RODNEY STEVENS ACOUSTICS

REPORT R231017R1

Revision 1

Noise Assessment

Brookvale Structure Plan

PREPARED FOR:
Northern Beaches Council

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Noise Assessment

Brookvale Structure Plan

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DOCUMENT CONTROL

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1 INTRODUCTION

Rodney Stevens Acoustics Pty Ltd (RSA) has been engaged by Northern Beaches Council to conduct a noise impact assessment for the Brookvale Structure Plan

This report addresses the road traffic noise impacts from Pittwater Road on the amenity of the proposed rezoning of the Brookvale precinct.

An additional investigation of noise from the existing breweries has been conducted to ascertain the noise impact from licensed venues into the future residential buildings.

This assessment is to form part of the supporting documentation for the Brookvale Structure Plan Stage 1. 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 structure plan aims to provide a rezoning to accommodate the delivery of 1350 new dwellings as well as a new town square. The proposed land zoning map is presented in Figure 2-1

Figure 2-1 Zoning Map

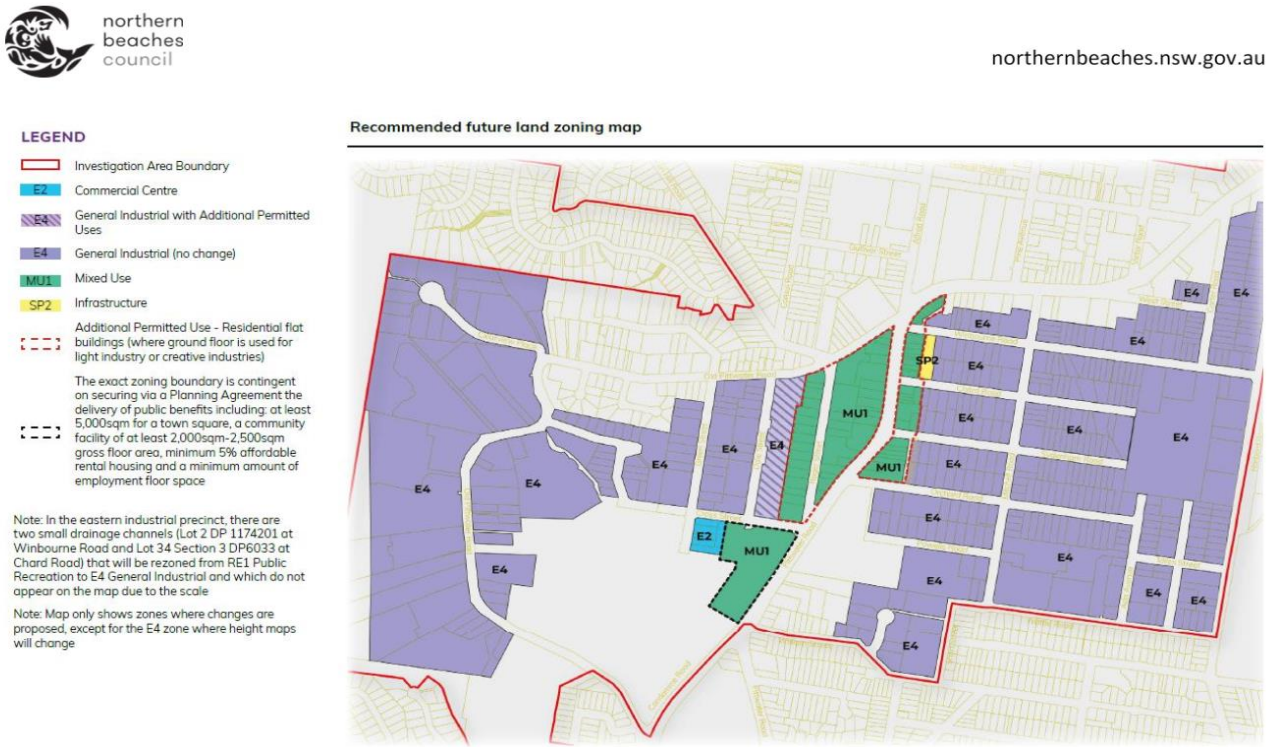


Figure 2-2 Brookvale Aerial View

In order to simplify the assessment locations, we have divided the proposed precinct into 3 areas, the locations in question are presented below:

Figure 2-3 Assessment Areas

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 Thursday 7th March and Thursday 14th March 2024 at the logging location shown in Figure 2-2. The aim of the unattended noise logging was to ascertain the traffic noise levels from Pittwater Road and the ambient noise levels of the different areas.

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 6 RION NL-42EX environmental noise loggers (serial numbers 572559, 546395, 572558,184112, 422907 and 322762) 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.

3.2 Data Processing

In order to assess noise emission from the Brookvale Structure Plan, 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
Location 3 Elizabeth Drive	L_{Aeq}	53	52	48
	RBL (Background)	44	43	36
Location 4 Dive Pro	L_{Aeq}	60	57	53
	RBL (Background)	48	43	39
Location 5 Super Cheap Auto	L_{Aeq}	63	60	56
	RBL (Background)	53	44	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).

3.1 Noise Intrusion (State Environmental Planning Policy (Transport and Infrastructure) 2021)

To assess noise intrusion into the Brookvale Structure Plan, the data obtained from the noise loggers has been processed to establish representative traffic noise levels at the facades most exposed to Pittwater Road. The traffic noise profile from Pittwater Road has been corelated from the 3 locations chosen

The time periods used for this assessment are as defined in the State Environmental Planning Policy (Transport and Infrastructure) 2021 and the Development near Rail Corridors and Busy Roads Interim Guideline. Results are presented below in Table 3-2.

Table 3-2 Traffic Noise Levels Corresponding to Defined SEPP 2021 Periods

Location	Period	External Noise Levels dB(A)
571 Pittwater Road	Day Time 7:00 am - 10:00 pm	$L_{Aeq(15hour)}$ 70
	Night Time 10:00 pm - 7:00 am	$L_{Aeq(9hour)}$ 67
Brookvale Oval	Day Time 7:00 am - 10:00 pm	$L_{Aeq(15hour)}$ 65
	Night Time 10:00 pm - 7:00 am	$L_{Aeq(9hour)}$ 63
Warringah Mall	Day Time 7:00 am - 10:00 pm	$L_{Aeq(15hour)}$ 72
	Night Time 10:00 pm - 7:00 am	$L_{Aeq(9hour)}$ 68

The noise levels measured from Pitwwater Road fall in line with major road of this nature, levels varying between 70 – 75 dB(A) are consistent with the existing traffic volumes

4 NOISE GUIDELINES AND CRITERIA

4.1 Road Noise Criteria

The determination of an acceptable level of traffic noise impacting the internal residential spaces requires consideration of the activities carried out within the space and the degree to which noise will interfere with those activities.

As sleep is the activity most affected by traffic noise, bedrooms are considered to be the most sensitive internal living areas. Higher levels of noise are acceptable in living areas without interfering with activities such as reading, listening to the television etc. Noise levels in utility spaces such as kitchens, bathrooms, laundries etc. can be higher.

4.2 State Environmental Planning Policy (Transport and Infrastructure) 2021

The NSW Government's State Environmental Planning Policy (Transport and Infrastructure) 2021 (SEPP (Transport and Infrastructure) 2021) was introduced to facilitate the delivery of infrastructure across the State by improving regulatory certainty and efficiency. The NSW Department of Planning and Infrastructure's "*Development near Rail Corridors and Busy Roads - Interim Guideline"* (the DP&I Guideline) of December 2008 provides noise criteria for residential and non-residential buildings. These criteria are summarised in Table 4-1.

Table 4-1 DP&I Interim Guideline Noise Criteria

Type of occupancy	Noise Level dB(A)	Applicable time period
Sleeping areas (bedroom)	35	Night 10 pm to 7 am

Other habitable rooms (excl. garages, kitchens, bathrooms & hallways)	40	At any time

Note 1: Airborne noise is calculated as $L_{Aeq(15hour)}$ daytime and $L_{Aeq(9hour)}$ night-time

The following guidance is also provided in the DP&I Guideline:

> *"These criteria apply to all forms of residential buildings as well as aged care and nursing home facilities. For some residential buildings, the applicants may wish to apply more stringent design goals in response to market demand for a higher quality living environment.*
>
> *The night-time "sleeping areas" criterion is 5 dB(A) more stringent than the "living areas" criteria to promote passive acoustic design principles. For example, designing the building such that sleeping areas are less exposed to road or rail noise than living areas may result in less onerous requirements for glazing, wall construction and acoustic seals. If internal noise levels with windows or doors open exceed the criteria by more than 10 dB(A), the design of the ventilation for these rooms should be such that occupants can leave windows closed, if they so desire, and also to meet the ventilation requirements of the Building Code of Australia."*

The noise criteria presented in Section 4.2 and in Table 4-1 apply to a 'windows closed condition'. Standard window glazing of a building will typically attenuate noise ingress by 20 dB(A) with windows closed and 10 dB(A) with windows open (allowing for natural ventilation). Accordingly, the external noise threshold above which a dwelling will require mechanical ventilation is an $L_{Aeq(9hour)}$ 55 dB(A) for bedrooms and $L_{Aeq(15hour)}$ 60 dB(A) for other areas.

Where windows must be kept closed, the adopted ventilation systems must meet the requirements of the Building Code of Australia and Australian Standard 1668 – The use of ventilation and air conditioning in buildings.

4.3 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.

4.3.1 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.

4.3.2 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.

4.3.3 Area Classification

The NPfI characterises the "Urban" noise environment as an area with an acoustical environment that:

- is dominated by 'urban hum' or industrial source noise,
- where urban hum means the aggregate sound of many unidentifiable, mostly traffic and/or industrial related sound sources
- has through-traffic with characteristically heavy and continuous traffic flows during peak periods
- is near commercial districts or industrial districts
- has any combination of the above.

The area surrounding the proposed development falls under the "Urban" area classification.

4.3.4 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 4-2. These project trigger noise levels are nominated for the purpose of assessing potential noise impacts from the proposed development.

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 4-2.

Table 4-2 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 $L_{Aeq(15min)}$
Area 1						
Residential	Day	60	43	53	**48**	58
	Evening	50	43	52	**48**	**48**
	Night	45	36	48	**41**	43

Area 2						
Residential	Day	60	48	61	**53**	58
	Evening	50	43	57	**48**	**48**
	Night	45	39	53	44	**43**
Area 3						
Residential	Day	60	53	63	**58**	**58**
	Evening	50	44	60	49	**48**
	Night	45	37	56	**42**	43

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

Note 2: RBL = “Rating Background Level”.

5 NOISE IMPACT ASSESSMENT

5.1 Traffic Noise Assessment

Traffic noise predictions from Pittwater Road have been predicted by utilising NSW EPA recognised and approved computer noise model SoundPlan 9 software. SoundPlan is a fully integrating software suite that specialises in computer simulations of noise situations incorporating over 50 calculation standards. The model calculates overall noise levels at receiver locations considering distance, atmospheric absorption, barriers effects of intervening ground types, weather conditions, source levels, source and receiver locations and topography.

Calculated current traffic noise levels have been correlated with the noise logger data to ensure the noise model is calibrated. Future traffic noise levels have been based on a 9% increase in traffic volumes per year for 10 years (2034). This is a conservative approach taking into account the normal yearly increase in traffic volumes, the predicted population growth due to the proposed upgrade and the future amenities that will attract new business to the area.

The final façade noise levels were predicted for each time period taking into account the distance attenuation from each respective source, virtual source, façade’s orientation and any barrier effects.

The required noise reduction via the building façade for each respective room for each time period will be compared to determine the appropriate design criteria levels.

It is typically accepted that an open window (fractionally open to meet ventilation requirements) results in an attenuation of external noise by 10 dB. This reduction has been used to predict the room noise level in the window open condition.

A noise map of the predicted future traffic noise levels at each façade is presented in Appendix D

5.2 Recommended Noise Control Treatment

The calculation procedure establishes the required noise insulation performance of each surface component such that the internal noise level is achieved whilst an equal contribution of traffic noise energy is distributed

across each component. Building envelope components with a greater surface area must therefore offer increased noise insulation performance.

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

- Bedrooms: 3000 x 3500 x 2700mm Carpet and underlay
- Living Room 6500 x 5000 x 2700mm Hard Flooring
- Wet Areas: 2000 x 1800 x 2700mm Tiles

The acoustic requirements shown in this report may increase further where the bedroom floor finishes are tiled or timber.

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).

5.3 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 habitable room 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 a qualified acoustic engineer 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.

Table 5-1 presents the minimum recommended R_w (weighted noise reduction) for glazing elements.

Table 5-1 Minimum Acoustic Rating (R_w) Required For Glazing Elements

Facade	Room	Window	Glazed Door/Door
Area 1			
East	Bedroom	-	Rw 38
	Living Room	Rw 38	Rw 38
South East	Bedroom	-	Rw 38
	Living Room	Rw 38	Rw 38
West	Bedroom	Standard	
	Living Room	Standard	
North	Bedroom	-	Rw 35
	Living Room	Rw 33	Rw 35
South	Bedroom	-	Rw 38
	Living Room	Rw 38	Rw 38
Area 2			
West	Bedroom	-	Rw 38
	Living Room	Rw 38	Rw 38
North	Bedroom	-	Rw 38
	Living Room	Rw 38	Rw 38
East	Bedroom	Standard	
	Living Room	Standard	
South	Bedroom	-	Rw 35
	Living Room	Rw 35	Rw 35

Area 3			
East	Bedroom	-	Rw 38
	Living Room	Rw 38	Rw 38
West	Bedroom	Standard	
	Living Room	Standard	
North	Bedroom	-	Rw 35
	Living Room	Rw 35	Rw 35
South	Bedroom	-	Rw 35
	Living Room	Rw 35	Rw 35

The Rw requirements presented above are based on standard glazing sizes and the room sizes presented in Section 5.2. The glazing sizes are as follows:

- Bedroom Sliding Door 2400 x 2000
- Bedroom Window 2000 x 1800
- Living Room Sliding Door 4500 x 2600

The required Rw ratings are likely to change based on the size of the rooms, number of doors and windows and glazing size. Area 3 will be subject to noise levels from neighbouring businesses including licensed venues, it is likely that glazing requirements will be higher to mitigate future noise impact from the entertainment in the area. A more detailed assessment by a qualified acoustic engineer must be carried out at a later stage when detailed plans are available.

We note that generally, glazing systems requiring an Rw37 rating consist of single glazed constructions, ratings Rw38 and higher will require double glazing configurations

The above recommended glazing systems consist of glass pane, frame and seals. Care should be taken when selecting the system to ensure the acoustic rating (Rw) is verified through laboratory tested data. As a guide, 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 5.3.

Table 5-2 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

5.4 External Walls

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

5.4.1 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 Rw rating is generally achieved with a standard construction with insulation. No further acoustic requirements are needed

5.4.2 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.

5.5 Mechanical Plant Noise Assessment

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 4-2 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 LICENSED PREMISES NOISE IMPACT

The proposed area 3 will be located to the east of Pittwater Road, between Chard and Sydenham Roads, this area is located in a commercial/industrial district with a number of breweries and distilleries. The future residential building may be affected by noise generated by licensed venues and other night time activities i.e. music and patron noise which can occur during the night time period (10:00pm to 7:00am). RSA has identified Nomad Brewing as the most likely venue to have an impact on any future residential development since it sits in close proximity to future residential receivers.

Our noise assessment will look into the possible noise impacts from Nomad Brewing into the future residential receivers. A map showing the locations of the brewery and the future residential building is shown below:

Figure 6-1 Future Residential Buildings

7 NOISE CRITERIA

The establishment of the noise criteria for the assessment of the proposed residential buildings have been based on the Liquor and Gaming NSW noise guidelines.

7.1 Liquor and Gaming

Liquor and Gaming NSW 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 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 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.*

7.2 International Standard ISO 226-2023

The International Standard ISO 226 : 2023- Normal Equal-Loudness-Level Contours provides a set of values in decibels that represent the minimum amount of sound that the human ear can register (threshold of hearing) per frequency band. The threshold of hearing values are presented in Table 1 of the ISO standard, the specific values are presented in the table below:

Table 7-1 Threshold of Hearing in Accordance to ISO 226-2003

Description	Tf Level per Octave Band -dB								
	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz	8k Hz
Threshold of hearing	60	38	22	11	4	2	-1	-5	13
A-Weightings	-39	-26	-16	-9	-3	0	1	1	-1
A-Weighted Hearing Thresholds for Reference	20	11	6	3	1	2	0	-4	12

7.3 Project Specific Noise Criteria

Based on the spectral data from the noise logger the project specific noise criteria for the operation of the proposed residential buildings have been established in accordance with LG noise guidelines. The project specific noise criteria for the proposed residential buildings are presented in tables below.

Table 7-2 External Criteria for Operational Noise

Description	Ambient Noise Level per Octave Band -dBA								
	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	20	16	25	33	37	36	30	23	16
L_{10} Daytime Criterion (Between 7 am and 12 midnight): At Surrounding Residences	**25**	**21**	**30**	**38**	**42**	**41**	**35**	**28**	**21**
Measured Night-time L_{90} Background Noise Level	20	11	20	28	35	34	29	22	16
L_{10} Night-time Criterion (Between 12 midnight and 7 am): At Surrounding Residences	**20**	**11**	**20**	**28**	**35**	**34**	**29**	**22**	**16**

8 NOISE IMPACT ASSESSMENT

8.1 Typical Patron Vocal Levels

The following sections summarise the results of patron and music noise assessment and predicted levels at future residential receivers as a result of the operation of Nomad Brewing.

Calculations of the amount of noise transmitted to these receivers from the proposed licensed venue have been based on voice levels as referenced in the AAAC Licensed Premises Noise Assessment Technical Guide V2.0. This document provides voice spectrums in different vocal efforts at 1 meter from the talker on axis of the mouth. The spectrum is given in the table below.

Table 8-1 Speech Spectrums - AAAC Licensed Premises Noise Assessment Technical Guide V2.0.

Type	Lzeq at 1m (dB) Octave Band Centre Frequency (Hz)							
	125	250	500	1 k	2 k	4 k	8 k	Overall dB(A)
Male (Normal)	47	56	58	52	48	44	39	58
Male (Raised)	56	63	65	62	57	52	46	66
Male (Loud)	59	67	73	72	67	62	53	76

8.2 Patron Sound Power Levels

Based on the maximum number of 60 patrons in the beer garden, 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.

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

Table 8-2 Sound Power Levels of People talking with Raised Voice - Lw – dB

Scenario	Resultant Sound Power Level per Octave Band (dB)							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
30 Patrons with Raised Vocal in Beer Garden	-	81	87	90	86	82	77	71

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.

8.3 Music Sound Power Level

RSA has conducted measurements of background music noise levels at various licensed venues, based on these measurements the sound power level spectrum of typical music is shown in Table 8-3 below.

Table 8-3 Typical Sound Power Level of Typical Music - Lw – dB

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

8.4 Predicted Noise Impacts

Predictive resultant noise spectrums have been calculated for all activities carried out at Nomad Brewing. 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.
- A maximum of 60 patrons use the beer garden.
- Live bands and DJs will be not used in the beer garden.
- Background music is played in the beer garden at a level of 85 dB(A) at 1m from the speakers
- Resulting noise levels have been calculated to the calculation point as indicated in the figure below.

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

Figure 8-1 Affected Receiver Locations

The resulting noise levels from the operation of Nomad Brewing are presented in the table below, we have assumed the worst case scenario were the beer garden is operating at full capacity.

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

R1 shows potential mixed use buildings, as identified in the Brookvale Structure Plan.

R2 shows potential residential uses as a worst case scenario (not identified in the Brookvale Structure Plan).

Table 8-4 Predicted External Noise Impact Levels - Residential Receivers Daytime

Receivers	Resultant Sound Pressure Level per Octave Band - dBA								
	31.5 Hz	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Daytime Assessment (7:00am to 12:00am)									
	L_{A10} Noise Level								
R1	-5	18	36	42	48	50	48	44	31
R2	-6	18	35	42	47	50	48	44	31
Daytime Criteria	**25**	**21**	**30**	**38**	**42**	**41**	**35**	**28**	**21**
Exceedance R1	-	-	***6***	***4***	***6***	***9***	***13***	***16***	***10***
Exceedance R2	-	-	***5***	***4***	***5***	***9***	***13***	***16***	***10***

We note that currently, Nomad Brewing only operates during the daytime period (7:00am to 12:00am)

The noise exceedances presented above are representative of a scenario where Nomad Brewing is operating at maximum capacity (worst case scenario), while this may not occur often, it is a possibility that may have an impact on the future residential buildings.

It will be unreasonable to expect compliance with the noise criteria as the main issue is the line of sight from the proposed residential buildings to the existing beer garden. No physical vertical barriers could be implemented to mitigate the noise impacts, a possible solution would require Nomad Brewing to upgrade their beer garden by installing highly absorptive panels along the walls and possibly a partial roof above the beer garden.

The noise exceedances are mainly in the high frequencies which indicates that most of the noise comes from patrons speaking. High frequency noise is easily treated and in most normal operational scenarios i.e. beer garden operating at half capacity, the noise will be significantly lower.

At this stage it will be feasible to manage this issue by design, ensuring that sensitive spaces such as bedrooms do not face directly to the beer garden, it will be preferrable to have non habitable rooms on the facades exposed to Nomad Brewery. Where this is not possible, glazing must be upgraded to ensure that noise from the licensed venue can be controlled by closing all doors and windows. The acoustic requirements of the glazing will need to be designed at the DA stage for the proposed residential buildings.

9 SUMMARY

In order to safeguard Brookvale Structure Plan from noise impacts from traffic noise on Pittwater Road and surrounding commercial premises, a number of mitigation measures must be implemented. The following table summarises the acoustic requirements for future facades affected by traffic noise

Table 9-1 Minimum Rw Requirements

Room Type	Building Element	Rw Requirement
Bedroom	Glazing	38
	Wall	55
Living Room	Glazing	38
	Wall	55

The minimum ratings presented above are based on standard room sizes and glazing openings (Refer to Section 5.2). A detailed site-specific assessment must be carried out by a qualified acoustic engineer to ensure any future building designs provide adequate acoustic treatment

New developments on the eastern side of Pittwater Road will be affected by noise from existing licensed venues, this noise includes, patrons, music and mechanical plant. In order to safeguard the amenity of future residents, design controls must be implemented to minimise the noise impact on new residential buildings. Noise controls must include the following:

- Window and door openings must be orientated away from noise sources
- Non sensitive areas (bathrooms, laundries, etc) must be located on the facades exposed to noise sources (where practicable)
- Limiting the number and size of openings facing noise sources i.e. windows or doors
- Where sensitive areas (bedrooms, living rooms, studies) overlook noise sources, double glazing must be implemented
- Where balconies overlook noise sources, the inclusion of louvres or enclosed balconies (wintergarden) must be explored

10 CONCLUSION

Rodney Stevens Acoustics has conducted a noise impact assessment of the Brookvale Structure Plan. The noise impact assessment has assessed the noise generation and intrusion of the site and compared it with the noise criteria required by in Northern Beaches Council and other relevant standards.

A noise survey has been conducted and the processed data has been used to determine the future traffic noise levels (2034) from Pittwater Road at the future residential buildings.

Based on the noise impact study conducted, the future residential buildings are assessed to comply with the SEPP (Transport and Infrastructure) 2021 noise criteria with recommendations from this report. A more detailed noise assessment must be carried out by a qualified acoustic engineer at a later stage when there are detailed architectural plans available.

Prepared by:

Camilo Castillo

Principal Acoustic Consultant

Approved by:

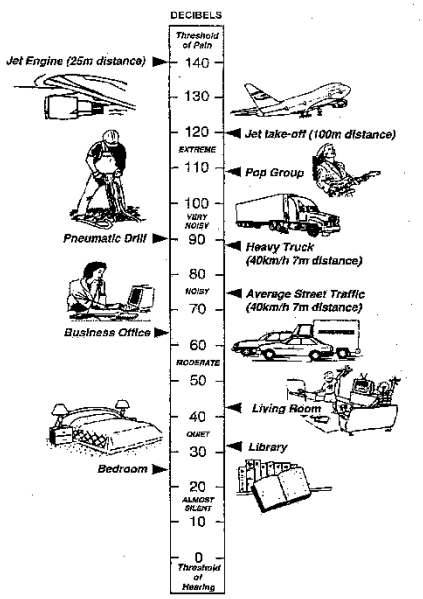
Desmond Raymond

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 '*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)	Rating background noise level (RBL) – the overall single-figure background level representing each assessment period (day/evening/night) over the whole monitoring period (as opposed to over each 24-hour period used for the assessment background level). The rating background level is the median 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)*.

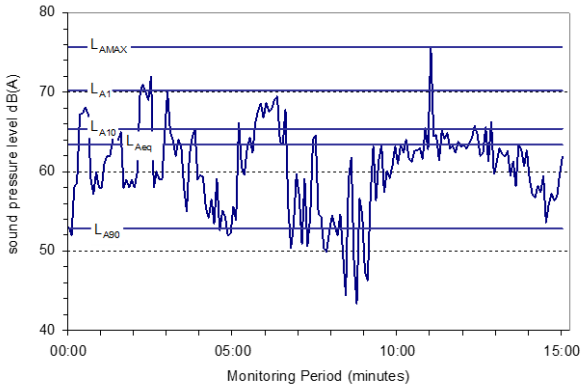
Sound Pressure Level (SPL)

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

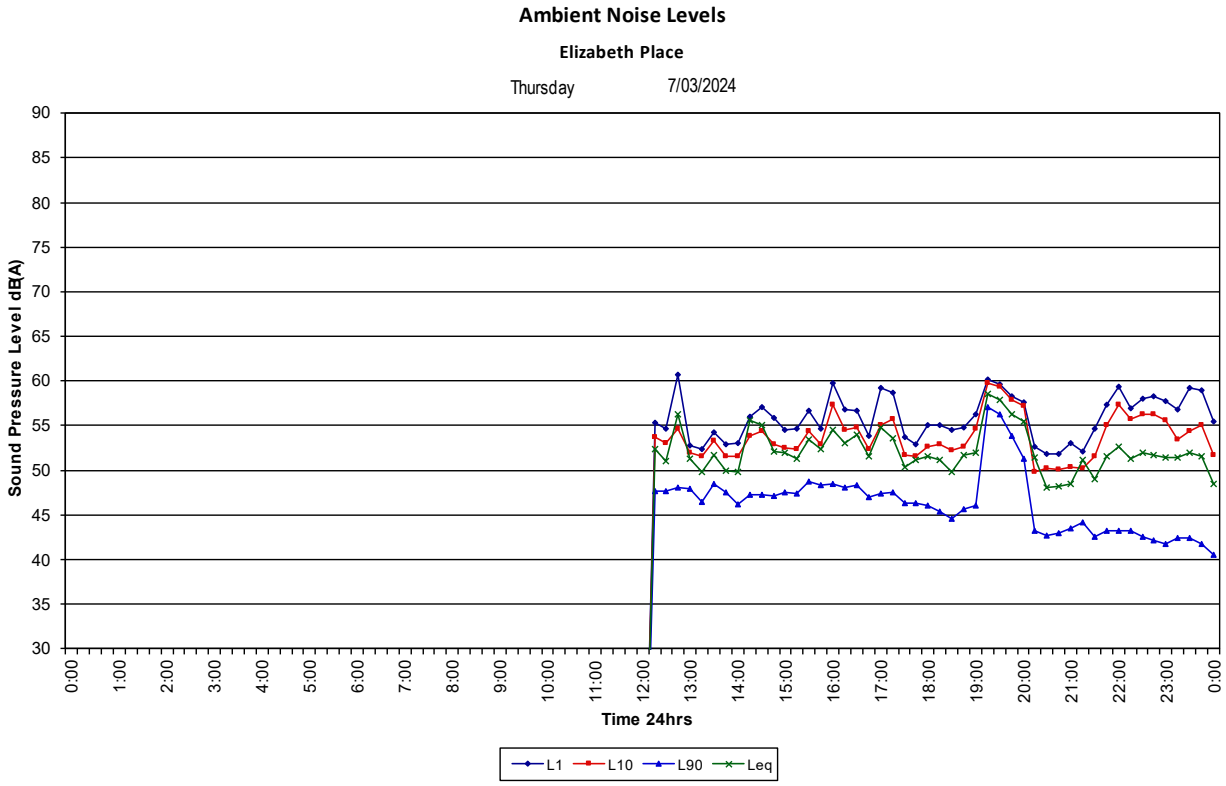
The lowest sound pressure level that produces a detectable response (in an instrument/person).

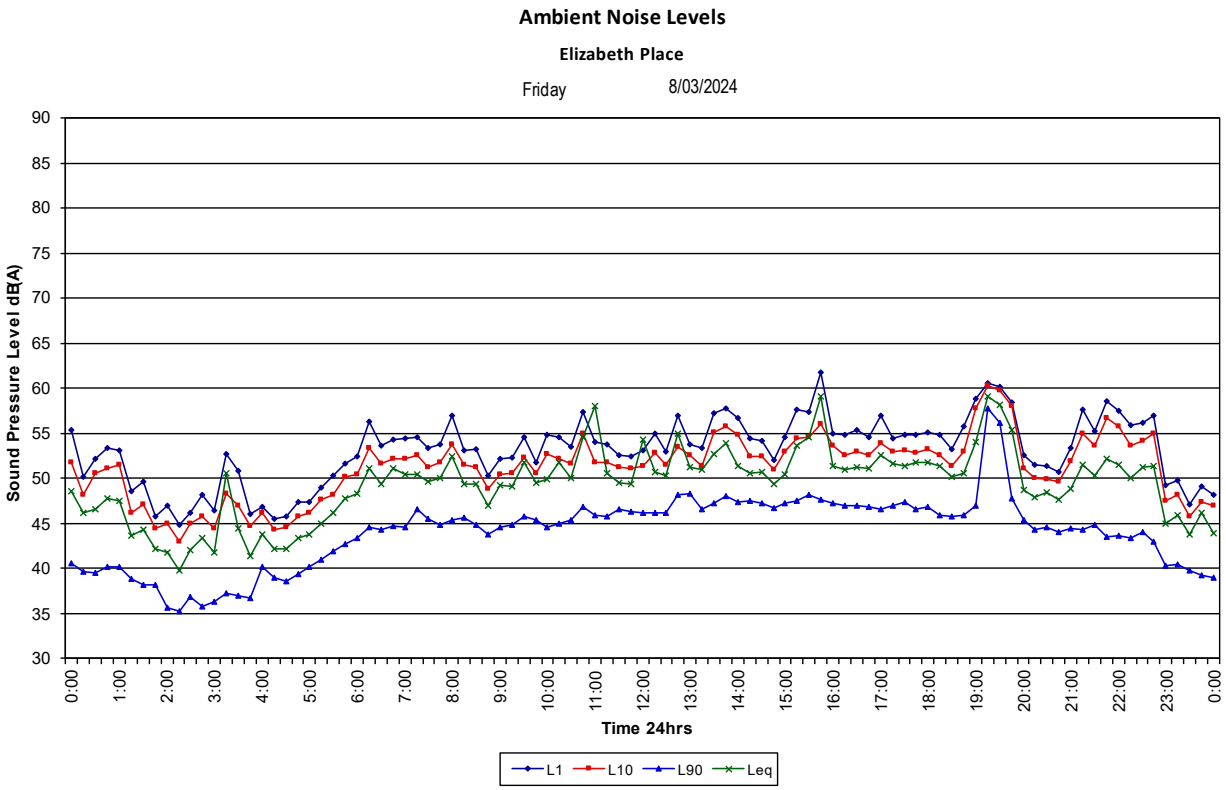
Tonality

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 – Logger Graphs

Ambient Logger – Elizbeth Place




Ambient Noise Levels
Elizabeth Place
Friday 8/03/2024
Sound Pressure Level dB(A)
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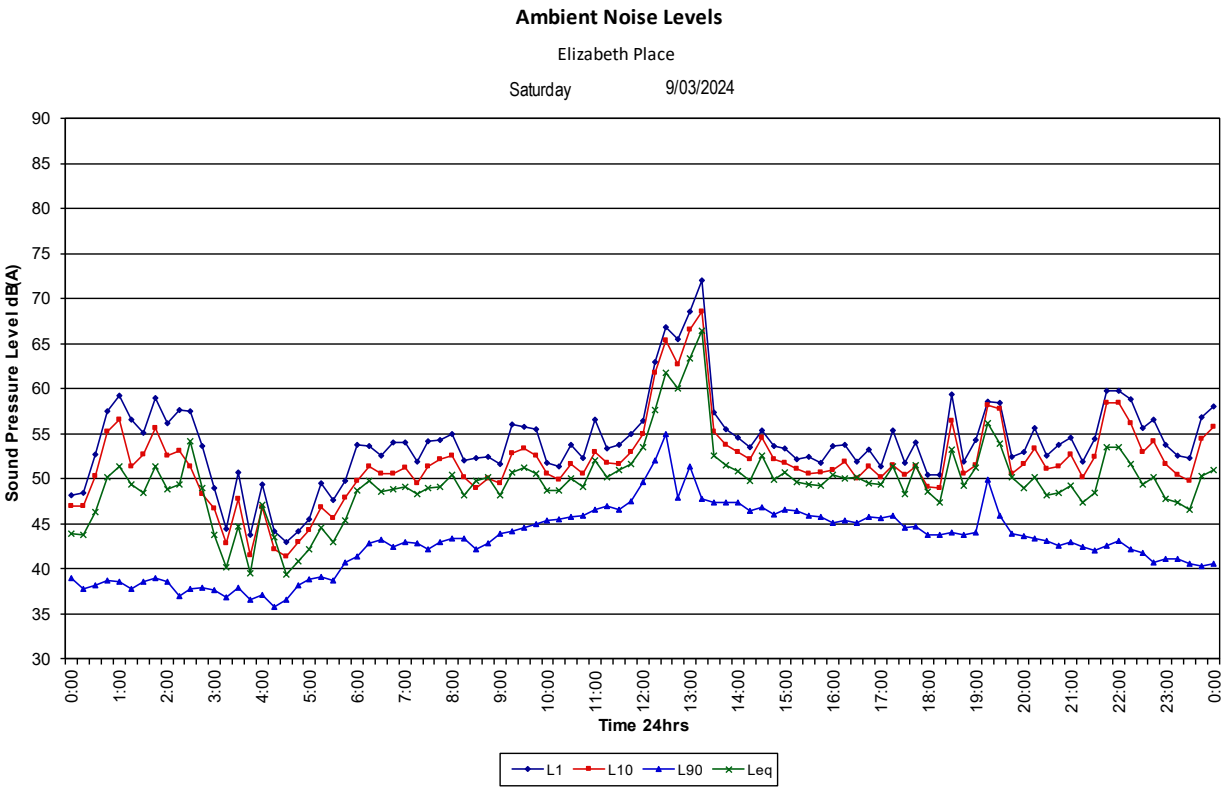
Time 24hrs
L1 L10 L90 Leq


Ambient Noise Levels
Elizabeth Place
Saturday 9/03/2024
Sound Pressure Level dB(A)
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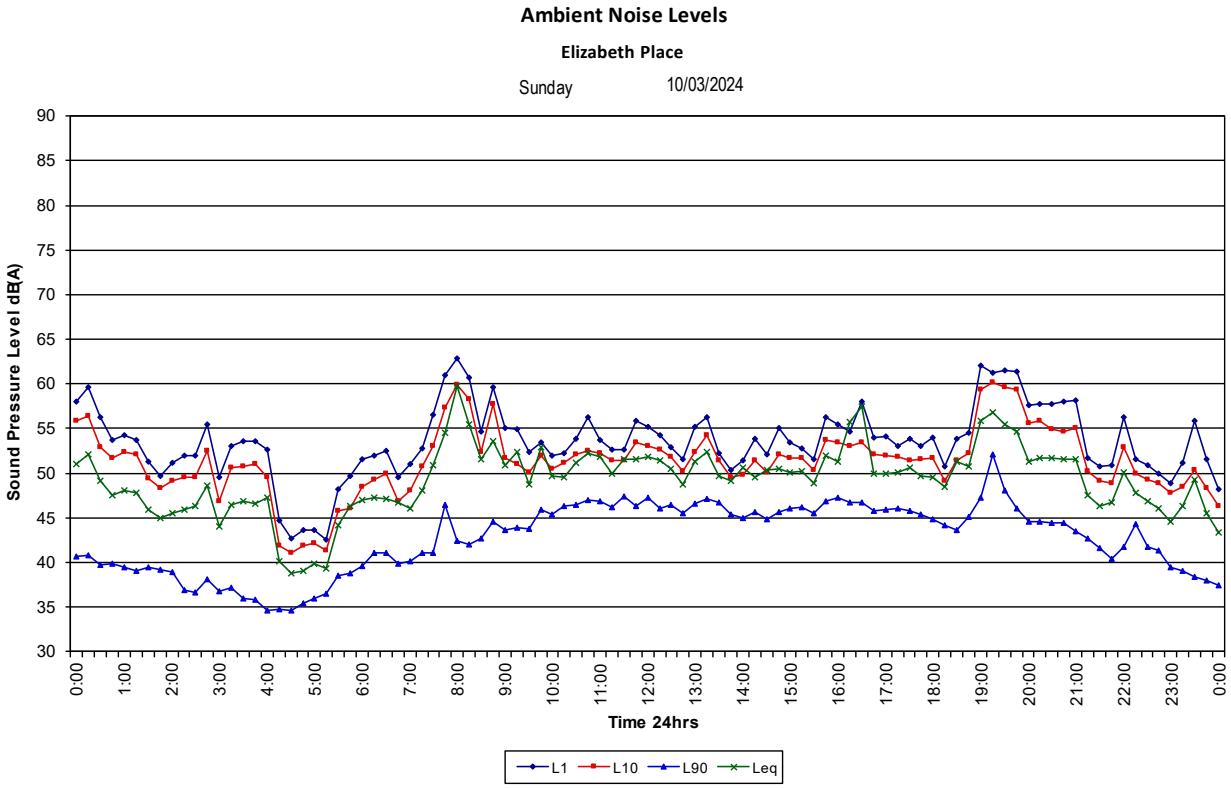
Time 24hrs
L1 L10 L90 Leq


Ambient Noise Levels
Elizabeth Place
Sunday 10/03/2024
Sound Pressure Level dB(A)
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Time 24hrs
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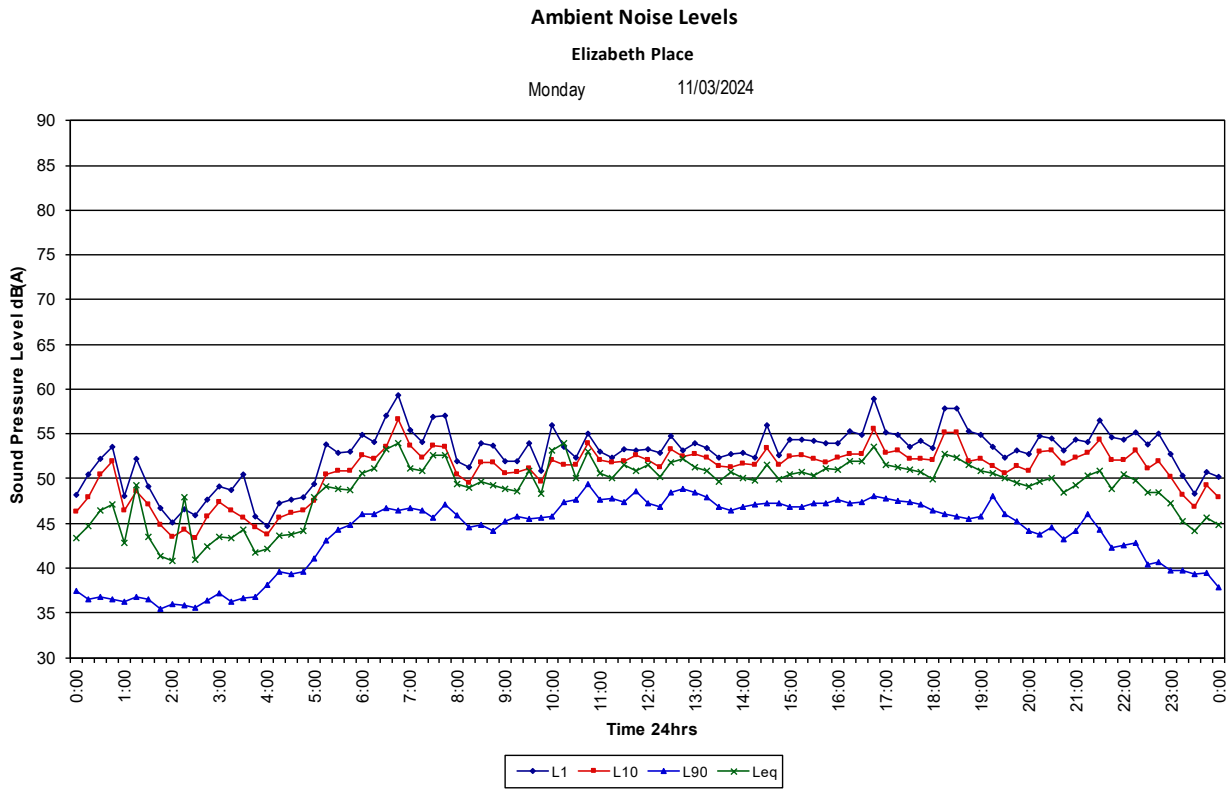
Ambient Noise Levels
Elizabeth Place
Monday 11/03/2024
Sound Pressure Level dB(A)
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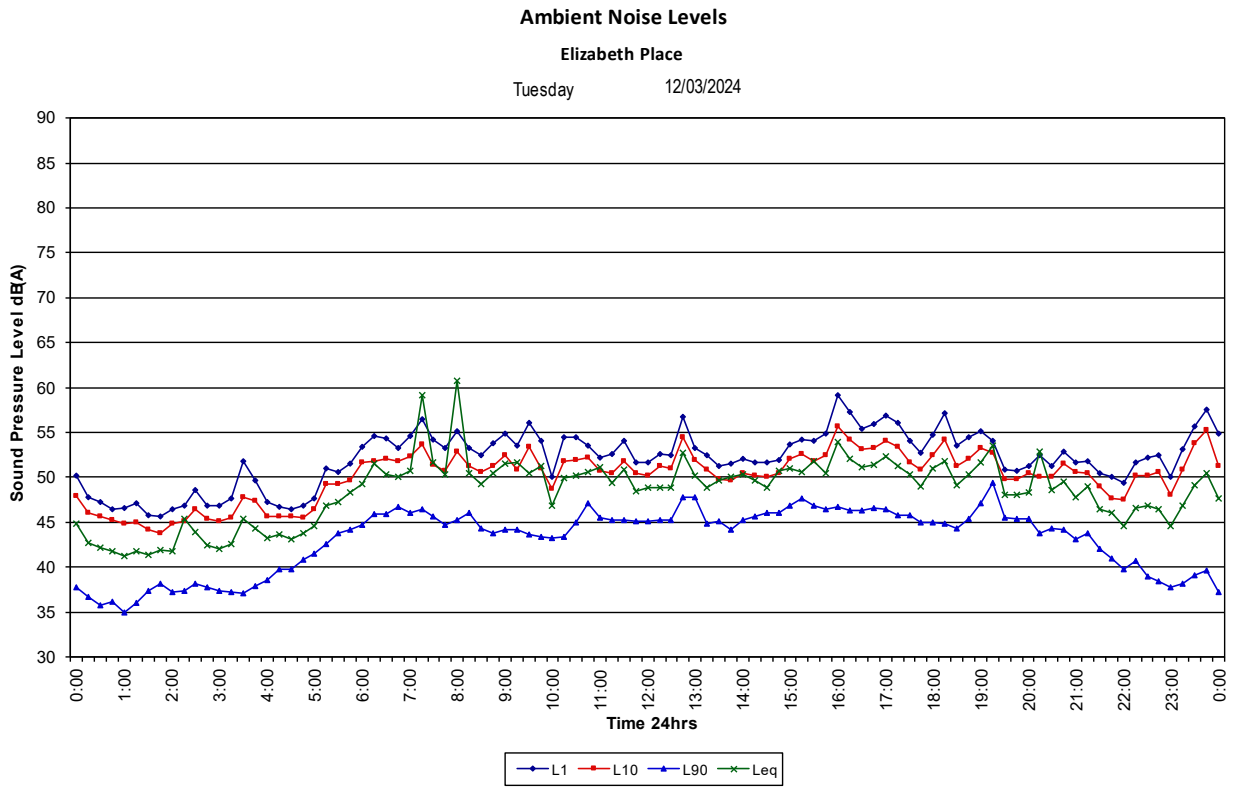
Ambient Noise Levels
Elizabeth Place
Tuesday 12/03/2024
Sound Pressure Level dB(A)
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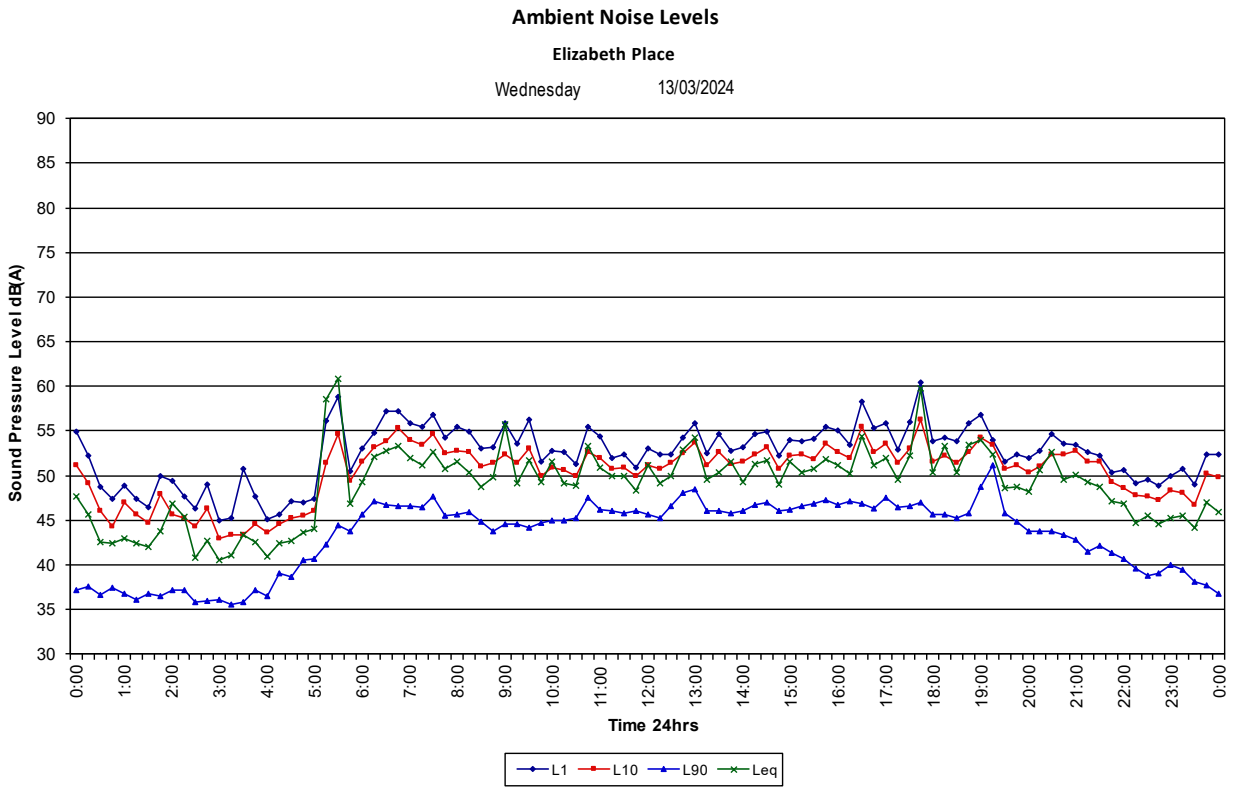
Time 24hrs
L1 L10 L90 Leq


Ambient Noise Levels
Elizabeth Place
Wednesday 13/03/2024
Sound Pressure Level dB(A)
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Time 24hrs
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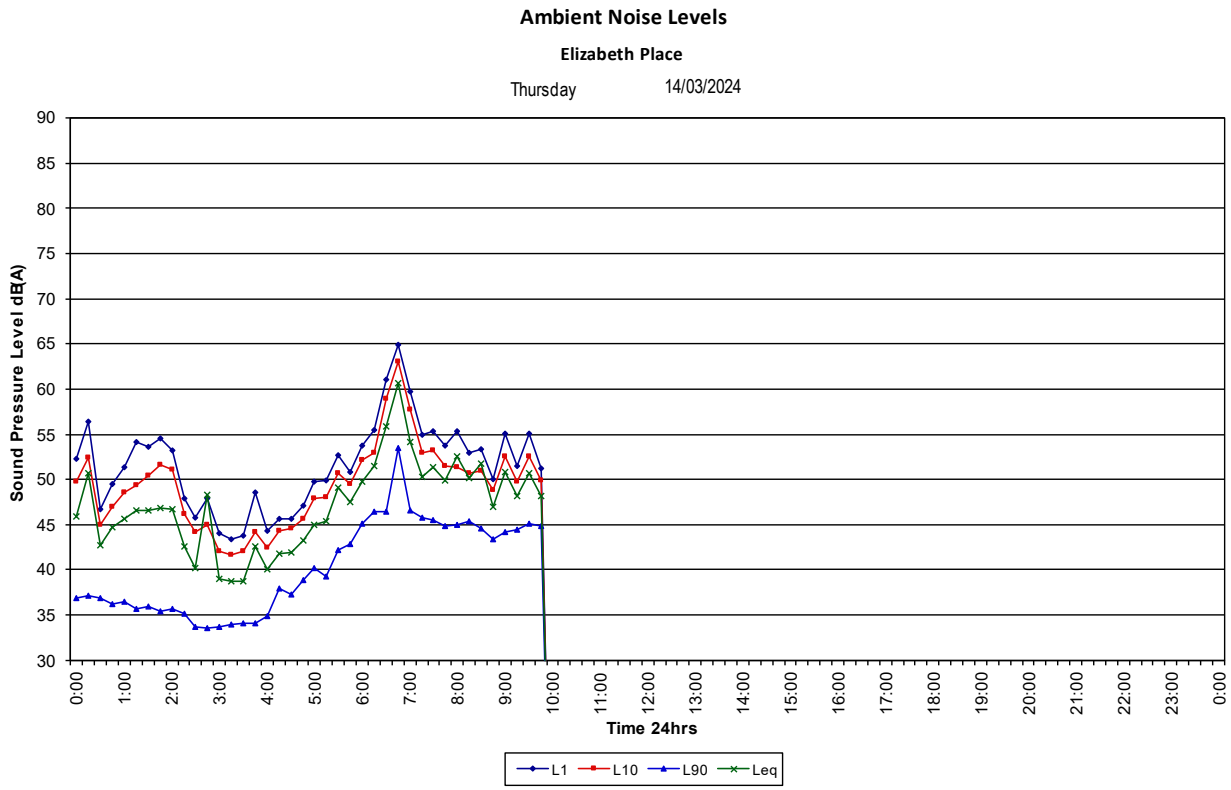
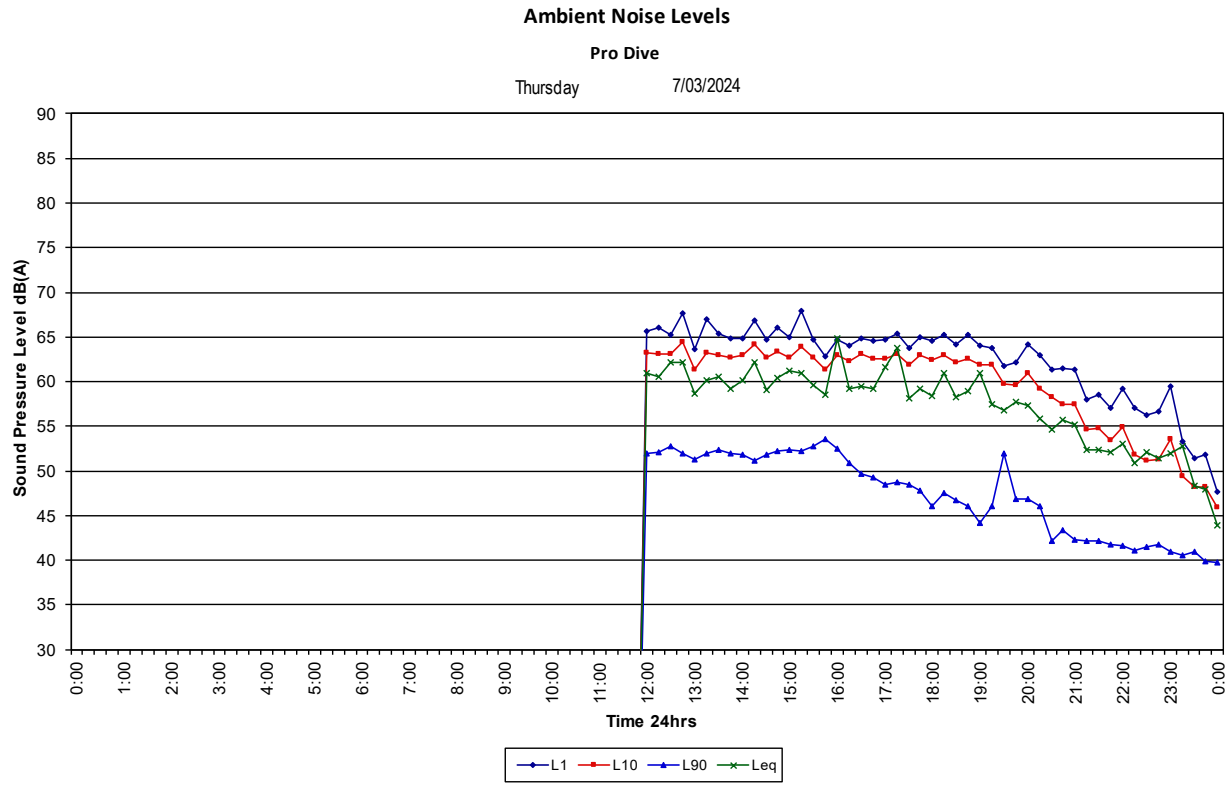
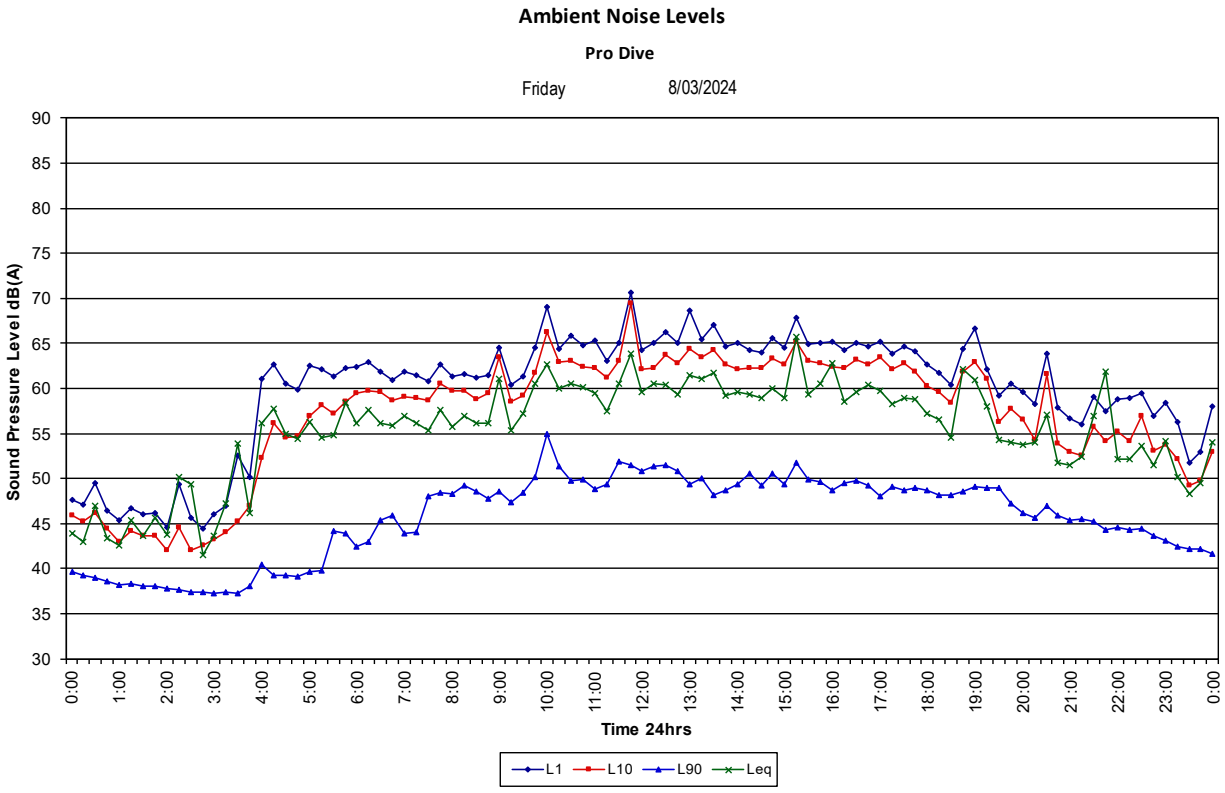


Ambient Logger Pro Dive




Ambient Noise Levels
Pro Dive
Friday 8/03/2024
Sound Pressure Level dB(A)
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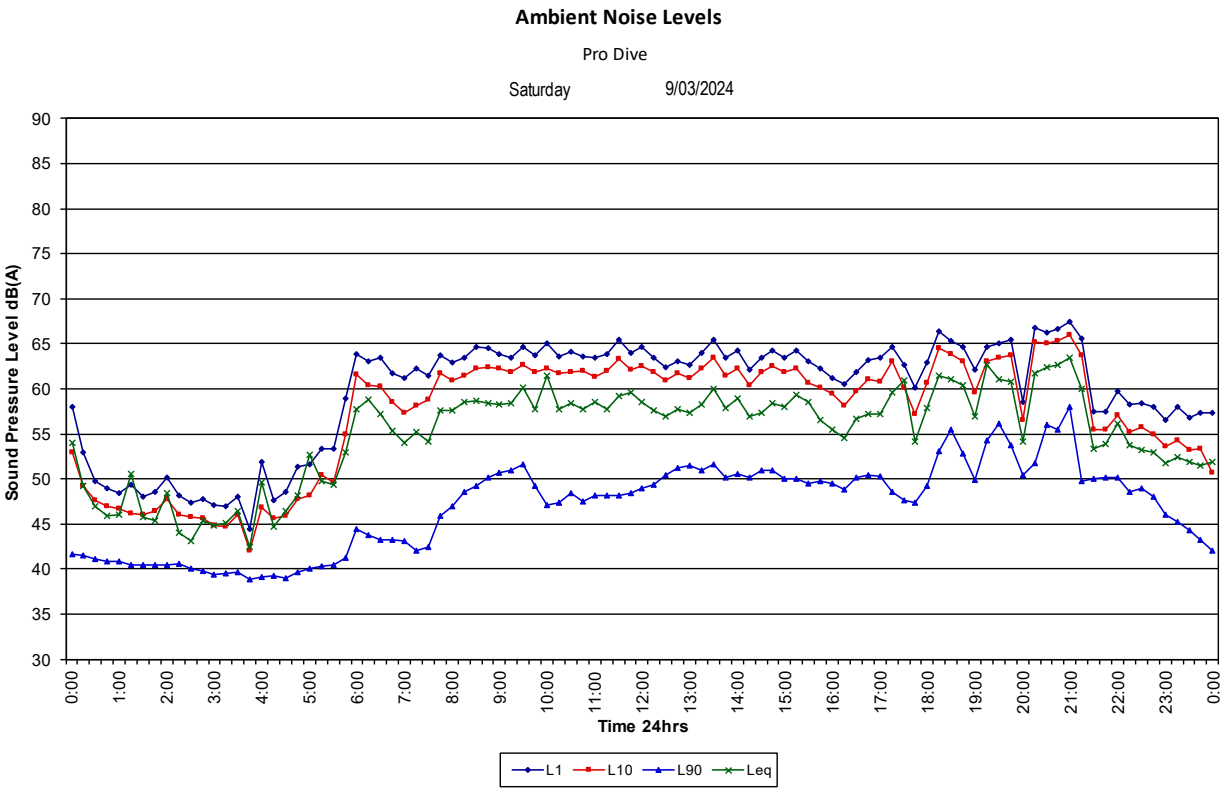
Time 24hrs
L1 L10 L90 Leq


Ambient Noise Levels
Pro Dive
Saturday 9/03/2024
Sound Pressure Level dB(A)
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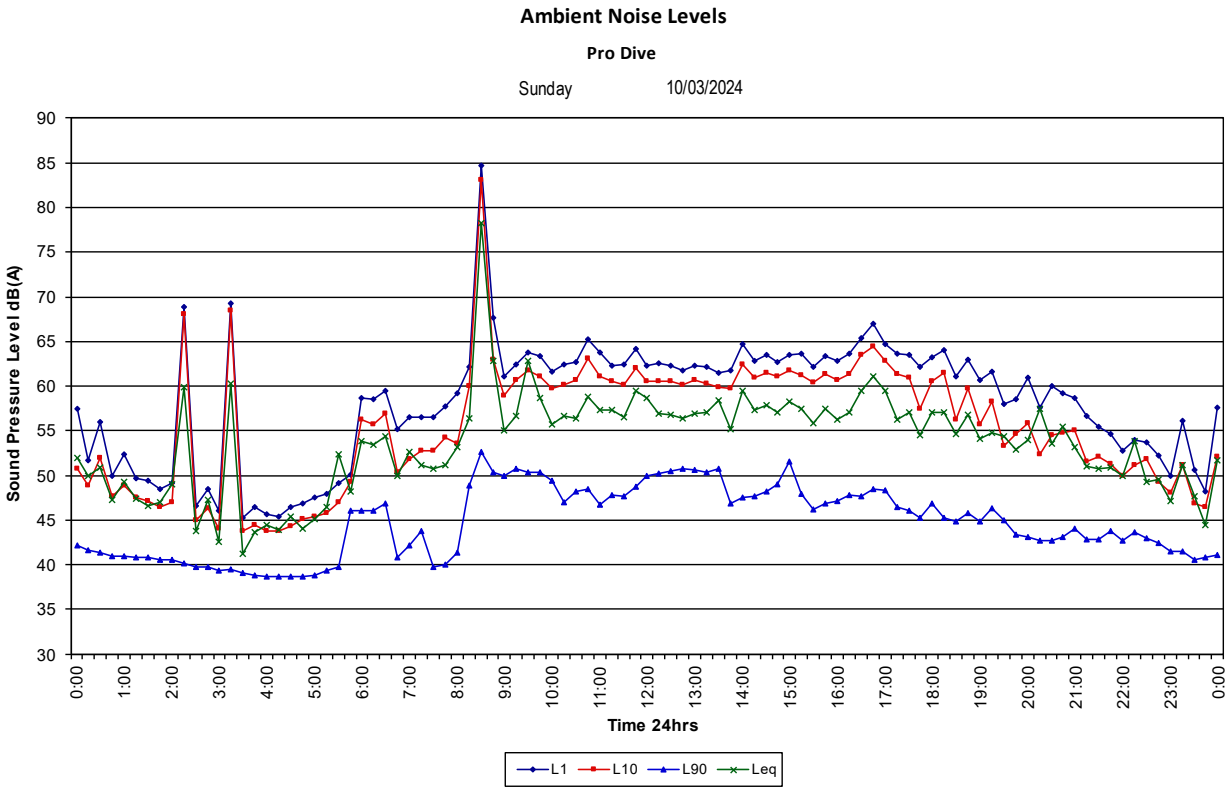
Time 24hrs
L1 L10 L90 Leq


Ambient Noise Levels
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Sound Pressure Level dB(A)
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Time 24hrs
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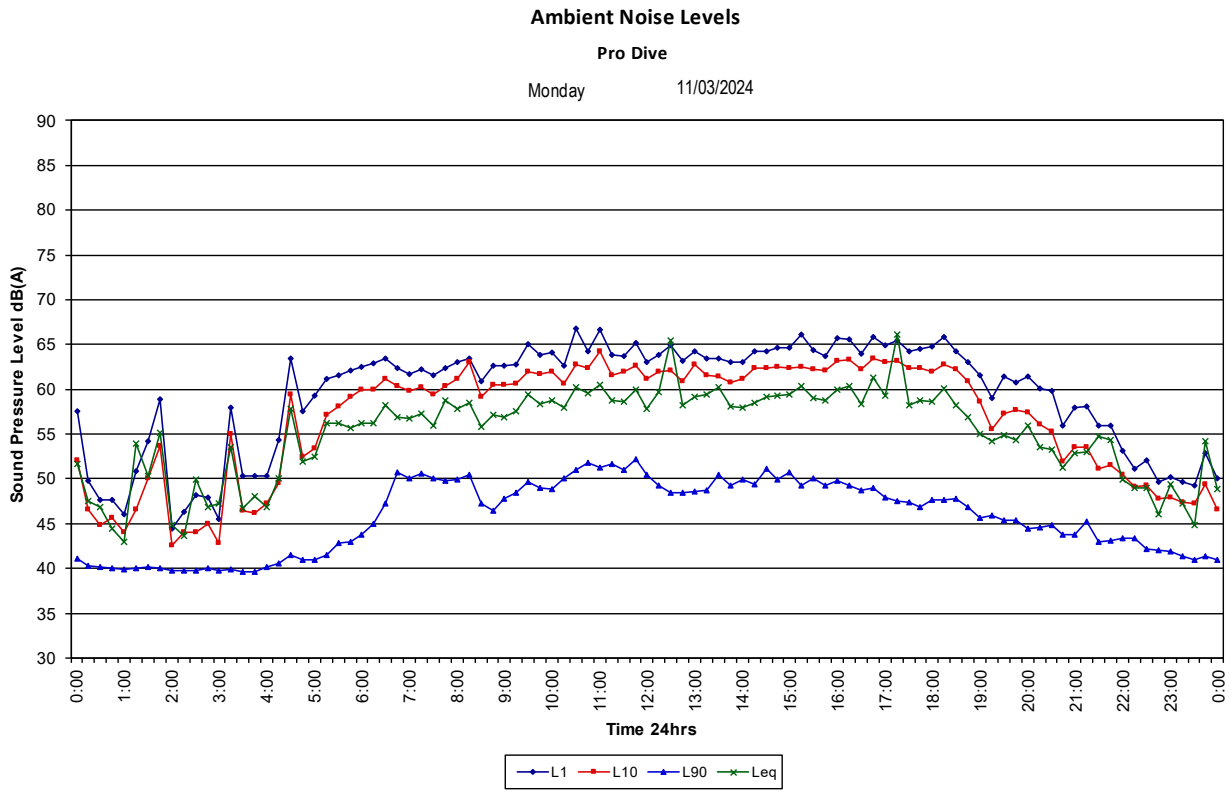
Ambient Noise Levels
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Sound Pressure Level dB(A)
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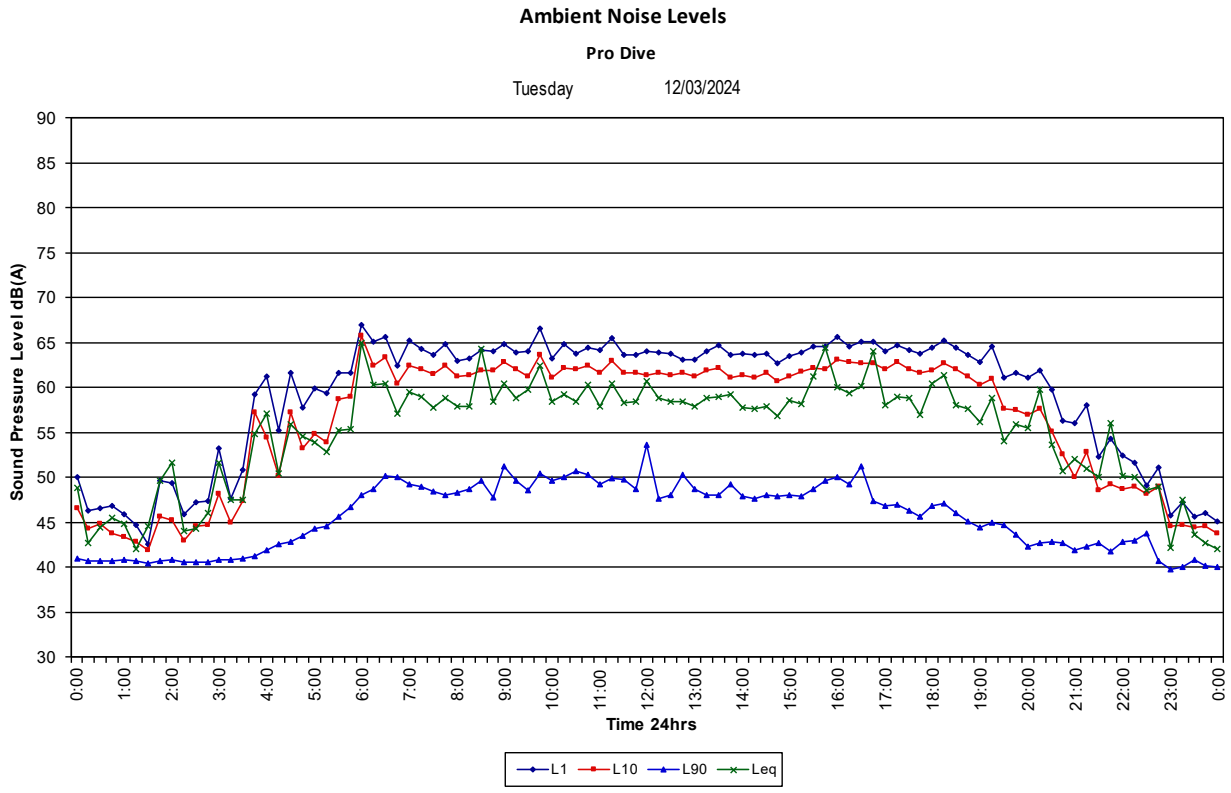
Time 24hrs
L1 L10 L90 Leq


Ambient Noise Levels
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Sound Pressure Level dB(A)
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Time 24hrs
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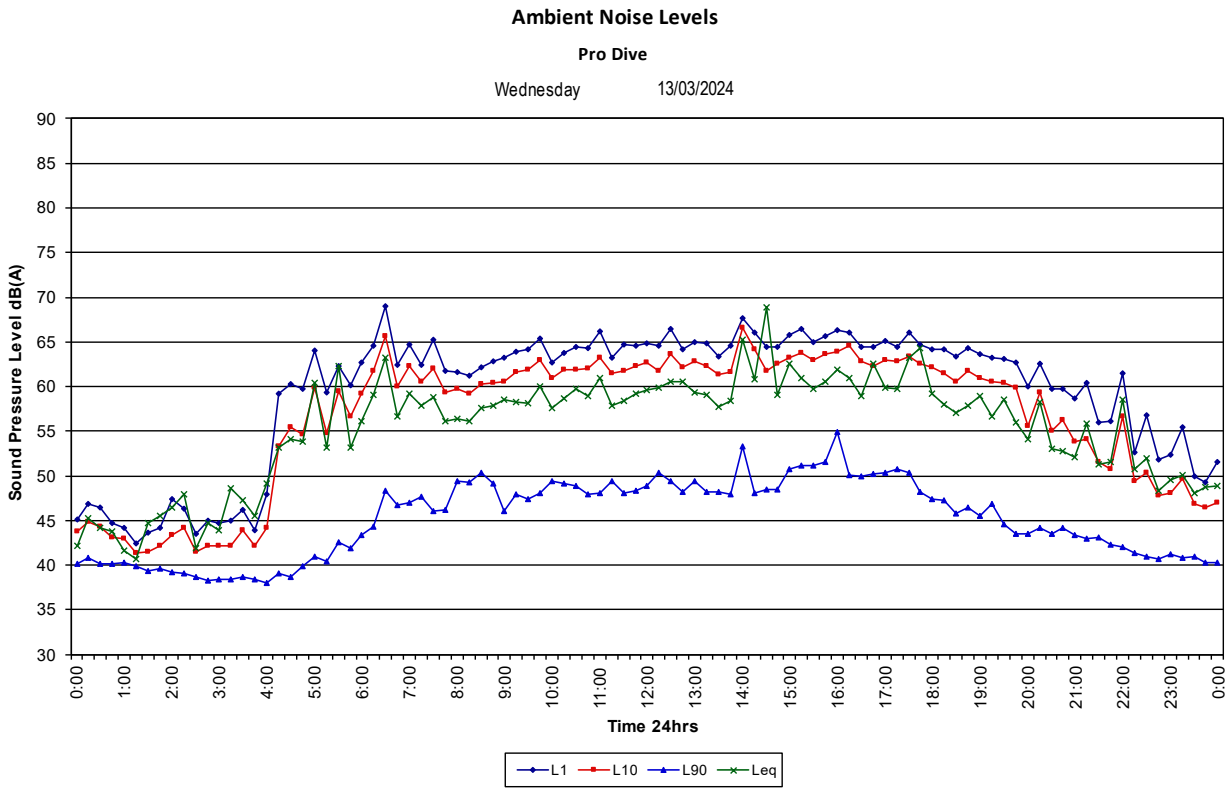
Ambient Noise Levels
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Sound Pressure Level dB(A)
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Time 24hrs
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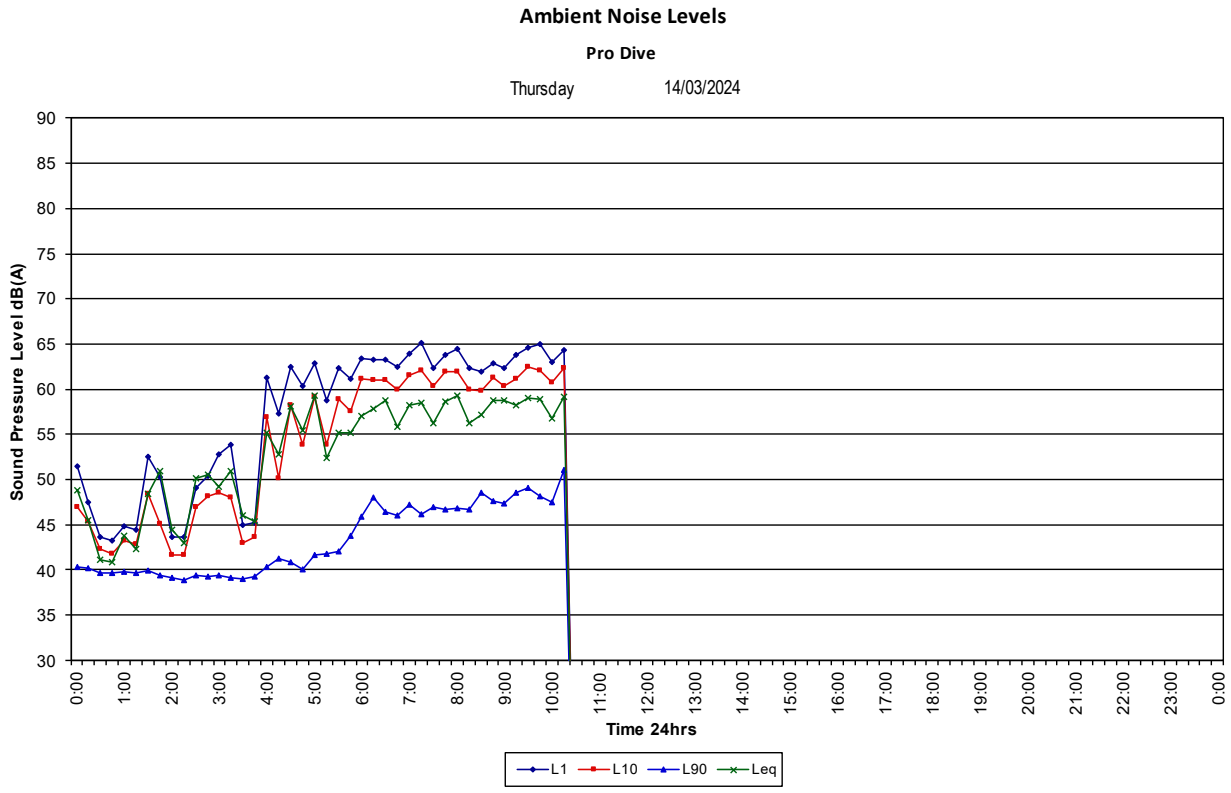
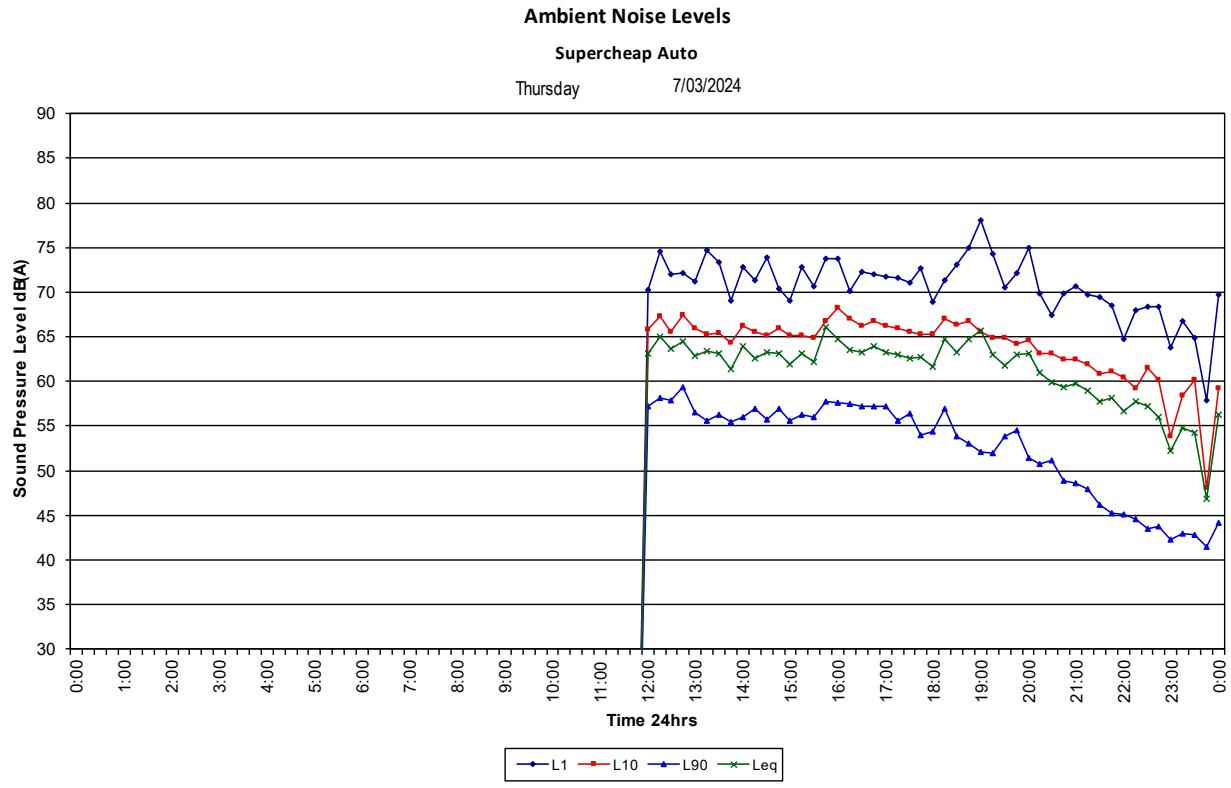
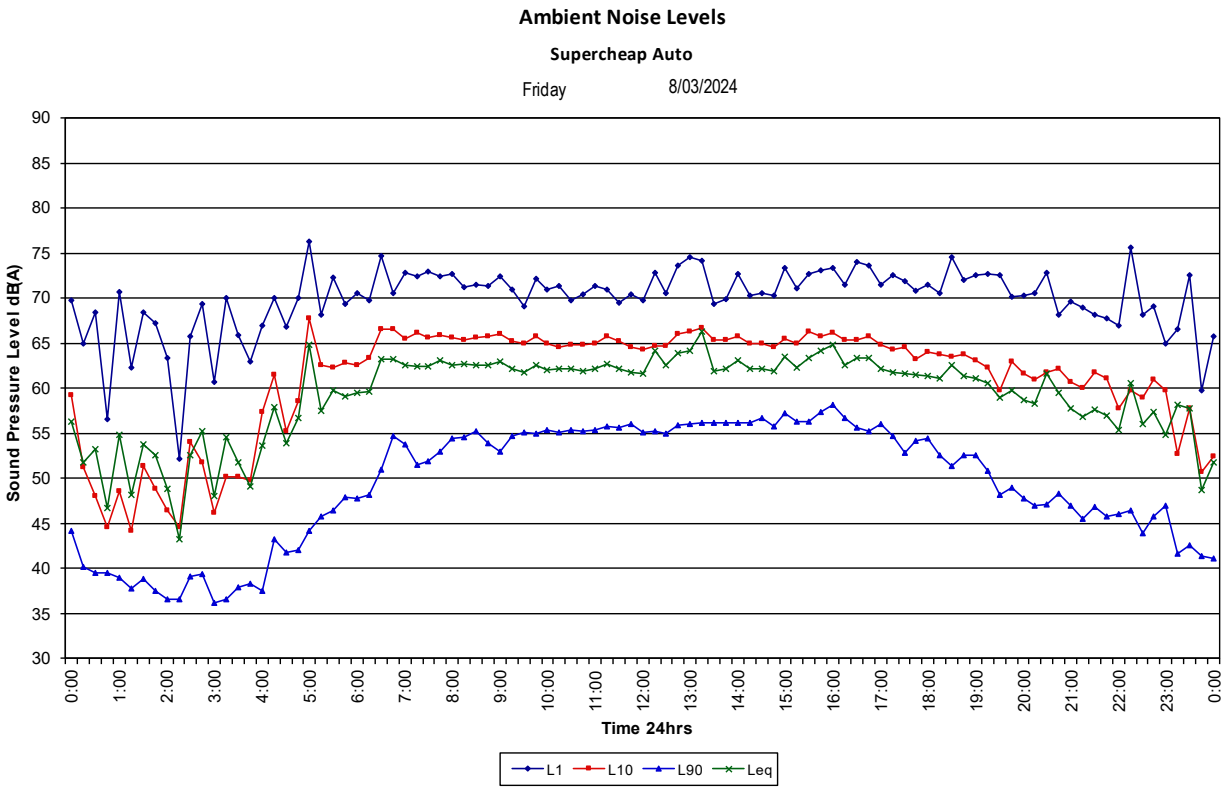


Ambient Logger Super Cheap Auto




Ambient Noise Levels
Supercheap Auto
Friday 8/03/2024
Sound Pressure Level dB(A)
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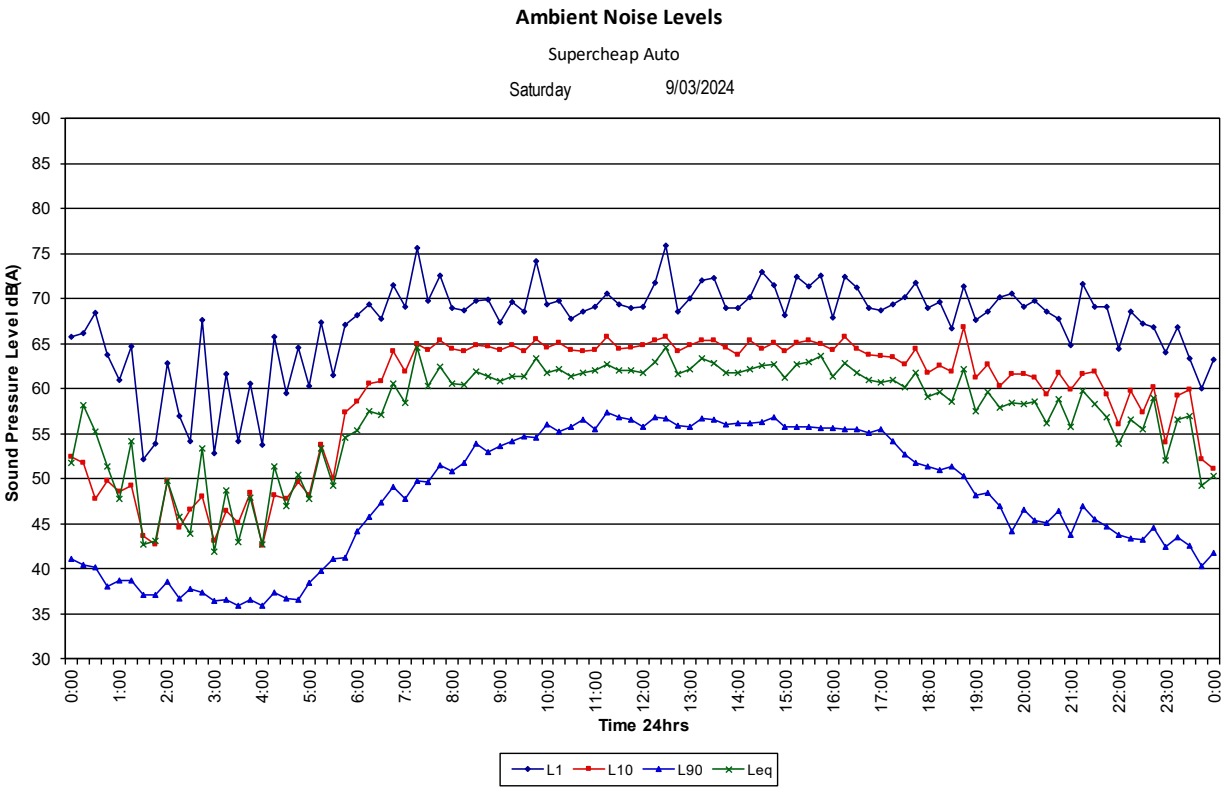
Time 24hrs
L1 L10 L90 Leq


Ambient Noise Levels
Supercheap Auto
Saturday 9/03/2024
Sound Pressure Level dB(A)
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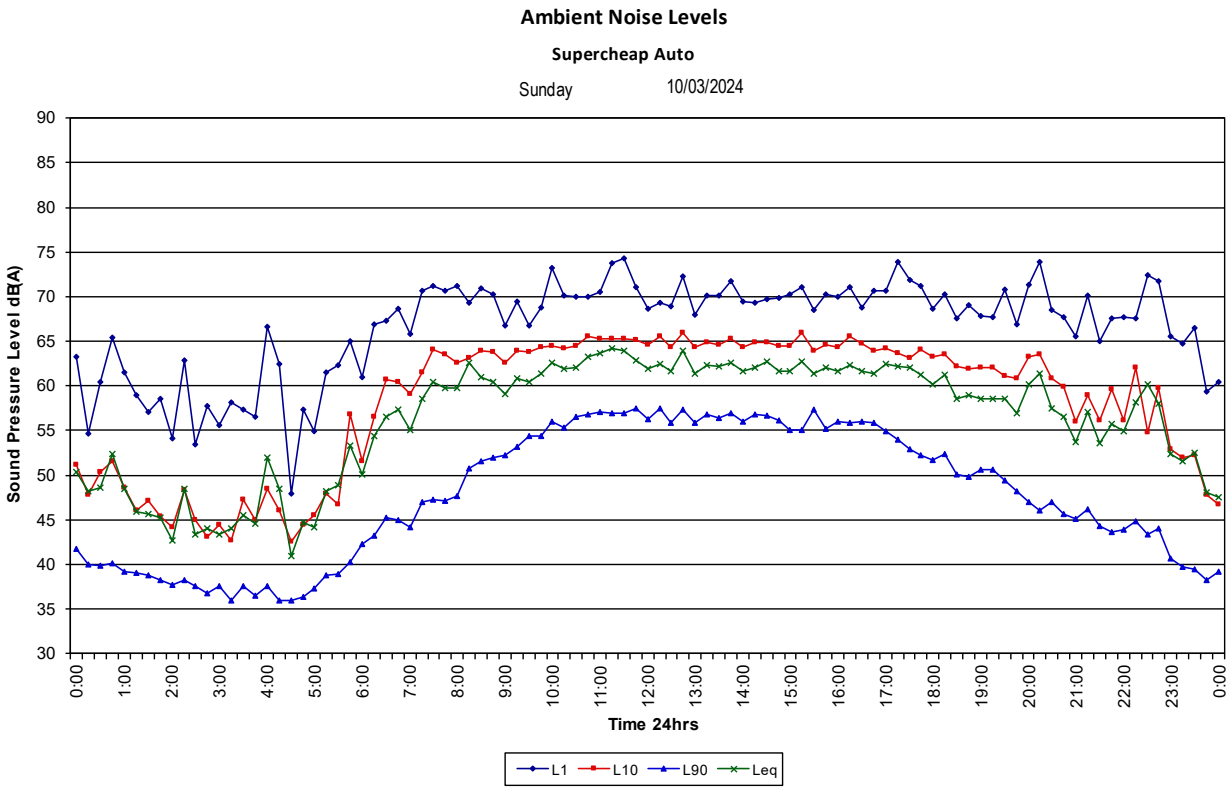
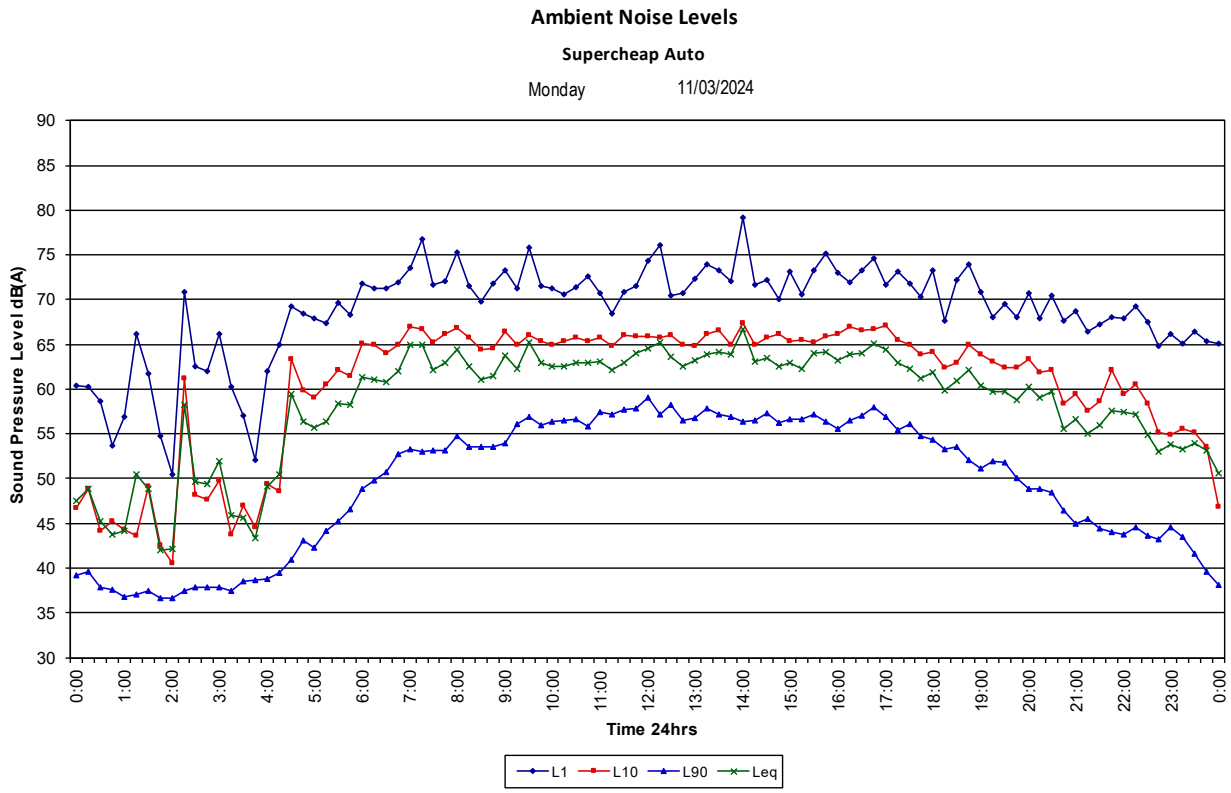

Ambient Noise Levels
Supercheap Auto
Sunday 10/03/2024
Sound Pressure Level dB(A)
Time 24hrs
L1 L10 L90 Leq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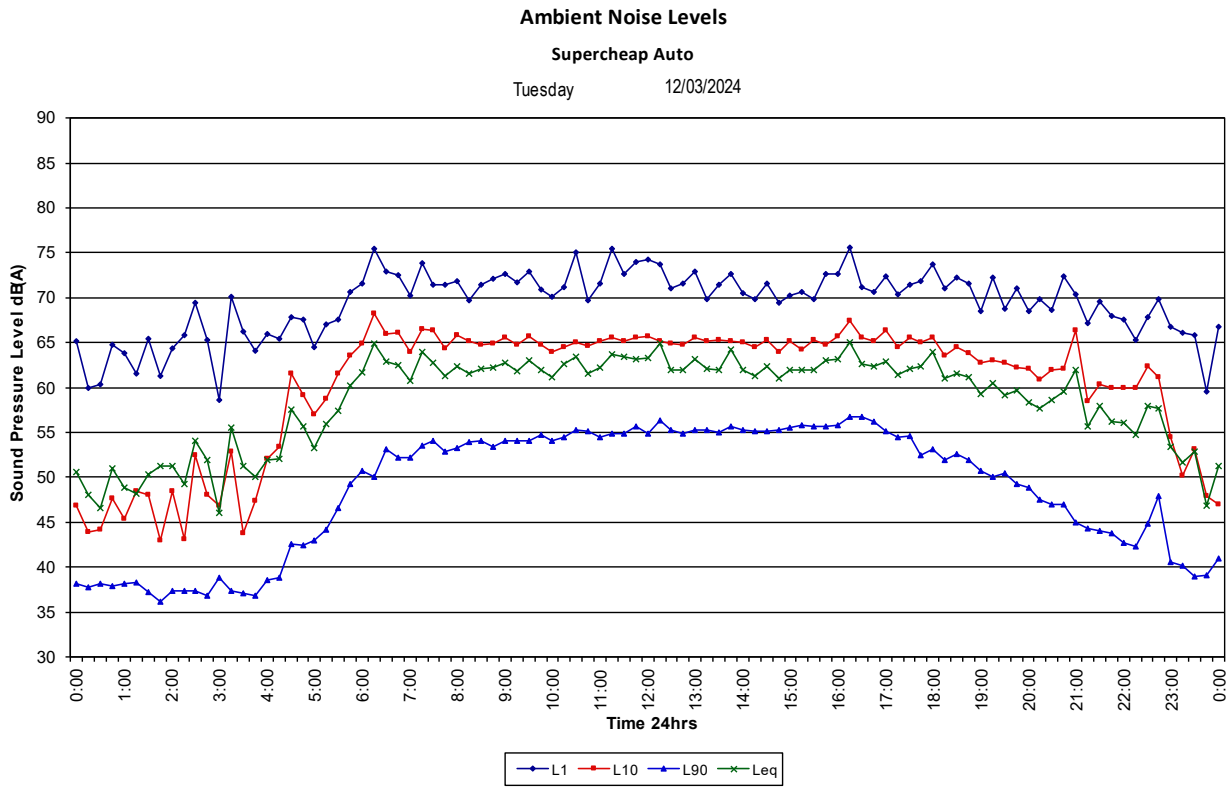
Supercheap Auto
Monday 11/03/2024
Sound Pressure Level dB(A)
Time 24hrs
L1 L10 L90 Leq


Ambient Noise Levels
Supercheap Auto
Tuesday 12/03/2024
Sound Pressure Level dB(A)
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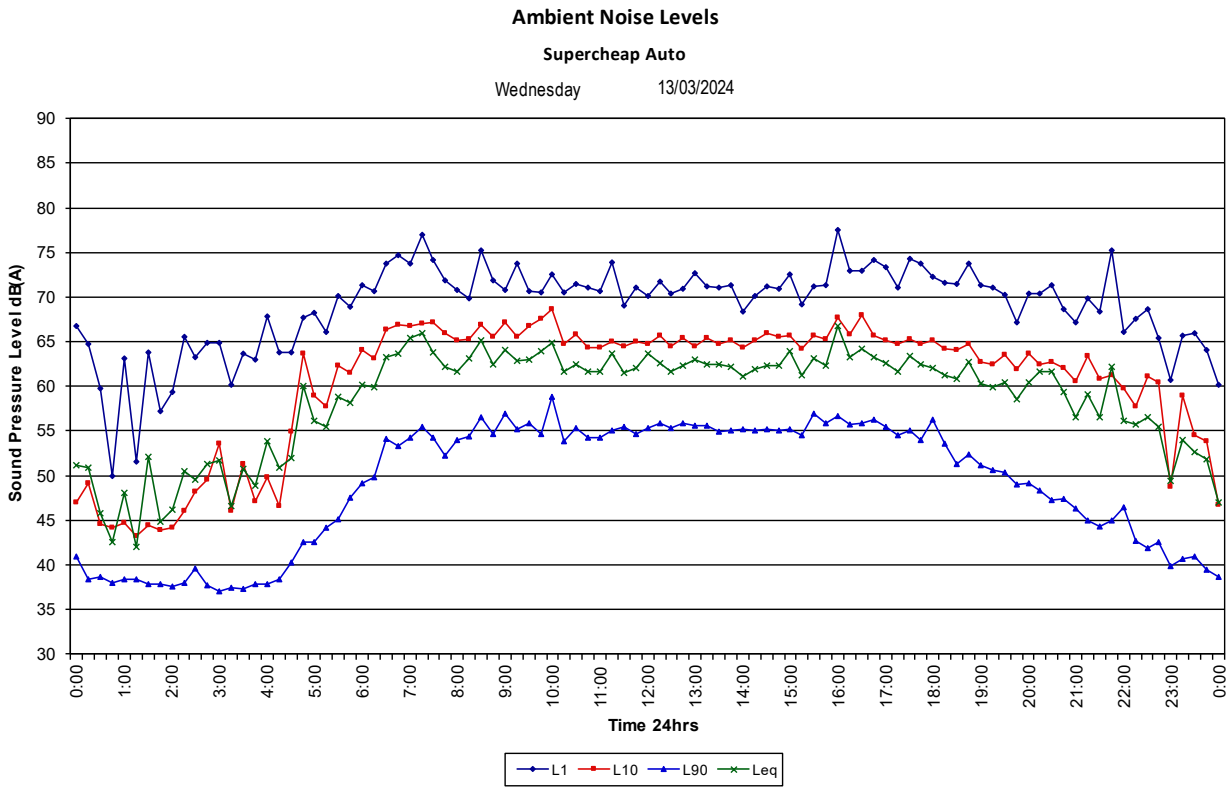
Time 24hrs
L1 L10 L90 Leq


Ambient Noise Levels
Supercheap Auto
Wednesday 13/03/2024
Sound Pressure Level dB(A)
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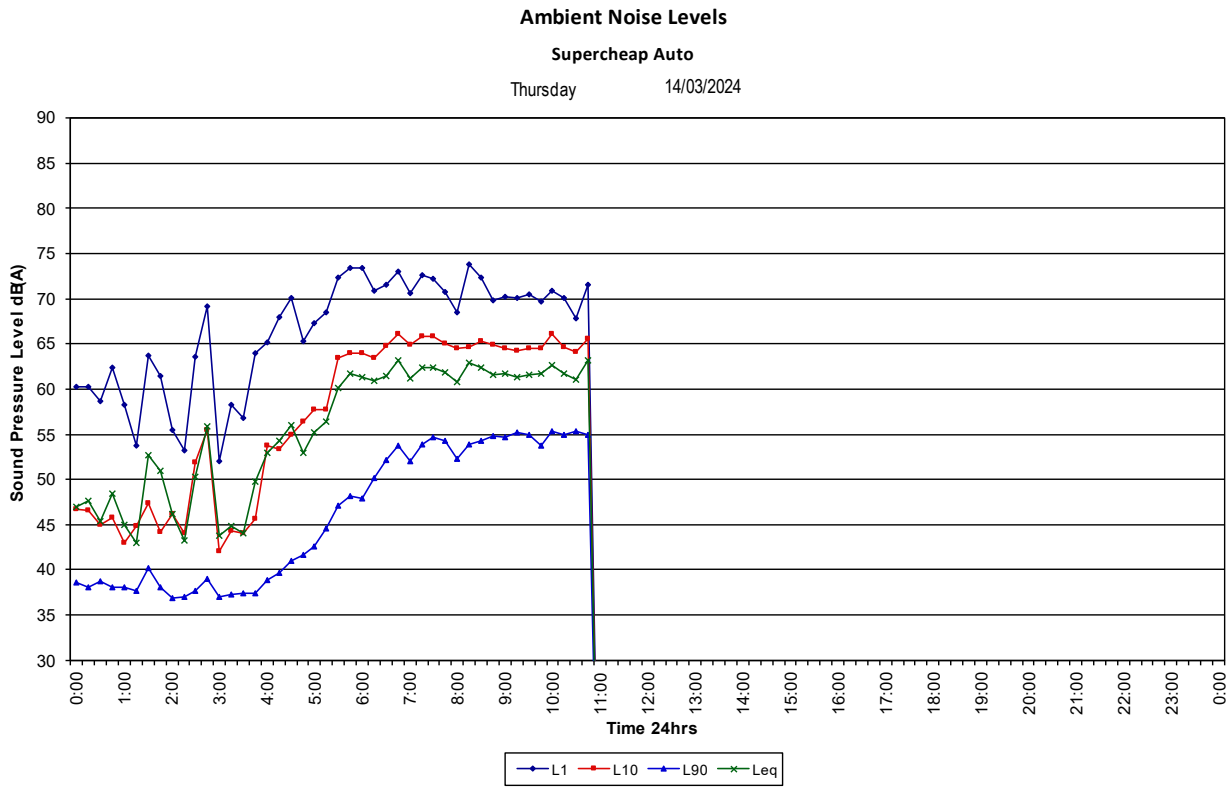
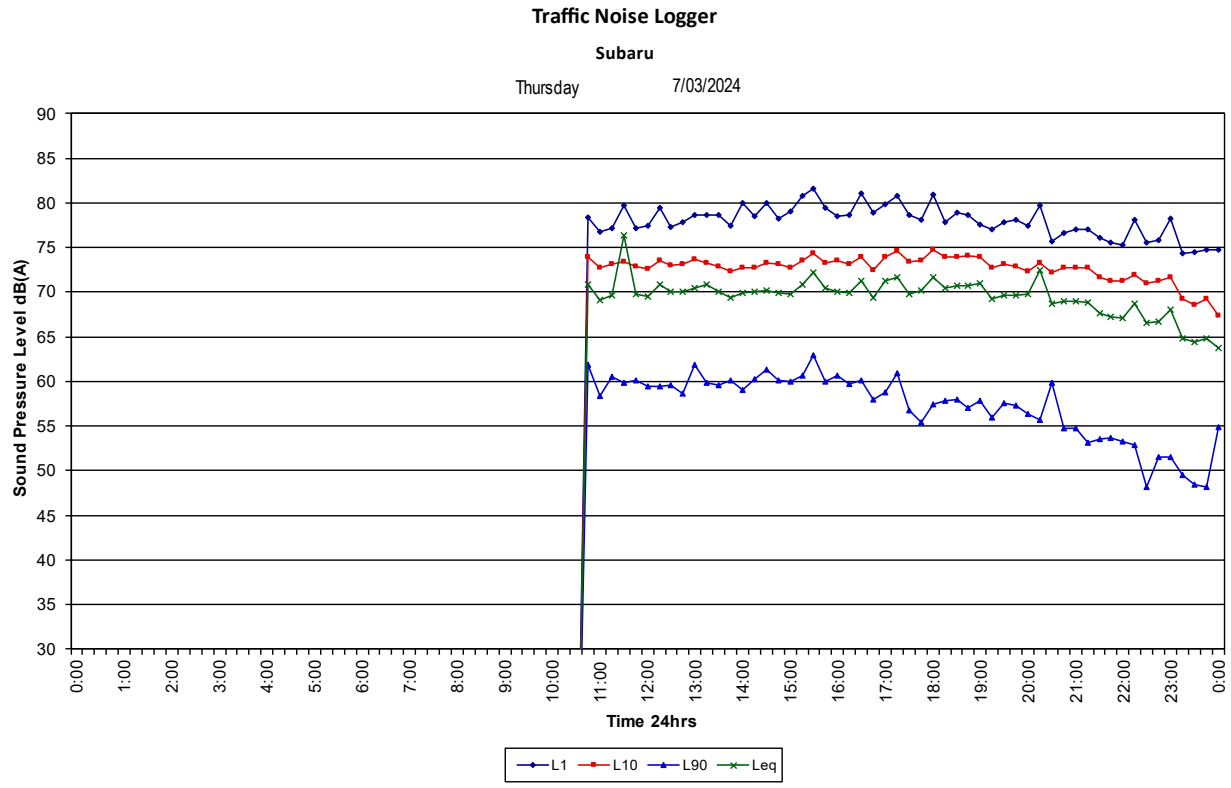
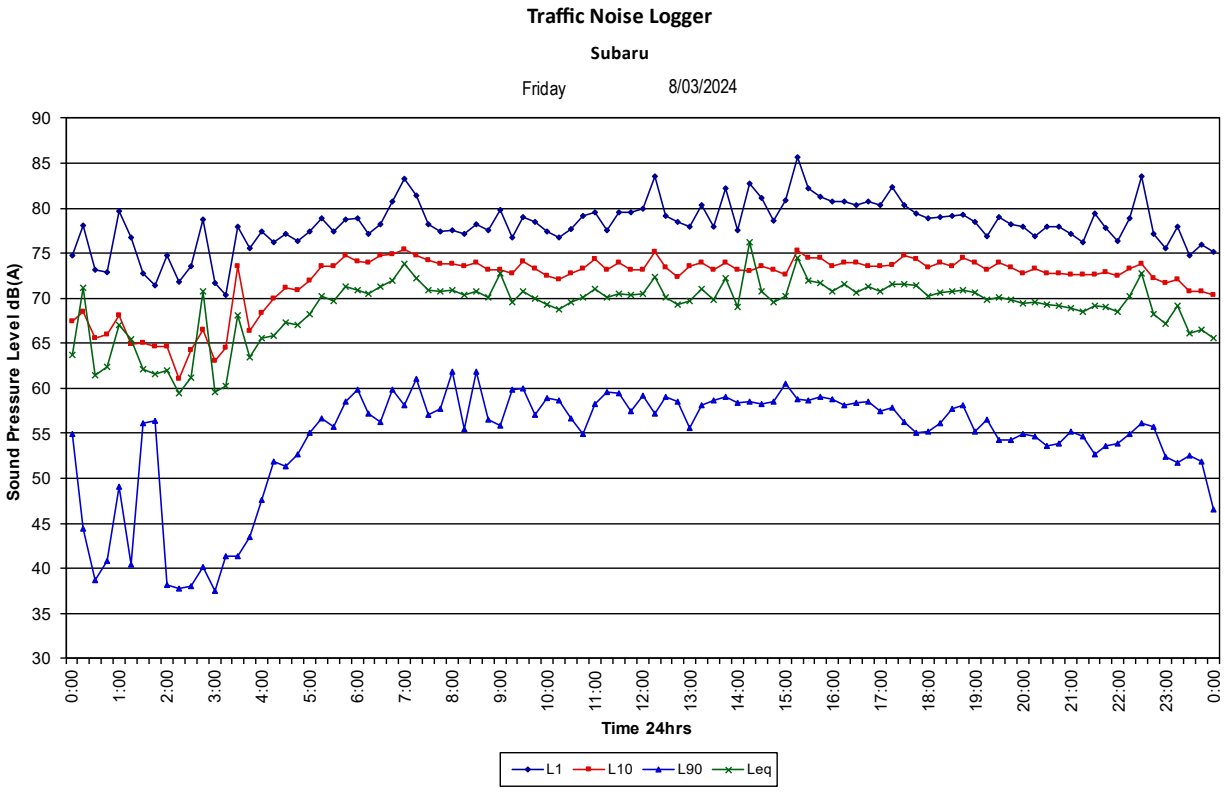
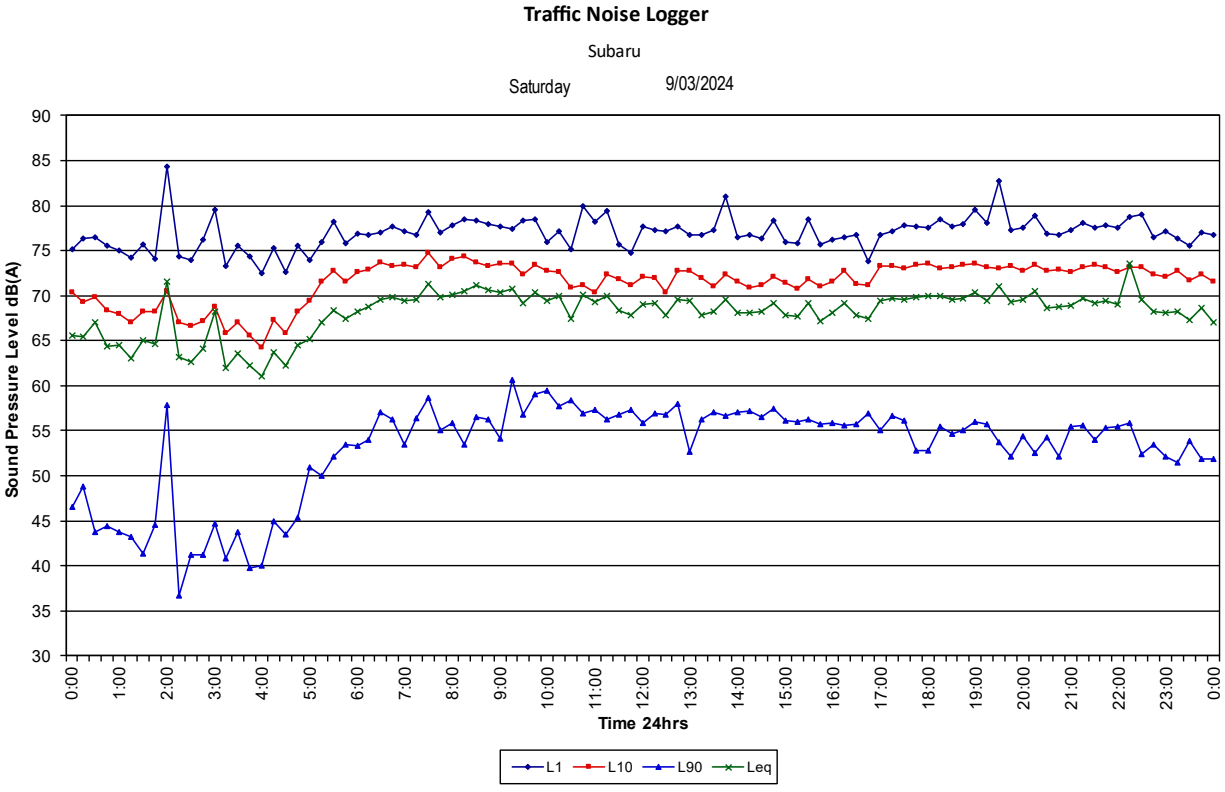
Time 24hrs
L1 L10 L90 Leq

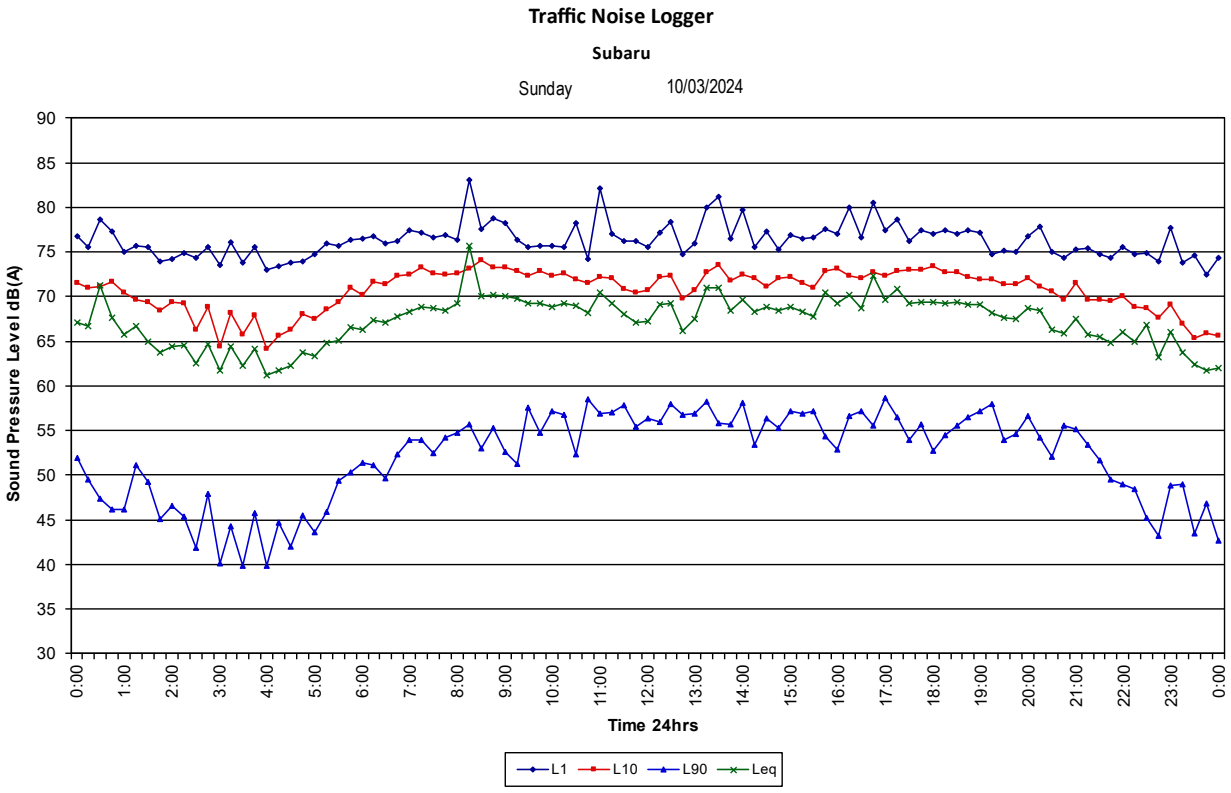


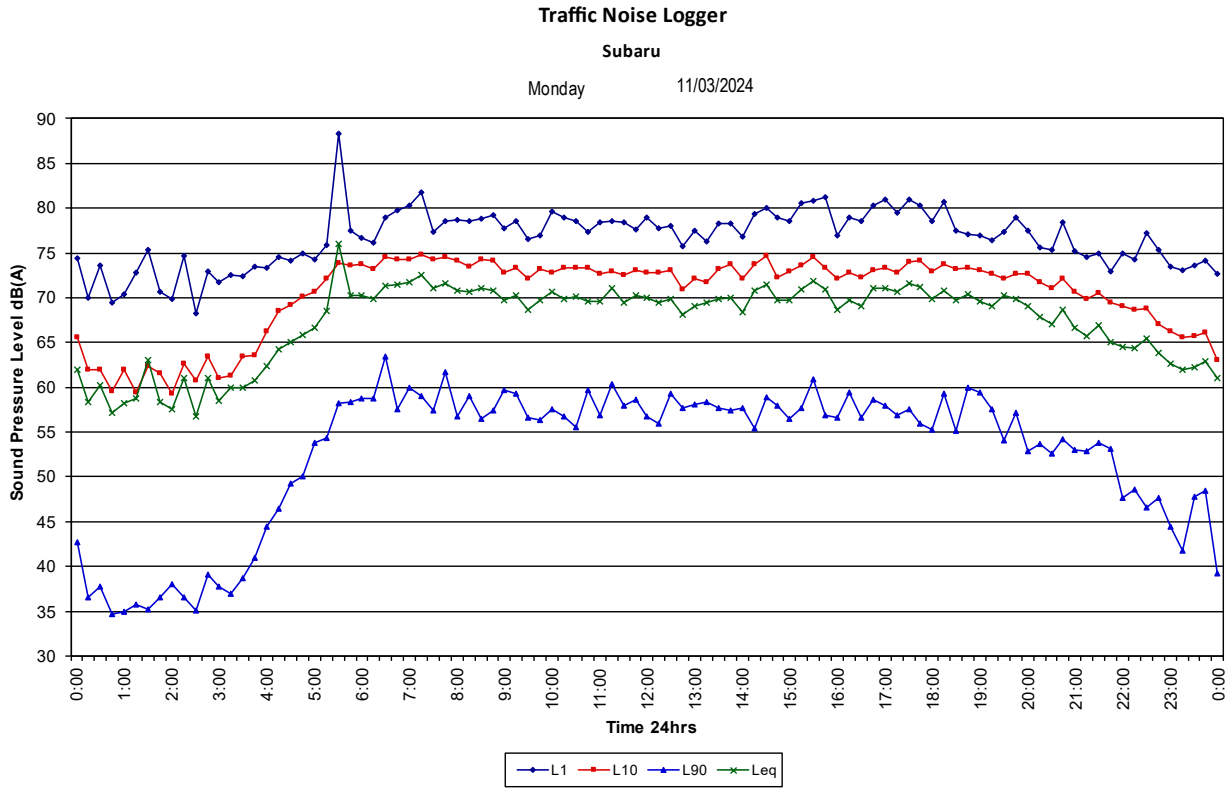
Traffic Logger Subaru

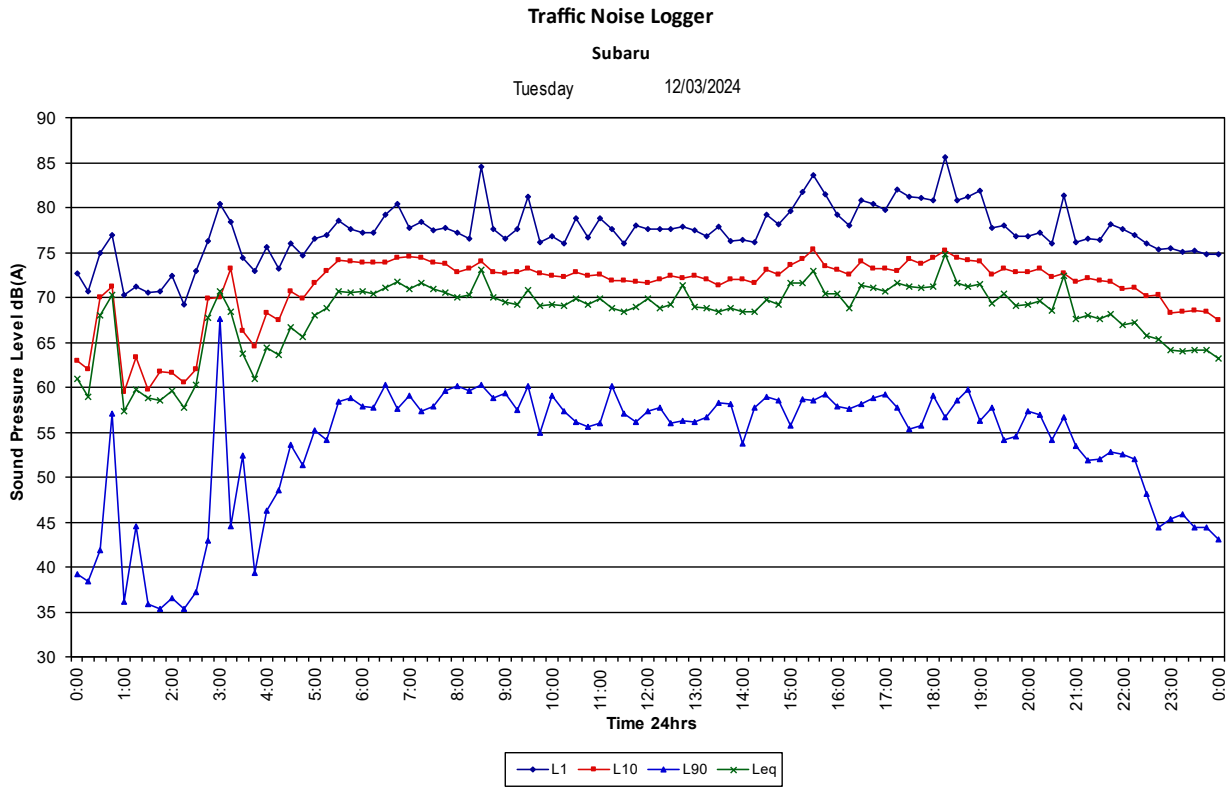


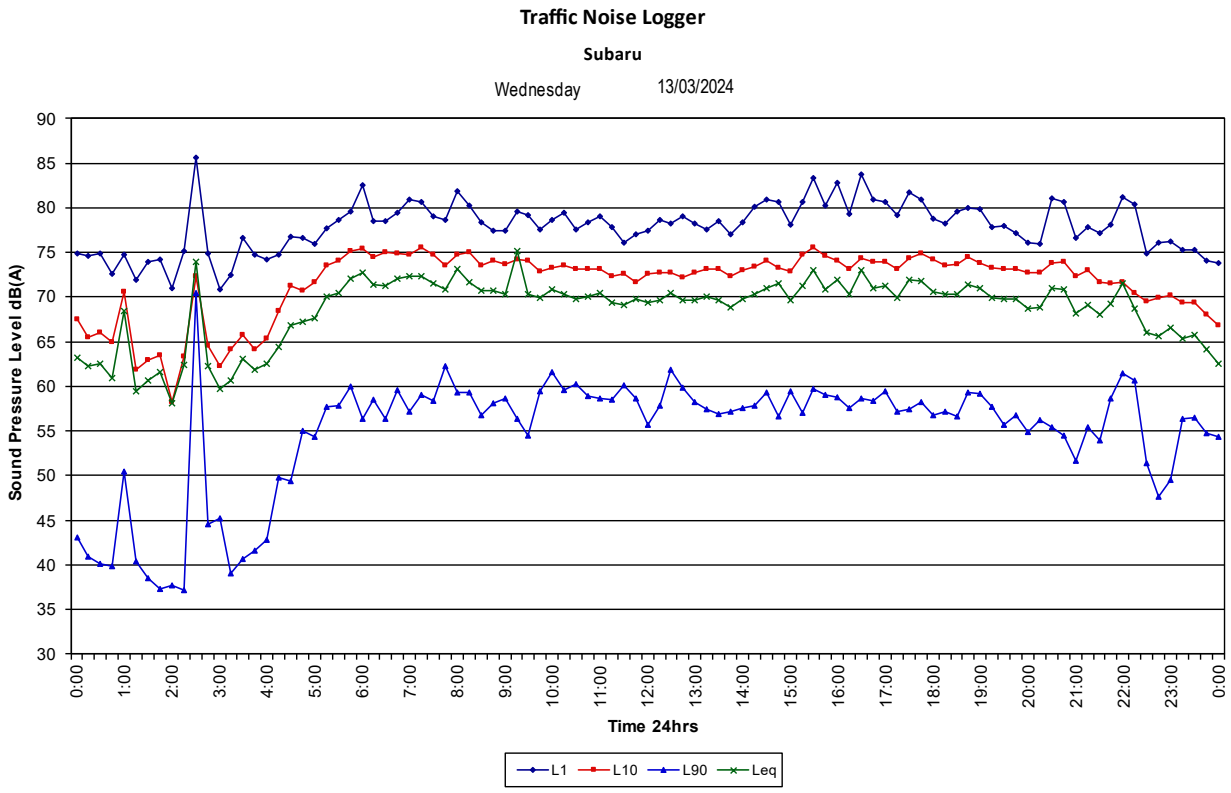

Traffic Noise Logger
Subaru
Friday 8/03/2024
Sound Pressure Level dB(A)
Time 24hrs
L1 L10 L90 Leq

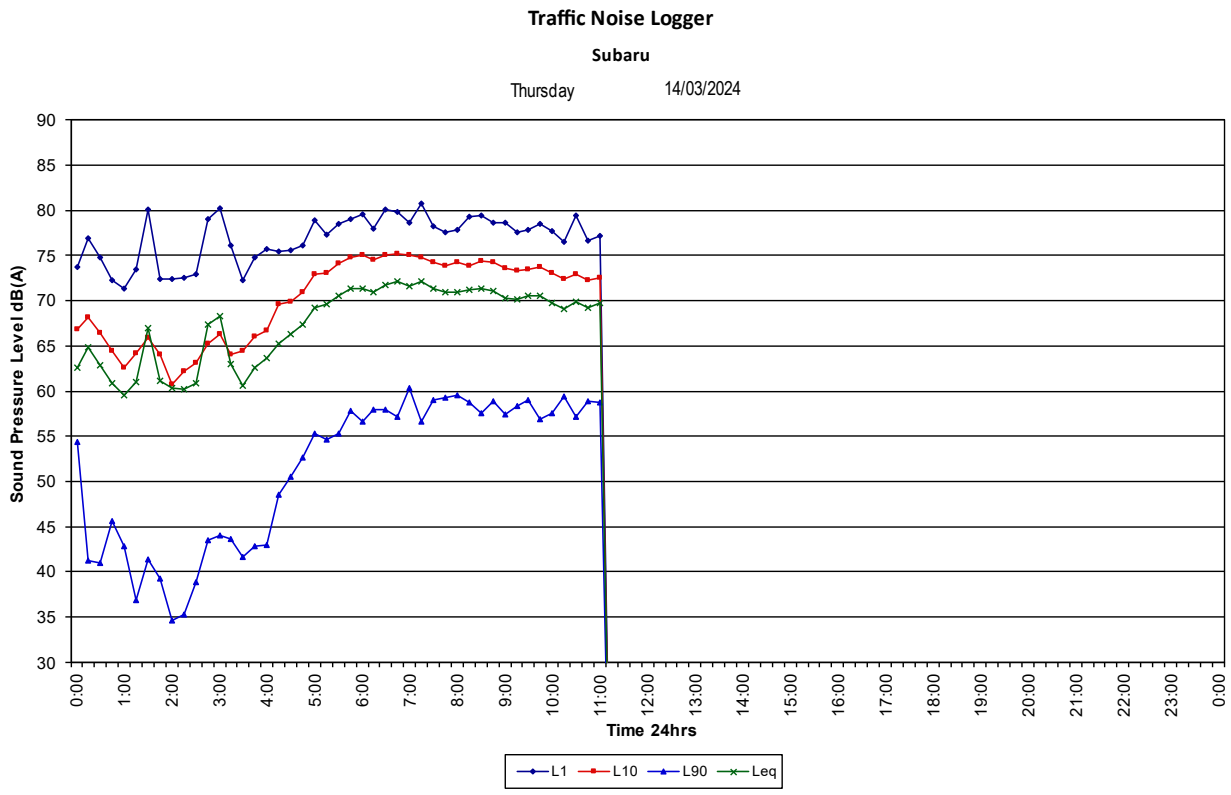

Traffic Noise Logger
Subaru
Saturday 9/03/2024
Sound Pressure Level dB(A)
Time 24hrs
L1 L10 L90 Leq


Traffic Noise Logger
Subaru
Sunday 10/03/2024
Sound Pressure Level dB(A)
Time 24hrs
L1 L10 L90 Leq

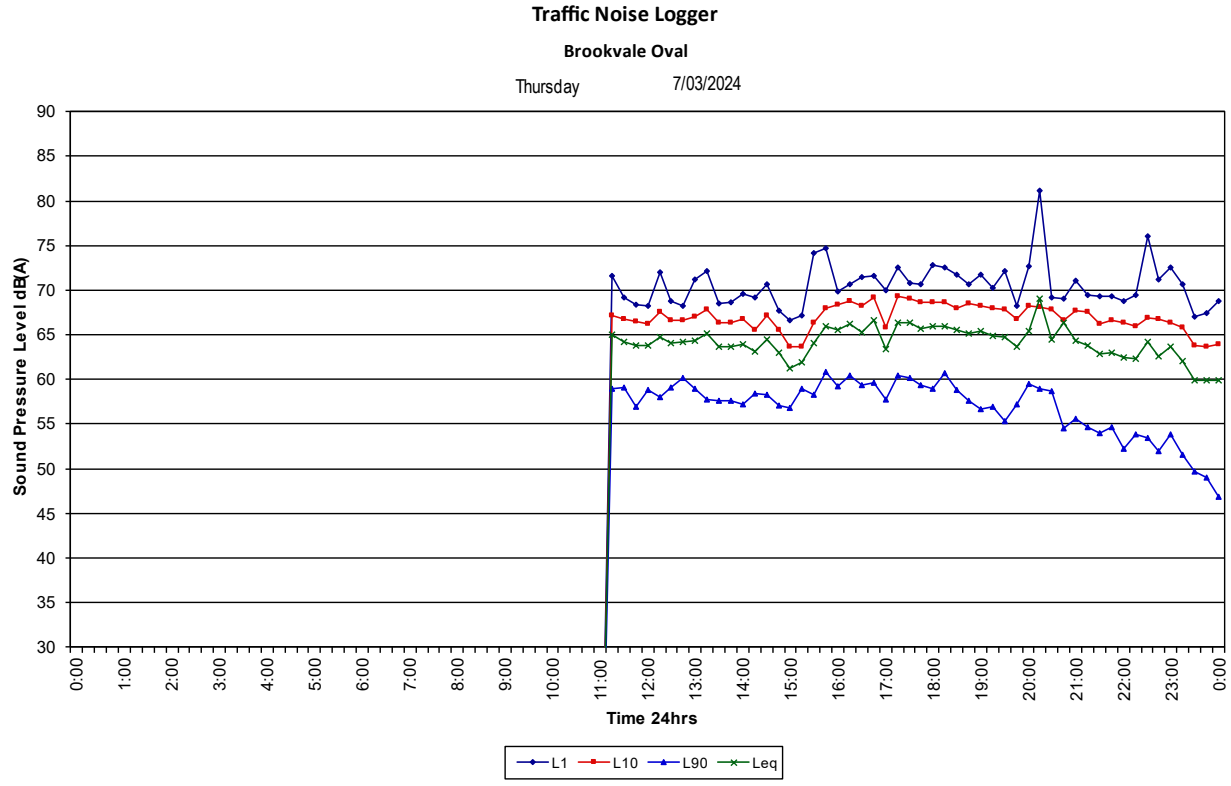

Traffic Noise Logger
Subaru
Monday 11/03/2024
Sound Pressure Level dB(A)
Time 24hrs
L1 L10 L90 Leq

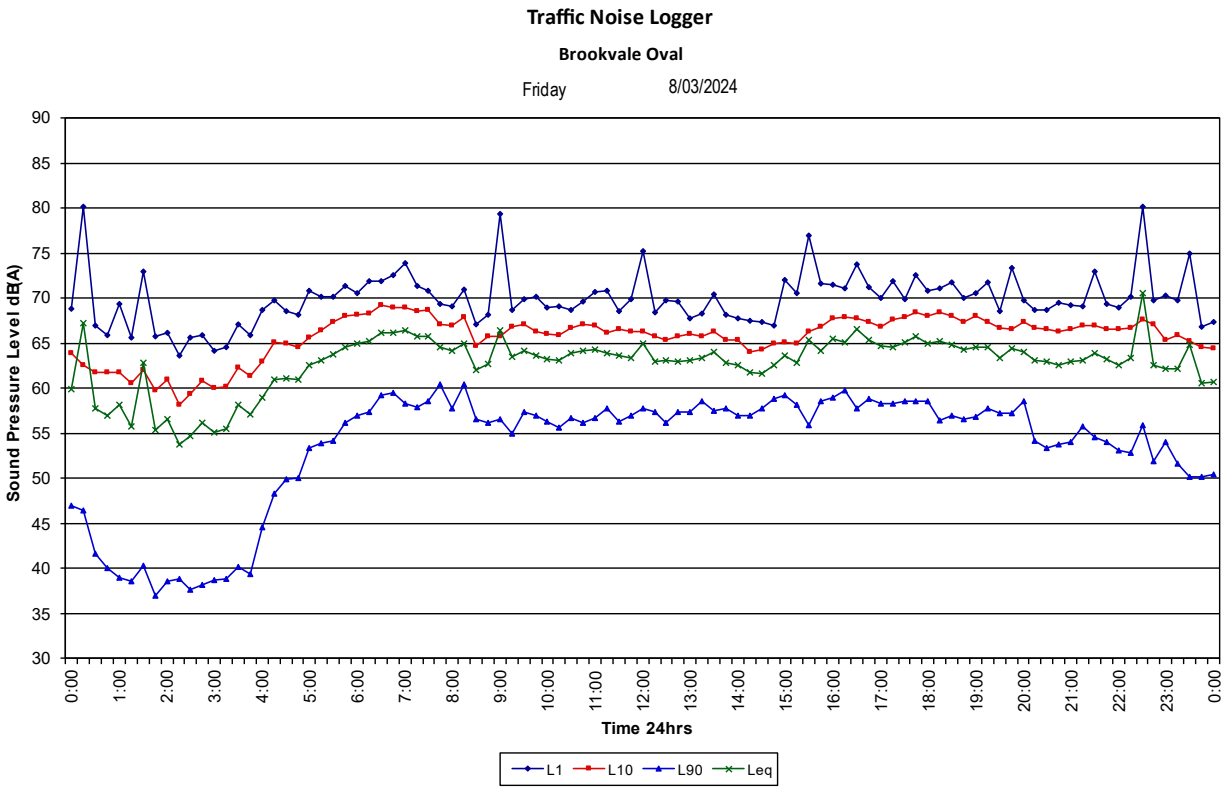

Traffic Noise Logger
Subaru
Tuesday 12/03/2024
Sound Pressure Level dB(A)
Time 24hrs
L1 L10 L90 Leq


Traffic Noise Logger
Subaru
Wednesday 13/03/2024
Sound Pressure Level dB(A)
Time 24hrs
L1 L10 L90 Leq



Traffic Logger Brookvale Oval




Traffic Noise Logger
Brookvale Oval
Friday 8/03/2024
Sound Pressure Level dB(A)
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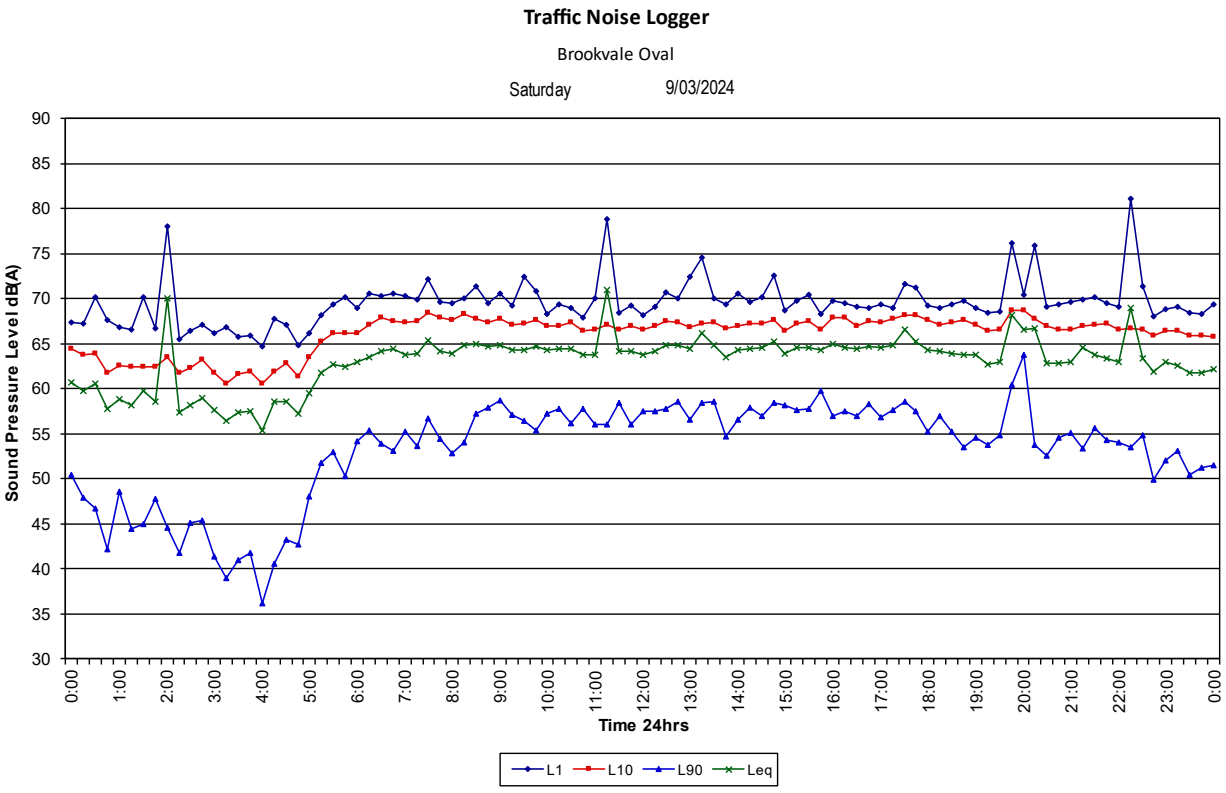
0:00 1:00 2:00 3:00 4:00 5:00 6:00 7:00 8:00 9:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00 0:00
Time 24hrs
L1 L10 L90 Leq


Traffic Noise Logger
Brookvale Oval
Saturday 9/03/2024
Sound Pressure Level dB(A)
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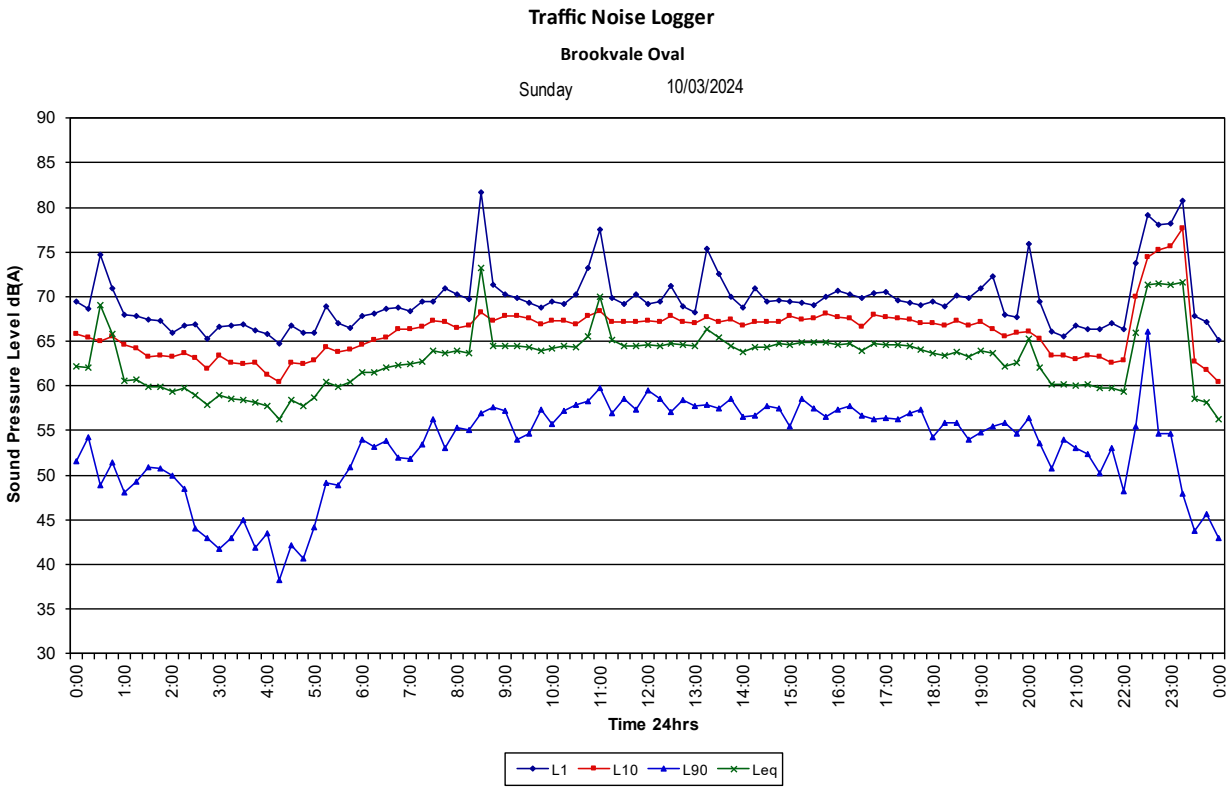
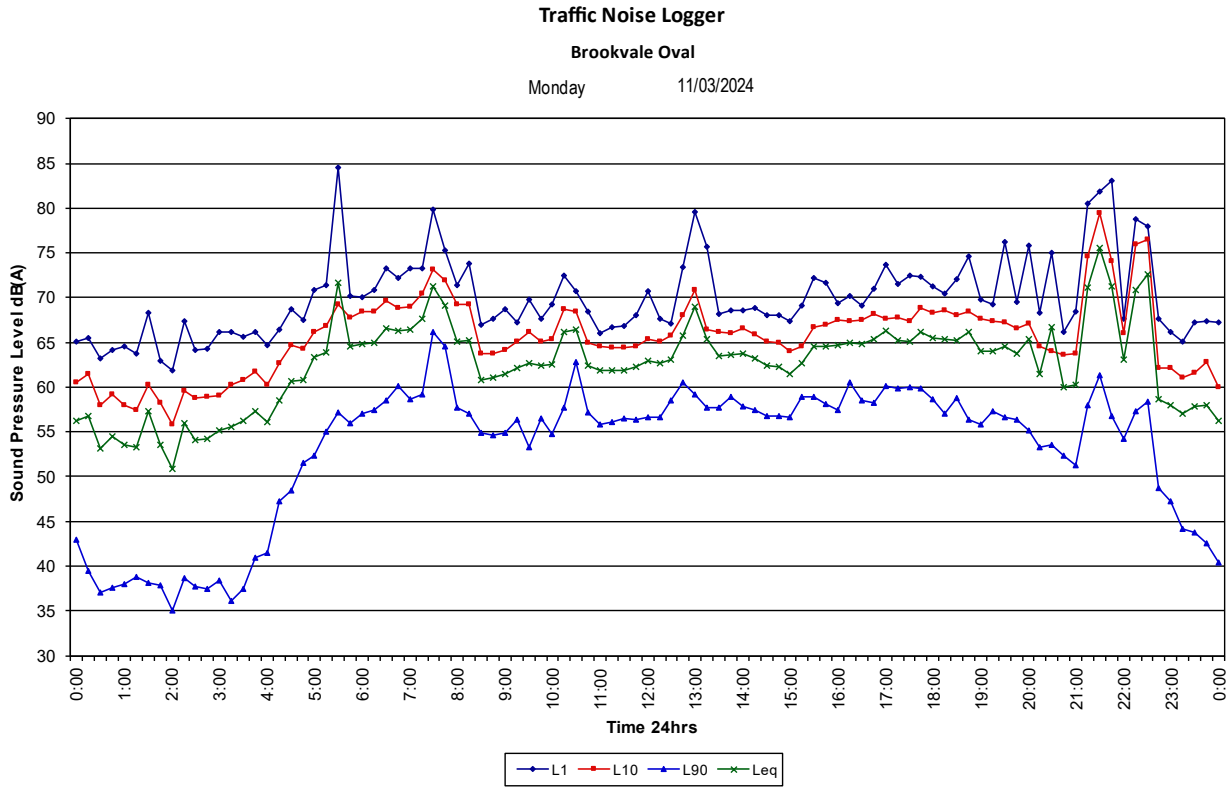
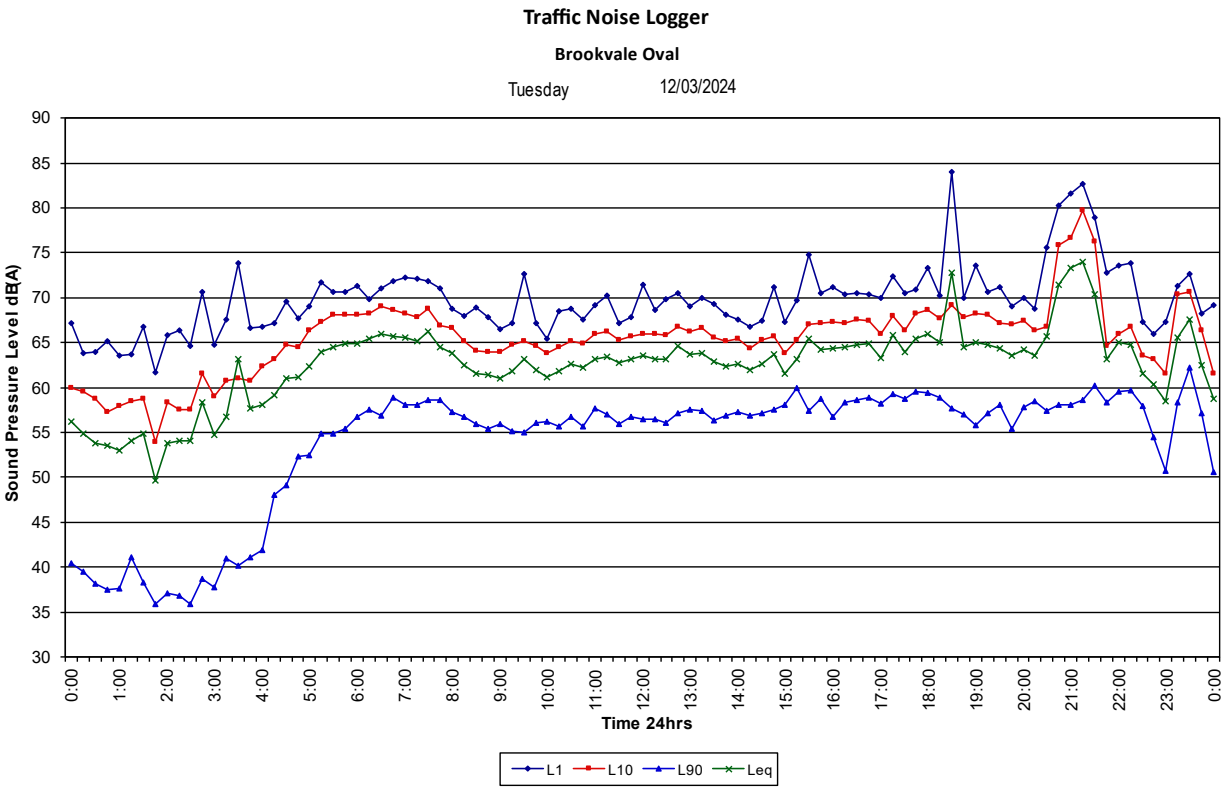
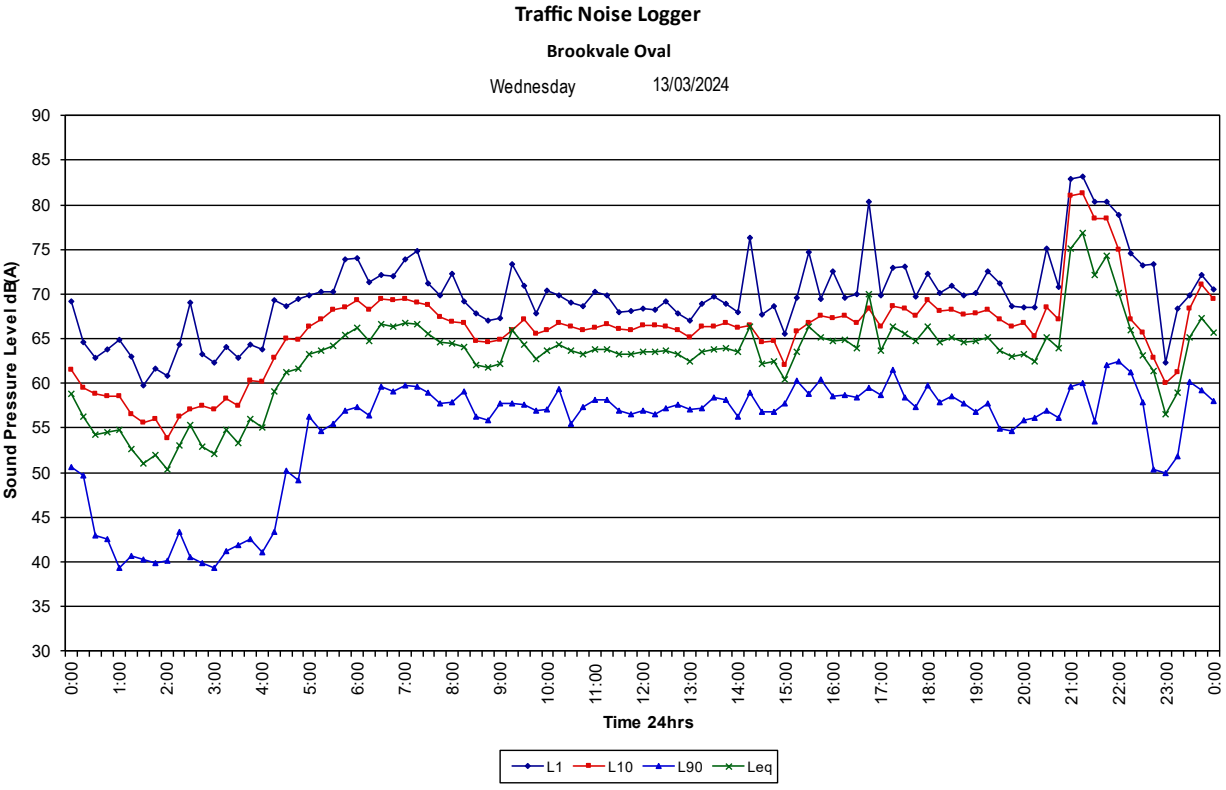
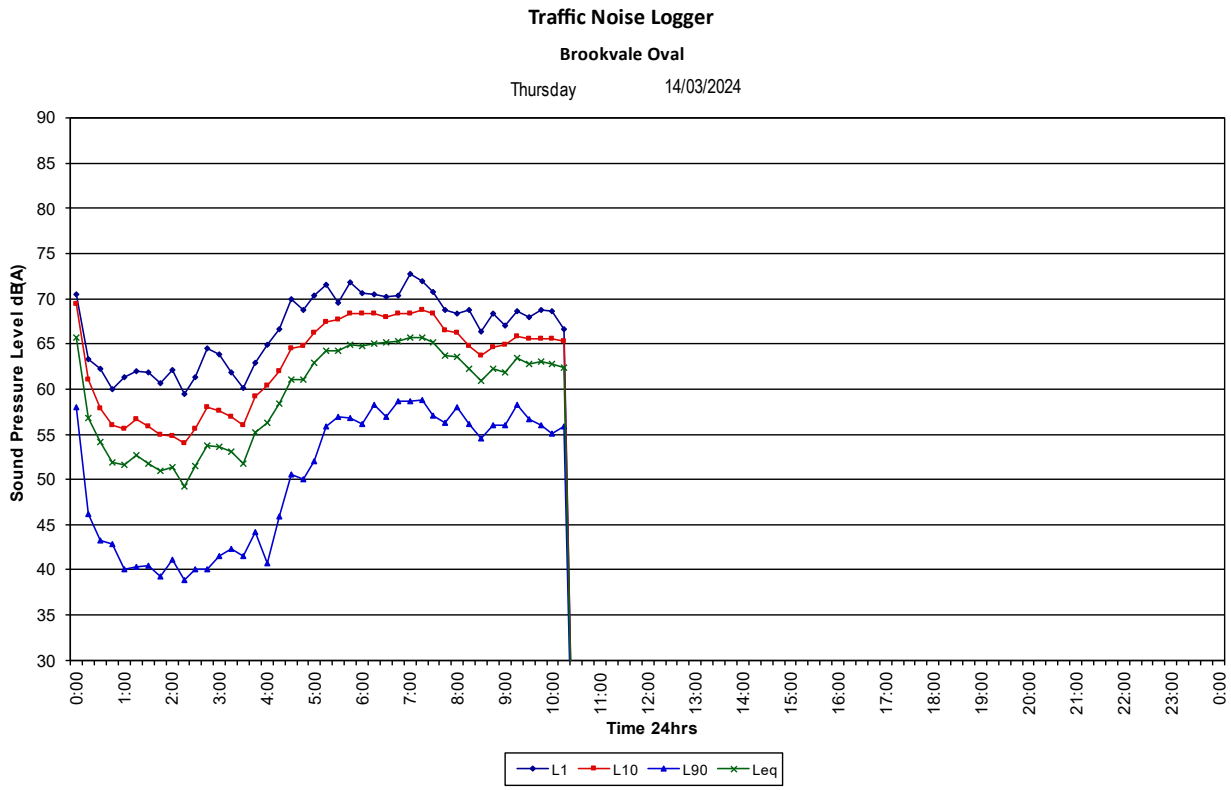
0:00 1:00 2:00 3:00 4:00 5:00 6:00 7:00 8:00 9:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00 0:00
Time 24hrs
L1 L10 L90 Leq


Traffic Noise Logger
Brookvale Oval
Sunday 10/03/2024
Sound Pressure Level dB(A)
Time 24hrs
L1 L10 L90 Leq

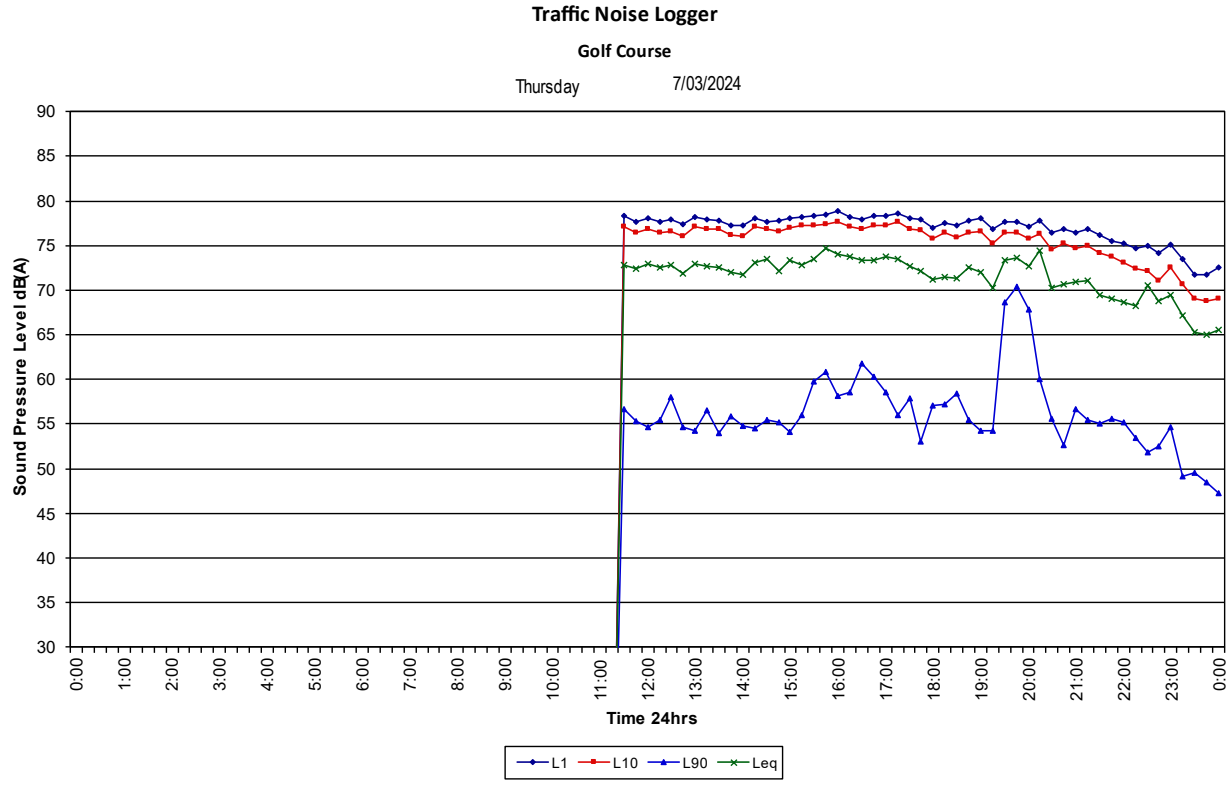

Traffic Noise Logger
Brookvale Oval
Monday 11/03/2024
Sound Pressure Level dB(A)
Time 24hrs
L1 L10 L90 Leq

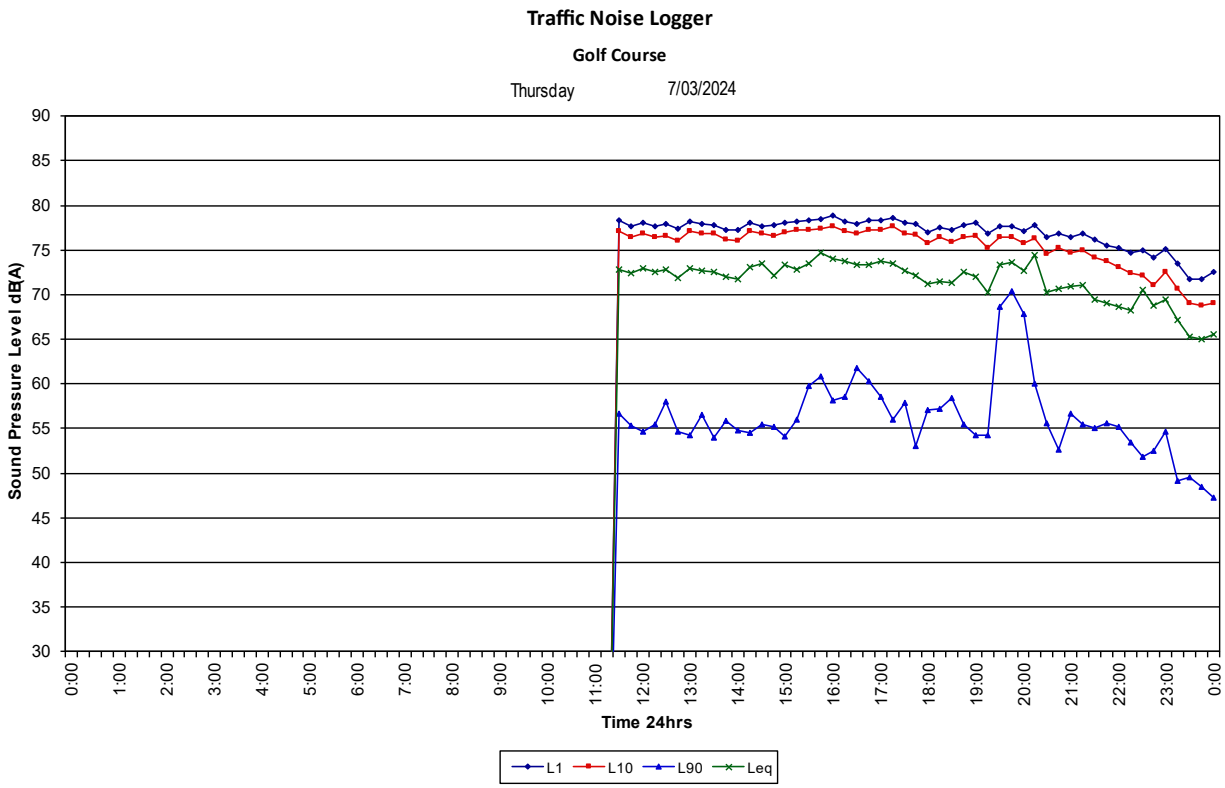

Traffic Noise Logger
Brookvale Oval
Tuesday 12/03/2024
Sound Pressure Level dB(A)
Time 24hrs
L1 L10 L90 Leq


Traffic Noise Logger
Brookvale Oval
Wednesday 13/03/2024
Sound Pressure Level dB(A)
Time 24hrs
L1 L10 L90 Leq



Traffic Logger Gold Course




Traffic Noise Logger
Golf Course
Thursday 7/03/2024
Sound Pressure Level dB(A)
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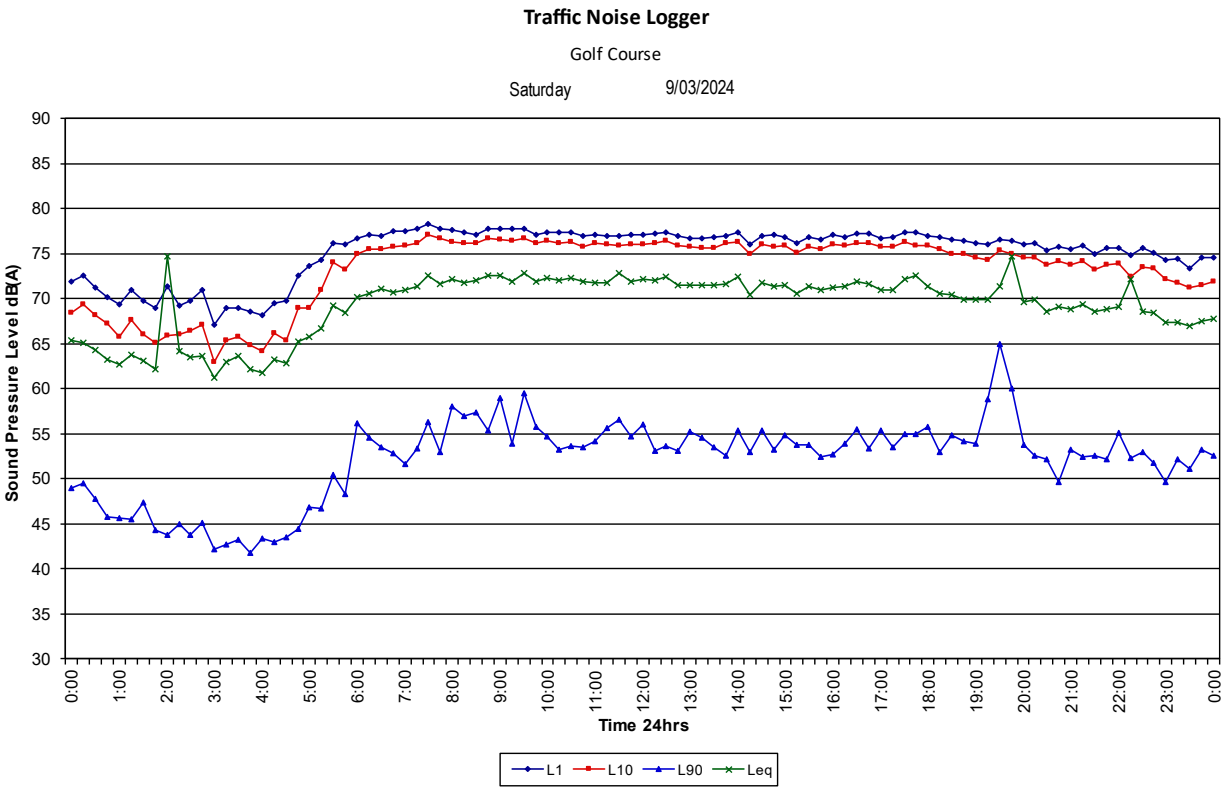
Time 24hrs
L1 L10 L90 Leq


Traffic Noise Logger
Golf Course
Saturday 9/03/2024
Sound Pressure Level dB(A)
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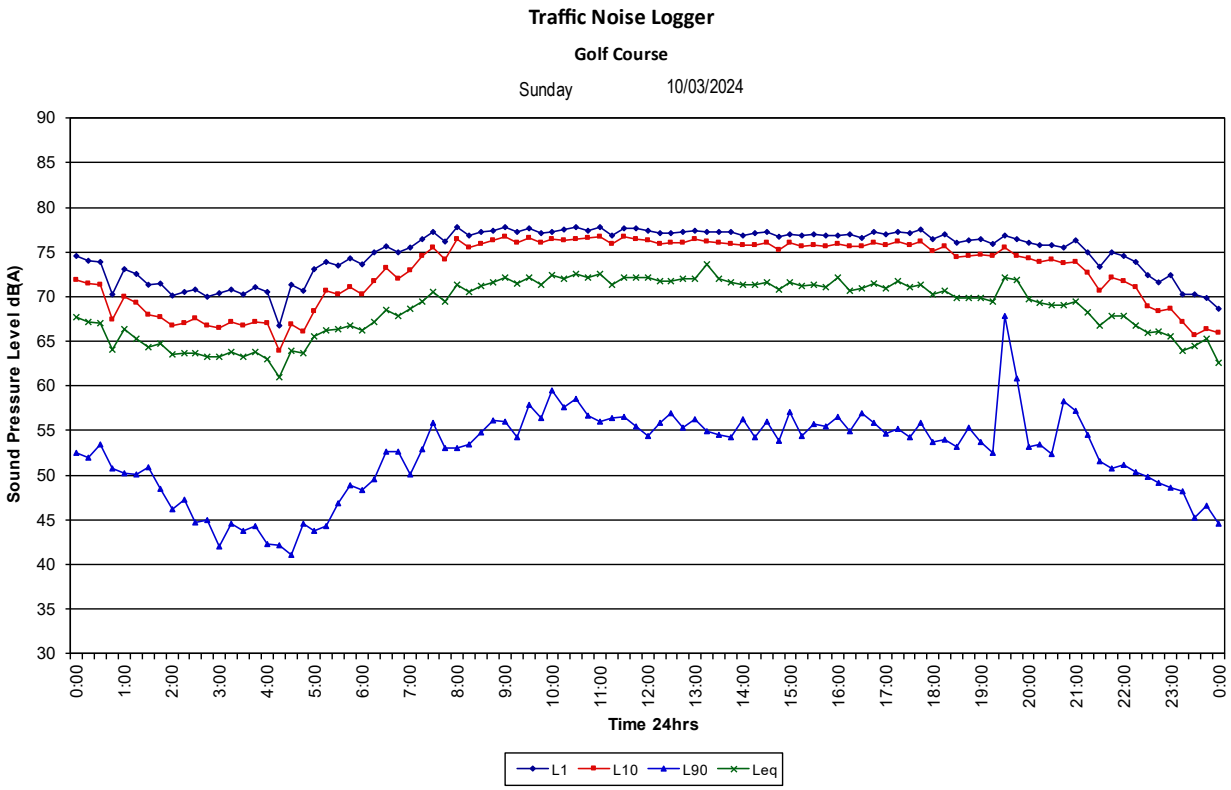
0:00 1:00 2:00 3:00 4:00 5:00 6:00 7:00 8:00 9:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00 0:00
Time 24hrs
L1 L10 L90 Leq


Traffic Noise Logger
Golf Course
Sunday 10/03/2024
Sound Pressure Level dB(A)
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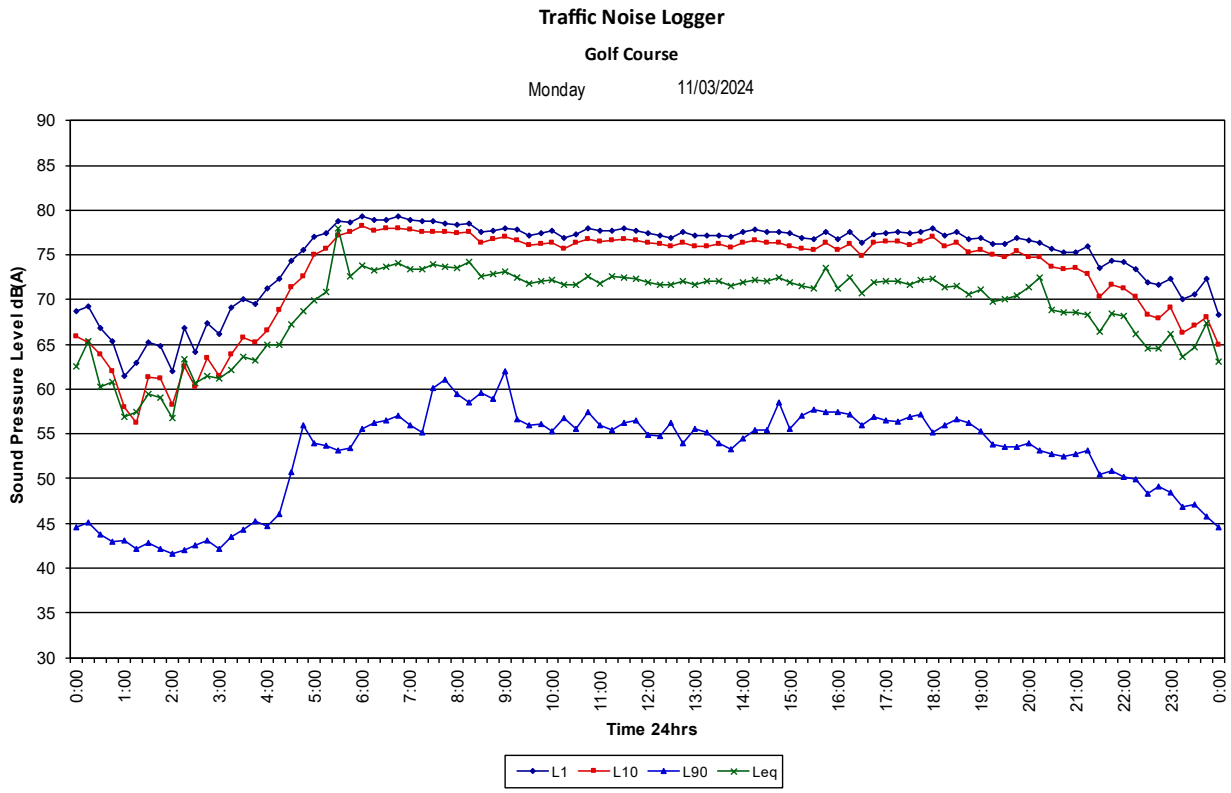
0:00 1:00 2:00 3:00 4:00 5:00 6:00 7:00 8:00 9:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00 0:00
Time 24hrs
L1 L10 L90 Leq


Traffic Noise Logger
Golf Course
Monday 11/03/2024
Sound Pressure Level dB(A)
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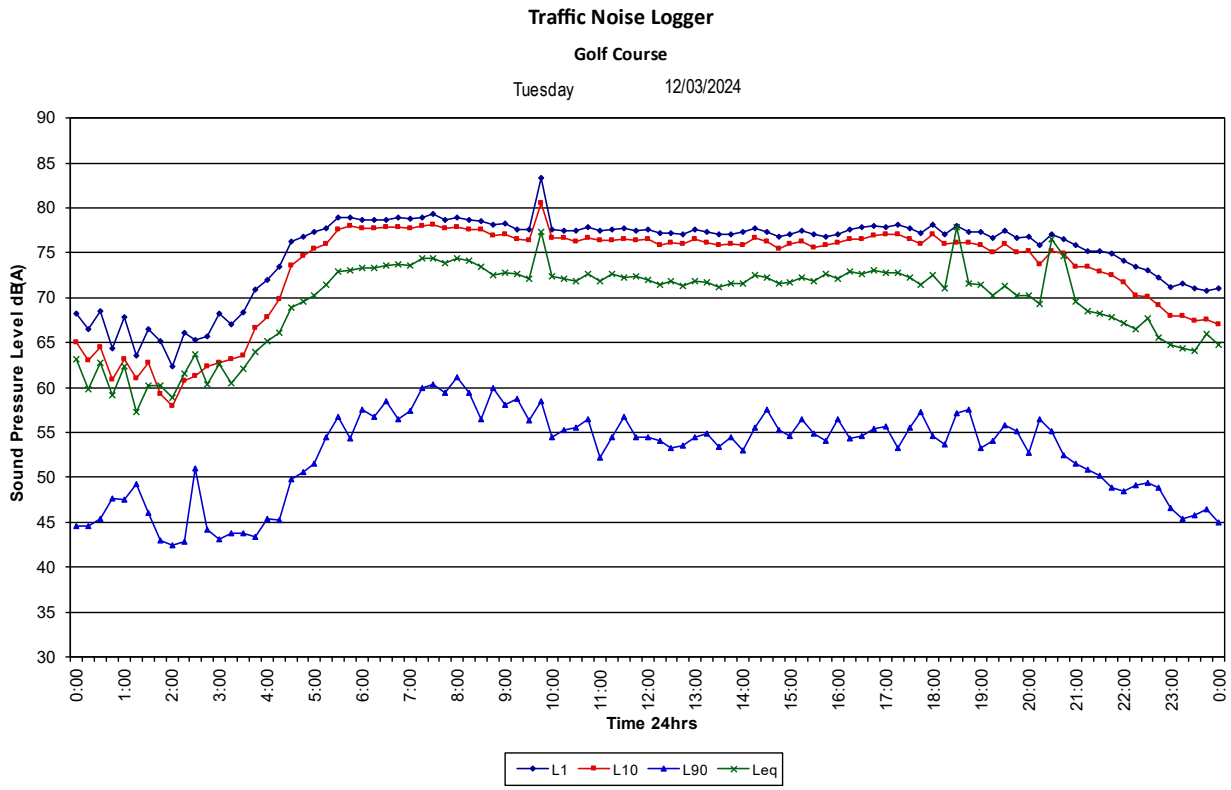
0:00 1:00 2:00 3:00 4:00 5:00 6:00 7:00 8:00 9:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00 0:00
Time 24hrs
L1 L10 L90 Leq


Traffic Noise Logger
Golf Course
Tuesday 12/03/2024
Sound Pressure Level dB(A)
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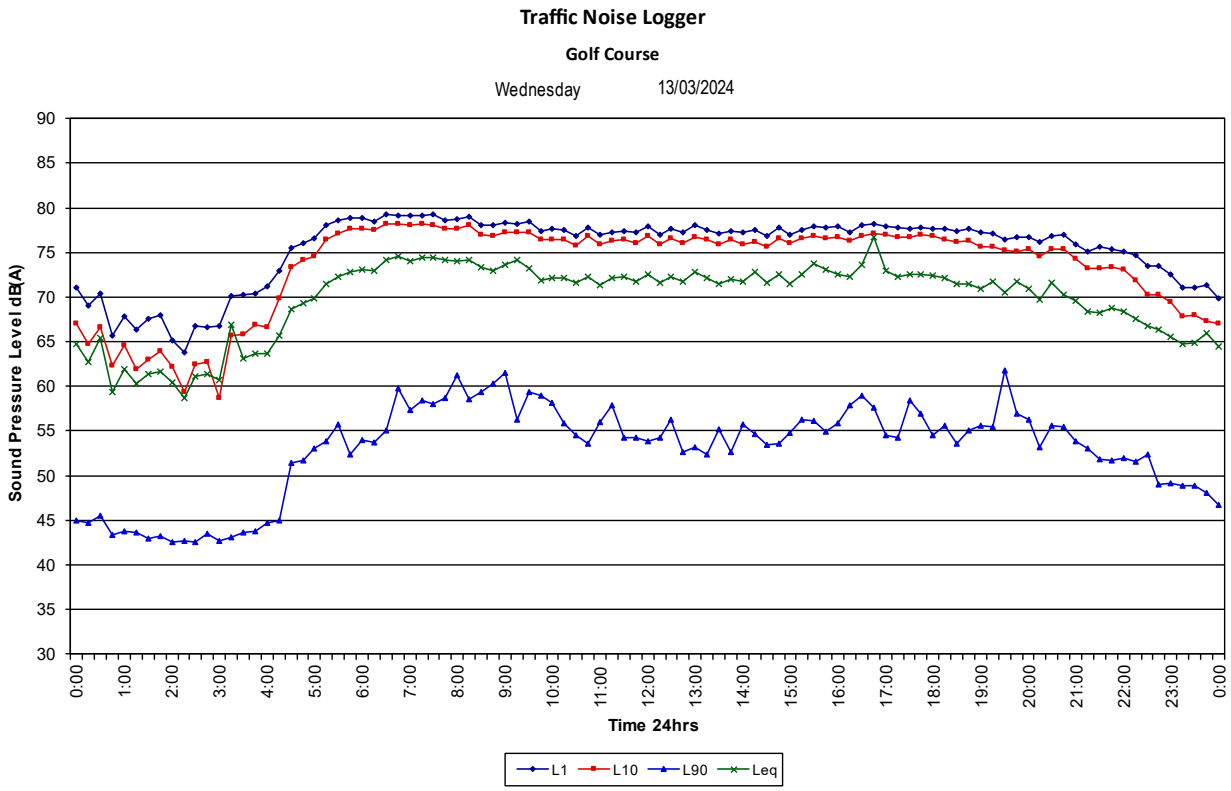
Time 24hrs
L1 L10 L90 Leq


Traffic Noise Logger
Golf Course
Wednesday 13/03/2024
Sound Pressure Level dB(A)
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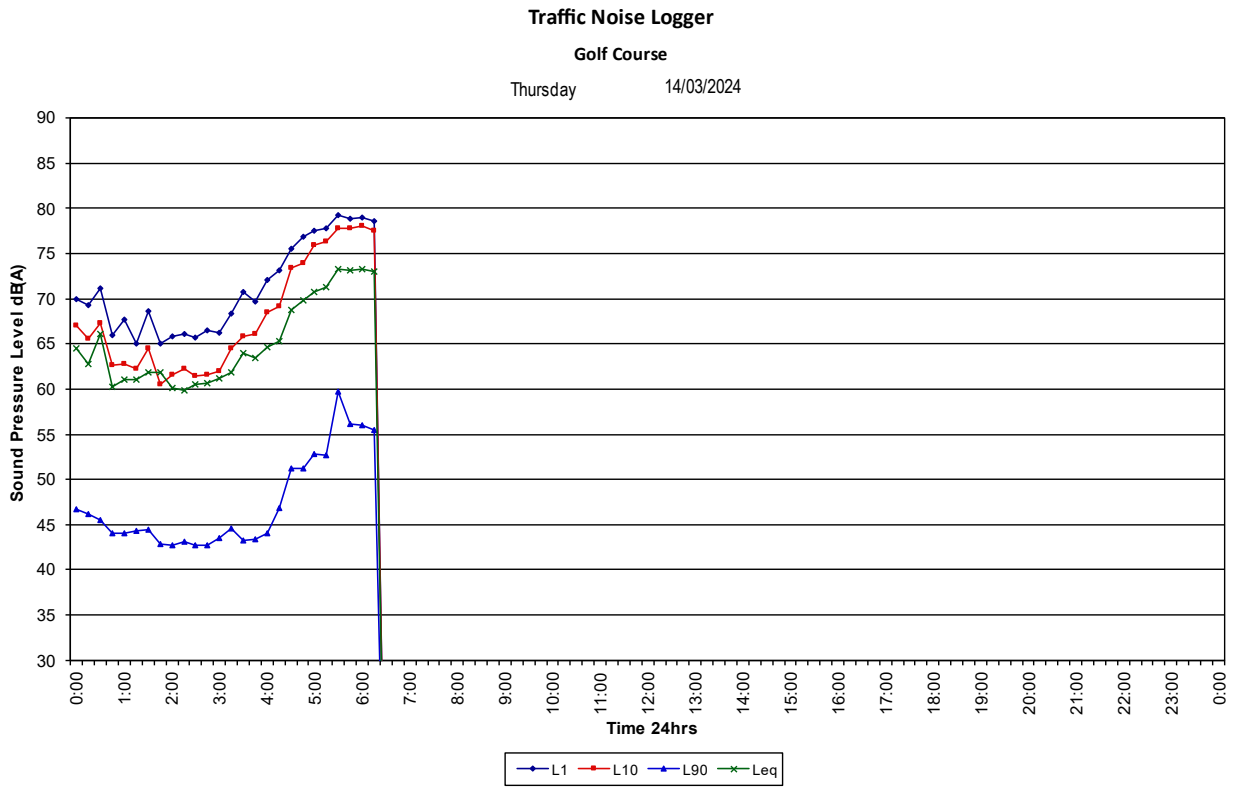
0:00 1:00 2:00 3:00 4:00 5:00 6:00 7:00 8:00 9:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00 0:00
Time 24hrs
L1 L10 L90 Leq


Traffic Noise Logger
Golf Course
Thursday
14/03/2024
Sound Pressure Level dB(A)
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Time 24hrs
L1
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Leq

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 C23513

Client Details	Rodney Stevens Acoustics Pty Ltd PO Box 522 Wahroonga NSW 2076
Equipment Tested/ Model Number :	NL-42EX
Instrument Serial Number :	00546395
Microphone Serial Number :	191389
Pre-amplifier Serial Number :	23057
Firmware Version :	2.1

Pre-Test Atmospheric Conditions		**Post-Test Atmospheric Conditions**	
Ambient Temperature :	20°C	**Ambient Temperature :**	22.3°C
Relative Humidity :	46.4%	**Relative Humidity :**	42.8%
Barometric Pressure :	102.1kPa	**Barometric Pressure :**	102.1kPa

Calibration Technician :	Ken Williams	**Secondary Check:**	Megan Williams
Calibration Date :	27 Jul 2023	**Report Issue Date :**	28 Jul 2023

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	*N/A*
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.

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	*±0.13dB*		

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.

PAGE 1 OF 1

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 C23782

Client Details	Rodney Stevens Acoustics Pty Ltd PO Box 522 Wahroonga NSW 2076
Equipment Tested/ Model Number :	NL-42EX
Instrument Serial Number :	00572559
Microphone Serial Number :	170370
Pre-amplifier Serial Number :	72880
Firmware Version :	2.0

Pre-Test Atmospheric Conditions		Post-Test Atmospheric Conditions	
Ambient Temperature :	23.5 °C	**Ambient Temperature :**	24.4 °C
Relative Humidity :	45.1 %	**Relative Humidity :**	43.1 %
Barometric Pressure :	100.17 kPa	**Barometric Pressure :**	100.09 kPa

Calibration Technician :	Max Moore	**Secondary Check:**	Emanuel Eid
Calibration Date :	30 Oct 2023	**Report Issue Date :**	30 Oct 2023

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	*N/A*
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.

Uncertainties of Measurement -

Acoustic Tests		Environmental Conditions	
125Hz	*±0.13 dB*	*Temperature*	*±0.1 °C*
1kHz	*±0.13 dB*	*Relative Humidity*	*±1.9 %*
8kHz	*±0.14 dB*	*Barometric Pressure*	*±0.11 kPa*
Electrical Tests	*±0.13 dB*		

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

NATA WORLD RECOGNISED ACCREDITATION

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.

PAGE 1 OF 1

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 C23560

Client Details	Rodney Stevens Acoustics Pty Ltd PO Box 522 Wahroonga NSW 2076
Equipment Tested/ Model Number :	Rion NL-42EX
Instrument Serial Number :	00572558
Microphone Serial Number :	192152
Pre-amplifier Serial Number :	72897
Firmware Version :	1.8

Pre-Test Atmospheric Conditions		Post-Test Atmospheric Conditions	
Ambient Temperature :	21.8 °C	**Ambient Temperature :**	21.3 °C
Relative Humidity :	50.1 %	**Relative Humidity :**	51.1 %
Barometric Pressure :	101.94 kPa	**Barometric Pressure :**	101.98 kPa

Calibration Technician :	Jeff Yu	**Secondary Check:**	Megan Williams
Calibration Date :	7 Aug 2023	**Report Issue Date :**	9 Aug 2023

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	*N/A*
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.

Uncertainties of Measurement -

Acoustic Tests		Environmental Conditions	
125Hz	*±0.13 dB*	*Temperature*	*±0.1 °C*
1kHz	*±0.13 dB*	*Relative Humidity*	*±1.9 %*
8kHz	*±0.14 dB*	*Barometric Pressure*	*±0.014 kPa*
Electrical Tests	*±0.13 dB*		

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.

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 C22531

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 :	196555
Pre-amplifier Serial Number :	02809
Firmware Version :	2.0

Pre-Test Atmospheric Conditions		Post-Test Atmospheric Conditions	
Ambient Temperature :	22.5°C	**Ambient Temperature :**	22.8°C
Relative Humidity :	50.1%	**Relative Humidity :**	49.3%
Barometric Pressure :	101.32kPa	**Barometric Pressure :**	101.28kPa

Calibration Technician :	Lucky Jaiswal	**Secondary Check:**	Dylan Selge
Calibration Date :	31 Aug 2022	**Report Issue Date :**	6 Sep 2022

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	*N/A*
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.

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	*±0.13dB*		

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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Sound Level Meter
IEC 61672-3:2013
Calibration Certificate

Calibration Number C22451

Client Details	Rodney Stevens Acoustics Pty Ltd 1 Majura Close St Ives Chase NSW 2075
Equipment Tested/ Model Number :	Rion NL-42AEX
Instrument Serial Number :	00422907
Microphone Serial Number :	197437
Pre-amplifier Serial Number :	25844

Pre-Test Atmospheric Conditions		Post-Test Atmospheric Conditions	
Ambient Temperature :	21.1°C	**Ambient Temperature :**	23°C
Relative Humidity :	59.8%	**Relative Humidity :**	55.9%
Barometric Pressure :	100.08kPa	**Barometric Pressure :**	100.07kPa

Calibration Technician : Lucky Jaiswal
Calibration Date : 7 Jul 2022
Secondary Check: Shaheen Boaz
Report Issue Date : 11 Jul 2022

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	*N/A*
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.

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	*±0.13dB*		

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

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Sound Level Meter
IEC 61672-3:2013
Calibration Certificate

Calibration Number C22449

Client Details	Rodney Stevens Acoustics Pty Ltd 1 Majura Close St Ives Chase NSW 2075
Equipment Tested/ Model Number :	Rion NL-42AEX
Instrument Serial Number :	00322762
Microphone Serial Number :	196486
Pre-amplifier Serial Number :	15494

Pre-Test Atmospheric Conditions		Post-Test Atmospheric Conditions	
Ambient Temperature :	25°C	**Ambient Temperature :**	25.2°C
Relative Humidity :	53.5%	**Relative Humidity :**	52.5%
Barometric Pressure :	101.09kPa	**Barometric Pressure :**	101.02kPa

Calibration Technician :	Lucky Jaiswal	**Secondary Check:**	Dhanush Bonu
Calibration Date :	5 Jul 2022	**Report Issue Date :**	7 Jul 2022

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	*N/A*
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.

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	*±0.13dB*		

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

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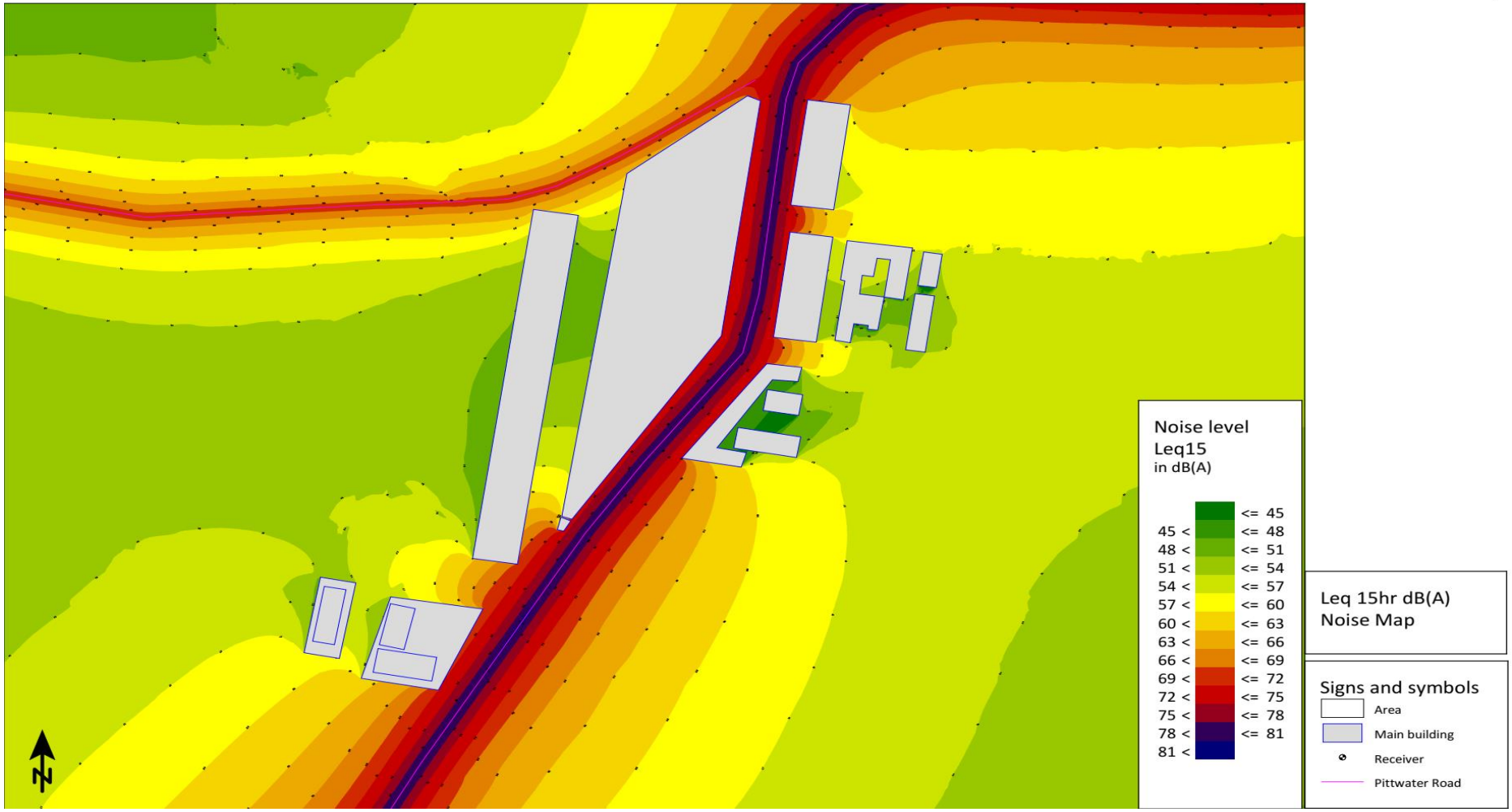
Appendix D – Noise Maps

R231017 Brookvale Stage 1
Traffic Noise Levels 2034 Daytime



R231017 Brookvale Stage 1
Traffic Noise Levels 2034 Night-time