Resonate

Newington Public School

Noise and Vibration Impact Assessment

S250301RP3 Revision G

Friday, 8 May 2026

Resonate

Document Information

Project	Newington Public School
Client	Lucid Consulting Engineers (NSW) Pty Ltd
Report title	Noise and Vibration Impact Assessment
Project Number	S250301

Revision Table

Report revision	Date	Description	Author	Reviewer
0	21 November 2025	Draft issue	Sam Johnson	Cameron Heggie
A	24 November 2025	First issue	Sam Johnson	Cameron Heggie
B	26 November 2025	First revision	Sam Johnson	Cameron Heggie
C	27 November 2025	Second revision	Sam Johnson	Cameron Heggie
D	5 December 2025	Third Revision	Sam Johnson	Cameron Heggie
E	23 January 2026	Addressing EPM & SP comments	Cameron Heggie	Ray Sim
F	3 February 2026	Minor comments	Sam Johnson	Cameron Heggie
G	8 May 2026	Minor comments	Sam Johnson	Cameron Heggie

Glossary

A-weighting	A spectrum adaption that is applied to measured noise levels to represent human hearing. A-weighted levels are used as human hearing does not respond equally at all frequencies.
Ambient noise	The **total** noise in a given situation, inclusive of all noise source contributions in the near and far field.
Characteristic	Associated with a noise source, means a tonal, impulsive, low frequency or modulating characteristic of the noise that is determined in accordance with the NSW EPA's *Noise Policy for Industry* to be fundamental to the nature and impact of the noise.
Compliance	The process of checking that source noise levels meet with the noise limits in a statutory context.
Day	Between 7 am and 6 pm as defined in the NPI
dB	Decibel—a unit of measurement used to express sound level. It is based on a logarithmic scale which means a sound that is 3 dB higher has twice as much energy. We typically perceive a 10 dB increase in sound as a doubling of loudness.
dB(A)	dB(A) denotes a single number sound pressure level that includes a frequency weighting ("A-weighting") to reflect the subjective loudness of the sound level. The frequency of a sound affects its perceived loudness. Human hearing is less sensitive at low and very high frequencies, and so the A-weighting is used to account for this effect. An A-weighted decibel level is written as dB(A).
Evening	Between 6 pm and 10 pm as defined in the NPI
Frequency (Hz)	The number of times a vibrating object oscillates (moves back and forth) in one second. Fast movements produce high frequency sound (high pitch/tone), but slow movements mean the frequency (pitch/tone) is low. 1 Hz is equal to 1 cycle per second.
L_{10}	Noise level exceeded for 10 % of the measurement time. The L_{10} level represents the typical upper noise level and is often used to represent traffic or music noise.
L_{90}	Noise level exceeded for 90 % of the measurement time. The L_{90} level is commonly referred to as the background noise level.
L_{eq}	Equivalent Noise Level—Energy averaged noise level over the measurement time.
L_{max}	The maximum instantaneous noise level.
Night	Between 10 pm on one day and 7 am on the following day as defined in the NPI
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 source	Premises or a place at which an activity is undertaken, or a machine or device is operated, resulting in the emission of noise
NPI	NSW EPA's *Noise Policy for Industry*.

Rating Background Level (RBL)	The RBL is the overall single figure background level representing each assessment period (day, evening and night) over the whole monitoring period (as opposed to over each 24-hour period used for the ABL). This is the level used for assessment purposes. It is the median value of: • All the day assessment background levels over the monitoring period for the day; • All the evening assessment background levels over the monitoring period for the evening; or All the night assessment background levels over the monitoring period for the night.
R_W	Weighted Sound Reduction Index—A laboratory measured value of the acoustic separation provided by a single building element (such as a partition). The higher the R_W the better the noise isolation provided by a building element.
$R_W + C_{tr}$	A measure of the sound insulation performance of a building element with a C_{tr} spectrum adaptation term placing greater emphasis on the low frequency performance.
Reverberation Time (RT)	Of a room, for a sound of a given frequency or frequency band, the time that would be required for the reverberantly decaying sound pressure level in the room to decrease by 60 decibels.
Sleep disturbance	Awakenings and disturbance of sleep stages.
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.

Table of Contents

1 Executive Summary

This Noise and Vibration Impact Assessment has been prepared to support the proposed Newington Public School. The assessment evaluates potential noise and vibration impacts arising from construction activities and the ongoing operation of the completed school buildings. It also examines potential noise intrusion into learning areas from external sources and identifies feasible and reasonable mitigation measures to ensure acoustic compliance in accordance with relevant NSW environmental and education standards.

The key objectives of the study were to:

- Establish project-specific construction noise and vibration criteria for nearby residential and recreational sensitive receivers in accordance with the NSW EPA Interim Construction Noise Guideline and Assessing Vibration: A Technical Guideline.
- Assess potential construction noise and vibration impacts arising from building works associated with new learning facilities, and landscaping.
- Predict operational noise impacts from mechanical building services and school-based activities, benchmarked against applicable requirements including the NSW Noise Policy for Industry, the EFSG 2025, AAAC Child Care Acoustic Guidelines and the NSW Noise Guide for Local Government.
- Determine appropriate acoustic requirements for internal learning environments to control intrusion from external road traffic, including glazing performance to meet EFSG internal noise criteria.
- Recommend feasible and reasonable mitigation measures to ensure compliant construction and operation, and minimise potential impacts on surrounding residents and community facilities.

The assessment concluded that:

- Construction noise is predicted to exceed Noise Management Levels at nearby residential properties during typical site works. However, impacts can be effectively managed through a Construction Noise and Vibration Management Plan (CNVMP) incorporating reasonable and feasible controls such as equipment selection, scheduling of high-noise activities, stakeholder engagement, and site/plant management practices.
- Construction vibration is unlikely to cause cosmetic or structural building damage but may exceed human comfort criteria if high-vibration equipment is used near boundaries. Safe working distances have been provided and monitoring is recommended to manage impacts.
- Operational noise from building services is expected to comply with relevant noise criteria at all surrounding receivers, provided the recommended acoustic louvre treatment is implemented for the air-conditioning plant enclosure.
- Internal noise criteria under the EFSG are largely achievable with standard glazing; however, a minimum R_W 33 glazing system is recommended in classrooms to meet internal noise targets.
- School activities such as outdoor play, public address and bell systems can comply with criteria when appropriately designed to control duration, directionality, and noise emission levels.

Overall, the assessment finds that the Newington Public School can be delivered in a manner that is consistent with applicable NSW noise and vibration guidelines. With the recommended mitigation measures incorporated into construction planning, building design and school operations, the project is not expected to result in unacceptable acoustic impacts on surrounding residents or community land uses.

2 Introduction

2.1 Overview

The purpose of this report is to determine possible construction and operational noise, and vibration impacts of the School on nearby residential receivers and if necessary, provide acoustic control commitments so that the development may be constructed and operated in an acoustically compliant manner.

This report covers these following aspects of acoustic assessment:

- Establish project specific noise and vibration criteria.
- Construction noise and vibration impacts.
- Operational noise emissions.
- Noise intrusion impacts from external sources (i.e traffic noise intrusion).
- Acoustical design requirements.

Unattended noise monitoring was conducted from Thursday 31 July to Monday 18 August 2025 at the proposed project site. This acoustic assessment is based on the architectural drawings (*Architectus, Ref: Rev T00, Dated 18.12.2025*), as well as the results of the noise survey. Appendix A provides a full explanation of the methodologies used to establish noise emission criteria in the preparation of this report.

2.2 Project Description

This Noise and Vibration Impact Assessment has been prepared by Resonate Consultants (Resonate) on behalf of the Department of Education (the Proponent) to assess the potential environmental impacts that could arise from the redevelopment of Newington Public School at 49A Newington Boulevard, Newington Lot 320 DP1285196 (the site). This report provides a framework for acoustic design principles that may be reasonably expected based on a review of currently available documentation and our experience on projects of a similar nature.

This report accompanies a Review of Environmental Factors (REF) that seeks approval for the redevelopment of Newington Public School, which involves the following works:

- Construction of a new two storey building comprising:
  - General and specialist learning areas
  - Staff facilities
  - External stairwell and lift
- Construction of a new covered walkway and partial demolition of an existing covered walkway.
- Landscaping
- Ancillary services and infrastructure upgrades.

For a detailed project description, refer to the Review of Environmental Factors (REF) prepared by EPM Projects.

2.3 Site Description

The site has frontage to Newington Boulevard (76 metres along western lot boundary), public open space (140 metres along the eastern boundary) and medium density residential development (179 metres along the northern lot boundary and 181 metres along the southern boundary). The site comprises a single allotment, legally described as Lot 320 in deposited plan (DP) 1285196 with an approximate site area of 2ha.

The site is located in the suburb of Newington on the western side of Haslams Creek, opposite the Sydney Olympic Park Precinct and Auburn waste resource facility. The site's location is approximately 5.2km southeast of the Parramatta central business district, approximately 2.5km north of the Lidcombe town centre and approximately 3km southwest of the Rhodes town centre.

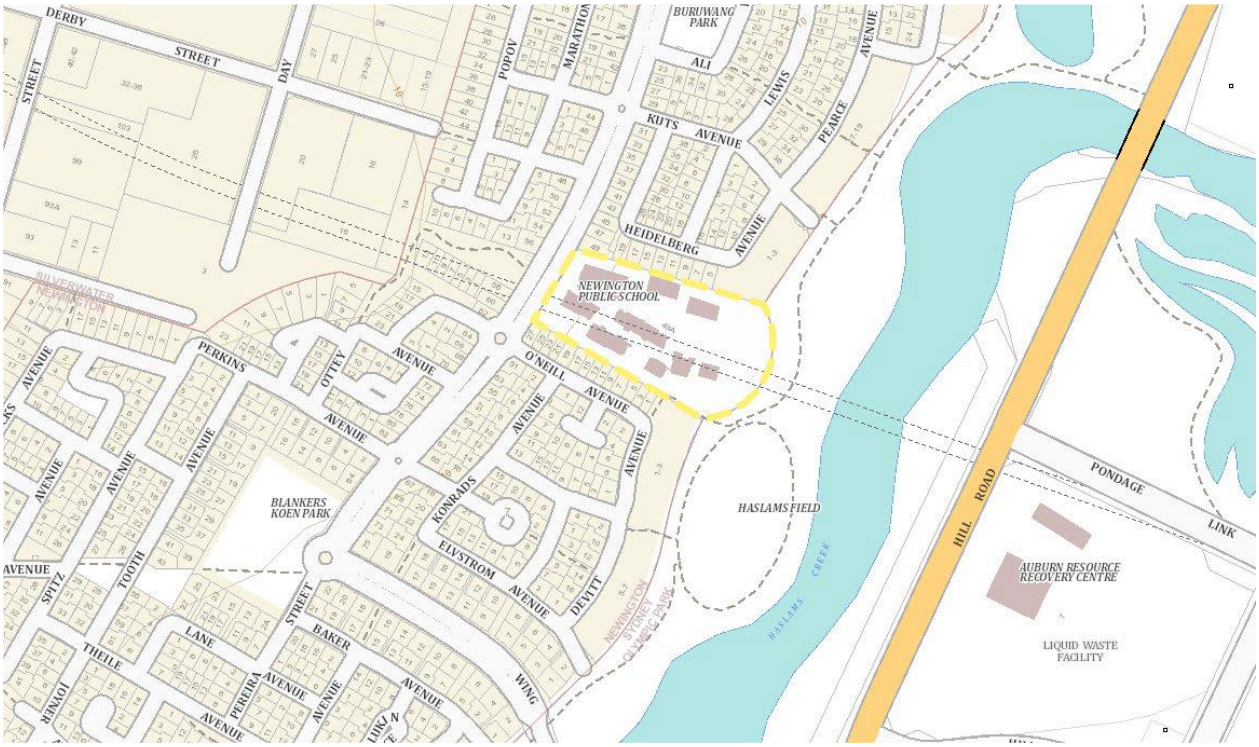


Figure 1 Location of the Newington Public School (NSW Spatial Viewer)

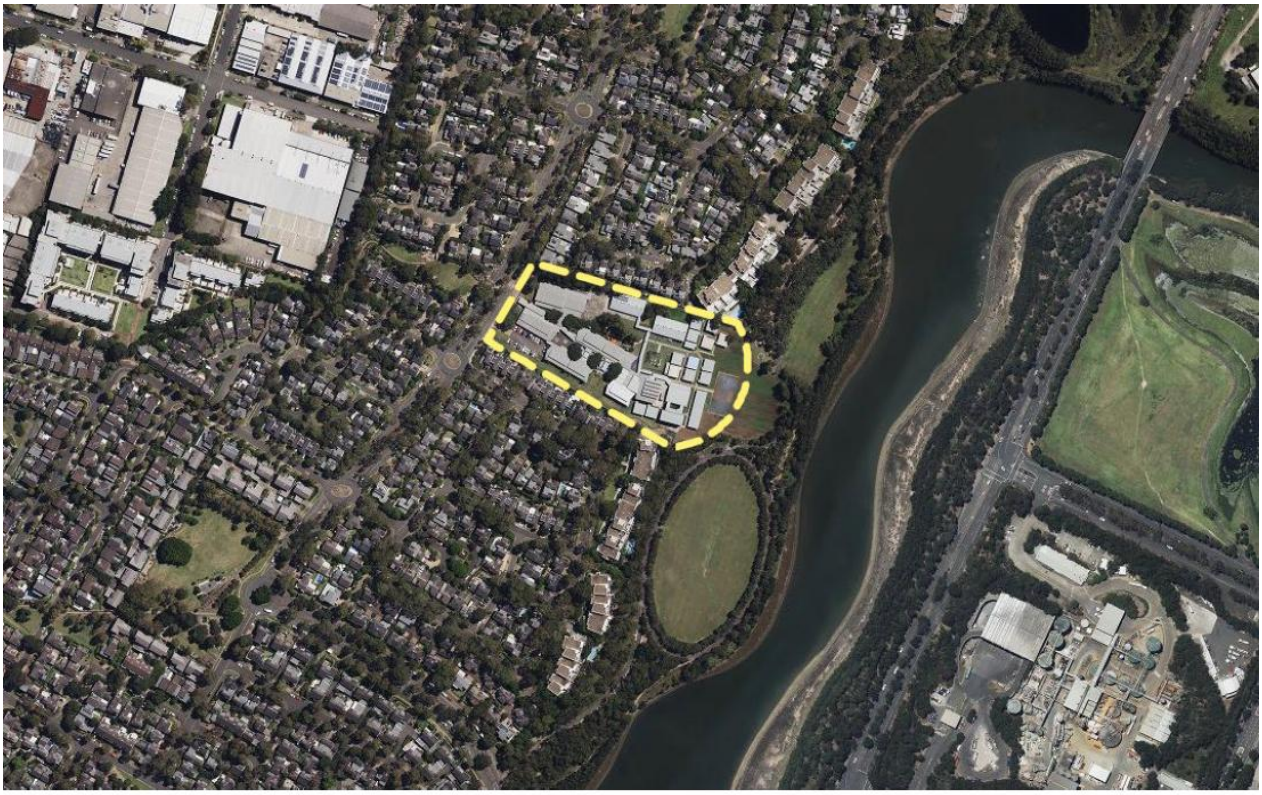


Figure 2 Aerial of Newington Public School (NSW Spatial Viewer)

2.4 Site in Context

The site is currently classified as an existing developed site and is located within the suburb of Newington. The school is situated within the City of Parramatta Local Government Area, bounded by residential receivers to the north and south, with Sydney Olympic Park lands located to the east. Table 1 identifies the most potentially affected nearby noise sensitive receivers that represent the highest risk of an adverse noise impact from the project.

Table 1 Nearby affected noise sensitive receivers

Reference	Address	Receiver type	Direction from project site
R01	5-17 Heidelberg Ave	Residential	North
R02	1-3 Heidelberg Ave	Residential	North
R03	1-9 O'Neill Ave	Residential	South
R04	1-3 Devitt Ave	Residential	South
PR01	Sydney Olympic Park	Passive Recreation	East

The school site is shown in the context of the surrounding environment, and acoustically significant site features are identified in Figure 3.

Background noise level measurement location UM01 is considered to be representative of these most at-risk noise sensitive receivers near the school site. Background noise measurements were undertaken over a period of 14 days to assess the relevant background noise levels in residential areas surrounding the site. Further details of noise measurements of the existing ambient acoustic environment can be found in Appendix A.

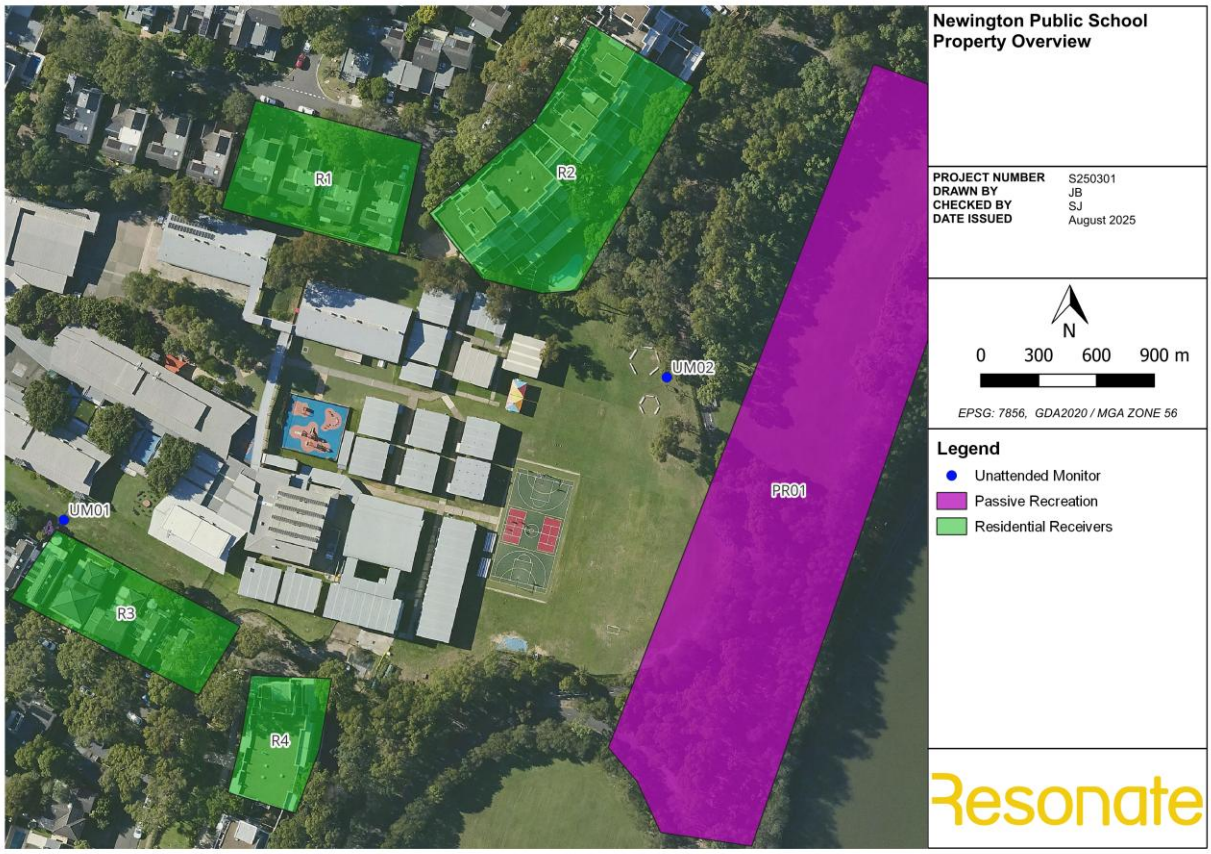


Figure 3 Site Location

2.5 Proposed school capacity

Newington Public School currently has approximately 662 students and has an existing capacity of 700 students. There is no anticipated increase to overall student numbers.

2.6 Hours of operation

The school's typical hours of operation are between 9:00 am to 3:00 pm, Monday to Friday with out of standard hours (OOSH) accommodation starting at 7:00am and concluding at 6:00pm.

3 Existing acoustic environment

3.1 Unattended noise monitoring

Noise monitoring was conducted during the period Thursday 31 July to Monday 18 August 2025 at the project site. Unattended noise monitoring equipment was set up to measure the background noise of the most affected residential receivers in representative locations, as shown in Figure 3.

Instrumentation for the survey comprised a Rion NL-42 Type 2 environmental noise logger and a Rion NL-22 Type 2 environmental noise logger (serial numbers 00409176 and 0946984) fitted with a microphone windshield. Calibration of the logger was checked prior to and following measurements. Calibration of the equipment 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. Noise measurements were taken in general accordance with AS1055.1.

Noise data has been filtered to remove data measured during adverse weather conditions upon consultation with historical weather reports provided by the Bureau of Meteorology (BOM). The logger determines L_{A1}, L_{A10}, L_{A90} and L_{Aeq} levels of the ambient noise. L_{A1}, L_{A10}, L_{A90} are the levels exceeded for 1%, 10% and 90% of the sample time respectively. The noise data obtained from the noise loggers have been processed in accordance with the procedures contained in the NSW EPA's Noise Policy for Industry (NPI) to establish representative noise levels at the monitoring locations.

Table 2 below presents the Rating Background Level (RBL) and average total noise level for the surrounding environment. These noise levels were used to establish the relevant noise criteria.

Table 2 Measured noise levels at background noise logging locations

	Description	Noise Level during Period – dB(A)		
		Daytime 07:00 – 18:00	Evening 18:00 – 22:00	Night-time 22:00 – 07:00
UM01	Rating Background Level (L_{A90})	42	42	39
	Ambient Noise Level (L_{Aeq})	58	49	47
UM02	Rating Background Level (L_{A90})	47	50	45
	Ambient Noise Level (L_{Aeq})	56	54	51

(1) 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); and

(2) All values expressed as dB(A) and rounded off to nearest 1 dB(A)

Noise monitoring has been undertaken in accordance with the requirements of the NPI and met the minimum required measurement periods after exclusions of data due to weather conditions and extraneous noise sources.

A detailed summary of the noise survey is provided in Appendix A and daily noise logging graphs are presented in Appendix B.

4 Criteria

4.1 Construction noise criteria

4.1.1 Interim Construction Noise Guideline (DECC, 2009)

Construction noise in New South Wales is assessed using the Department of Environment & Climate Change (now Environment Protection Authority) *Interim Construction Noise Guideline* (ICNG). The ICNG is also defined as the relevant guideline for construction noise by the SEARs issued by DPHI.

The ICNG aims to manage noise from construction works regulated by the EPA. It is also intended to provide guidance to other interested parties in the management of construction noise and has therefore been adopted for this construction noise assessment.

The ICNG prescribes $L_{eq,15min}$ Noise Management Levels (NML) for sensitive receivers as part of a quantitative construction noise assessment. Where the predicted or measured construction noise level exceeds these management levels, then all feasible and reasonable work practices should be implemented to reduce construction noise, and community consultation regarding construction noise is required to be undertaken.

4.1.2 Standard working hours

The ICNG recommends standard working hours for construction as follows:

- Monday to Friday, 7 am to 6 pm
- Saturday, 8 am to 1 pm
- No work on Sundays or Public Holidays

To encourage work during the Standard Working Hours, and to reflect the lower impact of work at these times, the ICNG prescribes less stringent Standard Working Hours NMLs. More stringent NMLs are prescribed for work outside of these times, as well as more onerous management requirements.

It should be noted that the Standard Working Hours are only applicable to residential (or similar) land uses. Working hours will be determined by the conditions as received from the Consent Authority. No work is proposed to occur outside of standard construction hours.

4.1.3 Residential land uses

The NMLs prescribed for residential land uses by the ICNG are presented in Table 3. The levels apply at the most exposed property boundary of the noise sensitive receiver at a height of 1.5 metres above ground level.

Table 3 Noise management levels for residential land uses

Time of day	NML, $L_{eq,15min}$	Application notes
Recommended Standard Working Hours	Noise affected: RBL + 10 dB(A)	May be some community reaction to noise. • Where the predicted or measured construction noise level exceeds the noise affected level, all feasible and reasonable work practices should be applied to meet the noise affected level. • All residents potentially impacted by the works should be informed of the nature of the works, the expected noise levels and duration, and provided with site contact details.

Time of day	NML, $L_{eq,15min}$	Application notes
	Highly noise affected: 75 dB(A)	May be strong community reaction to noise. • Where construction noise is predicted or measured to be above this level, the relevant authority may require respite periods that restrict the hours that the very noisy activities can occur. • Respite activities would be determined taking into account times identified by the community when they are less sensitive to noise, and if the community is prepared to accept a longer period of construction to accommodate respite periods.
Outside recommended Standard Working Hours	Noise affected: RBL + 5 dB(A)	• A strong justification would typically be required for works outside the recommended standard hours. • The proponent should apply all feasible and reasonable work practices to meet the affected noise level. • Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the affected noise level, the proponent should negotiate with the affected community.

4.1.4 Other sensitive land uses

The ICNG specifies construction noise management levels for other sensitive receivers which are detailed in Table 4.

Table 4 ICNG noise management levels for other sensitive land uses

Land use	NML $L_{eq,15min}$ (applies when property in use)
Classrooms at schools and other educational institutions	Internal noise level of 45 dB(A)
Passive recreation areas (characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation).	External noise level of 60 dB(A)

The project-specific construction “Noise Management Levels” (NML), for works within and outside the recommended standard hours for construction, are presented in Table 5.

These NMLs have been established with due regard to the requirements of the ICNG for all identified residential (dwelling) and other noise sensitive (non-residential) receptors. NML for all periods are provided for completeness despite construction works limited to the recommended standard hours for construction presented in the ICNG.

For residential (dwelling) receptors the NML are based on the RBL values presented in Section 3.

Table 5 Project specific construction noise management levels

Description	Receiver Type	Construction Noise Management Levels, $L_{eq,\ 15\ minute}$, dB(A)				High Noise Affected, $L_{eq,\ 15\ minute}$, dB(A)
		Standard Hours	Out-of-Hours			
		Day	Day	Evening	Night	
R01 - 5-17 Heidelberg Ave	Residential	52	47	47	44	75
R02 - 1-3 Heidelberg Ave	Residential	57	52	55	50	75
R03 - 1-9 O'Neill Ave	Residential	52	47	47	44	75
R04 – 1-3 Devitt Ave	Residential	52	47	47	44	75
PR01 - Sydney Olympic Park	Passive Recreation	60	60	60	60	-

It is understood that construction activities would only be carried out during standard daytime period. Therefore, construction noise impacts will only be assessed against the standard daytime NMLs.

4.2 Construction vibration criteria

Ground vibration generated by construction can have a range of effects on buildings and building occupants. The main effects are generally classified as:

- human disturbance – disturbance to building occupants: vibration which inconveniences or interferes with the activities of the occupants or users of the building
- effects on building structures – vibration which may compromise the condition of the building structure itself.

In general, vibration criteria for human disturbance are more stringent than vibration criteria for effects on buildings. Building occupants will normally feel vibration readily at levels well below those which may cause a risk of cosmetic or structural damage to a structure. However, it may not always be practical to achieve the human comfort criteria. Furthermore, unnecessary restriction of construction activities can prolong construction works longer than necessary, potentially resulting in other undesirable effects for the local community.

Construction vibration criteria have been adopted from the following sources:

- Cosmetic and structural damage to buildings: German Standard DIN 4150-3[1]
- Human comfort: Assessing Vibration – A Technical Guideline (the Vibration Guideline)

[1] German Standard DIN 4150-3, 1999, *Structural Vibration – Part 3: Effects of vibration on structures*.

4.2.1 Cosmetic and structural damage

DIN 4150-3 summarises structural and cosmetic damage assessment criteria for different types of buildings, which are presented in Table 6 which are widely used for the assessment of construction vibration effects on buildings in Australia. The criteria are specified as Peak Particle Velocity (PPV) levels measured in any direction at or adjacent to the building foundation.

Table 6 DIN 4150-3 vibration cosmetic and structural damage criteria

Structure type	Peak Particle Velocity (PPV), mm/s			
	Foundation of structure			Vibration at horizontal plane of highest floor at all frequencies
	<10 Hz	10-50 Hz	50-100 Hz	
Buildings used for commercial, industrial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
Dwelling and buildings of similar design and/or use	5	5 to 15	15 to 20	15
Structures that, because of their particular sensitivity to vibration, do not correspond to those listed in rows 1 and 2, and are of great intrinsic value (e.g. heritage-listed buildings)	3	3 to 8	8 to 10	8

DIN 4150-3 states that exposing buildings to vibration levels higher than that recommended would not necessarily result in damage. Rather, it recommends these values as maximum levels of short-term construction vibration at which experience has shown damage reducing the serviceability of structures will not occur due to vibration effects.

DIN 4150-3 is considered to be suitable for the assessment of both structural and cosmetic damage as it considers a reduction in serviceability of the structure is deemed to have occurred if:

- cracks form in plastered surfaces of walls
- existing cracks in the building are enlarged
- partitions become detached from loadbearing walls or floors.

4.2.2 Human comfort

The ICNG recommends that vibration from construction works be assessed under *Assessing Vibration – a technical guideline* (the Vibration Guideline).

The vibration assessment criteria defined in the Vibration Guideline are for human comfort and represent goals that, where predicted or measured to be exceeded, require the application of all feasible and reasonable mitigation measures. Where the maximum value cannot be feasibly and reasonably achieved, the operator would need to negotiate directly with the affected community.

The Vibration Guideline defines vibration assessment criteria for continuous, impulsive and intermittent vibration. Vibration can be classified according to the following definitions:

- Continuous vibration: continues uninterrupted for a defined period. Applies to continuous construction activity such as tunnel boring machinery.

- Impulsive vibration: rapid build-up to a vibration peak followed by a damped decay or the sudden application of several cycles of vibration at approximately the same magnitude providing that the duration is short. Applies to very occasional construction activities that create distinct events such as the occasional dropping of heavy equipment.
- Intermittent vibration: interrupted periods of continuous vibration (such as a drill) or repeated periods of impulsive vibration (such as a jack hammer).

The majority of construction activities as part of the proposed works would be expected to be continuous or intermittent in nature.

Table 7 presents the management levels for continuous and impulsive vibration at different land uses. The management levels specified are as overall unweighted RMS vibration velocity levels. The Vibration Guideline specifies the management levels as suitable for vibration sources predominantly in the frequency range 8-80 Hz as would be expected for construction vibration.

For intermittent vibration, the Vibration Dose Value (VDV) is used as the metric for assessment as it accounts for the duration of the source, which will occur intermittently over the assessment period. The VDV management levels at different land uses for intermittent vibration sources are presented in Table 8.

Table 7 RMS vibration velocity management levels for continuous and impulsive vibration

Land use	Continuous vibration – RMS vibration velocity, mm/s		Impulsive vibration – RMS vibration velocity, mm/s	
	Preferred	Maximum	Preferred	Maximum
Residences Daytime	0.010	0.020	0.30	0.60
Residences Night-time	0.007	0.014	0.10	0.20
Offices, schools, educational institutions and places of worship	0.4	0.8	13.0	26.0
Workshops	0.8	1.6	13.0	26.0

(1) Daytime is defined by the Vibration Guideline to be 7 am to 10 pm.

(2) Night-time is defined by the Vibration Guideline to be 10 pm to 7 am.

Table 8 VDV management levels for intermittent vibration

Land use	VDV – intermittent vibration, $m/s^{1.75}$	
	Preferred	Maximum
Residences Daytime	0.2	0.4
Residences Night-time	0.13	0.26
Offices, schools, educational institutions and places of worship	0.4	0.8
Workshops	0.8	1.6

(1) Critical operating areas include precision laboratories where sensitive operations are occurring.

(2) Daytime is defined by the Vibration Guideline to be 7 am to 10 pm.

(3) Night-time is defined by the Vibration Guideline to be 10 pm to 7 am.

4.2.3 Minimum working distances

The *Construction Noise and Vibration Guideline (CNVG)* (TfNSW, 2023) provides guidelines for minimum working distances for vibration-intensive activities with respect to the stated standards and guidelines. The minimum working distances for building damage should be complied with at all times. The distances are noted as being indicative and are likely to vary depending on the particular item of plant and local geotechnical conditions. The minimum working distances apply to addressing the risk of cosmetic (minor – easily reparable) damage of typical buildings under typical geotechnical conditions.

Where vibration intensive works are required to be undertaken within the specified minimum working distances, vibration monitoring should be undertaken to ensure acceptable levels of vibration are satisfied.

In relation to human comfort, the minimum working distances relate to continuous vibration. For most construction activities, the vibration emissions would be intermittent in nature and for this reason, higher vibration levels, occurring over shorter periods may be allowed.

Table 9 presents the recommended minimum working distances for vibration intensive plant.

Table 9 Recommended safe working distances for vibration intensive plant

Plant Item	Rating/Description	Minimum Working Distance – Cosmetic Damage (BS7385)	Minimum Working Distance – Human Response (OH&E Guideline)
Vibratory Roller	< 50 kN (Typically 1-2 tonnes)	Five metres	15 metres to 20 metres
	< 100 kN (Typically 2-4 tonnes)	Six metres	20 metres
	< 200 kN (Typically 4-6 tonnes)	12 metres	40 metres
	< 300 kN (Typically 7-13 tonnes)	15 metres	100 metres
	> 300 kN (Typically 13-18 tonnes)	20 metres	100 metres
	> 300 kN (> 18 tonnes)	25 metres	100 metres
Small Hydraulic Hammer	(300 kg - 5 to 12t excavator)	Two metres	Seven metres
Medium Hydraulic Hammer	(900 kg – 12 to 18t excavator)	Seven metres	23 metres
Large Hydraulic Hammer	(1600 kg – 18 to 34t excavator)	22 metres	73 metres
Vibratory Pile Driver	Sheet piles	2 metres to 20 metres	20 metres
Pile Boring	≤ 800 mm	2 metres (nominal)	Four metres
Jackhammer	Hand held	1 metres (nominal)	Two metres

4.3 Operational noise emissions

4.3.1 Educational Facilities Standards and Guidelines (EFSG)

The NSW Department of Education's *Educational Facilities Standards and Guidelines* 2025 (EFSG) outlines the acoustic requirements for schools in Section 001C Acoustics of the EFSG. EFSG Section 0001c-0.05 Noise emission (to the environment) states the following:

'Generally, noise emissions to the environment from mechanical services noise sources (such as air conditioners) are subject of a development consent condition. In NSW the development consent conditions will refer to the requirements of the NPI or Local Council requirement.

Noise associated with school activity (such as music or sport within a hall) are not a stationary noise source and is not subject to the NPI requirements. Where a condition of consent exists for the control of activity related noise, an acoustic engineer is to assess the noise emission. The acoustic engineer should define and state the activity, internal reverberant sound pressure level in the room or space and criteria (including sound pressure level and assessment location).'

4.3.2 NSW EPA Noise Policy for Industry (NPI) 2017

Noise emission to the environment from building services noise sources, such as external mechanical plant, should comply with the requirements of the NSW *Noise Policy for Industry* (NPI) 2017.

The NPI sets two separate noise criteria to meet desirable environmental outcomes:

- Intrusiveness – steady-state noise from the site should be controlled to no more than 5 dB(A) above the background noise level in the area. In this case, the steady-state L_{eq} noise level should not exceed the background noise level measured for different time periods in the environment.
- Amenity – amenity criteria are set based on the land use of an area. It requires noise levels from new industrial noise sources to consider the existing industrial noise level such that the cumulative effect of multiple sources does not produce noise levels that would significantly exceed the amenity criteria.

Based upon an unattended noise survey summarised in Appendix A, the project specific mechanical services noise criteria for nearby residential receivers are provided in Table 11.

Table 10 Operational noise emission criteria (building services) – residential receivers

Location	Noise emission criteria, LAeq (dB)		
	Daytime 07:00 – 18:00	Evening 18:00 – 22:00	Nighttime 22:00 – 07:00
Nearby residential premises	47	43	38

(1) Refer to Appendix A for further information on the derivation of the operational noise emission criteria.

Non-residential noise sensitive receivers are based on amenity noise emission criteria in accordance with the NPI. Relevant nearby non-residential noise sensitive receivers are presented in Table 11.

Table 11 Operational noise emission criteria (building services) – non-residential land uses

Non-residential classification	Amenity noise emission criteria, L_{Aeq} (dB)
Active recreation	53 dB(A) when in use

Non-residential classification	Amenity noise emission criteria, L_{Aeq} (dB)
Passive recreation	48 dB(A) when in use

4.3.3 AAAC Guideline for Child Care Centre Acoustic Assessment v3.0 2020

The EFSG states that noise associated with school activity (such as outdoor play) are not a stationary noise source and are not subject to the NPI requirements. Given the similarities between educational facilities and Child Care Centres in terms of land use, business hours and general operations (i.e. playtime hours etc), the duration of exposure to potential noise impacts at nearby noise-sensitive receivers is predicted to be similar. For this reason, the Association of Australasian Acoustical Consultants (AAAC)'s *Guideline for Child Care Centre Acoustic Assessment* has been adopted to assess potential noise impacts from the Project's proposed outdoor play areas for the following reasons:

- For most Child Care Centres, as the duration of time that children are allowed to play outside is reduced then the overall noise impact reduces.
- A total time limit of approximately 2 hours outdoor play per day is regarded as reasonable grounds for the allowance of an additional 5 dB emergence above the background level.

The noise criteria for outdoor play areas for Newington Public School with the additional students are summarised in Table 12.

Table 12 Outdoor play areas noise criteria for residential receivers

Receiver location(1)	Duration	Time of day	Measured RBL – dB(A)	Criteria $L_{eq,15min}$ – dB(A)	Comments
Residential Receivers	Up to 4 hours (total) per day	Daytime	42	52	The L_{Aeq} noise level emitted from the outdoor play area shall not exceed the background noise level by more than 10 dB.
	More than 4 hours per day	Daytime	42	47	The L_{Aeq} noise level emitted from the outdoor play area shall not exceed the background noise level by more than 5 dB.

(1) The assessment location is defined as the most affected point on or within any residential receiver property boundary.

Table 13 presents the criteria for all other noise sources associated with 'school activity' that are not subject to the NPI (such as music or school PA systems) as well as out of school hours activities. The cumulative $L_{Aeq,15\ minute}$ noise emission level resulting from the use and operation of the school, with the exception of noise emission from outdoor play discussed above, shall not exceed the background noise level by more than 5 dB(A) at noise sensitive residential receivers.

This is supported by noise goals outlined in the EPA "*Noise Guide for Local Government*" and other known similar assessments that have been approved within the Sydney Metropolitan area in conjunction with past experience in similar educational facility acoustic assessments.

Table 13 School Activity noise criteria

Receiver location	Period	Recommended criteria	Project specific criteria, $L_{Aeq,15min}$ (dB)
Residential Receivers	Daytime 7 am to 6 pm	$L_{Aeq,15min}$ must not exceed RBL + 5 dB	47
	Evening 6 pm to 10 pm	$L_{Aeq,15min}$ must not exceed RBL + 5 dB	47
	Nighttime 10 pm to 7 am	$L_{Aeq,15min}$ must not exceed RBL	44

4.3.4 Public address and school bell noise criteria

Given that there are currently no criteria specifically relating to noise emissions from public address (PA) system and bell, the NPI would be used referred to for the assessment of noise emissions from public address (PA) system and bell. The project specific NPI criteria for the development are presented in Section 4.3.2 which have been established for assessing external mechanical services noise impacts associated with the development.

4.3.5 Sleep disturbance noise criteria

The NPI also recommends criteria for the assessment of potential sleep disturbance, for the period between 10 pm and 7 am. The school is not expected to operate during this time period, therefore potential sleep disturbance is not being considered.

4.4 Road traffic noise intrusion criteria

The Department of Planning's *Development near Rail Corridors and Busy Road – Interim Guideline* aims to assist in the planning, design and assessment of both residential and non-residential developments in, or adjacent to rail corridors and busy roads and supports the specific provisions of the *State Environmental Planning Policy (Transport and Infrastructure) 2021* (TISEPP) in relation to rail and road traffic noise. The guideline also specifies recommended maximum internal noise levels for educational establishments adjacent to rail corridors and busy roads which are presented in Table 14.

Table 14 TISEPP internal noise criteria

Type of Occupancy	Recommended Max Level – dB(A)
Educational Institutions including child care centres	40

The NSW Department of Education's *Educational Facilities Standards and Guidelines* (EFSGs) also stipulates that road noise shall be assessed in accordance with the TISEPP requirements. However, the EFSGs sets lower internal noise levels for some spaces depending on their use and sensitivity.

Table 15 summarises the internal noise levels for the project in line with the EFSGs, which include contribution from steady-state noise sources such as road traffic and mechanical noise.

Table 15 EFSG internal noise criteria

Spaces	Maximum internal background noise levels for normal operations: includes building services and steady-state external noise sources	
	EFSG equivalent category	Design sound level $L_{eq,1\ hour}$ – dB(A)
Learning Commons	Open plan teaching area	40
GLS	Teaching spaces – primary schools	35
Special Program	Teaching spaces – primary schools	35
Staff Lounge	Staff common rooms	40
Storage	-	55
Toilets	Toilet / change / showers	50

The internal airborne noise criteria are generally achieved through a sealed building. Ideally, where natural ventilation is to be provided, the same criteria would also be achieved, particularly for critical spaces, where higher ambient noise levels may otherwise impact on speech intelligibility or unduly impact concentration. However, for some uses, research has indicated that occupants are willing to accept trade-offs in the ambient noise levels where natural ventilation is provided.

The TISEPP guideline allows for a + 10 dB concession for the open windows condition, and while this could be applied to educational uses, it is considered that such a decision should be made by the end users and/or relevant stakeholders. The desire for natural ventilation may be an important feature of the design but will leave the teaching areas vulnerable to noise intrusion, potentially exacerbating the listening issues associated with open plan classrooms.

5 Construction noise and vibration assessment

This section details the assessment of the construction noise and vibration impacts from the Project. Construction noise impacts predicted at the nearest residential receivers have been assessed against the adopted ICNG Noise Management Levels.

5.1 Construction noise

5.1.1 Construction noise sources

To assess the potential noise and vibration impacts during construction, a number of scenarios comprising typical plant and equipment have been developed based on Resonate's past project experiences.

Table 16 summarises the assumed sound power levels (L_W) for the major construction noise sources which we expect would be on site during each phase.

It is understood that all construction works are proposed to be carried out during standard daytime periods (7.00 am to 6.00 pm Monday to Friday and 8.00 am to 1.00 pm on Saturdays).

The sound power levels have been based on data obtained from previous measurements conducted by Resonate and those within the UK Department for Environment, Food and Rural Affairs (DEFRA) *Update of noise database for prediction of noise on construction and open sites*. An overall sound power level for each phase has also been assumed based on the loudest typical source(s) operating for each works phase.

Table 16 Construction noise source sound power levels

Stage	Typical plant items	Assumed sound power level, dB(A)
Stage 1 – Site establishment and enabling works	Large excavator	111
	Vibratory roller(1)	107
	Concrete truck	109
	Concrete pump	107
	Large truck	108
	Chainsaw	114
	Typical overall sound power level	**112**
Stage 2 – Demolition	Large excavator	111
	Rockbreaker(1)	121
	Crane	106
	Pneumatic jackhammer(1)	109
	Large truck	108
	Typical overall sound power level	**118**
Stage 3 – Retaining piles and excavation	Bored piling rig	111
	Large excavator	111

Stage	Typical plant items	Assumed sound power level, dB(A)
	Crane	106
	Large truck	108
	Typical overall sound power level	**112**
Stage 4 – Substructure	Crane	106
	Large excavator	111
	Pneumatic jackhammer(1)	109
	Concrete truck	109
	Concrete pump	107
	Large truck	108
	Typical overall sound power level	**114**
Stage 5 – Frame	Concrete truck	109
	Concrete pump	107
	Crane	106
	General hand tools	98
	Large truck	108
	Typical overall sound power level	**111**
Stage 6 – Facade works	Crane	106
	General hand tools	98
	Large truck	108
	Typical overall sound power level	**107**
Stage 7 – Internal works and fitout	General hand tools	98
	Compressor	94
	Portable generator	95
	Typical overall sound power level	**84(2)**

(1) Denotes “annoying” item of equipment as defined in the ICNG (i.e. contains characteristics such as impulsiveness, tonality etc.), and as such includes a +5 dB penalty adjustment to predictions.

(2) Includes a 15 dB(A) indoor-to-outdoor reduction in noise levels for internal works.

5.1.2 Predicted construction noise levels

Typical worst-case predicted noise levels are shown in Table 17 for each receiver location and each stage of works. Predicted noise levels were calculated using distance attenuation.

It is important to note that these predictions are typical worst-case predictions as they assume that:

- The receiver is located at the boundary of each receiver property.
- All plant/equipment within each stage are operating concurrently for the entire 15-minute period. This will not occur at all times as equipment will regularly be stood down or idled while other activities are undertaken.

Table 17 Typical worst-case external construction noise levels for Standard Working Hours

Receiver	NML – dB(A)	Typical worst-case external construction noise level for each stage during Standard Hours L_{eq} – dB(A)						
		Stage 1 - Site establishment	Stage 2 - Demolition	Stage 3 - Retaining piles and excavation	Stage 4 - Substructure	Stage 5 - Frame	Stage 6 - Facade works	Stage 7 - Internal works and fitout
R01 - 5-17 Heidelberg Ave	52	**65**	**71**	**65**	**67**	**64**	**60**	45
R02 - 1-3 Heidelberg Ave	57	**66**	**72**	**66**	**68**	**65**	**61**	53
R03 - 1-9 O'Neill Ave	52	**68**	**74**	**68**	**70**	**67**	**63**	40
R04 – 1-3 Devitt Ave	52	**75**	**81**	**75**	**77**	**74**	**70**	47
PR01 - Sydney Olympic Park	60	**73**	**79**	**73**	**75**	**72**	**68**	45

(1) Noise predictions have been based on construction works are occurring from the boundary line of the development site and that the receiver is located within 1 metre from the nearest residential receivers facade.

(2) A 10 dB(A) reduction has been added to allow for noise reduction through a receivers partially open window.

(3) Predicted levels that exceed the respective NML have been **BOLD**.

Discussions

The worst-case predicted construction noise impacts presented in Table 17, indicate the following:

- Construction noise impacts at surrounding residential receivers during Stages 1 to 6 works are likely to exceed the NML by up to 29 dB(A).
- Stage 7 works have been predicted to comply with the NML at all surrounding residential receivers.
- The worst-case construction noise impact of 81 dB(A) is predicted to occur during Stage 2 Demolition.
- Some works are expected to exceed the highly noise affected NML at Receiver R04 during some stages of construction.

Based on the predictions, construction noise from the site is predicted to exceed the relevant NMLs at all locations. Recommendations for construction noise management are provided in Section 5.2.1.

Construction noise has not been assessed for the existing school buildings, as they are located within the same site and are not required to be assessed under the ICNG. It is anticipated that noise impacts can be effectively managed through the school's implementation of noise management practices, including scheduling classes outside of the noisy work periods.

5.2 Construction vibration assessment

5.2.1 Minimum working distances

The Transport for NSW's (TfNSW) *Construction Noise and Vibration Guideline* (CNVG) provides guidelines for minimum working distances for vibration-intensive activities with respect to the stated standards and guidelines. The minimum working distances for building damage must be complied with at all times. The distances are noted as being indicative and are likely to vary depending on the particular item of plant and local geotechnical conditions. The minimum working distances apply to addressing the risk of cosmetic (minor – easily reparable) damage of typical buildings under typical geotechnical conditions.

Where vibration intensive works are required to be undertaken within the specified minimum working distances, vibration monitoring shall be undertaken to ensure acceptable levels of vibration are satisfied.

In relation to human comfort, the minimum working distances relate to continuous vibration. For most construction activities, vibration emissions would be intermittent in nature and for this reason, higher vibration levels, occurring over shorter periods may be allowed.

Table 18 presents the recommended minimum working distances for vibration intensive plant.

Table 18 Recommended safe working distances for vibration intensive plant

Plant Item	Rating/Description	Minimum Working Distance – Cosmetic Damage (BS7385)(1)	Minimum Working Distance – Human Response (OH&E Guideline)
Vibratory Roller	< 50 kN (Typically 1-2 tonnes)	5 metres	15 metres to 20 metres
	< 100 kN (Typically 2-4 tonnes)	6 metres	20 metres
	< 200 kN (Typically 4-6 tonnes)	12 metres	40 metres
	< 300 kN (Typically 7-13 tonnes)	15 metres	100 metres
	> 300 kN (Typically 13-18 tonnes)	20 metres	100 metres
	> 300 kN (> 18 tonnes)	25 metres	100 metres
Small Hydraulic Hammer	(300 kg - 5 to 12t excavator)	2 metres	7 metres
Medium Hydraulic Hammer	(900 kg – 12 to 18t excavator)	7 metres	23 metres
Large Hydraulic Hammer	(1600 kg – 18 to 34t excavator)	22 metres	73 metres
Vibratory Pile Driver	Sheet piles	2 metres to 20 metres	20 metres
Pile Boring	≤ 800 mm	2 metres (nominal)	4 metres
Jackhammer	Hand held	1 metres (nominal)	2 metres

(1) Based on residential structures.

The minimum working distances are indicative and will vary depending on the particular item of plant and local geotechnical conditions. They apply to cosmetic damage of typical buildings under typical geotechnical conditions.

Vibration monitoring is recommended to confirm the minimum working distances at specific sites and once plant selection has been confirmed.

5.2.2 Residential buildings

The nearest residential buildings to the site have been identified to be the residences to the south of the new classroom building, identified as R04. The nearest residential buildings are approximately 28 metres from the boundary of the site.

Based on the safe working distances in Table 18, cosmetic or structural damage to nearby residential buildings are considered unlikely. However, construction vibration impacting on human comfort is likely where larger equipment are utilised during the construction phase. It is recommended that smaller equipment is used where the safe working distances listed in Table 18 cannot be maintained.

5.2.3 Non-residential buildings

The nearest non-residential buildings would be the existing buildings on the site. Due to the close proximity of these buildings to the site, it is recommended that smaller vibration intensive plant such as vibratory roller and hydraulic hammer be utilised during construction and the safe working distances be adhered to. This is to ensure that construction vibration levels are maintained below the cosmetic damage and human comfort vibration limits.

5.3 Construction noise and vibration management measures

To manage the potential impact of noise and vibration during construction, reasonable and feasible management measures and work practices should be implemented as detailed below.

5.3.1 Construction noise and vibration management plan

Prior to the commencement of major construction works, the contractor should develop a Construction Noise and Vibration Management Plan (CNVMP). The CNVMP should:

- identify relevant construction noise and vibration criteria as detailed in this report
- identify neighbouring sensitive land uses for noise and vibration
- summarise key noise- and vibration-generating construction activities and the associated predicted levels at neighbouring land uses
- identify reasonable and feasible work practices to be implemented during the works
- summarise stakeholder consultation and complaints handling procedures for noise and vibration.

5.3.2 Stakeholder consultation

Nearby stakeholders should be consulted prior to the works and kept regularly informed of potential noise and vibration impacts from the works. Specifically, this would involve:

- Residential receivers on Heidelberg Ave
- Residential receivers on O'Neill Ave
- Residential receivers on Devitt Ave
- Existing buildings associated with the site

A noise and vibration complaints handling procedure and register should be developed and implemented during construction.

5.3.3 Work programming

Work should be programmed such that particularly noisy works occur during Standard Working Hours wherever feasible, namely:

- Monday to Friday 7 am to 6 pm
- Saturday 8 am to 1 pm
- No work on Sundays or public holidays.

If high noise works are to occur outside of the Standard Working Hours and later than 1 pm on a Saturday, then the CNVMP should define an approval process for undertaking out of hours works and for identifying reasonable and feasible mitigation measures to be implemented.

Consideration of a respite regime where particularly highly noise intensive activities are programmed to occur at times identified by the community when they are less sensitive to noise.

5.3.4 Truck movements and site access

Truck movements during long term construction projects have the potential to cause annoyance for sensitive receivers, even where trucks may be travelling on sealed roads. The design and selection of site access routes shall consider the potential disturbance to residents. In particular:

- site access and delivery points shall be located as far away from residences as possible
- truck movements shall use arterial roads and be diverted away from residential streets where feasible
- deliveries to/from site shall not occur during the night-time period where possible.

5.3.5 Site management

Site management procedures should include the following:

- processes that generate lower noise levels should be selected where feasible
- noisy plant should be located as far away from residences as is practical to allow efficient and safe completion of the task
- the potential shielding provided by site topography and intervening buildings should be considered in locating equipment
- site compounds should be located as far away as possible from residences
- equipment that is used intermittently should be shut down or throttled down to a minimum during periods when it is not in use
- works should be planned to minimise the noise from reversing signals
- warning horns should not be used as signalling devices
- two-way radios should be set to the minimum effective volume
- noise associated with packing up plant and equipment at the end of works should be minimised.

5.3.6 Equipment management

Equipment management should include the following:

- selection of low-noise plant and equipment where possible
- equipment should be well maintained
- equipment should have quality mufflers and silencers installed where relevant
- equipment not in use on site should be shut down
- tasks should be completed using the minimum feasible power and equipment.

6 Operational Noise Assessment

6.1 Operational noise emissions of building services

The Air Conditioning Plant Room located in the classroom block is proposed to have VRF condensing unit equipment as shown in Figure 4. There are four large units with two units being two modules combined. Table 19 presents the preliminary selection of units which have been used to determine acoustic louvre requirements.

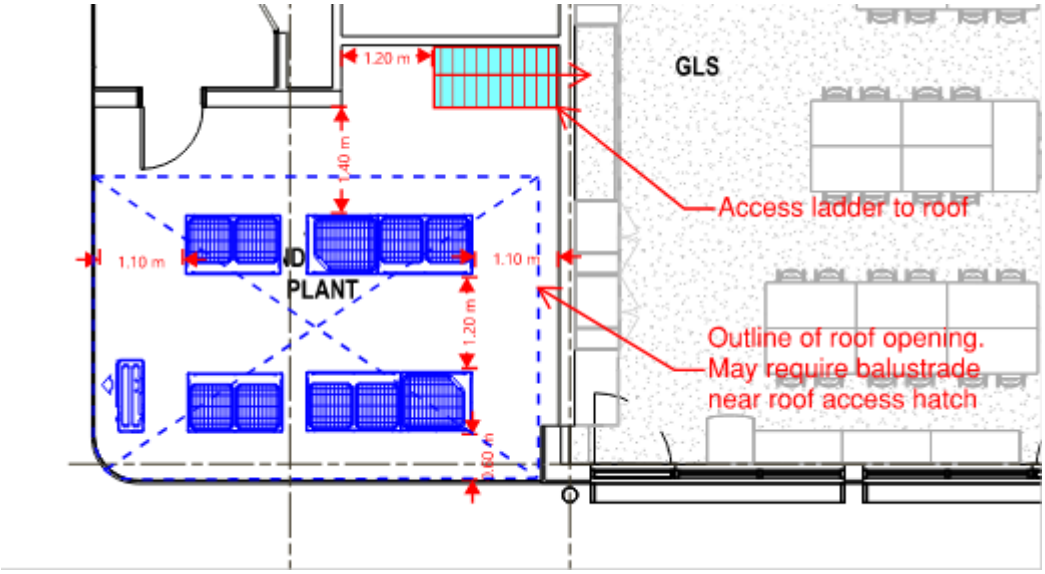


Figure 4 Air conditioning plant

Table 19 Proposed preliminary VRF selections

Reference	Proposed preliminary selection	Sound Power Level
CU-1	• Daikin REYQ24TAY1 – Daikin REYQ12TAY1 – Daikin REYQ12TAY1	• 83 dB(A) – 80 dB(A) – 80 dB(A)
CU-2	• Daikin REYQ14TAY1	• 81 dB(A)
CU-3	• Daikin REYQ24TAY1 – Daikin REYQ12TAY1 – Daikin REYQ12TAY1	• 83 dB(A) – 80 dB(A) – 80 dB(A)
CU-4	• Daikin REYQ10TAY1	• 85 dB(A)

A section of the plant room is proposed to be open to the external environment, allowing noise emissions directed towards nearby residential receivers. It is proposed that the open area is enclosed with an acoustic louvre screening where ventilation is required. The acoustic louvre should have the minimum insertion loss requirements presented in Table 20. This can be achieved with a Hudson 300 acoustic louvre.

Table 20 Required minimum installed insertion loss for acoustic louvres

Description	Insertion loss (dB) at octave band centre frequencies (Hz)						
	63	125	250	500	1000	2000	4000
Recommended acoustic louvre performance	-	4	6	14	20	27	28

Operational noise emissions from the Air Conditioning Plant Room have been predicted to the potentially most affected receivers identified in Table 1. Operational noise emissions were predicted using Resonate's proprietary acoustic calculation software SoundSurfer, which implements acoustic principles and formulas. The results of the predictions are presented in Table 21 below.

The prediction includes the following assumptions:

- The sound power levels of proposed plant are presented in Table 19.
- Sound power to sound pressure level to the distances determined by the source location of each noise generating plant or activity on the site to each noise sensitive receiver.
- It is assumed that the plant will not operate during the nighttime period.
- The plant is surrounded by an acoustic louvre, with the minimum insertion loss presented in Table 20.

Table 21 Calculated operational noise levels at nearby residential receivers

Receiver Location	Period	Noise Criteria – dB(A)	Predicted Noise Level $L_{eq(15\ minute)}$ – dB(A)	Compliance
R01 - 5-17 Heidelberg Ave	Daytime 7am – 6pm	47	22	✓
	Evening 6pm – 10pm	43	22	✓
	Night-time 10pm – 7am	38	-	-
R02 - 1-3 Heidelberg Ave	Daytime 7am – 6pm	47	23	✓
	Evening 6pm – 10pm	43	23	✓
	Night-time 10pm – 7am	38	-	✓
R03 - 1-9 O'Neill Ave	Daytime 7am – 6pm	47	35	✓
	Evening 6pm – 10pm	43	35	✓
	Night-time 10pm – 7am	38	-	✓
R04 – 1-3 Devitt Ave	Daytime 7am – 6pm	47	42	✓
	Evening 6pm – 10pm	43	42	✓
	Night-time 10pm – 7am	38	-	✓
PR01 - Sydney Olympic Park	When in use	48	33	✓

6.2 Public address system and school bell noise assessment

Public address (PA) system and school bell has the potential to impact on surrounding residential receivers. As the placement of the speakers for the PA/school bell system has not been determined, the PA/school bell system to the site should be designed to minimise noise spill to nearby properties by adopting the following principles.

- Speaker positioning/selection:
  - Speaker location and direction can be used to reduce noise spill to neighbouring properties while still maintaining suitable noise levels within the school grounds (typically 70-75 dB(A)).
  - Broadly speaking, more speakers, closer to the receiver is a more effective way to provide coverage of the external areas while reducing noise spill to neighbouring properties.
  - Similarly, highly directional speakers (angled downwards) will also reduce noise spill. Speakers with a drop of at least 5 dB(A) for mid-frequencies noise for each 10 degrees in the horizontal plane outside of the coverage area should be considered.
- Use of noise limiter system:
  - By limiting the maximum possible signal sent to a speaker, this can reduce intermittent increased noise generation as a result of the system user excessively raising their voice or holding the microphone too close.
  - In all likelihood, the limiter system would require that the system be installed, and volume adjusted such that the school is satisfied that a sufficient noise level has been reached in the assembly area, and the noise limit than set based on that.
- Duration:
  - Limiting the duration of PA school bells and announcements with any 15-minute period. A shorter noise duration would be considered less impactful to nearby noise sensitive receivers. Recommend limiting PA announcements to no greater than 1 minute duration.

The PA/bell system should be assessed in more detail (in accordance with the noise criteria outlined in Section 4) during the detailed design stage.

6.3 Additional students

The existing student population is approximately 662 students. The site is built for a total capacity of 700 students. Based on typical noise emission characteristics for school playgrounds, this potential full capacity of student numbers is predicted to result in a change in noise levels of approximately 1 dB(A) during peak activity periods (e.g. lunch and recess). An increase in noise levels of this magnitude is considered negligible and is generally below the threshold of human perception. Accordingly, the proposed capacity is not expected to result in any adverse noise impacts at surrounding residential receivers.

6.4 Electrical substation

A new electrical substation transformer is proposed to be located at the south west corner of the site, near Newington Boulevard and presented in Figure 5.

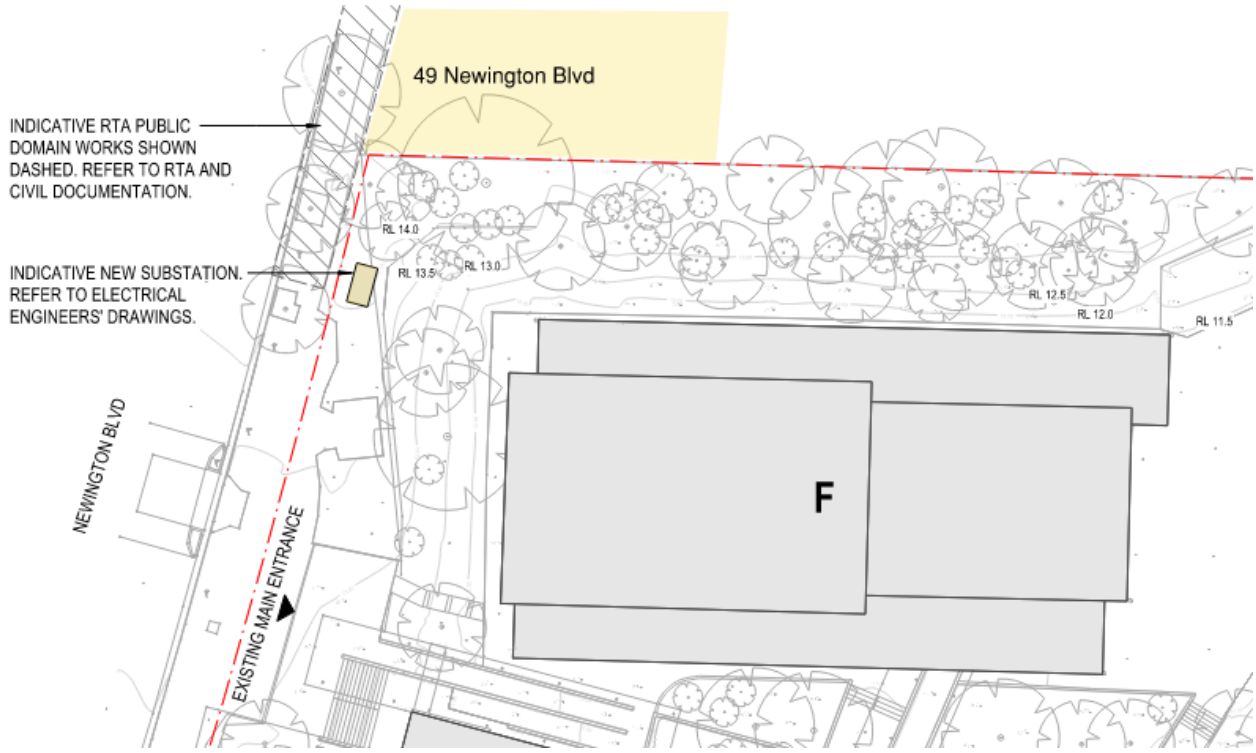


Figure 5 Proposed new electrical substation location

The proposed transformer is a Schneider L kiosk 600 kVA with a sound power level of 59 dB(A). The closest noise sensitive receiver is a residential property located at 49 Newington Boulevard, approximately 10 metres from the transformer. Table 22 presents the expected noise emissions against the NPI.

Table 22 Calculated operational noise levels of electrical substation at nearby residential receivers

Receiver Location	Period	Noise Criteria – dB(A)	Predicted Noise Level $L_{eq(15\ minute)}$ – dB(A)	Compliance
49 Newington Boulevard	Daytime 7am – 6pm	47	36(1)	✓
	Evening 6pm – 10pm	43	36(1)	✓
	Night-time 10pm – 7am	38	36(1)	✓

(1) A 5 dB modifying factor correction has been added to allow for tonal characteristics of the electrical substation.

Compliance with the NPI is expected to be achieved at all times with the newly proposed electrical substation.

7 Road Traffic and Rail Noise Intrusion

7.1 Road traffic noise intrusion

This assessment predicts noise intrusion from the external environment to the internal areas of the school building. To assess noise intrusion the data obtained from the logger at location UM01 (shown in Figure 3) has been processed to establish representative ambient noise levels at the building façade. The daytime (7 am to 10 pm) ambient noise level measured at logger location UM01 is 57 dB(A) $L_{eq,15hour}$.

Standard window glazing of a building will typically attenuate these noise levels by 20 dB(A) with windows closed and 10 dB(A) with windows open (allowing for natural ventilation). The predicted internal noise levels for standard facade glazing are presented in Table 23 for the windows open and windows closed scenarios. Standard window system (4 mm thick glass with aluminium frame) has been assumed for this prediction.

Table 23 Predicted road traffic noise levels - standard glazing

Location	Noise Level L_{Aeq} – dB(A) re 20 µPa		
	Daytime (0700 hrs – 2200 hrs)		
	Existing External	Windows Open	Windows Closed
Classroom	57	47	37
TISEPP Criteria(1)	N/A	50(3)	40
TISEPP Exceedance	N/A	-	-
Most stringent EFSG criteria(2)	N/A	50(3)	35
EFSG exceedance	N/A	-	2

(1) TISEPP internal noise criteria presented in Table 14.

(2) EFSG internal noise criteria presented in Table 15.

(3) The TISEPP guideline allows for a + 10 dB concession for the open windows condition. Therefore, a +10dB has been applied to the TISEPP criteria for opened windows.

The predicted internal noise levels indicate that internal noise levels inside the classrooms are likely to comply with the criteria with windows open however there is a marginal exceedance of 2dB(A) with windows closed. In order to comply with the EFSG internal noise criteria, glazing should be a minimum R_W 33. This can be achieved with 6.38 mm laminate glass, with the glazing suite to include acoustic seals.

7.2 Rail corridor noise and vibration intrusion

A future Sydney Metro rail corridor is currently proposed to run approximately 18 metres beneath the site. It should be noted that tunnelling works underneath the site have already been completed and will have no future impact to the Newington Public School development site.

Ground-borne noise and vibration (including re-radiated structure-borne noise within buildings) from the metro line would be expected to have been assessed as part of the Metro planning and reference design process, with any required mitigation (e.g., resilient track form, floating slab) incorporated within the rail corridor/tunnel design to achieve the applicable criteria at surrounding noise-sensitive receivers (including the existing school and nearby residential properties). Accordingly, the onus for managing rail-induced structure-borne noise and vibration rests with the rail

project proponent via corridor design, rather than with the school to retrofit mitigation measures.

As the site is located approximately 18 metres below ground surface level, any construction works being undertaking as part of the proposed Newington Public School development are not anticipated to have any noise and vibration impact on the Metro construction. Similarly, any further construction on the Metro line is not anticipated to have any noise and vibration impact on the Newington Public School development.

8 Conclusion

This report presents a construction and operational noise and vibration assessment for the proposed Newington Public School, which proposes the addition of a new two storey building comprising of general and specialist learning areas, staff facilities and stairwell.

Construction noise and vibration criteria have been determined in accordance with relevant guidance such as the ICNG and Assessing Vibration a Technical Guideline. It is likely that construction works may have some noise and vibration impact on the nearby residential receivers. It is anticipated that these impacts will be able to be managed through works being carried out during standard working hours and with the implementation of reasonable and feasible work practices.

Operational noise emission criteria have been set in accordance with the EFSG, NSW EPA's NPI and the AAAC guidelines and apply predominantly to mechanical plant noise emissions and school activities from the site. Provided the noise mitigation strategies presented in Section 9 are adopted, compliance with the noise emission criteria at neighbouring noise-sensitive land uses is expected.

9 Mitigation Measures

This section consolidates the recommended noise and vibration management measures identified throughout the assessment. Table 24 presents a summary of the mitigation strategies applicable to the project stages of design, construction and operation.

Table 24 Noise and vibration mitigation measures

ID	MM Name	Mitigation Measure	Timing
Noise and Vibration			
NV1	Construction Noise and Vibration	A Construction Noise and Vibration Management Plan must be implemented in accordance with the NSW EPA Interim Construction Noise Guideline (2009).	During Construction
NV2	Vibration During Construction	Vibration levels induced by demolition activities, or other vibration intensive activities such as rock hammering, must be in accordance with the AS2436 – Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites. The operation of plant and equipment must not give rise to the transmission of vibration nuisance or damage to other premises. Prior to commencement of vibration-generating activities, a specific vibration monitor must be set up either at the property boundary or nearest sensitive receiver to monitor and record the vibration levels affecting buildings on adjacent land using the Assessing Vibration: A Technical Guide (DECC, 2009).	During Construction
NV3	Operational Noise	A suitably qualified acoustic engineer must demonstrate that noise associated with the operation of mechanical plant or machinery installed does not exceed the relevant project noise trigger levels.	Prior to commencement of Operations
NV4*	Classroom Glazing Acoustic Performance	Glazing systems for classrooms must be selected to achieve a minimum Rw rating to meet EFSG internal noise criteria as specified in Section 7 of the Acoustic Assessment Report.	Design
NV5*	Air Conditioning Plant Acoustic Enclosure	Air conditioning plant room must be enclosed with acoustic louvres providing minimum octave-band insertion loss as specified in Section 6.1 of the Acoustic Assessment Report.	Design and During Operations
NV6*	PA and School Bell System Design	The PA and school bell system must be designed to minimise noise spill through use of directional speakers, appropriate speaker quantity and placement, noise limiter, and short announcement duration in accordance with Section 6.2 of the Acoustic Assessment Report.	Design and During Operations

ID	MM Name	Mitigation Measure	Timing
NV7*	Construction Noise and Vibration Management Plan	A Construction Noise and Vibration Management Plan must be developed and implemented, incorporating construction noise criteria, equipment usage schedules, community consultation processes and complaints management procedures as detailed in Section 5.3.1 of the Acoustic Assessment Report.	During Construction
NV8*	Stakeholder Consultation and Notification	Stakeholder consultation and notification must be undertaken for nearby residents on Heidelberg Ave, O'Neill Ave and Devitt Ave prior to commencement of works. A complaints register must be maintained throughout construction.	During Construction
NV9*	Work Programming and Scheduling	High-noise activities must be scheduled within standard working hours. Respite periods must be considered for high-noise tasks in accordance with Section 5.3.3 of the Acoustic Assessment Report.	During Construction
NV10*	Truck Movements and Site Access	Truck movements and site access points must be located away from residences where feasible, in accordance with Section 5.3.4 of the Acoustic Assessment Report.	During Construction
NV11*	Construction Site Management	Noisy plant must be located away from residences where feasible. Site management measures must include utilising shielding, reducing reversing alarms, and shutting down idle equipment in accordance with Section 5.3.5 of the Acoustic Assessment Report.	During Construction
NV12*	Equipment Management	Construction equipment management must include selection of low-noise plant, proper maintenance, use of mufflers/silencers, and minimised power output in accordance with Section 5.3.6 of the Acoustic Assessment Report.	During Construction
NV13*	Vibration Management	Smaller vibration intensive equipment must be used when working near site boundaries. Minimum working distances must be complied with. Vibration monitoring must be conducted if works are proposed within minimum working distance limits, in accordance with Section 5.2 of the Acoustic Assessment Report.	During Construction

Note: * represents a Bespoke MM identified, in addition to the Standard MMs, to manage a project-specific impact.

Appendix A – Noise survey

Noise monitoring

Noise monitoring was conducted during the period Thursday 31 July to Monday 18 August 2025 at the project site. Unattended noise monitoring equipment was set up to measure the background noise of the most affected residential receivers in representative locations, as shown in Figure 3.

Instrumentation

Instrumentation for the survey comprised a Rion NL-42 Type 2 environmental noise logger and a Rion NL-22 Type 2 environmental noise logger (serial numbers 00409176 and 0946984) fitted with a microphone windshield. Calibration of the logger was checked prior to and following measurements. Calibration of the equipment 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. Noise measurements were taken in general accordance with AS1055.1.

The noise logger was configured to record all relevant noise indices, including background noise level (L_{A90}) and equivalent continuous noise levels (L_{Aeq}), and average maximum noise levels (L_{A10}). Samples were accumulated at 15-minute intervals. The time response of the logger was set to 'fast'.

Noise measurements were taken in general accordance with AS1055.1[3]

Weather conditions

It is a requirement that noise data is captured during periods of favourable weather conditions for representative noise monitoring, avoiding adverse impacts of wind and rain on background noise levels. In order to assess weather conditions for the measurement period, half-hourly weather data was obtained from the Bureau of Meteorology (BOM) weather observation station ID 066212 (Sydney Olympic Park).

Noise data has been excluded from the processed results if:

- Rain occurred during a measurement period, and/or
- Wind speed exceeded 5 m/s (18 km/h) at the measurement height of 1.5 m above ground. Wind data obtained from the BOM is presented as the value at 10 m above ground (see explanation below).

The BOM wind speed data obtained for this report was measured at a height of 10 m above ground level. It is therefore necessary to apply a correction factor in order to estimate the wind speed at the height of the logger (1.5 m).

The methodology to formulate a correction factor has been derived[2]. The correction multiplier for the measured wind speed at 10 m is derived by the following formula.

$$W_{1.5}=W_{10}\times\left(\frac{M_{1.5,cat}}{M_{10,cat}}\right)$$

[2] Gowen, T., Karantonis, P. & Rofail, T. (2004), *Converting Bureau of Meteorology wind speed data to local wind speeds at 1.5m above ground level*, Proceedings of ACOUSTICS 2004

where:

$W_{1.5}$ = Wind speed at height of 1.5 m
W_{10} = Wind speed at height of 10 m
$M_{1.5,cat}$ = AS 1170 multiplier for receiver height of 1.5 m and terrain category
$W_{10,cat}$ = AS 1170 multiplier for receiver height of 10 m and terrain category

Unattended background noise monitoring results

Table 25 below presents the unattended background noise logging results for background and ambient noise levels of the surrounding environment.

Table 25 Measured noise levels at background noise logging location

Location	Description	Noise level during period – dB(A)		
		Daytime 07:00 – 18:00	Evening 18:00 – 22:00	Night-time 22:00 – 07:00
UM01	Rating Background Level (L_{A90})	42	42	39
	Ambient Noise Level (L_{Aeq})	58	49	47
UM02	Rating Background Level (L_{A90})	47	50	45
	Ambient Noise Level (L_{Aeq})	56	54	51

Derivation of noise emission criteria

Project specific noise trigger levels have been established in accordance with the NPI. Table 26 summarises the project specific acoustic criteria.

Table 26 Project specific noise criteria for residential receivers

Description	Derivation of NPI project specific noise levels		
	Daytime (7am – 6pm)	Evening (6pm – 10pm)	Night-time (10pm – 7am)
Rating background level (RBL)	42	42	39
Intrusive criterion (RBL + 5 dBA)	47	47	44
Amenity Noise Level (ANL) Suburban	50	45	35
Amenity Criterion (ANL – 5dBA + 3dBA)	48	43	38
NPI Project specific criteria for residential land uses	**47**	**43**	**38**

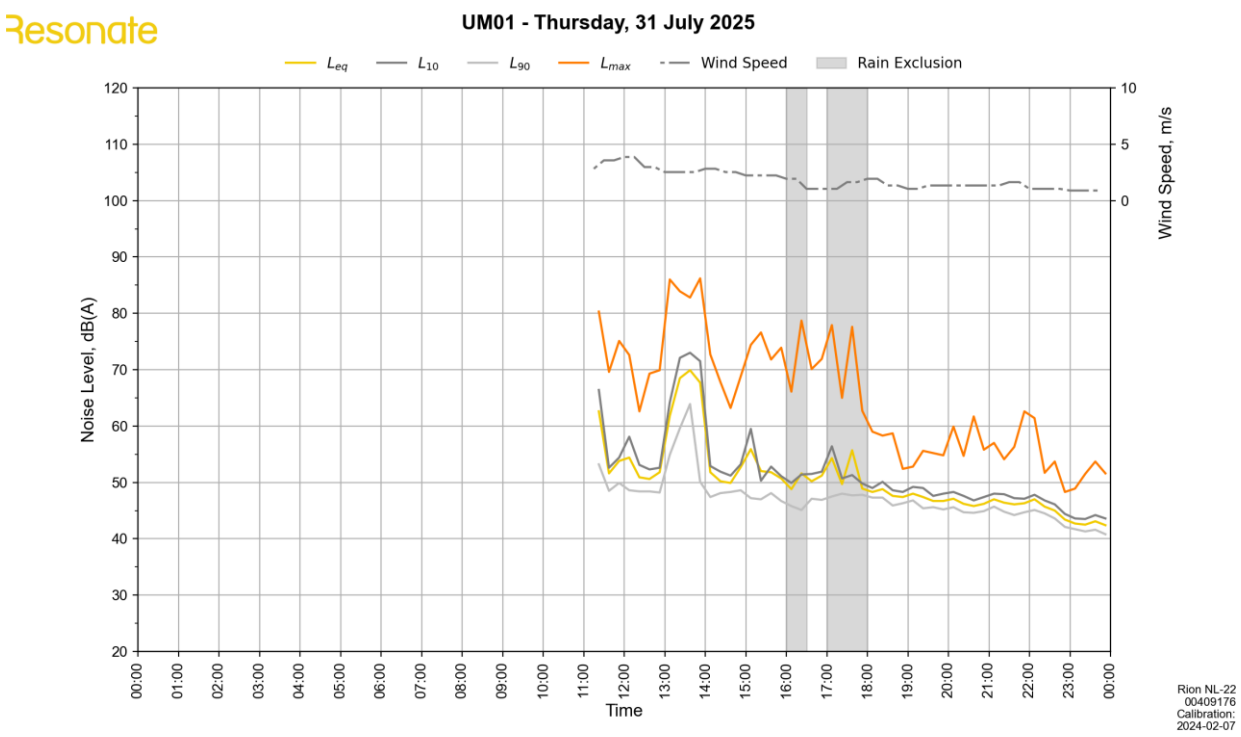
Based upon an unattended noise survey stated in Section 3 of this report, the project specific operational noise criteria for nearby receivers are provided in Table 27.

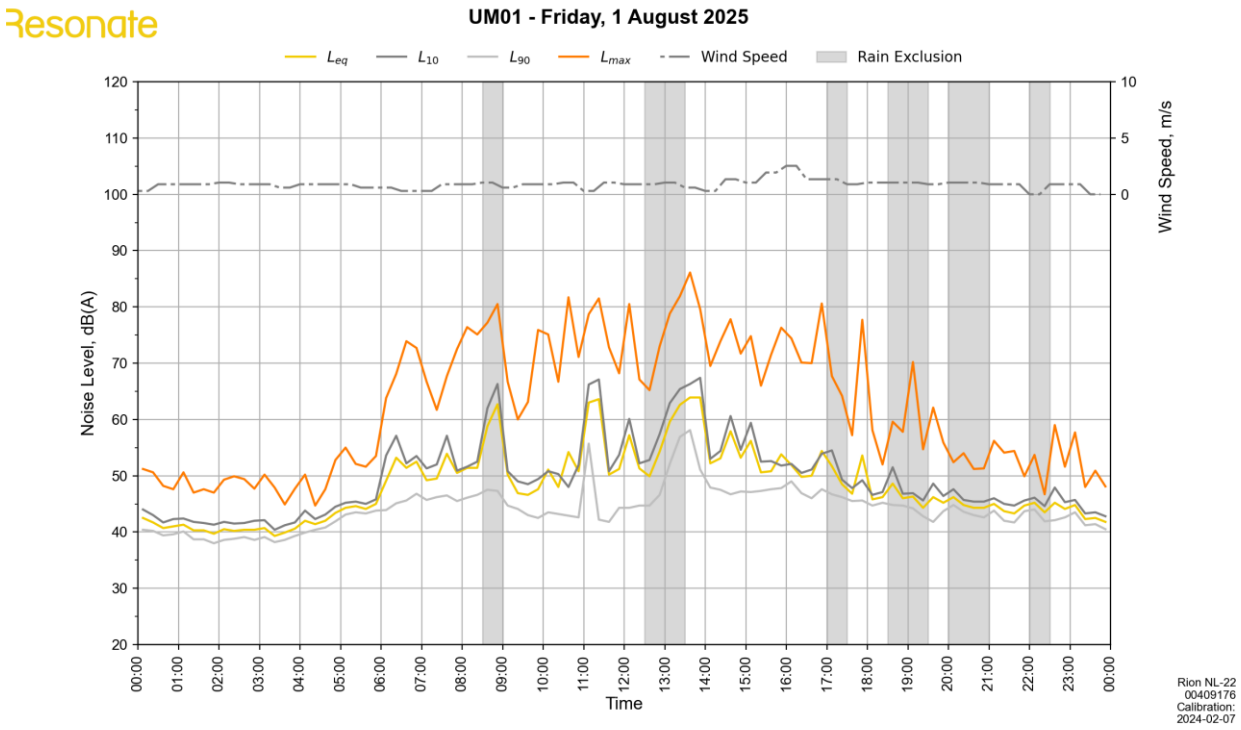
Table 27 Operational noise emission criteria (building services) – non-residential land uses

Location	Noise Emission Criteria (dB $L_{Aeq\ 15min}$)		
	Daytime 07:00 – 18:00	Evening 18:00 – 22:00	Night-time 22:00 – 07:00
Active recreation	53 dB(A) when in use		
Passive recreation	48 dB(A) when in use		

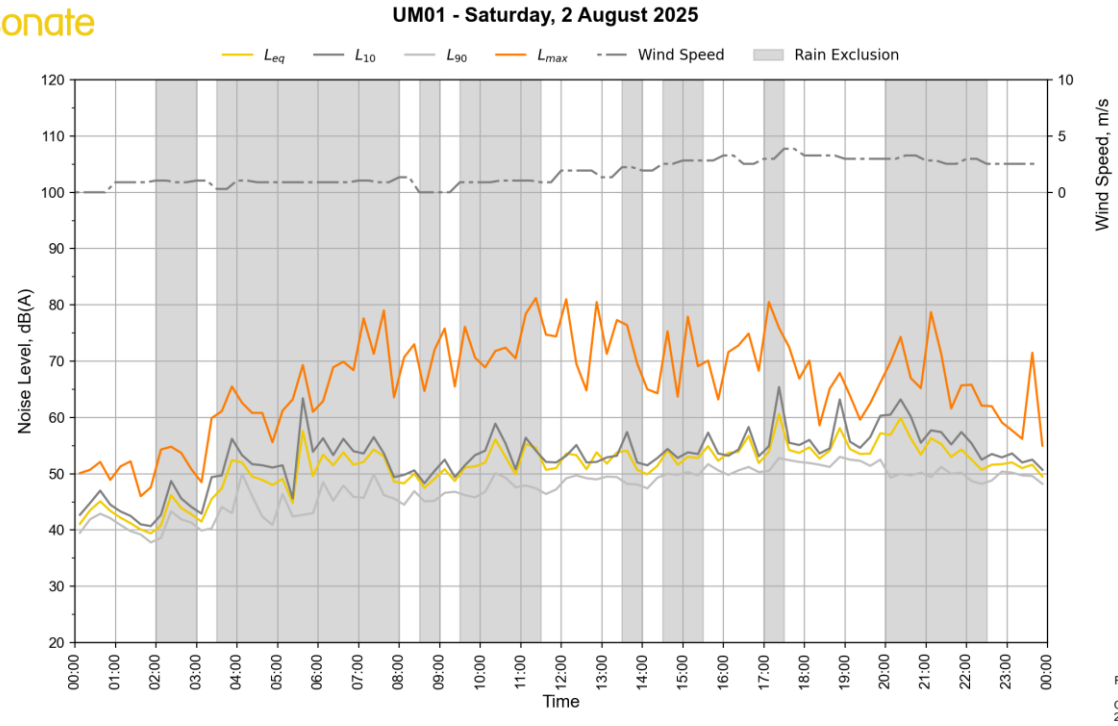
Appendix B – Daily noise graphs

Logger UM01

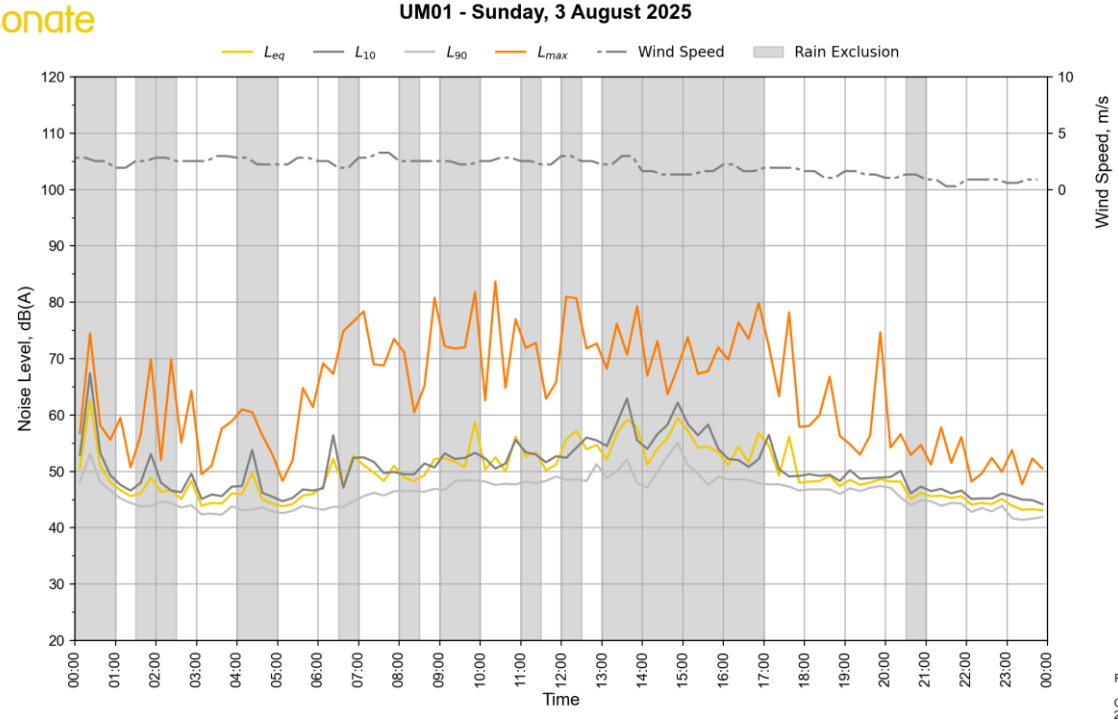


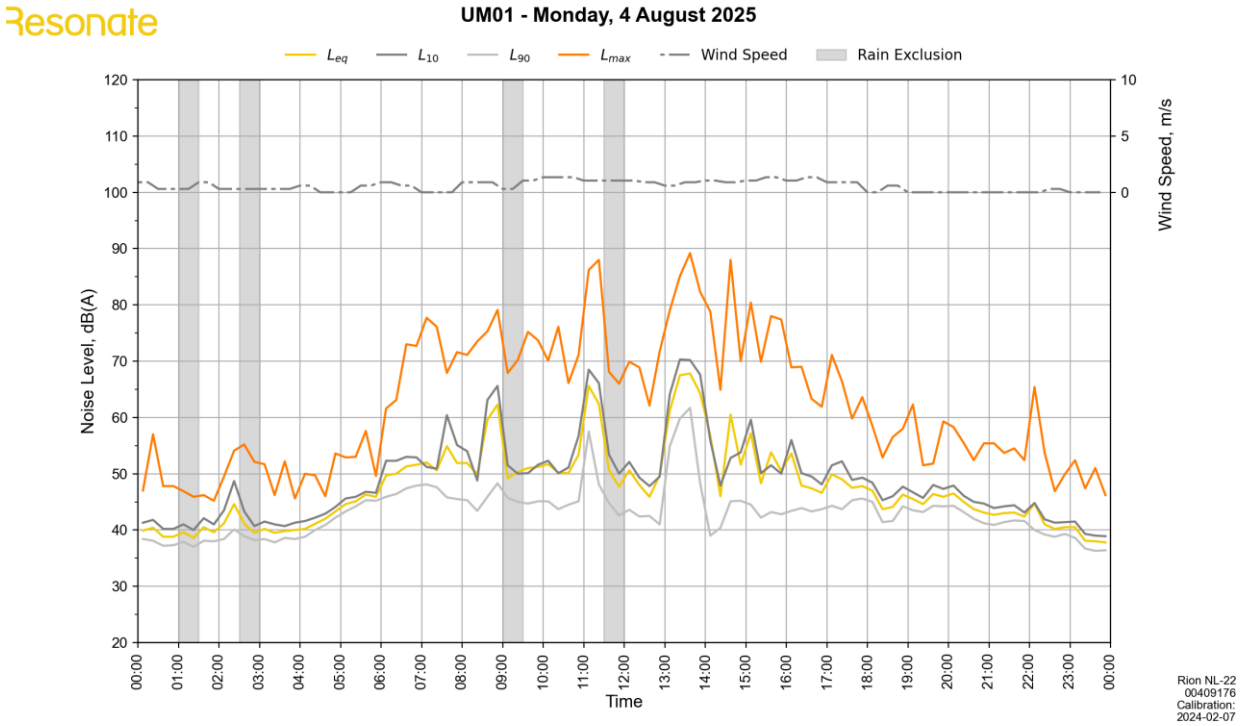


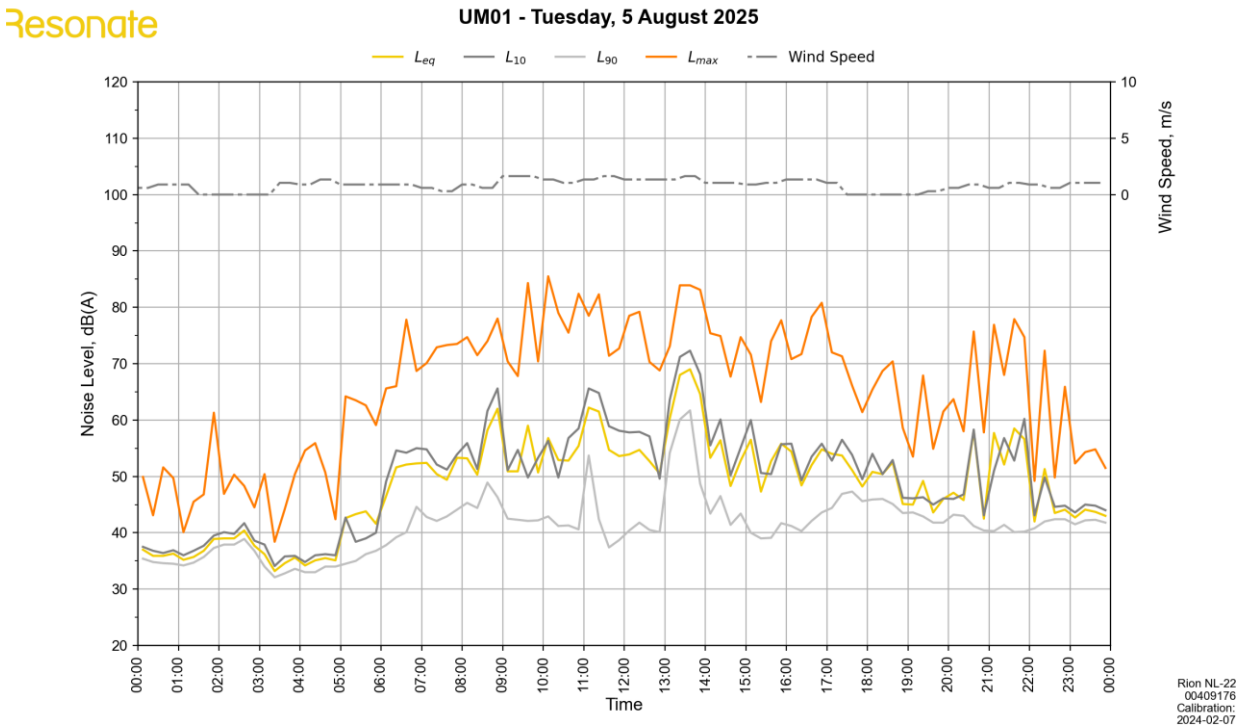
Resonate



Resonate

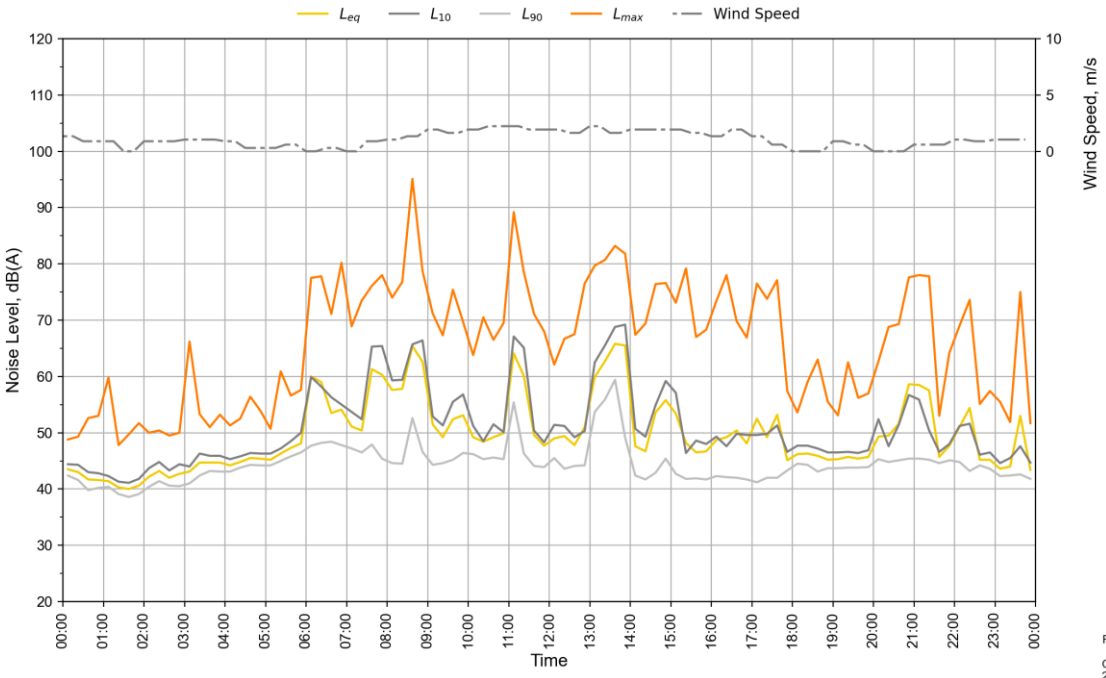



Resonate
UM01 - Monday, 4 August 2025
L_{eq} L_{10} L_{90} L_{max} Wind Speed Rain Exclusion
Noise Level, dB(A)
Wind Speed, m/s
Time
Rion NL-22
00409176
Calibration:
2024-02-07


Resonate
UM01 - Tuesday, 5 August 2025
L_{eq} L_{10} L_{90} L_{max} Wind Speed
Noise Level, dB(A)
Wind Speed, m/s
Time
Rion NL-22
00409176
Calibration:
2024-02-07

Resonate

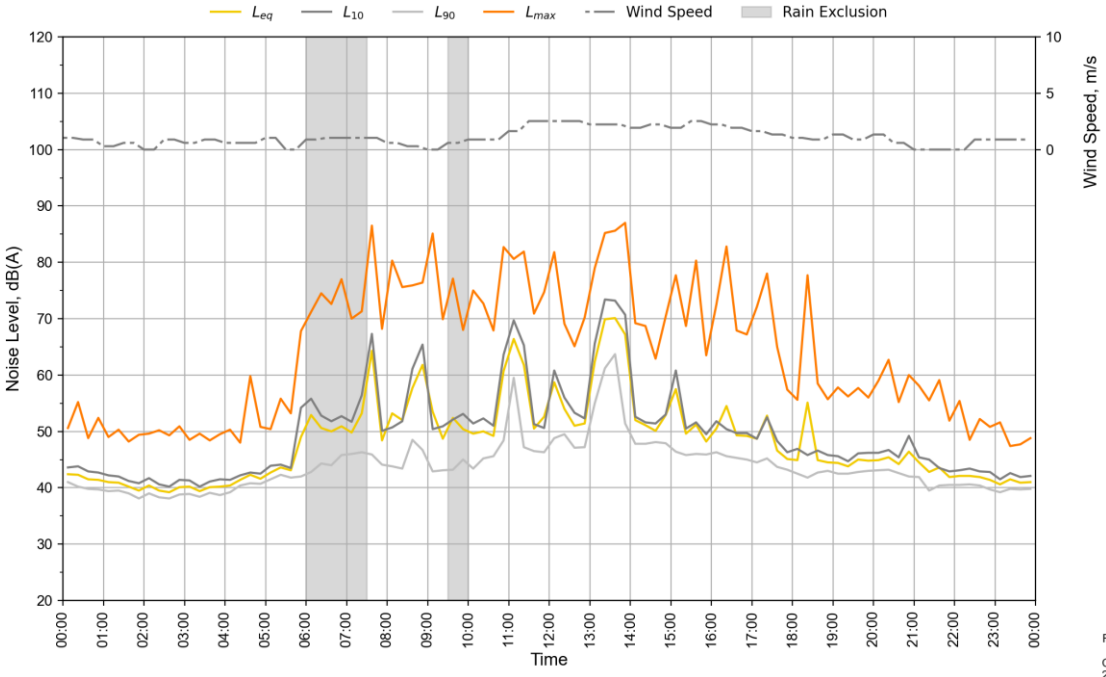
UM01 - Wednesday, 6 August 2025



Rion NL-22
00409176
Calibration:
2024-02-07

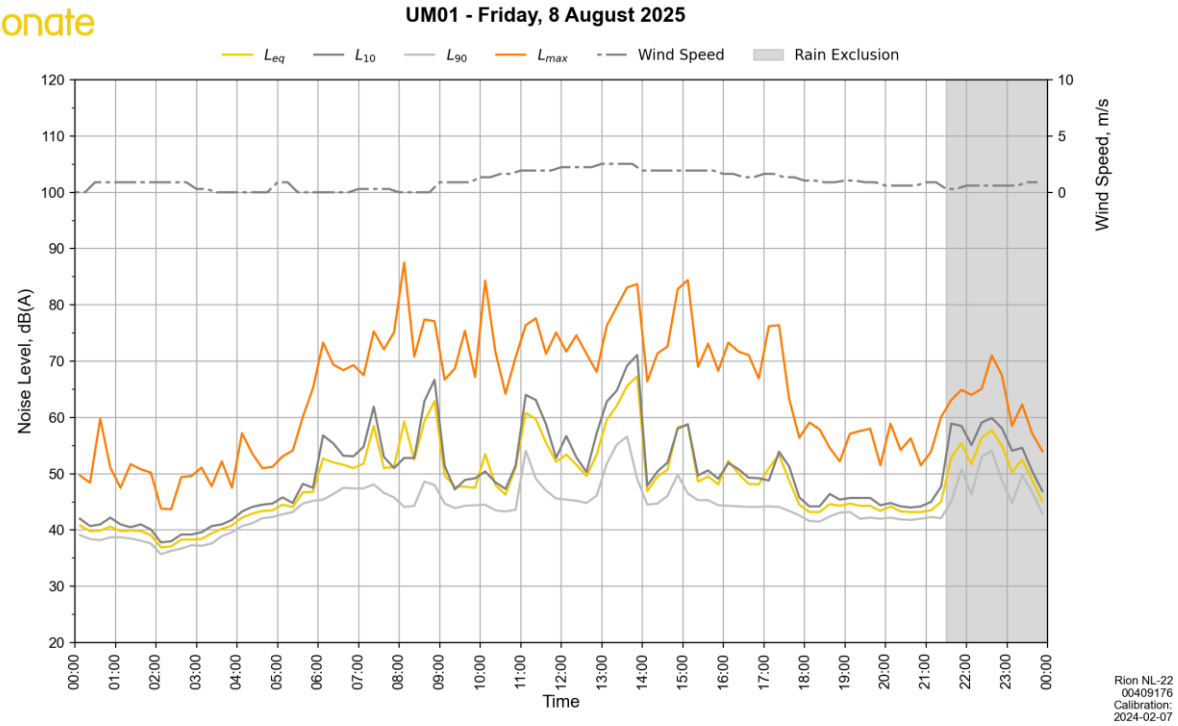
Resonate

UM01 - Thursday, 7 August 2025

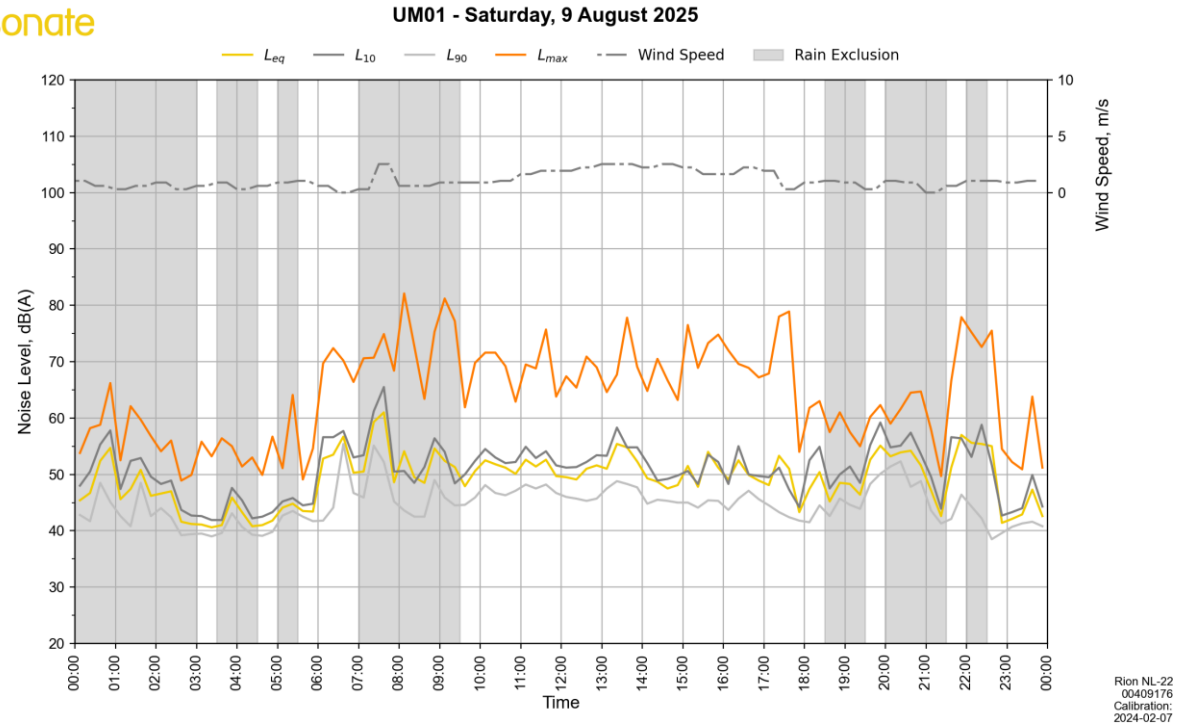


Rion NL-22
00409176
Calibration:
2024-02-07

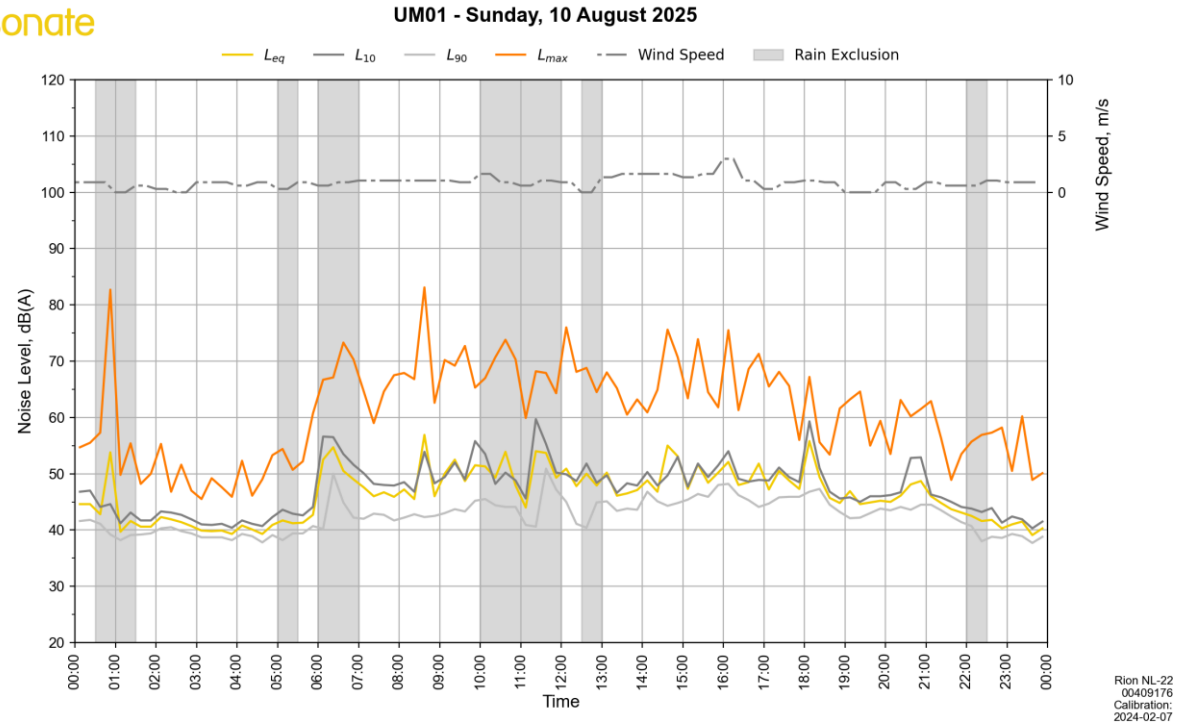
Resonate



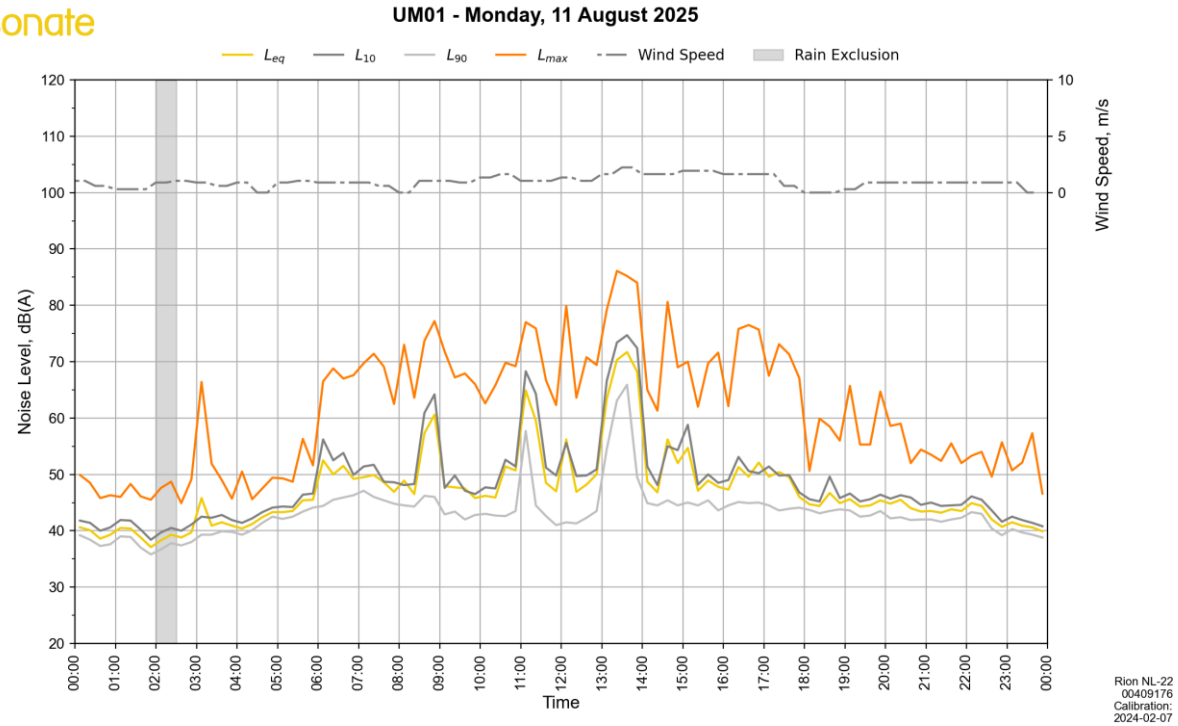
Resonate

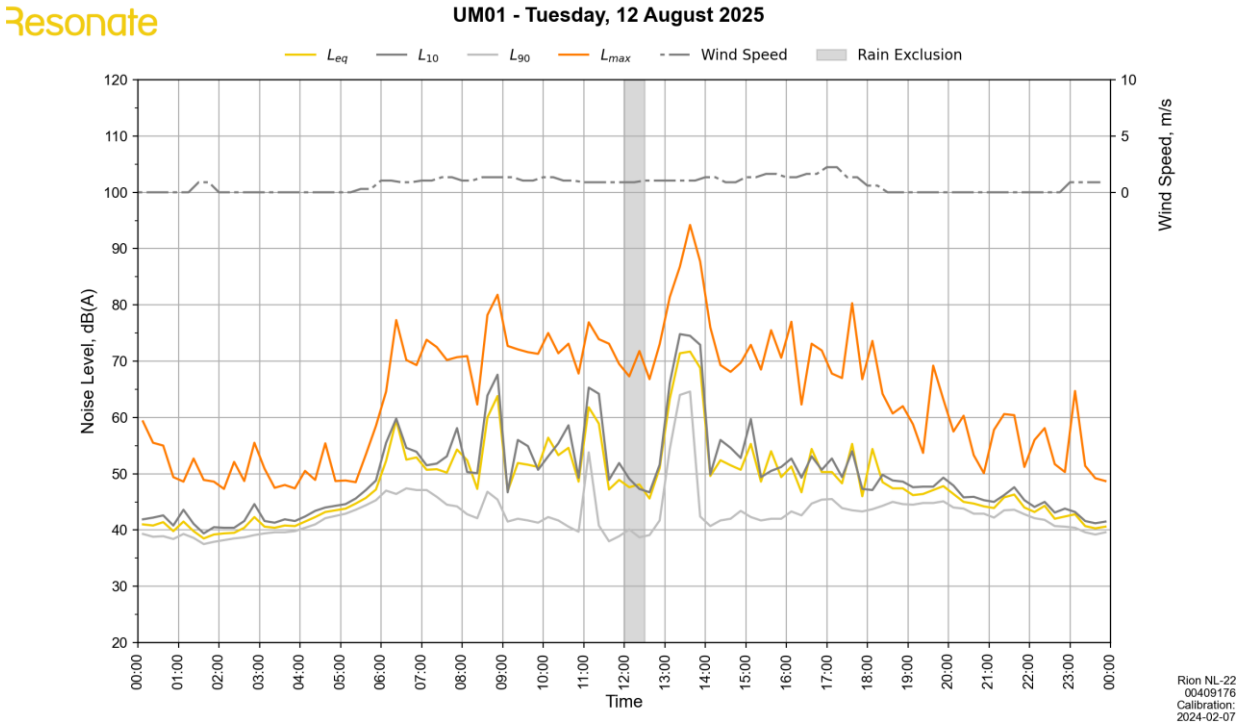


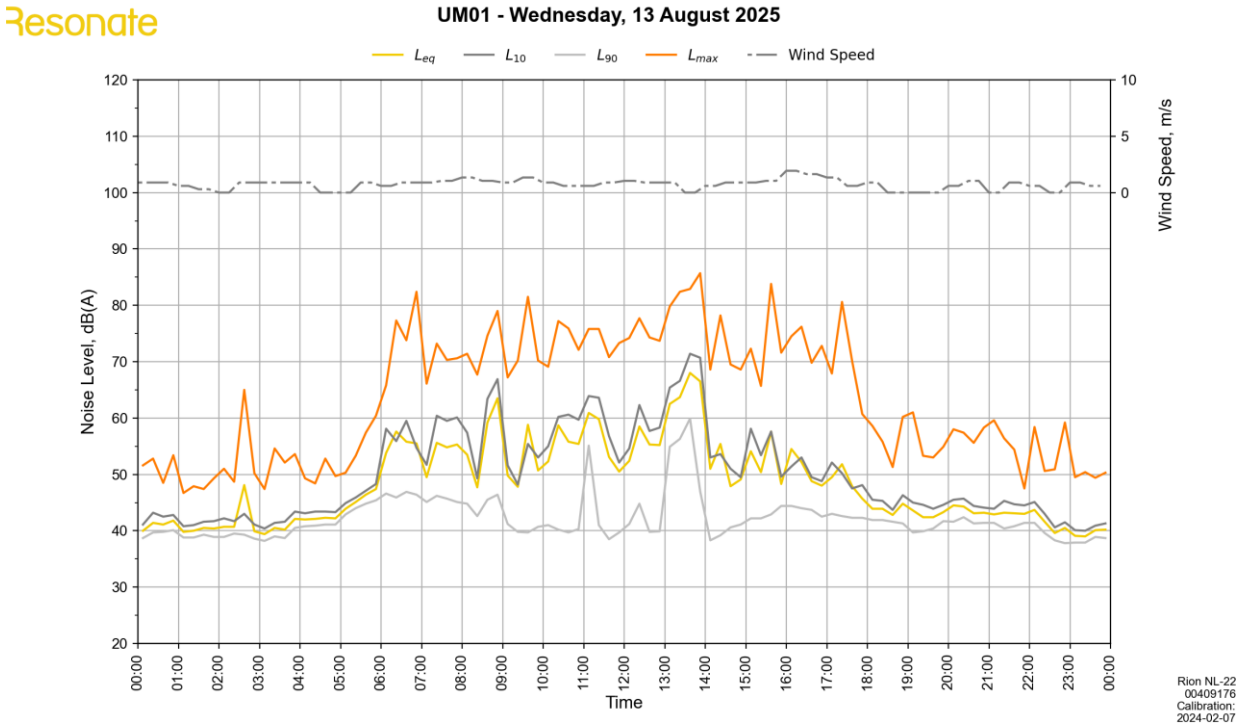
Resonate



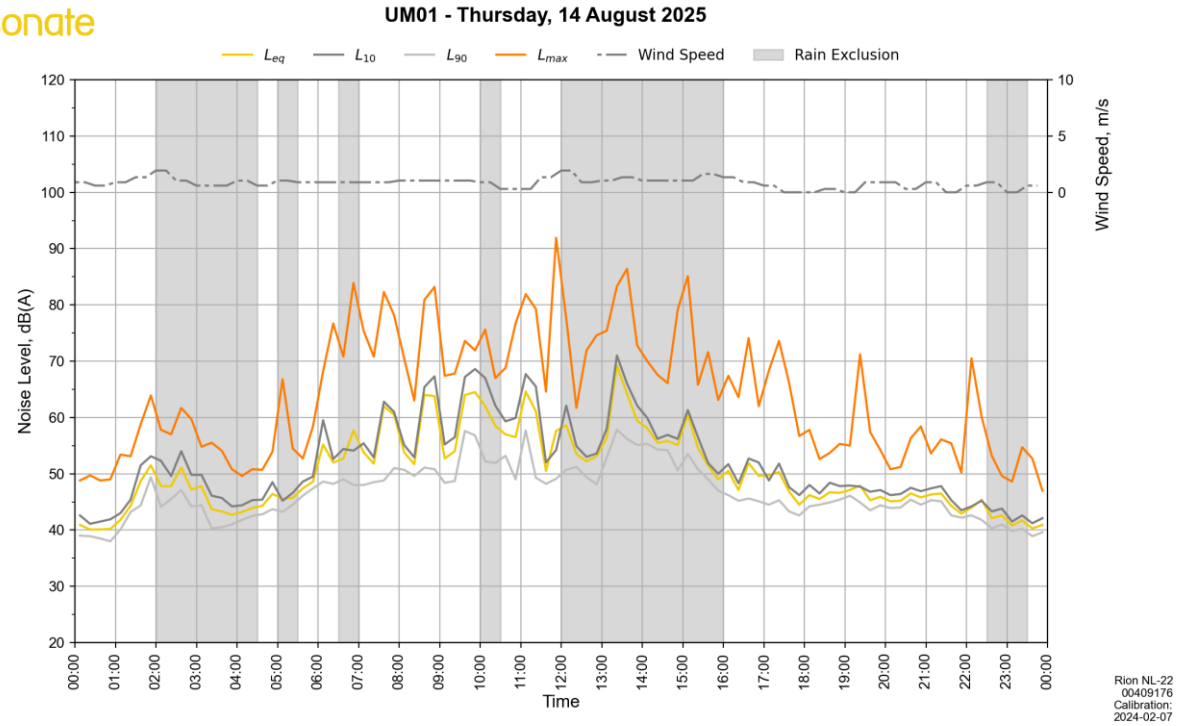
Resonate




Resonate
UM01 - Tuesday, 12 August 2025
L_{eq} L_{10} L_{90} L_{max} Wind Speed Rain Exclusion
Noise Level, dB(A)
Wind Speed, m/s
Time
Rion NL-22
00409176
Calibration:
2024-02-07


Resonate
UM01 - Wednesday, 13 August 2025
L_{eq} L_{10} L_{90} L_{max} Wind Speed
Noise Level, dB(A)
Wind Speed, m/s
Time
Rion NL-22
00409176
Calibration:
2024-02-07

Resonate



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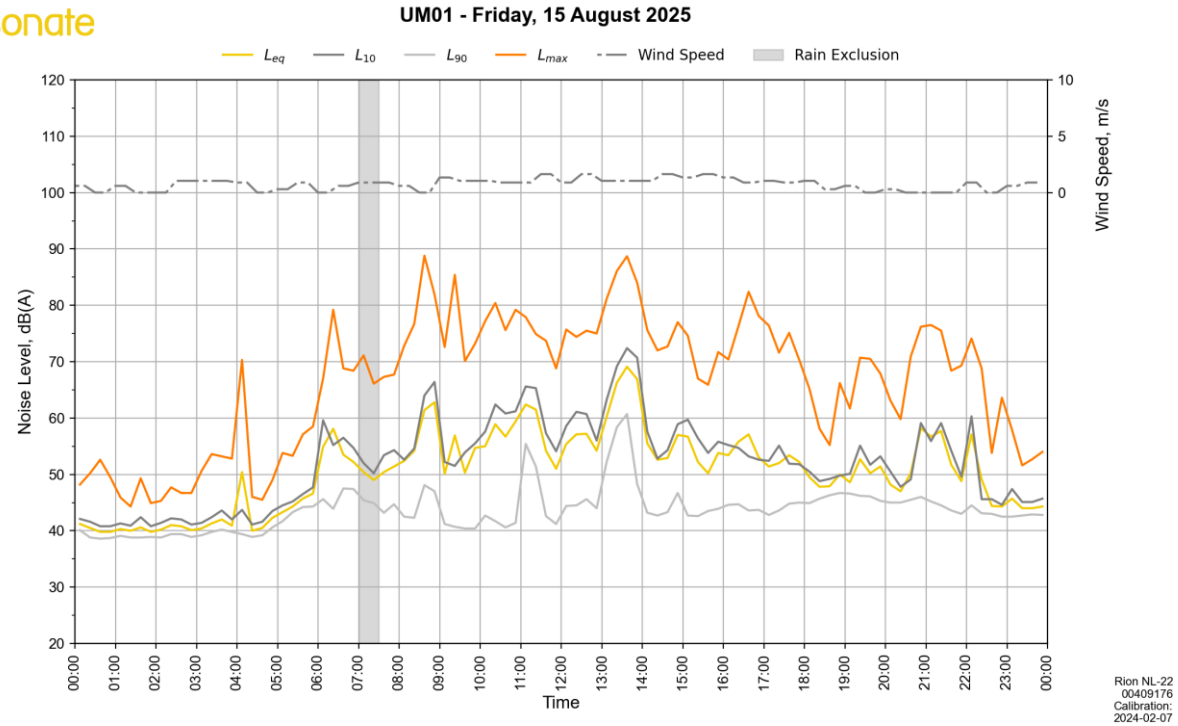
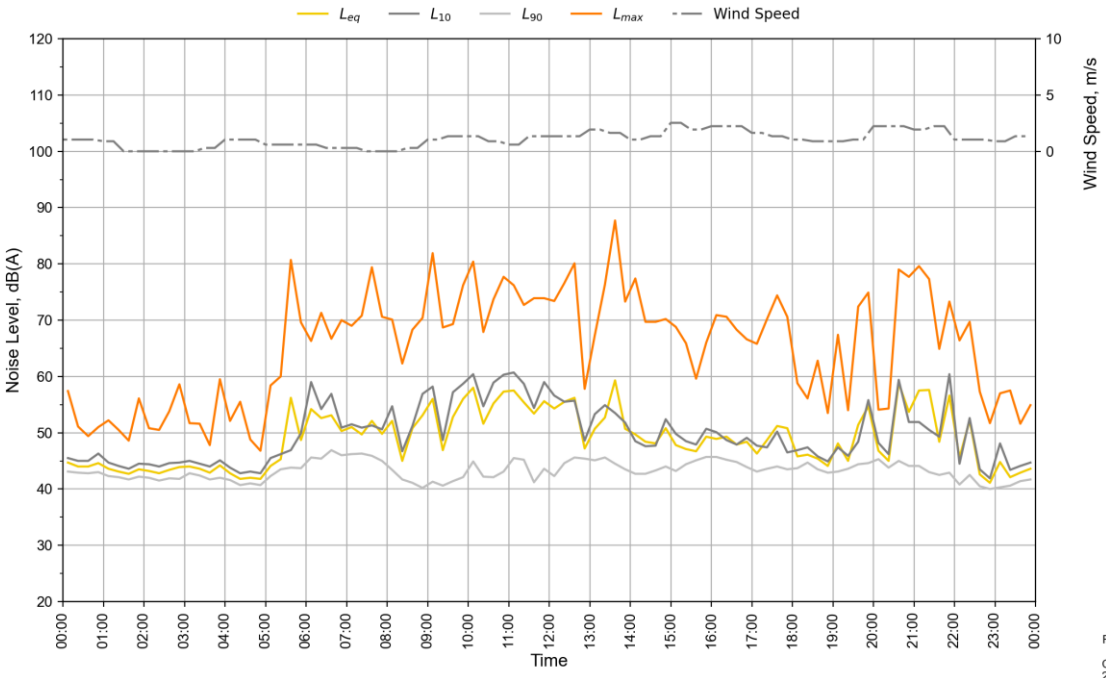


Resonate

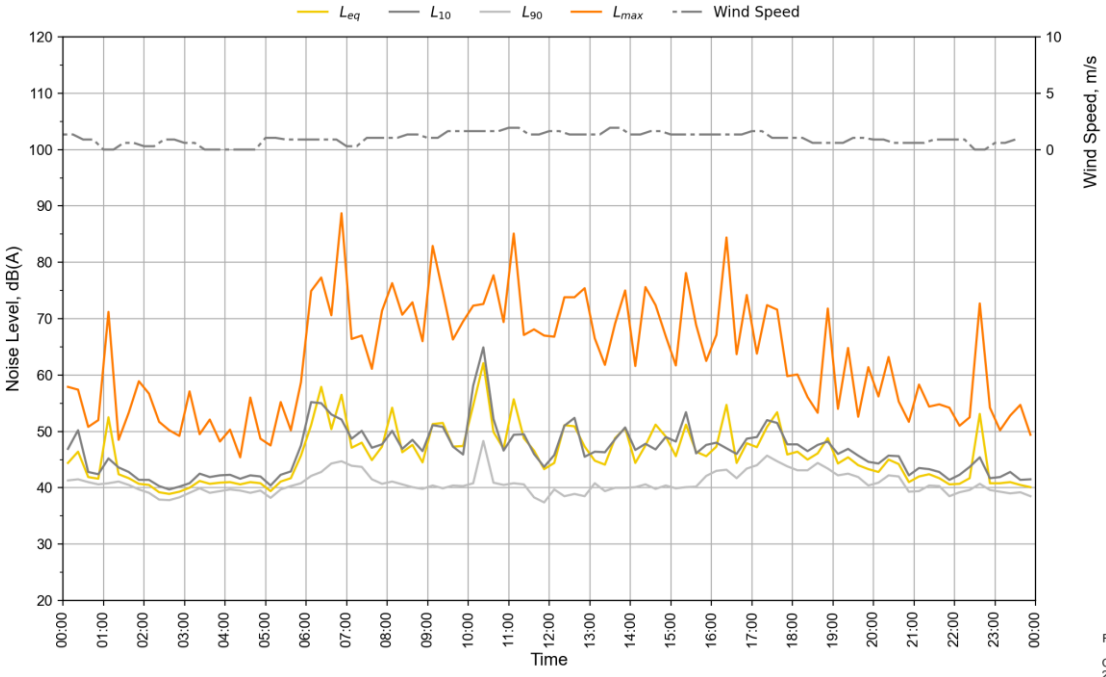
UM01 - Saturday, 16 August 2025



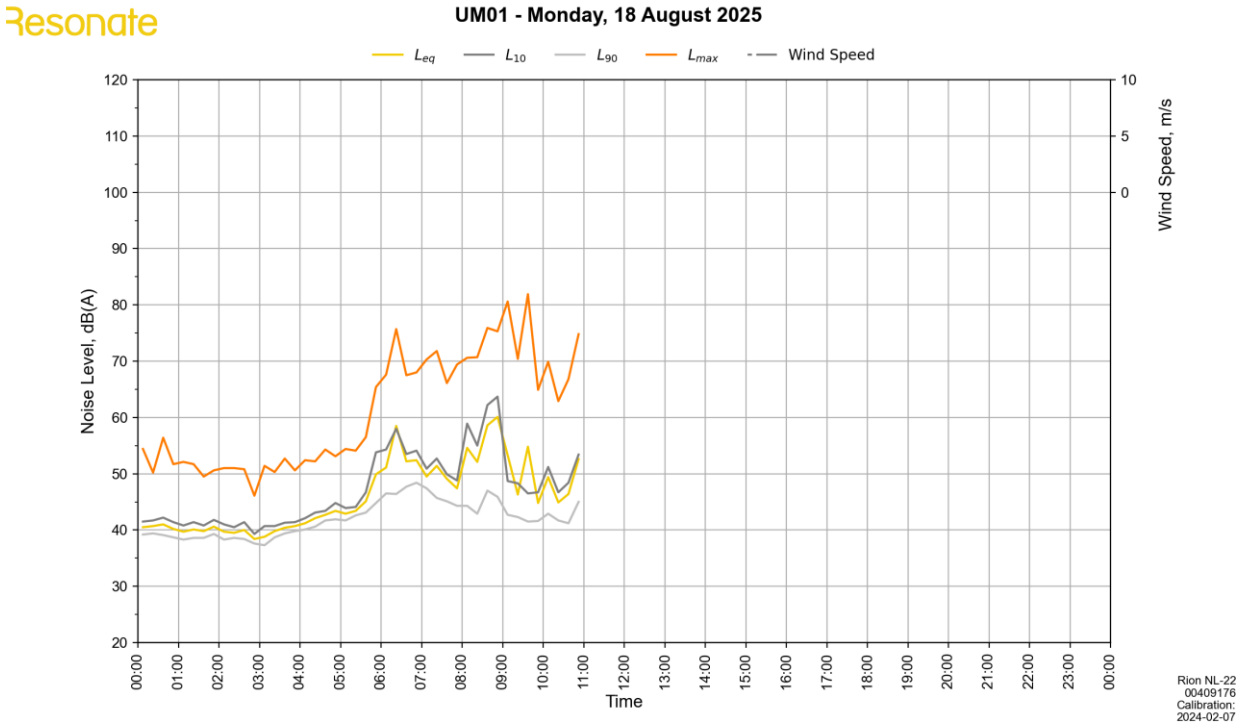
Rion NL-22
00409176
Calibration:
2024-02-07

Resonate

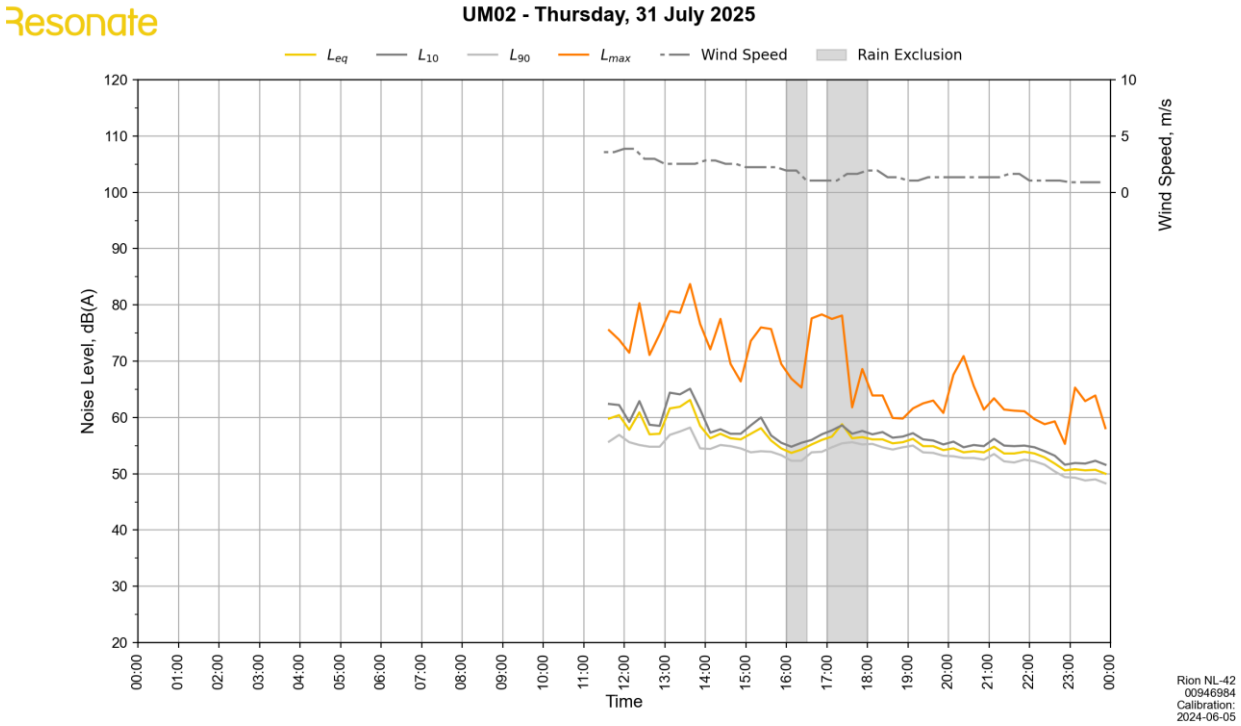
UM01 - Sunday, 17 August 2025

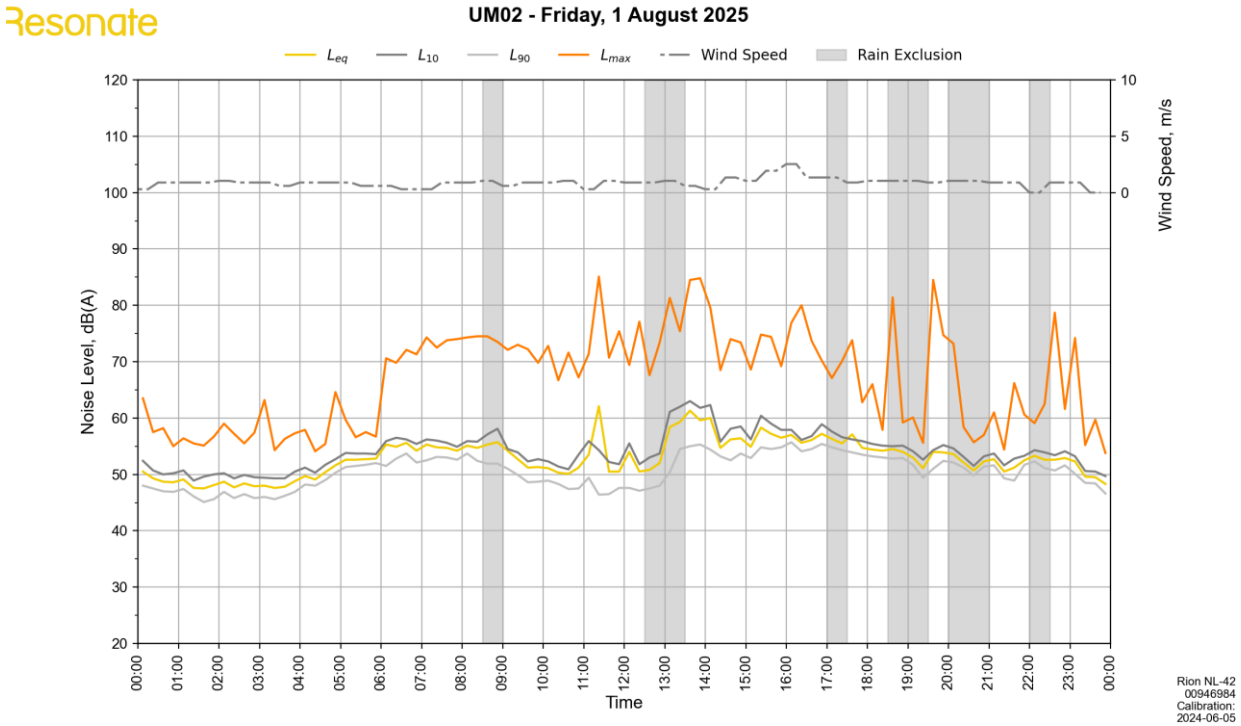


Rion NL-22
00409176
Calibration:
2024-02-07

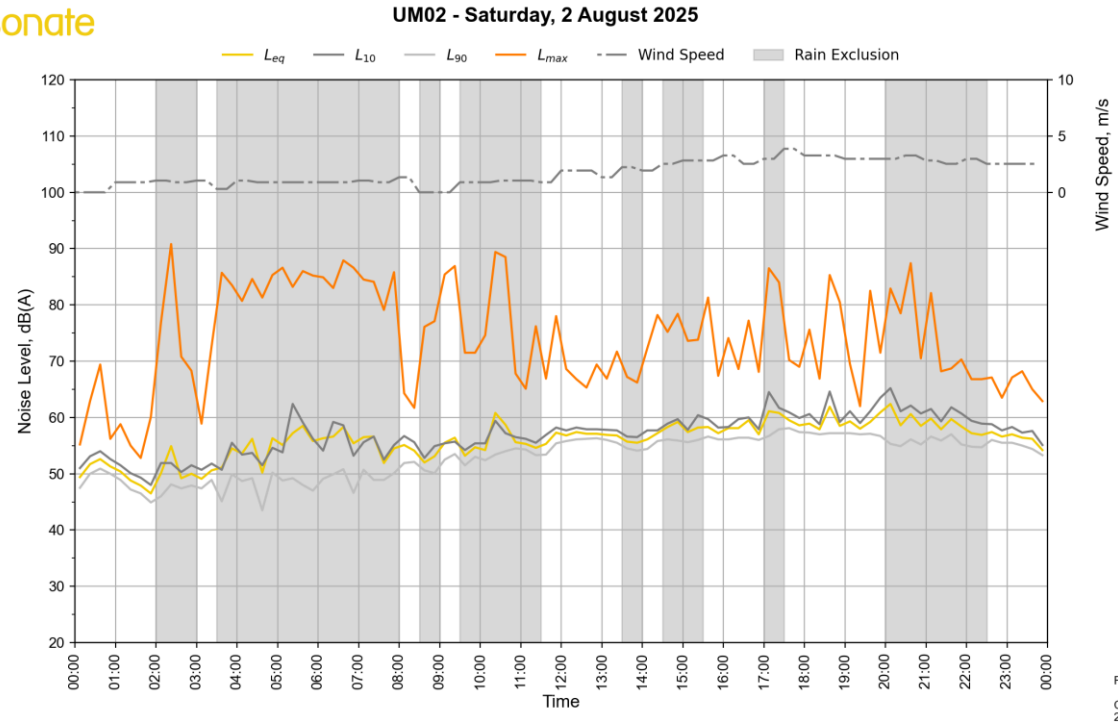

UM01 - Monday, 18 August 2025
L_{eq}
L_{10}
L_{90}
L_{max}
Wind Speed
Noise Level, dB(A)
Wind Speed, m/s
Time
Rion NL-22
00409176
Calibration:
2024-02-07

Logger UM02

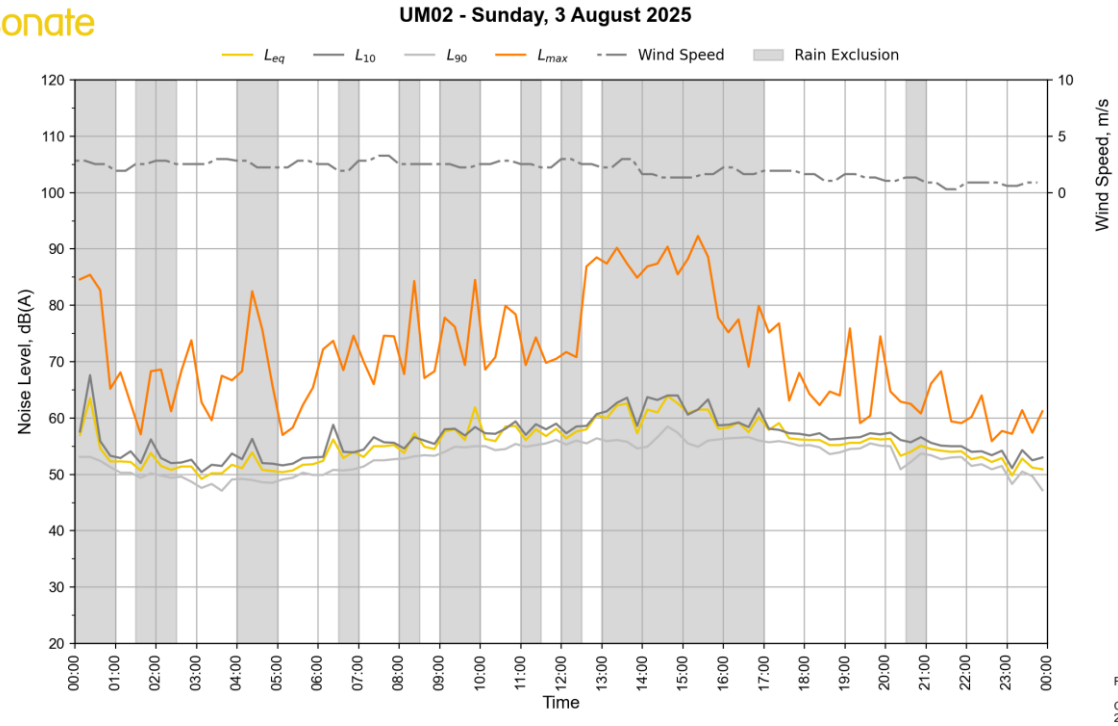

Resonate
UM02 - Thursday, 31 July 2025
Leq
L10
L90
Lmax
Wind Speed
Rain Exclusion
Noise Level, dB(A)
Wind Speed, m/s
Time
Rion NL-42
00946984
Calibration:
2024-06-05

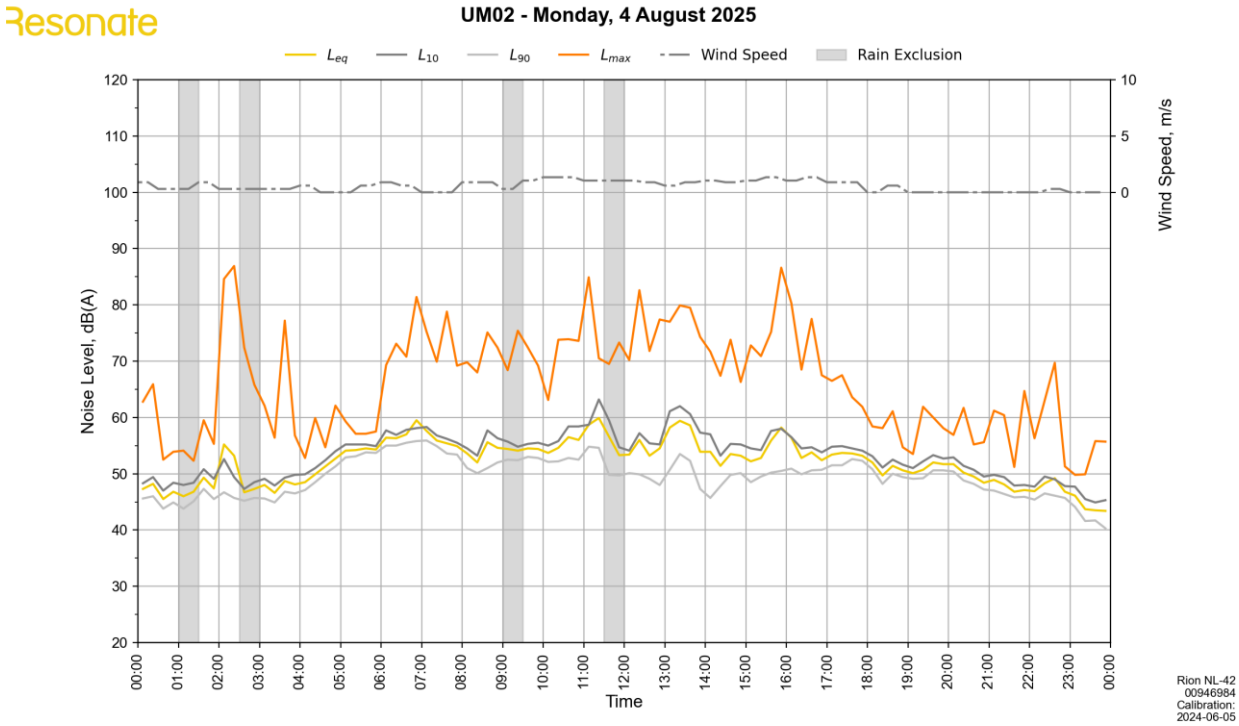

Resonate
UM02 - Friday, 1 August 2025
Leq
L10
L90
Lmax
Wind Speed
Rain Exclusion
Noise Level, dB(A)
Wind Speed, m/s
Time
Rion NL-42
00946984
Calibration:
2024-06-05

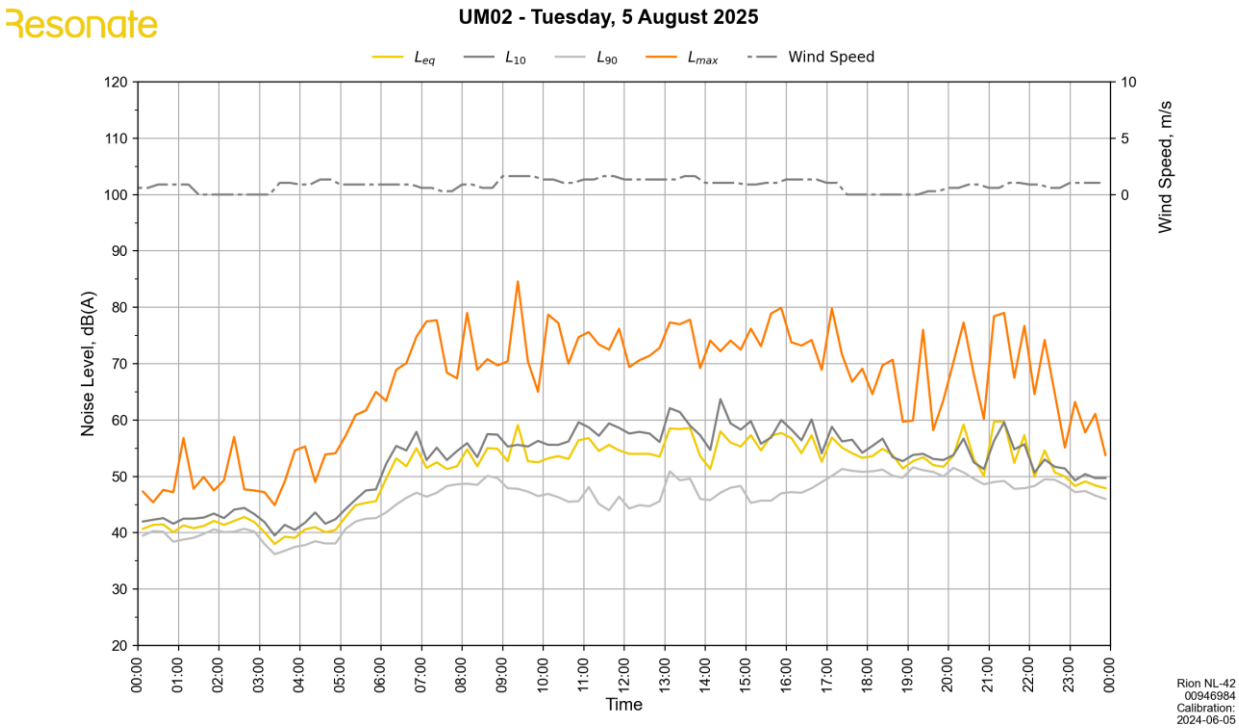
Resonate



Resonate

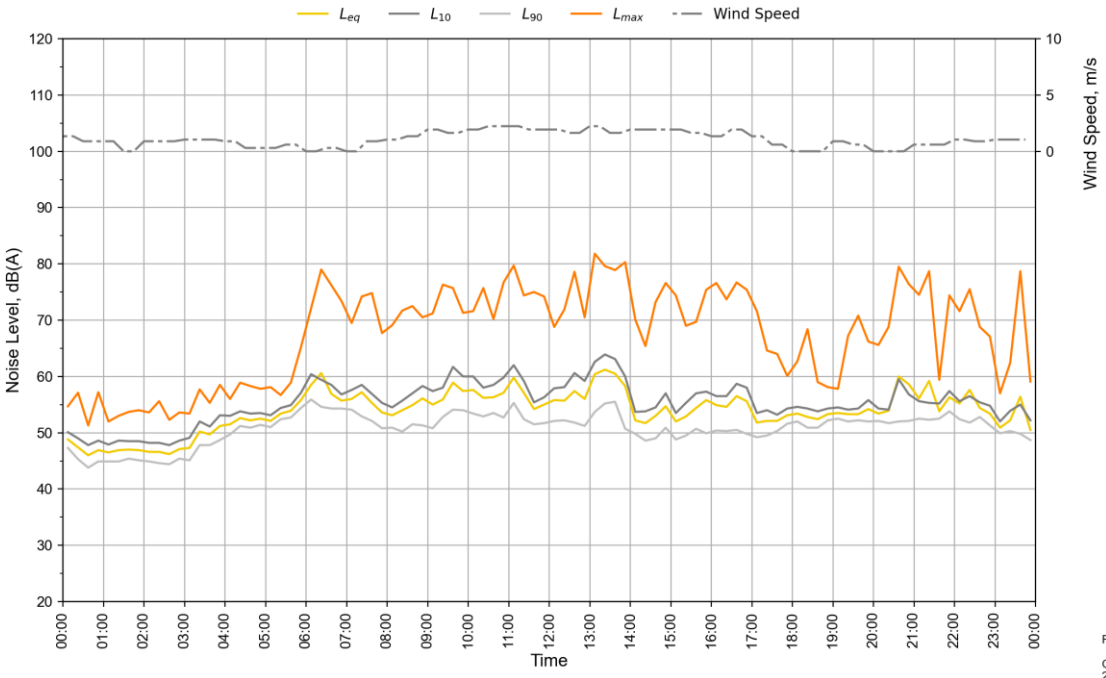



Resonate
UM02 - Monday, 4 August 2025
L_{eq} L_{10} L_{90} L_{max} Wind Speed Rain Exclusion
Noise Level, dB(A)
Wind Speed, m/s
Time
Rion NL-42
00946984
Calibration:
2024-06-05


Resonate
UM02 - Tuesday, 5 August 2025
L_{eq} L_{10} L_{90} L_{max} Wind Speed
Noise Level, dB(A)
Wind Speed, m/s
Time
Rion NL-42
00946984
Calibration:
2024-06-05

Resonate

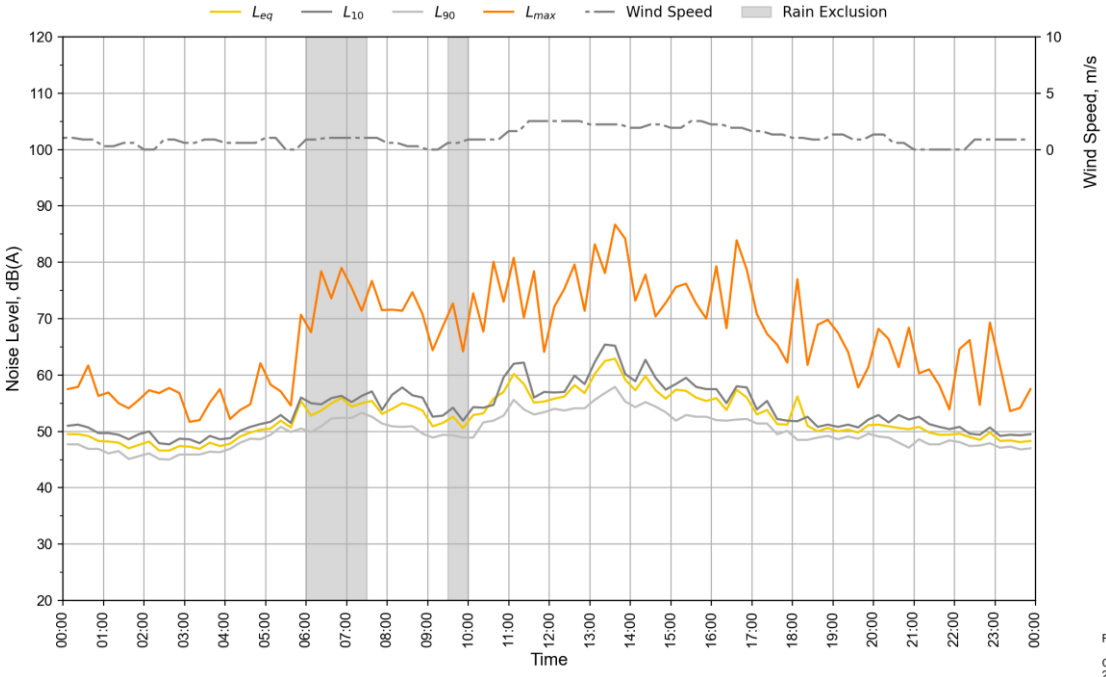
UM02 - Wednesday, 6 August 2025



Rion NL-42
00946984
Calibration:
2024-06-05

Resonate

UM02 - Thursday, 7 August 2025



Rion NL-42
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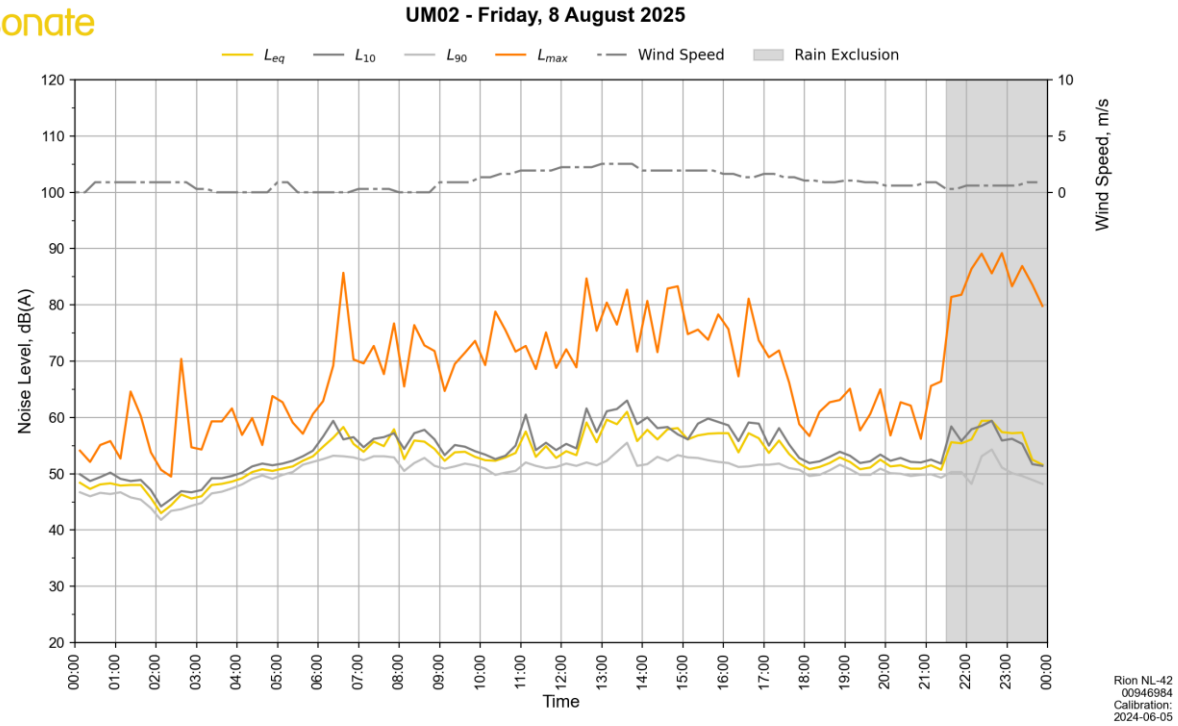
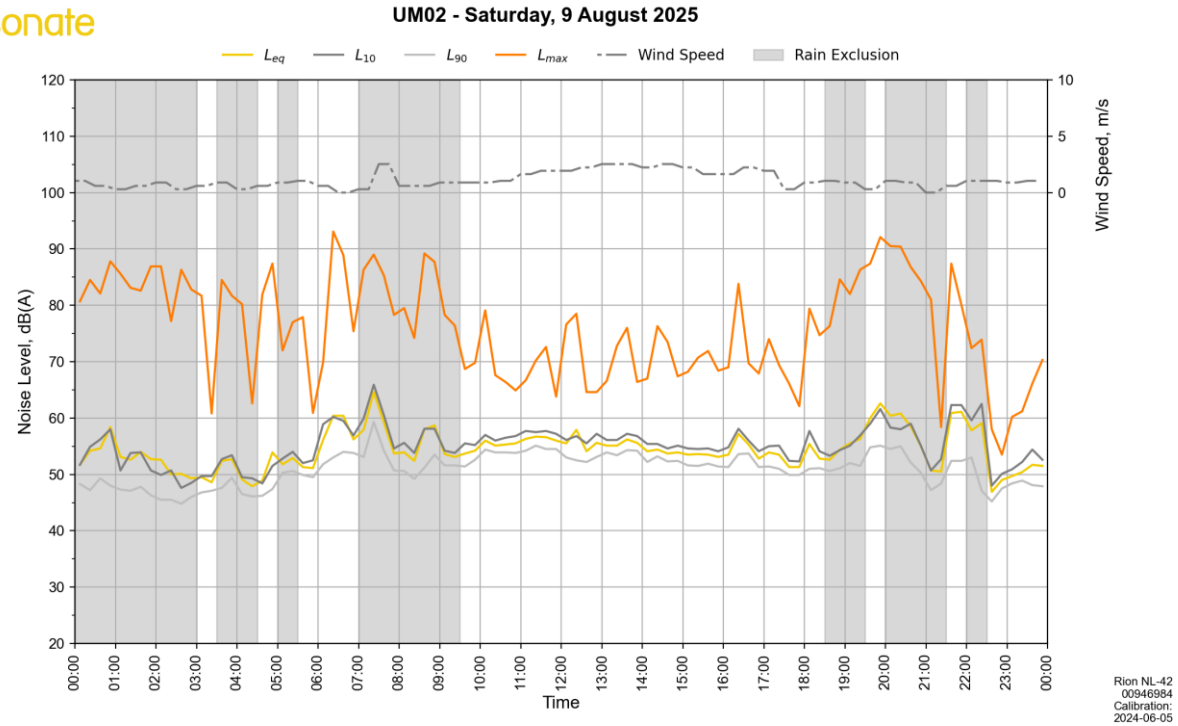
Calibration:
2024-06-05

Resonate



Resonate



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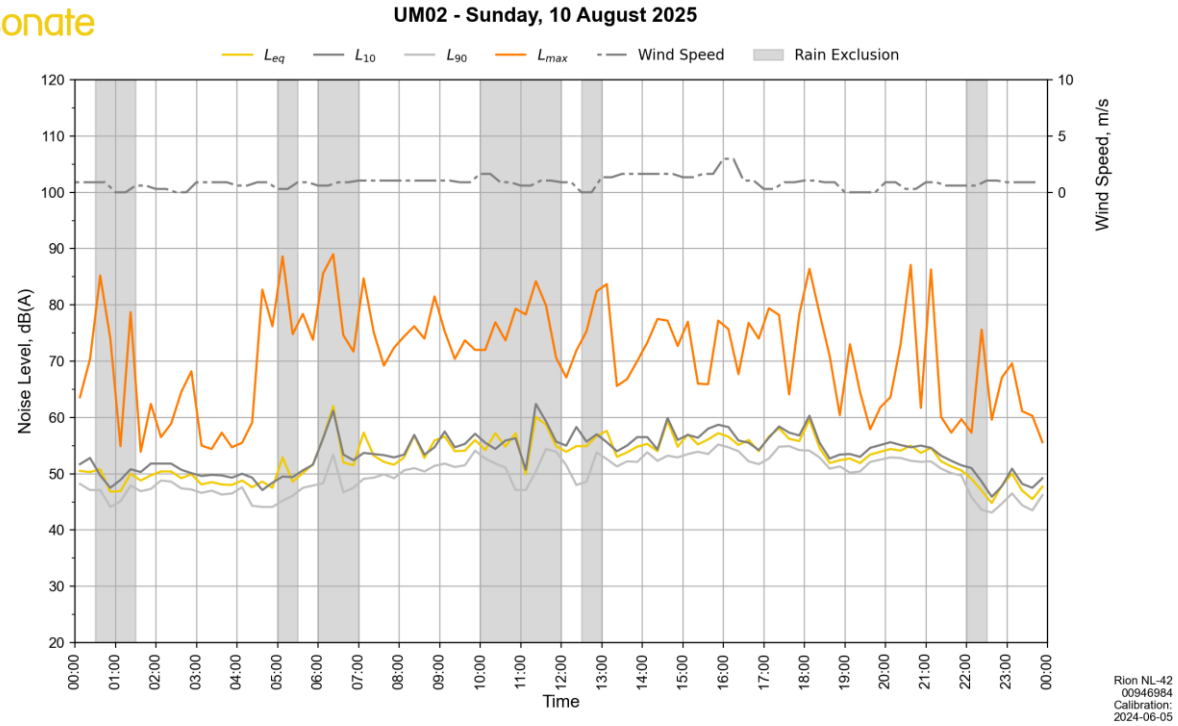
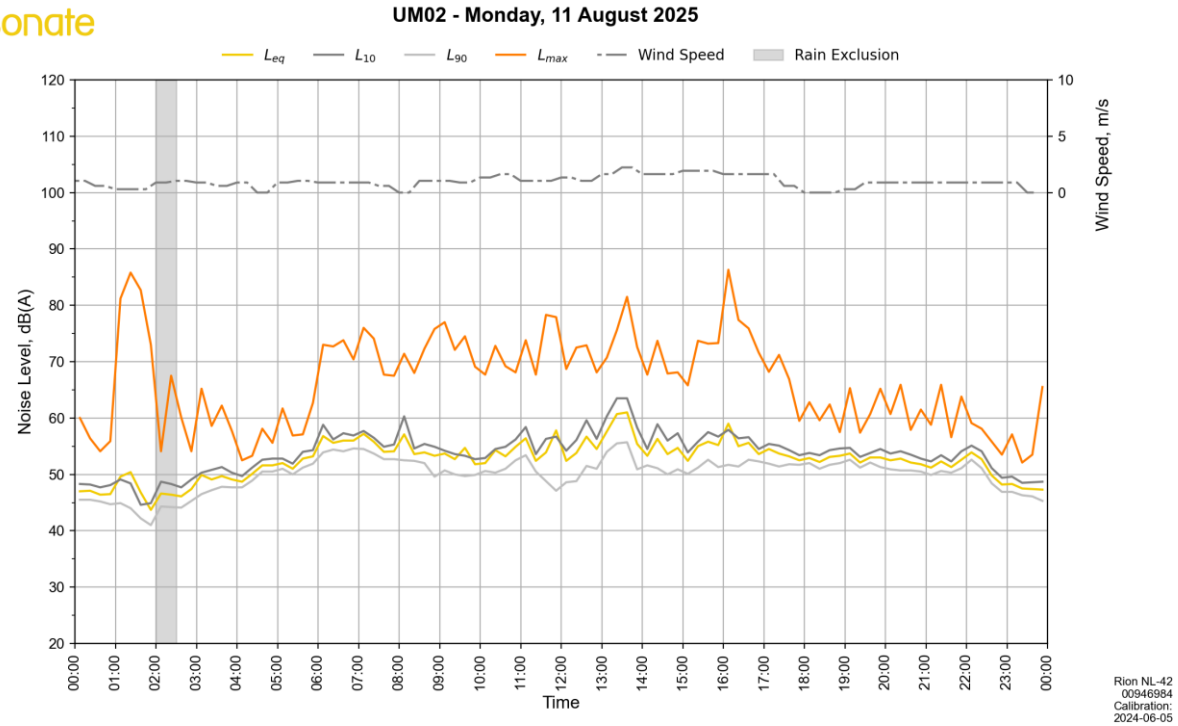
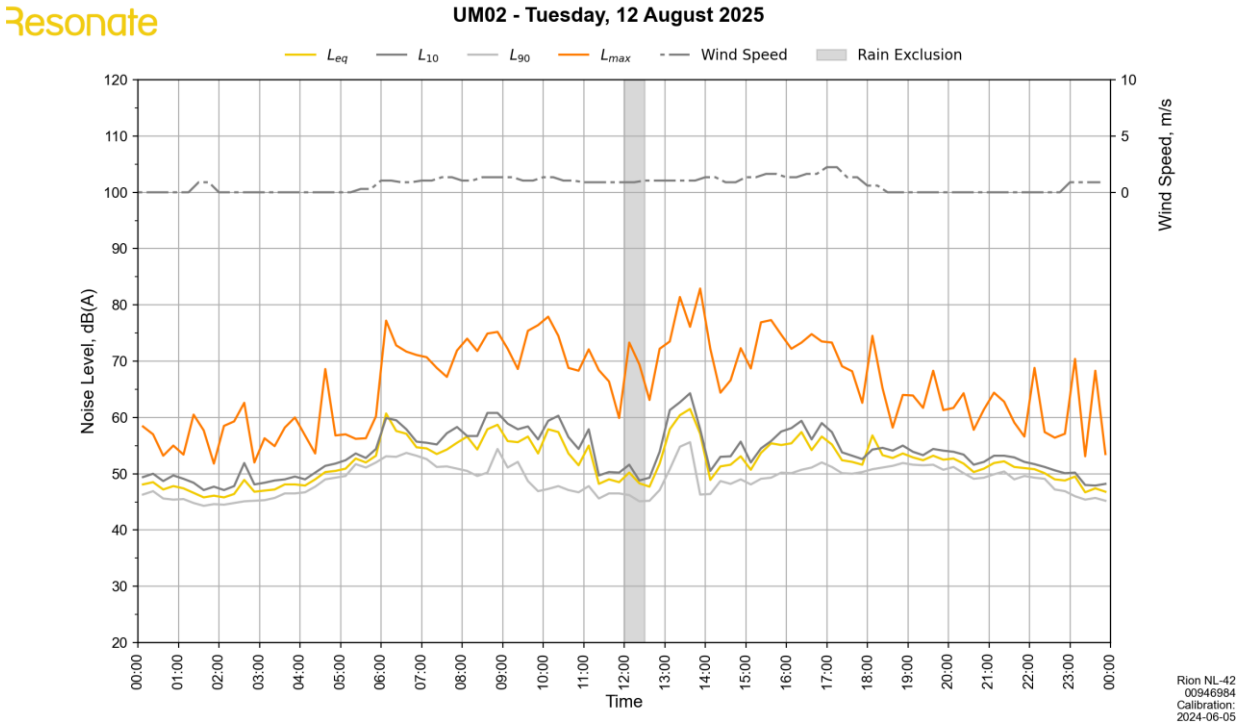
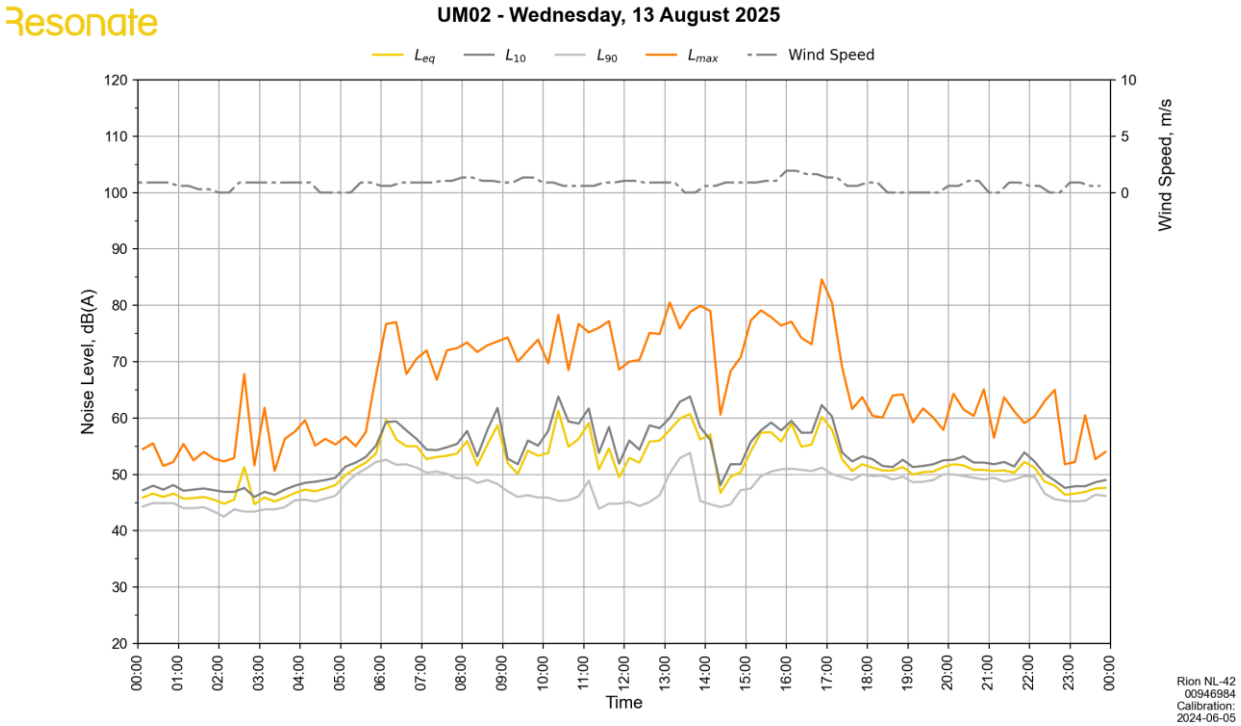


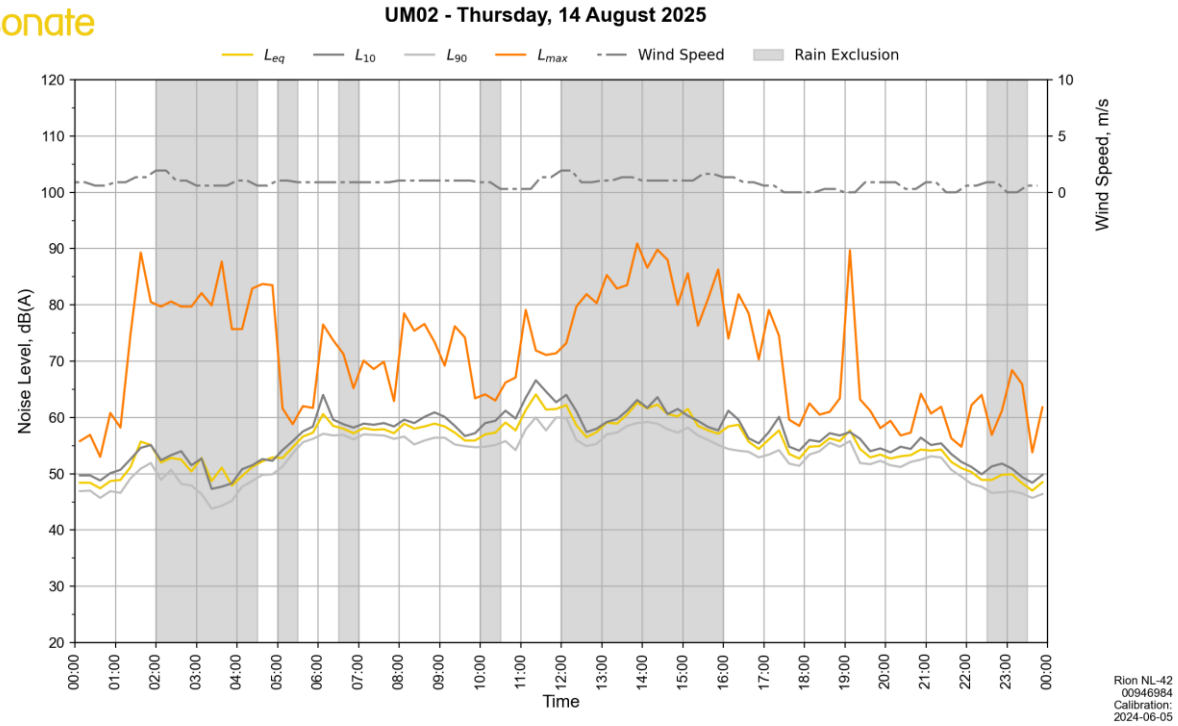
Resonate



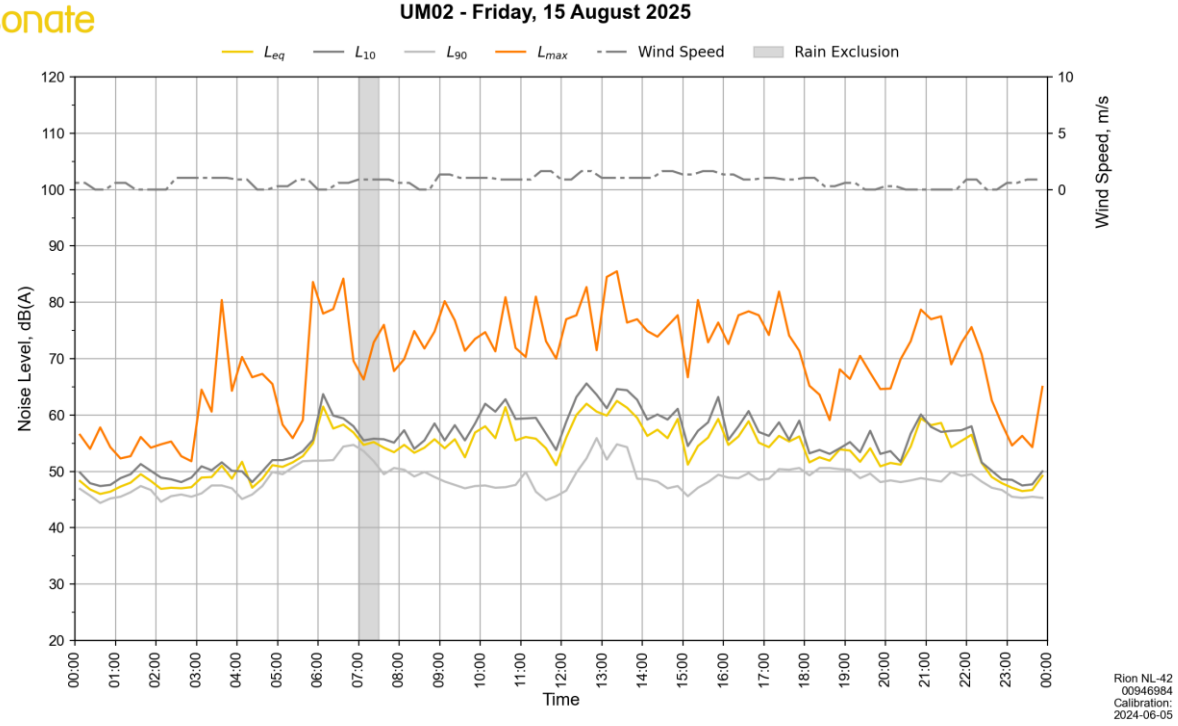

Resonate
UM02 - Tuesday, 12 August 2025
L_{eq} L_{10} L_{90} L_{max} Wind Speed Rain Exclusion
Noise Level, dB(A)
Wind Speed, m/s
Time
Rion NL-42
00946984
Calibration:
2024-06-05


Resonate
UM02 - Wednesday, 13 August 2025
L_{eq} L_{10} L_{90} L_{max} Wind Speed
Noise Level, dB(A)
Wind Speed, m/s
Time
Rion NL-42
00946984
Calibration:
2024-06-05

Resonate

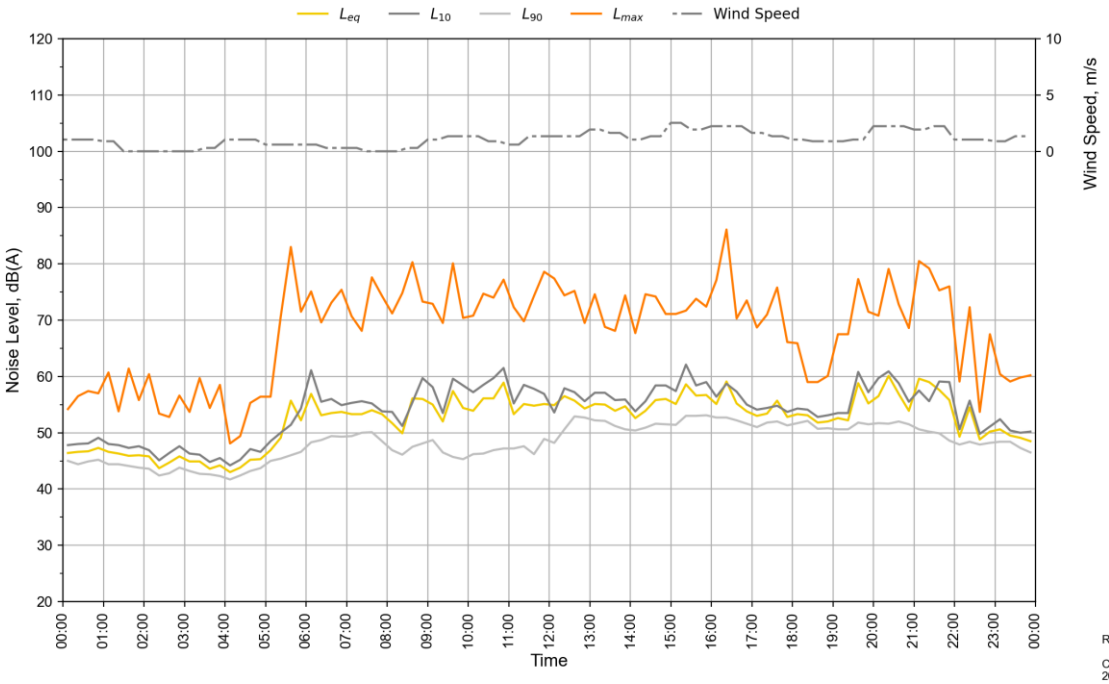


Resonate



Resonate

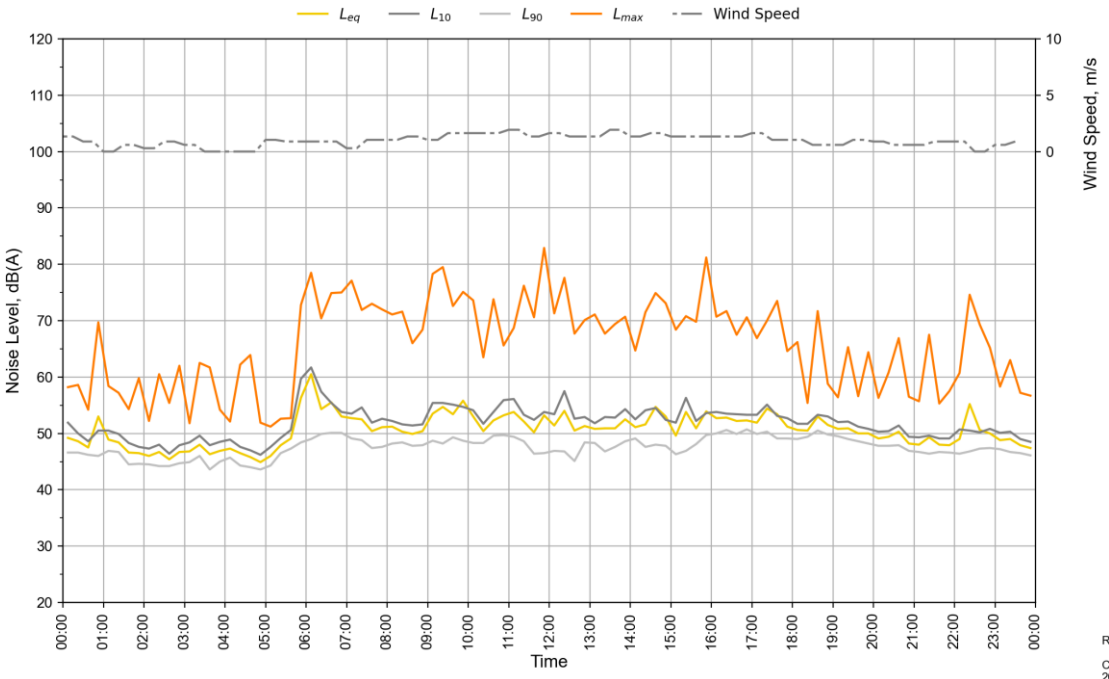
UM02 - Saturday, 16 August 2025



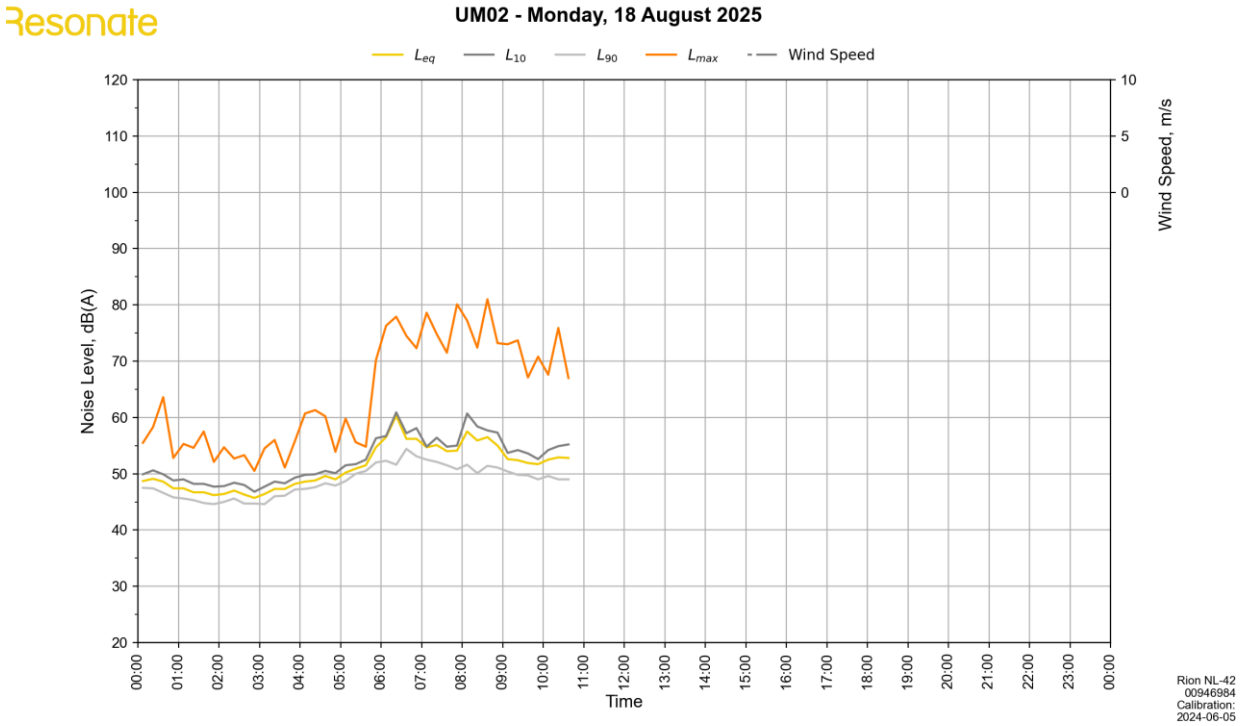
Rion NL-42
00946984
Calibration:
2024-06-05

Resonate

UM02 - Sunday, 17 August 2025



Rion NL-42
00946984
Calibration:
2024-06-05


Resonate
UM02 - Monday, 18 August 2025
L_{eq}
L_{10}
L_{90}
L_{max}
Wind Speed
Noise Level, dB(A)
Wind Speed, m/s
Time
Rion NL-42
00946984
Calibration:
2024-06-05