



REPORT R240587R1

Revision 2

Noise Impact Assessment
Proposed Block F
42A Beale Street, Georges Hall

PREPARED FOR:
Leaf Architecture

27 May 2025



Noise Impact Assessment

Proposed Block F

42A Beale Street, Georges Hall

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1 INTRODUCTION

Rodney Stevens Acoustics Pty Ltd (RSA) has been engaged by Leaf Architecture to prepare a noise assessment for the proposed Block F at Hopepoint Christian School at 42A Beale Street, Georges Hall.

This report details the results of an ambient noise survey and establishes the noise criteria for the use of the playground and proposed Block F.

This assessment is to form part of the supporting documentation for the DA submission to Canterbury Bankstown Council. Specific acoustic terminology is used in this report. An explanation of common acoustic terms is provided in Appendix A.

2 PROPOSED DEVELOPMENT

2.1 Development Site

The proposed 2 storey block is to be located at 42A Beale Street, Georges Hall. The site is bounded by adjoining residential receivers to the north, south, east and west.

Figure 2-1 shows an aerial image of the site area and the surrounding environment

Figure 2-1 Site Location



Aerial image courtesy of Google Maps © 2024

Figure 2-2 Proposed Block F



3 BASELINE NOISE SURVEY

3.1 Unattended Noise Monitoring

In order to characterise the existing acoustical environment of the area, unattended noise monitoring was conducted between Tuesday 10th September and Tuesday 17th September 2024 at the logging location shown in Figure 2-1. The noise logger was located at the Garrison Point Reserve at the same setback as the school, placing the noise logger at the school's playground was not suitable at the time of the survey. The noise monitoring at this location is representative of the ambient noise of the area.

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 other landowners.

Instrumentation for the survey comprised of A RION NL-42EX environmental noise logger (serial number 810779) fitted with microphone windshields. Calibration of the loggers 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.

The logger determines LA_1 , LA_{10} , LA_{90} and LA_{eq} levels of the ambient noise. LA_1 , LA_{10} , LA_{90} 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 assess noise emission from the proposed Block F and playground plant, 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 μ Pa		
		Daytime 7 am - 6 pm	Evening 6 pm – 10 pm	Night-time 10 pm – 7 am
Logger at Garrison Point Reserve	L_{Aeq}	61	59	58
	RBL (Background)	55	49	37

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).

4 NOISE GUIDELINES AND CRITERIA

4.1 Operational Noise Project Trigger Noise Levels

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.

4.1.1 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 (L_{Aeq}) of the source should not be more than 5 dB(A) above the measured Rated Background Level (RBL), over any 15 minute period.

4.1.2 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.

4.1.3 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.

4.1.4 Project Specific Trigger Noise Levels

Having defined the area type, the processed results of the unattended noise monitoring have been used to determine project specific project trigger noise levels. The intrusive and amenity project trigger noise levels 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 levels are assigned as per Table 2.2 of the NPfI (Recommended Amenity Noise Levels) and standardised as per Section 2.2 of the NPfI. For each assessment period, the lower (i.e. the more stringent) of the amenity or intrusive project trigger noise levels 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}	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	55	61	60	58
	Evening	45	49	59	54	48
	Night	40	37	58	42	43

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

Note 2: RBL = “Rating Background Level”.

4.2 Sleep Disturbance

The NSW EPA Noise Policy for Industry (NPfI) provides a guidance for sleep disturbance or sleep arousal assessment. The NPfI states the following:

The potential for sleep disturbance from maximum noise level events from premises during the night-time period needs to be considered. Sleep disturbance is considered to be both awakenings and disturbance to sleep stages.

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

- *LAeq,15min 40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or*
- *LAFmax 52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater,*

a detailed maximum noise level event assessment should be undertaken. The detailed assessment should cover the maximum noise level, the extent to which the maximum noise level exceeds the rating background noise level, and the number of times this happens during the night-time period. Some guidance on possible impact is contained in the review of research results in the NSW Road Noise Policy

Other factors that may be important in assessing the extent of impacts on sleep include:

- *how often high noise events will occur*
- *the distribution of likely events across the night-time period and the existing ambient maximum events in the absence of the subject development*
- *whether there are times of day when there is a clear change in the noise environment (such as during early-morning shoulder periods)*
- *current scientific literature available at the time of the assessment regarding the impact of maximum noise level events at night.*

Maximum noise level event assessments should be based on the LAFmax descriptor on an event basis under 'fast' time response.

The detailed assessment should consider all feasible and reasonable noise mitigation measures with a goal of achieving the above trigger levels

5 SCHOOL NOISE IMPACT

The current proposal includes the construction of a new block (Block F) with 10 new GLAs and an increase of children enrolments at the existing school. The current capacity is 185 students, the proposal is to increase this number to 400 students. The following assessment looks at the noise impacts from the proposed changes.

5.1 Typical Children Vocal Levels

The following sections summarise the results of children noise assessment and predicted levels at nearby receivers as a result of the operation of the school.

Calculations of the amount of noise transmitted to these receivers from the use of the playground and Block F 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 children 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 children 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)						
	125	250	500	1 k	2 k	4 k	8 k
Children (Raised)	31	56	61	60	56	52	46

5.2 Children Sound Power Levels

2 scenarios have been used for calculation purposes, the first scenario will consist of the additional 100 children using the playground and the second scenario consist of 50 children using the playground and 50 children engaged in music practice/class within a 15-minute period.

Table 5-2 Sound Power Levels of Childrentalking with Raised Voice - L_w – dB(A)

Scenario	Resultant Sound Power Level per Octave Band (dB)							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
400 Children with Raised Vocal in Playground	-	67	92	97	96	92	88	82
28 Children with Raised Vocal per GLA		56	80	85	84	80	76	70

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

5.3 Noise Emissions

Calculations of the noise levels from the operation of the proposed increase in children numbers have been carried out using the data in Table 5-1 and Table 5-2. Calculations take into account factors such as distance, shielding from buildings and barriers.

The following figure presents the existing site and all sensitive receivers. Table 5-3 shows the address of each affected receiver

Figure 5-1 Sensitive Receiver Location



Table 5-3 Sensitive Receivers

Receiver	Number of Levels	Sensitive Receiver's Address
R1	1	185 -187 Henry Lawson Drive
R2	2	170 -188 Henry Lawson Drive
R3	2	24 – 30 Ashcroft Street
R4	1	37 Ashcroft Street
R5	1	27 – 46 Ashcroft Street
R6	1	1 – 3 Lionel Street

5.4 Predicted Noise Levels

Predictive resultant noise levels have been calculated for both scenarios. Noise emissions at the nearest residential receivers are presented in the table below. The predicted noise calculations take into account the following:

Scenario 1 – All Children Using Playground

- Heights of receivers are assumed to be 1.5 meters above respective level.
- All 400 children are using the playground at the same time (worst case scenario)

Scenario 2 – Block F – Full Capacity

- Heights of receivers are assumed to be 1.5 meters above respective level.
- 28 children per GLA in Block F
- Doors and windows will be closed
- Resulting noise levels have been calculated to the calculation point

Table 5-4 Predicted Noise Levels At Sensitive Receivers.

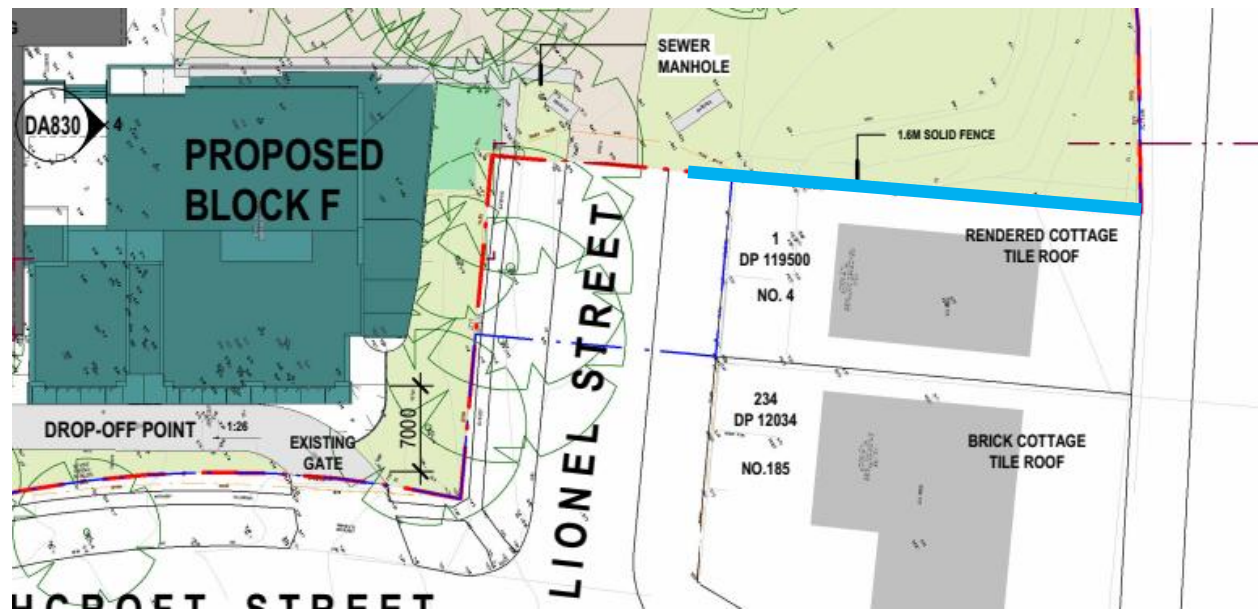
Receiver	Period	Calculated Noise Level L_{Aeq} – dB(A)	Criteria	Compliance
Scenario 1 – All Children Using the Playground				
R1	Day	52	58	Yes
R2		51	58	Yes
R2 Lv 1 Window		52	58	Yes
R3		43	58	Yes
R3 Lv 1 Window		44	58	Yes
R4		42	58	Yes
R5		37	58	Yes
R6		33	58	Yes
Scenario 2 – Block F				
R1	Day	<20	58	Yes
R2		<20	58	Yes
R2 Lv 1 Window		<20	58	Yes
R3		<20	58	Yes
R3 Lv 1 Window		<20	58	Yes
R4		<20	58	Yes
R5		<20	58	Yes
R6		<20	58	Yes

6 RECOMMENDATIONS

The operation of the proposed Block F and playground has been assessed to comply with the project specific noise criteria with the implementation of the following noise controls:

- The eastern boundary fence must be made solid to a height of 1.6 meters

Figure 6-1 Solid Barrier Location



7 AIRCRAFT NOISE INTRUSION

This section presents the results of the assessment, together with recommendations for building construction techniques to meet the requirements of Australian Standard 2021:2015 “*Acoustics - Aircraft noise intrusion - Building siting and construction*”. Rodney Stevens Acoustics has based its calculations on architectural plans provided by Leaf Architecture. Architectural plan details are provided in Appendix D

8 PROPOSED DEVELOPMENT

8.1 Site Location

The School is located at 42A Beale Street, Georges Hall. The proposed site and surroundings are shown in Figure 8-1.

Figure 8-1 Site Location



Aerial image courtesy of Google Maps © 2024

The development site is located between the ANEF 20 and 25 contour lines for Bankstown Airport ANEF 2039 (Aircraft Noise Exposure Forecast). The project site in relation to the ANEF 2039 contour lines are presented in Figure 8-2.

Figure 8-2 ANEF 2039 Site Location



Map courtesy of Bankstown Airport Master Plan

9 NOISE CRITERIA

Australian Standard AS 2021:2015 will be used in this assessment. *Australian Standard AS 2021:2015 Acoustics – Aircraft noise intrusion - Building siting and construction* provides recommendations for acceptable internal noise levels within various areas of occupancy inside buildings during aircraft flyovers. The recommended indoor design noise levels relating to residential premises are presented in Table 9-1 below.

Table 9-1 Recommended Indoor Design Sound Levels for Residences

Area of Occupancy	Indoor Design Sound Level (L_{ASmax})
Teaching Areas, Assembly Areas	55 dB(A)

10 ASSESSMENT OF AIRCRAFT NOISE

10.1 Site Location and Classification

AS 2021-2015 contains a detailed procedure for assessing maximum levels of aircraft noise intrusion based on the location of a building with respect to ANEF contours. The suitability of the site for a given building type is then ranked as either “Unacceptable”, “Conditionally Acceptable” or “Acceptable”. Based on the acceptability of the site for the proposed building use, there are further detailed procedures to determine the noise reduction required from the building construction to control maximum internal noise levels during aircraft flyovers.

Figure 8-2 shows the location of the school with respect to the most up-to-date excerpt from Bankstown Airport 2039 ANEF contour map. This shows that the project site is located between the ANEF 20 and ANEF 25 contours.

A review of AS 2021-2015 Table 2.1 “*Building Site Acceptability Based on ANEF Zones*” reveals that the project site is located between the ANEF 20 and ANEF 25 contours, this zone is classified as “Conditionally Acceptable” for residential land use. Note 2 of the standard states the following:

Within 20 ANEF and 25 ANEF, some people may find that the land is not compatible with educational or residential uses. Land use authorities may consider the incorporation of noise control features in the construction of residences or schools is appropriate.

In accordance with the methods provided in AS 2021:2015, distance coordinates for the site relative to Bankstown Airport runways have been determined. The specific distances from Bankstown Airport’s runways are presented in Table 10-1 below

Table 10-1 Distance Coordinates to Development Site

Site Location	Runway	Distance		
		DS	DL	DT
42A Beale Street, Georges Hall	11L/29R	200 m	1,180 m	2,270 m
	11C/29C	330 m	1,000 m	2,270 m
	11R/29L	445 m	1,130 m	2,100 m

10.2 Aircraft Noise Levels

The maximum aircraft flyover noise level at the proposed development has been calculated in accordance with the methodology in Section 3.1 of AS 2021- 2015. The calculated noise level is 75 dB(A), this level was calculated from a SAAB 340, this noise level will be used as the basis of aircraft noise impact assessment.

10.3 Aircraft Noise Reduction

The recommended indoor design sound levels presented in Table 9-1 have been used to determine the required aircraft noise reduction values (ANR) and have been calculated in accordance with the procedures outlined in AS 2021:2015 and are presented in Table 10-2.

Table 10-2 Aircraft Noise Reduction

Area of Occupancy	Aircraft Noise Reduction (ANR)
Teaching Areas, Assembly Areas	20

The internal design noise levels and the ANR derived above assume that the windows and external entry doors are closed. As it is necessary for the windows and doors to remain closed to comply with AS 2021:2015, an alternative means of ventilation approved by Council and in accordance with the relevant regulations such as the National Construction Code (NCC) and AS 1668.2 may be required.

11 BUILDING ENVELOPE CONSTRUCTION

11.1 Recommended Noise Control Treatment

The calculation procedure establishes the required noise attenuation performance of each surface component such that the internal noise level is achieved whilst an equal contribution of aircraft noise energy is distributed across each component. Building envelope components with a greater surface area must therefore offer increased noise attenuation performance.

The recommended acoustic treatment is based on the following floor finishes:

- GLA and general areas: Carpet and underlay

All recommendations must be checked by others to ensure compliance with other non-acoustic requirements that Council or other authority may impose (e.g. Thermal requirements for BASIX compliance).

11.2 Glazing

The R_w rating required for each window will vary from room to room. Recommendations for windows also apply to any other item of glazing located on the external facade of the building in a GLA unless otherwise stated.

Note that the R_w rating is required for the complete glazing and frame assembly. The minimum glazing thicknesses will not necessarily meet the required R_w rating without an appropriate frame system. It will be therefore necessary to provide a window glass and frame system having a laboratory tested acoustic performance meeting the requirements below.

The window systems must be tested in accordance with both of the following:

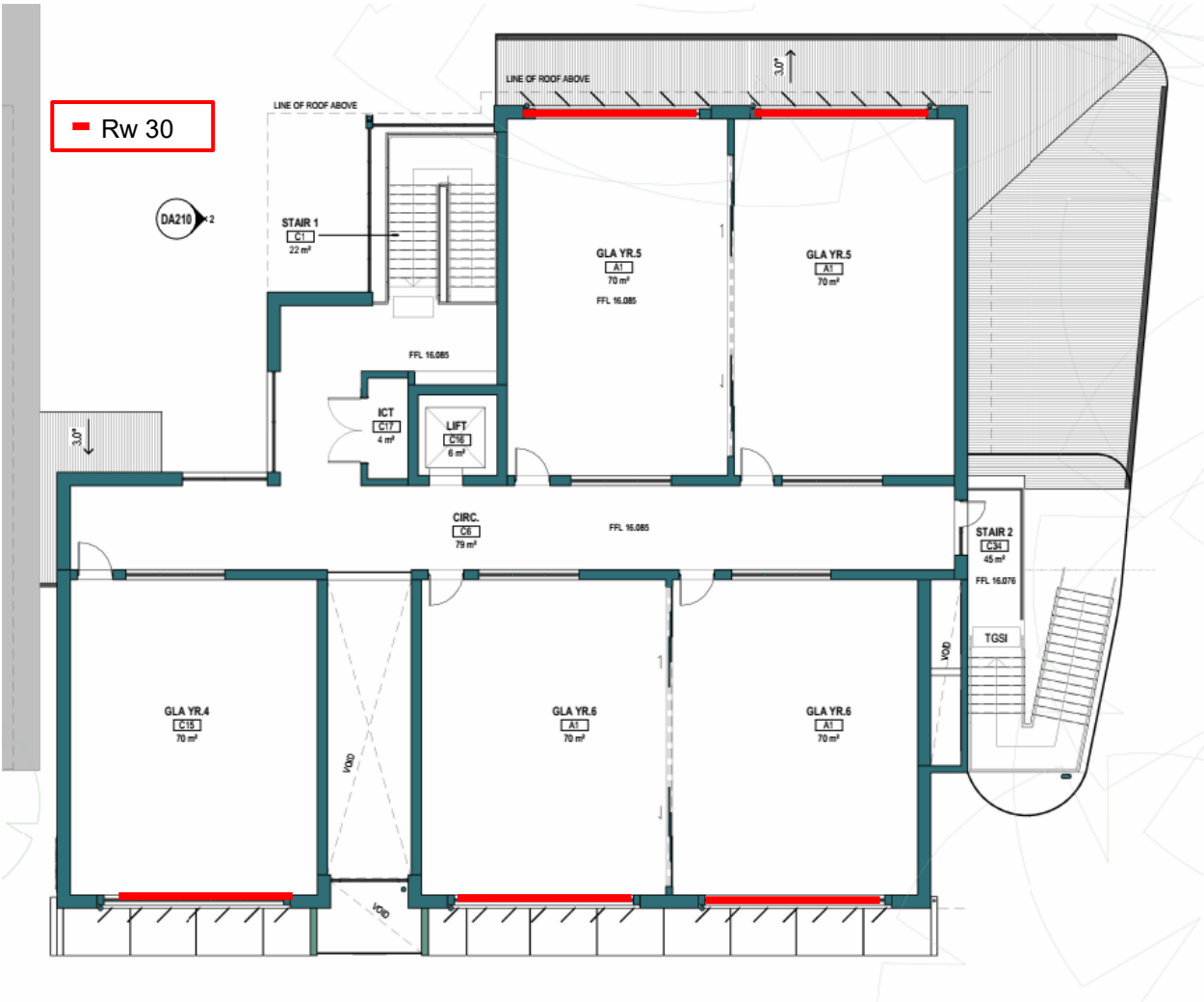
- Australian Window Association Industry Code of Practice Window and Door – Method of Acoustic Testing; and
- AS 1191 Acoustics – Method for laboratory measurement of airborne sound insulation of building elements.

It is necessary to submit such Laboratory certification for the proposed glazing systems (i.e. windows and framing systems) (e.g. NAL or CSIRO) for approval by RSA prior to ordering or commitment.

The entire frame associated with the glazing must be sealed into the structural opening using acoustic mastics and backer rods. Normal weather proofing details do not necessarily provide the full acoustic insulation potential of the window system. The manufacturers' installation instructions for the correct acoustic sealing of the frame must be followed.

It is possible that structural demands for wind loading or fire rating or the like may require more substantial glass and framing assemblies than nominated above. Where this is the case the acoustic requirements must clearly be superseded by the structural or fire rating demands.

Figure 11-2 Level 1 Rw Requirements



Highlight windows W7, W8 and W9 must have a minimum Rw rating of 30

The following table presents the Rw ratings of different glass thicknesses, please note that these are shown as a guide only, all final glazing system selections must comply with the requirements in Section 11.2. The glazing installer must certify that all systems have been installed as per manufacturer's instructions

Table 11-1 Glass Thickness Guideline

Glass Thickness	Rw Rating (Glass Pane Only)
5mm	26
6mm	28

6.38mm Laminated	32
8.38 Laminated	34
10.38 Laminated	36
12.38 Laminated	37
4mm – 50mm Airgap – 6mm Double Glazed	41

12 CONSTRUCTION RECOMMENDATIONS

The following roof and wall construction recommendations are given as guidance only. The client is responsible for selecting adequate systems in order to achieve the recommended acoustic ratings.

12.1 Roof/Ceiling

The overall acoustic rating required is $R_w + C_{tr}$ 37 (minimum). This can be achieved with Redbook CSR 10194c System:

- A low slope steel metal roof with minimum Bradford Anticon 60 MD over timber or steel purlins
- 185mm Bradford Gold Batts R 3.5;
- Rondo Furring channel at 600mm max. centres;
- 1 x 10mm Gyprock HD Plasterboard (minimum 8.5 kg/m² density)

If ventilators, heat extraction units or other openings into the ceiling cavity for lighting, ventilation, decoration or other purposes are to be provided, then care should be taken to ensure that such units are properly attenuated, and all penetrations are properly sealed off to avoid degradation of the acoustic performance of the roof/ceiling construction. Care should also be taken to avoid any noise paths into the ceiling cavity via the eaves.

12.2 Masonry Walls

It is understood that the existing external walls are rendered masonry. The masonry external walls will be required to achieve a rating of R_w 50. This R_w rating is generally achieved with a standard construction with insulation. No further acoustic requirements are needed.

12.3 Detailing

Note that well-detailed construction and careful installation is needed to achieve the required R_w acoustic ratings. All gaps are to be minimised and fully sealed with an acoustic rated sealant, such as FireBan One by Bostik or Sikaflex Pro 2HP by Sika.

12.4 Mechanical Ventilation

Windows and doors need to be closed in order to comply with the internal noise criteria required. This would interfere with the natural ventilation of the residence. As such, ventilation approved by Council and in accordance with the relevant regulations such as the National Construction Code (NCC Vol.1, Part 4.5 *Ventilation of rooms*) and AS1668.2-2002 *The use of ventilation and air conditioning* will be required.

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 future noise emissions may 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.

13 CONCLUSION

A noise impact assessment has been conducted in relation to the operation of the Proposed Block F and existing playground at 42A Beale Street, Georges Hall.

This assessment has been conducted and appropriate noise emission criteria have been established in accordance with Canterbury Bankstown Council's requirements.

This report shows that under the most conservative operating scenarios and the implementation of the recommendations, operational noise emission from the proposed mechanical plant will achieve the established criteria at neighbouring residences.

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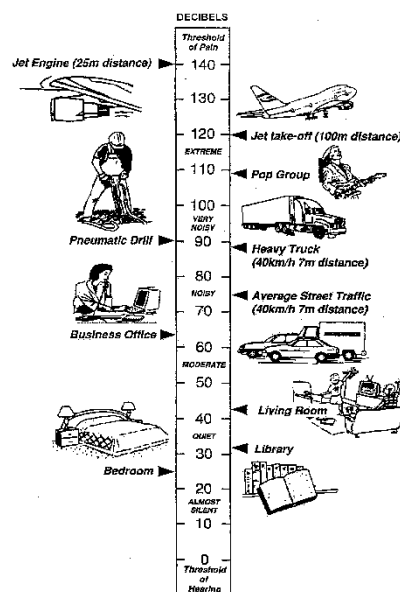
Director

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 ' <i>A-weighting</i> ' frequency filter is applied to the measured sound level <i>dB(A)</i> 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 <i>dB(linear)</i> .
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 2×10^{-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 $dB(A)$.

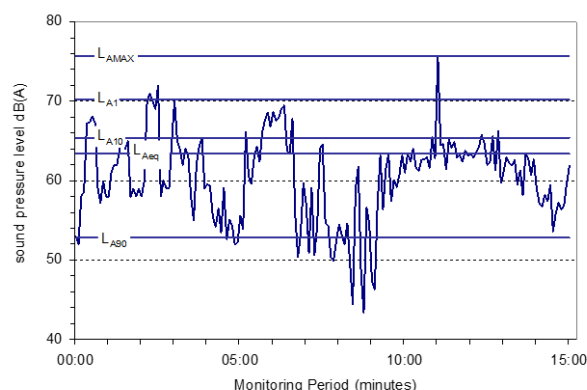
Sound Pressure Level (SPL)

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).

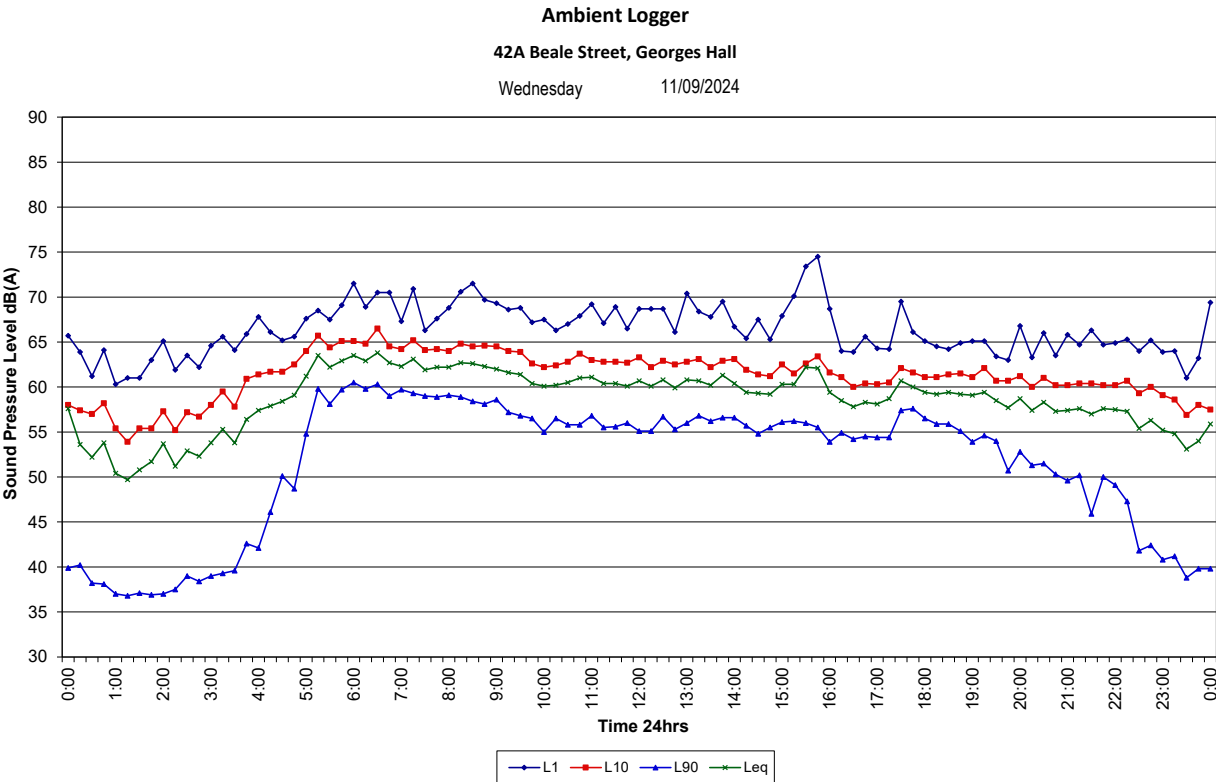
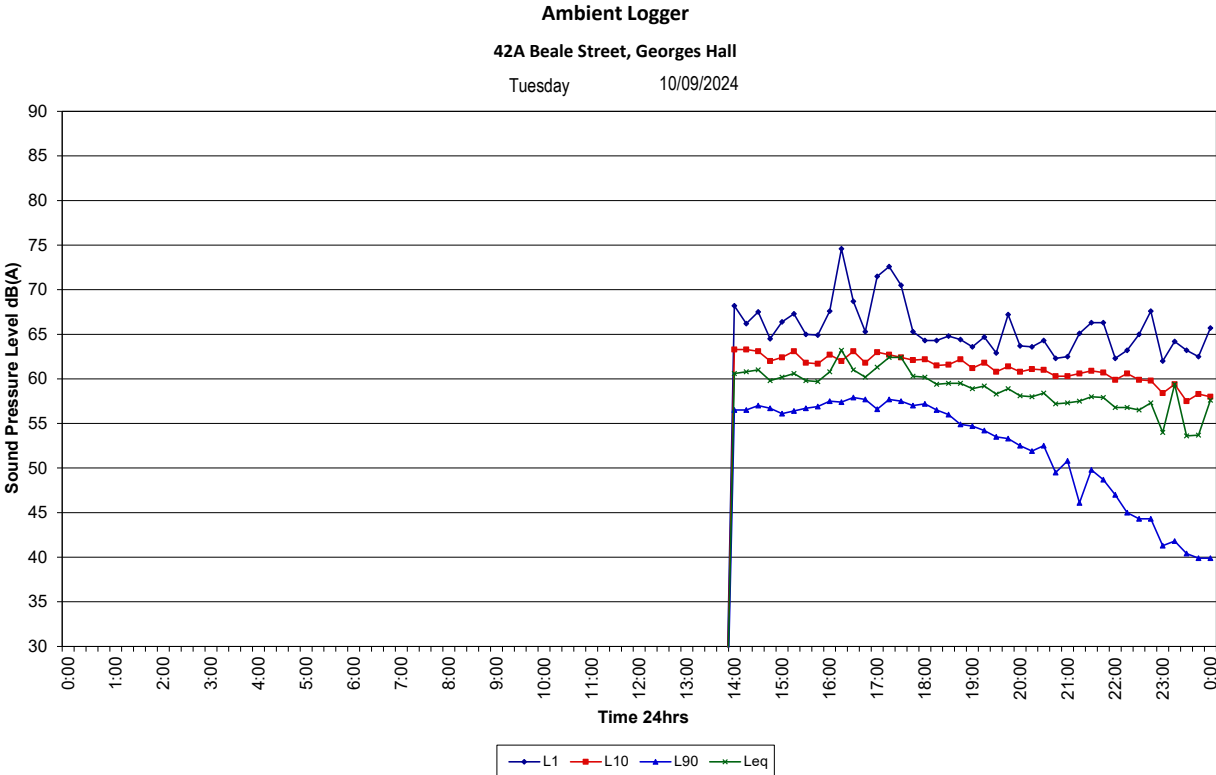
Threshold

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

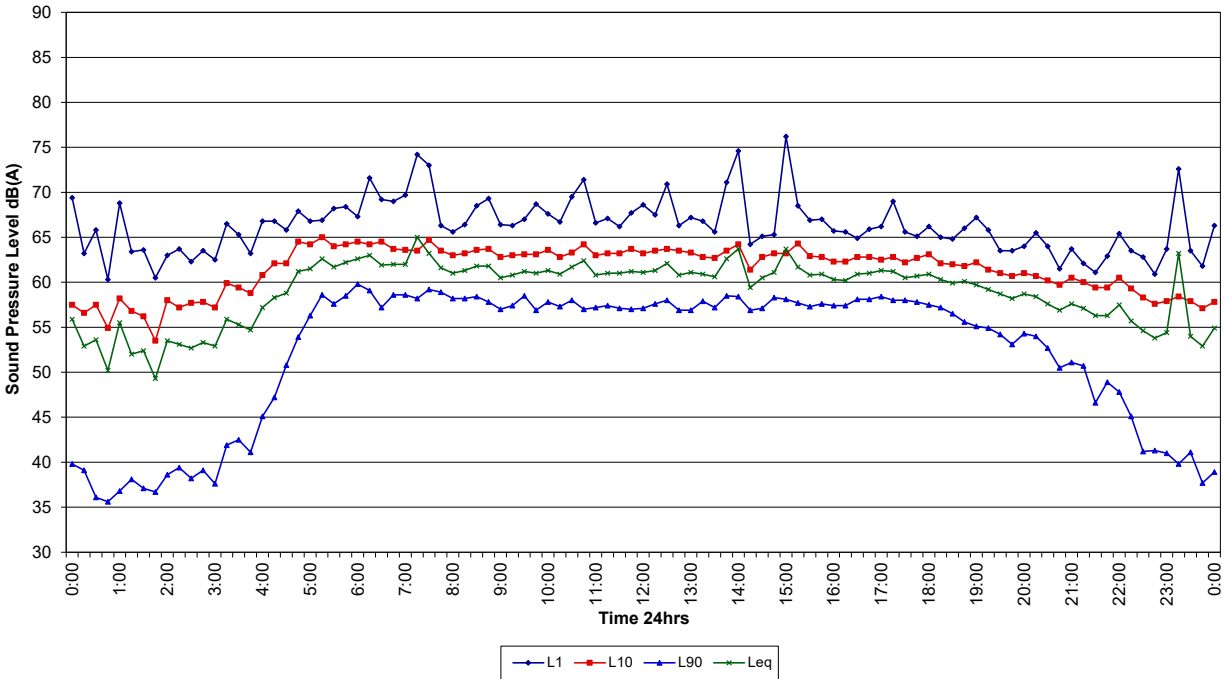
Appendix B – Logger Graphs



Ambient Logger

42A Beale Street, Georges Hall

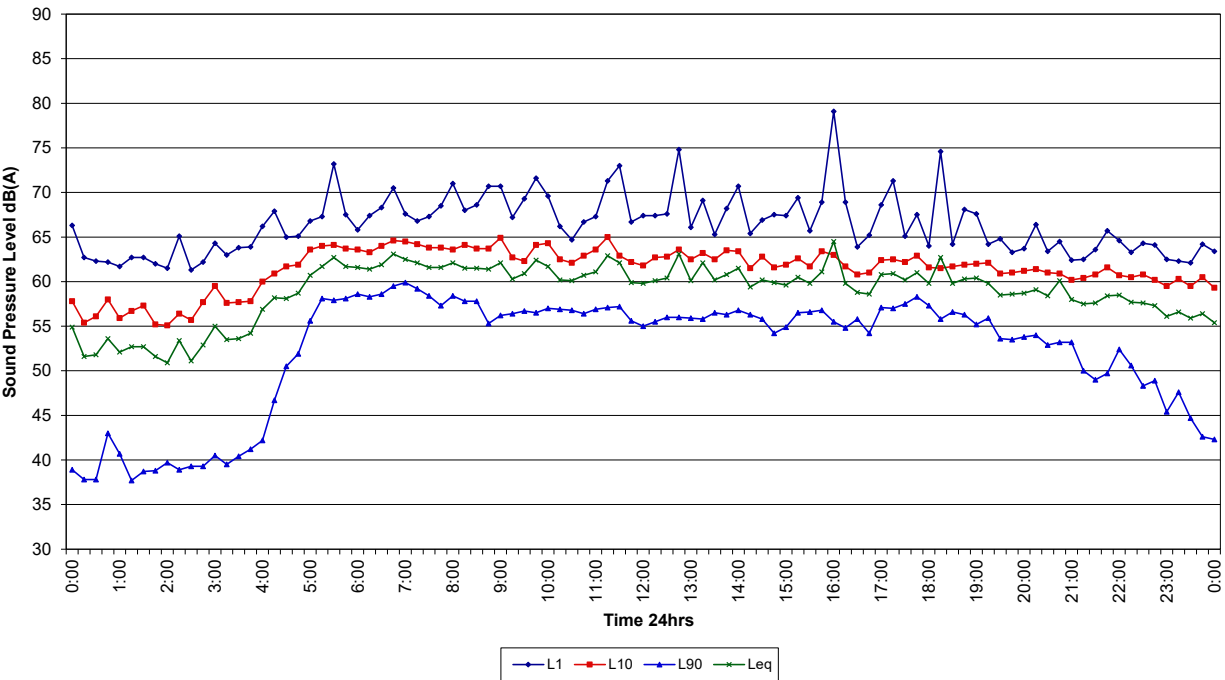
Thursday 12/09/2024



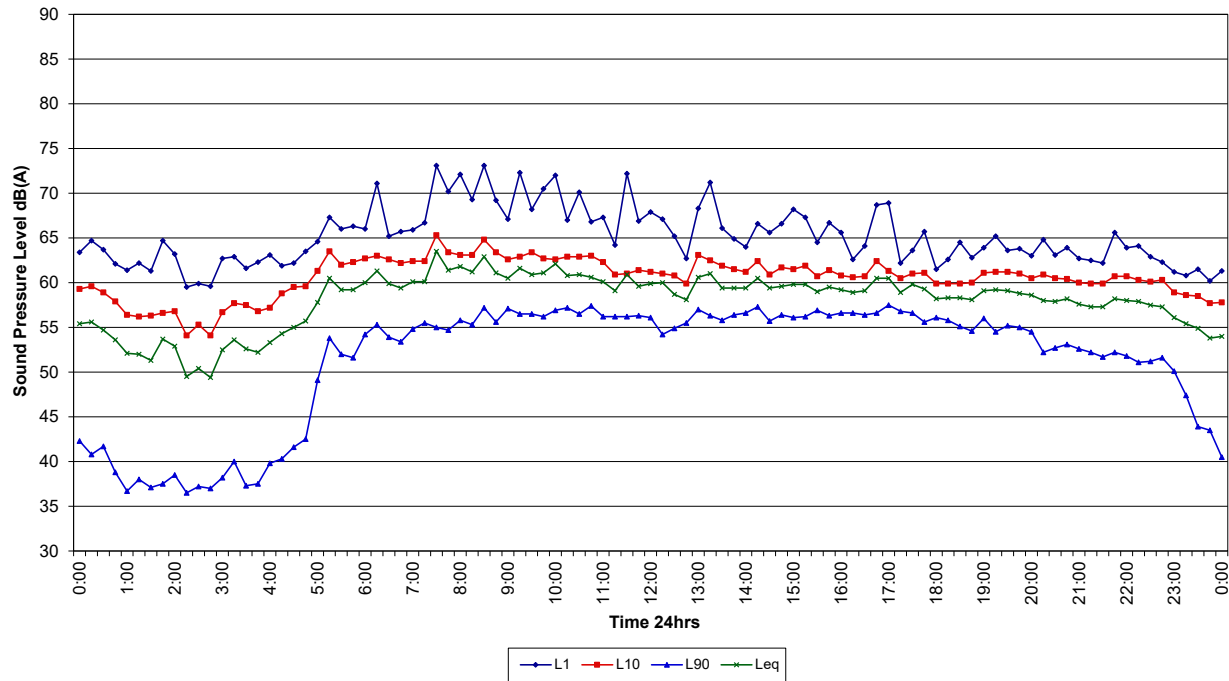
Ambient Logger

42A Beale Street, Georges Hall

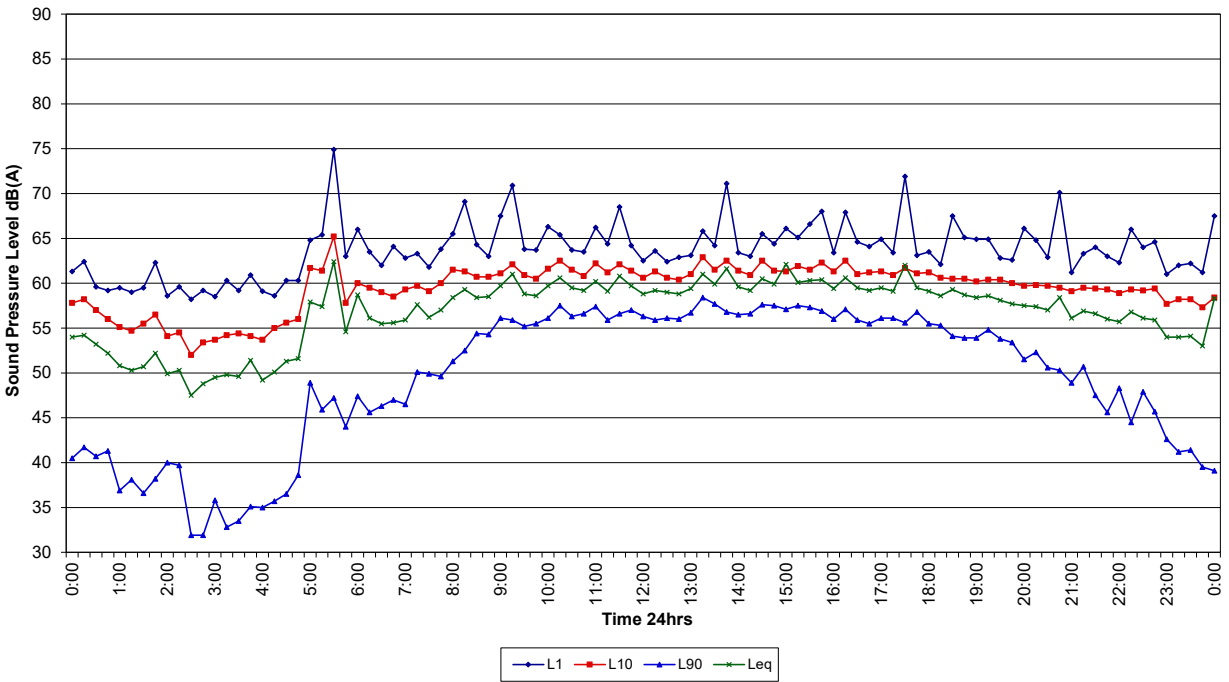
Friday 13/09/2024



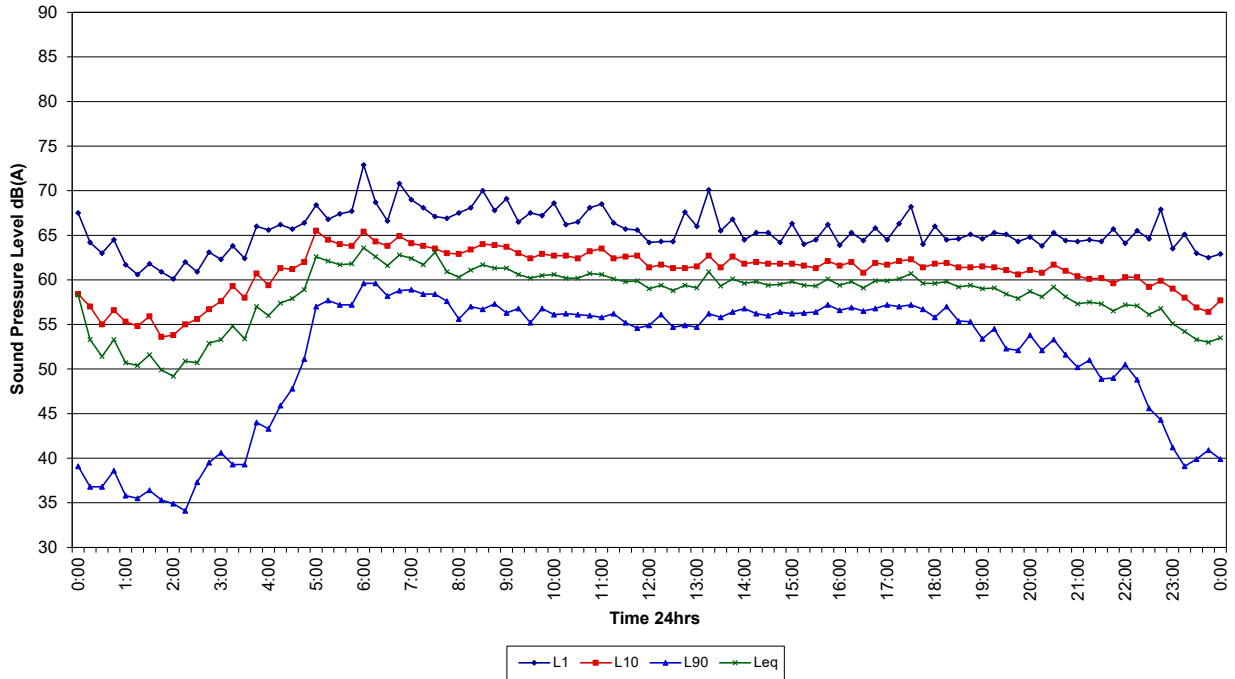
Ambient Logger
42A Beale Street, Georges Hall
Saturday 14/09/2024



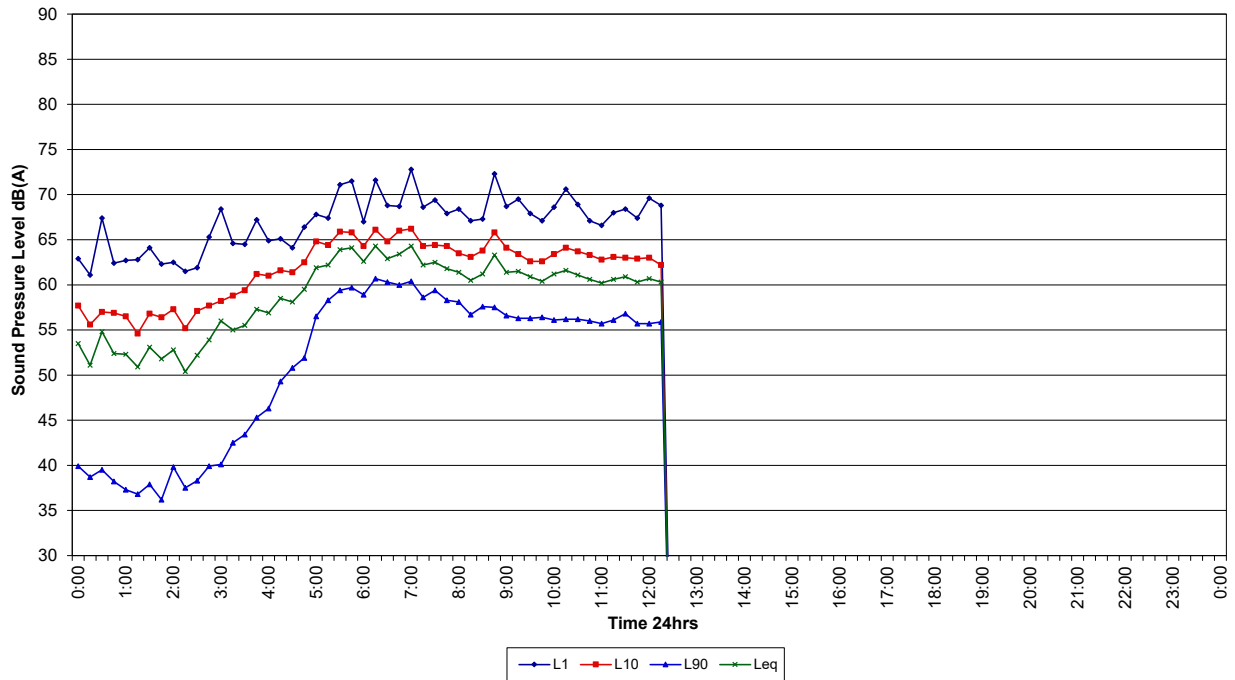
Ambient Logger
42A Beale Street, Georges Hall
Sunday 15/09/2024



Ambient Logger
42A Beale Street, Georges Hall
Monday 16/09/2024



Ambient Logger
42A Beale Street, Georges Hall
Tuesday 17/09/2024



Appendix C – Calibration Certificate



**Acoustic
Research
Labs Pty Ltd**

Unit 36/14 Loyalty Rd
North Rocks NSW AUSTRALIA 2151
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 C21736

Client Details		Rodney Stevens Acoustics Pty Ltd PO Box 522 Wahroonga NSW 2076	
Equipment Tested/ Model Number :		Rion NL-42EX	
Instrument Serial Number :		00810779	
Microphone Serial Number :		148338	
Pre-amplifier Serial Number :		22257	
Pre-Test Atmospheric Conditions		Post-Test Atmospheric Conditions	
Ambient Temperature : 23.3°C		Ambient Temperature : 24°C	
Relative Humidity : 54.3%		Relative Humidity : 52.4%	
Barometric Pressure : 101.1kPa		Barometric Pressure : 101.1kPa	
Calibration Technician : Lucky Jaiswal		Secondary Check: Rhys Gravelle	
Calibration Date : 4 Nov 2021		Report Issue Date : 8 Nov 2021	
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 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	
125Hz	±0.13dB	Temperature	±0.1°C
1kHz	±0.13dB	Relative Humidity	±1.9%
8kHz	±0.14dB	Barometric Pressure	±0.014kPa
Electrical Tests	±0.10dB		

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.

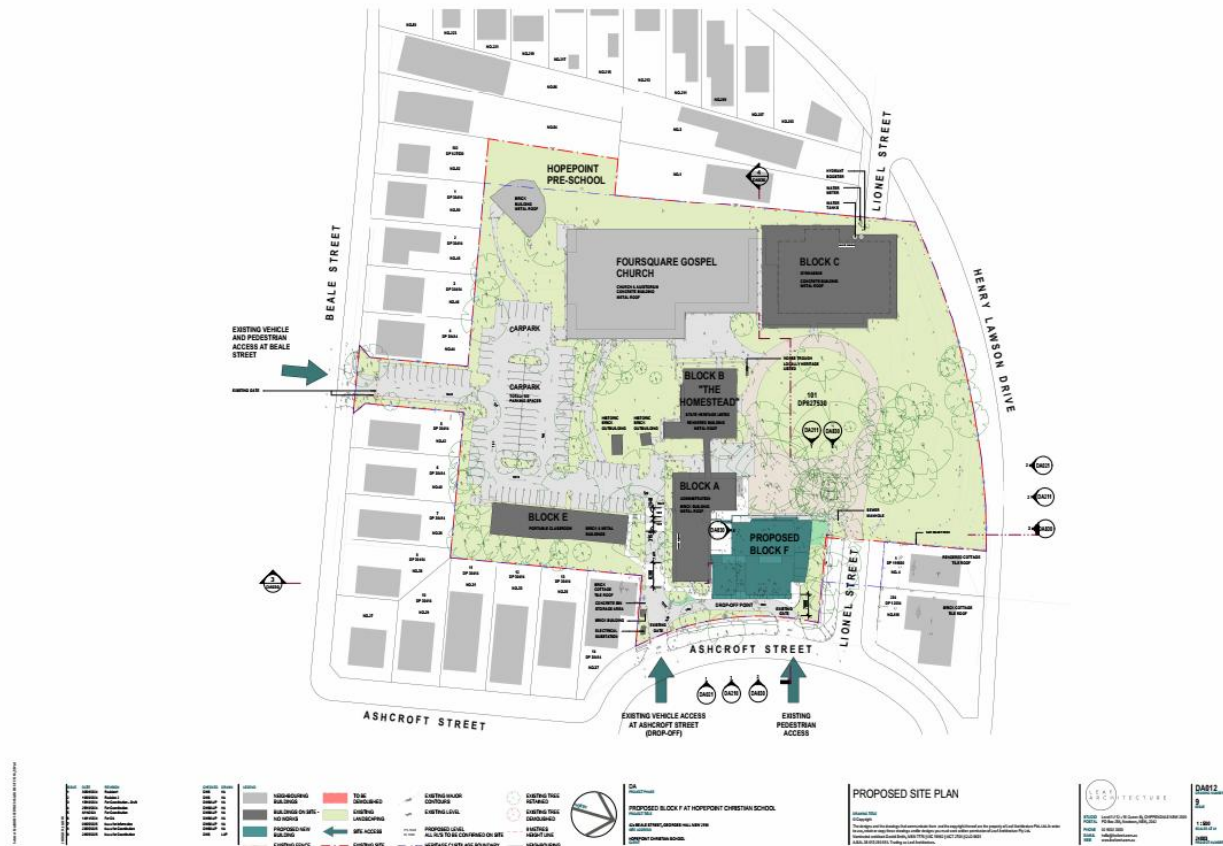
Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025 - calibration.

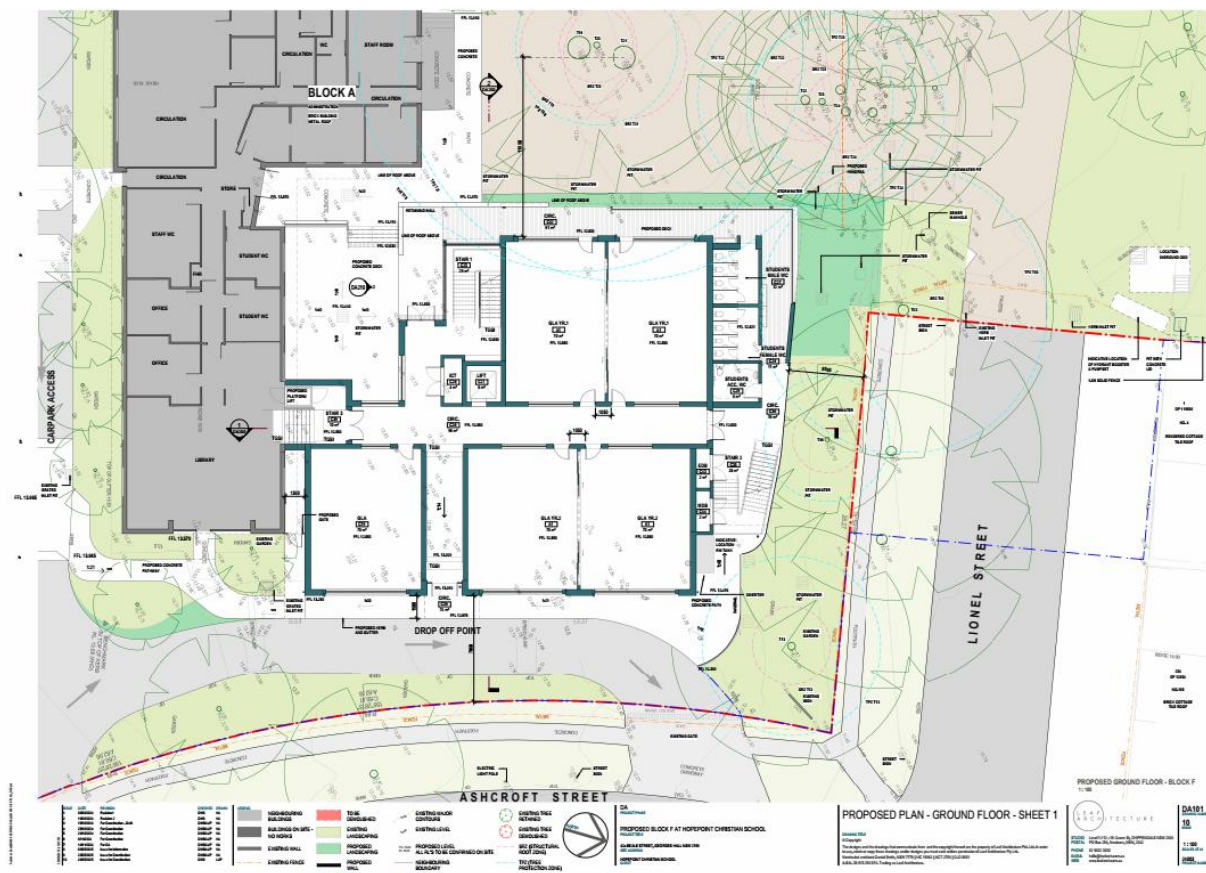
The results of the tests, calibrations and/or measurements included in this document are traceable to SI units.

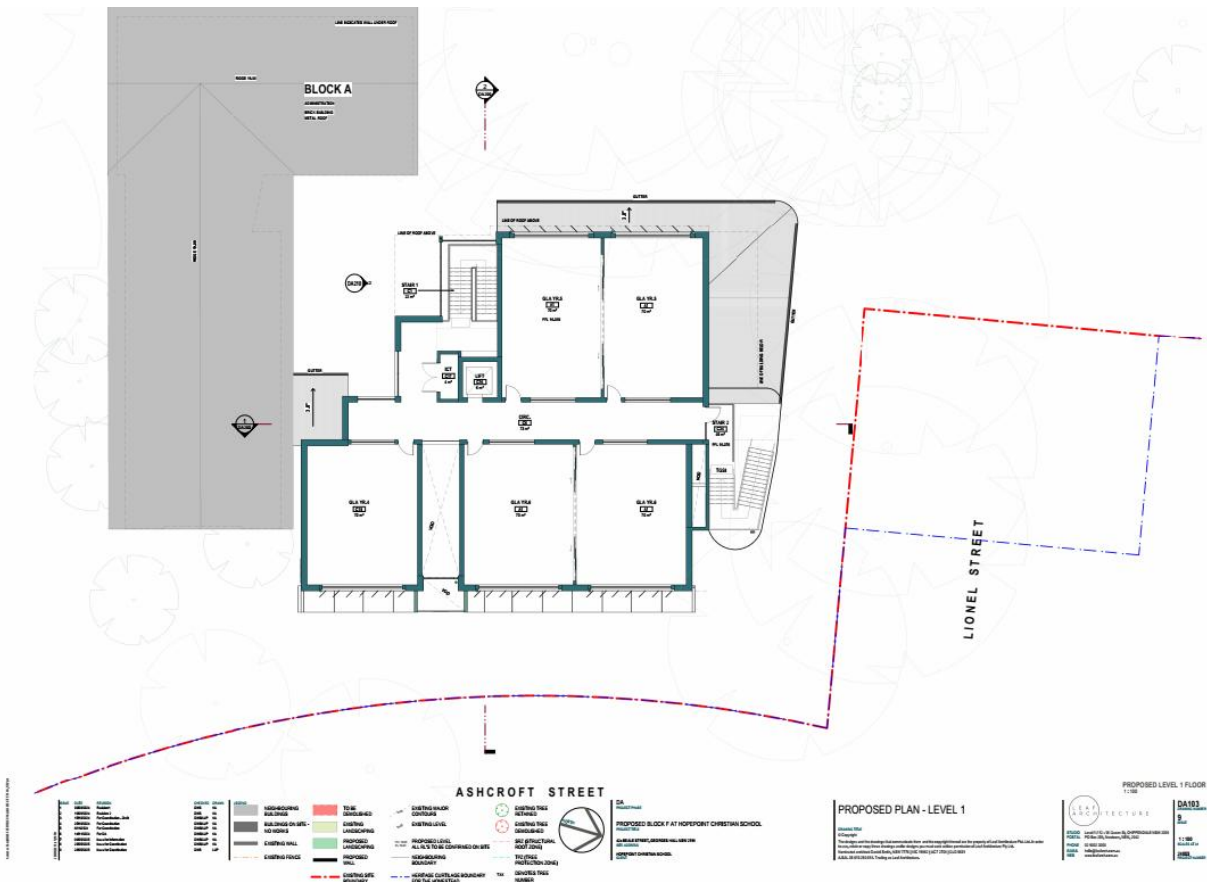
NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

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Appendix D – Drawings

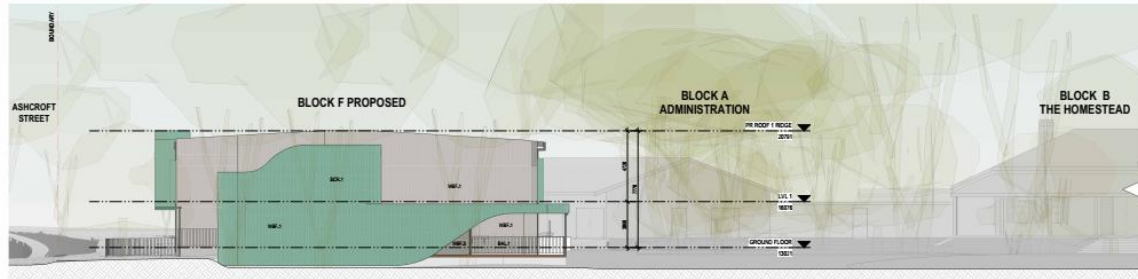








PROPOSED WEST ELEVATION
1:100

PROPOSED NORTH ELEVATION
1/1/99

FROM EXHIBIT TO
RECEIVED FROM

LEAF ARCHITECTURE
 9700 E. 1st Ave. Suite 100
 Denver, CO 80231
 Tel: 303.733.1111
 www.leafarchitecture.com