608-612 High Street, Penrith

DA Acoustic Assessment

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1 INTRODUCTION

This report presents our development application acoustic assessment for the proposed mixed-use development at 608-612 High Street, Penrith.

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

- The Penrith City Council DCP 2014;
- The Department of Planning's 'Development near Rail Corridors and Busy Roads – Interim Guideline';
- Australian and New Zealand AS/NZS 2107:2016 *'Recommended design sound levels and reverberation times for building interiors'*;
- The NSW EPA Industrial Noise Policy (INP);
- The NSW Road Noise Policy;
- The 'Interim Construction Noise Guideline'.

ALC confirms that the development can comply with all of the aforementioned authorities and standards on the proviso that the acoustic treatments nominated in this report are adopted.

This assessment has been conducted using the architectural drawings provided by Building Environments Pty Ltd, project n. 1410 and dated April 2018.

2 SITE DESCRIPTION

The site is located at 608-612 High Street, Penrith. The proposed development consists of a basement level for car parking, a commercial tenancy, a common open space, an on-grade visitors car park on ground level and five residential levels from Level 1 to Level 5.

The northern façade faces the High Street which carries medium to high volumes of traffic. The southern boundary of the site abuts Union Road which carries low volumes of traffic. The East of the site is bounded by an existing commercial development and to the west of the site lies a vacant site.

Figure 1 shows the site surroundings and measurement locations.

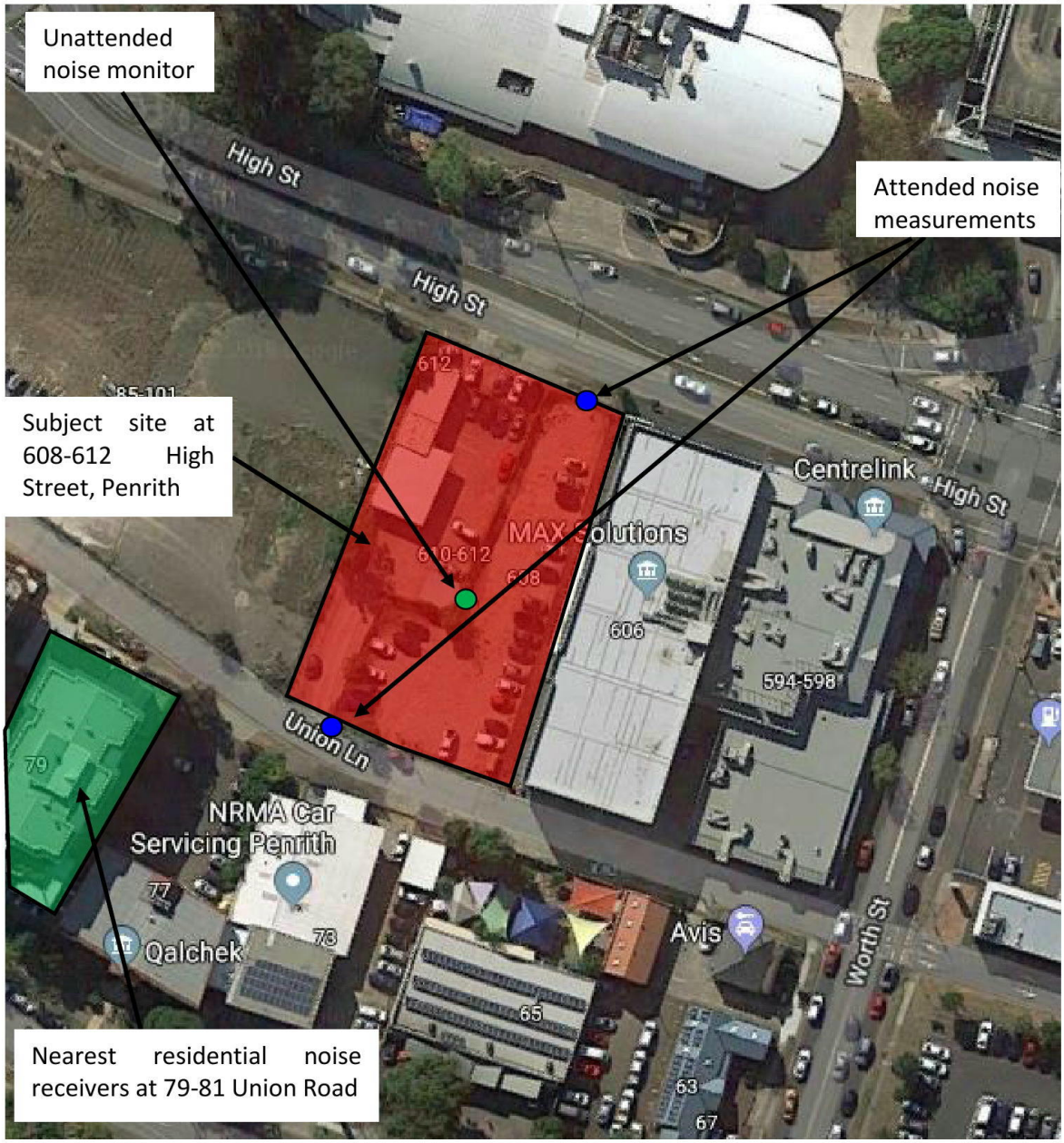


Figure 1: Site Map and Measurement Locations

3 NOISE DESCRIPTORS

Traffic noise constantly varies in level, due to fluctuations in traffic speed, vehicle types, road conditions and traffic densities. Accordingly, it is not possible to accurately determine prevailing traffic noise conditions by measuring a single, instantaneous noise level. To accurately determine the effects of traffic 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. These parameters are used to measure how much annoyance would be caused by a particular noise source.

In the case of 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 at 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 measurement period. L_{eq} is important in the assessment of traffic noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of traffic noise.

Current practice favours the L_{eq} parameter as a means of measuring traffic noise, whereas the L_{10} parameter has been used in the past and is still incorporated in some codes. For the reasons outlined above, the L_{90} parameter is not used to assess traffic noise intrusion.

LA_{max} refers to the maximum noise level occurring during a measurement period, and is used when assessing sleep disturbance impacts.

4 NOISE INTRUSION ASSESSMENT

4.1 PROJECT ACOUSTIC OBJECTIVES

Penrith Council DCP states the following with respect to noise intrusion:

Part C, Section 12.1, Road Traffic Noise

"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.

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."

As per the requirements of the Penrith DCP, the assessment of noise intrusion has been conducted in accordance with the NSW State Environmental Planning Policy Infrastructure (2007).

4.1.1 State Environmental Planning Policy 2007

The NSW Department of Planning's policy, Development Near Rail Corridors And Busy Roads – Interim Guideline, sets out internal noise level criteria adapted from the State Environmental Planning Policy (Infrastructure) 2007 (the 'Infrastructure SEPP') for developments with the potential to be impacted by traffic or rail noise and vibration.

The Infrastructure SEPP defines busy roads that are subject to an acoustic assessment as:

"Clause 102: development for any of the following purposes that is on land in or adjacent to a road corridor for a freeway, a tollway or a transit way or any other road with an annual average daily traffic volume of more than 40,000 vehicles (based on the traffic volume data available on the website of the RTA) and that the consent authority considers is likely to be adversely affected by road noise or vibration:

- *building for residential use*
- *a place of public worship*

- *a hospital*
- *an educational establishment or childcare."*

The Infrastructure SEPP sets out the following criteria for internal noise levels from airborne traffic noise:

> *"For Clauses 87 (Rail) and 102 (Road):*
>
> *"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."*

Internal requirements are for residential spaces and are measured internally with windows closed.

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

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

Table 1 – Recommended Design Sound Level

Space /Activity Type	Recommended Maximum Design Sound Level dB(A) L_{eq}
Commercial	45 dB(A)L_{eq}
Retail	50dB(A) L_{eq}

4.1.3 Summary of Applicable Criteria

The governing project criteria are presented in the table below.

Table 2 – Internal Noise Level Criteria

Location	Criteria
	Traffic Noise Intrusion
Bedroom	35 dB(A) $L_{eq(9hr)}$
Living Area	40 dB(A) $L_{eq(15hr)}$
Commercial	45 dB(A)L_{eq} (9 hour, when in use)
Retail	50dB(A) L_{eq} (9 hour, when in use)

Compliance with the criteria in the table above will result in compliance with Council's DCP and SEPP Infrastructure.

4.2 NOISE MEASUREMENTS

Traffic measurements were taken along future facades the proposed development. Both short term (attended) and long term (unattended) measurements were conducted.

A Long-term monitor was installed within the middle of the existing site (between Union and High Street). The monitor had a full view of the road without any obstructions, as indicated in Figure 1. The long-term noise monitor was conducted from 14th May 2018 to 21st May 2018. Supplementary attended measurements were taken at various locations of the site, as shown in Figure 1. These were conducted on 21st May 2018.

The long-term monitoring was conducted using an Acoustic Research Laboratories Pty Ltd noise logger. The logger was set to A-weighted fast response and was programmed to store 15-minute statistical noise levels throughout the monitoring period. The monitor was calibrated at the start and end of the monitoring period using a Rion NC-73 calibrator. No significant drift was noted.

Attended measurements were undertaken using a Norsonic 140 sound level analyser, set to A-weighted fast response. The sound level analyser was calibrated before and after the measurements, no significant drift was noted.

The traffic noise levels listed in the table below were determined based on the logging data and attended measurements. In determination of acoustic treatments, the measured level is adjusted for distance and orientation.

Table 3 – External Noise Level (Traffic Noise)

Location	Time Period	Traffic Noise Level
Northern Façade (High Street)	Day	68 dB(A)$L_{Aeq\ (15hr)}$
	Night	63 dB(A)$L_{Aeq\ (9hr)}$

4.2.1 Glazing Construction

The recommended glazing assemblies are indicated in the table below. The glazing thicknesses recommended are those needed to satisfy acoustic requirements and do not take into account other requirements such as structural, safety or other considerations. These additional considerations may require the glazing thickness to be increased beyond the acoustic requirement.

Table 4 – Residential Units - Glazing Requirements

Façade	Room	Glazing Thickness	Acoustic Seals
High Street	Bedroom	10.38mm laminated glass	Yes
	Living Room	10.38mm laminated glass	Yes
Eastern / Western	Bedroom	6.38mm laminated glass	Yes
	Living Room	6.38mm laminated glass	Yes
Union Road	Bedroom	6.38mm laminated glass	Yes
	Living Room	6mm glass	Yes

Table 5 – Retail / Commercial

Façade	Room	Glazing Thickness	Acoustic Seals
High Street	Retail	6mm toughened	Yes
	Commercial	10mm toughened	Yes
All Others	Retail	6mm toughened	Yes
	Commercial	6mm toughened	Yes

Note: Glazing to be reviewed at CC stage based on construction drawings.

In addition to complying with the minimum scheduled glazing thickness, the STC/R_w rating of the glazing fitted into operable frames and fixed into the building opening should not be lower than the values listed in the table below.

Where nominated, this will require the use of acoustic seals equal to Schlegel Q-lon series *(acoustic bulb seal)* around the full perimeter of operable frames. The frame will need to be sealed into the building opening using a flexible 100% polyurethane sealant equal to Bostik Seal N' Flex. Note that mohair seals and/or mohair/plastic fin combination seals in windows and doors are **not** acceptable where acoustic seals are required.

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

Table 6 – Minimum STC/R_w of Glazing Requirements

Glazing Assembly	Acoustic Seals	Minimum STC/R_w of Installed Window
6mm toughened	Yes	29
6.38mm laminated	Yes	31
10mm toughened	Yes	33
10.38mm laminated	Yes	35

4.2.2 External Walls

For external walls of masonry construction, no acoustic upgrade is required. There should be no vents on the internal skin of external walls. All penetrations in the internal skin of external walls should be acoustically sealed. In the event lightweight external constructions are used, these are to be reviewed at CC stage.

4.2.3 Roof/Ceiling Construction

The proposed concrete slab roof does not require any acoustic upgrade. Penetrations in ceilings (such as for light fittings etc.) must be sealed gap free with a flexible sealant. Any ventilation openings in the ceilings would need to be acoustically treated to maintain the acoustic performance of the ceiling construction.

4.2.4 External Doors

Any glass doors should be constructed using glazing thickness set out in Table 4 and Table 5. Full perimeter acoustic seals around the doors are required.

4.3 MECHANICAL VENTILATION

As internal levels cannot be achieved with windows open for units facing High Street (see figure below), it is required that an alternative outside air supply system or air conditioning be installed to meet AS 1668.2 requirements.

Any mechanical ventilation system that is installed should be acoustically designed such that the acoustic performance of the recommended constructions is not reduced by any duct or pipe penetrating the wall/ceiling/roof.

Noise emitted to the property boundaries by any ventilation system shall comply with EPA or Local Council guidelines.

5 NOISE EMISSION ASSESSMENT

The external noise emission criteria are set up in this section of the report to ensure that the amenities of nearby land users are not adversely affected.

5.1 BACKGROUND NOISE MONITORING

A long-term unattended monitor was used for background noise measurements supplemented with attended measurements at the boundaries of the site.

Table 7 – Measured Background Noise Levels

Location	Period/Time	Background Noise Level dB(A) $L_{90(period)}$
Surrounding Residential Receivers	Day (7am-6pm)	47
	Evening(6pm-10pm)	45
	Night(10pm-7am)	40

5.2 NOISE EMISSION OBJECTIVES – GENERAL OPERATION AND MECHANICAL PLANT

The following documents are used to establish the noise emission criteria for the development site:

- Penrith City Council Development Control Plan 2014;
- EPA Noise Policy for Industry; and
- Protection of Environmental Operation Act Regulation;
- NSW Road Traffic Noise Policy.

5.2.1 Penrith City Council Development Control Plan 2014

Penrith Council Development Control Plan does not contain any explicit noise criteria for noise emissions. Therefore, the typically adopted NSW EPA Noise Policy for Industry will be adopted.

5.3 EPA - NOISE POLICY FOR INDUSTRY (NPfI)

Noise sources covered by this code include mechanical services noise (the identified potential noise emission source from the site). Both the Intrusiveness and the Project Amenity criteria (as set out below) must be complied with.

5.3.1 NPfI - Intrusiveness Noise Goals

Intrusiveness criteria permit noise generation to be no more than 5dB(A) above existing background noise levels. The criteria are as follows:

Table 8 - EPA Intrusiveness Criteria

Location	Time of Day	Background noise Level - dB(A)L_{90}	Intrusiveness Noise Objective dB(A)$L_{eq(15min)}$ (Background + 5dB)
Residences Surrounding the Site	Day Time (7am - 6pm)	47	52
	Evening (6pm - 10pm)	45	50
	Night (10pm - 7am)	40	45

5.3.2 INP – Project Amenity Goals

Project amenity criteria are determined based on the land use in the area (residential/commercial/industrial). The residential land use is then further categorised into rural, sub-urban and urban areas. For the purpose of this assessment the existing residential dwellings will be considered suburban.

Table 9 -EPA Project Amenity Criteria

Noise Receiver	Amenity Noise Level – dB(A)$L_{Aeq(15min)}$		
	Daytime	Evening	Night
Existing Residential (Suburban)	45	43	38

5.4 SLEEP AROUSAL ASSESSMENT

Potential sleep arousal impacts should be considered for noise generated after 10pm.

Sleep arousal is a function of both the noise level and the duration of the noise.

As recommended in the NPfI, to assess potential sleep arousal impacts, a two-stage test is carried out:

- Step 1 – Section 2.5 *Maximum noise level event assessment* from the NPfI states the following:

  Where the subject development/premises night-time noise levels at a residential location exceed:

  - $L_{Aeq,15min}$ *45dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or*
  - L_{AFmax} *55 dB(A) or the prevailing RBL plus 15 dB, whichever is greater,*

  a detailed maximum noise level event assessment should be undertaken.

Based on the above the following noise objectives apply:

Table 10– Sleep Arousal Criteria (Maximum/L_{Max} Noise Events)

Location	Rating Background Level dB(A)L_{90}	Rating Background Level + 15dB(A)	Governing Criteria dB(A)$L_{(Max)}$
Surrounding Residential Receivers	40	55	55

- Step 2 - If there are noise events that could exceed the average/maximum criteria detailed in the tables above, then an assessment of sleep arousal impact is required to be carried out taking into account the level and frequency of noise events during the night, existing noise sources, etc. This test takes into account the noise level and number of occurrences of each event with the potential to create a noise disturbance. As is recommended in the explanatory notes of the EPA Industrial Noise Policy, this more detailed sleep arousal test is conducted using the guidelines in the EPA Road Noise Policy. Most relevantly, the Road Noise Policy states:

  For the research on sleep disturbance to date it can be concluded that:

  - *Maximum internal noise levels below 50-55dB(A) are unlikely to awaken people from sleep.*
  - *One to two noise events per night with maximum internal noise levels of 65-70dB(A) are not likely to affect health and wellbeing significantly.*

5.5 NOISE FROM INCREASED TRAFFIC GENERATION ON PUBLIC STREETS

For land use developments with the potential to create additional traffic, the requirements of the NSW EPA Road Noise Policy are typically applied. Noise emission guidelines as a result of road traffic generated by the site (as measured at the façade of a nearby residence) is presented below.

Table 11 – Criteria for Traffic Noise Generated by New Developments

Road Type	Time of day	Criteria for Acceptable Traffic Noise Level Arterial Roads
Local	Day (7am to 10pm)	55dB(A)$L_{eq(1hr)}$
	Night (10pm to 7am)	50dB(A)$L_{eq(1hr)}$

5.6 ASSESSMENT OF NOISE EMISSIONS

5.6.1 Mechanical plant

Detailed review of all external mechanical plant should be undertaken at construction certificate stage (once plant selections and locations are finalised). Acoustic treatments should be determined in order to control plant noise emissions to the levels set out in section 5.2 of this report.

While compliance with noise emission requirements will be achievable with appropriate acoustic treatment, it is highly likely that any roof top equipment which may operate 24 hours per day (such as refrigeration plant) will require either enclosure in plant rooms or acoustic screens to provide a line of sight break between the equipment and any future residences.

Other equipment external items (fans) would be expected to be capable of compliance through use of internal duct lining and/or in-duct attenuators.

5.6.2 On-grade Car Park

The following development controls should be incorporated to ensure that noise emissions from the car park comply with the nominated criteria.

- The car park pavement shall be smooth and level to ensure minimal vertical displacement and potential for noise generated by wheel to concrete impacts. The surface finish shall be of a type that minimises squealing of car tyres.
- Concrete to have a broom finish or similar, to prevent tyre squeal.
- Traffic calming devices should be applied to control vehicle speeds below 10km/Hour.
- No speed humps are to be installed within the car park.
- Grates and any cover plates are to be fixed flush and tight. Any cover plates are to be smooth and level with the slab (ie no humps).

5.6.3 Retail

In the event that café tenants propose late night use of outdoor dining areas, it is assumed this would be part of a separate development application where detailed review of operating times and patron numbers (and the associated noise generated) would be assessed with reference to Council and (if necessary) Liquor and Gaming NSW acoustic criteria.

5.6.4 Garbage Collection

Recommendations are as follows:

- Balers to be vibration isolated from the building structure.

6 CONSTRUCTION NOISE AND VIBRATION ASSESSMENT

Both noise and vibration criteria for construction activities will be outlined below.

6.1 CONSTRUCTION NOISE

Relevant guidelines are:

- The NSW EPA Interim Construction Noise Guidelines and
- Australian Standard 2436.

6.1.1 NSW EPA Interim Construction Noise Guidelines

This guideline nominates acceptable levels of noise emissions above the background noise level. For projects within the recommended standard hours the guideline recommends a noise level of 10dB(A) above the background – this level is referred to as the "noise affected level". The noise emission goals for nearby development is as follows:

Where noise from the construction works is above the "noise affected level", the proponent should apply any feasible and reasonable work practices to minimise noise.

If noise emissions are likely to exceed 75dB(A)$L_{eq(15min)}$, the receiver is deemed to be "highly noise affected". Introduction of management controls such as scheduling of noisy periods, or respite periods is recommended.

Table 12 - Noise Emission Goal – Residential Properties

TIME OF DAY	MEASURED BACKGROUND LEVELS – dB(A)L_{90}	NOISE AFFECTED LEVEL BACKGROUND + 10dB(A)$L_{eq(15min)}$	HIGHLY NOISE AFFECTED MANAGEMENT LEVEL, dB(A)$L_{eq(15min)}$
Day (7am-6pm)	47	57	75

6.1.2 Australian Standard 2436-1981 "Guide to Noise Control on Construction Maintenance and Demolition Site".

Where compliance with NSW EPA cannot be achieved, noise emissions are to be managed in accordance with principles in AS2436:

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

6.2 VIBRATION

Vibration caused by construction should be limited to:

- For structural damage vibration, German Standard DIN 4150-3 *Structural Vibration: Effects of Vibration on Structures; and*

- For human exposure to vibration (amenity), the evaluation criteria presented in the British Standard BS 6472:1992 *Guide to Evaluate Human Exposure to Vibration in Buildings (1Hz to 80Hz)* for low probability of adverse comment

The criteria and the application of this standard are discussed in separate sections below.

6.2.1 Structure Borne Vibrations

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 Table 13.

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 13 - 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

6.2.2 Assessing Amenity

Department of Environment and Conservation NSW "Assessing Vibration: A Technical Guideline" (Feb 2006) is based on the guidelines contained in BS 6472:1992. This guideline provides procedures for assessing tactile vibration and regenerated noise within potentially affected buildings.

The recommendations of this guideline should be adopted to assess and regulate vibration within the construction site.

Table 14 – NSW EPA Recommended Vibration Criteria

		RMS acceleration (m/s^2)		RMS velocity (mm/s)		Peak velocity (mm/s)	
Place	Time	Preferred	Maximum	Preferred	Maximum	Preferred	Maximum
Continuous Vibration							
Residences	Daytime	0.01	0.02	0.2	0.4	0.28	0.56
Impulsive Vibration							
Residences	Daytime	0.3	0.6	6.0	12.0	8.6	17.0

6.3 COMMENT / ASSESSMENT

Potential noise and vibration impacts are reviewed below.

Noise impacts on nearby development will be dependent on the activity and where on the site the activities will be undertaken.

We note that at this stage, providing a detailed construction noise management plan for Penrith City Council is not feasible as no contractor is engaged and no equipment schedule or site operations methodologies (locations of equipment, truck routes, timetabling) are available.

For this reason, the detailed construction noise and vibration management plans will be prepared at CC stage when a contractor has been engaged to ensure that the management controls are applied.

Once the above information (construction methodologies, construction plant schedule, etc) is provided by the client, noise levels generated by construction activities will be predicted and assessed as per the following:

If required, noise impacts will be minimised using the following:

- Selection of equipment and process.
- Location of static plant (particularly concrete pumps).
- Use of screens or enclosures (typically only feasible for static plant).
- Scheduling of noisy activities and provision of respite periods.

In light of the above, we recommend:

- On completion of the construction program, an acoustic review of proposed construction activities and plant/methods should be undertaken to identify work items likely to exceed NSW EPA guidelines.

- For those activities likely to generate high noise levels, the analysis should identify where on the site are the areas likely to result in high noise levels. This will then assist in determining the likely time period for which high noise levels will occur.

- Identify feasible acoustic controls or management techniques (use of screens, scheduling of noisy works, notification of adjoining land users, respite periods) when excessive levels may occur.

- For activities where acoustic controls and management techniques still cannot guarantee compliant noise levels, implement a notification process whereby nearby development and sensitive receivers are made aware of the time and duration of noise intensive construction processes.

Through adoption of the above, noise impacts on nearby development can be suitably managed to prevent excessive impact.

7 CONCLUSION

This report presents the assessment of noise impacts associated with the proposed mixed-use development to be located at 608-612 High Street, Penrith.

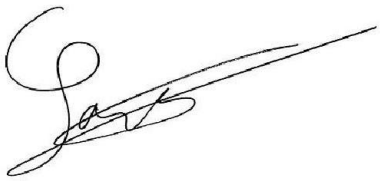
Noise intrusion impact from traffic noise onto the future occupants of the development has been assessed in accordance with State of Environment Planning Policy (Infrastructure) and Penrith Council DCP. The acoustic treatments in principle necessary to achieve these guidelines have been set presented within this report.

Noise emission criteria for the development site have been determined based on the site noise logging and NSW EPA Noise Policy for Industry and Protection of the Environmental Operation Act Regulation. These requirements have been presented in Section 5.

ALC confirm that acoustic treatments have been formulated to ensure that internal noise levels comply with the requirements of Penrith City Council DCP and Australian Standard AS2107-2016 “Recommended Design Sound Levels and Reverberation Times for Building Interiors”.

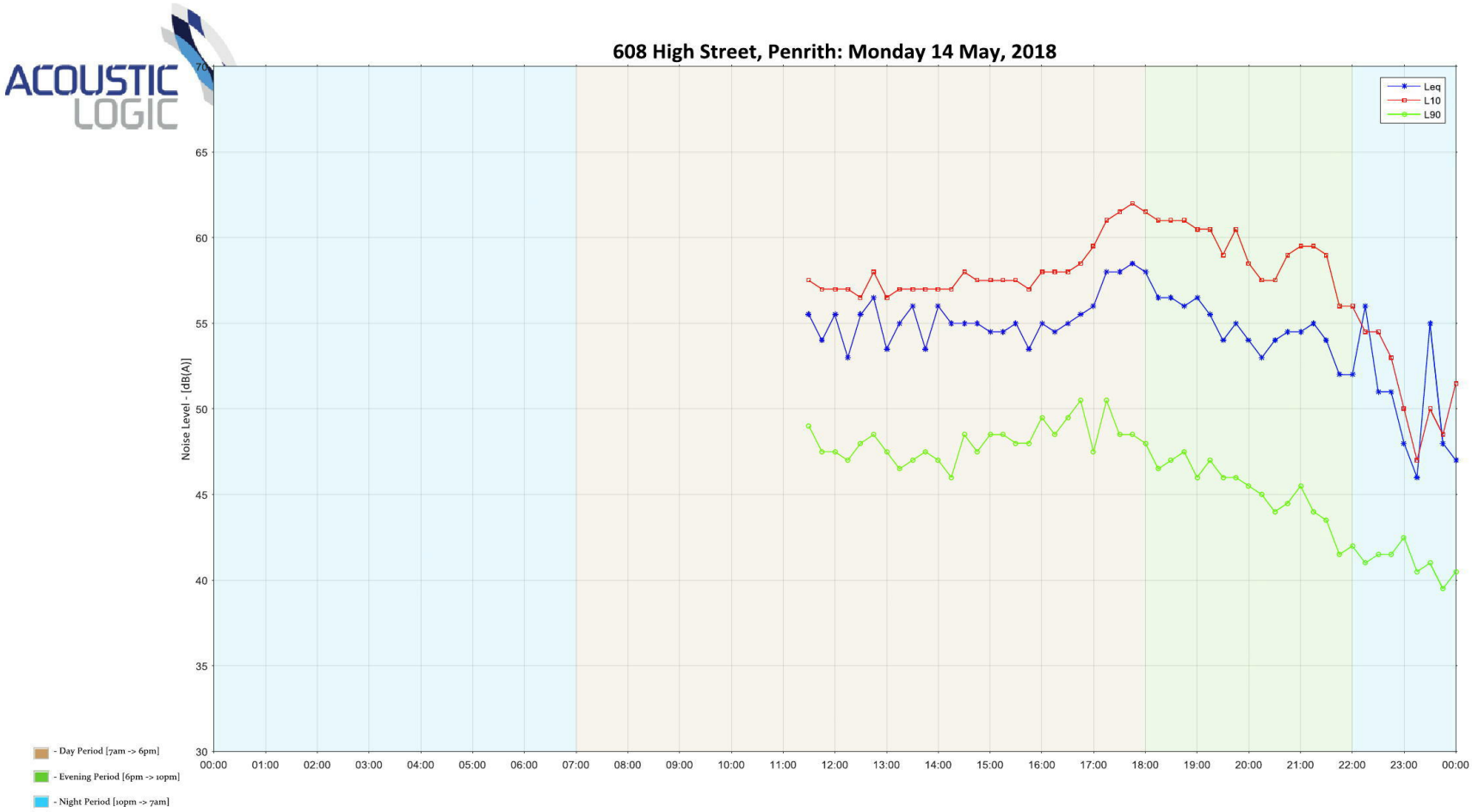
Please contact us should you have any further queries.

Yours faithfully,



Remi Larmandieu

APPENDIX 1 – UNATTENDED NOISE MONITORING DATA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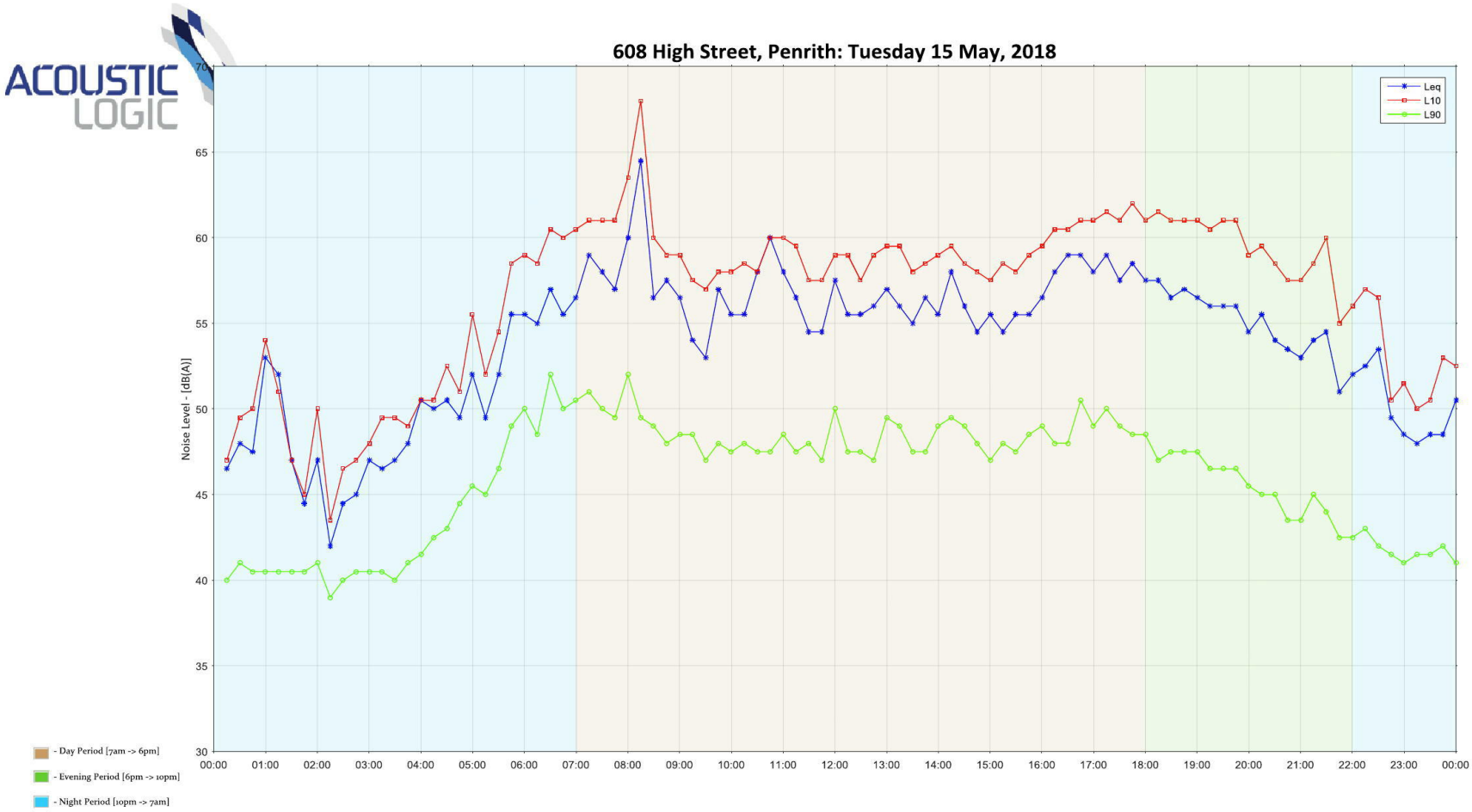
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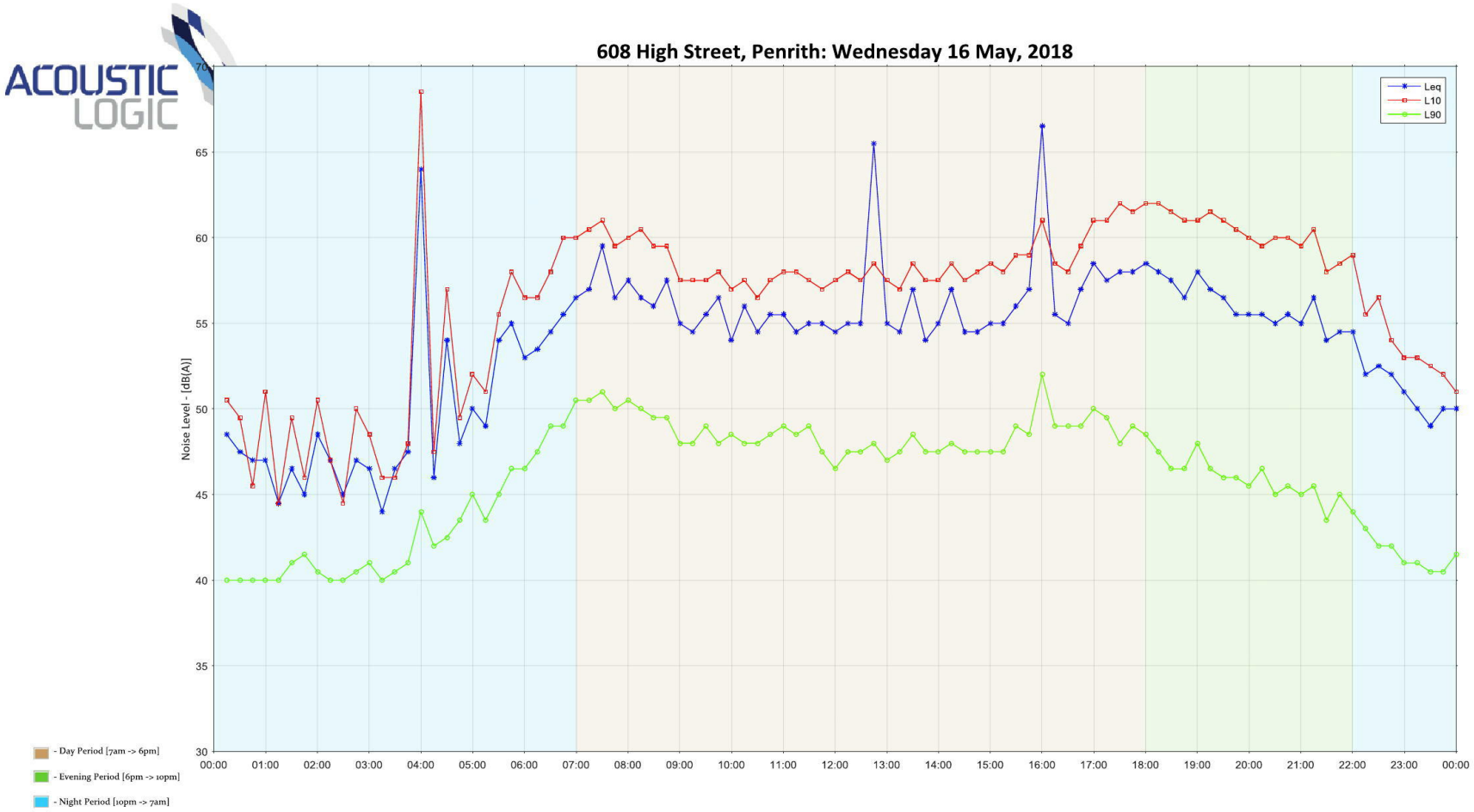
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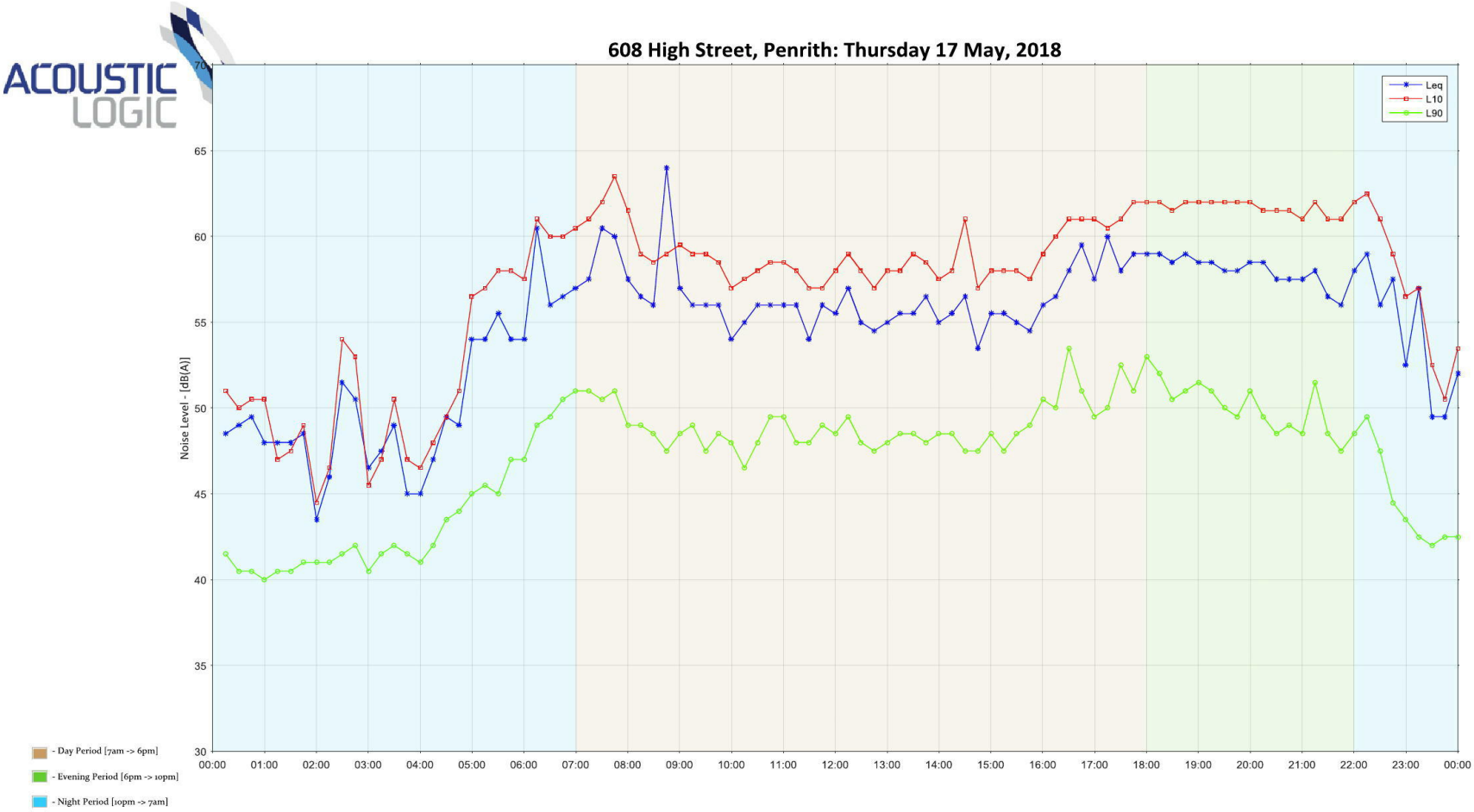
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


608 High Street, Penrith: Thursday 17 May, 2018
Leq
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Noise Level - [dB(A)]
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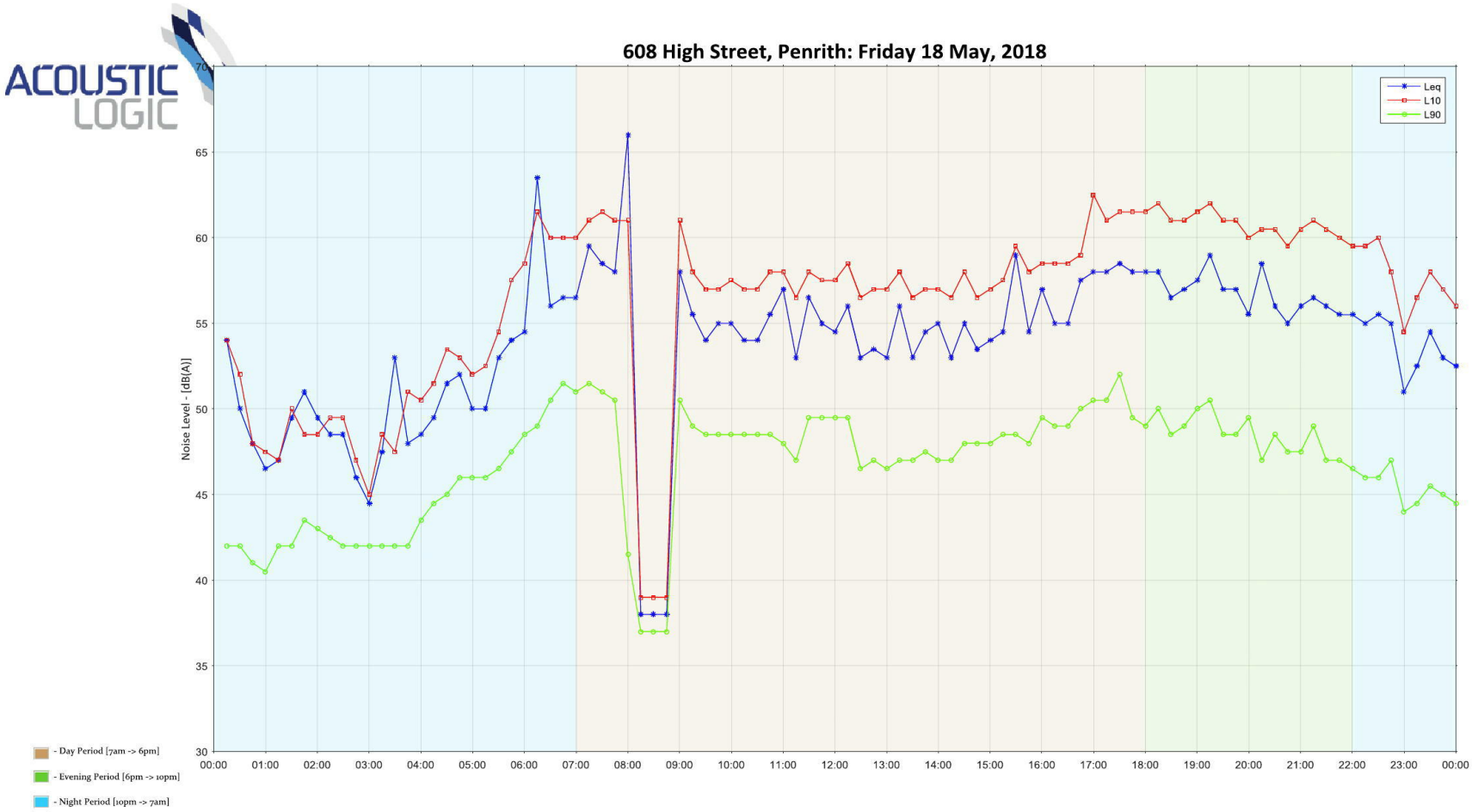
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


608 High Street, Penrith: Friday 18 May, 2018
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Noise Level - [dB(A)]
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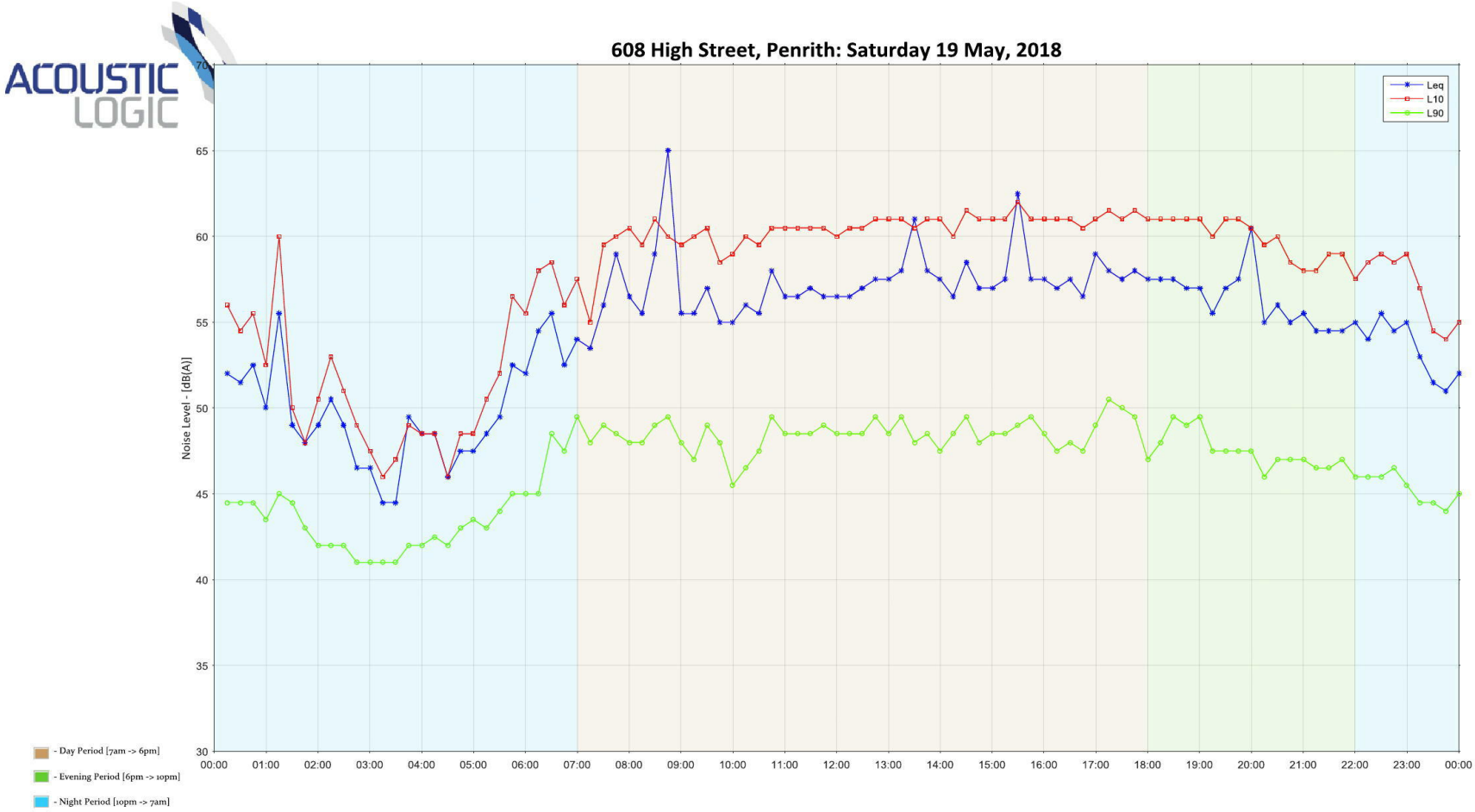
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


608 High Street, Penrith: Saturday 19 May, 2018
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Noise Level - [dB(A)]
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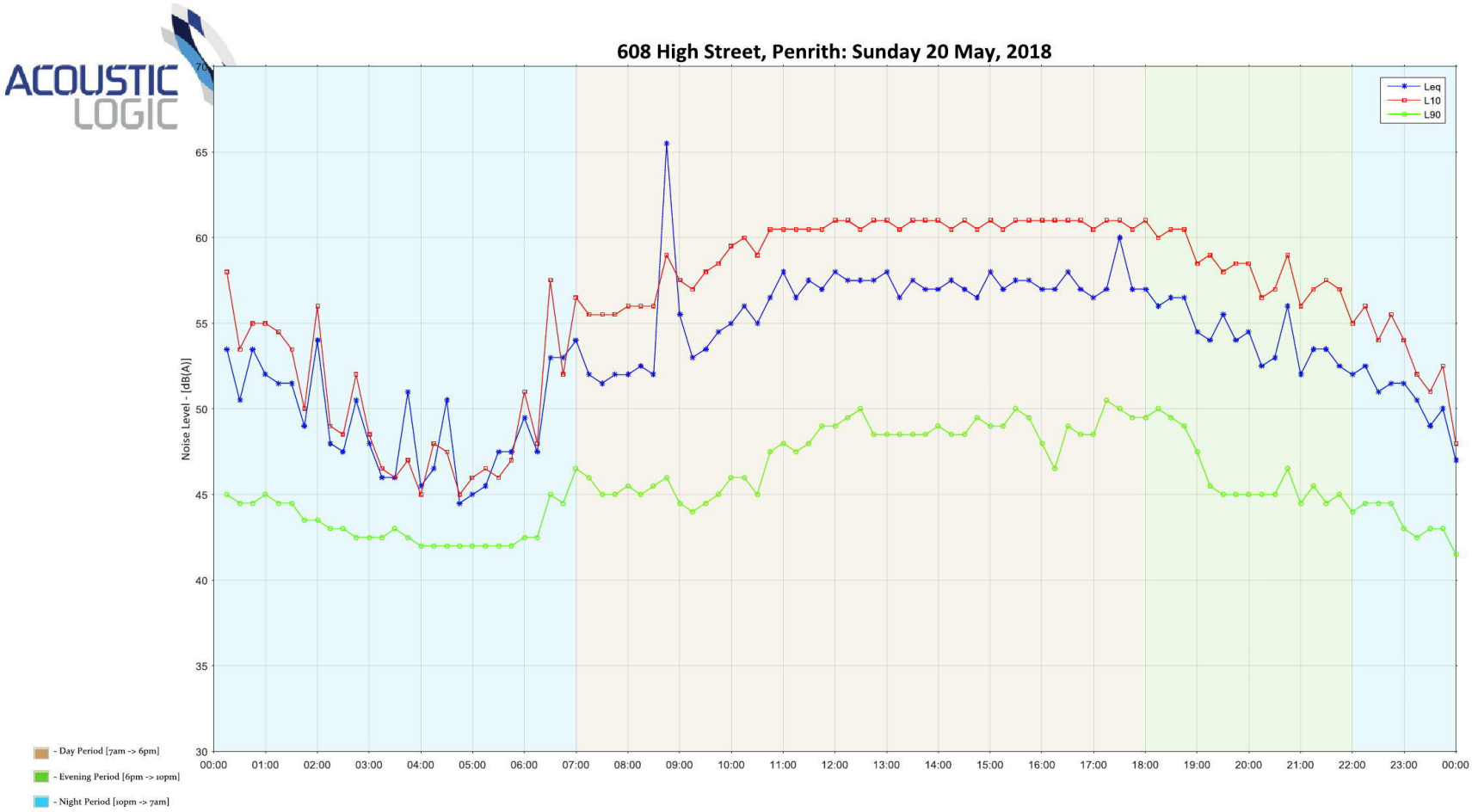
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


608 High Street, Penrith: Sunday 20 May, 2018
Leq
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Noise Level - [dB(A)]
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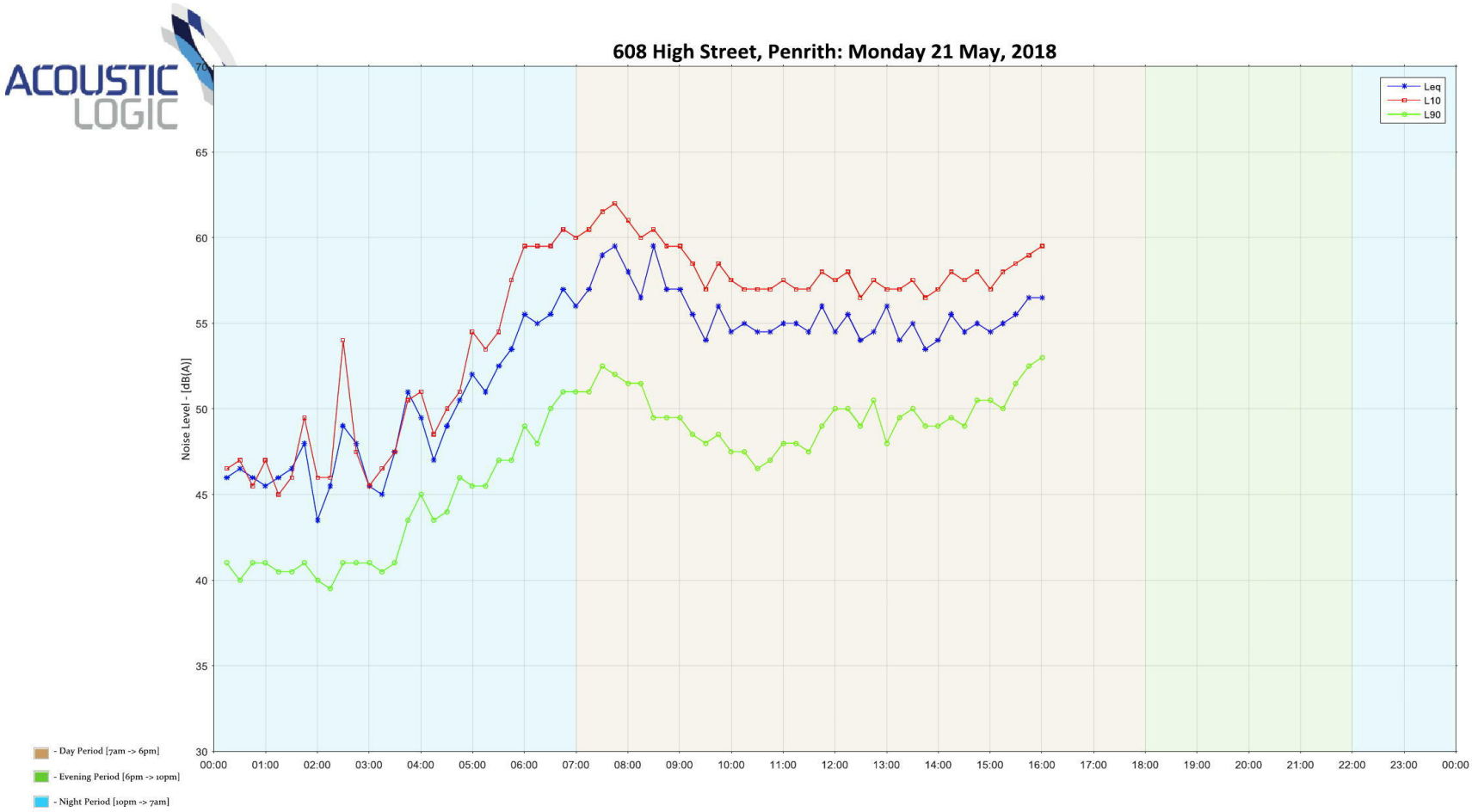
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


608 High Street, Penrith: Monday 21 May, 2018
Leq
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Noise Level - [dB(A)]
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- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]