RODNEY STEVENS ACOUSTICS
Acoustic Consultants
Member Australian Acoustical Society

REPORT R190145R1

Revision 2

Noise Impact Assessment

Proposed Community Club Redevelopment

72 Laycock Street, Bexley North NSW 2207

PREPARED FOR:
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PREPARED BY:

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1 INTRODUCTION

Rodney Stevens Acoustics Pty Ltd (RSA) has been engaged by the Order of AHEPA N.S.W Inc. to prepare a noise impact assessment for the proposed redevelopment to the existing bowling club located at 72 Laycock Street, Bexley North NSW 2207. This assessment forms part of the supporting documentation for DA submission to Bayside Council.

The purpose of this report is to determine possible noise impacts on nearby receivers and if necessary provide acoustic control recommendations so that the proposed development may operate in an acoustically compliant manner in accordance with Bayside Council's requirements and Office of Liquor and Gaming NSW license conditions.

This report presents RSA's methodology, assessment criteria and recommendations regarding noise emissions from the operation of the proposed development.

Council has requested additional information and clarification as part of their assessment of the suitability of the proposal and this has been included in this version of the report.

Specific acoustic terminology is used in this report. An explanation of common acoustic terms is provided in Appendix A.

2 PROPOSED DEVELOPMENT

2.1 Site Description

The club is located within a residential district with residential receivers to the north, south, east and west. Figure 2-1 shows an aerial image of the location of the club, the surrounding environment and the noise monitoring locations.

2.2 Proposed Development

The proposed work consists of the demolition of the existing buildings and construction a of new community club.

The proposal consists of:

- The demolition of existing club facilities, replacing it with a new building with club and community facilities;
- The construction of new parking facilities, at the existing ground floor parking location and proposed basement parking, which will provide approximately 72 new car parking spots
- Reinstating the existing bowling green to good and functional condition.

Architectural plans for the development are shown in Appendix D.

2.3 Hours of Operation

It is understood that the club is proposing the following hours of operation:

- Sunday to Thursday: 9:00 am to 11:00 pm
- Friday and Saturday: 9:00 am to 1:00 am

2.4 Number of Patrons

The maximum capacity as per AHEPA NSW requirements is 445 patrons at any one time.

Although the venue can hold more than this number in various sections, management restrictions on patron numbers will ensure that no more than 445 patrons are using the venue at any one time.

The capacity of 445 patrons is only envisaged to occur on a few occasions (particularly during special events etc.), whereas the regular capacity of the venue is considered to be closed to a maximum of 240 patrons. This would include a maximum of 200 people Monday to Friday 9am to 6pm, 225 people 6pm to 11pm Sunday to Thursday and 240 people 6pm to 1am Friday and Saturday.

Notwithstanding this, the acoustic assessment conducted in this report is based on a "worst case scenario" where the venue is operating at the nominated capacity of 445 patrons.

2.5 Special Events

The following special events are proposed to take place at the club throughout the year

Table 2-1 Special Events

Event	Day	Time	Number of patrons
Christmas Party	Friday to Sunday	7:00 pm to 11:00pm	300
Greek National Day Oxi Day	28th October or weekend closer to date	2:00pm to 6:00pm	280
Greek National Day	25th March or weekend closer to date	2:00pm to 6:00pm	280

Figure 2-1 Site Location

Image Courtesy of Near Maps © 2019.

3 BASELINE NOISE SURVEY

3.1 Unattended Noise Monitoring

In order to characterize the existing acoustical environment of the area unattended noise monitoring was conducted between Friday 12th April and Thursday 18th April 2019. The first logger was located at the site of the proposed of the new community club, this location is representative of the ambient noise levels of the proposed development area. The second logger was on one of the existing bowling greens (and one of the proposed car park locations).

Logger locations were selected with consideration to other noise sources which may influence readings, security issues for noise monitoring equipment and gaining permission for access from residents and landowners.

Instrumentation for the survey comprised of one Octave Frequency Analyzing Environmental Noise Logger and one Environmental Noise Logger (serial numbers 184112 and 87807D) fitted with microphone windshield. Calibration of the logger was checked prior to and following measurements. Drift in calibration did not exceed ±0.5 dB(A). All equipment carried appropriate and current NATA (or manufacturer) calibration certificates (these are shown in Appendix C).

Measured data has been filtered to remove data measured during adverse weather conditions upon consultation with historical weather reports provided by the Bureau of Meteorology (BOM).

The logger determines L_{A1}, L_{A10}, L_{A90} and L_{Aeq} levels of the ambient noise. L_{A1}, L_{A10}, L_{A90} are the levels exceeded for 1%, 10% and 90% of the sample time respectively (see Glossary for definitions in Appendix A).

Detailed results at the monitoring location are presented in graphical format in Appendix B. The graphs show measured values of L_{A1}, L_{A10}, L_{A90} and L_{Aeq} for each 15-minute monitoring period.

3.2 Data Processing

In order to establish the ambient noise criteria of the area, the data obtained from the noise logger has been processed in accordance with the procedures contained in the NSW Environmental Protection Authority's (EPA) *Noise Policy for Industry* (NPfI, 2017) to establish representative noise levels that can be expected in the residential vicinity of the site. The monitored baseline noise levels are detailed in Table 3-1.

Table 3-1 Measured Baseline Noise Levels Corresponding to Defined NPfI Periods

Location	Measurement Descriptor	Measured Noise Level – dB(A) re 20 µPa		
		Daytime 7 am - 6 pm	Evening 6 pm – 10 pm	Night-time 10 pm – 7 am
Logger at existing bowling club	L_{Aeq}	52	51	51
	RBL (Background)	35	41	36
Logger at bowling green	L_{Aeq}	53	48	51
	RBL (Background)	40	41	39

Notes: All values expressed as dB(A) and rounded to nearest 1 dB(A);

L_{Aeq} Equivalent continuous (energy average) A-weighted sound pressure level. It is defined as the steady sound level that contains the same amount of acoustic energy as the corresponding time-varying sound.

L_{A90} Noise level present for 90% of time (background level). The average minimum background sound level (in the absence of the source under consideration).

3.2.1 OLG Analysis

The Office of Liquor and Gaming NSW provides a guideline to access noise from licensed venues, the noise criteria is required to be in one octave band frequency. The noise logger used for the unattended measurements has the capability of recording noise data in one octave band frequency allowing us to establish spectral information of typical background noise levels experienced by the nearby residential receivers.

The background noise levels have been processed in accordance with NPfI procedures and are presented in octave band frequency form in Section 4.3 of this report

4 NOISE CRITERIA

The establishment of the noise criteria for the licensed premises assessment of the proposed club have been based on the OLG noise guidelines.

4.1 Office of Liquor and Gaming

OLG guidelines for the assessment of noise from licensed premises is as follows:

a) The L_{A10} noise level emitted from the use must not exceed the background noise level (L_{90}) in any Octave Band Centre Frequency (31.5 Hz to 8 kHz inclusive) by more than 5 dB between the hour of 7.00 am and 12.00 midnight when assessed at the boundary of any affected residence.

b) The L_{A10} noise level emitted from the use must not exceed the background noise level (L_{90}) in any Octave Band Centre Frequency (31.5 Hz to 8 kHz inclusive) between the hour of 12.00 midnight and 7.00 am when assessed at the boundary of any affected residence.

c) Notwithstanding compliance with a) and b) above, the noise from the use must not be audible within any habitable room in any residential property between the hours of 12.00 midnight and 7.00 am.

4.2 Operational Noise Criteria

Responsibility for the control of noise emissions in New South Wales is vested in Local Government and the EPA. The EPA oversees the Noise Policy for Industry (NPfI) October 2017 which provides a framework and process for deriving project trigger noise level. The NPfI project noise levels for industrial noise sources have two (2) components:

- Controlling the intrusive noise impacts for residents and other sensitive receivers in the short term; and
- Maintaining noise level amenity for particular land uses for residents and sensitive receivers in other land uses.

4.2.1 Intrusiveness Noise Levels

For assessing intrusiveness, the background noise generally needs to be measured. The intrusiveness noise level essentially means that the equivalent continuous noise level (LAeq) of the source should not be more than 5 dB(A) above the measured Rated Background Level (RBL), over any 15 minute period.

4.2.2 Amenity Noise Levels

The amenity noise level is based on land use and associated activities (and their sensitivity to noise emission). The cumulative effect of noise from industrial sources needs to be considered in assessing the impact. The noise levels relate only to other industrial-type noise sources and do not include road, rail or community noise. The existing noise level from industry is measured.

If it approaches the project trigger noise level value, then noise levels from new industrial-type noise sources, (including air-conditioning mechanical plant) need to be designed so that the cumulative effect does not produce total noise levels that would significantly exceed the project trigger noise level.

4.2.3 Area Classification

The NPfI characterises the “Suburban” noise environment as an area with an acoustical environment that:

- has local traffic with characteristically intermittent traffic flows or with some limited commerce or industry.
- This area often has the following characteristic: - evening ambient noise levels defined by the natural environment and human activity

The area surrounding the proposed development falls under the “Suburban” area classification.

4.2.4 Project Specific Trigger Noise Levels

Having defined the area type, the processed results of the noise monitoring have been used to determine project specific project trigger noise level. The intrusive and amenity project trigger noise level for nearby residential premises are presented in Table 4-1. These project trigger noise levels are nominated for the purpose of assessing potential noise impacts from the proposed development.

In this case, the ambient noise environment is not controlled by industrial noise sources and therefore the project amenity noise level are assigned as per Table 2.2 of the NPfI (Recommended Amenity Noise Levels).

For each assessment period, the lower (i.e. the more stringent) of the amenity or intrusive project trigger noise level are adopted. These are shown in bold text in Table 4-1.

Table 4-1 Operational Project Trigger Noise Levels

Receiver	Time of Day	ANL [1] $L_{Aeq(15min)}$	Measured		Project Trigger Noise Levels	
			RBL [2] $L_{A90(15min)}$	Existing $L_{Aeq(Period)}$	Intrusive $L_{Aeq(15min)}$	Amenity $L_{Aeq(15min)}$
Residential	Day	55	40	53	**45**	55
	Evening	45	41	48	46	**45**
	Night	40	39	51	44	**40**

Note 1: ANL = "Amenity Noise Level" for residences in Suburban Areas.

Note 2: RBL = "Rating Background Level".

4.3 Project Specific Noise Criteria

Based on the spectral data from the noise logger the project specific noise criteria for the operation of the proposed redevelopment of the club have been established in accordance with OLG noise guidelines. The project specific noise criteria for the residential receivers is presented in tables below.

Table 4-2 External Criteria for Operational Noise

Description	Ambient Noise Level per Octave Band -dB								
	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz	8k Hz
Measured Daytime L_{90} Background Noise Level	47	44	35	30	28	29	24	20	15
L_{10} Daytime Criterion (Between 7 am and 12 midnight): At Surrounding Residences	**52**	**49**	**40**	**35**	**33**	**34**	**29**	**25**	**20**
Measured Night-time L_{90} Background Noise Level	47	45	36	30	30	30	21	14	15
L_{10} Night-time Criterion (Between 12 midnight and 7 am): At Surrounding Residences	**47**	**45**	**36**	**30**	**30**	**30**	**21**	**14**	**15**

Table 4-3 Internal Criteria for Operational Noise

Description	Ambient Noise Level per Octave Band -dB								
	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz	8k Hz
Measured Night-time L_{90} Background Noise Level	47	45	36	30	30	30	21	14	15
L_{10} Night-time Criterion (Between 12 midnight and 7 am): Inside Residences	**37**	**35**	**26**	**20**	**20**	**20**	**11**	**4**	**5**

5 NOISE IMPACT ASSESSMENT

The following sections summarise the results of patron and music noise assessment, car parking and loading bay and predicted levels at nearby receivers as a result of the operation of the proposed alterations and additions.

5.1 Typical Patron Vocal Levels

Calculations of the amount of noise transmitted to these receivers from patrons at the proposed development have been based on voice levels as referenced in the Handbook of Acoustical Measurements and Noise Control by Cyril M. Harris. This handbook provides voice spectrums for males and females as well as different vocal efforts. The spectrum is given in Table 5-1.

The spectra have been scaled based upon the overall number of patrons expected to be in the respective areas at any given time

Table 5-1 Speech Spectrums - Handbook of Acoustical Measurements and Noise Control.

Type	Noise Level (dB) at Octave Band Centre Frequency (Hz)							Overall dB(A)
	125	250	500	1 k	2 k	4 k	8 k	
Male (Raised)	53	59	64	58	54	49	43	64
Female (Raised)	35	55	60	58	54	49	43	62

5.2 Patron Sound Power Levels

Based on the maximum number of patrons in all public areas of the club, the following worst-case operational scenarios have been assumed for our assessment:

- Only 50% of all patrons per room will be talking at any given time, this is assuming that 1 person will be talking and 1 person will be listening.

Table 5-2 Sound Power Levels of People talking with Raised Voice - L_W – dB(A)

Scenario	Resultant Sound Power Level per Octave Band (dB)							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Up to 395 Patrons with Raised Vocal in Downstairs Club Areas	-	89	93	97	92	88	84	78

Up to 185 Patrons with Raised Vocal in Upstairs Club Areas	-	86	90	94	89	85	81	75

Note: Maximum number of patrons within the venue at one time will be limited to no more than 445 patrons throughout the venue. The regular capacity of the venue is considered closer to 240 patrons, but 445 has been asseumed for the assessment.

It is generally agreed that the human voice is not capable of producing noise at 32 Hz and 63Hz octave bands at significant amplitudes. It is also very likely that even if noise emission in this low frequency octave bands exceeds the noise criterion; it will be very close to, if not below, the human threshold of hearing at the receivers.

Appropriate sound power levels conversations have been made for the varying distribution number of patrons.

5.3 Music Sound Power Level

RSA has conducted measurements of background music and live music noise levels at various licensed venues, based on these measurements the sound power level spectrum of typical music is shown in Table 5-3 below:

Table 5-3 Typical Sound Power Level of Typical Music - L_w – dB(A)

Scenario	Resultant Sound Power Level per Octave Band (dB)								
	31.5Hz	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Typical Background Music	70	79	87	84	79	82	80	78	71
Typical Live Band	93	103	103	102	104	97	91	90	87

5.4 Predicted Noise Impacts

Predictive resultant noise spectrums have been calculated for all proposed club activities. Noise emissions at the nearest receivers are presented in the tables below. The predicted noise calculations take into account the following:

- Heights of receivers are assumed to be 1.5 m above their respective floor level;
- The number of patrons is as presented in Section 2.4 and Table 5-2;
- Special events presented in Table 2-1 have been taken into account;
- Live music and DJs using speaker systems will be used in the function room and some public spaces;
- The entry doors close automatically;
- The carpark capacity is 72 spaces;
- The venue will operate until 1:00 am Friday and Saturday and 11:00 pm on other trading days.

We note that patrons attended the special events form part of the overall capacity of the club as per Section 2.4

The following figure shows the proposed development in relation to the most affected receivers.

Figure 5-1 Affected Receiver Locations

The site is surrounded by residential premises to the north, south, east and west.

The resulting noise levels from the operation of the proposed redevelopment are presented in the table below, we have assumed the worst case scenario were the public areas of the club are operating simultaneously and at the relevant full capacity of the venue (i.e. a maximum of 445 patrons at any one time).

The following table shows the predicted noise level results for the residential receivers.

Table 5-4 Predicted External Noise Impact Levels - Residential Receivers Day Criteria

Receivers	Resultant Sound Pressure Level per Octave Band - dB								
	31.5 Hz	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Daytime Assessment (7:00am to 12:00am)									
Combined Noise Level									
Patrons									
R1	<0	<0	19	26	35	36	33	28	16
R2	<0	<0	11	19	25	22	18	13	3
R3	<0	<0	10	14	23	24	21	14	<0
Daytime Criteria	**52**	**49**	**40**	**35**	**33**	**34**	**29**	**25**	**20**
Exceedance R1	-	-	-	-	*2*	*2*	*4*	*3*	-
Exceedance R2	-	-	-	-	-	-	-	-	-
Exceedance R3	-	-	-	-	-	-	-	-	-
Live Music									
R1	20	32	36	35	38	33	24	20	11
R2	18	28	29	26	28	20	9	3	<0
R3	<0	20	20	16	17	9	<0	<0	<0
Daytime Criteria	**52**	**49**	**40**	**35**	**33**	**34**	**29**	**25**	**20**
Exceedance R1	-	-	-	-	*5*	-	-	-	-
Exceedance R2	-	-	-	-	-	-	-	-	-
Exceedance R3	-	-	-	-	-	-	-	-	-

It should be noted that this noise prediction is based on the venue operating at capacity (445 patrons). The noise predictions show a slight exceedance of criteria when the venue is at capacity. Recommendations are set out in this report to ensure compliance under all circumstances.

The proposed development will comply under all criteria under “normal” operations (when the venue is catering for <400 people).

Table 5-5 Predicted External Noise Impact Levels - Residential Receivers Night Criteria

Receivers	Resultant Sound Pressure Level per Octave Band - dB								
	31.5 Hz	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Night-time Assessment (12:00am to 7:00am)									
Combined Noise Level									
R1	<0	<0	19	26	35	36	33	28	16
R2	<0	<0	11	19	25	22	18	13	3
R3	<0	<0	10	14	23	24	21	14	<0
Night-time Criteria	**47**	**45**	**36**	**30**	**30**	**30**	**21**	**14**	**15**
Exceedance R1	-	-	-	-	*5*	*6*	*12*	*14*	*1*
Exceedance R2	-	-	-	-	-	-	-	-	-
Exceedance R3	-	-	-	-	**-**	-	**-**	**-**	-

The noise predictions show the potential for exceedance of criteria at one sensitive receiver when the venue is at capacity. Recommendations set out in this report will ensure compliance with regulatory criteria.

Table 5-6 Predicted Internal Noise Impact Levels - Residential Receivers Night Criteria

Receivers	Resultant Sound Pressure Level per Octave Band - dB								
	31.5 Hz	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Night-time Assessment (12:00am to 7:00am)									
Combined Noise Level									
R1	<0	<0	<0	6	15	15	10	3	<0
R2	<0	<0	<0	<0	5	2	<0	<0	<0
R3	<0	<0	<0	<0	3	4	1	<0	<0
Night-time Criteria Minus 10 dB(A) (Inaudibility)	**37**	**35**	**26**	**20**	**20**	**20**	**11**	**4**	**5**
Exceedance R1	-	-	-	-	-	-	-	-	-
Exceedance R2	-	-	-	-	-	-	-	-	-
Exceedance R3	-	-	-	-	-	-	-	-	-

5.5 Carpark Emission

The proposed car park is to be located on the ground floor and basement of the site, it has a capacity of 72 car spaces. Calculations of noise from the carpark have been based on typical noise generating events within a carpark such as, door slams, engine starts and cars driving away. We have assumed a scenario where 30 cars enter or leave the carpark in a span of 15 minutes.

The calculated noise levels from the activities carried out within the carpark are presented in the table below:

Table 5-7 Calculated Carpark Noise Levels

Receiver	Predicted Carpark Activities Noise at Neighbouring Residents – dB(A)	Criteria	Compliance
R1	41	45	Yes
	41	45	Yes
	41*	40	Yes*
R2	41	45	Yes
	41	45	Yes
	41*	40	Yes*
R3	35	45	Yes
	35	45	Yes
	35	40	Yes

* We note that an exceedance of 1dB(A) is not considered acoustically significant.

5.6 Delivery Vehicle Emissions

The proposed loading bay is to be located to the south of the site. Calculations of noise from the loading bay have been based on typical noise generating events within a loading bay with trucks and vans making deliveries on most days of the week, this includes vehicle movements, reverse alarms and the like. We have assumed a scenario where 1 truck and 1 delivery van enter or leave the loading bay in a span of 15 minutes.

The calculated noise levels from the activities carried out within the loading bay are presented in the table below:

Table 5-8 Calculated Loading Bay Noise Levels

Receiver	Predicted Delivery Activities Noise at Neighbouring Residents – dB(A)	Criteria	Compliance
R1	34	45	Yes
	34	45	Yes
	34	40	Yes
R2	43	45	Yes
	43	45	Yes
	43	40	No
R3	<20	45	Yes
	<20	45	Yes
	<20	40	Yes

There is an exceedance of the relevant criteria for one sensitive receiver during the night time assessment period.

5.7 Garbage Collection Vehicle Emissions

The proposed garbage collection point is to be located to the south of the site. Calculations of noise from the garbage collection have been based on typical noise generating events garbage trucks picking up waste once per day, this includes vehicle movements, reverse alarms and the like. We have assumed a scenario where 1 truck enter or leave the loading bay in a span of 15 minutes.

The calculated noise levels from the activities carried out within the garbage collection area are presented in the table below:

Table 5-9 Calculated Garbage Collection Noise Levels

Receiver	Predicted Delivery Activities Noise at Neighbouring Residents – dB(A)	Criteria	Compliance
R1	33	45	Yes
	33	45	Yes
	33	40	Yes

R2	41	45	Yes
	41	45	Yes
	41*	40	Yes*
R3	<20	45	Yes
	<20	45	Yes
	<20	40	Yes

* We note that an exceedance of 1dB(A) is not considered acoustically significant.

5.8 Mechanical Plant

A specific mechanical plant selection has not been supplied at this stage. It is anticipated that the building will be serviced by typical mechanical ventilation/air conditioning equipment.

It is likely that the criteria set out in Table 4-1 will be met through the use of conventional noise control methods (e.g. selection of equipment on the basis of quiet operation and, where necessary, providing enclosures, localised barriers, silencers and lined ductwork).

An appropriately qualified acoustic consultant should review the mechanical plant associated with the development at the detailed design stage when final plant selections have been made.

6 RECOMMENDATIONS

The noise emissions from the proposed changes to the club have the potential to comply with the required criteria when the venue is at capacity with the implementations of the following recommendations:

6.1 General Community Club Recommendations

- All external windows and doors to be closed at 10:00 pm.
- External doors to have self-closing mechanisms installed.
- External windows and doors to be closed when all internal spaces are at capacity.
- Outdoor areas to be closed at 10:00 pm.
- All patrons must be advised to leave the club in an orderly and quiet manner, staff must guide patrons at the end of special events
- Patrons must not congregate outside the club or in the carpark
- Signs must be placed in the carpark advising patrons to not cause unnecessary noise when leaving the club

6.2 Function Spaces

- A noise limiter is to be installed on all speaker systems to ensure live music does not exceed 95 dB(A) at 1 meter from the speakers. All amplified equipment must be connected to the limiter.
- No live music after midnight.

6.3 Mechanical Plant

- Items of mechanical plant that do not require to be used 24 hours a day to be switched off when not in use or when the venue is closed.
- A mechanical plant assessment must be carried out at Construction Certificate stage once final selection has been determined.

6.4 Loading Dock

- All deliveries must occur during the day time hours, preferably from 8:00am and not before 7:00am.
- All truck and van drivers must be instructed to minimise the reversing time where possible.
- Trucks and van should have “squawking” reverse alarms (if possible).

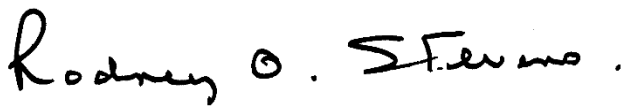
7 CONCLUSION

A noise impact assessment has been conducted in relation to the operation of the proposed development at the community club located at 72 Laycock Street, Bexley North.

This assessment has been conducted and appropriate noise emission criteria have been established in accordance with the Office of Liquor & Gaming NSW noise guidelines and other relevant criteria.

This report shows compliance with the specific noise criteria with the implementation of the recommendations provided in this report. It is therefore recommended that planning approval be granted for the proposed alterations and additions on the basis of acoustics.

Approved:-



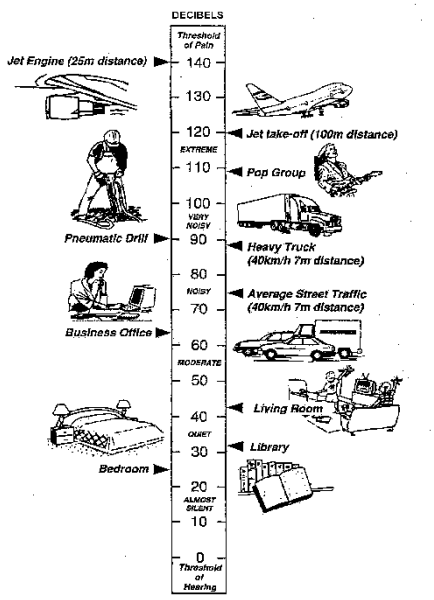
Rodney Stevens

Manager/Principal

Appendix A – Acoustic Terminology

A-weighted sound pressure	The human ear is not equally sensitive to sound at different frequencies. People are more sensitive to sound in the range of 1 to 4 kHz (1000 – 4000 vibrations per second) and less sensitive to lower and higher frequency sound. During noise measurement an electronic '*A-weighting*' frequency filter is applied to the measured sound level *dB(A)* to account for these sensitivities. Other frequency weightings (B, C and D) are less commonly used. Sound measured without a filter is denoted as linear weighted dB(linear).
Ambient noise	The total noise in a given situation, inclusive of all noise source contributions in the near and far field.
Community annoyance	Includes noise annoyance due to: ▪ character of the noise (e.g. sound pressure level, tonality, impulsiveness, low-frequency content) ▪ character of the environment (e.g. very quiet suburban, suburban, urban, near industry) ▪ miscellaneous circumstances (e.g. noise avoidance possibilities, cognitive noise, unpleasant associations) ▪ human activity being interrupted (e.g. sleep, communicating, reading, working, listening to radio/TV, recreation).
Compliance	The process of checking that source noise levels meet with the noise limits in a statutory context.
Cumulative noise level	The total level of noise from all sources.
Extraneous noise	Noise resulting from activities that are not typical to the area. Atypical activities may include construction, and traffic generated by holiday periods and by special events such as concerts or sporting events. Normal daily traffic is not considered to be extraneous.
Feasible and reasonable measures	Feasibility relates to engineering considerations and what is practical to build; reasonableness relates to the application of judgement in arriving at a decision, taking into account the following factors: ▪ Noise mitigation benefits (amount of noise reduction provided, number of people protected). ▪ Cost of mitigation (cost of mitigation versus benefit provided). ▪ Community views (aesthetic impacts and community wishes). ▪ Noise levels for affected land uses (existing and future levels, and changes in noise levels).
Impulsiveness	Impulsive noise is noise with a high peak of short duration or a sequence of these peaks. Impulsive noise is also considered annoying.

Low frequency	Noise containing major components in the low-frequency range (20 to 250 Hz) of the frequency spectrum.
Noise criteria	The general set of non-mandatory noise levels for protecting against intrusive noise (for example, background noise plus 5 dB) and loss of amenity (e.g. noise levels for various land use).
Noise level (goal)	A noise level that should be adopted for planning purposes as the highest acceptable noise level for the specific area, land use and time of day.
Noise limits	Enforceable noise levels that appear in conditions on consents and licences. The noise limits are based on achievable noise levels, which the proponent has predicted can be met during the environmental assessment. Exceedance of the noise limits can result in the requirement for either the development of noise management plans or legal action.
Performance-based goals	Goals specified in terms of the outcomes/performance to be achieved, but not in terms of the means of achieving them.
Rating Background Level (RBL)	The rating background level is the overall single figure background level representing each day, evening and night time period. The rating background level is the 10^{th} percentile min L_{A90} noise level measured over all day, evening and night time monitoring periods.
Receptor	The noise-sensitive land use at which noise from a development can be heard.
Sleep disturbance	Awakenings and disturbance of sleep stages.
Sound and decibels (dB)	Sound (or noise) is caused by minute changes in atmospheric pressure that are detected by the human ear. The ratio between the quietest noise audible and that which should cause permanent hearing damage is a million times the change in sound pressure. To simplify this range the sound pressures are logarithmically converted to decibels from a reference level of 2 x 10-5 Pa. The picture below indicates typical noise levels from common noise sources.



dB is the abbreviation for decibel – a unit of sound measurement. It is equivalent to 10 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure.

Sound power Level (SWL)

The sound power level of a noise source is the sound energy emitted by the source. Notated as SWL, sound power levels are typically presented in *dB(A)*.

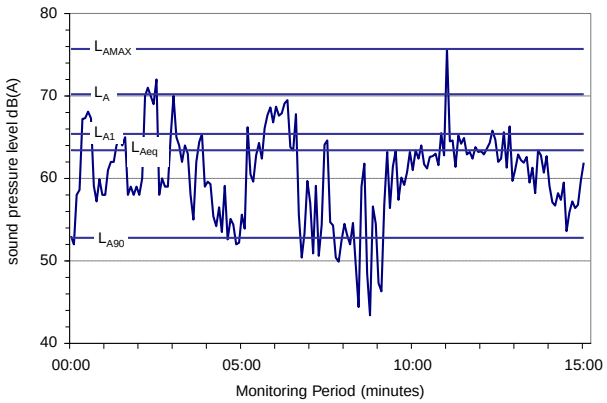
Sound Pressure Level (SPL)

The level of noise, usually expressed as SPL in *dB(A)*, as measured by a standard sound level meter with a pressure microphone. The sound pressure level in *dB(A)* gives a close indication of the subjective loudness of the noise.

Statistic noise levels

Noise levels varying over time (e.g. community noise, traffic noise, construction noise) are described in terms of the statistical exceedance level.

A hypothetical example of A weighted noise levels over a 15 minute measurement period is indicated in the following figure:



Key descriptors:

L_{Amax} Maximum recorded noise level.

L_{A1} The noise level exceeded for 1% of the 15 minute interval.

L_{A10} Noise level present for 10% of the 15 minute interval. Commonly referred to the average maximum noise level.

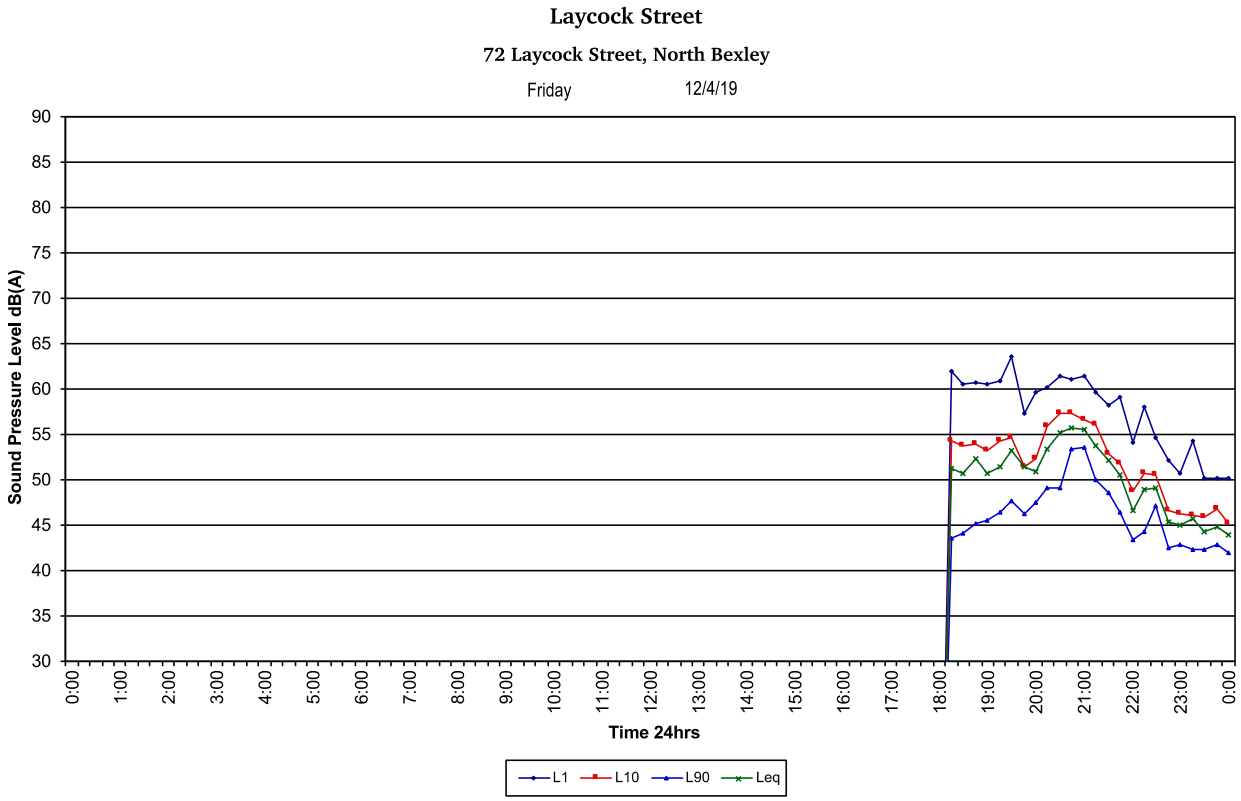
L_{Aeq} Equivalent continuous (energy average) A-weighted sound pressure level. It is defined as the steady sound level that contains the same amount of acoustic energy as the corresponding time-varying sound.

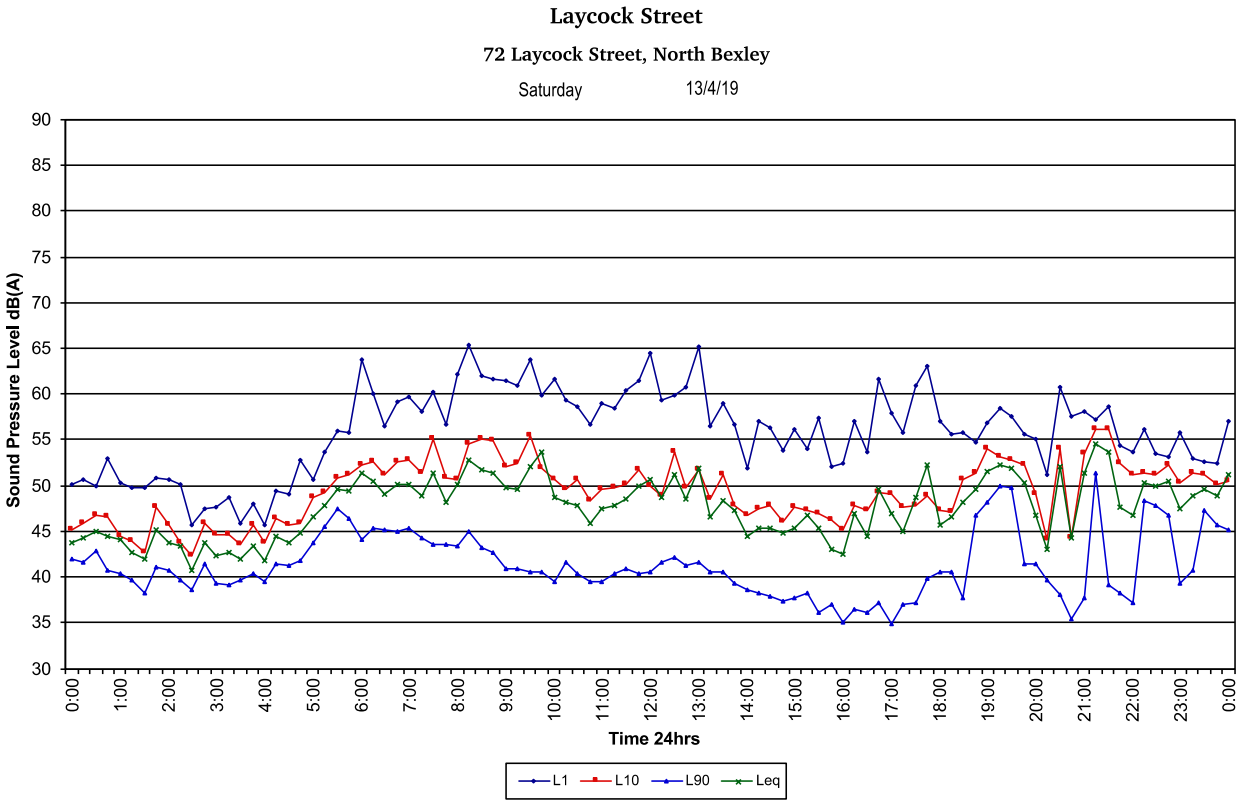
L_{A90} Noise level exceeded for 90% of time (background level). The average minimum background sound level (in the absence of the source under consideration).

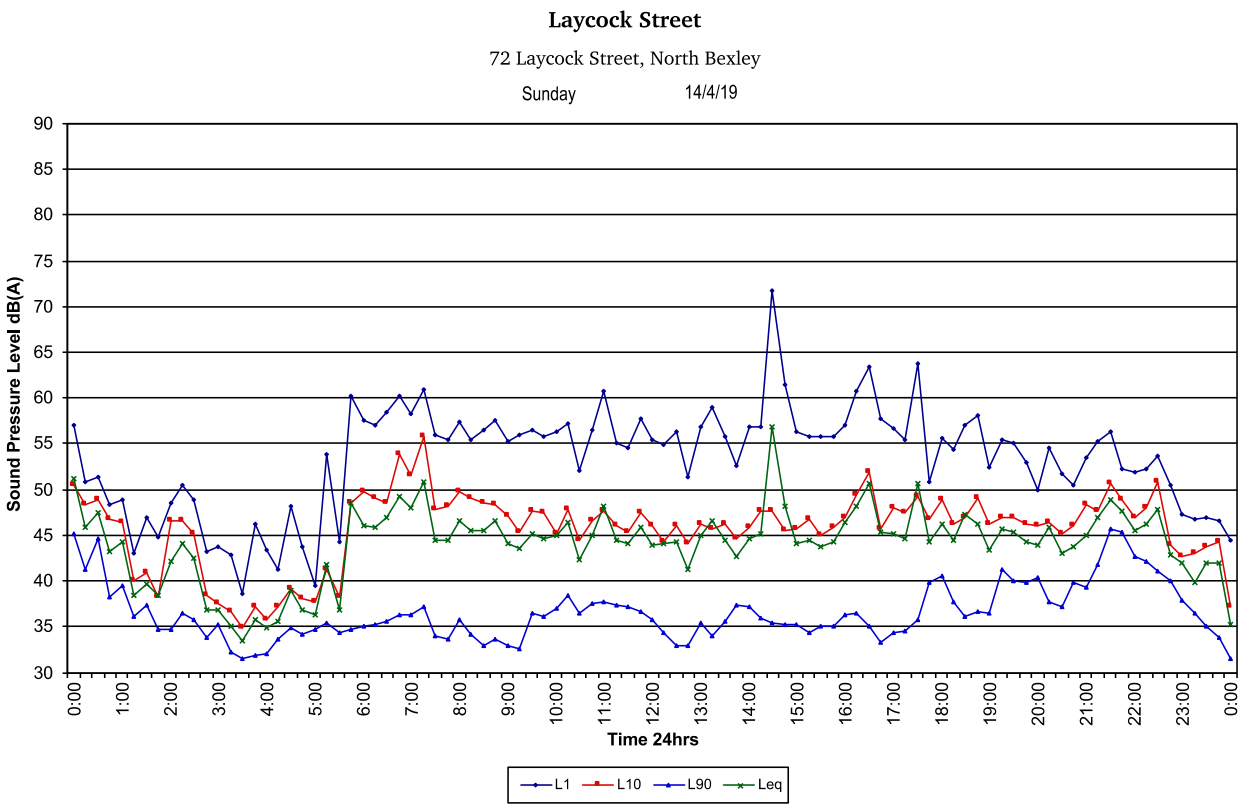
Threshold The lowest sound pressure level that produces a detectable response (in an instrument/person).

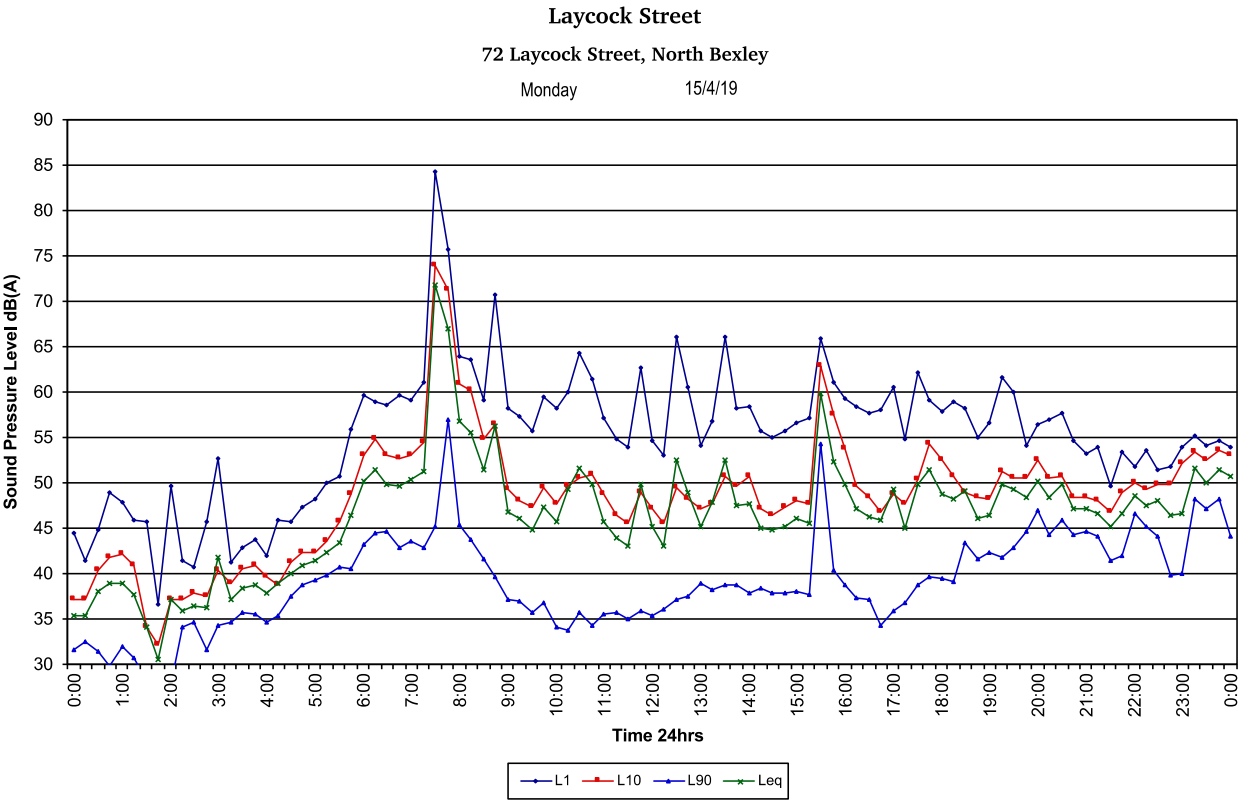
Tonality Tonal noise contains one or more prominent tones (and characterised by a distinct frequency components) and is considered more annoying. A 2 to 5 dB(A) penalty is typically applied to noise sources with tonal characteristics

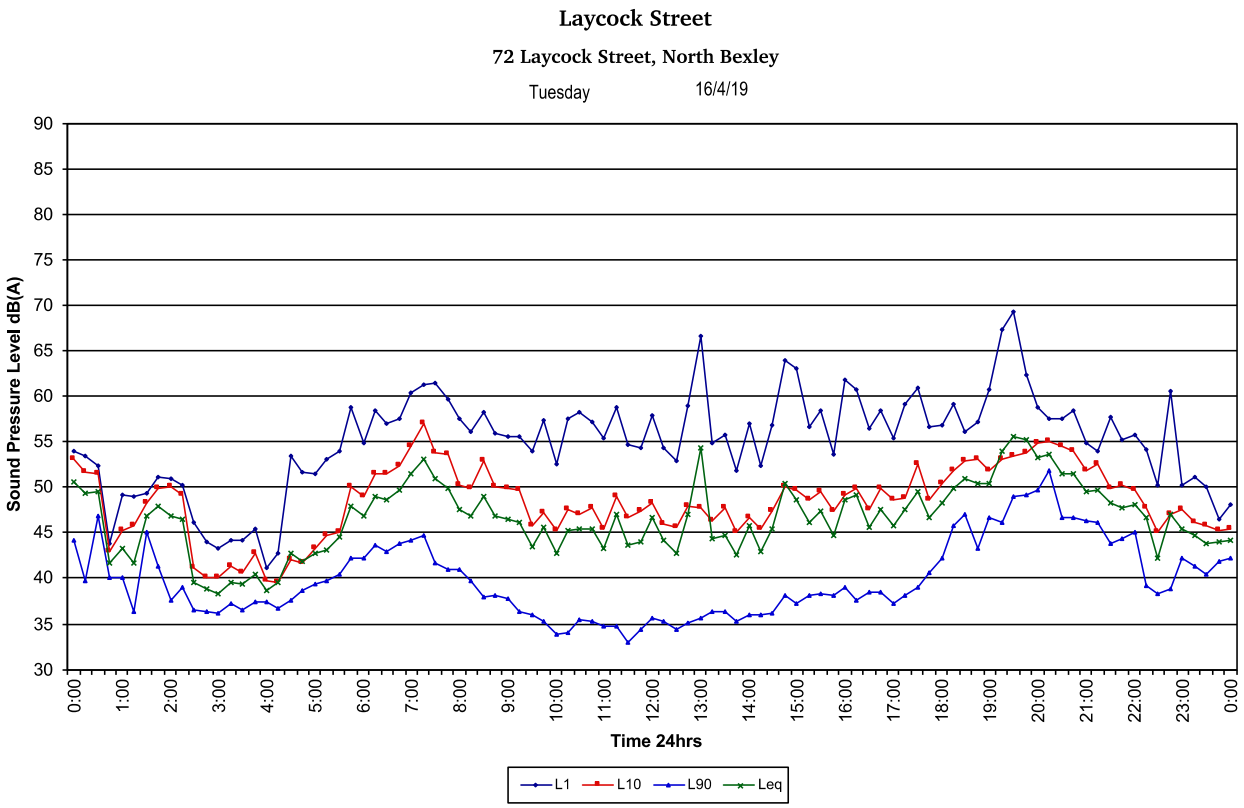
Appendix B – Baseline Noise Survey Graphs

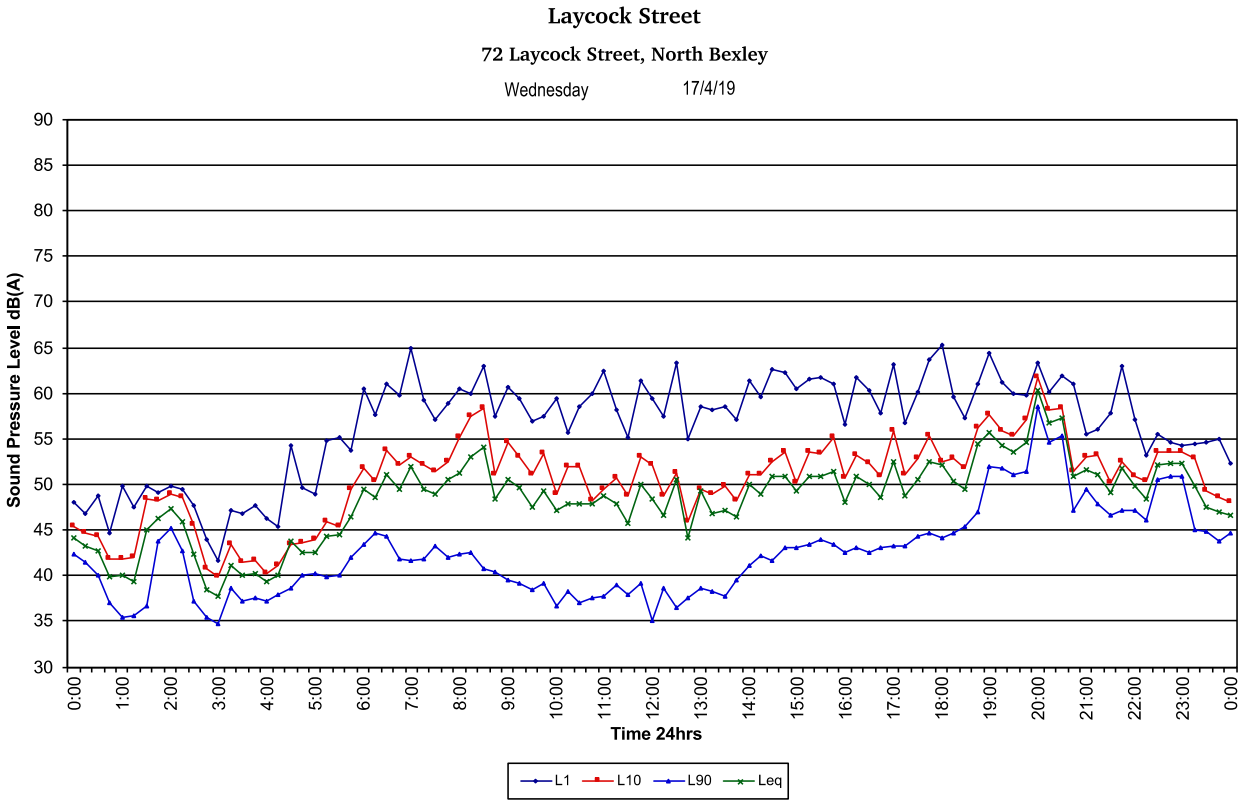


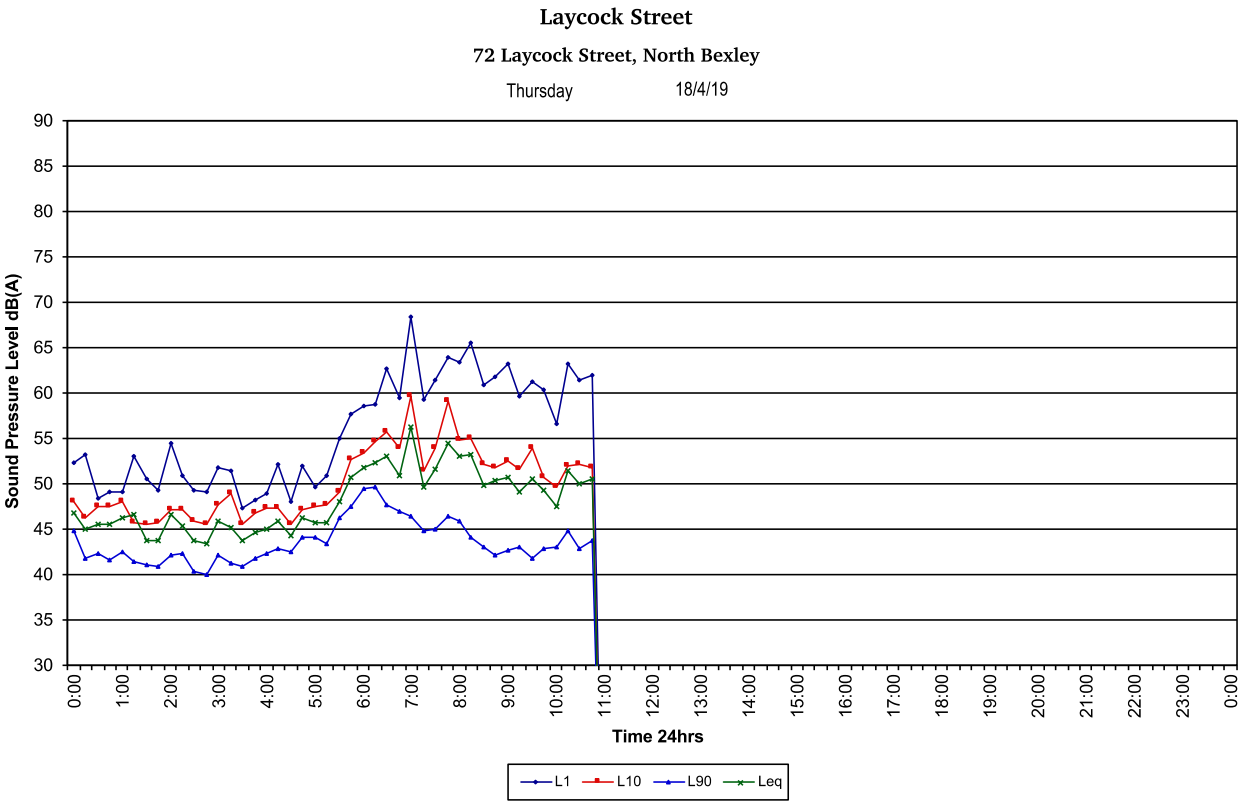


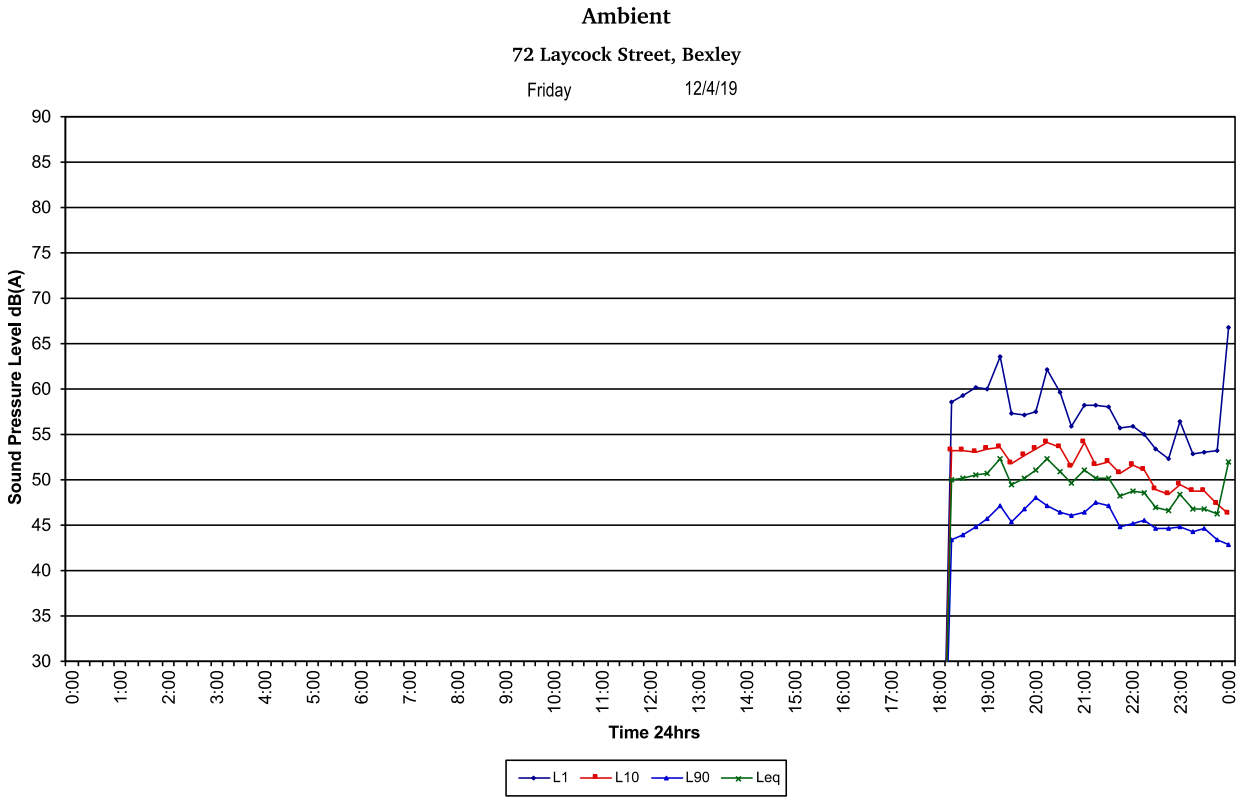

Laycock Street
72 Laycock Street, North Bexley
Sunday 14/4/19
Sound Pressure Level dB(A)
Time 24hrs
L1 L10 L90 Leq

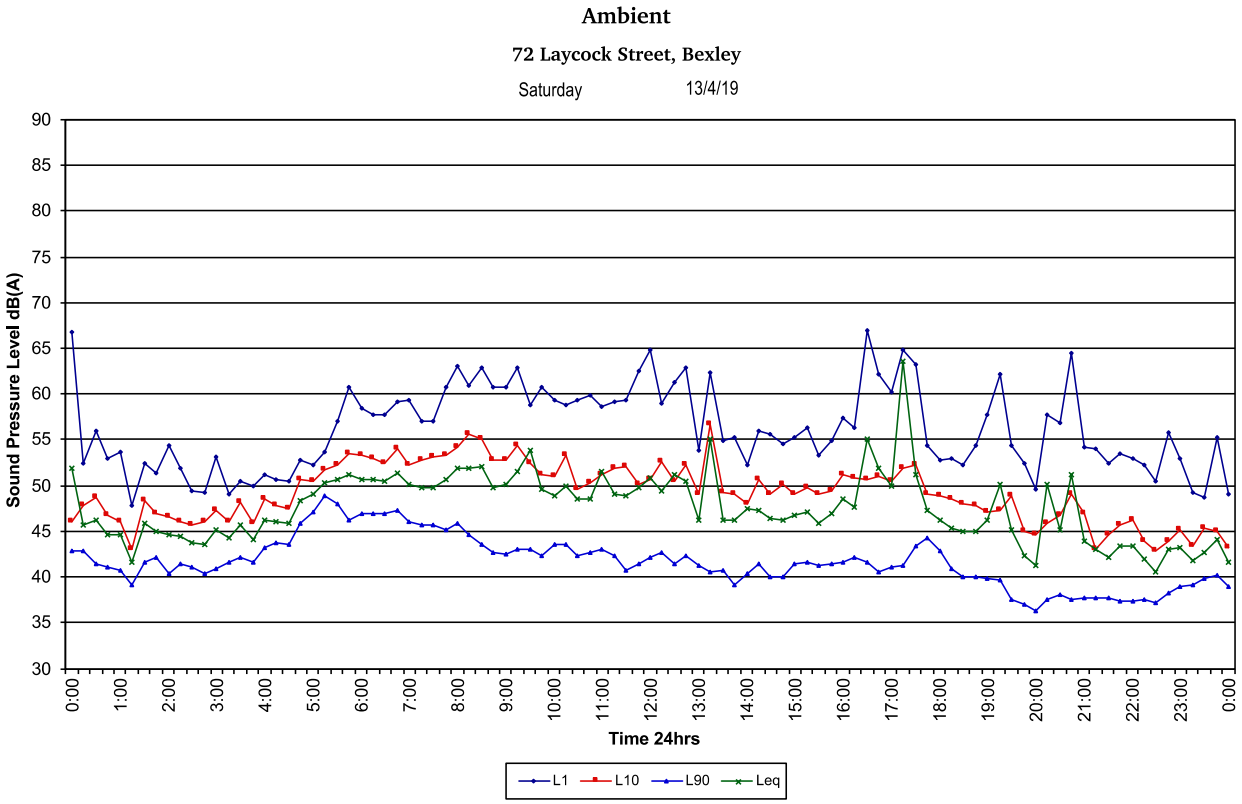

Laycock Street
72 Laycock Street, North Bexley
Monday 15/4/19
Sound Pressure Level dB(A)
Time 24hrs
L1 L10 L90 Leq


Laycock Street
72 Laycock Street, North Bexley
Tuesday 16/4/19
Sound Pressure Level dB(A)
Time 24hrs
L1
L10
L90
Leq


Laycock Street
72 Laycock Street, North Bexley
Wednesday 17/4/19
Sound Pressure Level dB(A)
Time 24hrs
L1
L10
L90
Leq


Laycock Street
72 Laycock Street, North Bexley
Thursday 18/4/19
Sound Pressure Level dB(A)
90
85
80
75
70
65
60
55
50
45
40
35
30
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
Time 24hrs
L1
L10
L90
Leq


Ambient
72 Laycock Street, Bexley
Friday 12/4/19
Sound Pressure Level dB(A)
90
85
80
75
70
65
60
55
50
45
40
35
30
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
Time 24hrs
L1
L10
L90
Leq


Ambient
72 Laycock Street, Bexley
Saturday 13/4/19
Sound Pressure Level dB(A)
90
85
80
75
70
65
60
55
50
45
40
35
30
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
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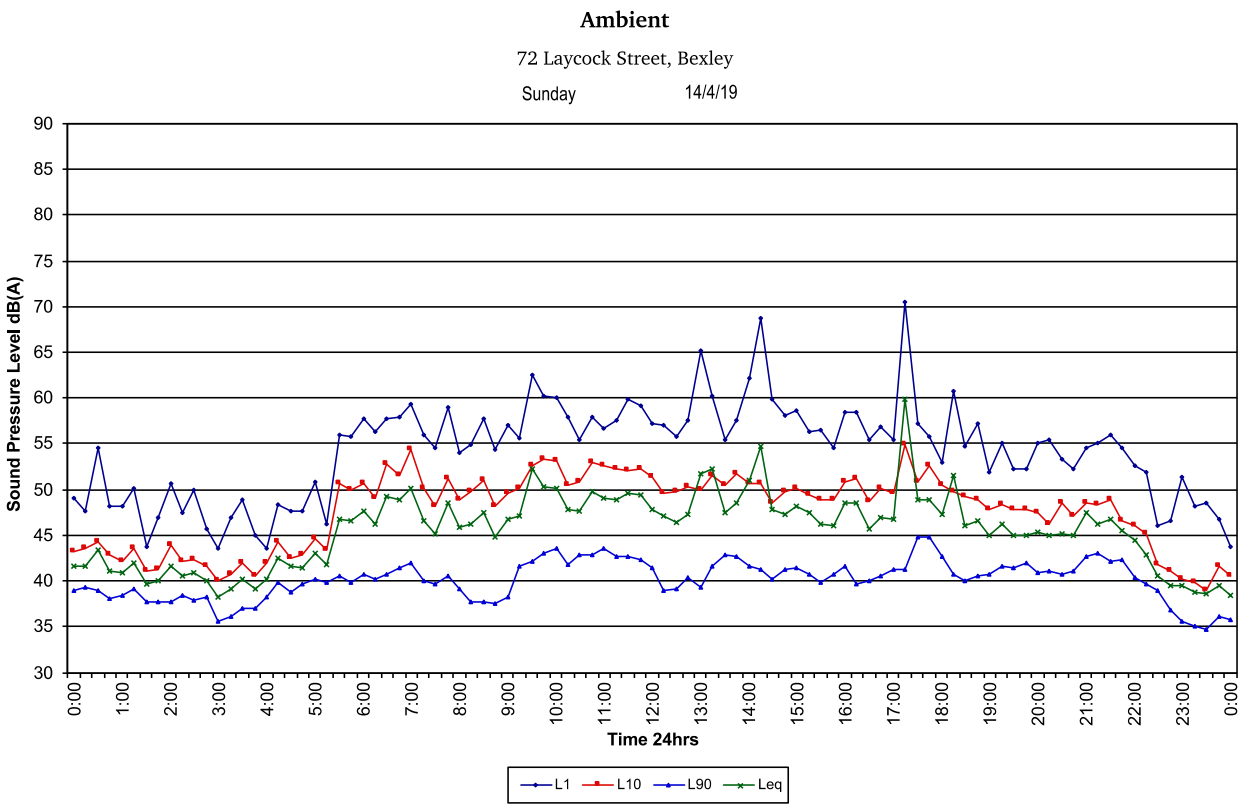
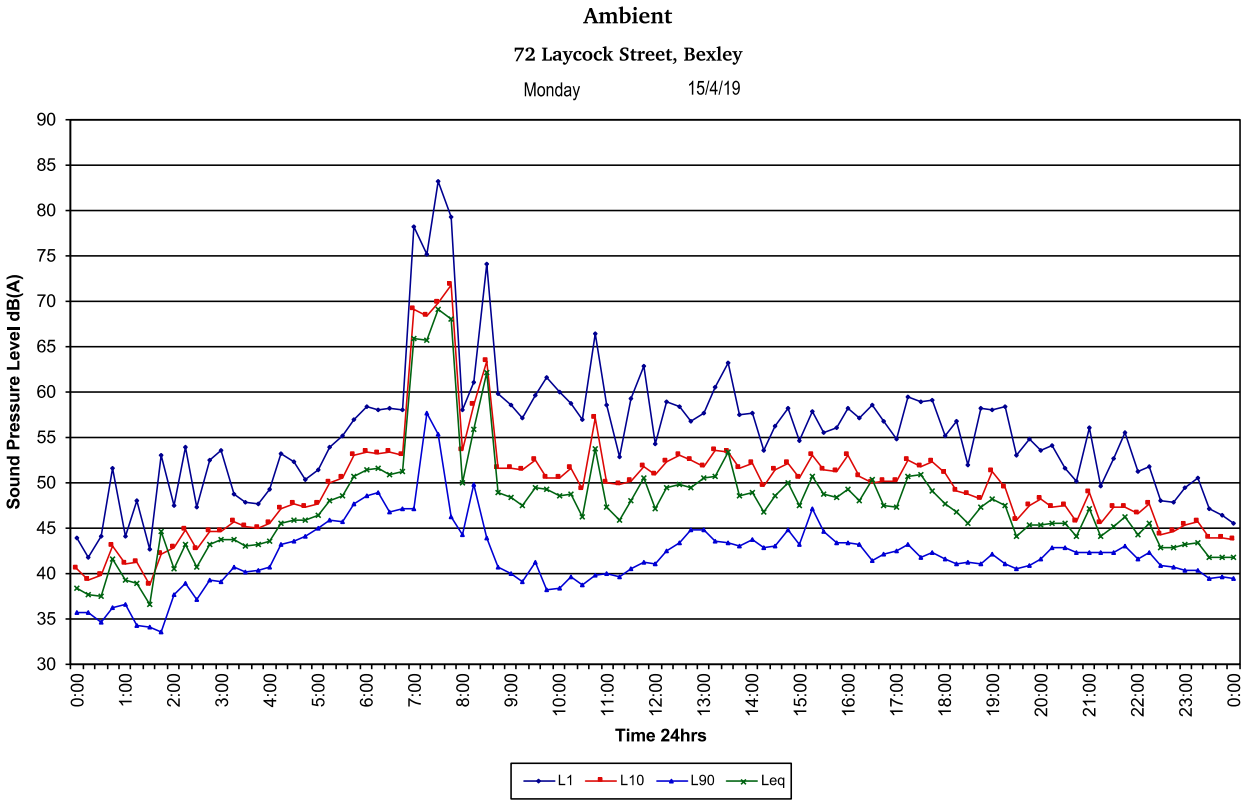
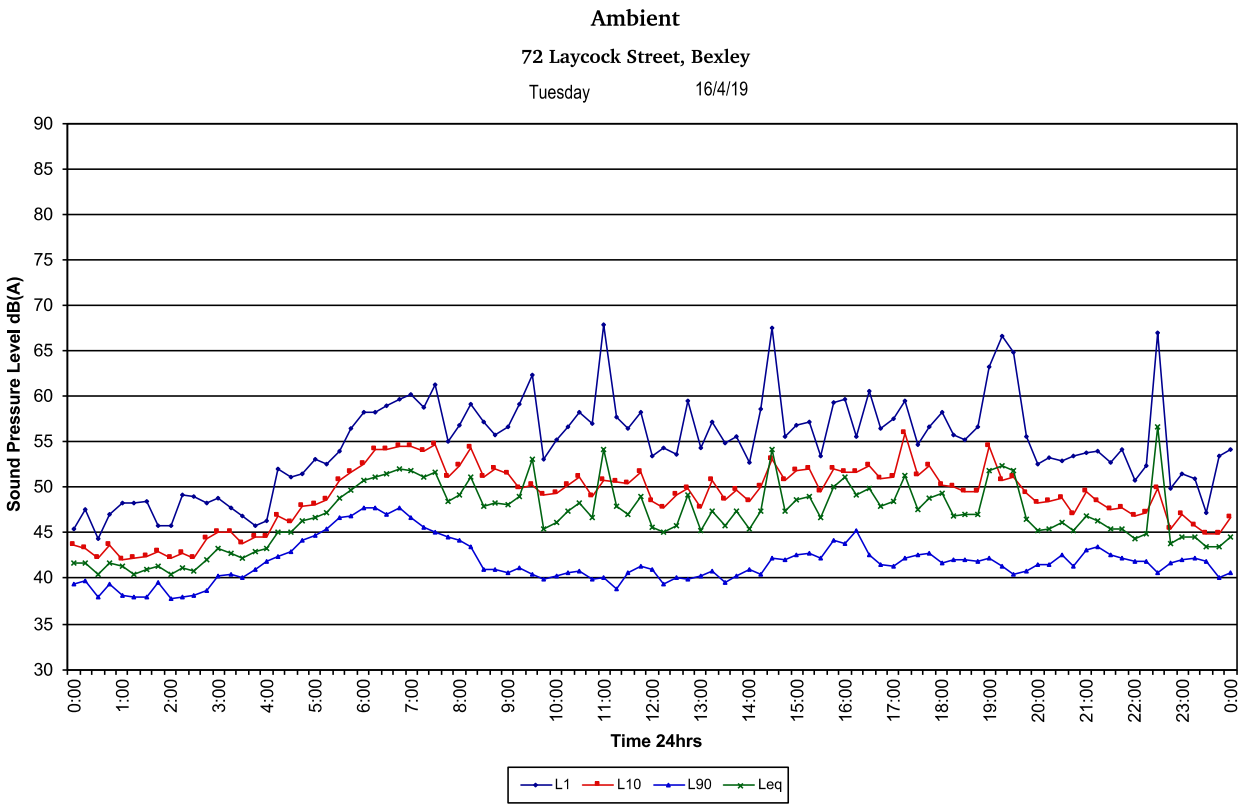
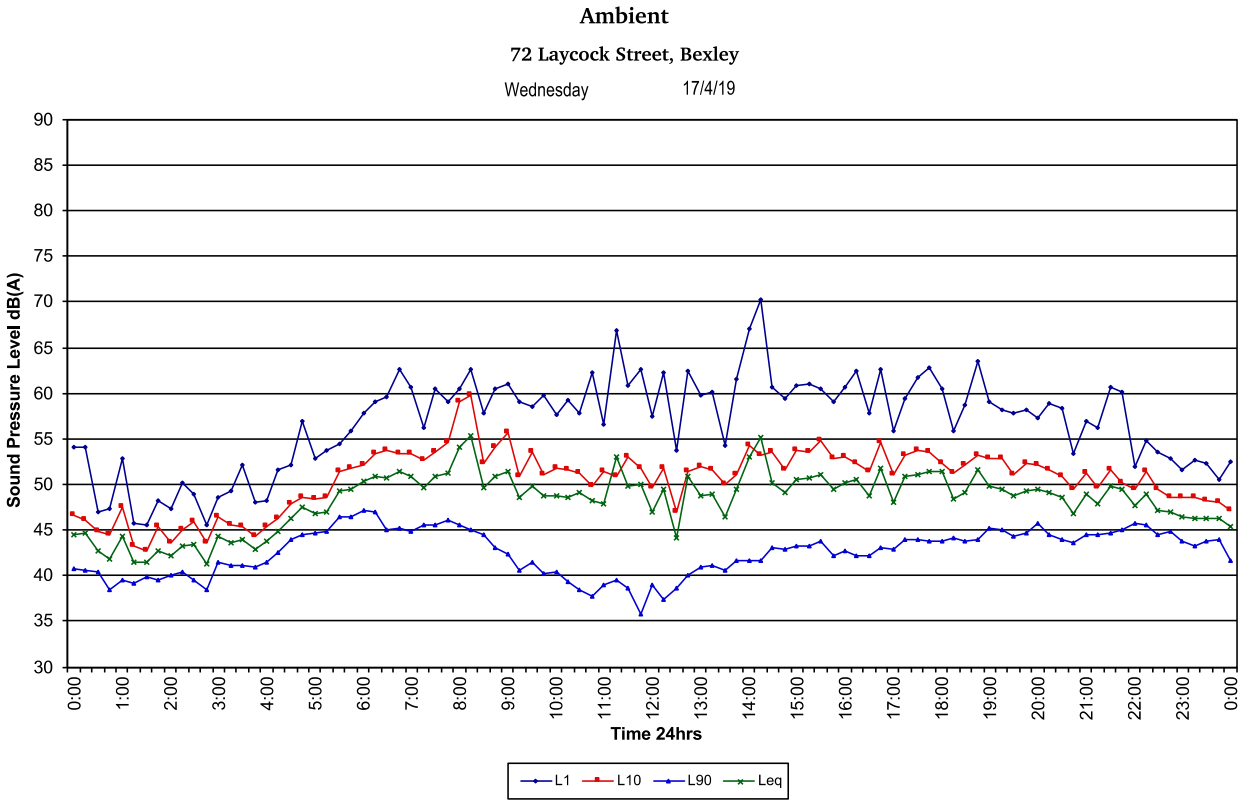
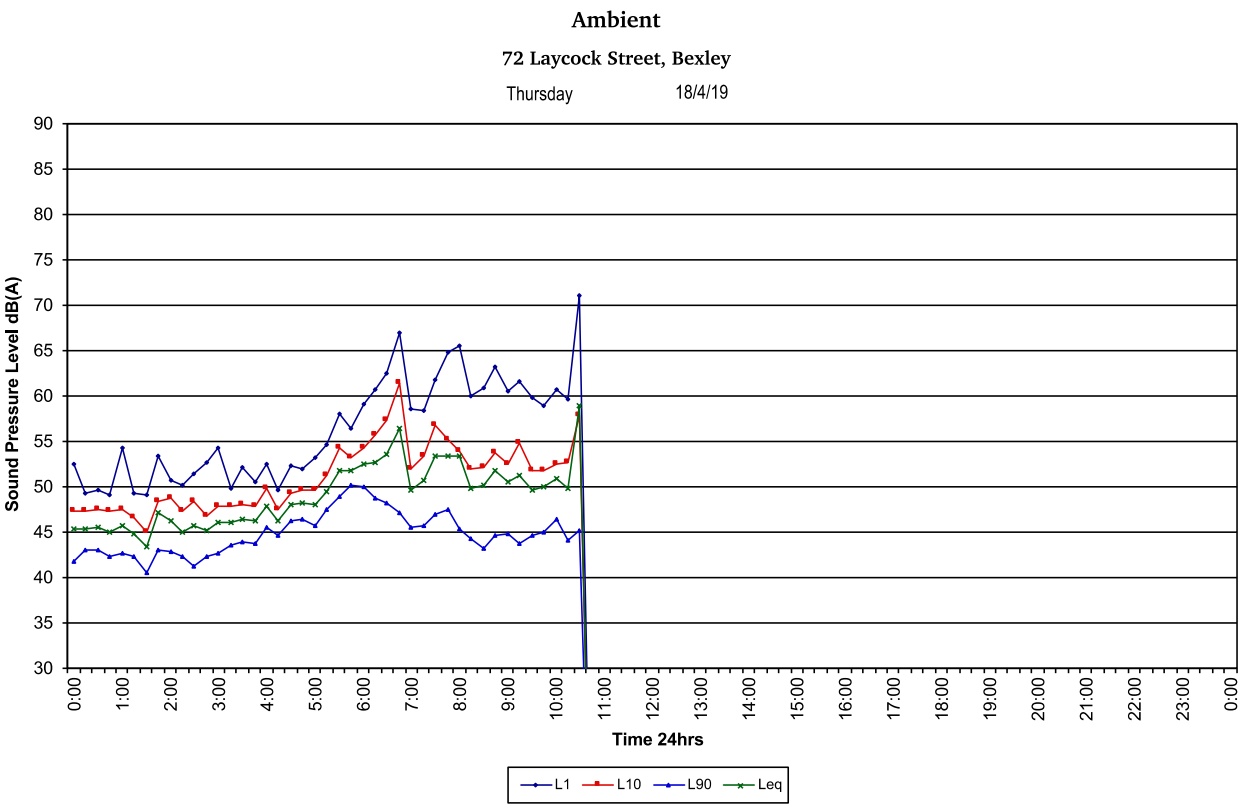
20:00
21:00
22:00
23:00
0:00
Time 24hrs
L1
L10
L90
Leq


Ambient
72 Laycock Street, Bexley
Sunday 14/4/19
Sound Pressure Level dB(A)
Time 24hrs
L1 L10 L90 Leq


Ambient
72 Laycock Street, Bexley
Monday 15/4/19
Sound Pressure Level dB(A)
Time 24hrs
L1 L10 L90 Leq


Ambient
72 Laycock Street, Bexley
Tuesday 16/4/19
Sound Pressure Level dB(A)
Time 24hrs
L1
L10
L90
Leq


Ambient
72 Laycock Street, Bexley
Wednesday 17/4/19
Sound Pressure Level dB(A)
Time 24hrs
L1
L10
L90
Leq


Ambient
72 Laycock Street, Bexley
Thursday 18/4/19
Sound Pressure Level dB(A)
90
85
80
75
70
65
60
55
50
45
40
35
30
0:00
1:00
2:00
3:00
4:00
5:00
6:00
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13:00
14:00
15:00
16:00
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18:00
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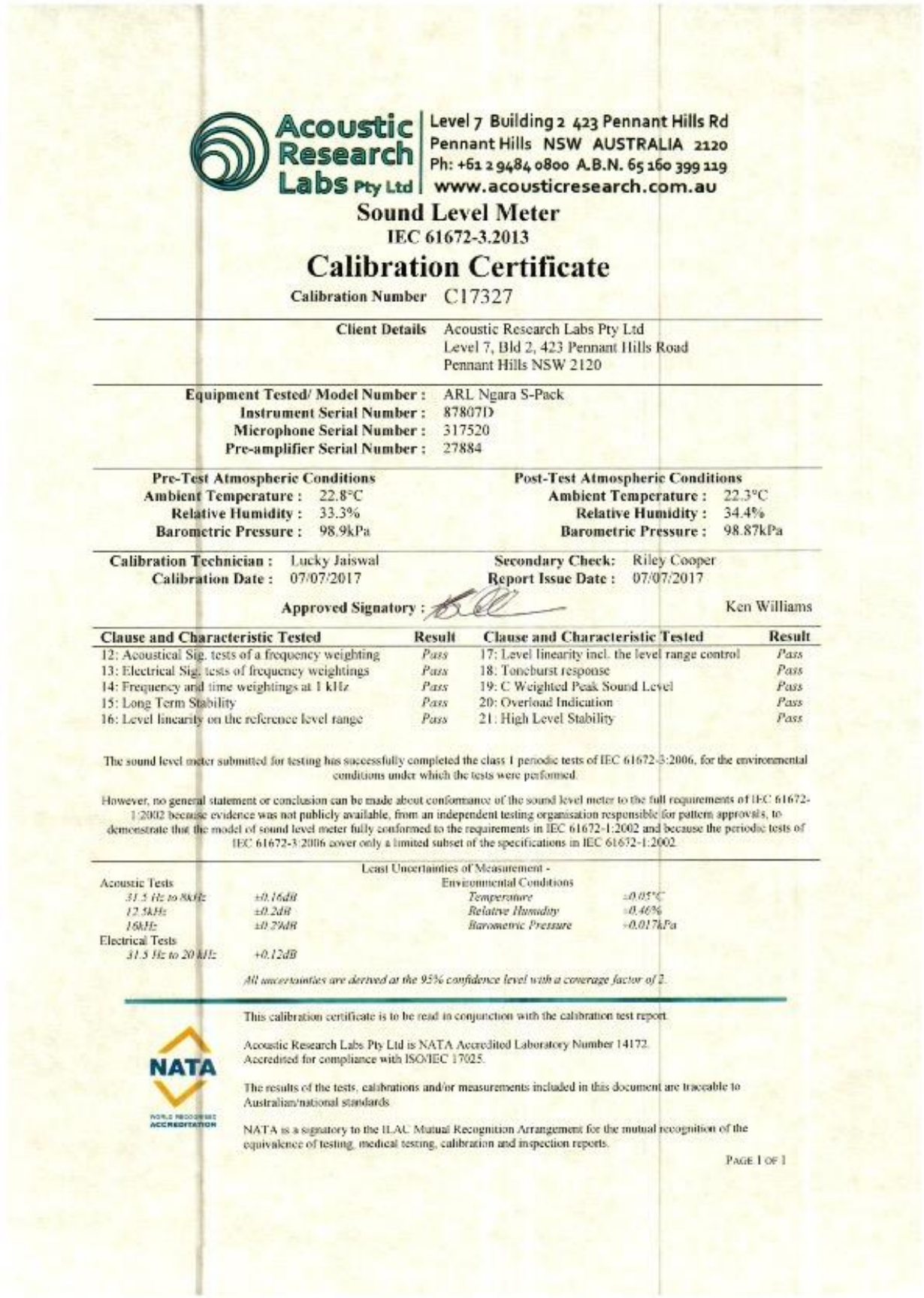
20:00
21:00
22:00
23:00
0:00
Time 24hrs
L1
L10
L90
Leq

Appendix C – Instrument Calibration Certificate



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Level 7 Building 2 423 Pennant Hills Rd
Pennant Hills NSW AUSTRALIA 2120
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

Sound Level Meter
IEC 61672-3.2013

Calibration Certificate

Calibration Number C17327

Client Details Acoustic Research Labs Pty Ltd
Level 7, Bld 2, 423 Pennant Hills Road
Pennant Hills NSW 2120

Equipment Tested/ Model Number : ARL Ngara S-Pack
Instrument Serial Number : 87807D
Microphone Serial Number : 317520
Pre-amplifier Serial Number : 27884

Pre-Test Atmospheric Conditions		Post-Test Atmospheric Conditions	
Ambient Temperature :	22.8°C	**Ambient Temperature :**	22.3°C
Relative Humidity :	33.3%	**Relative Humidity :**	34.4%
Barometric Pressure :	98.9kPa	**Barometric Pressure :**	98.87kPa

Calibration Technician : Lucky Jaiswal
Calibration Date : 07/07/2017
Secondary Check: Riley Cooper
Report Issue Date : 07/07/2017

Approved Signatory : Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	*Pass*	17: Level linearity incl. the level range control	*Pass*
13: Electrical Sig. tests of frequency weightings	*Pass*	18: Toneburst response	*Pass*
14: Frequency and time weightings at 1 kHz	*Pass*	19: C Weighted Peak Sound Level	*Pass*
15: Long Term Stability	*Pass*	20: Overload Indication	*Pass*
16: Level linearity on the reference level range	*Pass*	21: High Level Stability	*Pass*

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed.

However, no general statement or conclusion can be made about conformance of the sound level meter to the full requirements of IEC 61672-1:2002 because evidence was not publicly available, from an independent testing organisation responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002 and because the periodic tests of IEC 61672-3:2006 cover only a limited subset of the specifications in IEC 61672-1:2002.

Least Uncertainties of Measurement -

Acoustic Tests		Environmental Conditions	
31.5 Hz to 8kHz	*±0.16dB*	*Temperature*	*±0.05°C*
12.5kHz	*±0.2dB*	*Relative Humidity*	*±0.46%*
16kHz	*±0.29dB*	*Barometric Pressure*	*±0.017kPa*
Electrical Tests			
31.5 Hz to 20 kHz	*±0.12dB*		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.

Accredited for compliance with ISO/IEC 17025.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

PAGE 1 OF 1

Acoustic Research Labs Pty Ltd
Level 7 Building 2 423 Pennant Hills Rd
Pennant Hills NSW AUSTRALIA 2120
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

Sound Level Meter
IEC 61672-3.2013
Calibration Certificate

Calibration Number C18124

Client Details	Rodney Stevens Acoustics Pty Ltd 1 Majura Close St Ives Chase NSW 2075
Equipment Tested/ Model Number :	Rion NL-42EX
Instrument Serial Number :	00184112
Microphone Serial Number :	173008
Pre-amplifier Serial Number :	74638

Pre-Test Atmospheric Conditions		Post-Test Atmospheric Conditions	
Ambient Temperature :	22.8°C	**Ambient Temperature :**	22.3°C
Relative Humidity :	57.6%	**Relative Humidity :**	58.2%
Barometric Pressure :	99.35kPa	**Barometric Pressure :**	99.37kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 5 Mar 2018
Secondary Check: Riley Cooper
Report Issue Date : 5 Mar 2018

Approved Signatory : Juan Aguero

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	*Pass*	17: Level linearity incl. the level range control	*Pass*
13: Electrical Sig. tests of frequency weightings	*Pass*	18: Toneburst response	*Pass*
14: Frequency and time weightings at 1 kHz	*Pass*	19: C Weighted Peak Sound Level	*Pass*
15: Long Term Stability	*Pass*	20: Overload Indication	*Pass*
16: Level linearity on the reference level range	*Pass*	21: High Level Stability	*Pass*

The sound level meter submitted for testing has successfully completed the class 2 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed.

However, no general statement or conclusion can be made about conformance of the sound level meter to the full requirements of IEC 61672-1:2013 because evidence was not publicly available, from an independent testing organisation responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013 and because the periodic tests of IEC 61672-3:2013 cover only a limited subset of the specifications in IEC 61672-1:2013.

Least Uncertainties of Measurement -

Acoustic Tests		Environmental Conditions	
31.5 Hz to 8kHz	*±0.15dB*	*Temperature*	*±0.07°C*
12.5kHz	*±0.21dB*	*Relative Humidity*	*±0.58%*
16kHz	*±0.29dB*	*Barometric Pressure*	*±0.017kPa*
Electrical Tests			
31.5 Hz to 20 kHz	*±0.12dB*		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025 - calibration.

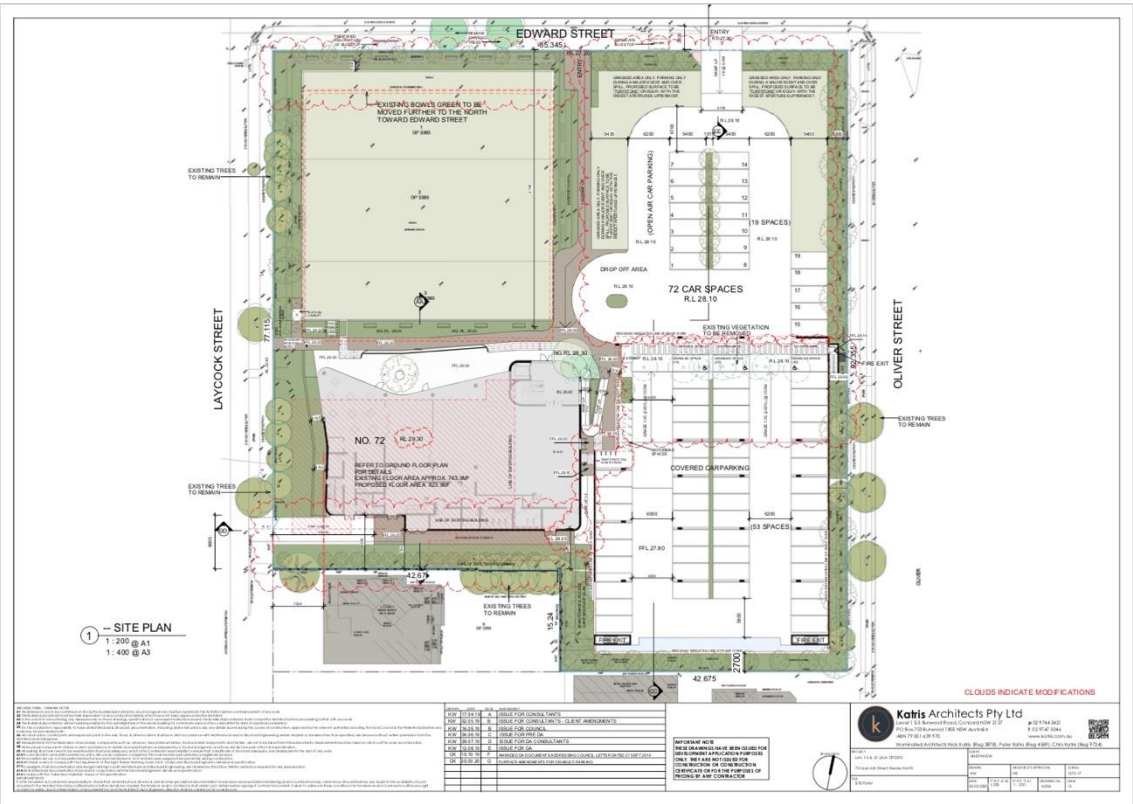
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

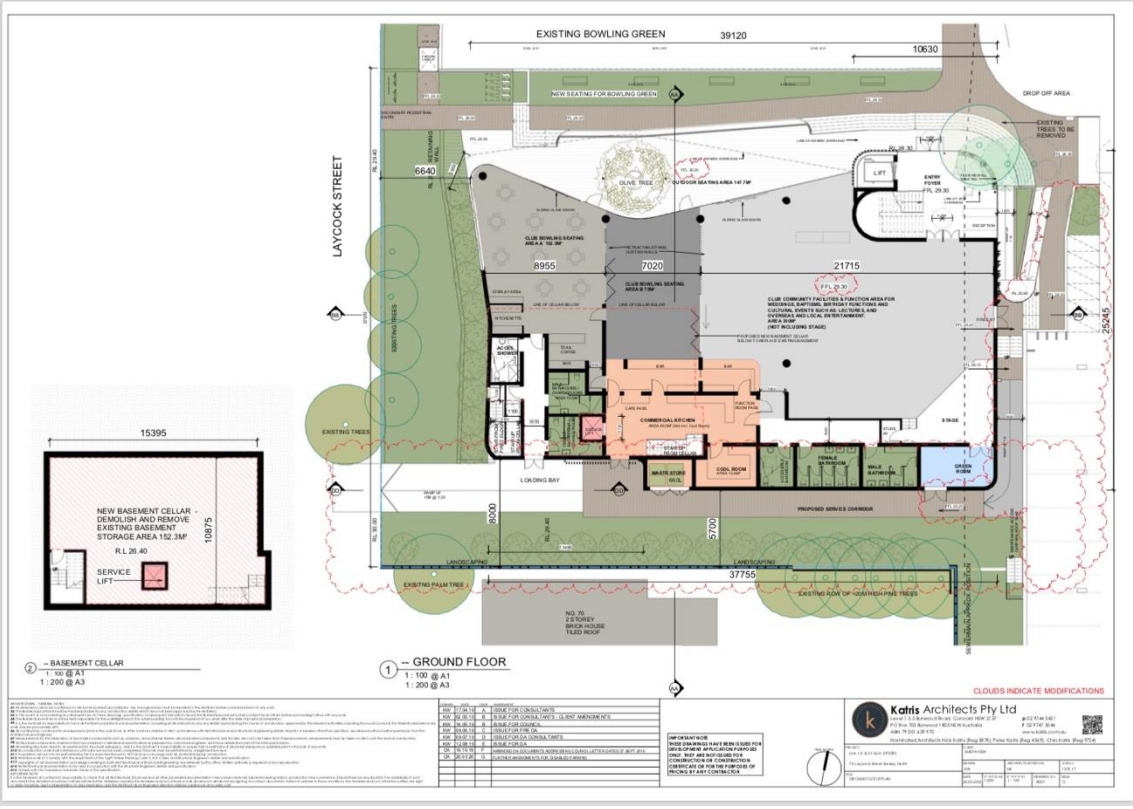
PAGE 1 OF 1

Appendix D – Architectural Plans

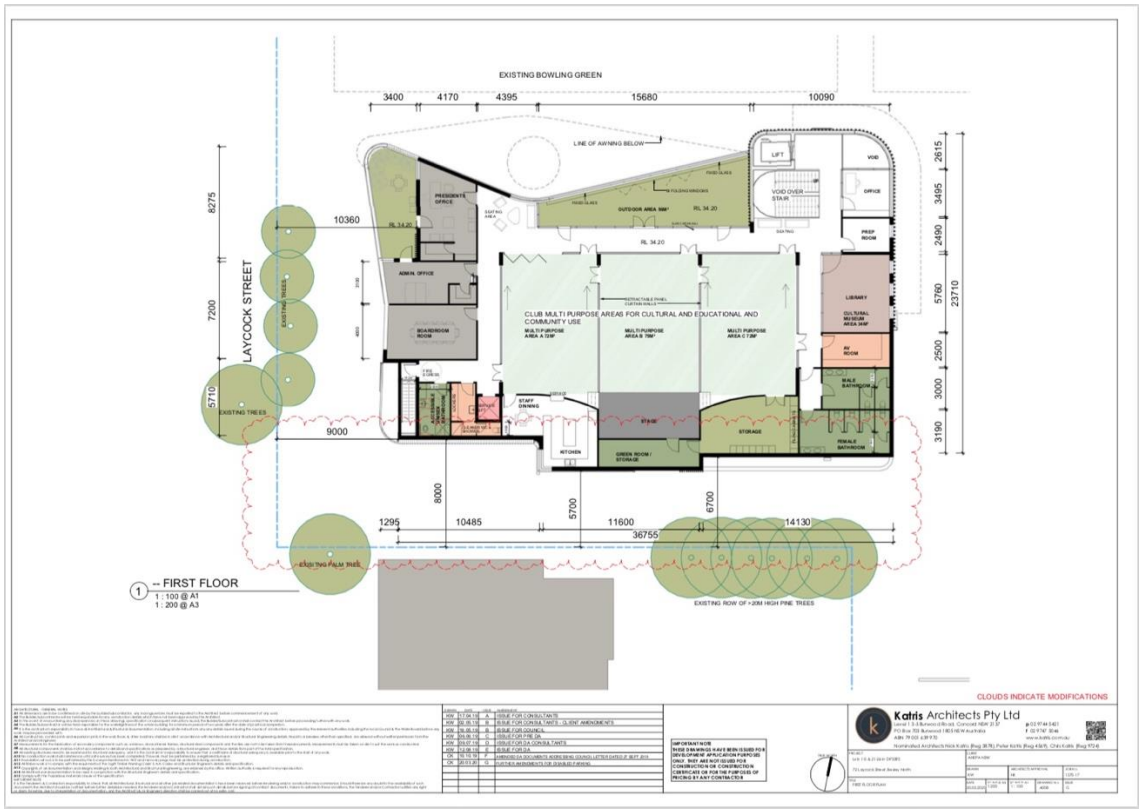
Site Plan



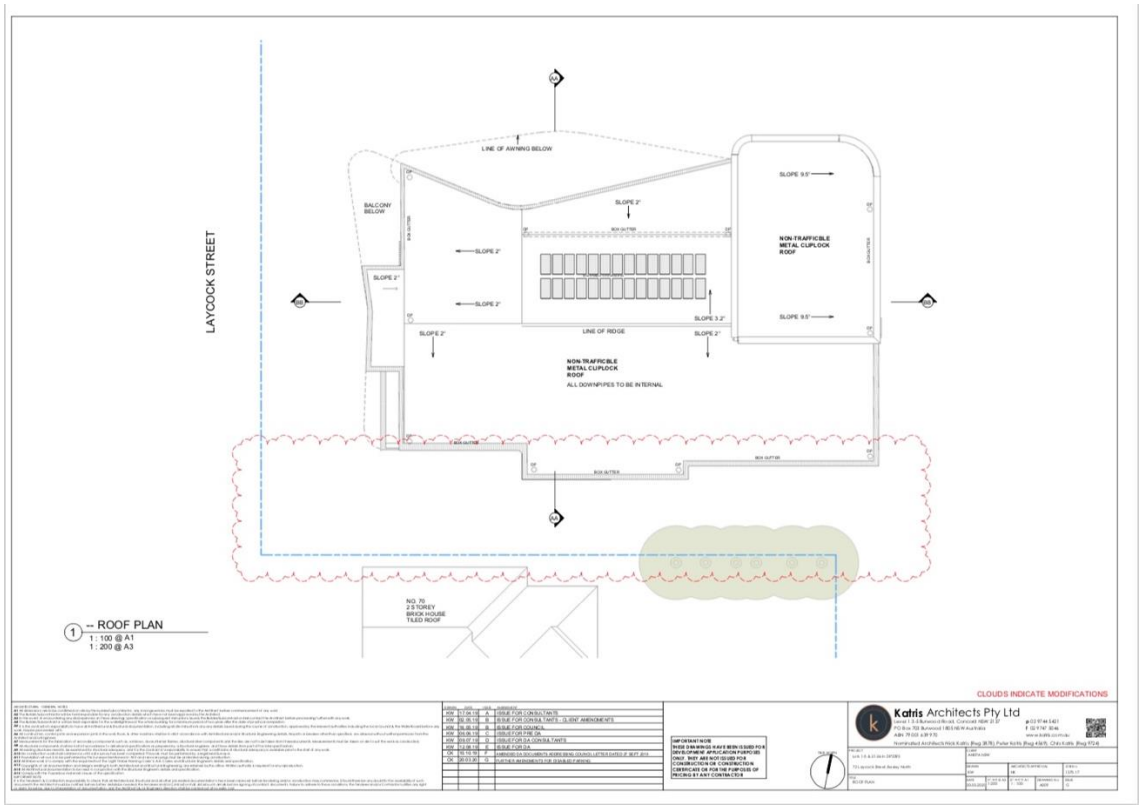
Basement Cellar and Ground Floor Plan



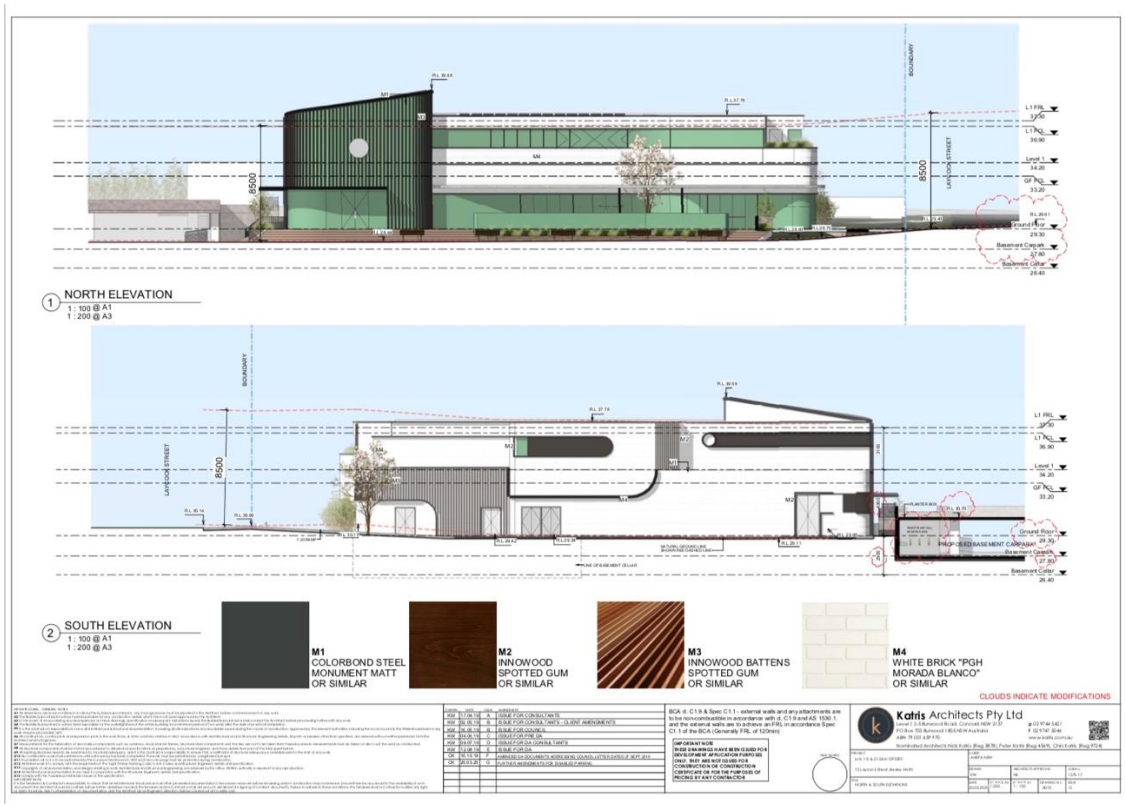
First Floor Plan



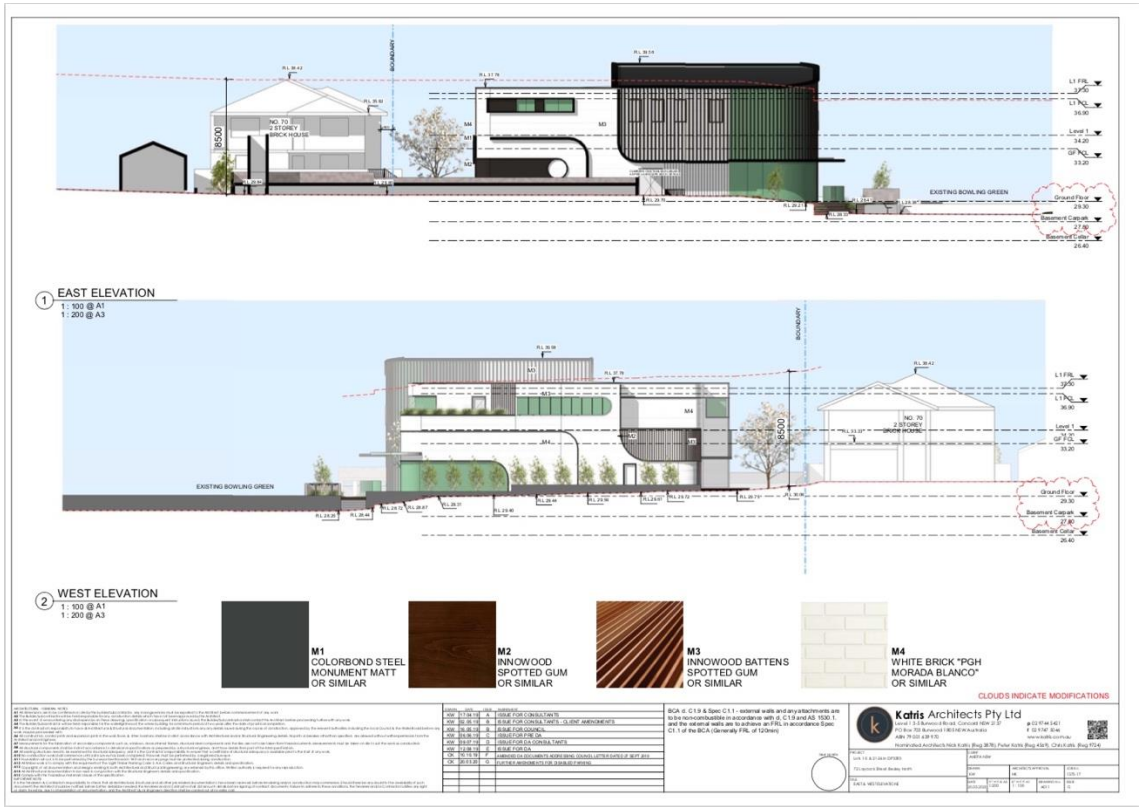
Roof Plan



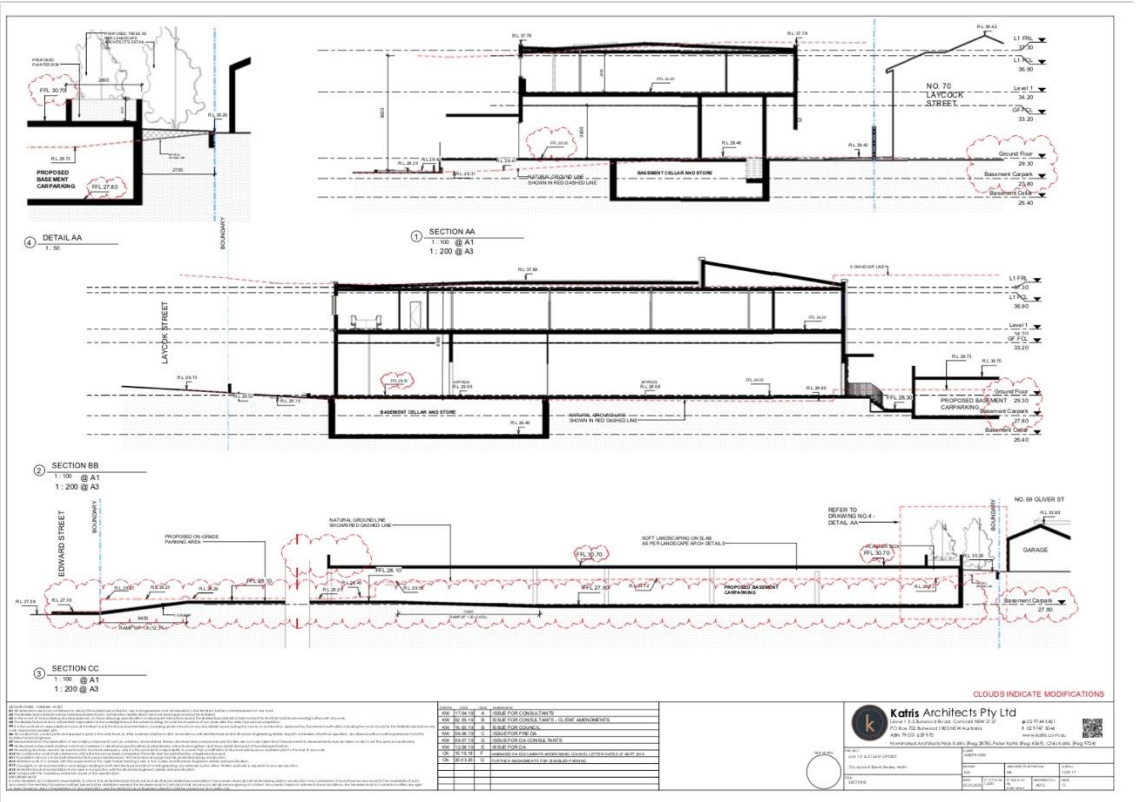
North and South Elevations



East and West Elevations



Sections


DETAIL AA
1 : 50
SECTION AA
1 : 100 @ A1
1 : 200 @ A3
SECTION BB
1 : 100 @ A1
1 : 200 @ A3
SECTION CC
1 : 100 @ A1
1 : 200 @ A3
NO. 70 LAYCOCK STREET
LAYCOCK STREET
EDWARD STREET
BOUNDARY
PROPOSED BASEMENT CARPARKING
BASEMENT CELLAR AND STORE
NATURAL GROUND LINE SHOWN IN RED DASHED LINE
PROPOSED ON-GRADE PARKING AREA
SOFT LANDSCAPING ON SLAB AS PER LANDSCAPE ARCH DETAILS
REFER TO DRAWING NO.4 - DETAIL AA
NO. 69 OLIVER ST
GARAGE
CLOUDS INDICATE MODIFICATIONS
Katris Architects Pty Ltd