

DA ACOUSTIC REPORT

Ku-ring-Gai High School, Multi-Purpose Hall

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Prepared For:

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The work reported herein has been carried out in accordance with the terms of membership. We stress that the advice given herein is for acoustic purposes only, and that the relevant authorities should be consulted with regard to compliance with regulations governing areas other than acoustics.

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1.0 INTRODUCTION

PKA has been engaged by Butler & Co Architects (Butler & Co) to provide acoustic services for the development project at Ku-ring-Gai High School located at 403 Bobbin Head Road. Ku-ring-gai High School is a coeducational institution for students from grades 7 – 12. The development project involves the construction of a multi-purpose hall and other visual arts/drama rooms.

This report will address the noise breakout to sensitive receivers and relevant acoustic treatment and management measures that will need to be incorporated to meet the acoustic criteria. The outcomes of this assessment are not intended to be used to establish restrictions to the use of the hall, but rather to identify the potential impacts of the use of the hall at times when it would be in use.

The purpose of this report is strictly to assess acoustic impact and is not to be meant to be used as an overall plan of management. This report was prepared in accordance with information provided to PKA and any accuracies pertaining to the nature of use or the hours of operation is the responsibility of the client.

This report does not include internal partition sound insulation treatment that is outside the scope of standard DA requirements. Please refer to the acoustic planning report (ref. PKA11279 R03) for these details.

Amendment Notes

PKA previously submitted report ref. R01v2 dated 13th Nov 2018 for the proposed development. This report has been amended to address the additional information required by council and to separate the internal design that does not pertain to noise breakout. The following table presents a summary of the additional information requested.

Table 1-1 Summary of amendments

	Council Comments	PKA Comments
1	Section 8.1 of the acoustic planning report indicates that calculations for use of the multipurpose hall for the purpose of presentations assumes approximately 200 persons to be present within the space, yet architectural drawings indicate the potential of a seating capacity of 680 persons within the hall. Is there likely to be further noise impacts by the higher number of persons within the hall? The noise impacts at the halls highest capacity needs to be calculated and assessed.	Our assumption of 200 persons was chosen to provide the appropriate internal reverberation treatment for fit out purposes if the hall was less than fully occupied. This has now been removed from this report as it is an issue pertaining to internal design and does not address noise breakout or other potential DA issues. Regarding the potential for noise impacts due to a high number of persons, PKA's assumed noise levels within the hall are based on full occupancy (680 persons) with the 85dBA taken from previous measurements of fully occupied halls of similar scale. Therefore, our noise breakout calculations remain unchanged.
2	Table 5.1 of the acoustic planning report states the RBL for evening to be 38dB(A) which is higher than would be expected for the site / location. The report has not provided more detailed results such as an ambient noise survey, nor any kind of explanation as to why the night time reading is higher than the evening, which is considered to be unusual. This shall be addressed within an amended report.	We have attached detailed graphs and results in Appendix B of this amended report. Although the noise logger was located away from any operating plant, the graphs show unusual elevated evening and night-time results for many of the logging days. Presently we cannot account for these measured noise levels as we did not record audio due to the sensitive nature of the premises. If the premises were to operate after school hours of 7am to 6pm, a repeat noise survey would be required to establish the evening and night-time RBLs and further understand the anomalies.
3	The acoustic planning report has not adequately addressed all potential noise impacts upon sensitive residential receivers arising from the use of the proposed development, including noise which may be generated during times outside normal school hours such as events, or private use of the proposed facility. This must be considered and assessed as afterhours use of the hall is implicit in the Education SEPP.	The client has advised that the premises will not be used before 7am and after 6pm for private use. This report does not address activity after 6pm.

	Council Comments	PKA Comments
4	No details have been provided as to potential noise impacts of the movement of people and traffic utilising the proposed development (particularly outside school hours) nor is there a Plan of Management which may address these potential impacts.	We have not undertaken an acoustic assessment of the proposed development's car traffic and people as the operational plans remain the same as the existing operation. Furthermore, the client has advised that the premises will not be used before 7am or after 6pm. This report does not address activity after 6pm.
5	The acoustic planning report does not adequately describe how the potential noise impact on the nearest residential receiver has been calculated, and the breakdown of contributing noise sources.	PKA have updated the report to further detail out the calculations.
Other	<p>In addition to the above points, the acoustic report when being revised is to include all potential noise sources from the development, including mechanical plant, amplified music or speech, sporting activities within the hall, and general people noise including voice and its impacts on the nearest residential receivers.</p> <p>Consideration is to be given to potential events that may be associated with the use of the proposed development, particularly those held outside normal school hours (including private hiring of facilities).</p> <p>The acoustic report should detail noise impacts on the residential receiver both before and after attenuation measures have been applied.</p> <p>If specific orientation of amplifier speakers or noise limiters is required to achieve compliance, these details must be provided in the recommendations of the revised report. Any physical attenuation measures are to be shown on the architectural plans.</p> <p>If there are likely to be potential noise impacts which are not able to be adequately attenuated to achieve compliance of RBL+5dB(A) then a Plan of Management will be necessary, outlining how events would be managed to minimise acoustic impacts on any sensitive receivers.</p>	<p>PKA have updated the relevant Section further detail the calculations. We have based the internal noise levels of the Hall of a Leq 85dBA which in our experience is typical for sporting activities and amplified music for school activities. As calculations show compliance by a considerable margin during daytime use there was no specific requirements of loudspeaker orientation and/or noise limiters applied.</p> <p>The attenuation measures are based on the façade sound insulation performance with management-based requirements to keep external doors closed facing west.</p> <p>We have updated our report to include mechanical plant which does not require any additional noise mitigation measures.</p>

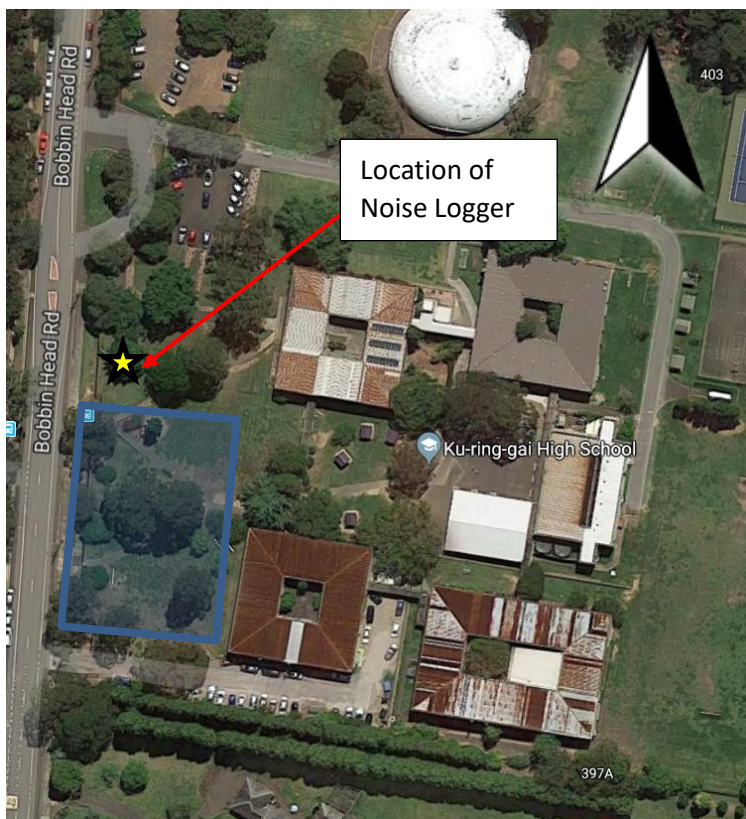
2.0 SITE DESCRIPTION

The location of Ku-ring-gai High School and the proposed development are shown below in Figure 2-1 and Figure 2-2.

Figure 2-1: Site Location (Extent of Entire School)



Figure 2-2: Site Location (Extent of Proposed Development)



3.0 ACOUSTIC CRITERIA

NSW EPA Noise Policy for Industry (NPfI)

Noise generated from commercial premises and from mechanical noise is generally assessed against the requirements of *Industrial Noise Policy (2000)*, which has been reviewed and superseded by the current *NSW EPA Noise Policy for Industry 2017 (NPfI)*.

The policy sets out two separate criteria to ensure environmental noise objectives are met. The first criterion considers intrusive noise to residential properties and the second is set to ensure the amenity of the land use is protected. The lower value of both criteria is considered to be the Project noise trigger level, which is the limit of the $L_{Aeq, 15min}$ noise level that must not be exceeded for the corresponding period of the day.

Amenity Criterion

To limit continuing increases in noise levels, the maximum ambient noise level within an area from commercial noise sources should not normally exceed the levels as specified in Table 2.2 of the policy for the specified time of the day. The NPfI recommends the following Amenity Noise Levels for various receiver premises.

Table 3-1 Noise Criteria - Amenity for receiver buildings*All values in dB(A)*

Type of receiver	Time of day	Recommended Amenity Noise Level $L_{Aeq, (period)}$
Residential (Suburban)	Day 7am to 6pm	55 dB(A)

The proposed use of the development is only during the day time and therefore, an assessment for evening and night-time has been excluded.

To ensure that industrial noise levels (existing plus new) remain within the recommended amenity noise levels for an area, a project amenity noise level applies for each new source of industrial noise as follows:

Project amenity noise level for development = recommended amenity noise level minus 5 dB(A) .
--

To standardise the time periods for the intrusiveness and amenity noise levels, this policy assumes that the Amenity $L_{Aeq, 15min}$ will be taken to be equal to the $L_{Aeq, period} + 3 \text{ decibels (dB)}$.

Intrusiveness Criterion

The intrusiveness of a stationary noise source may be considered acceptable if the average of the maximum A-weighted levels of noise, $L_{Aeq, 15 \text{ minute}}$ from the source do not exceed by more than 5dB the Rating Background Level (RBL) measured in the absence of the source. This applies during all times of the day and night. There also exists an adjustment factor to be applied as per the character of the noise source. This includes factors such as tonal, fluctuating, low frequency, impulsive, intermittent etc. qualities of noise. The RBL is determined in accordance with Section 2.3 of the NSW EPA NPfI. The intrusiveness criterion is $L_{Aeq, 15 \text{ minute}} < RBL + 5$.

4.0 NOISE SURVEY

Unattended noise monitoring was conducted on site for a week from 3rd July to record the ambient noise levels. Although the monitor was on site for this period, the ambient noise level after Friday (6th July 2018) was excluded due to the school holidays as the measurements were not representative of the usual school activity.

PKA expects the results of monitoring during the included period to be representative of the existing background noise and that than any additional period of monitoring would have resulted in similar results during the weekday and weekend periods. Furthermore, time restraints did not allow for extended monitoring at the time of the noise survey.

The monitors were programmed to store the Ln percentile noise levels for each 15-minute sampling period. Measurements were made of L_{min} , L_{max} , L_{90} , and L_{eq} and were later retrieved for analysis.

The position of the noise monitor is shown in Figure 2-2.

4.1 Instrumentation

Noise measurements were conducted using the following equipment:

- Sound analyser Acoustic Research Laboratory, Serial number 16-207-017.
- Sound calibrator B&K 4230, Serial number 11419.

The instruments were calibrated before and after the noise measurements and there were no adverse deviations between the two. The analysers are type 1 and comply with AS IEC 61672.2-2004. The instruments carry traceable calibration certificates.

4.2 Project Noise Criteria

Data from the noise monitors were processed to obtain the ambient noise levels and the noise goals. The tables below present the results of the ambient noise monitor measurements.

Ambient Noise Measurements

As a guide, the noise criteria defined in the *Noise Policy for Industry* (NPfI) is listed below. The daytime assessment period is defined by the NSW NPfI are between 7am and 6pm. The premises are not proposed to be used outside of these hours and therefore, an assessment has been conducted only for this period. If the hall is proposed to be used in the future post the daytime, an acoustic survey will have to be conducted to establish the acoustic criteria for those periods.

Table 4-1 NPfI Project Noise Trigger Levels - Values in dB(A)

Receiver Type	Period	Measured RBL (L_{A90})	Measured Ambient Noise (L_{Aeq} period)	Acceptable Noise Levels $L_{Aeq}(\text{period})$	NSW Noise Policy for Industry Criteria		Project Noise Trigger Levels $L_{Aeq15min}$
					Amenity $L_{Aeq15min}$	Intrusiveness $L_{Aeq15min}$	
Residential (Sub-Urban)	Day 7am to 6pm	41	58	55	53	46	46

5.0 NOISE BREAKOUT FROM MULTI-PURPOSE HALL

5.1 Proposed Operational Activity

Considering the potential for noise breakout from the proposed multi-purpose hall to the nearby sensitive residential receivers, an assessment has been conducted to ensure compliance. The following details have been considered in the calculations.

- The total estimated occupancy is 680.
- PKA have previously performed measurements in large multi-purpose halls. This including activity such as audience speaking and clapping and the use of reinforced music.
- Based on previous measurements conducted by PKA, a noise level of $L_{Aeq15min}$ 85dB(A) is being used as a maximum internal noise level. This level considers full occupancy as per operational and architectural plans provided to PKA.
- PKA has been advised that the premises will not be used after hours (beyond 6pm) and therefore, only daytime activity is being considered.
- PKA has not been provided a car park or traffic management plan. However, the client has advised that the new hall is replacement of the existing Bini Dome operations. Once the new Hall is built, all the activities currently happening in Bini Dome will be moved into the new Hall. Therefore, it is expected that the noise impact from the use of the car park will remain the same as the existing operation.

5.2 Calculated Noise Impact

The construction details of the façade have been assumed based on the recommendations made in Section 6.0 and that external doors facing west (toward Bobbin Head) remaining closed during large events. The nearest sensitive residential receiver has been identified as 1 Leura Crescent and calculations were made to assess the acoustic impact at the boundary of this receiver.

Table 5-1 Noise Impact from use of Hall

Receiver Type	Internal Sound Pressure Level in hall	Loss from façade and distance	Calculated Noise Impact at receiver	Noise Criteria	Complies?
Residential	$L_{Aeq15min}$ 85dB(A)	Inside to outside loss >25dB(A) Loss from distance from hall to receiver >30dB(A)	<35 dB(A) from the use of the hall at full capacity (680 people)	46dB(A) Day-time (7am to 6pm)	Yes

Due to the extremely large calculated margin of compliance, an increase in occupancy or activity of the use of the multi-purpose hall is not expected to result in non-compliance. However, to achieve and maintain this compliance, the recommendations made in Section 6.0 of this report must be implemented.

6.0 RECOMMENDATIONS

Notes:

1. The acoustic recommendations made are ones that satisfies the acoustic requirements only. No representation is given that it is fit for any other purpose. The build-up must be checked and designed by others to verify that it complies with all necessary fire rating, structural, waterproofing, durability and any other non-acoustic requirements.
2. Any additional construction or fixtures must be acoustically detailed to seal to the room and ceiling construction without degrading the R_w ratings required in either instance.

6.1 Use of Multi-purpose Hall

To maintain compliance, the doors of the multi-purpose hall facing west (towards Bobbin Head Road) must remain closed during large events. This is based on our previous experience in noise compliance testing of multi-purpose hall use. We recommend noise compliance testing be conducted within the first 3 months of operation during a high generating noise event to determine whether the doors can remain open, and whether adjustments need to be made to the internal amplified speaker system for ongoing compliance.

Based on the proposed use, the current assessment is valid only for the use of the premises between 7am and 6pm. Any proposed use outside these hours must be assessed following an acoustic survey to establish the background noise during these hours.

6.2 Outdoor Mechanical Equipment

There is only one outdoor mechanical plant on site and it is located significantly away from any other sensitive receivers surrounding the school. No additional mitigation measures will be required due to acoustic energy loss from the distance. Any typical outdoor condenser units are expected to comply by a large margin.

6.3 Carpark/Traffic Noise Assessment

If the certifying authority recognises that the existing operations are not acceptable (assessment of existing operations is not part of this assessment), then a re-assessment must be conducted. A further acoustic assessment of this matter cannot be performed till a detailed traffic management plan is made available to PKA.

6.4 Architectural Treatment

6.4.1 External Walls

All external walls are to be designed to have a minimum sound insulation rating of R_w 40.

Wall	Minimum Configuration	Construction Notes
Wall R_w 40	Option 1: Standard Brick Veneer Construction Option 2: Light-weight Construction External lining: 1 x 9mm Fibre Cement Lining (min. 13 kg/m ²) Top hats as required Vapour barrier as required. 90mm studwork 75mm glasswool insulation (min. 14kg/m ³) Internal lining: 1 x 13 mm plasterboard (min. 8.4 kg/m ²).	
Glazing/Glazed elements R_w 35	10.38mm laminated glass	Acoustic-rated seals and frame
All entry doors R_w 30	Solid-core door min. 45mm with acoustic-rated seals	Overall acoustic performance of partition is reduced by inclusion of any door. Any vision panel within door to be min. 6.38mm acoustic laminate glass

6.4.2 Roof & Rain Noise

The current roof design will achieve a minimum sound insulation rating of R_w 40. This is necessary to adequately control rain noise intrusion and address noise breakout.

As the current design of the roof uses Colorbond roof sheeting and a pitch of approximately 5°, there should not be considerable concern for rain noise intrusion providing foiled backing insulation is installed against the underside of the roof sheeting.

Polyisocyanurate PIR rigid board insulation should not be used in any circumstances against the metal deck roofing sheets. Acoustically PIR insulation results in amplification of noise and increase an acceptable rain noise level to unacceptable conditions.

Skylights

Butler&Co provided The External Finishes Schedule which notes a “Velux FS Fixed glass skylight”. PKA have reviewed the CSIRO acoustic laboratory test certificate TL637-03 which achieved a R_w 32. A fixed glazed element at ceiling level, min. 4mm thick with acoustic seals, is required to maintain the acoustic performance of the roof structure and minimise rain noise intrusion.

Smoke Ventilation

We have been advised by Butler&Co that the mechanical consultants require roof/ceiling smoke ventilation. The extent and location have yet to be determined. The acoustic performance of any roof penetrations must achieve a min. R_w40 to maintain the acoustic performance of the roof.

APPENDIX A DRAWINGS USED TO PREPARE REPORT

This report was prepared using architectural drawings (Job: 1740CD) provided by Butler & Co Architects.

No.	Rev.	Title	Date
CD002	P1	Existing Site-Demolition Plan	28-08-2018
CD003	P2	Proposed External Wall Plan	28-08-2018
CD100	P3	Ground Floor Plan	28-08-2018
CD101	P3	Reflected Ceiling Plan	29-08-2018
CD102	P3	Furniture Plan	23-08-2018
CD103	P2	Roof Plan	28-08-2018
CD104	P1	Highlight Level Plan	29-08-2018
CD200	P3	Elevations 1	20-08-2018
CD201	P3	Elevations 2	20-08-2018
CD300	P1	Sections	25-06-2018
CD301	P1	Sections 2	25-06-2018
CD400	-	Detail Sections 1	27-04-2018
CD401	-	Detail Sections 2	27-04-2018
CD402	P2	Stairs & Ramps	31-09-2018
CD500	P1	Internal Layouts – Wet Areas 1	03-09-2018
CD501	P1	Internal Layouts – Wet Areas 2	03-09-2018
CD502	-	Internal Elevations I – Multi-Purpose Hall	07-2018

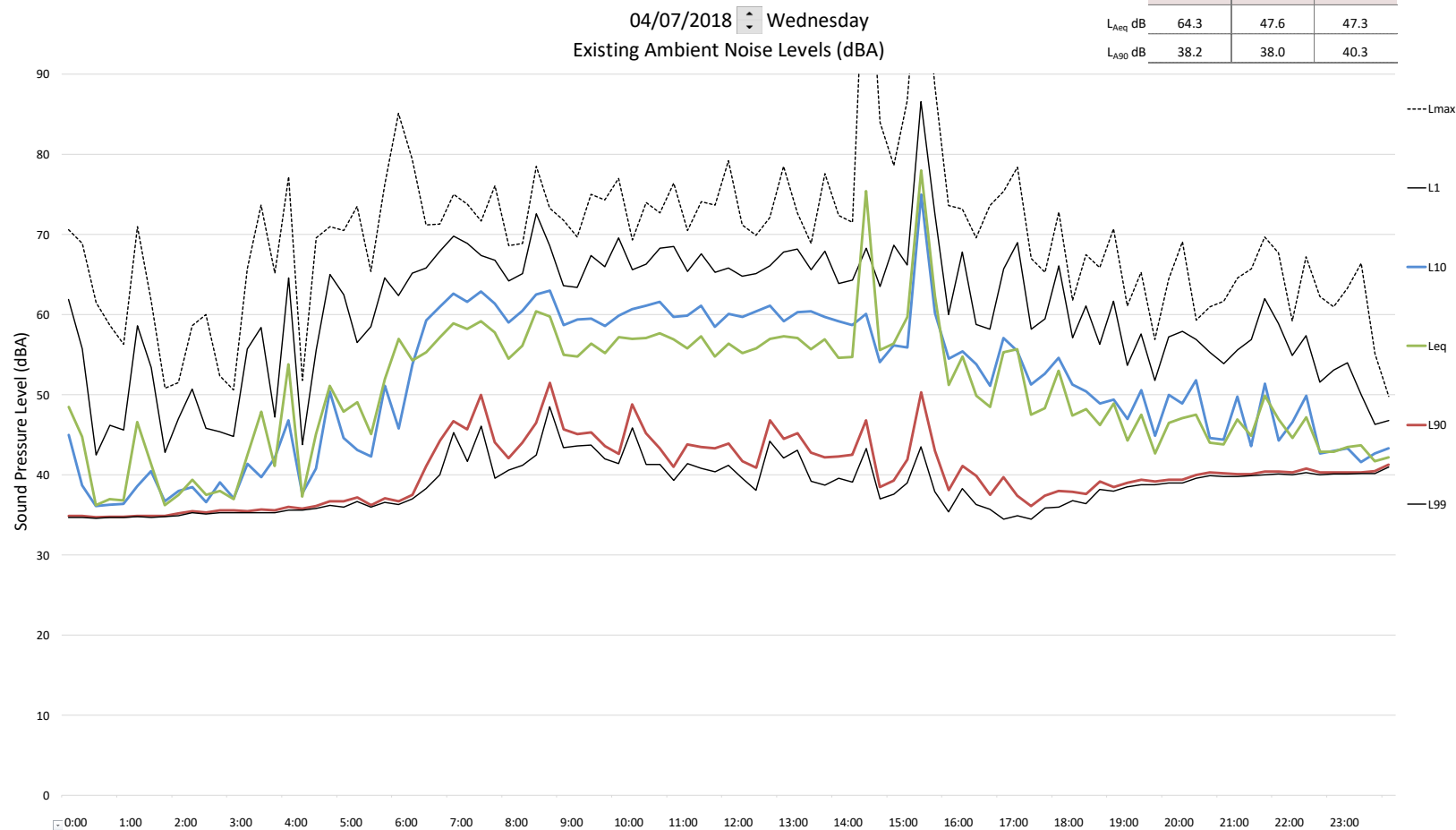
APPENDIX B NOISE MONITORING RESULTS (GRAPHICAL)

11279 Ku-Ring-Gai High School

Project Address: 403 Bobbin Head Rd, North Turramurra

Logger Location: At proposed setback facing Bobbin Head Road

PKA Acoustic Consulting



11279 Ku-Ring-Gai High School

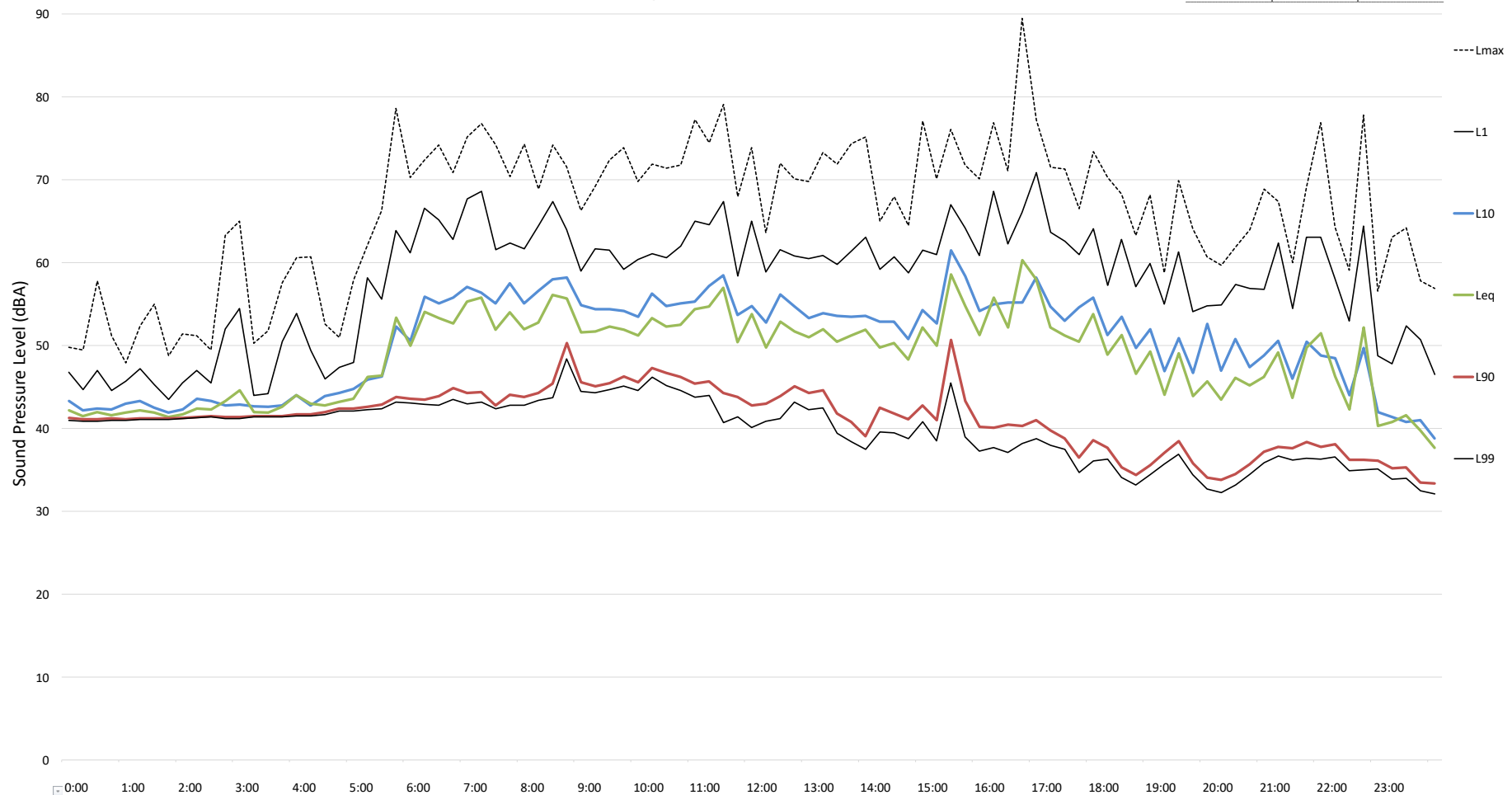
Project Address: 403 Bobbin Head Rd, North Turramurra

Logger Location: At proposed setback facing Bobbin Head Road

PKA Acoustic Consulting

05/07/2018 Thursday
Existing Ambient Noise Levels (dBA)

	Daytime 07:00 - 18:00 Measured	Evening 18:00 - 22:00 Measured	Nighttime 22:00 - 07:00 Measured
L_{Aeq} dB	64.3	47.6	47.3
L_{A90} dB	38.2	38.0	40.3



11279 Ku-Ring-Gai High School

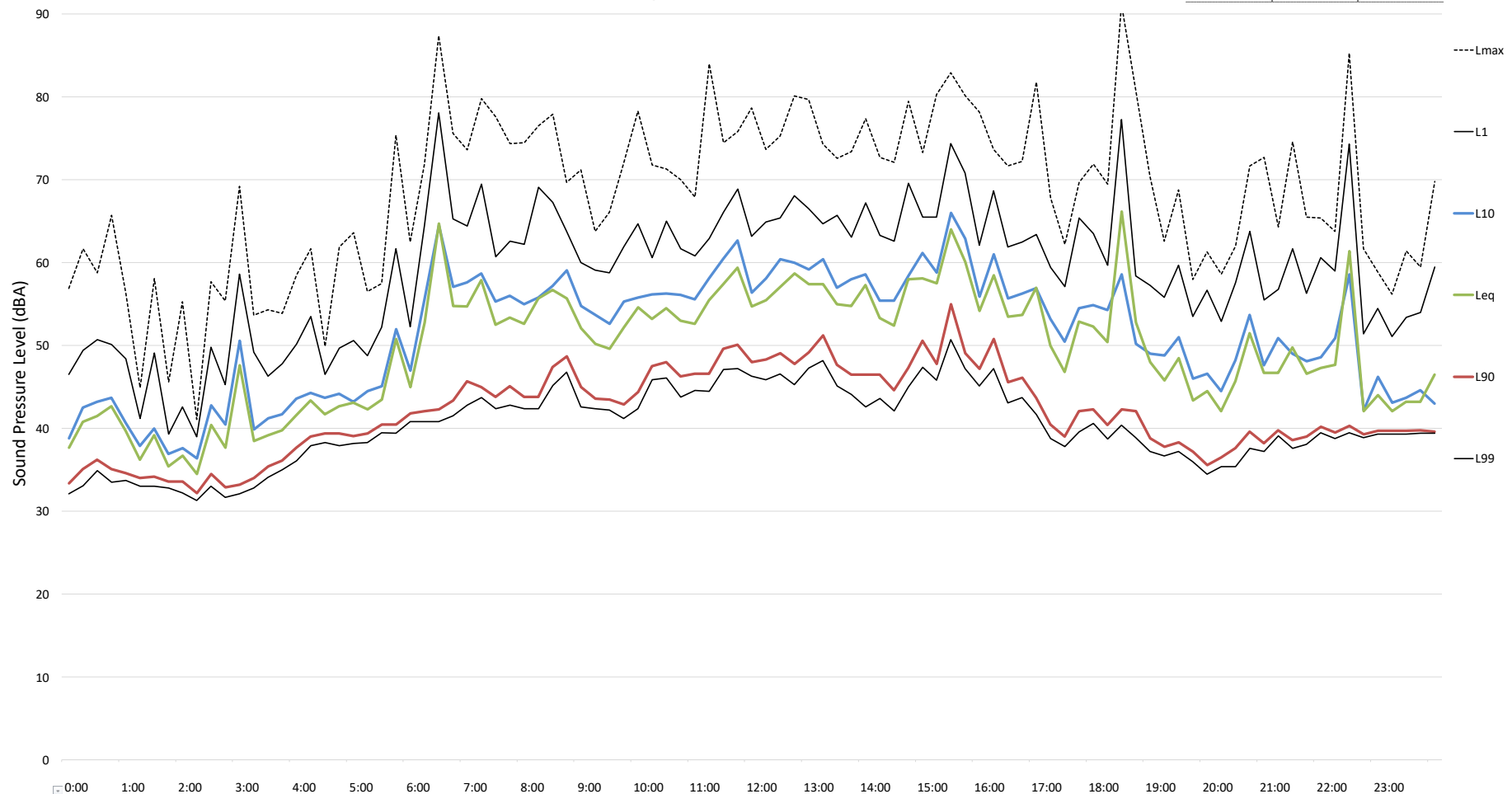
Project Address: 403 Bobbin Head Rd, North Turramurra

Logger Location: At proposed setback facing Bobbin Head Road

PKA Acoustic Consulting

06/07/2018 Friday
Existing Ambient Noise Levels (dBA)

	Daytime 07:00 - 18:00 Measured	Evening 18:00 - 22:00 Measured	Nighttime 22:00 - 07:00 Measured
L _{Aeq} dB	64.3	47.6	47.3
L _{A90} dB	38.2	38.0	40.3



11279 Ku-Ring-Gai High School

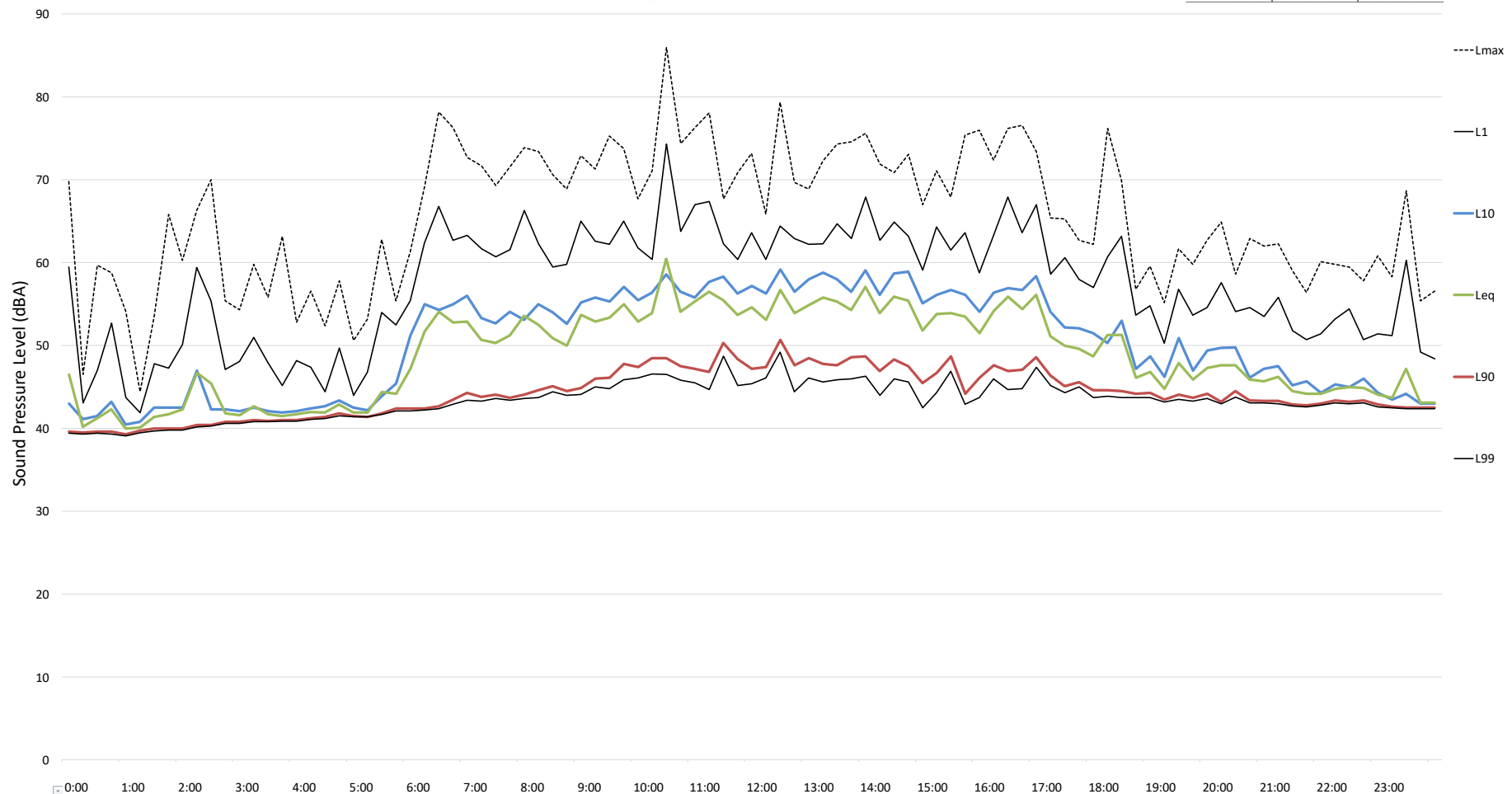
Project Address: 403 Bobbin Head Rd, North Turramurra

Logger Location: At proposed setback facing Bobbin Head Road

PKA Acoustic Consulting

07/07/2018 Saturday
Existing Ambient Noise Levels (dBA)

	Daytime 07:00 - 18:00 Measured	Evening 18:00 - 22:00 Measured	Nighttime 22:00 - 07:00 Measured
L _{Aeq} dB	64.3	47.6	47.3
L _{A90} dB	38.2	38.0	40.3



11279 Ku-Ring-Gai High School

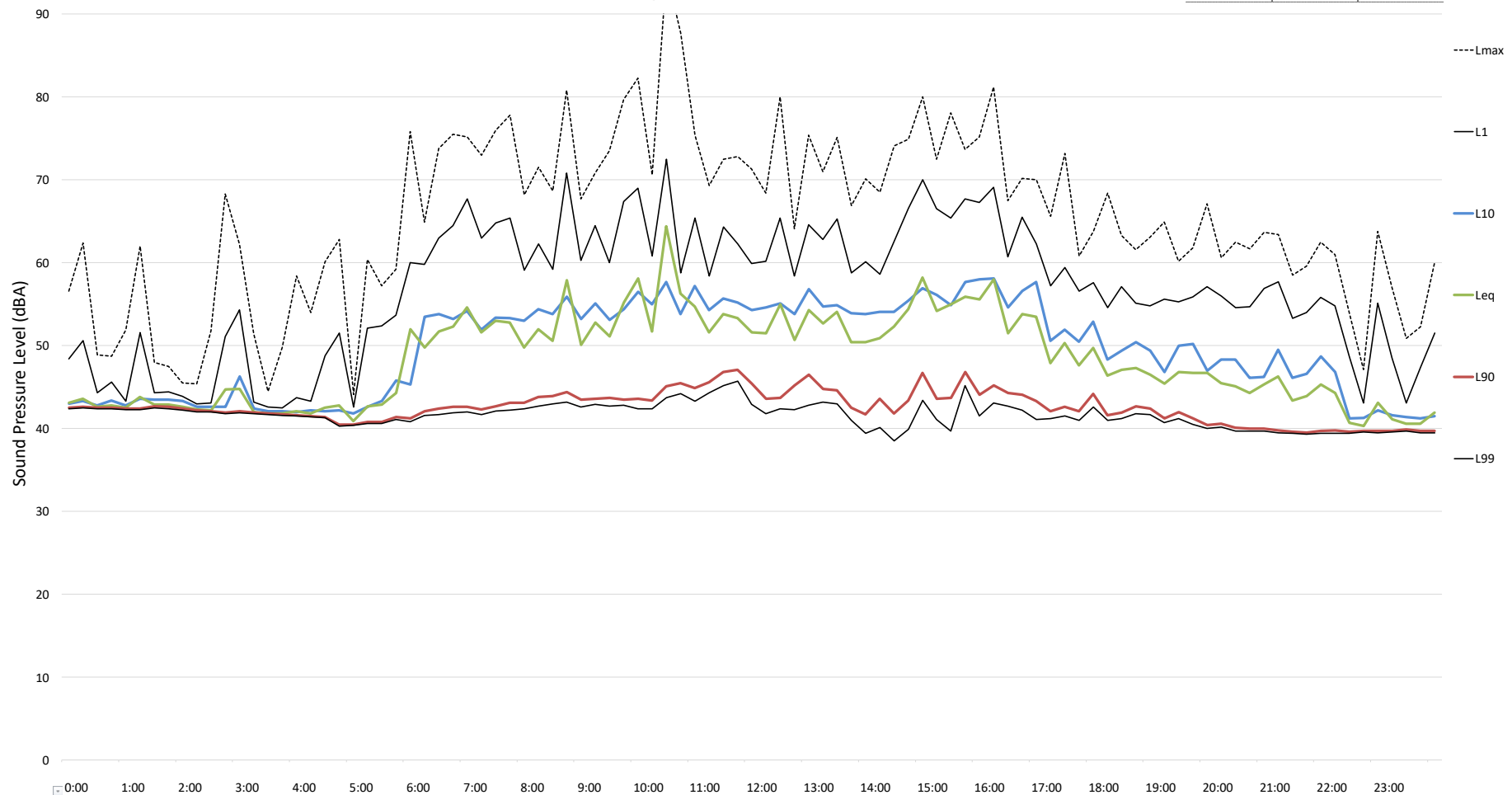
Project Address: 403 Bobbin Head Rd, North Turramurra

Logger Location: At proposed setback facing Bobbin Head Road

PKA Acoustic Consulting

08/07/2018 Sunday
Existing Ambient Noise Levels (dBA)

	Daytime 07:00 - 18:00 Measured	Evening 18:00 - 22:00 Measured	Nighttime 22:00 - 07:00 Measured
L _{Aeq} dB	64.3	47.6	47.3
L _{A90} dB	38.2	38.0	40.3



11279 Ku-Ring-Gai High School

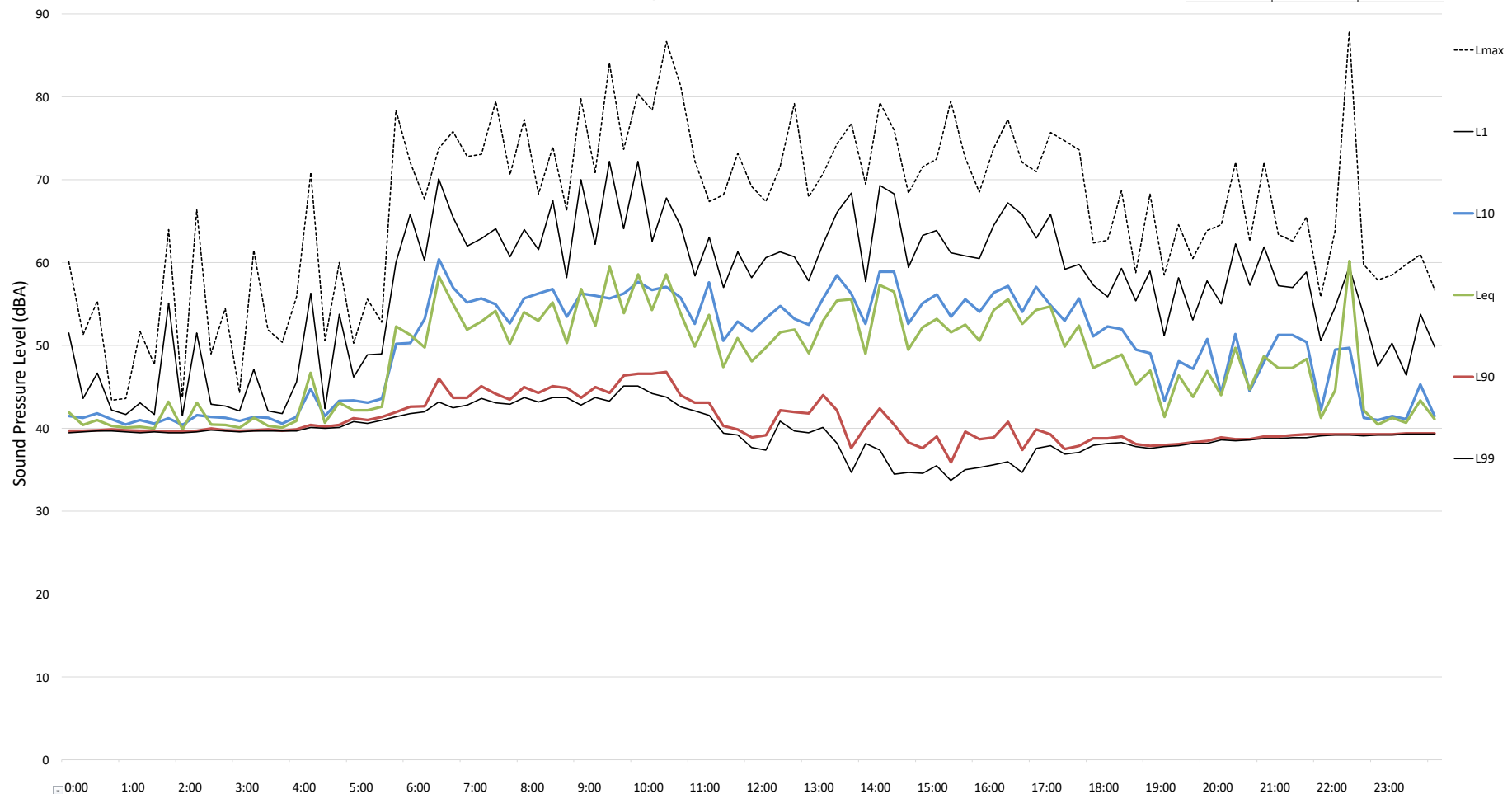
Project Address: 403 Bobbin Head Rd, North Turramurra

Logger Location: At proposed setback facing Bobbin Head Road

PKA Acoustic Consulting

09/07/2018 Monday
Existing Ambient Noise Levels (dBA)

	Daytime 07:00 - 18:00 Measured	Evening 18:00 - 22:00 Measured	Nighttime 22:00 - 07:00 Measured
L _{Aeq} dB	64.3	47.6	47.3
L _{A90} dB	38.2	38.0	40.3



11279 Ku-Ring-Gai High School

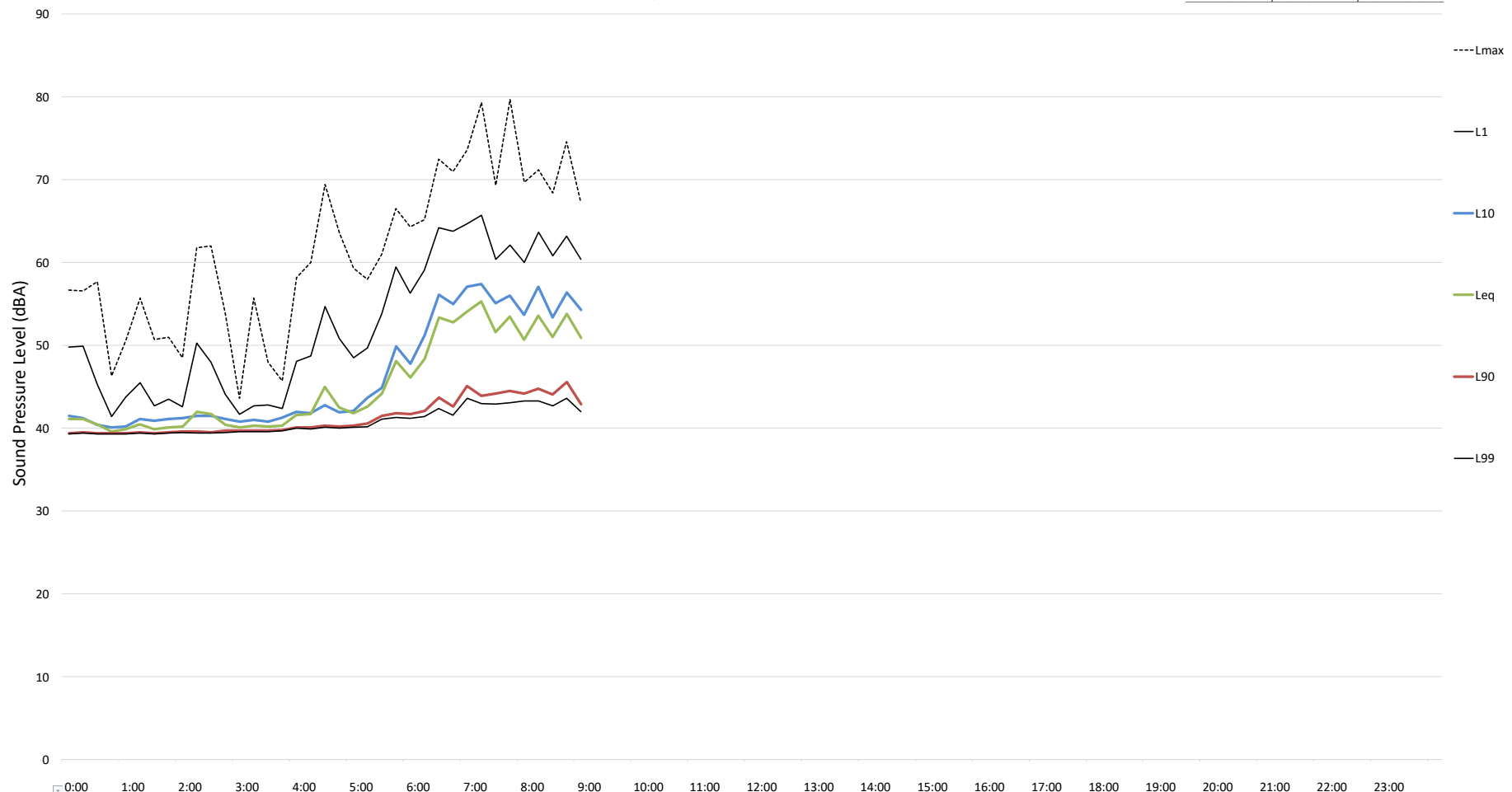
Project Address: 403 Bobbin Head Rd, North Turramurra

Logger Location: At proposed setback facing Bobbin Head Road

PKA Acoustic Consulting

10/07/2018 Tuesday
Existing Ambient Noise Levels (dBA)

	Daytime 07:00 - 18:00 Measured	Evening 18:00 - 22:00 Measured	Nighttime 22:00 - 07:00 Measured
L_{Aeq} dB	64.3	47.6	47.3
L_{A90} dB	38.2	38.0	40.3



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