mitigate noise emissions.

6.1.3 Summarised Noise Emission Goal

Noise emission goal have been summarised below based on the requirements above and background noise data collected on site.

Table 4 –Noise Emission Goal

Noise Receivers	Construction Noise Objective dB(A)$L_{eq(15min)}$	"Highly Noise Affected" Level - dB(A)$L_{eq(15min)}$
Residential Receivers	Background (7am-6pm) + 10 dB = 63dB(A)$L_{Aeq,\ 15\ mins}$	75
Commercial Receivers	70	N/A
Hospital Wards	45 (Internal)	N/A

*If the noise goal is still exceeded after applying all practical engineering controls to limit noise emissions, investigate management and other techniques to mitigate noise emissions

6.2 NOISE EMISSION ASSESSMENT

Predictions of noise levels from likely construction activities at the sensitive receivers identified have been made of the construction processes with the potential to produce significant noise.

It is noted that:

- Many of the noise sources are present over a small period of the day or may be present for a few days with a significant intervening period before the activity occurs again.
- The distance between the noise source and the receiver.

The A-weighted sound power levels for all the component parts of the above-described activities are outlined in the table below.

Table 5 - Sound Power Levels of the Typical Equipment

Stage	Activity	Sound Power Level (SWL) dB(A)
Excavation	Excavator (with bucket attachment)	110
	Bobcat	105
Construction	Angle Grinders	105
	Electric Saw	102
	Drilling	95
	Concrete Vibrator	100
	Cement Mixing Truck	105
	Concrete Pumps	105

The noise levels presented in the above table are derived from the following sources, namely:

- On-site measurements;
- Table A1 of Australian Standard 2436-2010; and
- Data held by this office from other similar studies.

6.2.1 Predicted Noise Levels

The following table presents the predicted noise levels

Table 6 – Predicted Noise Level

Receiver	Work Item	Predicted Noise Level dB(A)$L_{eq,\ 15min}$	Criteria dB(A)$L_{eq,\ 15min}$	Comments
Receiver 1	Excavation	67-73	63 Construction Noise objective dB(A)Leq(15min) 75 "Highly Noise Affected" Level - dB(A)Leq(15min)	A further detailed assessment is recommended to be undertaken at CC stage once further detailed knowledge of proposed construction methodologies are known.
	Construction	62-68		
Receiver 2	Excavation	38-44	45 Construction Noise objective dB(A)Leq(15min) Internal	
	Construction	33-39		
Receiver 3	Excavation	33-38		
	Construction	28-33		

*Refer to figure 1 for receiver locations.

6.2.2 Summary of Results

Noise management for the excavation and construction of project site will be required including acoustic barriers, respite hours, community consultation etc. Details shall be determined at CC stage to ensure that the noise emission from the project site to receivers are minimised.

7 CONCLUSION

This report presents an acoustic assessment of noise impacts associated with proposed medical development to be located at 84-88 Parker Street, Kingswood. Based on the information provided above we conclude the following;

Provided that the treatments set out in section 4 of this report are employed, internal noise levels shall comply with the requirements below:

- Penrith City Council document – *'Penrith City Council Development Control Plan (DCP) 2014'*;
- Australian Standard AS 3671:1989 *'Acoustics—Road traffic noise intrusion—Building siting and construction'*;
- Australian and New Zealand Standard AS/NZS 2107:2016 *'Recommended design sound levels and reverberation times for building interiors'*;
- NSW Health Guideline document – *'Engineering Services Guidelines' 2016;*

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

- Penrith City Council document – *'Penrith City Council Development Control Plan (DCP) 2014'*; and
- NSW Environmental Protection Authority (EPA) document – *'Noise Policy for Industry (NPfI)'*.

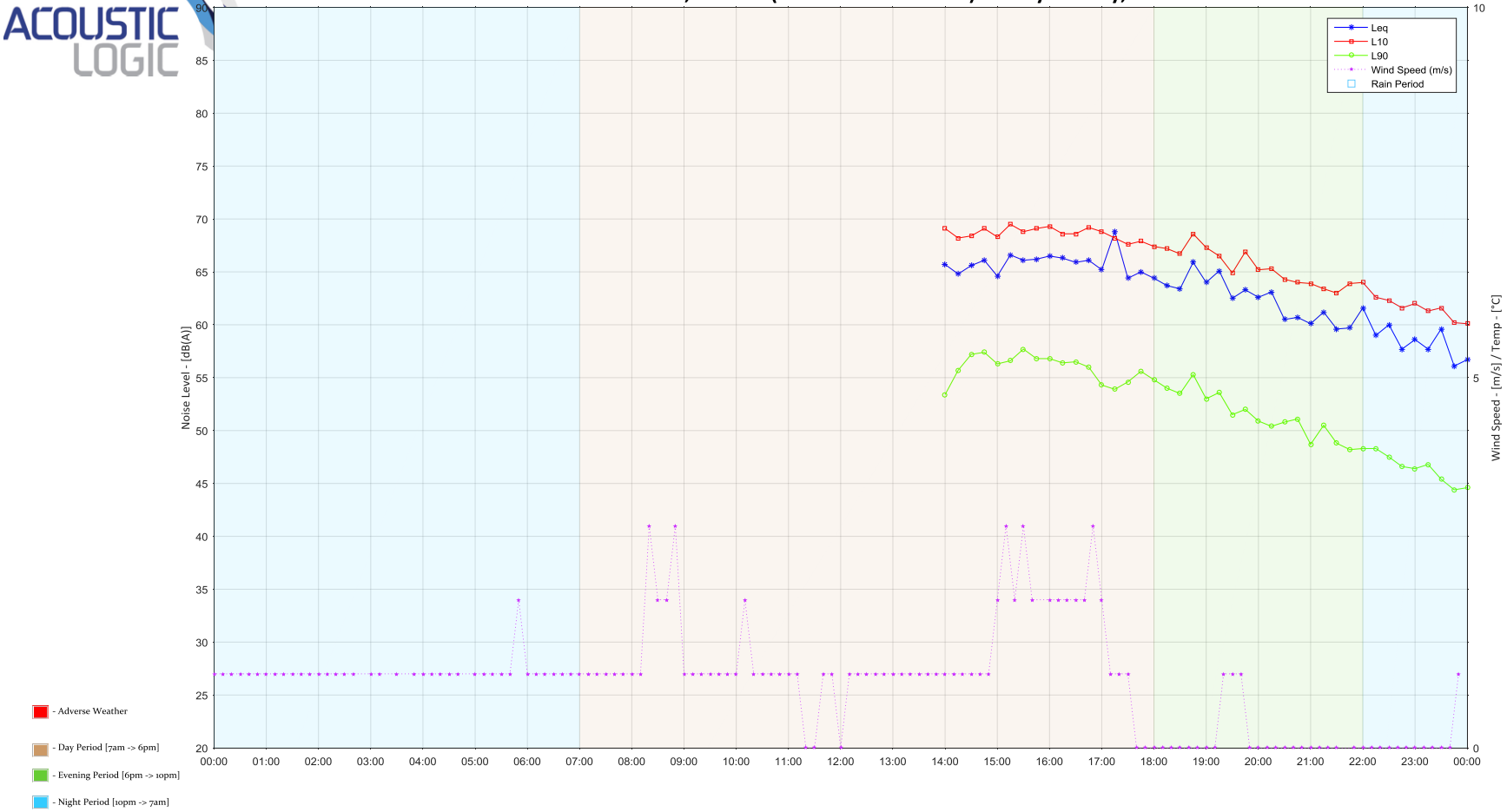
Detailed acoustic control measures for the plant servicing the proposed development will be determined at CC stage.

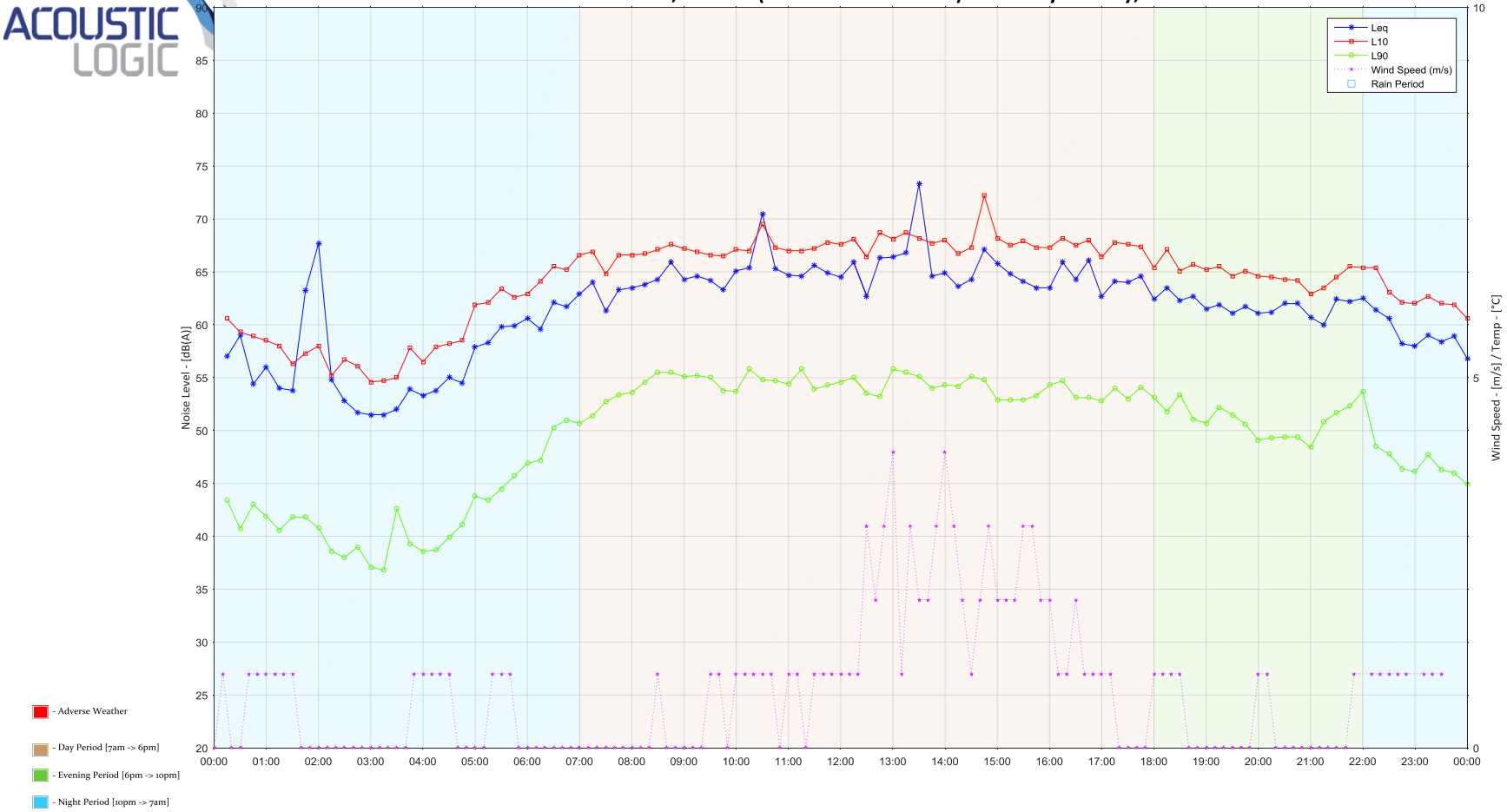
We trust this information is satisfactory. Please contact us should you have any further queries.

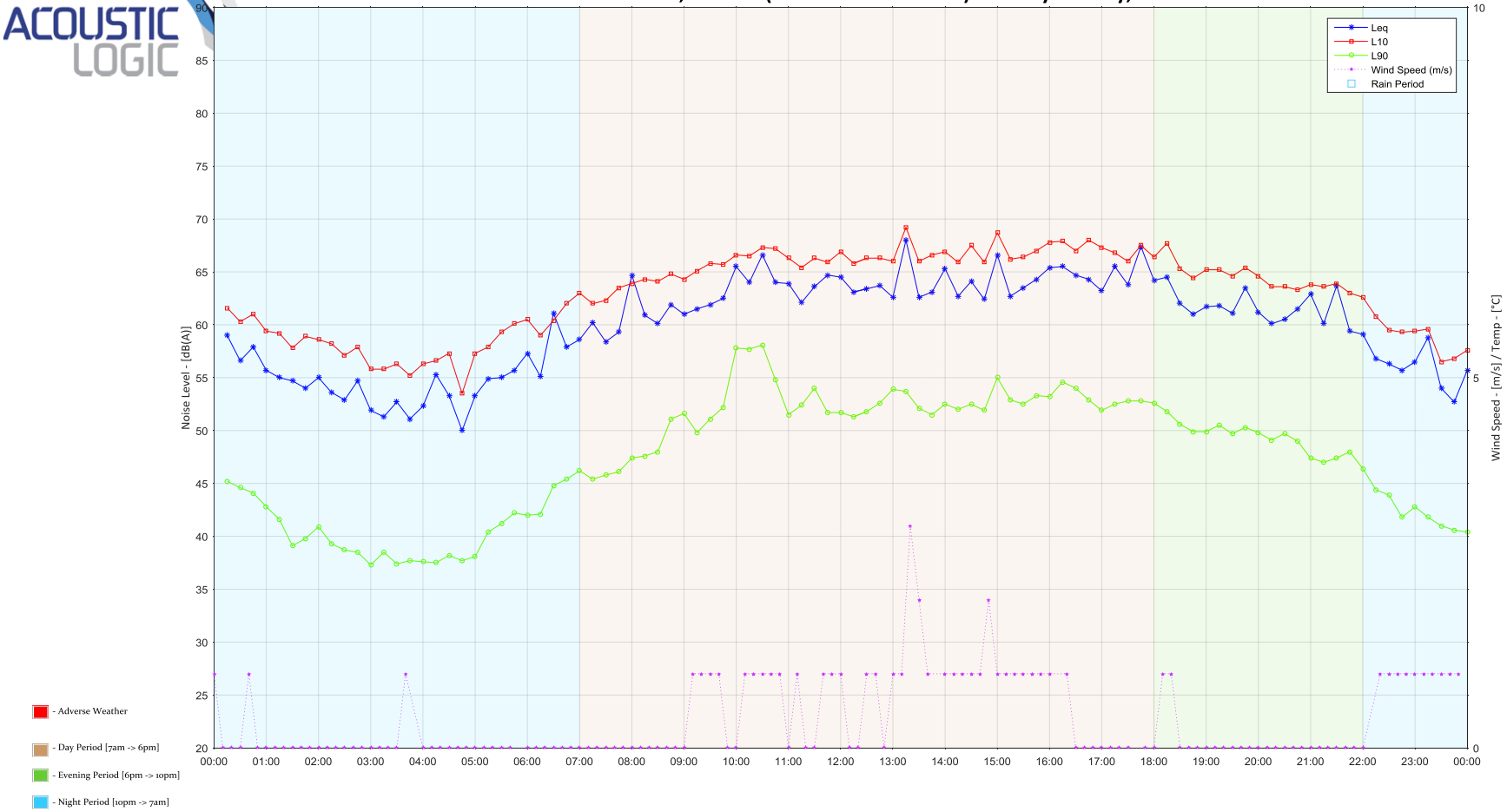
Yours faithfully,

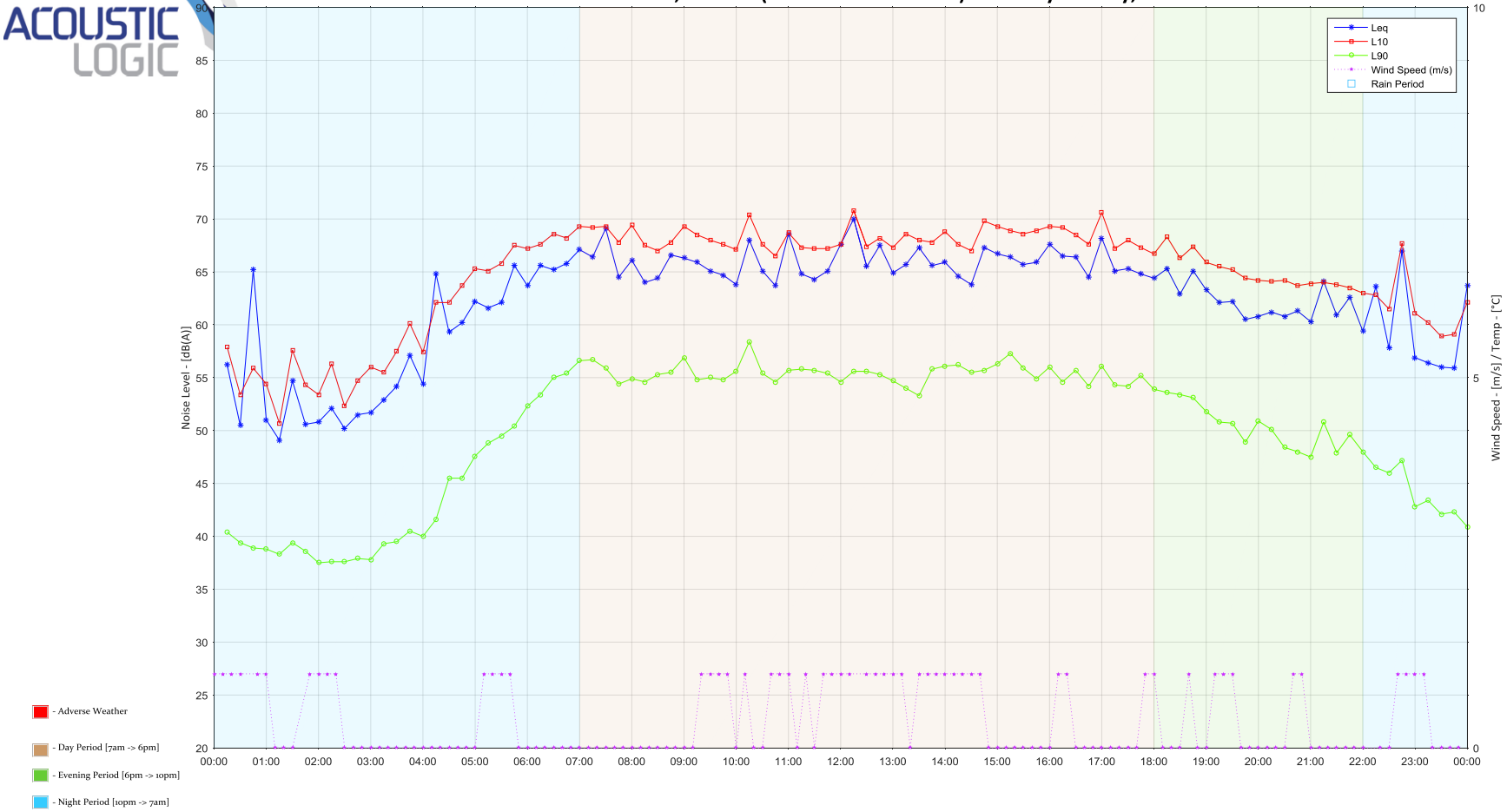
Acoustic Logic Consultancy Pty Ltd
Matthew Furlong

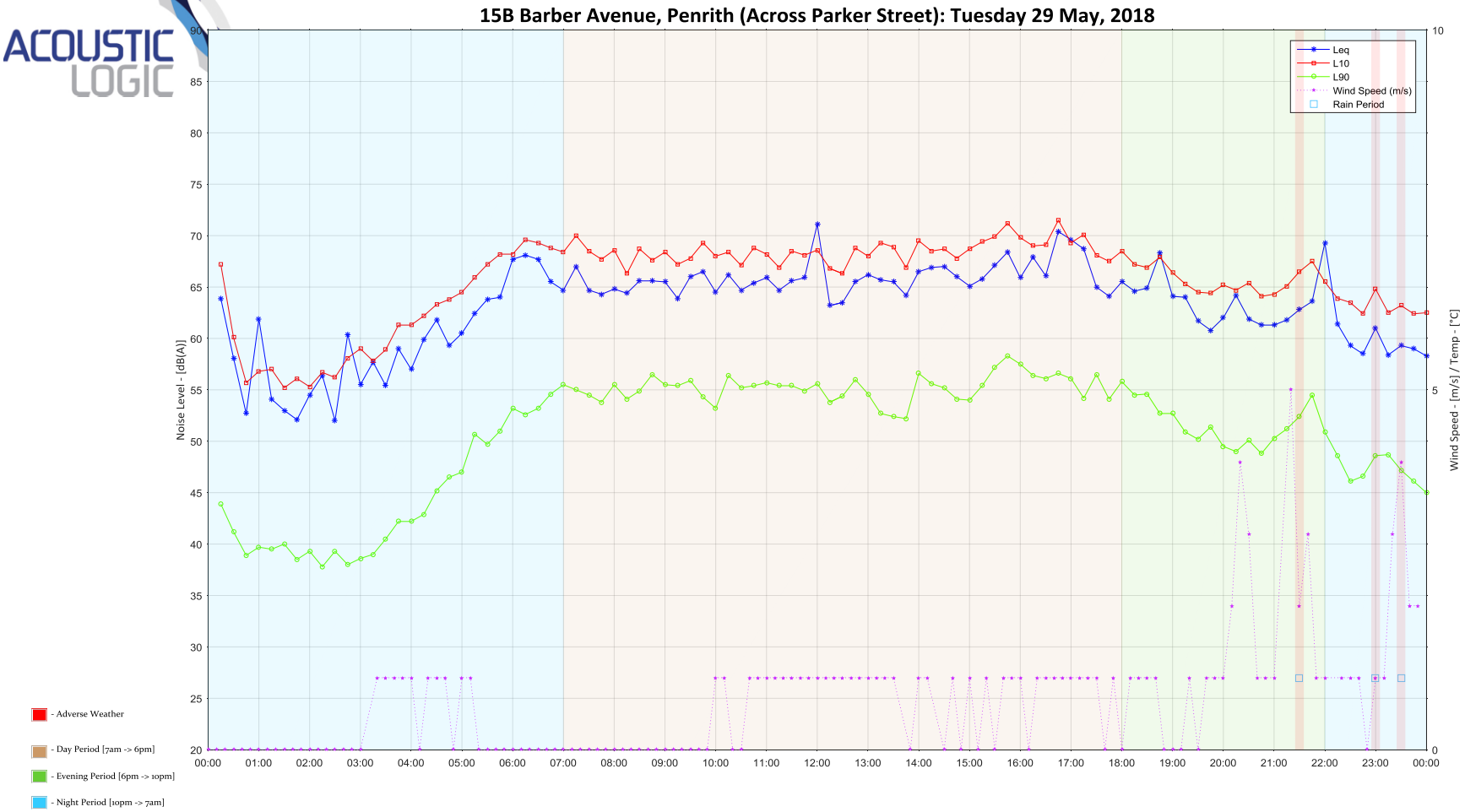
APPENDIX A – UNATTENDED NOISE MONITORING DATA – LOGGER LOCATION 1 – 15B BARBER AVENUE, PENRITH

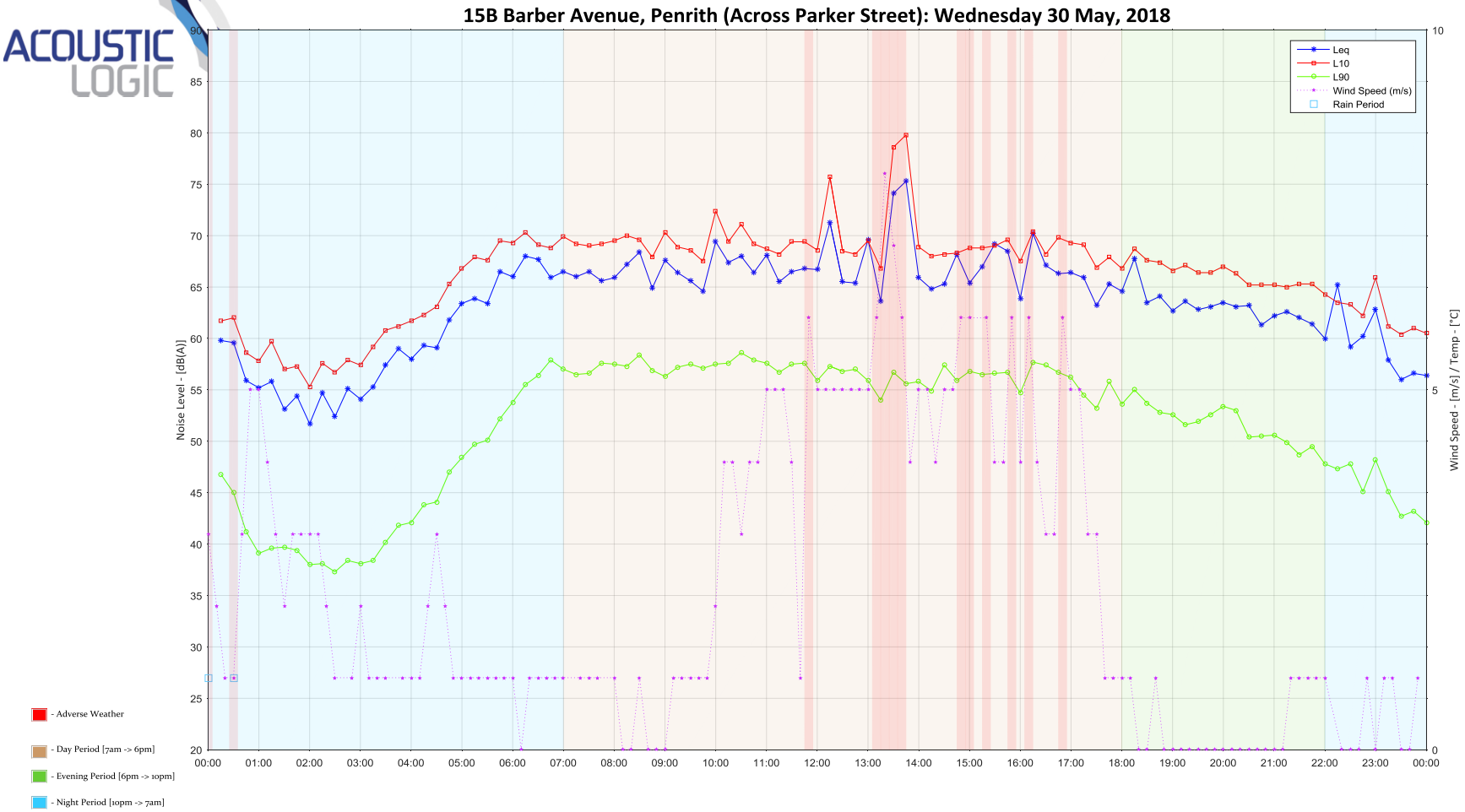

15B Barber Avenue, Penrith (Across Parker Street): Friday 25 May, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


15B Barber Avenue, Penrith (Across Parker Street): Saturday 26 May, 2018
Leq
L10
L90
Wind Speed (m/s)
Rain Period
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


15B Barber Avenue, Penrith (Across Parker Street): Sunday 27 May, 2018
Leq
L10
L90
Wind Speed (m/s)
Rain Period
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


15B Barber Avenue, Penrith (Across Parker Street): Monday 28 May, 2018
Leq
L10
L90
Wind Speed (m/s)
Rain Period
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


15B Barber Avenue, Penrith (Across Parker Street): Tuesday 29 May, 2018
Leq
L10
L90
Wind Speed (m/s)
Rain Period
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


15B Barber Avenue, Penrith (Across Parker Street): Wednesday 30 May, 2018
Leq
L10
L90
Wind Speed (m/s)
Rain Period
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

15B Barber Avenue, Penrith (Across Parker Street): Thursday 31 May, 2018