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**BAPS Swaminarayan Hindu Temple,
230-242 Aldington Road, Kemps Creek**

Acoustic Assessment

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1 INTRODUCTION

Acoustic Logic Consultancy has been engaged to undertake an assessment of operational noise likely to be associated with the proposed BAPS Swaminarayan Hindu Temple, at 230-242 Aldington Road, Kemps Creek.

In this report, we will:

- Identify nearby noise sensitive receivers and anticipated operational noise sources with the potential to adversely impact nearby development.
- Identify relevant Council and EPA acoustic criteria applicable to the development.
- Predict operational noise emissions and assess them against acoustic criteria.
- If necessary, determine building and/or management controls necessary to ensure ongoing compliance with noise emission goals.

2 SITE DESCRIPTION AND PROPOSED WORKS

The site is located on 230-242 Aldington Road, Kemps Creek.

The current use of the site, and the surrounding land use is primarily rural residential.

The proposed development consists of the construction of a Place of Public Worship. The site comprises the following:

- The “Landscape Precinct” – the western third of the site.
- The “Central Precinct” – the central third of the site.
- The “Mandir and Monks Residence Precinct” – the eastern third of the site.

Primary elements and uses of the three precincts are as follows:

- The Landscape Precinct:
 - This consists primarily of a garden area and provides pedestrian and vehicular access to the site.
 - There are 96 passenger vehicle parking spaces in this area.
- The Central Precinct:
 - This area has two primary buildings:
 - Block B and D – a kitchen and multiuse building.
 - Block A and C – the Sabha Hall and Youth Centre (and includes two activity halls and a number of classrooms/offices within it).

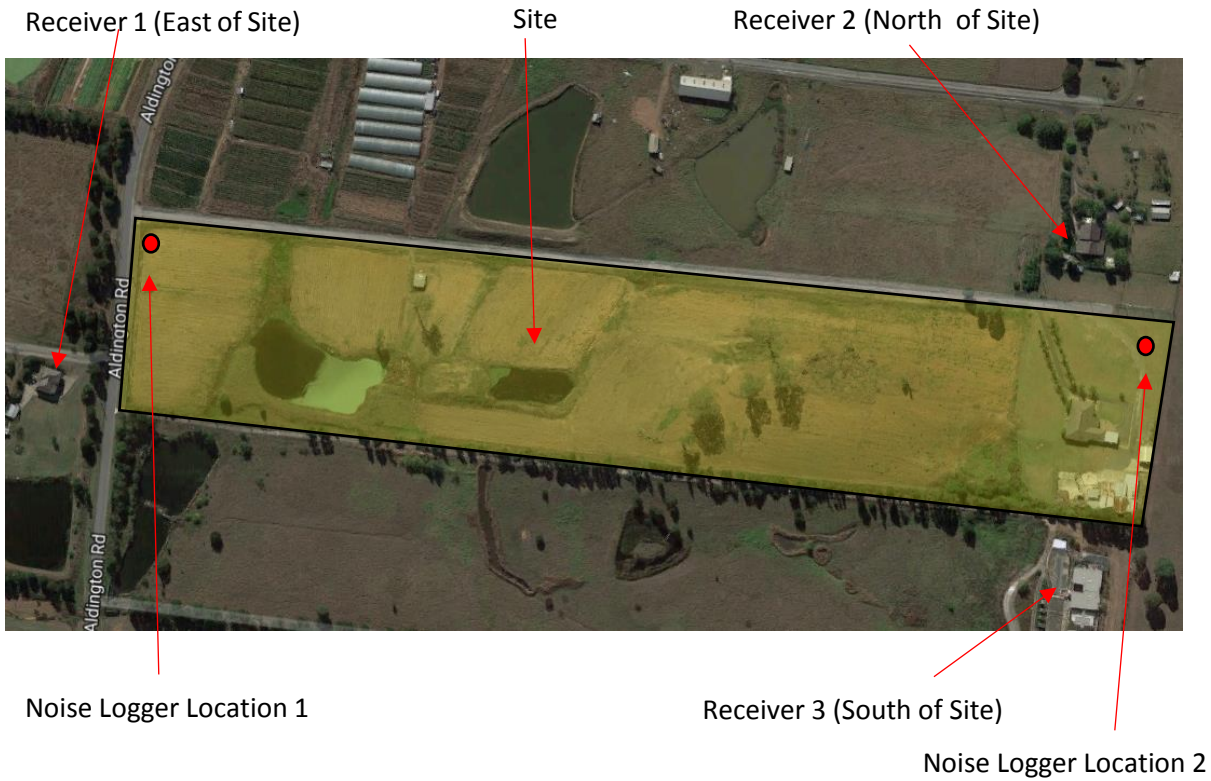
- The Sabha Hall is used to house the Sunday congregation of 600 people between 4.30pm and 6.30pm (congregation arriving individually or small groups and the primary noise source being group/chorus chanting) and special event congregation of approximately 800 people.
- Both buildings have external roof terraces, however these are not accessible to the public.
- The Central Precinct also contains two outdoor play areas.
- There are approximately 149 passenger vehicle parking spaces available.
- Monks Residences and Mandir/Temple (Block F):
 - Within the Mandir - Individual meditation and prayer between 7.00am and 11.30am and 4.00pm to 7.00pm daily (individual/ritual chanting, with approximately 50 congregation members and typically arriving/leaving separately through the 3 hour period).
 - The Monk's residence does not have group activities or musical performances and would not generate significant noise.
 - There are approximately 56 passenger vehicle parking spaces available.

The site is bounded as follows:

- To the west by Aldington Road. Further to the west (on the opposite side of Aldington Road) is a rural residential development (Receiver 1, as identified in the aerial photograph below).
- To the north and south by rural residential development. We note that the residential dwelling on these properties is located at the eastern end of the site (closest to the Mandir/Monk's Residence). These residences are identified as Receivers 2 and 3 respectively in the aerial photograph below.
- To the east by rural land (no residences). The nearest residence to the east are the suburban residences on Bowood Road, approximately 630m from the eastern boundary of the site (Receiver 4).

See aerial photograph below.

Aerial Photo – Site



Aerial Photo – District View



3 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 traffic noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of environmental noise.

L_1 levels represent is the loudest 1% noise event during a measurement period.

4 SURVEY OF AMBIENT NOISE

Unattended noise logging was conducted to quantify the existing acoustic environment at the site.

Unattended noise monitoring was using Acoustic Research Laboratories monitors set on A-weighted fast response mode. The monitors were calibrated before and after the measurements using a Rion Type NC-73 calibrator. No significant drift was recorded.

Two monitors were installed (refer to aerial photograph in section 2 for location):

- One monitor ("Logger 1", installed from 28 August to 4 September 2017) was installed near the eastern boundary of the site. Noise levels at this logger will be indicative of background noise levels and road traffic noise levels experienced by Receiver 1, the residence directly east of the site.
- A second monitor ("Logger 2", installed from 28 August to 4 September 2017) was installed in northern-eastern corner of the site and will be indicative of the background noise levels experienced by the residences to the north and south of the site.

These monitoring locations were selected as they were both secure for monitoring equipment and would provide background noise data representative of the nearest noise receivers. All monitoring locations are marked in the aerial photograph in section 2.

Measured noise levels (ambient and rating background noise level) are presented below.

Table 1 – Long Term Noise Logging Data

Location	Time of Day		
	Daytime (7am-6pm)	Evening (7am-6pm)	Night (7am-6pm)
Logger 1 (Aldington Road)	58dB(AL _{eq} (15min) 36dB(A)L ₉₀	58dB(AL _{eq} (15min) 34dB(A)L ₉₀	51dB(AL _{eq} (15min) 34dB(A)L ₉₀
Logger 2 (Eastern End of site)	45dB(AL _{eq} (15min) 34dB(A)L ₉₀	37dB(AL _{eq} (15min) 34dB(A)L ₉₀	40dB(AL _{eq} (15min) 35dB(A)L ₉₀

5 NOISE EMISSION CRITERIA

The following noise controls and guidelines are applicable to the site:

- Penrith Council DCP 2014.
- EPA Industrial Noise Policy.
- EPA Road Noise Policy.
- EPA guidelines for sleep arousal (Application Notes to the Industrial Noise Policy).

5.1 PENRITH COUNCIL DCP 2014

Places of Public Worship are addressed in section 5.6 of the Penrith DCP:

- Objective B(a) states that the design and location of places of public worship are not to adversely impact the amenity of the area.
- Section 5.6.4(a) states that a noise impact assessment may be required, and if so, the provisions of the Noise and Vibration section of the DCP would apply (section C12 of the DCP).

Relevant sections relating to acoustics from section C12 are as follows:

- Objective B (a) – To ensure that the amenity of all residential development and other sensitive land uses is not significantly affected by road traffic noise.
- Objective (b) - To ensure that the traffic associated with development does not significantly impact upon the amenity of surrounding land uses.
- Control 1b – Requires that a sensitive development (including a place of public worship) comply with the provisions for road traffic noise of State Government and Australian Standards.

Remaining parts of section 12 address rail noise and vibration, aircraft noise, commercial, industrial or rural operational noise and are not relevant to this assessment.

The above criteria do not set specific performance objectives. Instead, they refer to relevant state guidelines or Australian Standards. For the purpose of this assessment, the following standards will be adopted:

- Noise generated by the site will be assessed with reference to the NSW EPA Industrial Noise Policy and associated Application Notes.
- Noise as a result of road traffic generated by the site will be assessed with reference to the NSW EPA Road Noise Policy.

5.2 EPA INDUSTRIAL NOISE POLICY

Noise sources covered by this code will include vehicle noise (generated on the site), operational noise (from use of outdoor areas and internal spaces within buildings) and mechanical services noise. Both the Intrusiveness and the Amenity criteria (as set out below) must be complied with.

5.2.1 INP - Intrusiveness Assessment

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

Table 2 - EPA Intrusiveness Criteria

Location	Time of Day	Background noise Level - dB(A)_{L₉₀}	Intrusiveness Noise Objective dB(A)_{Leq(15min)} (Background + 5dB)
Noise Receiver 1	Day Time (7am - 6pm)	36	41
	Evening (6pm - 10pm)	34	39
	Night (10pm - 7am)	34	39
Noise Receiver 2, 3 and 4	Day Time (7am - 6pm)	34	39
	Evening (6pm - 10pm)	34	39
	Night (10pm - 7am)	35	40

5.2.2 INP - Amenity Assessment

The Amenity criteria set noise emission goals based on the land use of the noise sensitive receivers.

Amenity criteria are as follows:

Table 3 -EPA Amenity Criteria

Receiver Location	Land Type	Time of Day	Amenity Noise Objective dB(A) _{Leq(Period)}
Receivers 1, 2 and 3	Rural Residential	Day Time (7am – 6pm)	50
		Evening (6pm – 10pm)	45
		Night (10pm-7am)	40
Receiver 4	Suburban	Day Time (7am – 6pm)	55
		Evening (6pm – 10pm)	45
		Night (10pm-7am)	40

5.3 SLEEP AROUSAL ASSESSMENT

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

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

Potential impacts are assessed using the recommended procedure in the Application Notes to the EPA Industrial Noise Policy. As recommended in the Application Notes, when assessing potential sleep arousal impacts, a two stage test is carried out:

- Step 1 - An “emergence” test is first carried out. That is, the L_1 noise level of any specific noise source should not exceed the background noise level (L_{90}) by more than 15 dB(A) outside a resident’s bedroom window between the hours of 10pm and 7am. If the noise events are within this, then sleep arousal impacts are unlikely and no further analysis is needed. This is consistent with the Noise Guide for Local Government. The guideline level is set out below.

Table 4 – Sleep Arousal (Emergence Criteria)

Location	Background Noise Level dB(A) _{L90}	Emergence Level dB(A) $L_1(1min)$
Noise Receiver 1	34	49
Noise Receivers 2, 3 and 4	35	50

- Step 2 - If there are noise events that could exceed the emergence level, 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.*

The internal noise level guidelines have also been adopted in this assessment.

5.4 NOISE FROM INCREASED TRAFFIC GENERATION ON PUBLIC STREETS

For land use developments with the potential to create additional traffic on public streets the development should comply with the EPA Road Noise Policy.

Noise levels generated by traffic should not exceed the noise levels set out in the table below when measured at a nearby property.

Table 5 - Criteria for Traffic Noise Generated by New Developments

Road Type	Time of day	Permissible Noise Generation
Sub-Arterial/Collector* (Aldington Road)	Day (7am to 10pm)	60 dB(A) _{Leq(15hr)}
	Night (10pm to 7am)	55 dB(A) _{Leq(9hr)}

*We note that the term Collector Road is a commonly used term in road categorisation but is not used in the Road Noise Policy. The nearest equivalent road categorisation would be sub-arterial.

However, if existing noise levels exceed those in the table above, section 3.4 of the Road Noise Policy is applicable, which requires noise impacts are reduced through feasible and reasonable measures. However, in determining what is feasible/reasonable, the Policy notes that an increase of less than 2dB(A) is a minor impact and would be barely perceptible.

6 NOISE EMISSION ASSESSMENT

An assessment of operational noise emissions is presented. The following noise sources are assessed:

- Noise from the use of external areas:
 - Vehicular noise on site (use of car parks/vehicle circulation).
 - Outdoor play areas.

(We note that the roof terraces in the Youth Centre/Sabha Hall and Multi-Use Building are only accessible for maintenance, and not used by the public and will not be assessed any further).
- Noise from internal areas:
 - The Mandir (chanting – groups of 50 as a worst case scenario).
 - From the Dining Hall and Activity hall in the Multi-Use building and Sabha Hall Youth Centre (teaching activities, music performances on Sundays and Special Events).
 - From Sabha Hall (chanting during the Sunday congregation of 600 people and during special events of up to 800).
- Noise created on public roads as a result of traffic generated by the site.
- A preliminary assessment of noise from mechanical plant.

We note that the site is not located near a busy road, rail corridor or within an aircraft noise affected area (it lies outside the ANEF 20 contour), and as such, an assessment of external noise impact on the site is not required.

6.1 NOISE FROM EXTERNAL AREAS (DESIGNATED PLAYGROUNDS)

Noise emission predictions are based on the following data/assumptions:

- Designated playgrounds (Central Precinct):
 - The sound power level of a child using in outdoor play area is 80dB(A)_{Leq}, with one in two children using the play areas at any one time.
 - Up to 60 children are assumed to use each of the dedicated outdoor play areas at any one time (a reasonable assumption given the size of the play areas and that a total of no more than 600 people are anticipated to be on site during any typical peak period).

Noise emissions are predicted at the following locations:

- The property boundary for Receiver 1 (Aldington Road residence, the nearest residence to the roof top terraces).

- When assessing the designated playground noise, noise emissions are assessed at a point 30m from the dwelling for Receivers 2 and 3 (as is recommended EPA practice when assessing noise impacts on large rural residential properties).

As the primary periods of use of the site are between 7am and 6pm, noise emissions are assessed with reference to the Daytime acoustic criteria.

Table 6 – Assessment of Noise from External Areas

Noise Source	Noise Receiver Location	Predicted Noise Level – dB(A) _{Leq(15min)}	Compliance
Designated Playgrounds	Receiver 2 and 3 (Rural residences north and south of the site)	37dB(A) _{Leq(15min)}	Complies with 39dB(A) noise goal (see tables 2 and 3).

Noise generated by the use of outdoor areas on site is compliant with EPA Industrial Noise Policy noise emission requirements.

6.2 NOISE FROM VEHICLES CIRCULATING ON SITE

With respect to noise from vehicles circulating on the site, the key noise sources that should be assessed are:

- Noise from vehicles entering the site from the Aldington Road driveway.
- Noise from the car parks.

Noise generated by vehicles on site is assessed with reference to the EPA Industrial Noise Policy.

Noise emission predictions are based on the following data/assumptions:

- During a peak one hour period of use, there are up to 300 vehicle movements per hour generated by the site (as per Traffic Impact Assessment by Traffix dated November 2017), and apportioned equally between the northern and southern driveways.
- When driving on the site (approx. 20km/h), a passenger vehicle sound power level of 82dB(A).
- When assessing that noise from the car parks, it is assumed that the eastern most car parks (those closest to the dwelling to the north and south of the site) are used first, and as such represents a worst case scenario assessment.

Noise emissions are predicted at the following locations:

- The property boundary for Receiver 1 (Aldington Road residence, near the driveway entry/exit).
- At a point 30m from the dwelling for Receivers 2 and 3 (as is recommended EPA practice when assessing noise impacts on large rural residential properties).

As the primary periods of use of the site are between 7am and 7pm, noise emissions are assessed with reference to the Daytime acoustic criteria.

Table 7 – Noise Emission Assessment - Vehicles

Noise Source	Noise Receiver Location	Predicted Noise Level – dB(A) $L_{eq(15min)}$	Compliance
Vehicle entry/exit	Receiver 1 (Aldington Road Residence)	40dB(A) $L_{eq(15min)}$	Complies with 41dB(A) noise goal (see tables 2 and 3)
Cars manoeuvring within Car Park	Receiver 2 and 3 (Rural residences north and south of the site)	35dB(A) $L_{eq(15min)}$	Complies with 39dB(A) noise goal (see tables 2 and 3).

Noise generated by vehicles on site is compliant with EPA Industrial Noise Policy noise emission requirements.

6.3 NOISE FROM INTERNAL AREAS (MANDIR, YOUTH HALL/SABHA HALL AND DINING HALL)

Noise emission predictions are based on the following data/assumptions:

- Mandir:
 - It is during the daily congregation that the peak level of noise generation will occur (50 people, chorus chanting for approximately 3 minutes).
 - It is assumed that the sound pressure level within the Mandir is 80dB(A) L_{eq} during chorus chanting (a conservatively high assumption, as measurements of similar activities at similar sites indicates that a sound pressure level of 75dB(A) is more likely).
- Sabha Hall/Youth Centre, Dining Hall:

Two scenarios are considered:

- Typical use, being the Sunday Congregation (600 people) sporting or similar activity within the Activity Halls in the Youth Centre or use of the Dining hall. Sound pressure levels within internal spaces for these activities is assumed to be up to 85dB(A) L_{eq} . For these activities, the windows to the buildings are assumed to be left open.
- Special event usage, which may include a music performance. Sound pressure levels within internal spaces for these activities is assumed to be up to 95dB(A) L_{eq} . For these activities, the windows to the buildings are assumed to be closed.

Noise emissions are predicted at the following locations:

- The property boundary for Receiver 1 (Adlington Road residence, the nearest residence to the Youth Centre/Sabha Hall and Multiuse building).

- When assessing the Mandir noise, noise emissions are assessed at a point 30m from the dwelling for Receivers 2 and 3 (as is recommended EPA practice when assessing noise impacts on large rural residential properties).

Noise emissions will be assessed with reference to Daytime and Evening acoustic criteria.

Table 8 – Assessment of Noise from Internal Areas

Noise Source	Noise Receiver Location	Predicted Noise Level – dB(A) _{Leq(15min)}	Compliance
Sabha Hall/Dining Hall Internal Space (Typical Use with 600 people chanting, Windows Open)	Receiver 1 (Aldington Road Residence)	37dB(A) _{Leq(15min)}	Complies with 39dB(A) noise goal (see tables 2 and 3)
Sabha Hall/Dining Hall Internal Space (Music Performance – Windows Closed)	Receiver 1 (Aldington Road Residence)	<30dB(A) _{Leq(15min)}	Complies with 39dB(A) noise goal (see tables 2 and 3)
Mandir (50 people, chorus chanting, windows closed)	Receiver 2 and 3 (Rural residences north and south of the site).	<30dB(A) _{Leq(15min)}	Complies with 39dB(A) noise goal (see tables 2 and 3)

Noise generated by the use of indoor areas on site is compliant with EPA Industrial Noise Policy noise emission requirements provided that windows to the Mandir and Sabha Hall/Multi-Use Building are kept closed during special events and music performances

6.4 NOISE GENERATED BY ADDITIONAL TRAFFIC ON PUBLIC ROADS

Noise created as a result an increase in traffic on public roads is assessed with reference to the EPA Road Noise Policy.

Primary access/egress to the site is via a driveway on Aldlington Road. Predictions of noise generation are based on the following:

- An assumed sound power level of a vehicle driving on a public road (at 60km/h) of 94dB(A) for a passenger vehicle.
- During a peak period of use, there are up to 300 vehicle movements per hour generated by the site (as per Traffic Impact Assessment by Traffix dated November 2017).
- A 30m front set back to the dwellings on Aldington Road (a worst case scenario, as many are set back further).

Noise emissions are predicted at front façade of the residences on Arlington Road, as is consistent with the EPA Road Noise Policy

As the primary periods of use of the site are between 7am and 10pm, noise emissions are assessed with reference to the Daytime acoustic criteria.

Predicted noise levels are as follows:

Table 9 – Noise Generated by Additional Road Traffic

Time of Day	Receiver Location	Predicted Noise Level – dB(A) L_{eq}	Compliance
Daytime (7am-10pm)	Aldington Road Residences	54dB(A) L_{eq} (Worst 1hr)	Complies with 60dB(A) L_{eq} (Day) criteria (see table 5).

Noise generated by traffic generation on public roads is compliant with EPA Road Noise Policy noise emission requirements.

6.5 NOISE FROM MECHANICAL PLANT

Detailed acoustic design of mechanical plant cannot be undertaken at approval stage, as plant selections and locations are not finalised.

Given the size of the site and the distance to the nearest residences, noise emission compliant with the EPA Industrial Noise Policy will be capable of being achieved through typical acoustic treatments of plant items (in duct lining, enclosures or screens). These are typically design at CC stage, following detailed equipment selections and layout design.

6.6 TRANSIENT NOISE EVENTS (SLEEP AROUSAL)

Noise events occurring between 10pm and 7am should be assessed for potential sleep disturbance impacts on nearby residents.

As there is no typical proposed use of the site after 10pm or before 7am, no further assessment is required.

7 RECOMMENDATIONS

We recommend the following acoustic treatments/management controls to ensure compliance with EPA and Council noise emission guidelines.

- Mandir – windows to the Mandir should be kept closed during chorus chanting.
- Sabha Hall/Youth Centre/Multi-Use Hall – windows to these buildings are to be kept closed during or presentation using PA systems in the evening time or a music performance at any time.
- Detailed acoustic review of all external plant items should be undertaken following equipment selection and duct layout design. Initial analysis indicates that with acoustic treatment, all plant items will be capable of meeting noise emission requirements.

8 CONCLUSION

Noise emissions associated with the proposed BAPS Swaminarayan Hindu Temple development at Adlington Road, Kemps Creek have been assessed with reference to relevant EPA and Penrith Council acoustic guidelines.

An analysis of typical operational noise indicates that the site is capable of complying with relevant noise emission criteria. Acoustic treatments for control of vehicle noise has been presented in Section 7 of this report.

Please contact us if you have any queries.

Yours faithfully,



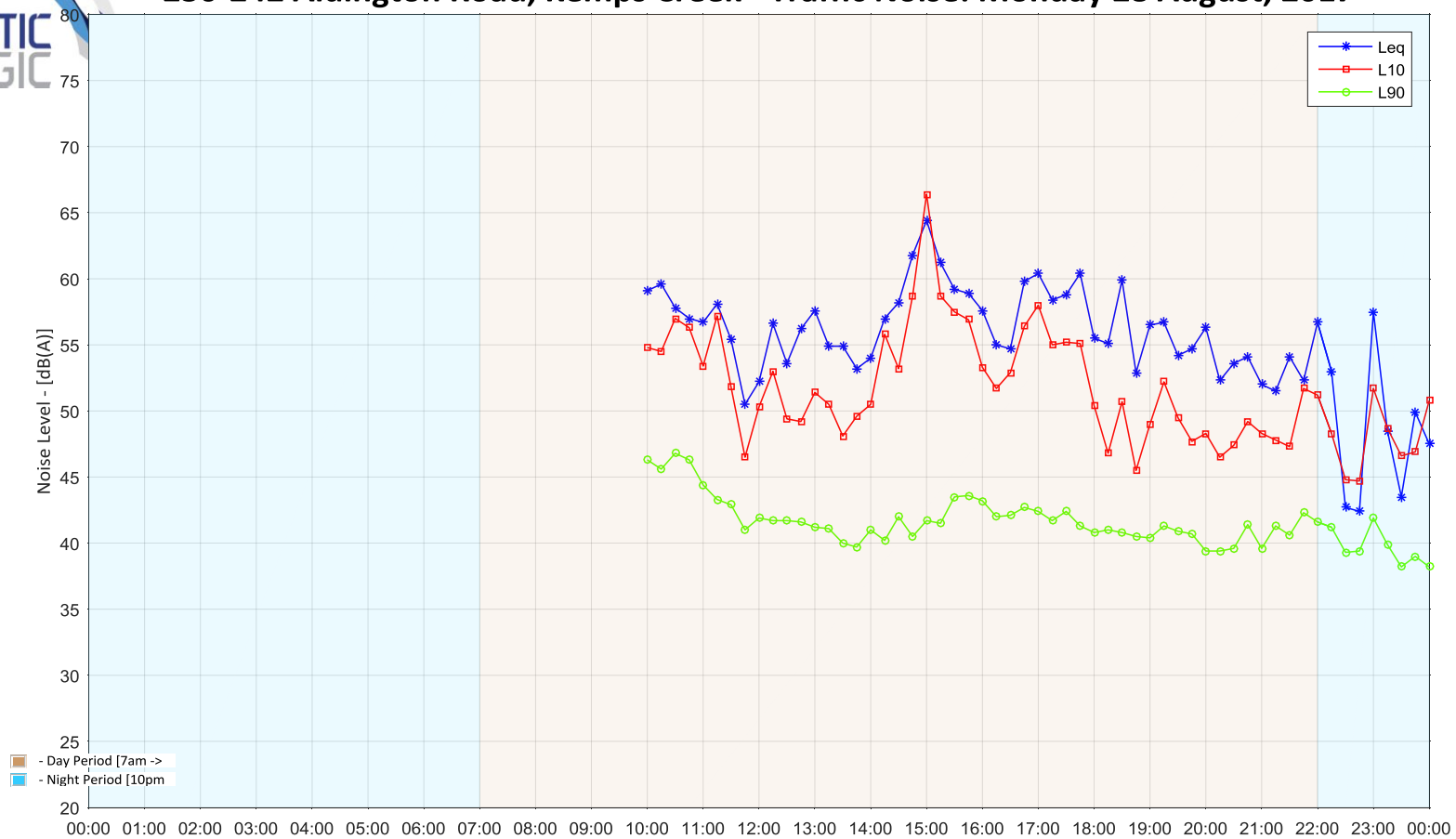
Acoustic Logic Consultancy Pty Ltd
Thomas Taylor

Appendix 1

Noise Logging Results – Location 1 (Aldington Road)

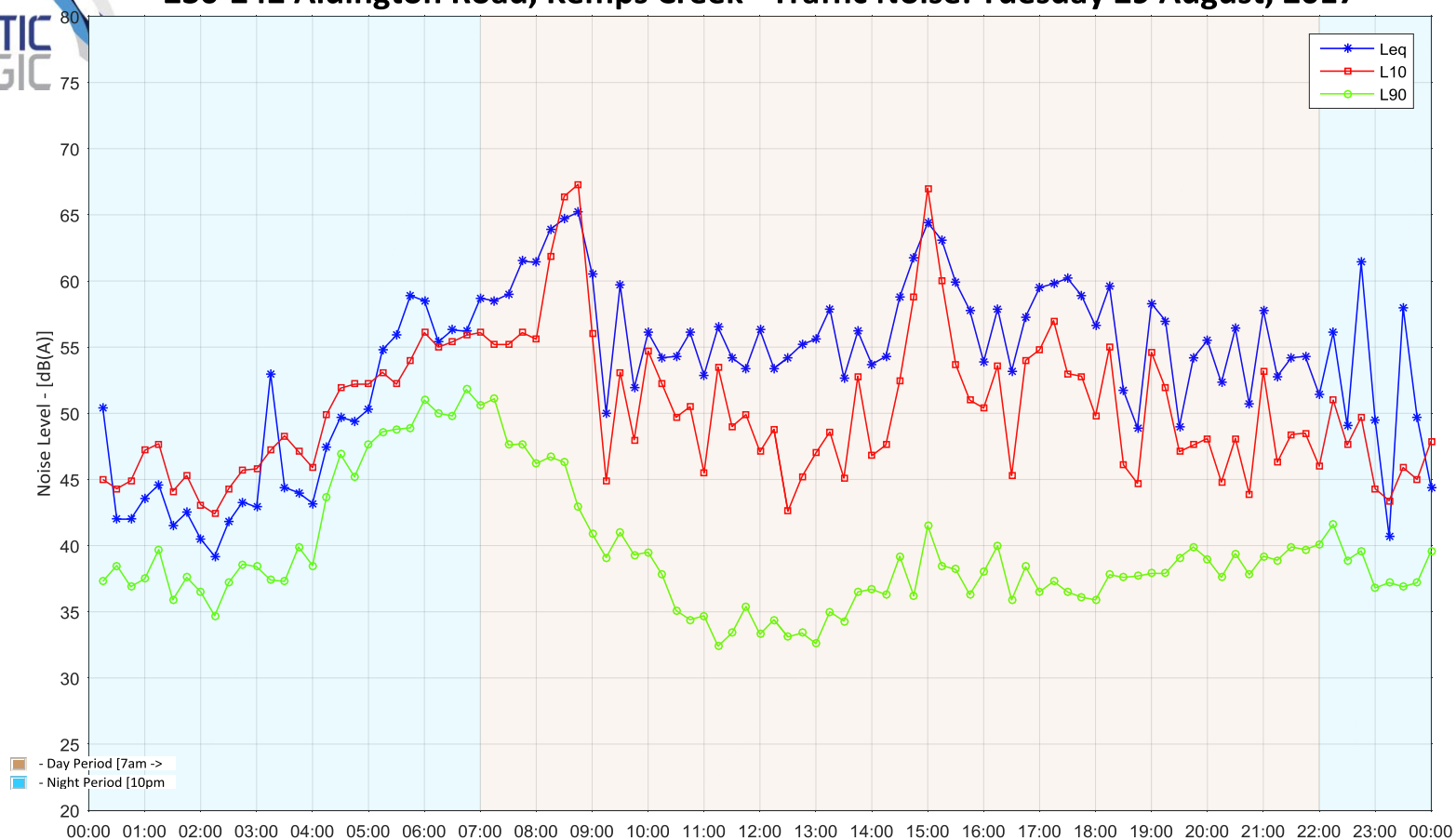


230-242 Aldington Road, Kemps Creek - Traffic Noise: Monday 28 August, 2017



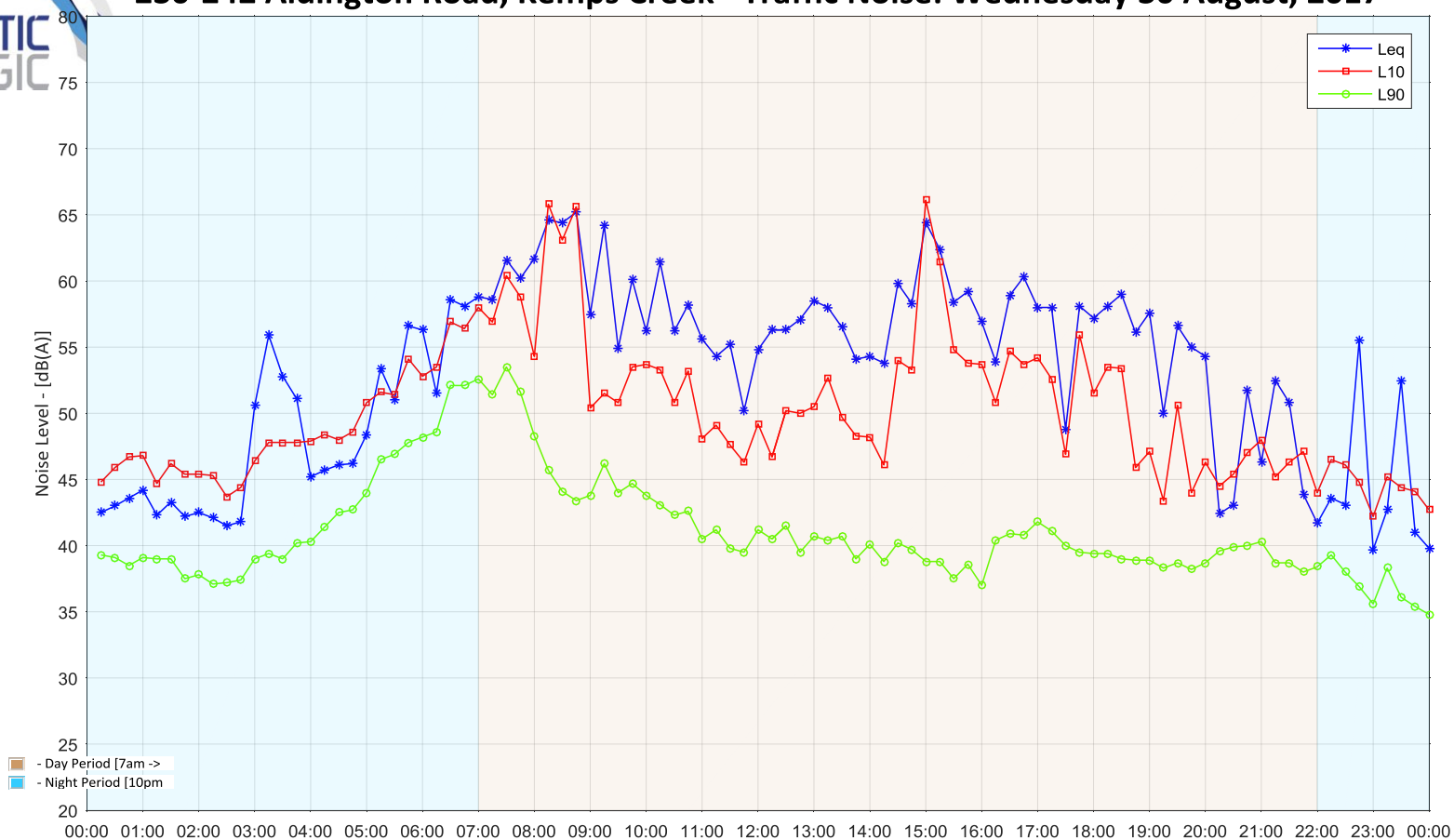


230-242 Aldington Road, Kemps Creek - Traffic Noise: Tuesday 29 August, 2017



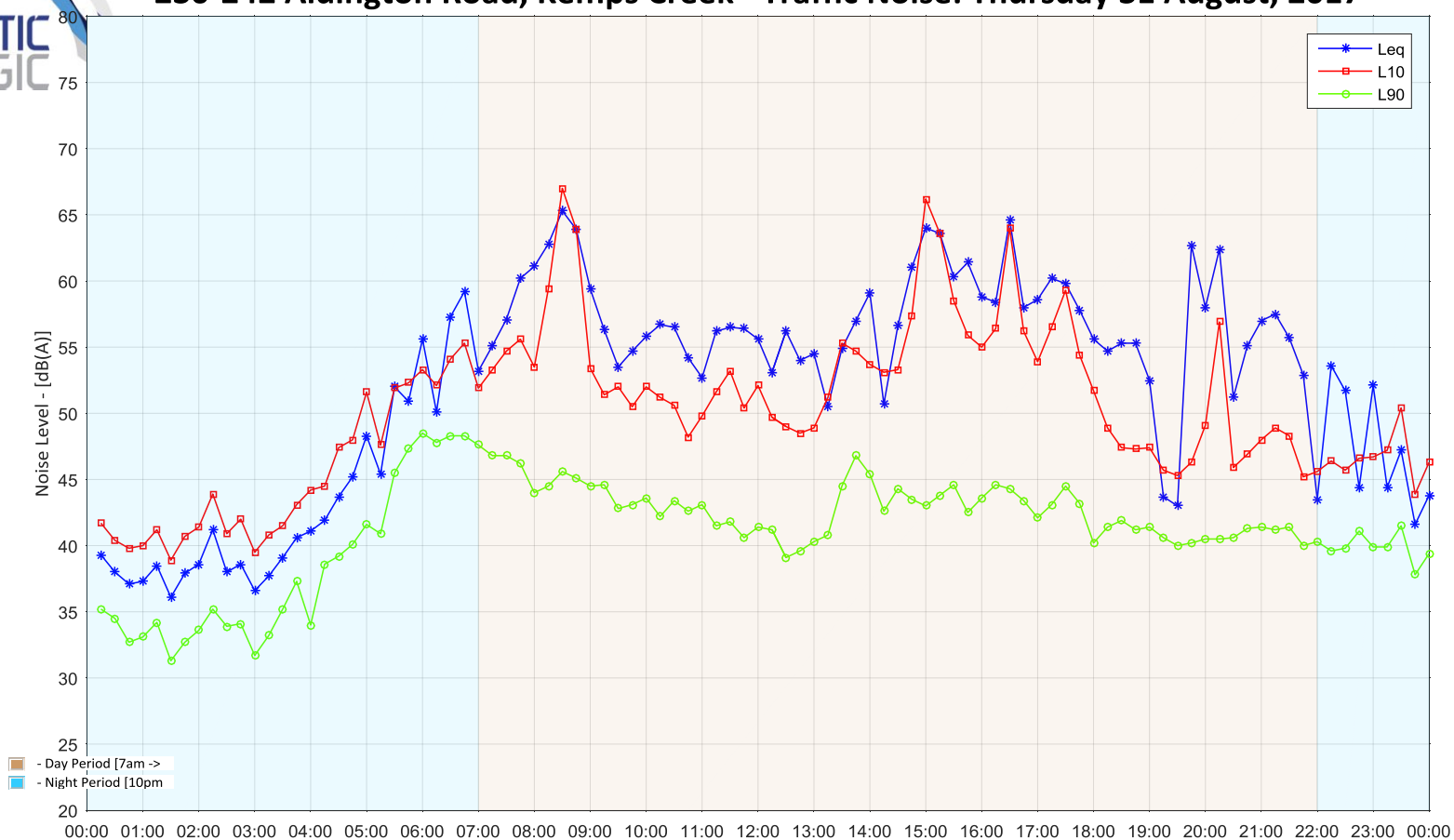


230-242 Aldington Road, Kemps Creek - Traffic Noise: Wednesday 30 August, 2017



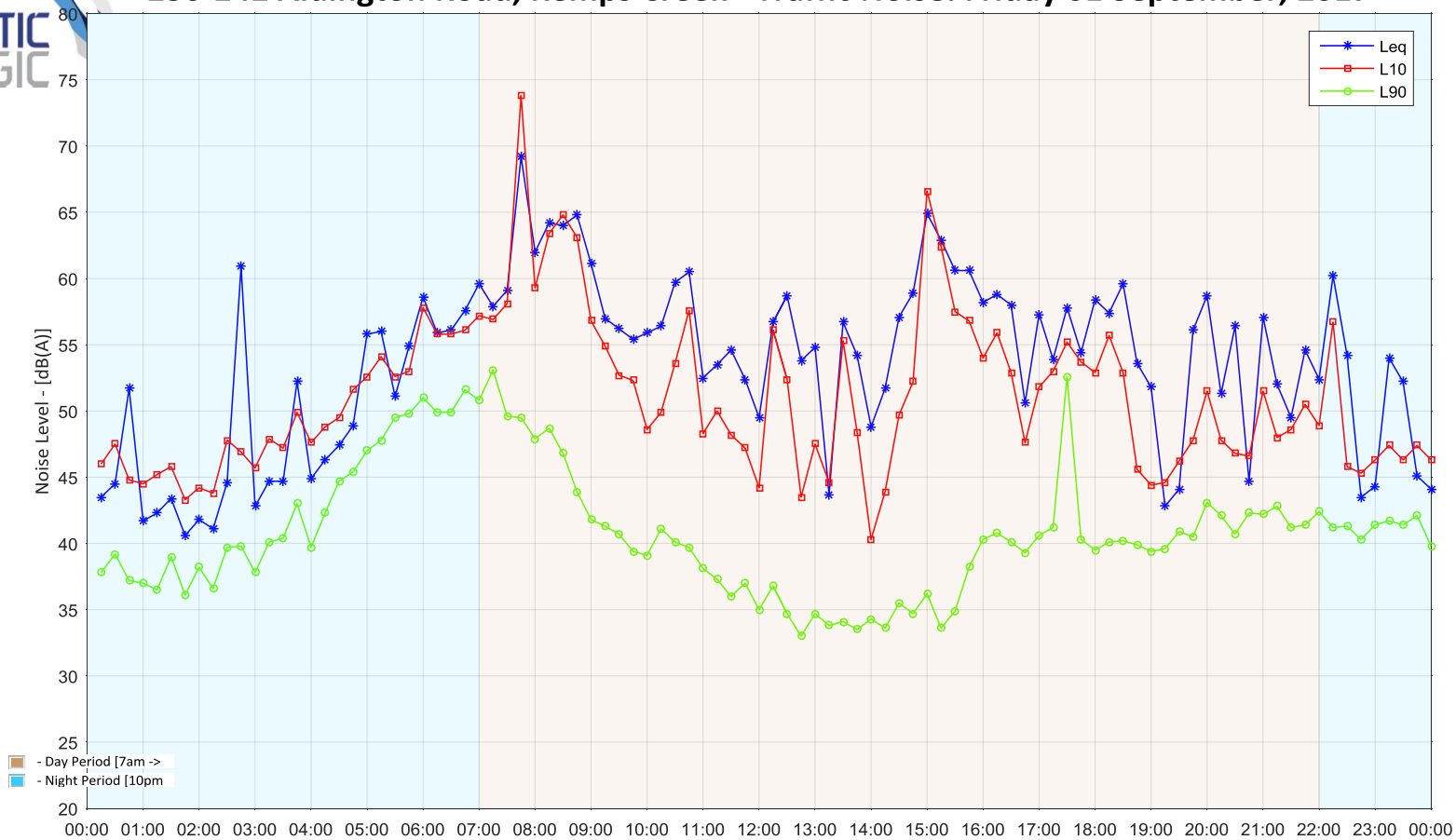


230-242 Aldington Road, Kemps Creek - Traffic Noise: Thursday 31 August, 2017



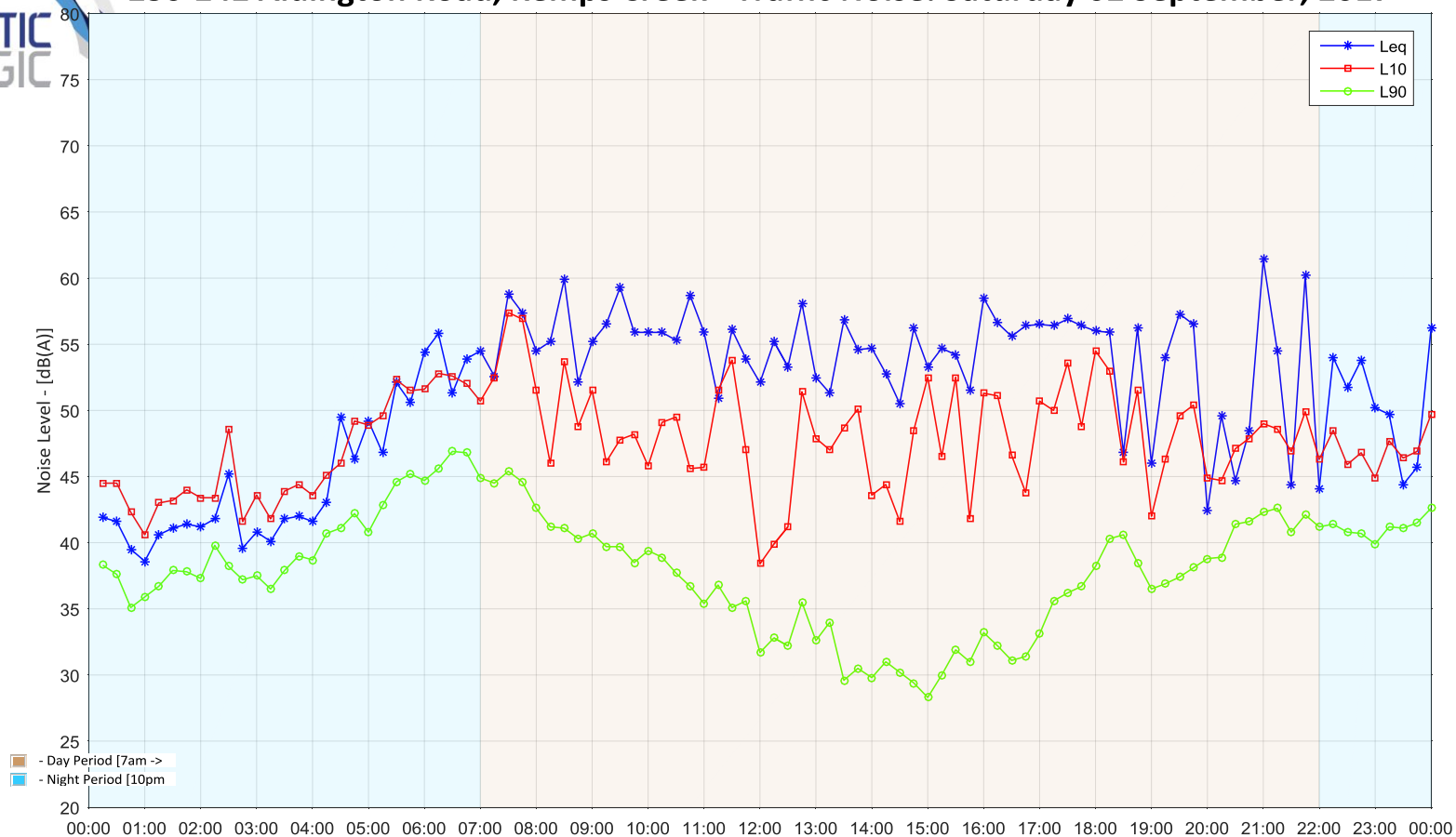


230-242 Aldington Road, Kemps Creek - Traffic Noise: Friday 01 September, 2017



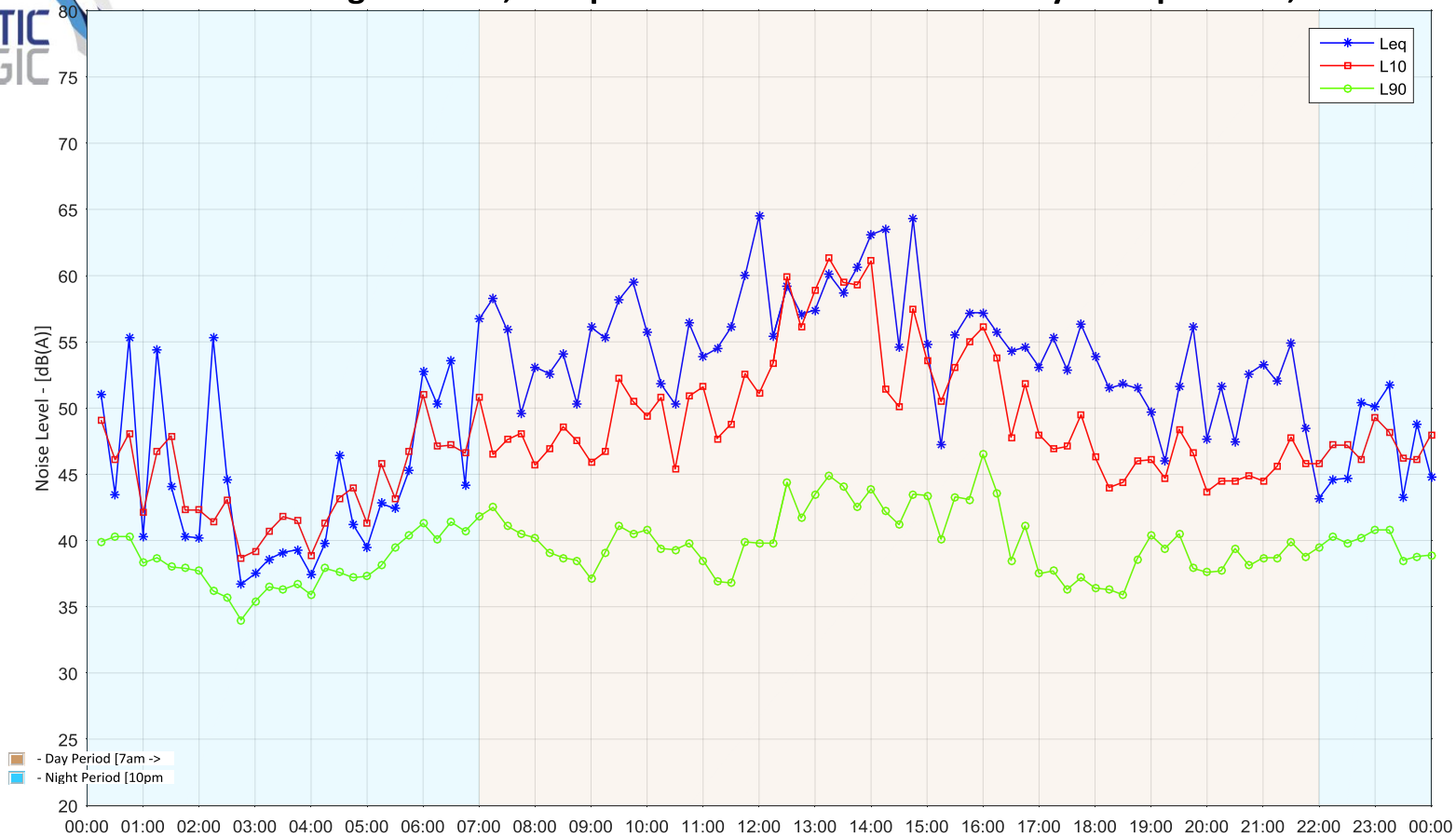


230-242 Aldington Road, Kemps Creek - Traffic Noise: Saturday 02 September, 2017



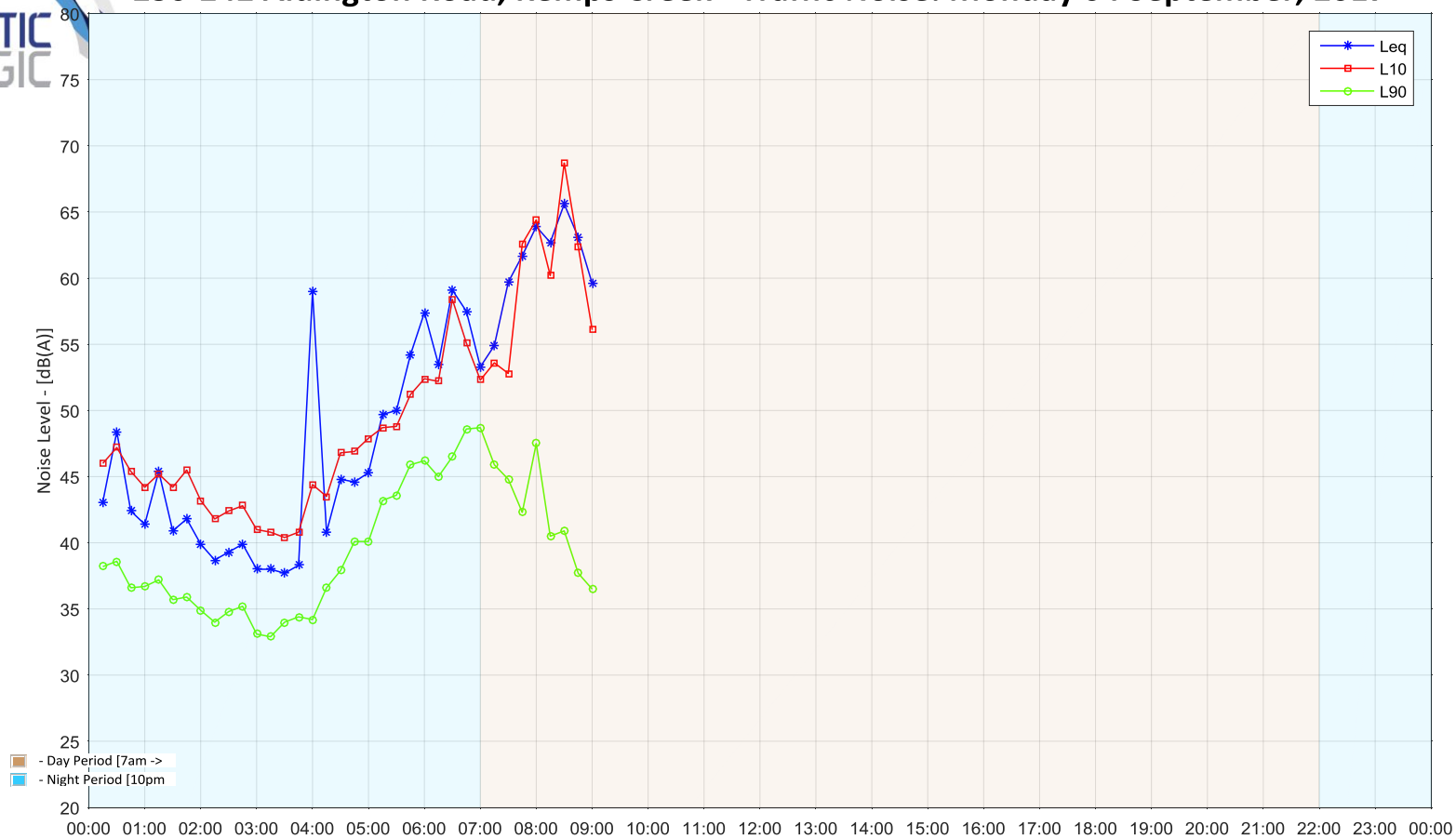


230-242 Aldington Road, Kemps Creek - Traffic Noise: Sunday 03 September, 2017





230-242 Aldington Road, Kemps Creek - Traffic Noise: Monday 04 September, 2017

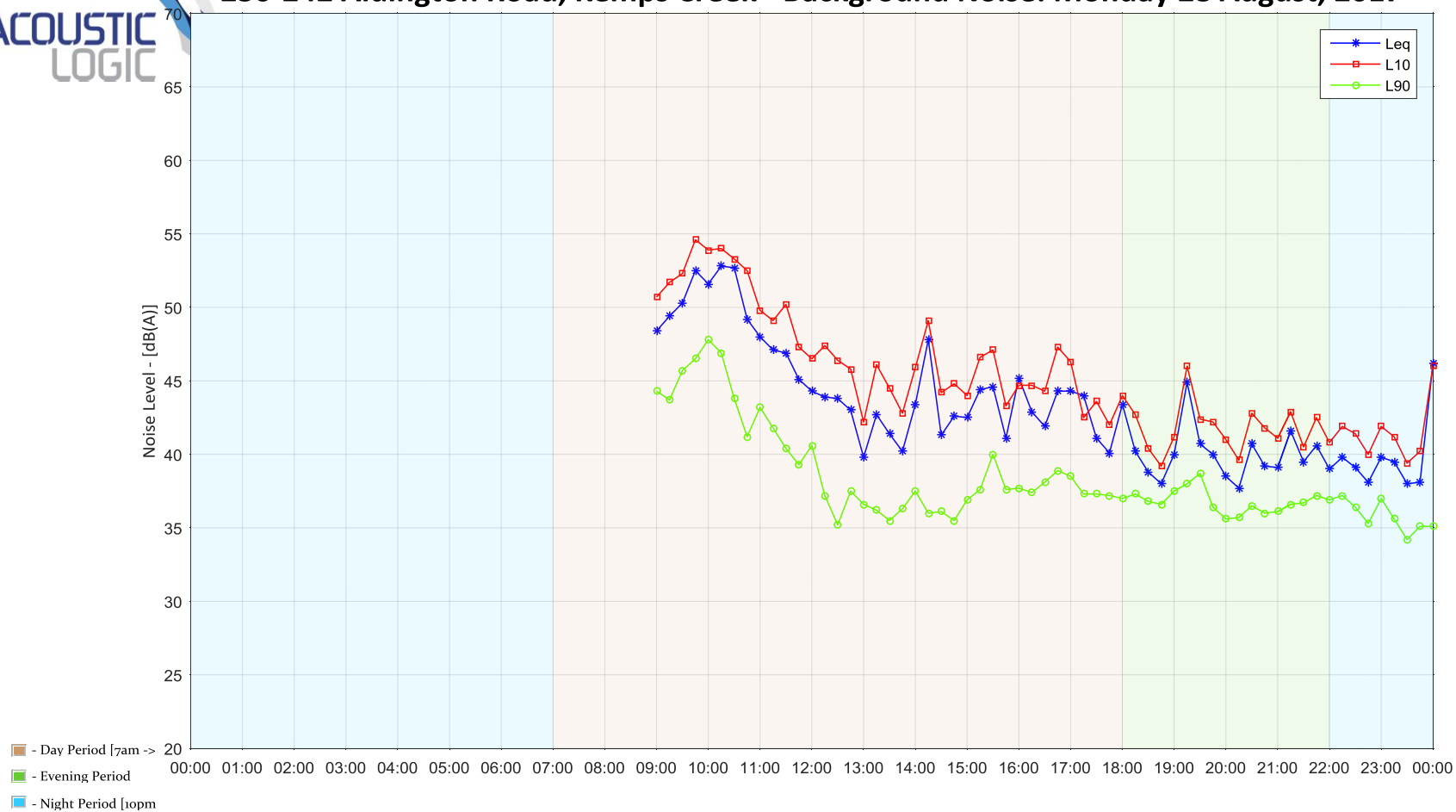


Appendix 2

Background Noise Logging Results – Location 2 (Rear of Site)

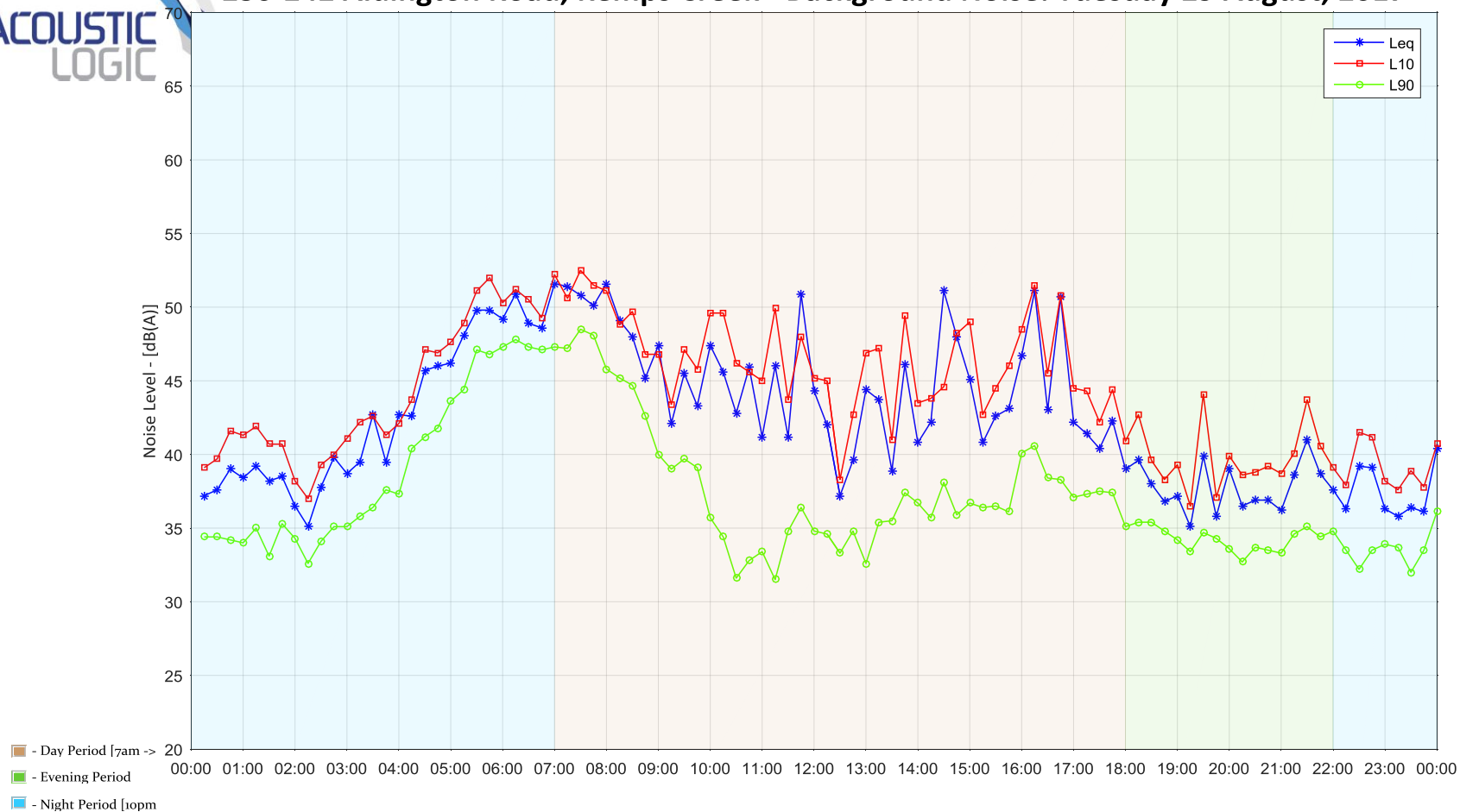


230-242 Aldington Road, Kemps Creek - Background Noise: Monday 28 August, 2017



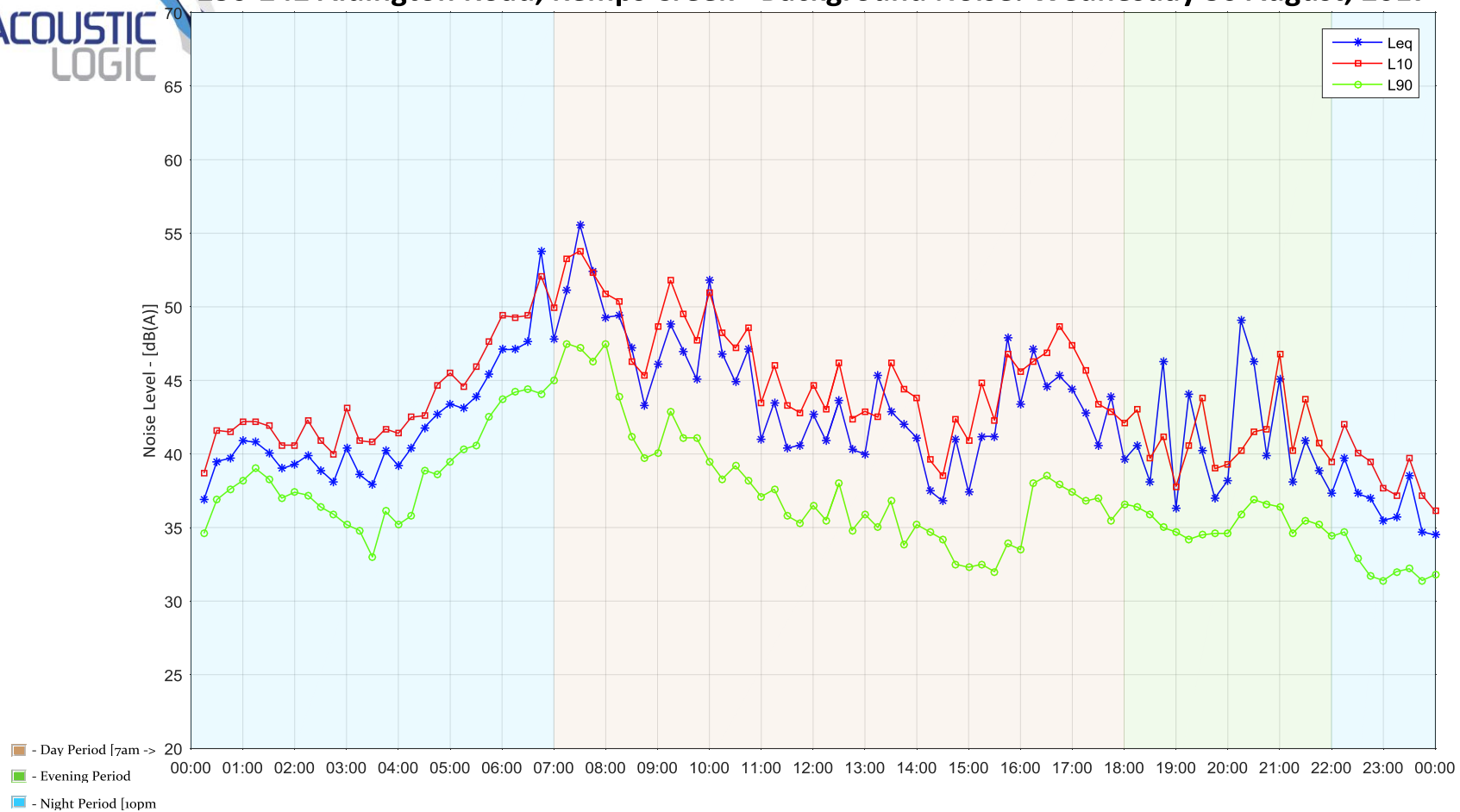


230-242 Aldington Road, Kemps Creek - Background Noise: Tuesday 29 August, 2017

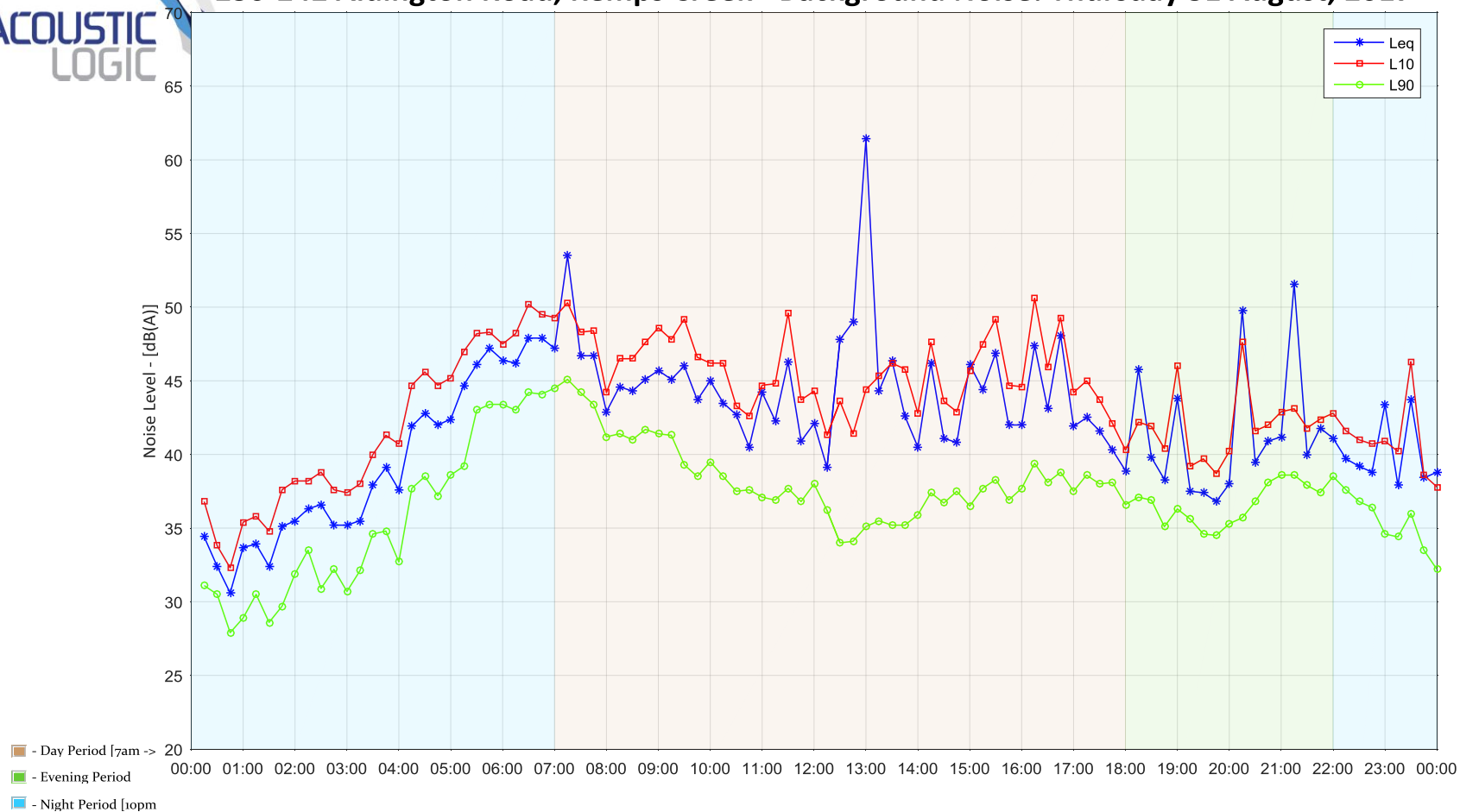




230-242 Aldington Road, Kemps Creek - Background Noise: Wednesday 30 August, 2017

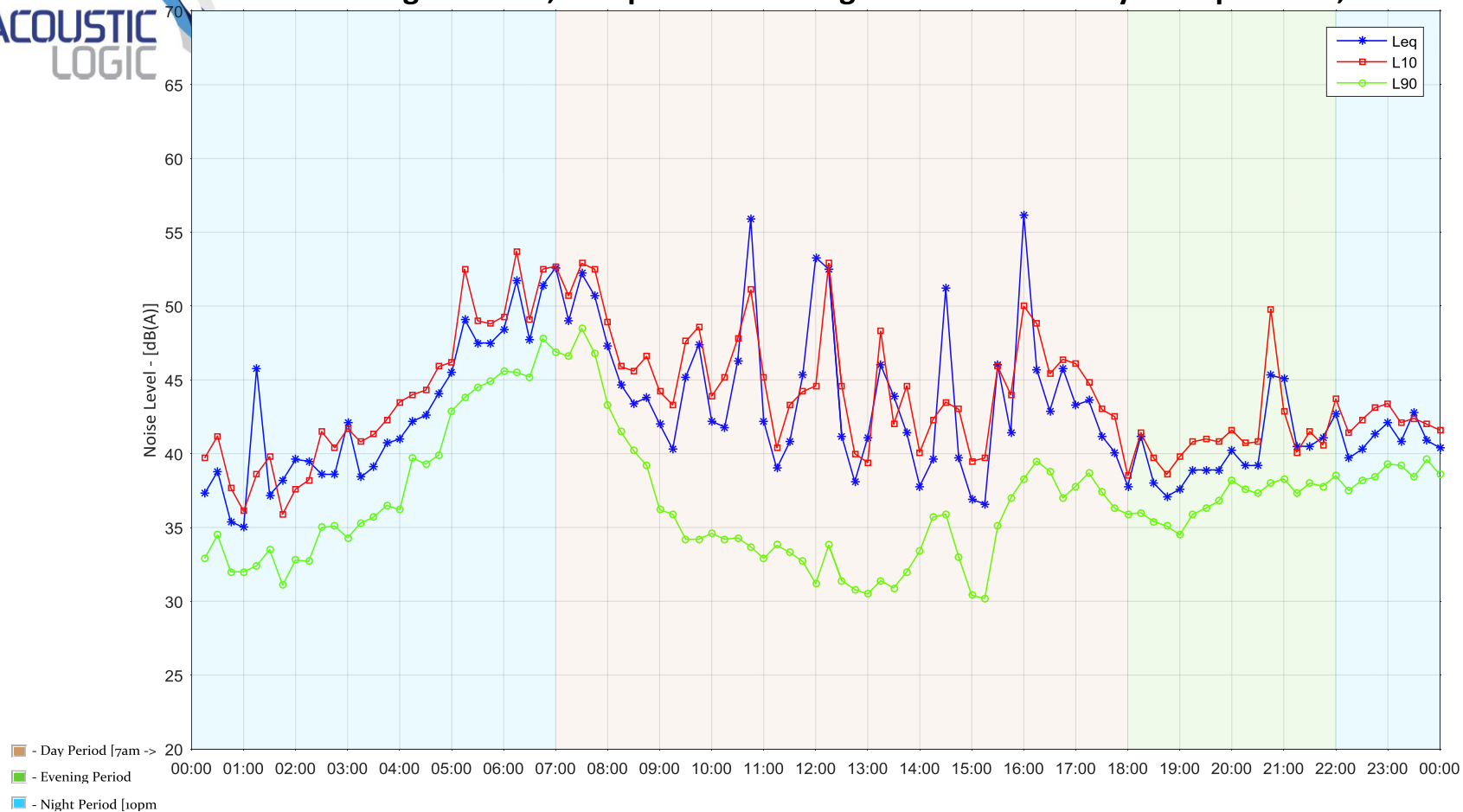


230-242 Aldington Road, Kemps Creek - Background Noise: Thursday 31 August, 2017



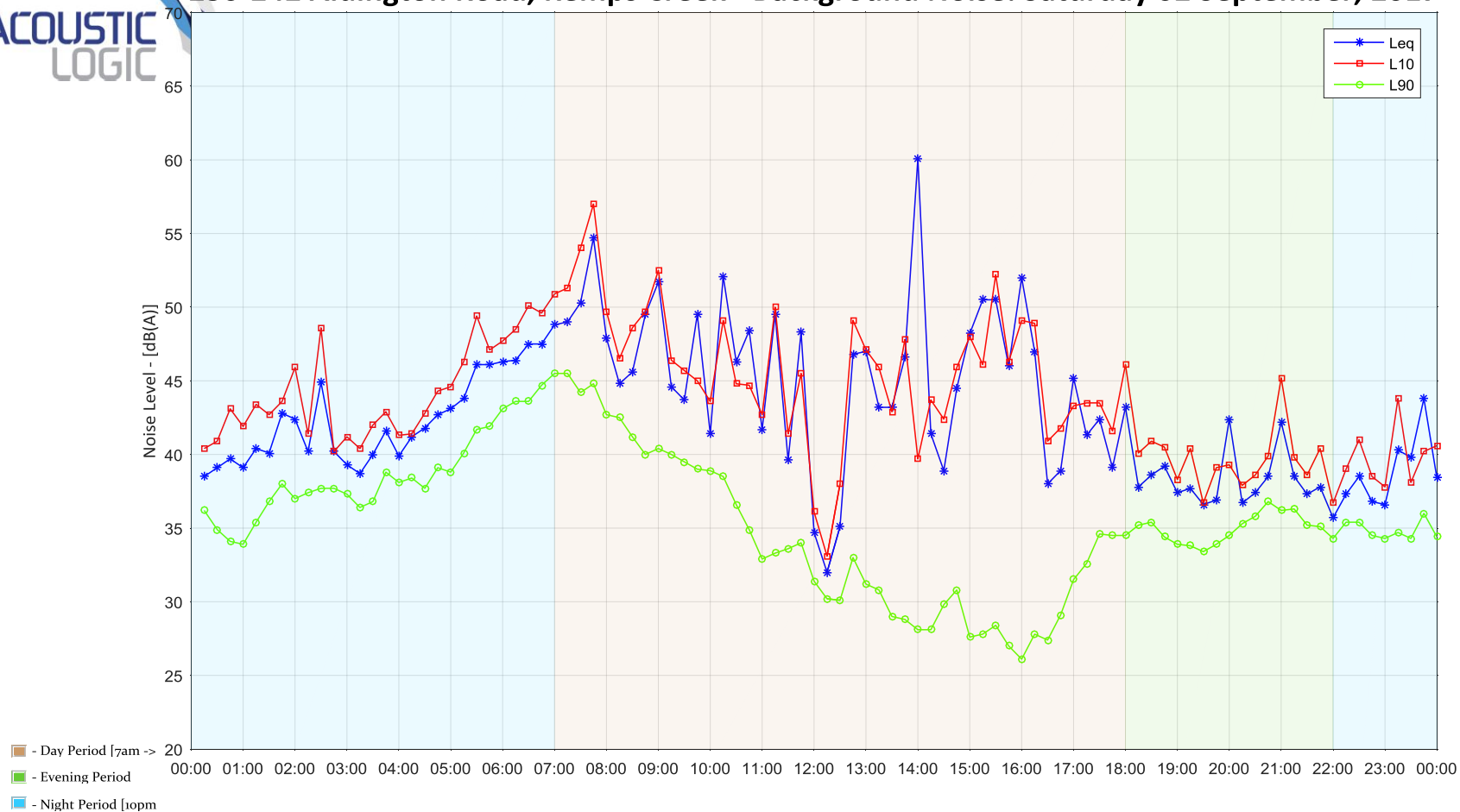


230-242 Aldington Road, Kemps Creek - Background Noise: Friday 01 September, 2017



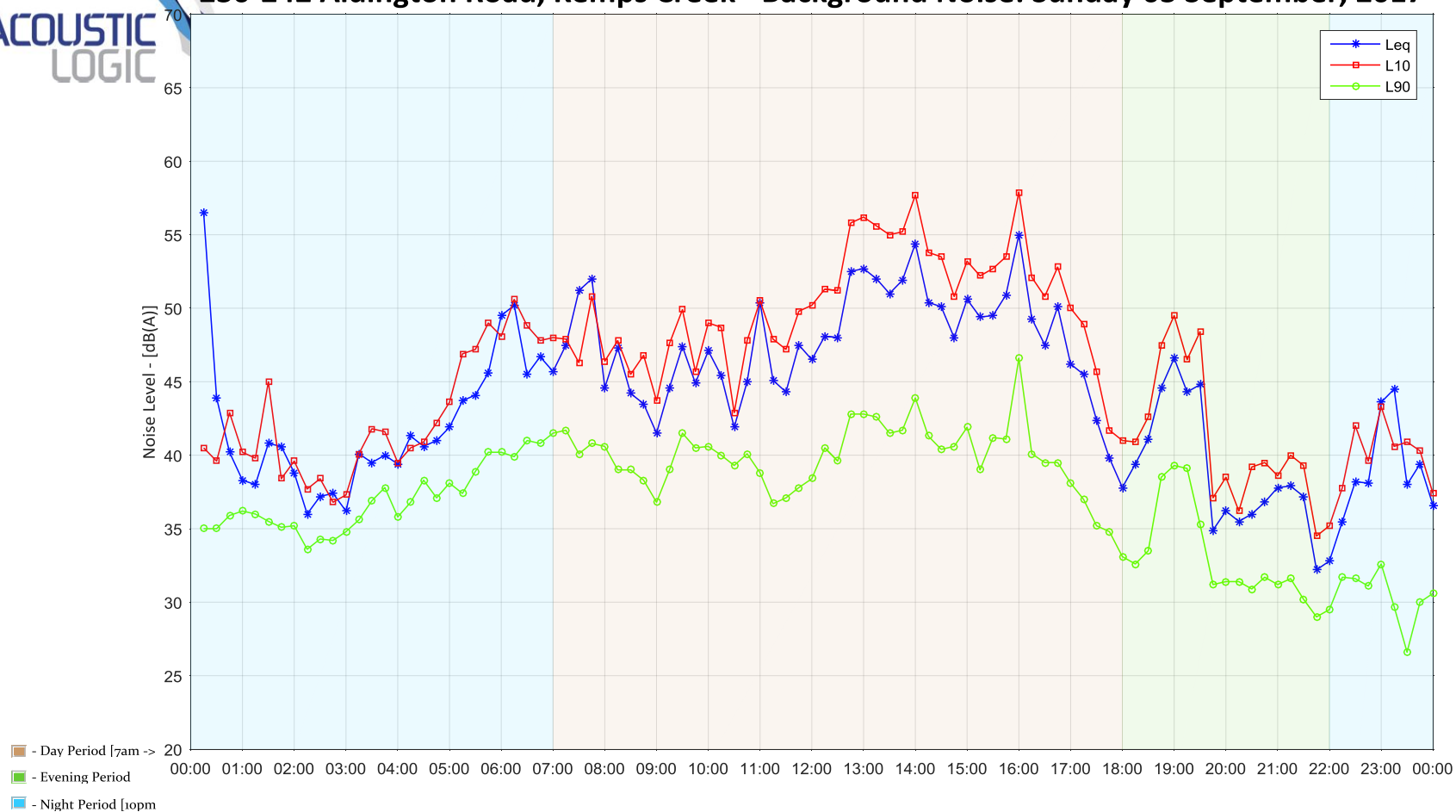


230-242 Aldington Road, Kemps Creek - Background Noise: Saturday 02 September, 2017





230-242 Aldington Road, Kemps Creek - Background Noise: Sunday 03 September, 2017





230-242 Aldington Road, Kemps Creek - Background Noise: Monday 04 September, 2017

