Rutherglen BESS

Noise impact assessment

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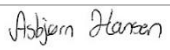
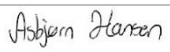
	Name	Position	Signature	Date
Prepared by:	Andrew Durrer	Senior Engineer		11/05/2026
Reviewed by:	Asbjorn Hansen (RPEQ: 21838)	Principal Consultant		11/05/2026
Approved by:	Asbjorn Hansen (RPEQ: 21838)	Principal Consultant		11/05/2026
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1 INTRODUCTION

Red Hill Renewable Energy Pty Ltd (RHRE) propose to develop and operate the Rutherglen Battery Storage System (the project). This involves the development of a large-scale battery energy storage system (BESS) with a discharge capacity of 400 megawatts (MW) and a storage capacity of 1,600 megawatt hours (MWh). The project also incorporates an on-site substation and connection infrastructure to facilitate transfer of energy to and from the electrical grid, and ancillary infrastructure.

The site proposed to be developed is located within the Gladstone Regional Council local government area (LGA) at 837 Red Hill Road, Bororen QLD, approximately 6 km east of the township of Bororen, 10 km north of Miriam Vale, 33 km west of Agnes Waters and 53 km south-east of Gladstone. The project will be developed within privately owned land (Lot 132 FD 700) and will incorporate into the existing electrical network via overhead transmission lines. The total project site will occupy an area of approximately 15 ha. The project is shown in its regional and local context in Figure 1-1.

The project will drive innovation at scale using a battery-centric architecture which means more energy into the network and better stability. It reduces the need for electrical infrastructure and the amount of land used.

This noise impact assessment (NIA) has been prepared by Matrix Acoustics and addresses the specific requirements outlined in the Gladstone Regional Council Planning Scheme, State Code 27: Battery Storage Facility and the Environmental Protection (Noise) Policy 2019 (EPP Noise), as summarised in Table 1-1.

Table 1-1 Summary of requirements for noise

Regulation	Requirements
Gladstone Regional Council Planning Scheme	PO13 requires that development prevents or minimises noise nuisance to nearby sensitive land uses. BESS developments are capable of emitting noise that can cause nuisance. Provide an Acoustic assessment or statement by suitably qualified person that demonstrates compliance with the requirements of the code.
State Code 27: Battery storage facility	PO20 Construction, operation, maintenance and decommissioning meets the acoustic quality objectives for sensitive receptors on or adjacent to the site identified in the Environmental Protection (Noise) Policy 2019.
	PO21 Construction, operation, maintenance and decommissioning does not cause vibration impacts that adversely affect the operational performance or sensitive receptors within or adjacent to the site.

1.1 PROJECT INFORMATION

The project will involve the following components:

- construction and operation of 112 - 132 inverters and 336 - 396 battery installations housing lithium-ion phosphate (LFP) battery packs and related control equipment, and transformers and inverters with a peak connection capacity of 400 MW;
- connection to the existing network by way of connection to the existing aboveground infrastructure and a switch station; and
- Construction of the project is expected to commence in 2027.

Construction activities are scheduled to only occur during the day time periods. The greatest noise impact is anticipated to originate from the installation of the inverters/batteries where excavation and slab pouring will be required at the site.

Throughout its operational life, certain components and technologies may be replaced and/or upgraded, however such works are unlikely to be intensive. The storage system would operate 24 hours a day, 7 days a week and be operated remotely.

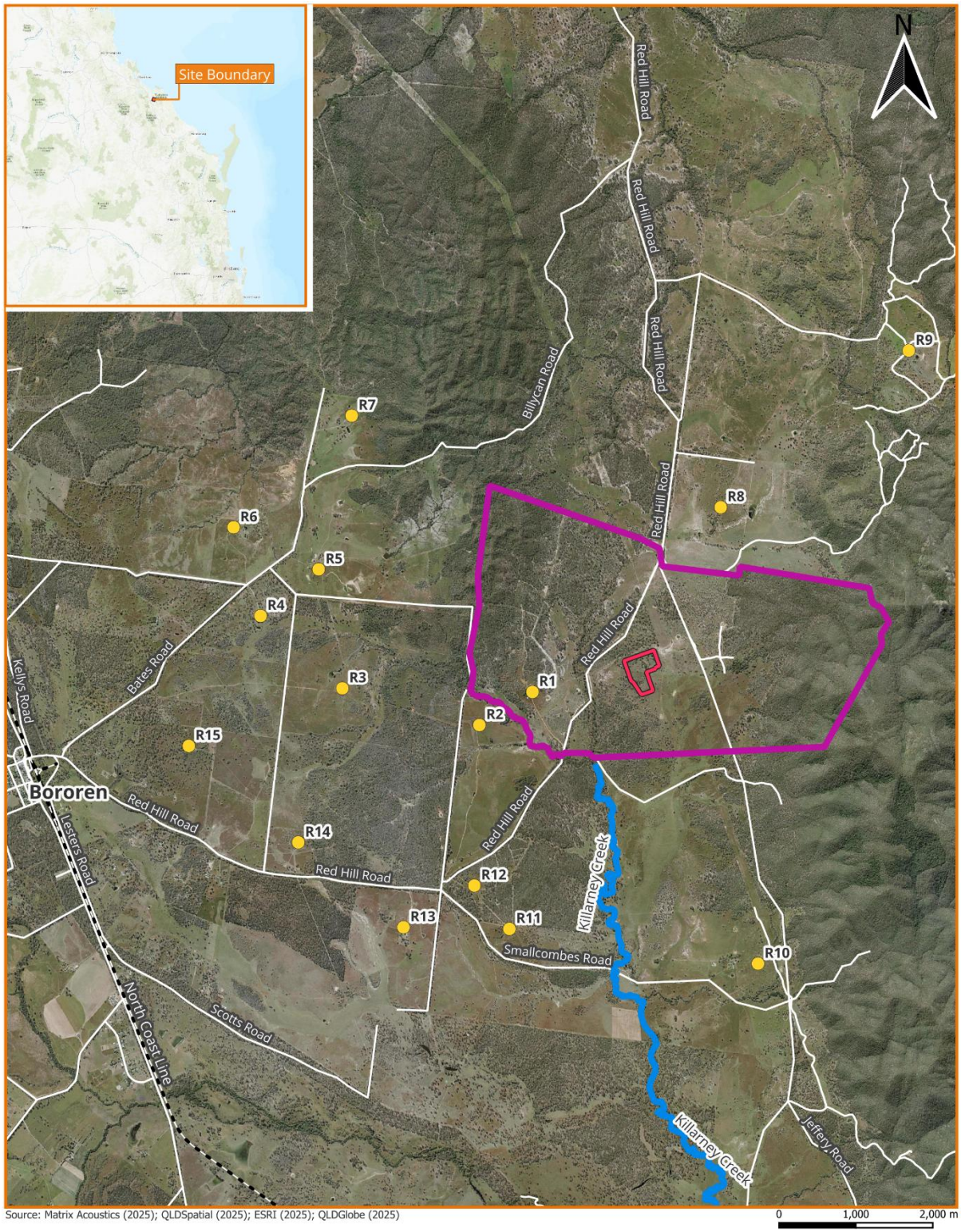
The nearest representative noise sensitive locations to the project have been identified for the purpose of determining potential noise impacts related to the project.

Details of the identified noise sensitive receptors are provided in Table 1-2. Their locations are shown in Figure 1-1. Note that R1 is a project related residence and comprises a homestead and worker's accommodation.

Table 1-2 Noise sensitive receptors

ID	Classification	Address/Lot Number	Distance to site boundary (m)	Coordinates (MGA 56)	
				Easting	Northing
R1	Residential	837 Red Hill Road, Bororen QLD	1,300	353854	7319072
R2	Residential	595 Red Hill Road, Bororen QLD	2,052	353154	7318641
R3	Residential	206 Bates Road, Bororen QLD	3,680	351372	7319119
R4	Residential	236 Bates Road, Bororen QLD	4,762	350309	7320061
R5	Residential	394 Bates Road, Bororen QLD	4,146	351064	7320667
R6	Residential	Bates Road, Bororen QLD (Lot 176FD824)	5,365	349958	7321212
R7	Residential	568 Bates Road Bororen QLD	4,765	351494	7322665
R8	Residential	1274 Red Hill Road Bororen QLD	2,053	356292	7321473
R9	Residential	Balaclava Road Bororen QLD (Lot 3FD982)	5,116	358737	7323511
R10	Residential	408 Smallcombes Road Bororen QLD	3,803	356777	7315540
R11	Residential	65 Smallcombes Road Bororen QLD	3,496	353544	7315991
R12	Residential	612 Red Hill Road Bororen QLD	3,298	353089	7316555
R13	Residential	542 Red Hill Road Bororen QLD	4,327	352167	7316012
R14	Residential	519 Red Hill Road Bororen QLD	4,810	350799	7317116
R15	Residential	255 Red Hill Road Bororen QLD	5,767	349375	7318370

Figure 1-1 Site and Surrounds



2 CRITERIA

The purpose of the EPP Noise 2019 is to achieve the object of the Environmental Protection Act (EP Act) in relation to the acoustic environment. The EPP Noise provides specific noise levels which, if complied with, would be considered achieving the objective of the EP Act, namely to not cause environmental nuisance or harm.

The EPP Noise identifies the environmental values to be enhanced or protected relating to the qualities of the acoustic environment that are conducive to:

- Protecting the health and biodiversity of ecosystems;
- Human health and wellbeing, including an individuals' ability to have sleep, study or learn, and recreation activities (including relaxation and conversation); and
- Protect the amenity of the community.

The acoustic quality objective is the measurement of an acoustic descriptor at a sensitive receptor. The policy defines noise sensitive receptors as the following:

- Dwelling;
- Library and educational institute (including a school, college and university);
- Childcare or kindergarten;
- School or playground;
- Hospital, surgery or medical institution;
- Commercial and retail activity;
- Protected area, or an area identified under a conservation plan under *the Nature Conservation Act 1992* as a critical habitat or an area of major interest;
- Marine park under the *Marine Parks Act 2004; and*
- Park or garden that is open to the public (whether or not on payment of an amount) for use other than for sport or organised entertainment.

Table 2-1 shows the acoustic quality objective for each type of sensitive receptor. Time periods are defined as follows:

- Daytime – 7 am to 6 pm;
- Evening – 6 pm to 10 pm; and
- Night time – 10 pm to 7 am.

Table 2-1 Acoustic quality objectives from EPP Noise

Sensitive receptor type	Location	Time of day	Acoustic quality objectives (measured at the receptor) dB(A)		
			$L_{Aeq,adj,1hr}$	$L_{A10,adj,1hr}$	$L_{A01,adj,1hr}$
Dwelling	outdoors	Daytime and evening	50	55	65
Dwelling	indoors	Daytime and evening	35	40	45
		Night-time	30	35	40
Library and educational institution (including a school, college and university)	indoors	when open for business or when classes are being offered	35	—	—
Childcare centre or kindergarten	indoors	when open for business, other than when the children usually sleep	35	—	—
Childcare centre or kindergarten	indoors	when the children usually sleep	30	—	—
School or playground	outdoors	when the children usually play outside	55	—	—
Hospital, surgery or other medical institution	indoors	visiting hours	35	—	—
Hospital, surgery or other medical institution	indoors	anytime, other than visiting hours	30	—	—
Commercial and retail activity	indoors	when the activity is open for business	45	—	—
Protected area, or an area identified under a conservation plan under the Nature Conservation Act 1992 as a critical habitat or an area of major interest		anytime	The level of noise that preserves the amenity of the existing area or place		
Marine park under the Marine Parks Act 2004		anytime	The level of noise that preserves the amenity of the existing marine park		
Park or garden that is open to the public (whether or not on payment of an amount) for use other than for sport or organised entertainment		anytime	The level of noise that preserves the amenity of the existing park or garden		

In addition to the acoustics quality objectives noise limits presented in Table 2-1, the EPP Noise further states, in section 9.2.b, that noise must be dealt with in a way that ensure that background creep in an area or place is prevented or minimised to the extent it is reasonable to do so. Where the acoustics quality objectives are met, background creep is inherently prevented or minimised. Therefore, if the project is able to show compliance with the acoustic quality objectives, a suitable background noise level is also maintained.

2.1 OPERATIONAL NOISE CRITERION

The nearest receptors to the project site are residential dwellings. The most stringent criterion for residential dwellings is the indoor, night-time L_{Aeq} criterion of 30 dB(A).

A lightweight building structure with the windows open will typically provide a minimum of 7 dB noise reduction from outside to inside. Dwellings constructed from brick, or with the windows closed will provide a higher level of noise reduction from outside to inside. For this assessment, the most conservative option of assuming a minimum of 7 dB reduction has been adopted. Based on this, the most stringent criteria from the EPP Noise results in an external noise criterion of 37 dB(A). This has been adopted as the most stringent outdoor noise criterion for operational noise impacts.

2.2 CONSTRUCTION NOISE CRITERION

Construction works are scheduled to only take place during day time hours. The most stringent criterion for daytime hours is 50 dB(A) L_{Aeq}. This has been adopted as the most stringent criterion for construction noise impacts.

3 EXISTING ENVIRONMENT

The area of the proposed development accommodate a variety of rural and agriculture. Ambient noise levels are controlled by the natural environment with limited impact from human activity, traffic and other activities.

Existing ambient noise level measurements were undertaken between the 10th - 24th January 2025. A Type 1 Instralabs - KNM01 sound level meter was used for the noise monitoring. It was field calibrated using a Pulsar 105 Type 1 Acoustic Calibrator, prior to, and at the completion of the noise monitoring. Both the noise meter and the acoustic calibrator were under current NATA calibration. No significant drift was identified over the monitoring period. Table 3-1 provides details of the equipment used for the noise monitoring.

Figure 3-1 shows the location of the noise monitors and the weather station as described in Table 3-1.

Image 3-1 and Image 3-2 shows the setup of the noise monitoring equipment.

Calibration certificates can be supplied on request.

Table 3-1 Equipment details

Equipment	Manufacturer and model	Serial number	Receiver address	Monitoring Location ID	Receiver Location ID
Noise Monitor	Instralabs - KNM01	ec6260c31724	837 Red Hill Road, Bororen QLD	NM1	R1
Noise Monitor	Instralabs - KNM01	94e6860ba6b8		NM2	
Sound Level Meter	NTi Audio – XL2	A2A-16668-E0		WS1	
Weather Station	Davis - Vantage Vue ISS	N/A	-		
Calibrator	Pulsar - model 105	72905	-		

Full monitored noise levels are included in Appendix A. The summary of the monitored noise levels is shown in Table 3-2. The noise levels measured in the project area are typical for a highly rural area. The overall noise levels are quiet.

It was noted that significant insect noise was audible at both logger locations during attended measurements and is reflected in the ambient noise monitoring results. This is considered to be a feature of the area and should further assessment be required, noise measurements are recommended to be undertaken during the winter period where insect noise would be less prevalent.

Table 3-2 Ambient noise monitoring results summary

Monitoring Location	Time period	Average L_{Aeq}	Average L_{A90}	Average L_{A10}	RBL
NM1	Day	51	38	49	38
	Evening	47	34	44	32
	Night	49	34	44	32
NM2	Day	64	48	66	45
	Evening	60	48	59	49
	Night	58	47	56	45

Figure 3-1 Noise monitoring locations

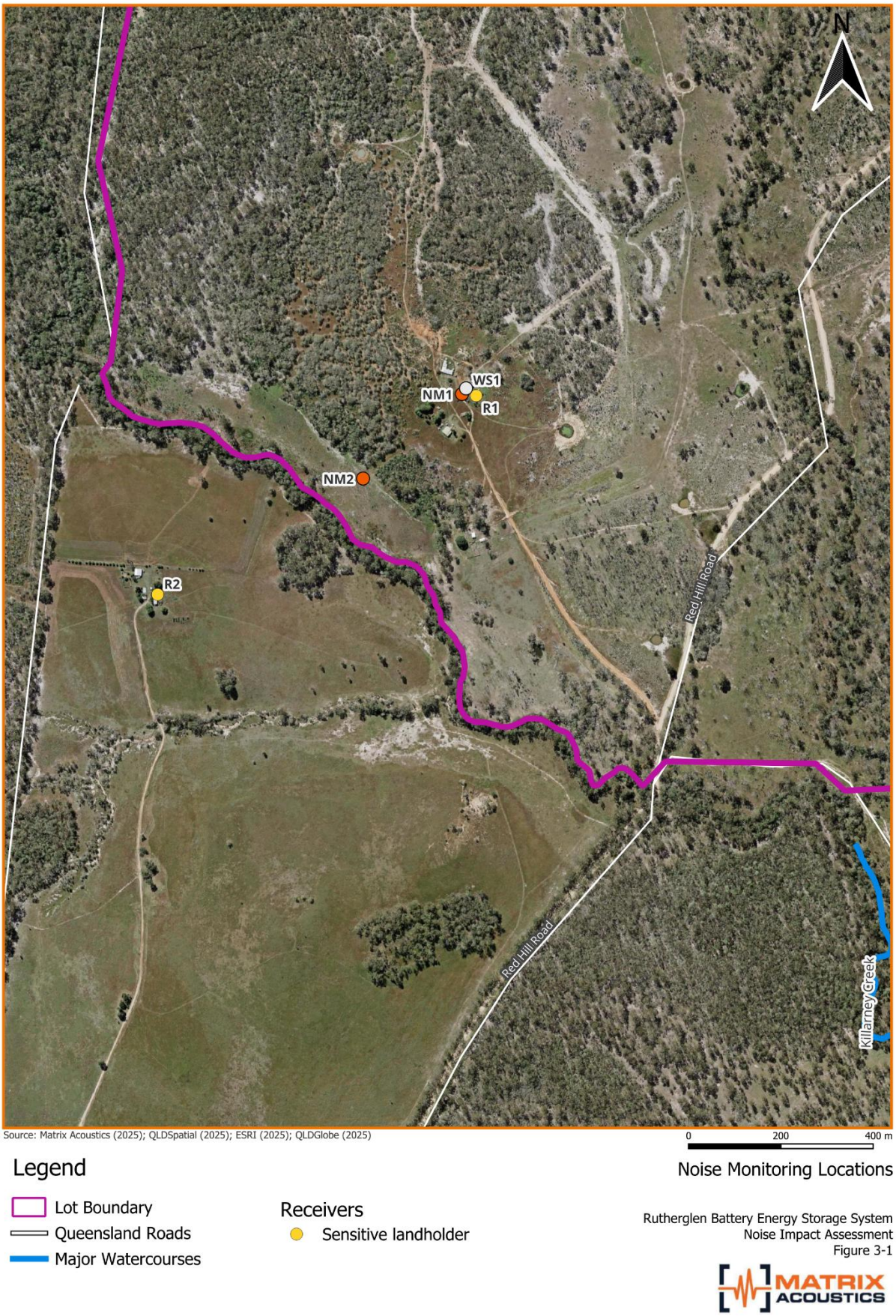


Image 3-1 NM1 & WS1 location (ec6260c31724)

Image 3-2 NM2 location (94e6860ba6b8)

4 MODELLED NOISE EMISSIONS

4.1 MODELLING

This section presents the methods and base parameters used to model construction noise and operational noise emissions from the proposed development. Operational and construction noise levels were predicted using a computer-generated model using SoundPLAN modelling software. The model predictions were completed utilising the ISO9613-2:1996 "Acoustics – Attenuation of Sound during Propagation Outdoors – general method" algorithm.

The model calculates total noise levels at assessment locations from concurrent operation of multiple noise sources. It considers factors that influence noise propagation such as the lateral and vertical location of plant, source-to-receptor distances, ground effects, atmospheric absorption, topography of the site and surrounding area and applicable meteorological conditions.

The model was populated with 3-D topography of the project and surrounding area, extending out past the assessed noise sensitive receptors. Plant and equipment of the proposed construction and operation scenarios was placed at locations which would result in worst case noise predictions for the construction scenario. Plant and equipment were placed at the locations specified for this development for the noise prediction of the operational phase.

Modelling was undertaken for both construction and operational scenarios. For both scenarios, a reasonable worst-case modelling setup was adopted.

4.2 CONSTRUCTION

For construction noise, the highest scheduled activity period was modelled. Vehicle movements were assumed based on previous similar solar farm and BESS installation assessments completed by Matrix Acoustics.

Construction activities are scheduled to only occur during the daytime periods.

The predominant source for construction noise for this site is delivery of equipment to site, and the pouring of slabs at the central facilities area.

To present the reasonable worst case for assessment, the following was assumed:

- All vehicles listed in Table 4-1 were operating simultaneously and travelling within the site generally along the already formed tracks;
- The concrete truck and pump were operating simultaneously; and
- 25 crews were installing batteries and inverters within the site boundary.

The noise source data for the construction noise predictions is shown in Table 4-1, and Table 4-2. Noise modelling has been completed with simulated construction activities occurring within the site boundaries. Mobile equipment is collectively modelled within the site boundary installation area.

Table 4-1 Sound power data for construction noise model

Source	Qty	A weighted SWL (frequency), dB(A)								
		Overall	63	125	250	500	1000	2000	4000	8000
Semi-trailer	18	105	93	91	96	99	99	98	93	88
Mobile crane	1	98	82	88	90	88	92	92	85	77
Ute + trailer	6	88	72	73	82	81	80	81	79	75
Bus	1	92	80	81	82	84	85	87	82	79
Forklift	2	106	83	84	83	84	96	105	87	80
Tractor	2	96	76	78	83	89	91	89	88	77
Trailer and Motorbike	8	89	72	79	82	81	80	81	79	75
Concrete Truck	1	108	85	86	85	94	98	107	89	82
Concrete Pump	1	108	85	89	94	100	102	104	96	90
Hand Tools	25	94	71	81	86	85	87	89	85	80

Table 4-2 Grouped Construction Sources

Source	A weighted SWL (frequency), dB(A)								
	Overall	63	125	250	500	1000	2000	4000	8000
Stationary Equipment	113	91	97	102	103	106	110	102	96
Mobile Equipment	118	106	104	109	112	112	112	106	101

4.3 OPERATION

For the operational scenario, all inverters and batteries were operational along with the substation and central power area.

The equipment that will be generating noise during the operational phase of the project are:

- Inverters;
- Batteries; and
- Transformers.

There are 112 - 132 inverters and 336 - 396 battery installations located within the proposed development. The maximum number of 132 inverters and 396 battery installations have been modelled with all units operating at full capacity in order to assess the worst case scenario. The modelled sound power for these inverters and distributed battery installations is shown in Table 4-3.

Table 4-3 Operational sources sound power level

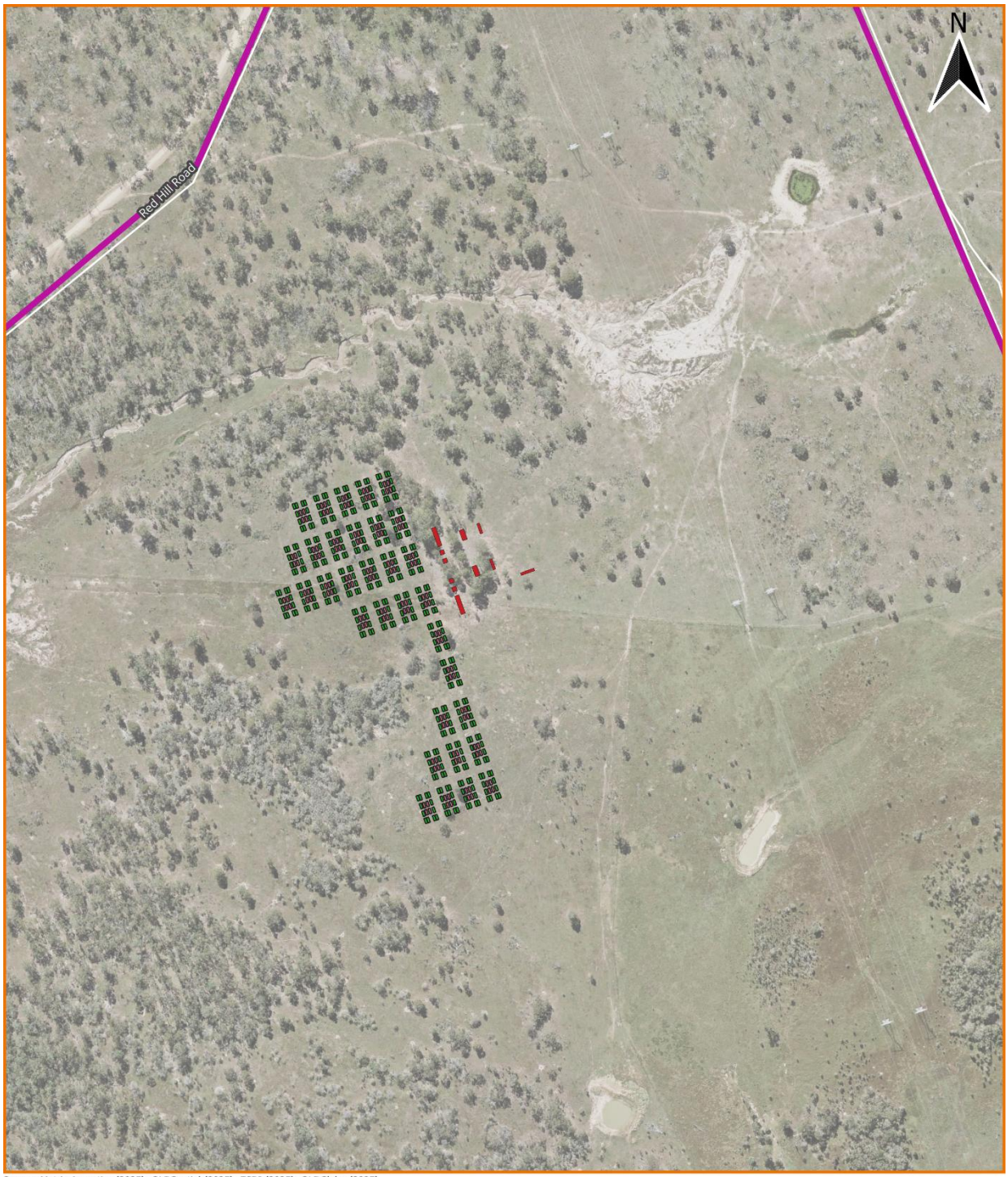
	Number of units	A weighted SWL (frequency), dB(A)									
		Overall	63	125	250	500	1000	2000	4000	8000	16000
Power Electronics DC-AC Converters (Combined with fan speeds at 80%)[2,3]	132	95	86	89	92	83	81	79	77	73	65
Sunwoda Energy Battery at 100% Capacity[2]	396	85	-	66	73	76	78	79	77	73	-
Combined 250 kVa & **275 kV Transformers**[1]	2 (250kV) 33 (275 kV)	97	86	89	93	86	86	86	84	80	65

1. The combined noise levels will be subject to final quantity, configuration and layout of equipment.
2. Data sourced from equipment manufacturer specifications and acoustic testing reports.
3. Manufacturer specifications show that operations at or below 40°C will have fan speeds at 80%, whilst achieving 100% power generation. Temperatures during the night time period typically will not exceed this and as such this is considered a worst case scenario during the night time period.

The minimum setback of the inverters and distributed power installations is 60 m from the site boundary.

Figure 4-1 shows the modelled locations of the inverters and distributed power installations.

Figure 4-1 Project Layout



Source: Matrix Acoustics (2025); QLDSpatial (2025); ESRI (2025); QLDGlobe (2025)

0 100 200 m

Legend

- Site Boundary
- Lot Boundary
- Transformers
- Battery Storage
- Inverters
- Queensland Roads

Project Layout

Rutherglen Battery Energy Storage System
Noise Impact Assessment
Figure 4-1

MATRIX ACOUSTICS

5 IMPACTS

5.1 CONSTRUCTION NOISE IMPACTS

Predicted noise levels for the reasonable worst case construction activity (from all scenarios described in Section 4.1) are provided in Table 5-1.

All works are planned to be predominantly conducted during standard daytime hours. Standard daytime hours as defined by the EPP Noise occurs between 7:00 am to 6:00 pm.

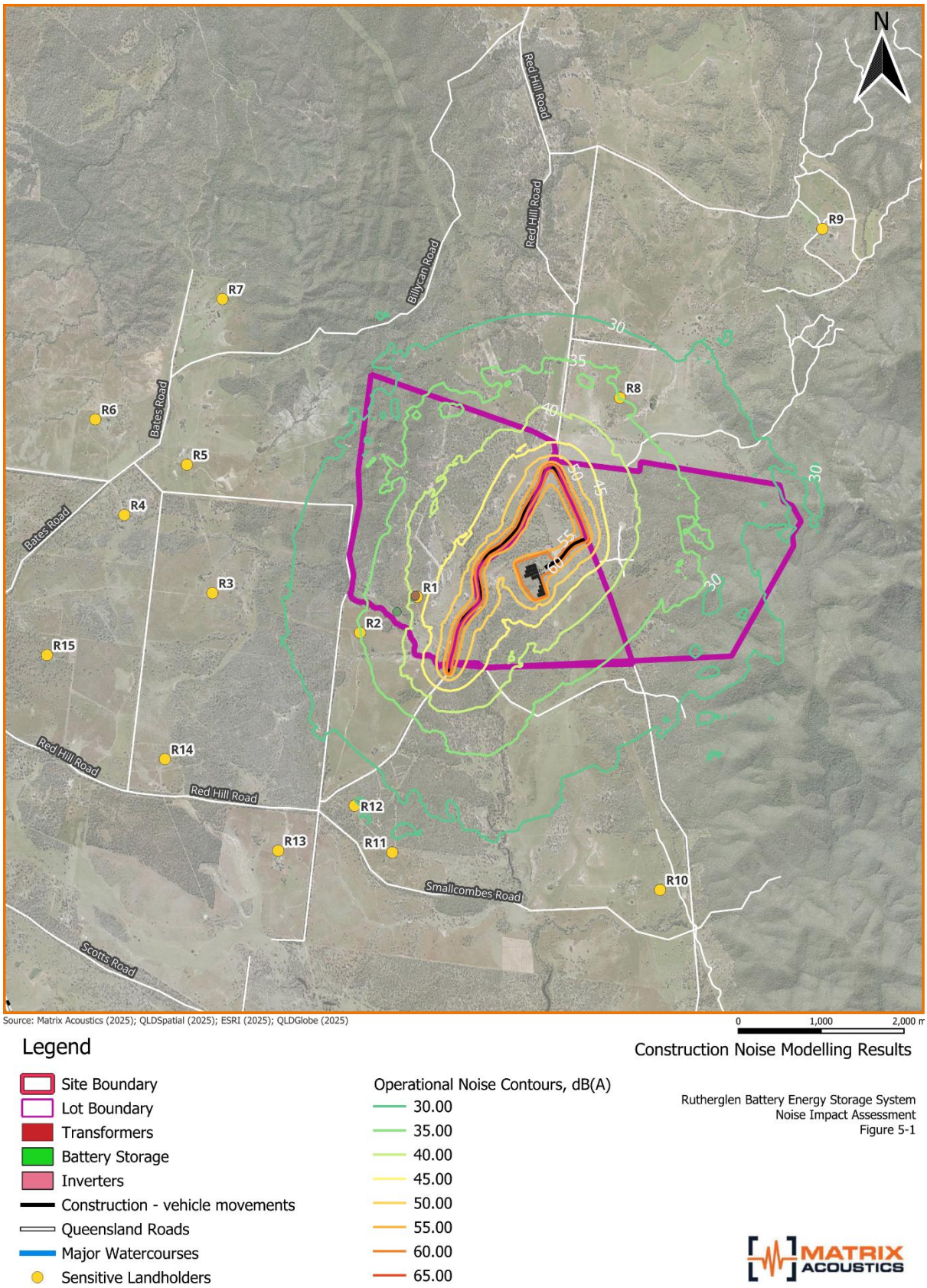
It can be seen that the day time noise limit of 50 dB(A) is not exceeded outside the project property boundary. Therefore, the site is considered to be able to comply with the noise limits set forth in the EPP Noise for the construction of the proposed development. Figure 5-1 shows modelling results for the construction works occurring nearest to the site boundaries as well as construction vehicles travelling within the property boundary.

Table 5-1 Construction noise results

Assessment location	Classification	Period	Noise limit, dB(A)	Predicted construction noise level[1], dB(A) $L_{Aeq,15min}$
R1	Residential	Standard Hours	50	43
R2	Residential	Standard Hours	50	35
R3	Residential	Standard Hours	50	27
R4	Residential	Standard Hours	50	22
R5	Residential	Standard Hours	50	25
R6	Residential	Standard Hours	50	<20
R7	Residential	Standard Hours	50	22
R8	Residential	Standard Hours	50	34
R9	Residential	Standard Hours	50	20
R10	Residential	Standard Hours	50	24
R11	Residential	Standard Hours	50	27
R12	Residential	Standard Hours	50	28
R13	Residential	Standard Hours	50	24
R14	Residential	Standard Hours	50	22
R15	Residential	Standard Hours	50	<20

1. R1 not included as this is a project related homestead and workers accommodation.
2. The daytime is 7.00am to 6.00pm; evening 6.00pm to 10.00pm; night-time 10.00pm to 7.00am.

Figure 5-1 Construction noise modelling



5.2 OPERATIONAL NOISE IMPACTS

Predicted operational noise levels are presented in Table 5-2 and in Figure 6-1 and Figure 6-2. The noise predictions assumed that all battery units were running at 100%, and the DC inverters were operating at 80% capacity.

It can be seen that there is one predicted exceedance at R1 during the most stringent night time criterion of 37 dB(A). As such, mitigation should be considered during the development of the battery storage on the western side, in order to minimise the noise impacts on R1. All other receptors are predicted to comply with the night time criterion of 37 dB(A).

Table 5-2 Operational noise results

Assessment location	Classification	Noise limit, dB(A)	Predicted operational noise level[1], dB $L_{Aeq,15min}$	Predicted operational noise level (with barrier)[2], dB $L_{Aeq,15min}$
R1	Residential	37	39	37
R2	Residential	37	35	32
R3	Residential	37	28	25
R4	Residential	37	25	22
R5	Residential	37	27	24
R6	Residential	37	<20	<20
R7	Residential	37	23	20
R8	Residential	37	34	31
R9	Residential	37	<20	<20
R10	Residential	37	28	25
R11	Residential	37	29	26
R12	Residential	37	30	27
R13	Residential	37	27	24
R14	Residential	37	25	22
R15	Residential	37	<20	<20

1. Excluding noise mitigation.
2. Including 1.8 m noise barrier along western site boundary.

6 NOISE MANAGEMENT

Noise modelling indicates that the site is expected to exceed the night-time noise criteria specified in the EPP Noise at one sensitive receptor (R1). Noise mitigation measures should be considered for this location. Potential strategies include the installation of a noise barrier along the western site boundary and/or adjustments to the site's operational parameters.

Installation of a 1.8 m noise barrier (ensuring line of sight is broken to the receptor) along the western side of the site is predicted to achieve a 2 dB(A) reduction in noise levels at R1, as shown in Figure 6-2.

We note the advice of the developer that a 2.7m high earth berm is proposed to be installed to the western and northern sides of BESS development for visual impact reasons. A continuous grassed berm will provide suitable reduction in sound levels for receptors, where installed as per Figure 5-3 at minimum. It is recommended that post-installation verification noise monitoring be conducted during night-time periods to confirm the acoustic performance of key equipment, including the Power Electronics DC-AC inverters and Sunwoda battery systems.

Noise levels at all other assessed receptors are predicted to comply with the applicable night-time noise criteria.

The site is predicted to comply with the night time criterion at all other receptors.

The site is predicted to be able to comply with the day and evening noise criterion outlined in the EPP Noise at all locations. However, good environmental management practice should be undertaken throughout the construction and operational phases of the project.

Good environmental management practice for noise includes:

- An environmental management plan that clearly states the noise criteria for the time periods of day, evening and night.
- Procedures for addressing noise complaints
- A noise monitoring program including items such as, spot noise monitoring, noise monitoring in response to complaints, periodic noise monitoring, or long-term permanent noise monitoring.

It is also recommended that noise measurements be undertaken of the power equipment on site including the localised inverters and batteries, and the high voltage switch yard. This will enable confirmation that the assumptions made in the analysis phase of the project are acceptable.

Figure 6-1 Operational noise contours – without mitigation

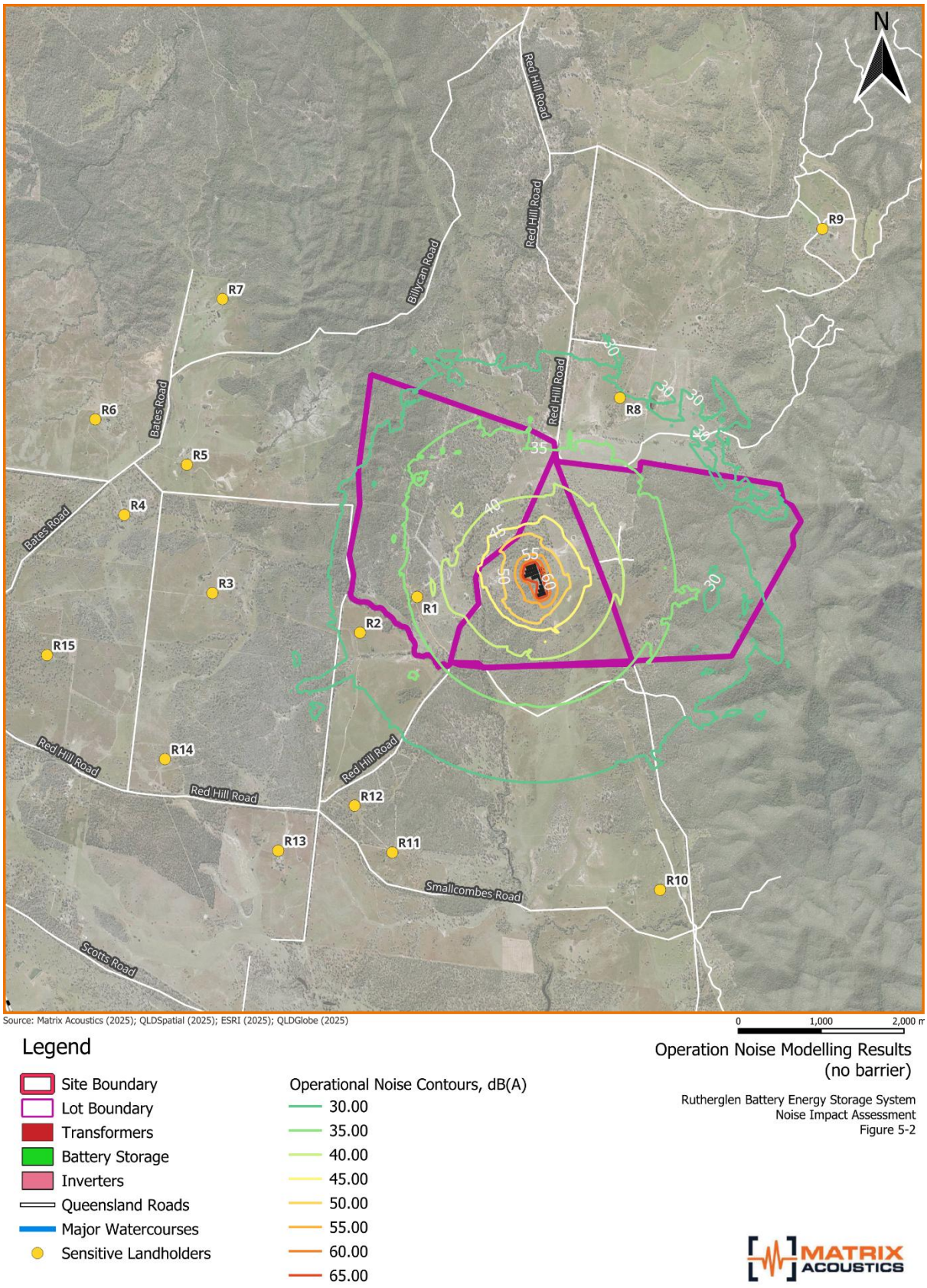
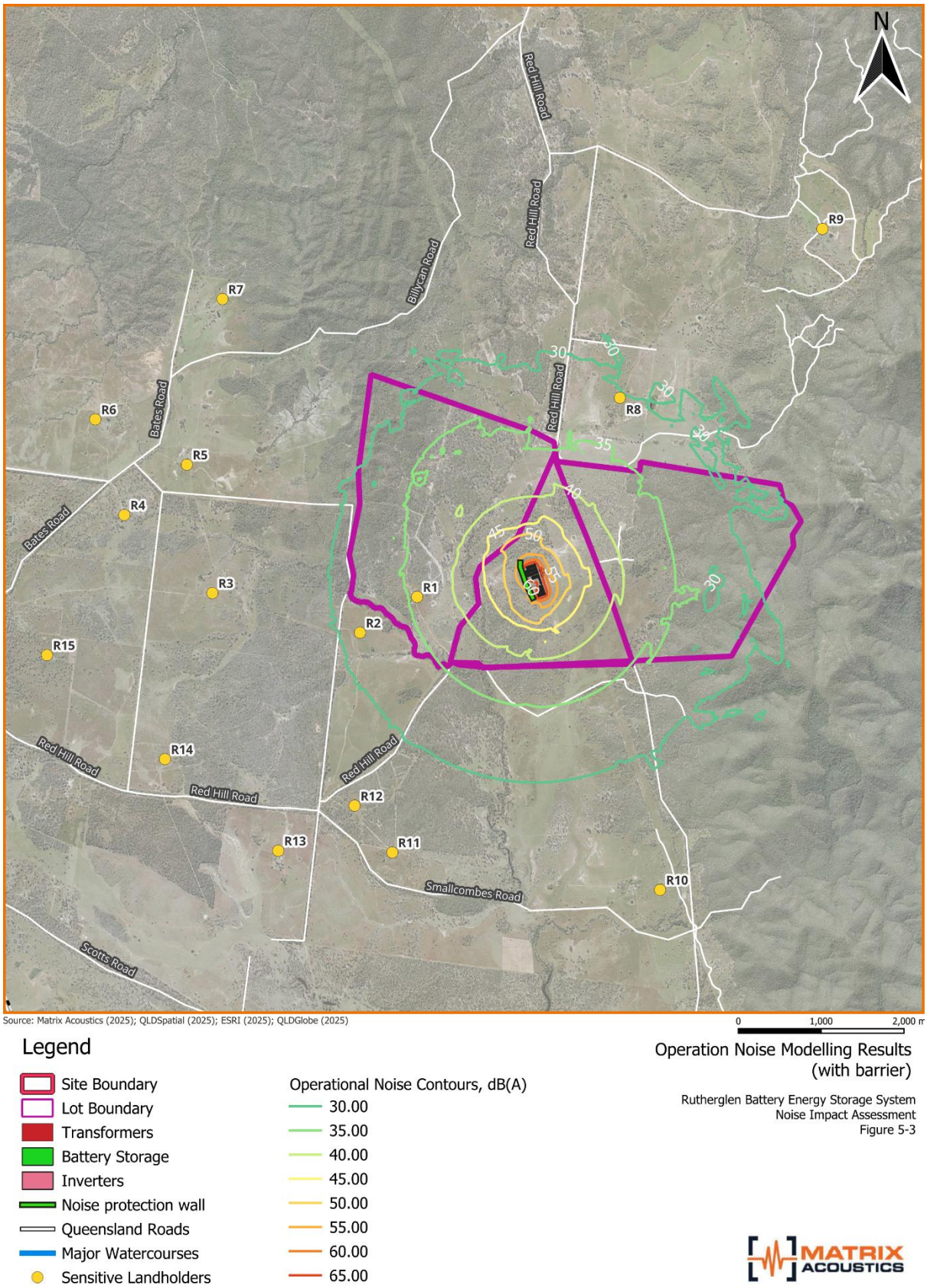


Figure 6-2 Operational noise contours – with mitigation



7 VIBRATION IMPACT

No vibration intensive equipment is anticipated to be utilised for this project. Furthermore, the nearest receptor is located at a distance of 600 m away from the nearest road and 1200 m away from the nearest project construction activities.

Vibration impacts are not considered to be of concern for this project.

8 CONCLUSION

Matrix acoustics were engaged to conduct a noise impact assessment for the proposed Rutherglen Battery Storage System. The noise emissions for the construction and operation of the proposed battery energy storage system located at 837 Red Hill Road, Bororen QLD have been assessed and reported.

Noise monitoring was undertaken in the area to determine the existing ambient noise environment. The noise monitoring identified that the existing background levels are typical for a highly rural area.

It was noted that significant insect noise was audible at both logger locations during attended measurements and is reflected in the ambient noise monitoring results. This is considered to be a feature of the area and should further assessment be required, noise measurements are recommended to be undertaken during the winter period where insect noise would be less prevalent.

A 3D noise model was constructed of the area and used to predict noise levels for the construction as well as the operation of the proposed development.

The noise modelling indicates that with the additional installation of a 1.8 m noise barrier (or proposed 2.7 m high earth berm as proposed by the developer) on the western boundary of the site, the site will be in compliance with the noise criteria contained in the Environmental Protection (Noise) Policy.

Initial noise measurements and ongoing noise management for noise emissions from the site have been recommended.

9 GLOSSARY

Table 9-1 Glossary

Term	Definition
A-weighting	A standard electronic weighting network within a sound level meter, designed to approximate the loudness response of the average ear to sounds of different frequency at moderate sound pressure levels.
ABL	Assessment background level - The single-figure background level representing each assessment period–day, evening and night (i.e. three ABLs are determined for each 24 hour period of the monitoring period). ABL is a measure of background noise level in the absence of noise from the source. Determination of the ABL is by the tenth percentile method, i.e. sort the recorded hourly LA90's into ascending order and select the lowest ten percentile level.
A-weighted equivalent continuous sound pressure level (denoted LAeq)	The equivalent continuous sound pressure level measured using an A-weighted network.
Adjusted measured noise level (denoted LAeq,adj)	The measured noise level from a noise source, with adjustments applied to correct for background ambient sound level and particular audible characteristics. The adjusted measured noise level is also referred to as the assessed noise level.
Airblasts (overpressure due to blasting)	The pressure wave transmitted through the air, caused by an explosion and which contains significant airborne energy at frequencies in or below the audible range of the human ear.
Ambient noise	The totally encompassing sound in a given situation at a given time, composed of sound from all sources near and far, measured by the totally encompassing time average A-weighted sound pressure level in a given situation at a given time.
Background noise	The underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is removed. This is described using the LA90 descriptor.
Background noise level	The minimum ambient level, in the absence of the noise source under investigation. It may be defined as the A-weighted sound pressure level that is equalled or exceeded for 90 per cent of that part of the interval in which the investigated noise is absent (LA90).
C-weighting	A standard electronic weighting network within a sound level meter which is designed to approximate the loudness response of the average ear to sounds of different frequency at high sound pressure levels.
C-weighted equivalent continuous sound pressure level (denoted LCeq)	The equivalent continuous sound pressure level measured using a C-weighted network.
Continuous noise	(steady state noise) Noise that gives fluctuations over a range of not more than three dB.
Dominant low frequency noise	Where the noise is dominated by sound in the frequency range 10 Hz to 200 Hz.
Engineering noise control	Measures which provide a reduction in the noise level at the receiver by physical means (excluding personal hearing protection).
EPP Noise	Environmental Protection (Noise) Policy 2019
Equivalent continuous sound pressure level (denoted Leq)	That level, which, if present as a steady signal, would in any particular time period have the same sound energy as the actual fluctuating sound pressure level in the same period.

Term	Definition
Fast response	An instrument time weighting (125 ms) within the sound level meter.
Frequency weighting	The practice of modifying the level of the various components of an incoming signal in a standardised manner which varies with the frequency or spectral composition of the signal. With sound level meters or other sound measurement instrumentation, this is done to provide an instrument response which approximates the (non-linear) response of the human perception of hearing to sounds of different frequency and level. The two weightings in most common use are the A and C frequency weightings. Z-weighting is now being used in blast noise assessment and low frequency noise evaluation.
Groundborne noise (also structureborne noise or regenerated noise)	A separate issue to airborne noise, groundborne noise is generated by vibration transmitted through the ground into a structure. The vibration of structures causes noise to be radiated into a room.
Impulsivity	Sound characterised by brief excursions of sound pressure level (acoustic impulses) that significantly exceed the background sound pressure level. The duration of a single impulsive sound is usually less than one second. Infrasound Very low frequency sound below the normal range of human hearing (that is, less than around 20 Hz).
Intermittent noise (also transient, variable noise)	Noise that gives fluctuations greater than five dB.
L_{A1}	The A-weighted sound pressure level, which in any particular time period is exceeded one per cent of the time by the actual fluctuating sound pressure level.
L_{A10}	The L_{A10} is the "A"-weighted statistical noise level exceeded 10% of the time. It is sometimes referred to as the average maximum noise level.
L_{A90}	The L_{A90} is the "A"-weighted statistical noise level exceeded 90% of the time. It is commonly referred to as the background noise level.
$L_{A\%,}$	The A-weighted sound pressure level that is exceeded for the per cent exceedance under consideration for the time interval (T) considered.
$L_{Aeq,T}$	The A-weighted, equivalent continuous sound pressure level within a measuring period (T).
$L_{Aeq,adj,T}$	An A-weighted sound pressure level of a continuous steady sound, adjusted for characteristics (see Chapter 2, Table 2.1.2.1(b) Adjustment factors), that within a measuring period (T) has the same mean square sound pressure level as a sound pressure level that varies with time.
$L_{Aeq,adj,15\ minute}$	The adjusted A-weighted equivalent continuous sound pressure level considering adjustment factors (see Table 2.1.2.1(b)), measured over a 15-minute time period.
L_{Amax}	The maximum A-weighted sound pressure level in any particular time period. LAmax is an RMS parameter and should not be confused with the peak level (or non-RMS instantaneous maximum level). LASMax The A-weighted maximum sound pressure level with slow response. LCeq The C-weighted, equivalent continuous sound pressure level.
Noise	Defined by the Environmental Protection Act 1994 as 'vibration of any frequency, whether emitted through air or another medium'. For the purposes of this Code, noise is used in the more limited sense of 'unwanted sound' (that is, vibration of the air).
Peak sound pressure level	The peak sound pressure level (Lpeak) or 'peak level' and is 20 times the logarithm to the base 10 of the ratio of the peak sound pressure to the reference sound pressure (20 µPa). For purposes of blast monitoring, peak level is synonymous with 'overpressure level' or 'airblast level'. Peak level is a non-RMS level. It should not be confused with the maximum level (Lmax or LAmax) which refers to the maximum, RMS, sound pressure level.
Peak noise level	The peak sound pressure level.

Term	Definition
Rating background level (RBL)	Rating background level - 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 ABL). It is the median value of the ABL's.
Slow response	An instrument time weighting (1 second) within the sound level meter.
Sound pressure	The instantaneous difference between the actual pressure and the average or barometric pressure at any particular location. Sound pressure is measured in Pascals (Pa). The 'effective sound pressure' is the RMS sound pressure. The 'maximum sound pressure' is the maximum RMS sound pressure. The 'peak sound pressure' is the instantaneous amplitude (non-RMS or 'peak') of the (positive or negative) fluctuation in pressure during the passage of a sound wave.
Sound pressure level (Lp)	The level of the RMS sound pressure level in decibels given by Lp = 10log10(p/po)2 (where p is the RMS sound pressure in Pascals. The reference sound pressure po is 20 µPa).
Sound power level (LWA) for the noise source	An absolute that does not vary with distance or differing acoustic environments. It is 10 times the common logarithm of the ratio of the sound power of the source to a reference sound power (usually 1 pW).
Sound absorption	That property of a material or surface which allows it to absorb and dissipate sound.
Sound absorption coefficient	The ratio of sound energy absorbed (that is, not reflected) by a material (or surface) to the total sound energy incident upon it.
Sound level meter	An instrument which is designed and calibrated for measurement of sound pressure level.
Time response (also time weighting) of a sound level meter	The dynamic response of the instrument (refer Australian Standard AS 1259.2-1990 or Australian Standard AS IEC 61672.1-2004). Time weightings in common use include 'Fast', 'Slow', 'Impulse' and 'Peak' (see also fast response, slow response).
Tonality	A sound producing in a listener a definite pitch sensation.

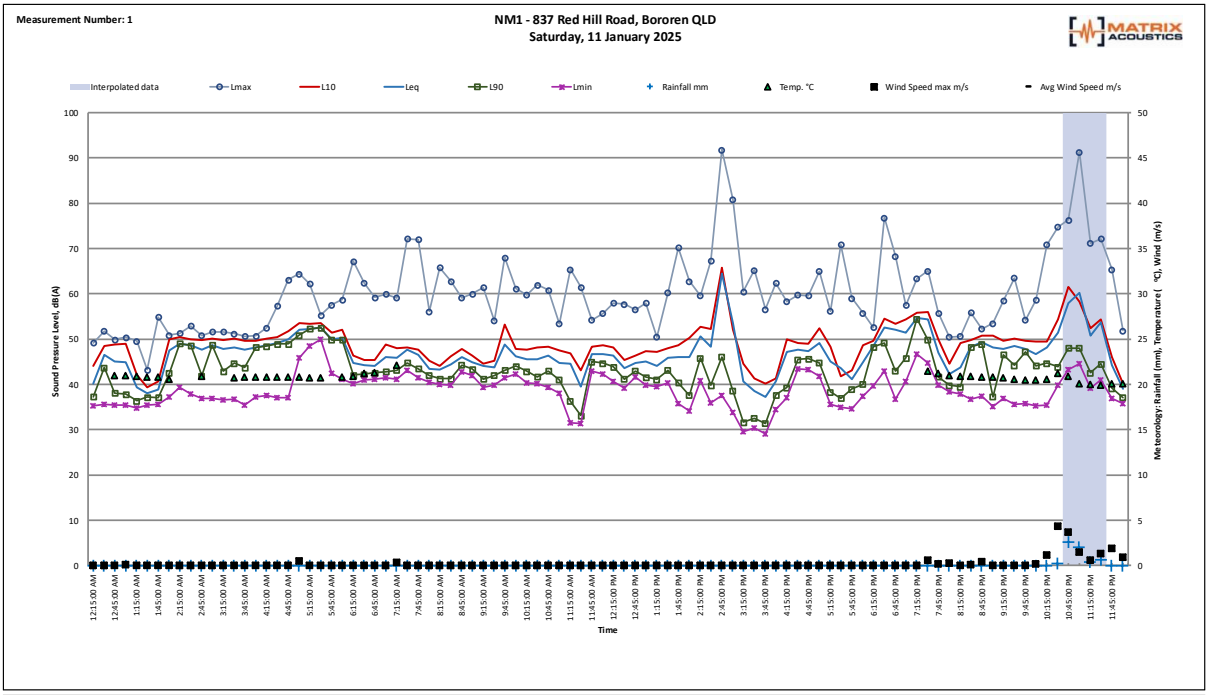
10 APPENDIX A – NOISE MONITORING FULL RESULTS

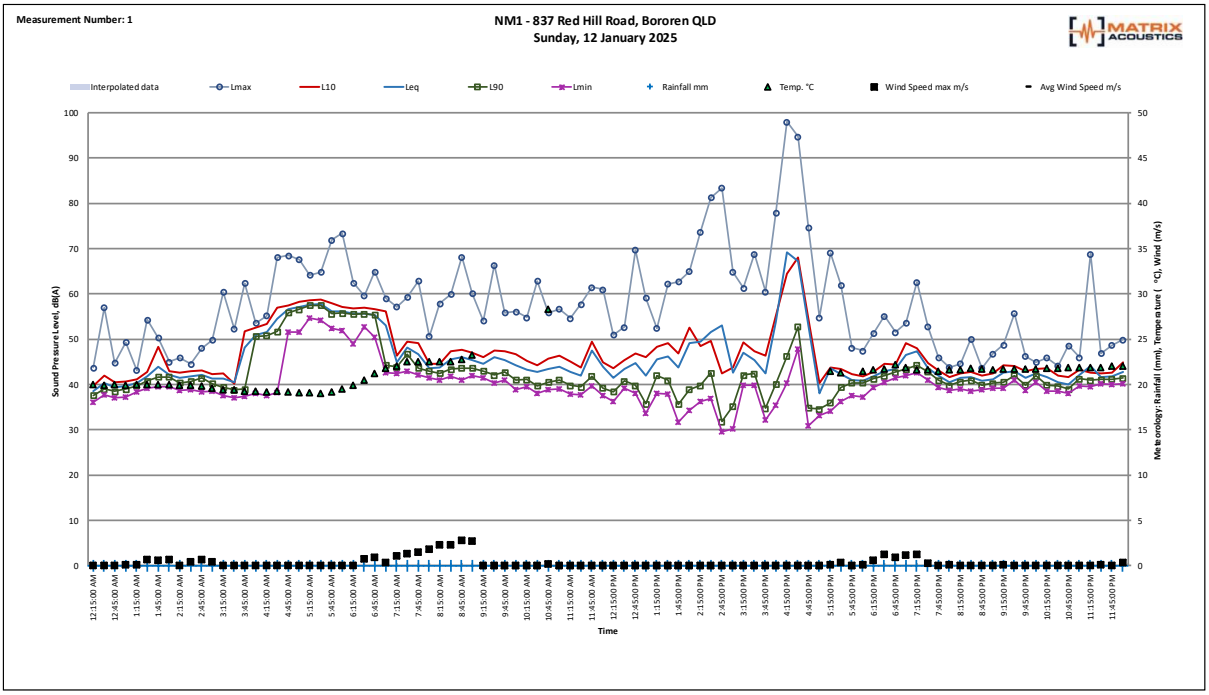
10.1 NM1 (EC6260C31724) – NOISE MONITORING RESULTS

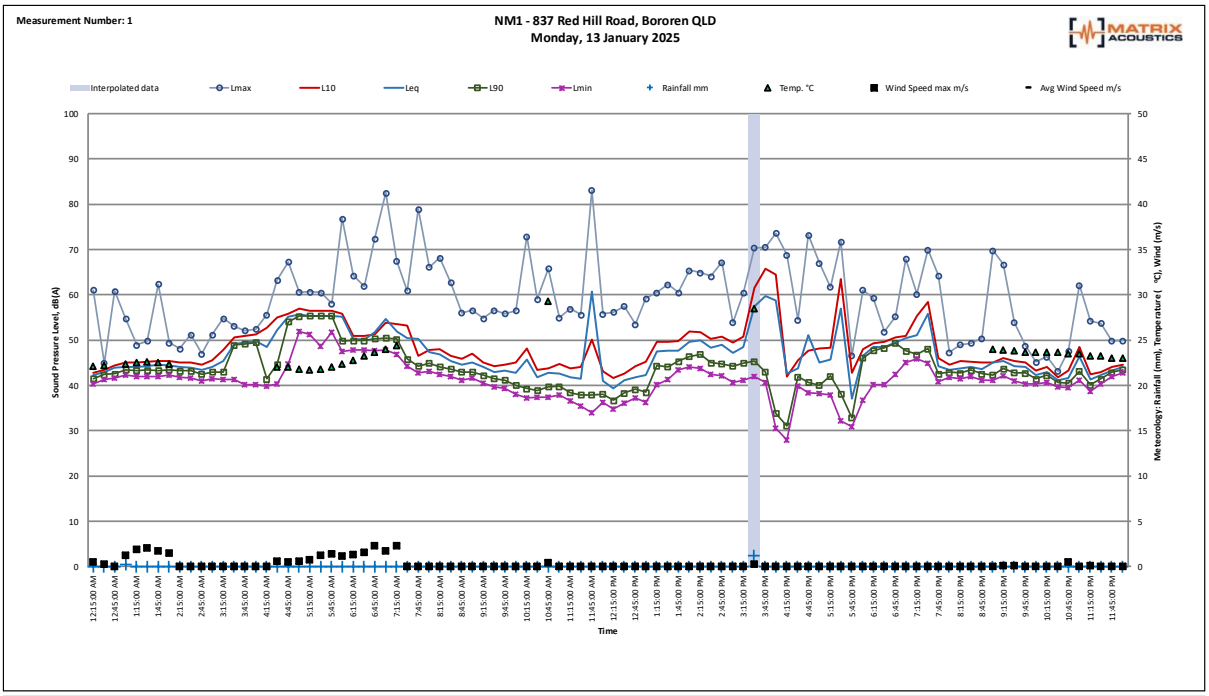
Table 10-1 NM1 - Daily Summary Data

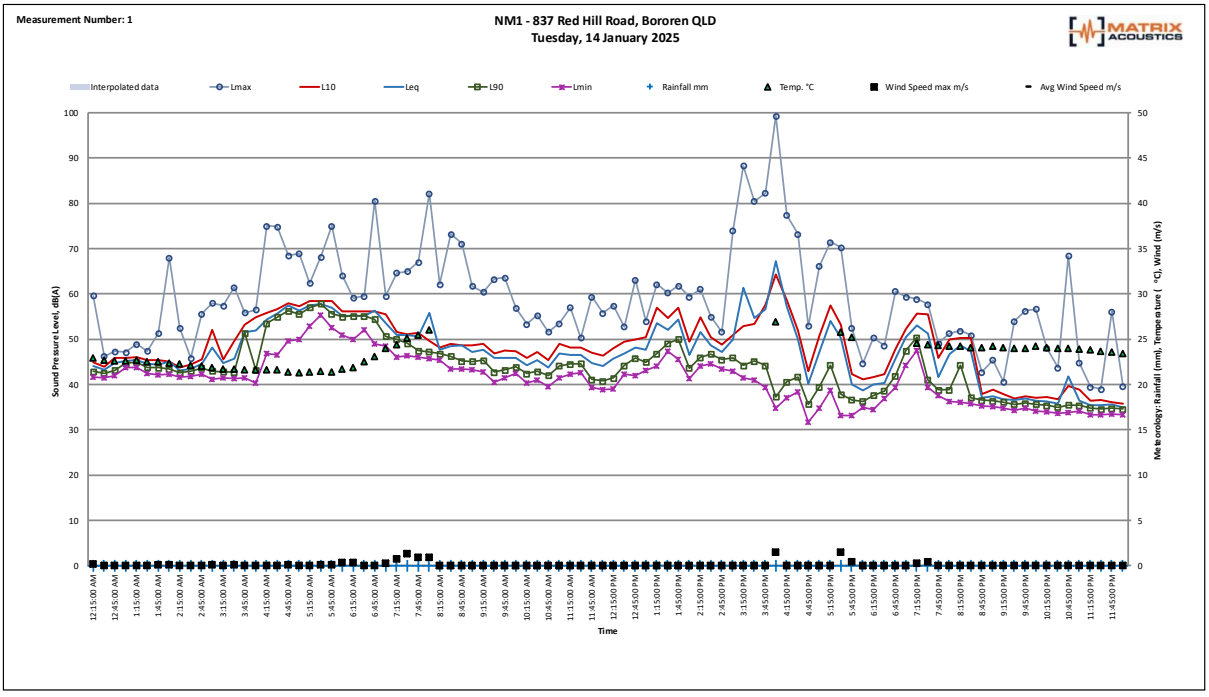
Date	Day			Evening			Night		
	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}
Saturday, 11 January 2025	50	36	48	50	40	51	53	39	50
Sunday, 12 January 2025	56	35	47	44	40	44	50	41	48
Monday, 13 January 2025	51	38	49	49	42	48	52	42	50
Tuesday, 14 January 2025	54	38	50	47	36	45	51	34	44
Wednesday, 15 January 2025	62	41	52	49	31	46	47	32	44
Thursday, 16 January 2025	51	45	53	58	32	50	45	35	42
Friday, 17 January 2025	48	40	50	47	33	40	49	31	45
Saturday, 18 January 2025	49	35	49	50	31	45	45	31	43
Sunday, 19 January 2025	50	36	50	43	32	42	43	31	42
Monday, 20 January 2025	44	34	45	43	33	40	46	30	39
Tuesday, 21 January 2025	47	40	48	44	30	39	61	30	38
Wednesday, 22 January 2025	49	41	50	45	30	40	44	30	39
Summary	**51**	**38[1]**	**49**	**47**	**32[1]**	**44**	**49**	**32[1]**	**44**

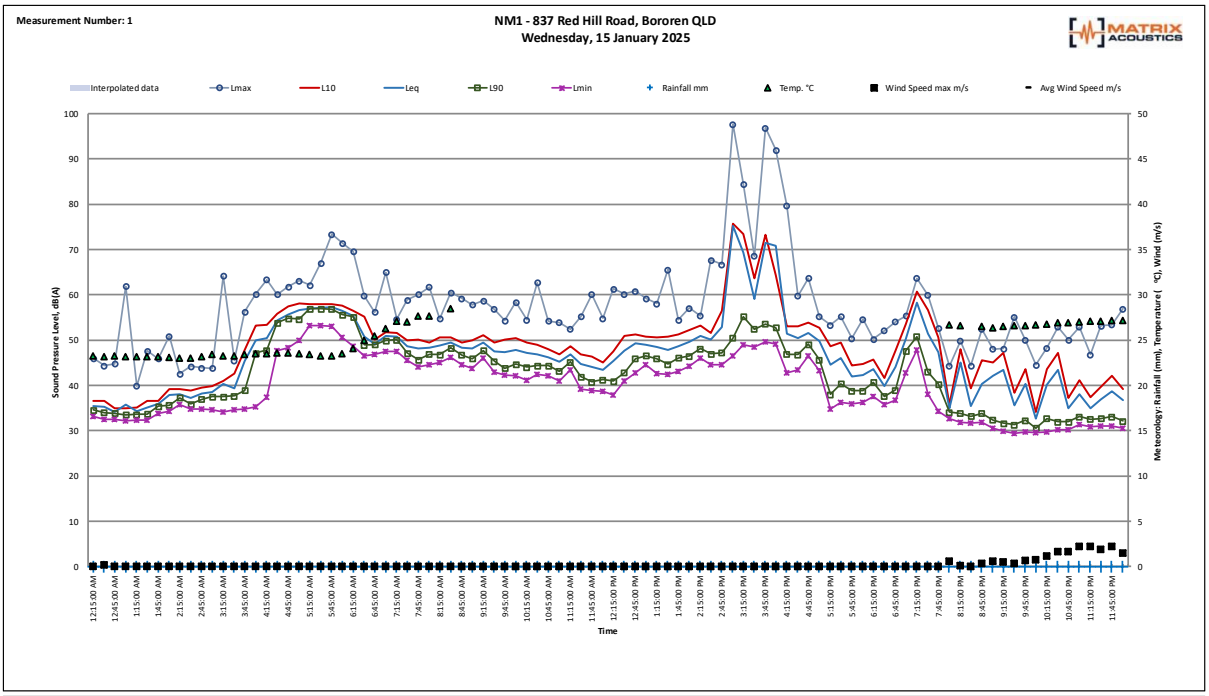
1. RBL

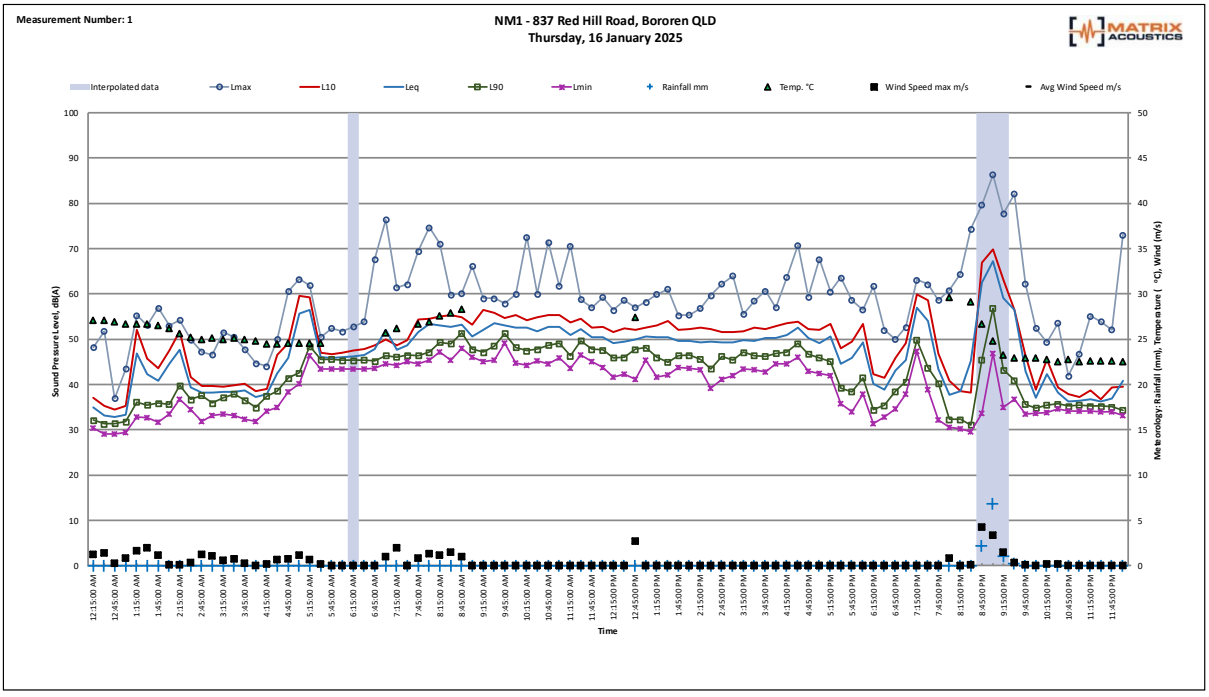

Measurement Number: 1
NM1 - 837 Red Hill Road, Bororen QLD
Saturday, 11 January 2025
MATRIX ACOUSTICS
Interpolated data
Lmax
L10
Leq
L90
Lmin
Rainfall mm
Temp. °C
Wind Speed max m/s
Avg Wind Speed m/s
Sound Pressure Level, dB(A)
Meteorology: Rainfall (mm), Temperature (°C), Wind (m/s)
Time

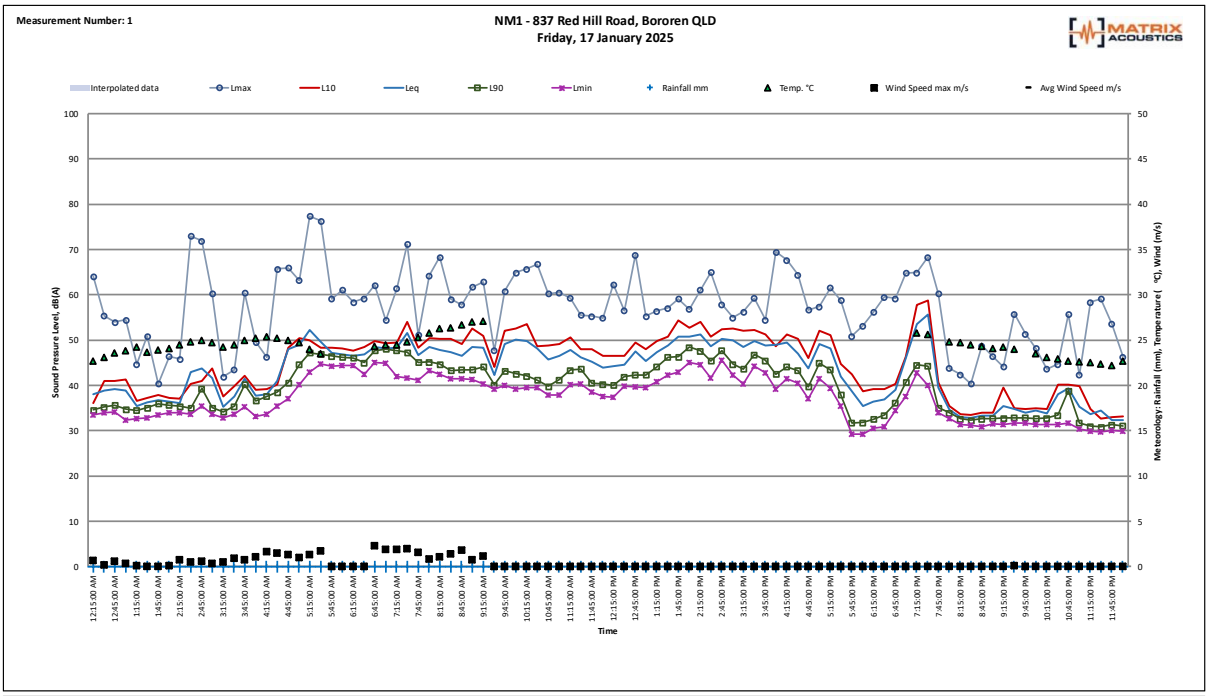

Measurement Number: 1
NM1 - 837 Red Hill Road, Bororen QLD
Sunday, 12 January 2025
MATRIX ACOUSTICS
Interpolated data
Lmax
L10
Leq
L90
Lmin
Rainfall mm
Temp. °C
Wind Speed max m/s
Avg Wind Speed m/s
Sound Pressure Level, dB(A)
Meteorology: Rainfall (mm), Temperature (°C), Wind (m/s)
Time

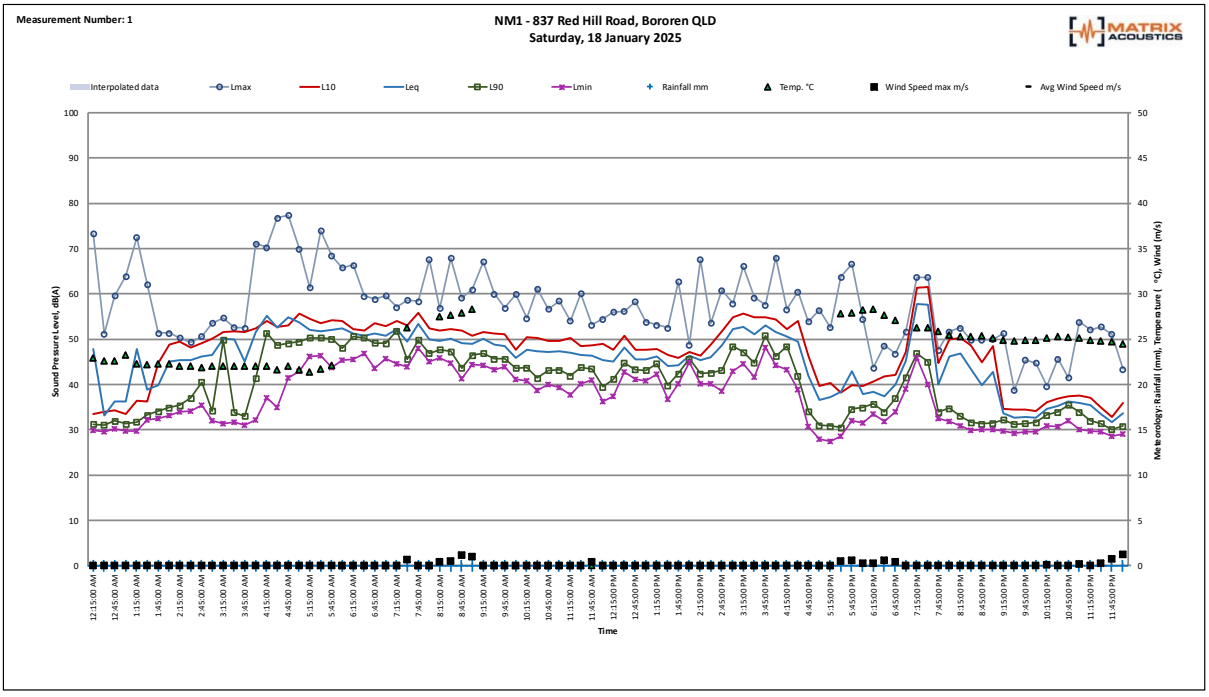

Measurement Number: 1
NM1 - 837 Red Hill Road, Bororen QLD
Monday, 13 January 2025
MATRIX ACOUSTICS
Interpolated data
Lmax
L10
Leq
L90
Lmin
Rainfall mm
Temp. °C
Wind Speed max m/s
Avg Wind Speed m/s
Sound Pressure Level, dB(A)
Meteorology: Rainfall (mm), Temperature (°C), Wind (m/s)
Time

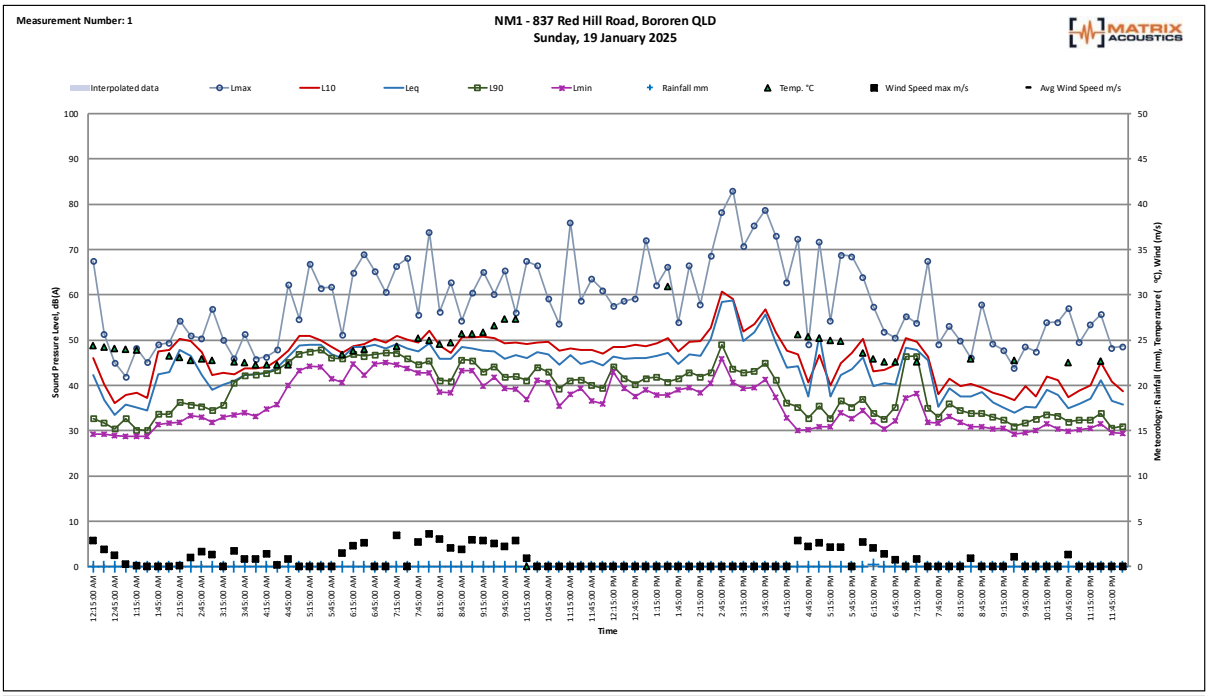

Measurement Number: 1
NM1 - 837 Red Hill Road, Bororen QLD
Tuesday, 14 January 2025
MATRIX ACOUSTICS
Interpolated data
Lmax
L10
Leq
L90
Lmin
Rainfall mm
Temp. °C
Wind Speed max m/s
Avg Wind Speed m/s
Sound Pressure Level, dB(A)
Meteorology: Rainfall (mm), Temperature (°C), Wind (m/s)
Time

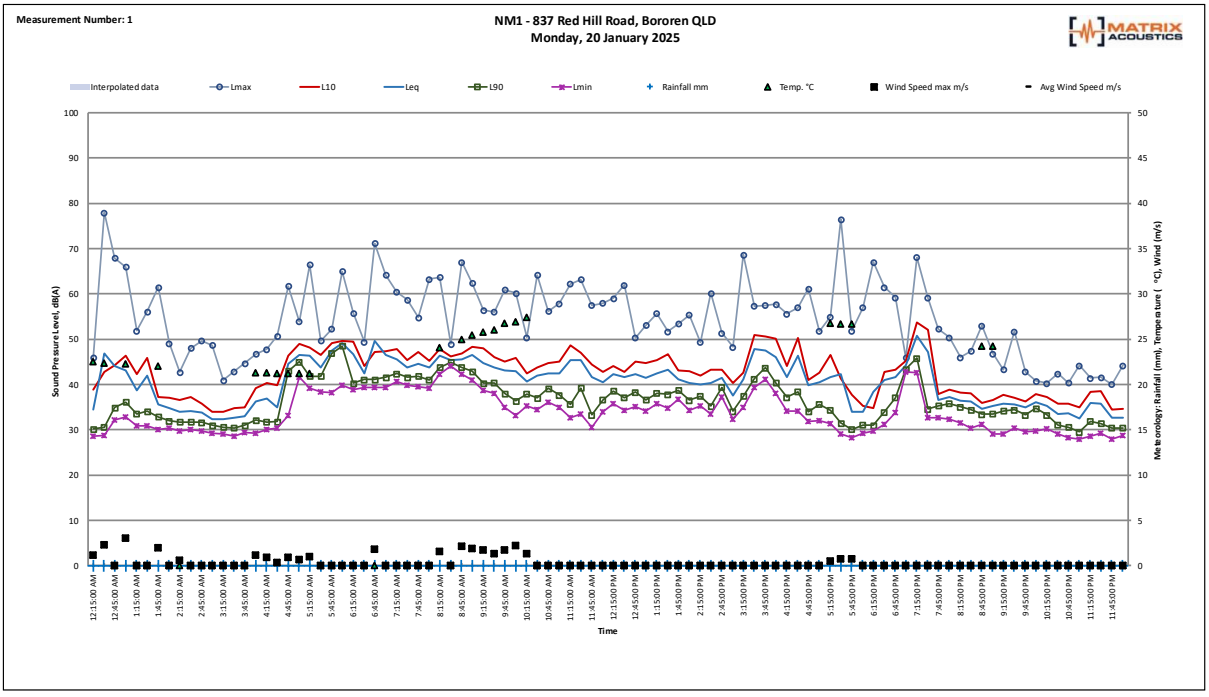

Measurement Number: 1
NM1 - 837 Red Hill Road, Bororen QLD
Wednesday, 15 January 2025
MATRIX ACOUSTICS
Interpolated data
Lmax
L10
Leq
L90
Lmin
Rainfall mm
Temp. °C
Wind Speed max m/s
Avg Wind Speed m/s
Sound Pressure Level, dB(A)
Meteorology: Rainfall (mm), Temperature (°C), Wind (m/s)
Time

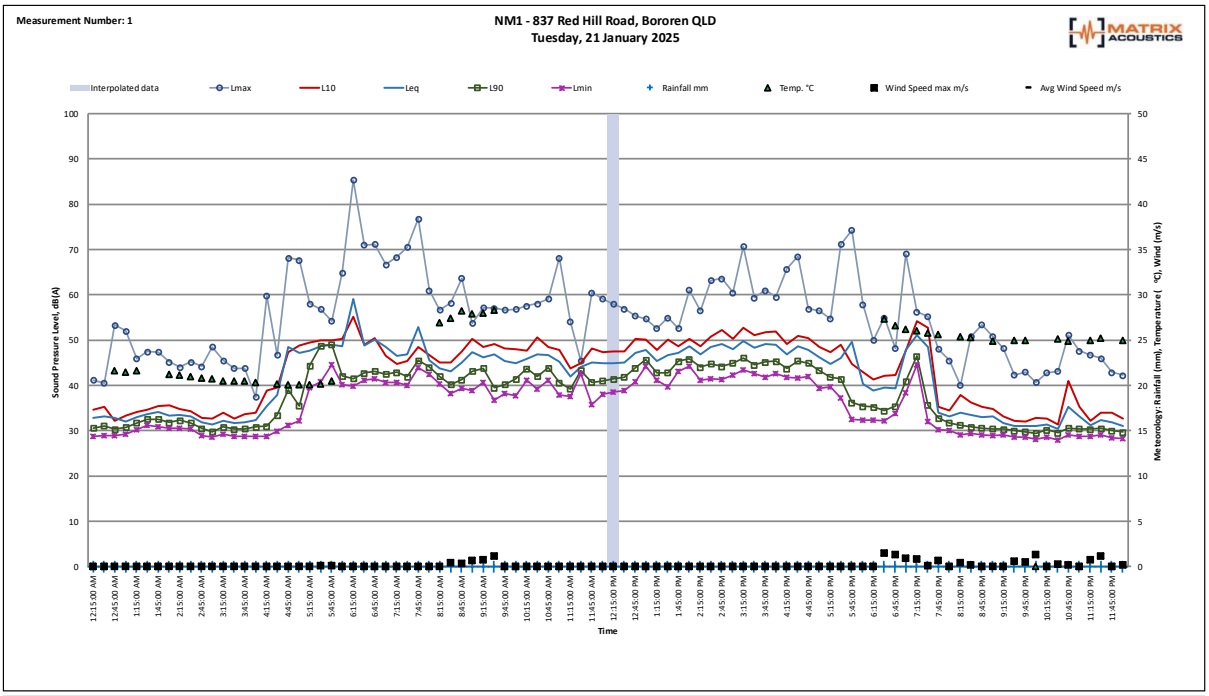

Measurement Number: 1
NM1 - 837 Red Hill Road, Bororen QLD
Thursday, 16 January 2025
MATRIX ACOUSTICS
Interpolated data
Lmax
L10
Leq
L90
Lmin
Rainfall mm
Temp. °C
Wind Speed max m/s
Avg Wind Speed m/s
Sound Pressure Level, dB(A)
Meteorology: Rainfall (mm), Temperature (°C), Wind (m/s)
Time

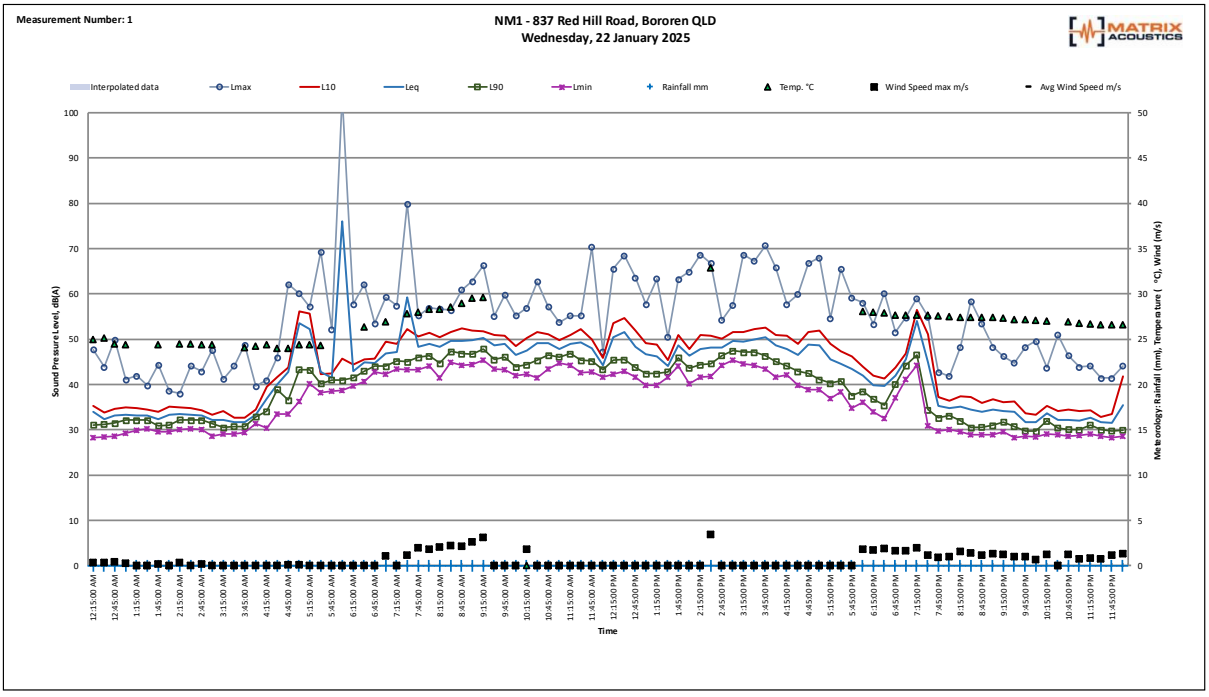

Measurement Number: 1
NM1 - 837 Red Hill Road, Bororen QLD
Friday, 17 January 2025
MATRIX ACOUSTICS
Interpolated data
Lmax
L10
Leq
L90
Lmin
Rainfall mm
Temp. °C
Wind Speed max m/s
Avg Wind Speed m/s
Sound Pressure Level, dB(A)
Meteorology: Rainfall (mm), Temperature (°C), Wind (m/s)
Time

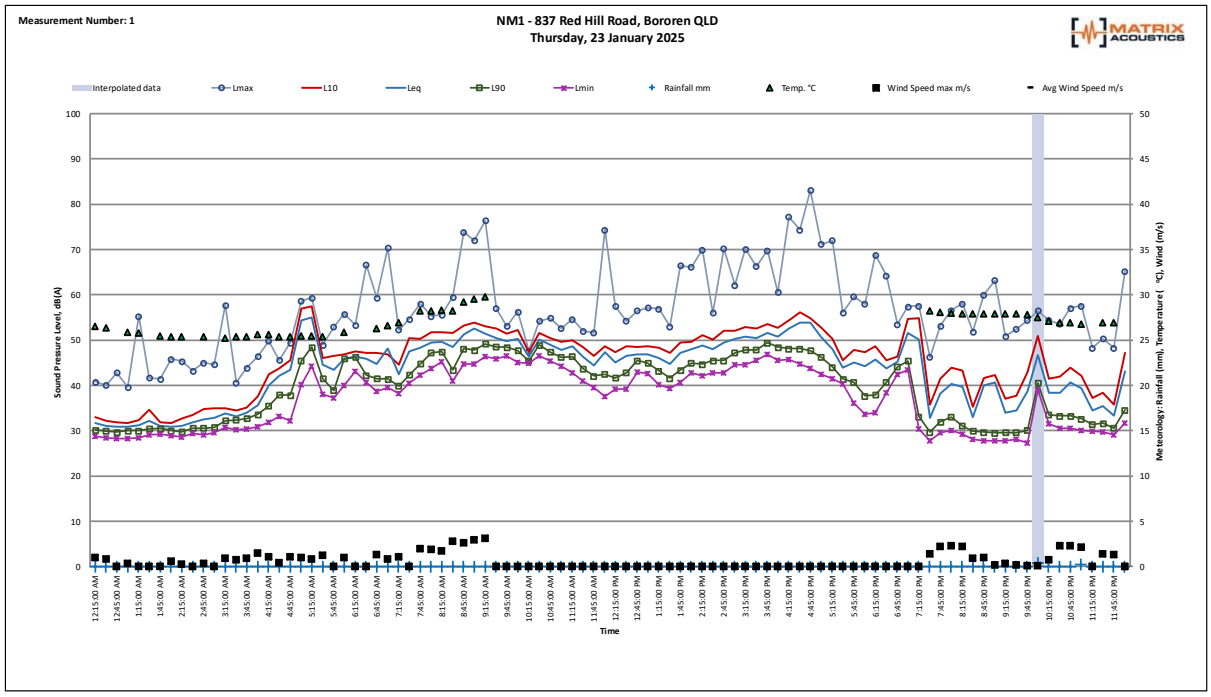

Measurement Number: 1
NM1 - 837 Red Hill Road, Bororen QLD
Saturday, 18 January 2025
MATRIX ACOUSTICS
Interpolated data
Lmax
L10
Leq
L90
Lmin
Rainfall mm
Temp. °C
Wind Speed max m/s
Avg Wind Speed m/s
Sound Pressure Level, dB(A)
Meteorology: Rainfall (mm), Temperature (°C), Wind (m/s)
Time


Measurement Number: 1
NM1 - 837 Red Hill Road, Bororen QLD
Sunday, 19 January 2025
MATRIX ACOUSTICS
Interpolated data
Lmax
L10
Leq
L90
Lmin
Rainfall mm
Temp. °C
Wind Speed max m/s
Avg Wind Speed m/s
Sound Pressure Level, dB(A)
Meteorology: Rainfall (mm), Temperature (°C), Wind (m/s)
Time


Measurement Number: 1
NM1 - 837 Red Hill Road, Bororen QLD
Monday, 20 January 2025
MATRIX ACOUSTICS
Interpolated data
Lmax
L10
Leq
L90
Lmin
Rainfall mm
Temp. °C
Wind Speed max m/s
Avg Wind Speed m/s
Sound Pressure Level, dB(A)
Meteorology: Rainfall (mm), Temperature (°C), Wind (m/s)
Time


Measurement Number: 1
NM1 - 837 Red Hill Road, Boroen QLD
Tuesday, 21 January 2025
MATRIX ACOUSTICS
Interpolated data
Lmax
L10
Leq
L90
Lmin
Rainfall mm
Temp. °C
Wind Speed max m/s
Avg Wind Speed m/s
Sound Pressure Level, dB(A)
Meteorology: Rainfall (mm), Temperature (°C), Wind (m/s)
Time


Measurement Number: 1
NM1 - 837 Red Hill Road, Boroen QLD
Wednesday, 22 January 2025
MATRIX ACOUSTICS
Interpolated data
Lmax
L10
Leq
L90
Lmin
Rainfall mm
Temp. °C
Wind Speed max m/s
Avg Wind Speed m/s
Sound Pressure Level, dB(A)
Meteorology: Rainfall (mm), Temperature (°C), Wind (m/s)
Time

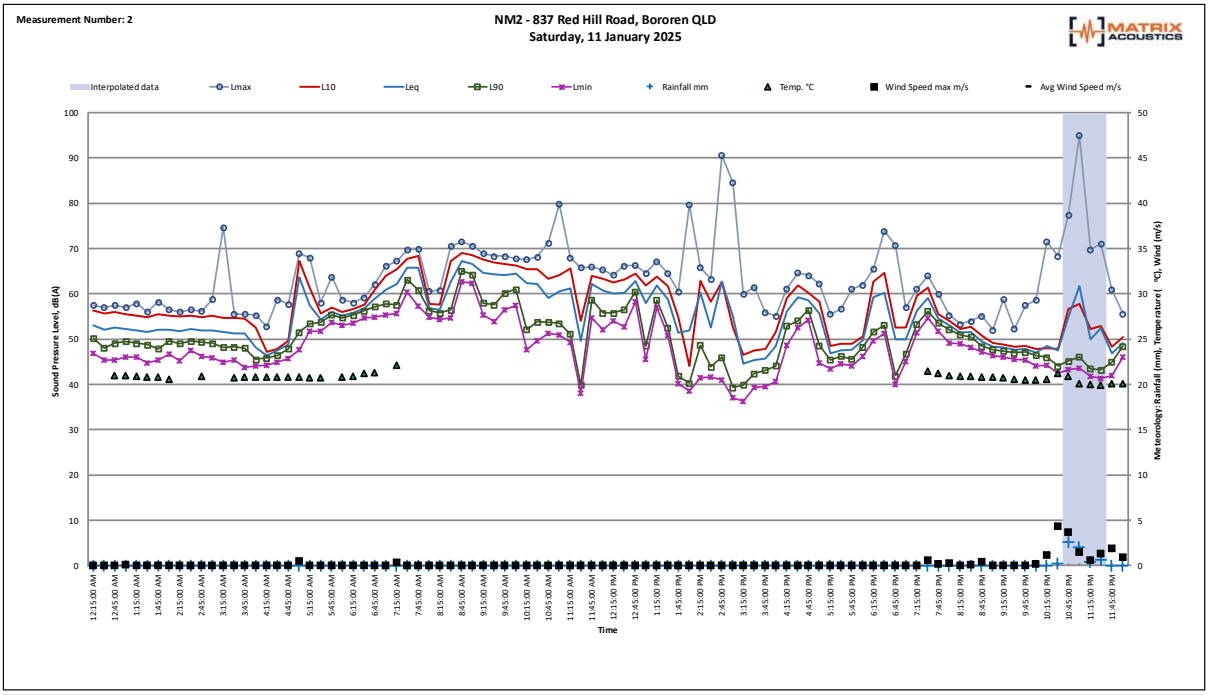

Measurement Number: 1
NM1 - 837 Red Hill Road, Bororen QLD
Thursday, 23 January 2025
MATRIX ACOUSTICS
Interpolated data
Lmax
L10
Leq
L90
Lmin
Rainfall mm
Temp. °C
Wind Speed max m/s
Avg Wind Speed m/s
Sound Pressure Level, dB(A)
Meteorology: Rainfall (mm), Temperature (°C), Wind (m/s)
Time

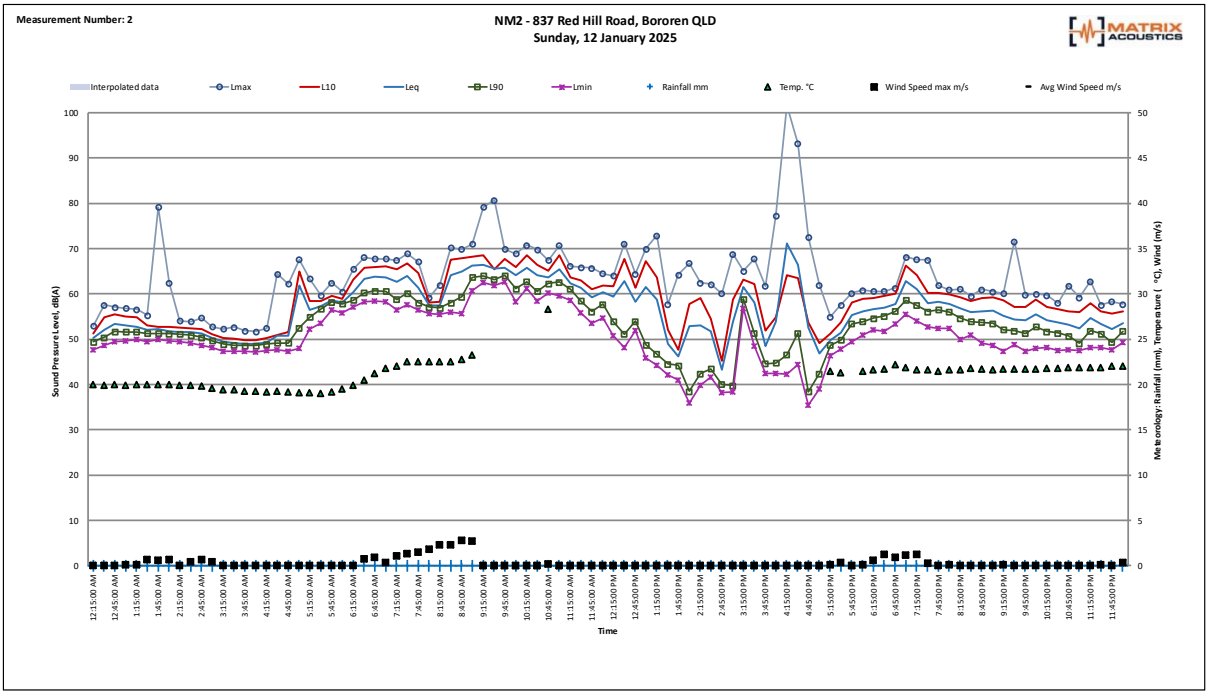
10.2 NM2 (94E6860BA6B8) – NOISE MONITORING RESULTS

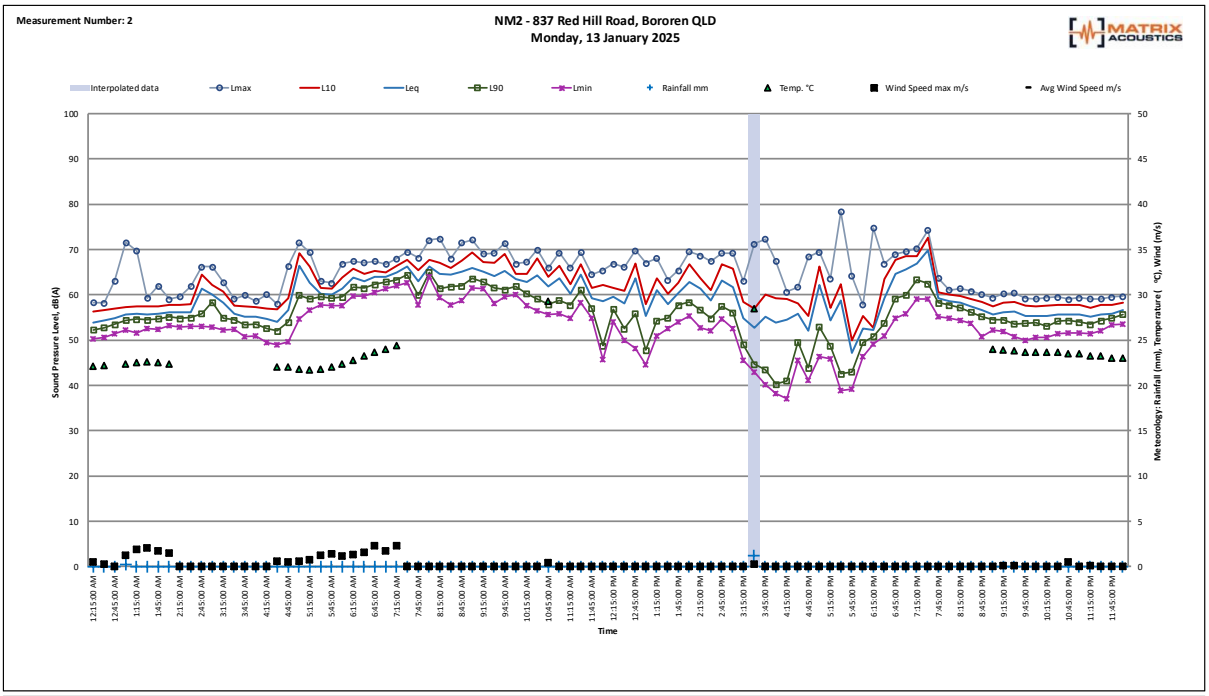
Table 10-2 NM2 - Daily Summary Data

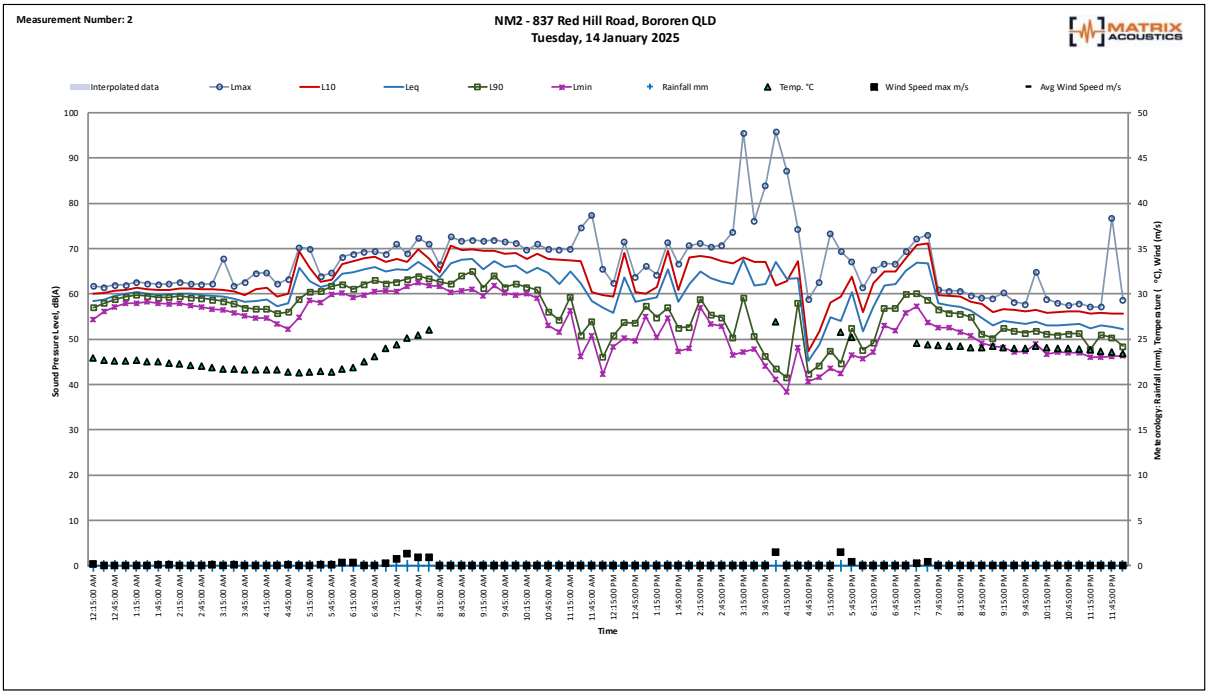
Date	Day			Evening			Night		
	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}
Saturday, 11 January 2025	61	42	60	55	47	54	57	45	55
Sunday, 12 January 2025	62	42	61	58	52	60	59	51	59
Monday, 13 January 2025	62	44	63	62	54	61	61	54	61
Tuesday, 14 January 2025	64	45	65	61	51	61	61	50	59
Wednesday, 15 January 2025	65	52	67	62	51	60	59	45	57
Thursday, 16 January 2025	63	52	67	62	47	60	58	51	59
Friday, 17 January 2025	66	53	68	61	51	59	57	47	57
Saturday, 18 January 2025	64	45	65	63	50	59	57	45	56
Sunday, 19 January 2025	66	43	65	55	43	54	54	44	55
Monday, 20 January 2025	65	45	66	60	46	58	54	45	55
Tuesday, 21 January 2025	66	52	69	61	49	59	58	45	55
Wednesday, 22 January 2025	66	52	69	63	49	59	61	41	52
Summary	**64**	**45[1]**	**66**	**60**	**49[1]**	**59**	**58**	**45[1]**	**56**

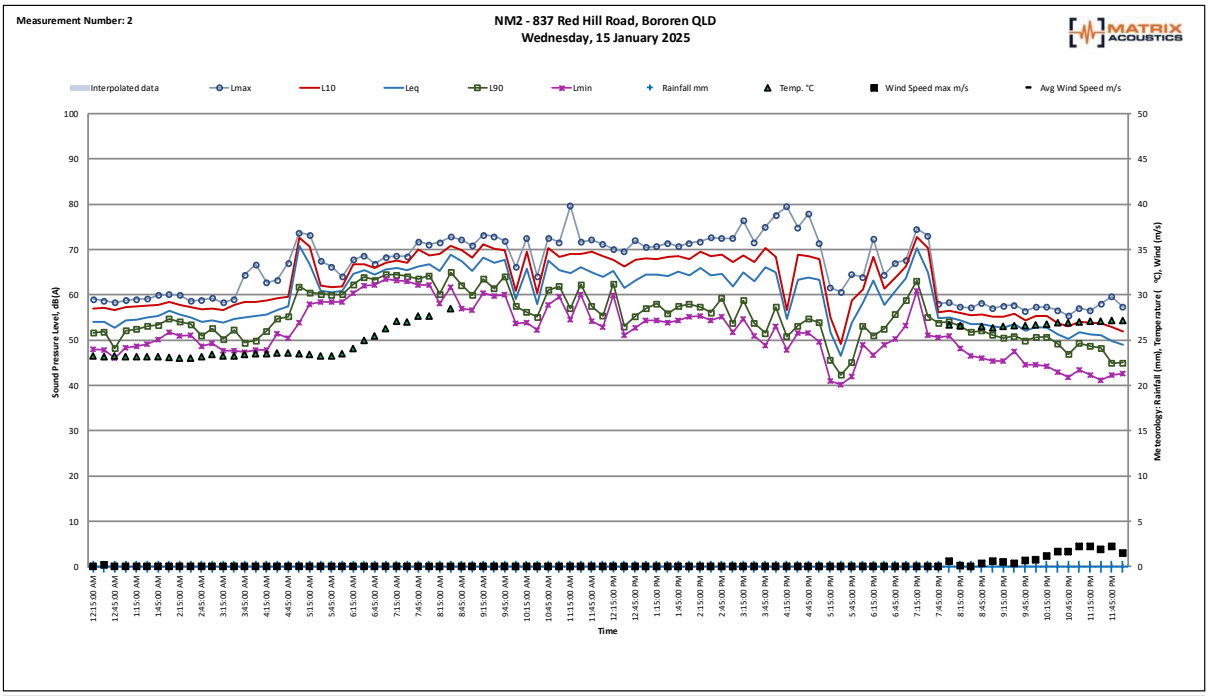
1. RBL

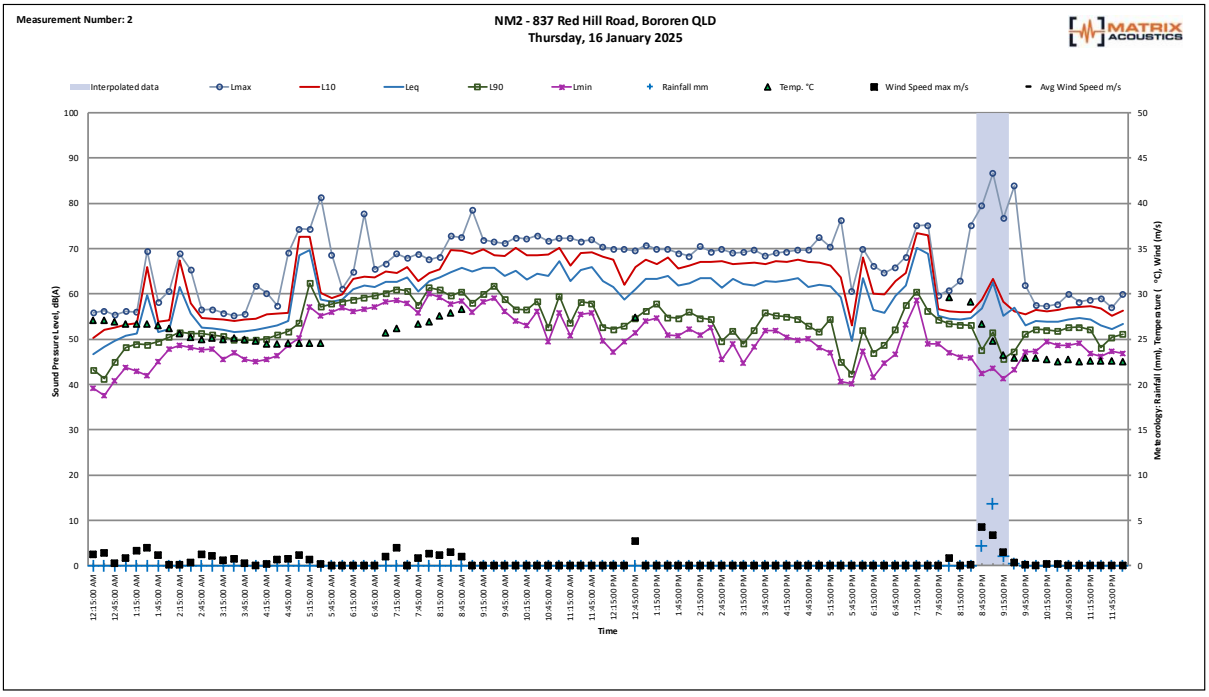

Measurement Number: 2
NM2 - 837 Red Hill Road, Bororen QLD
Saturday, 11 January 2025
MATRIX ACOUSTICS
Interpolated data
Lmax
L10
Leq
L90
Lmin
Rainfall mm
Temp. °C
Wind Speed max m/s
Avg Wind Speed m/s
Sound Pressure Level, dB(A)
Meteorology: Rainfall (mm), Temperature (°C), Wind (m/s)
Time

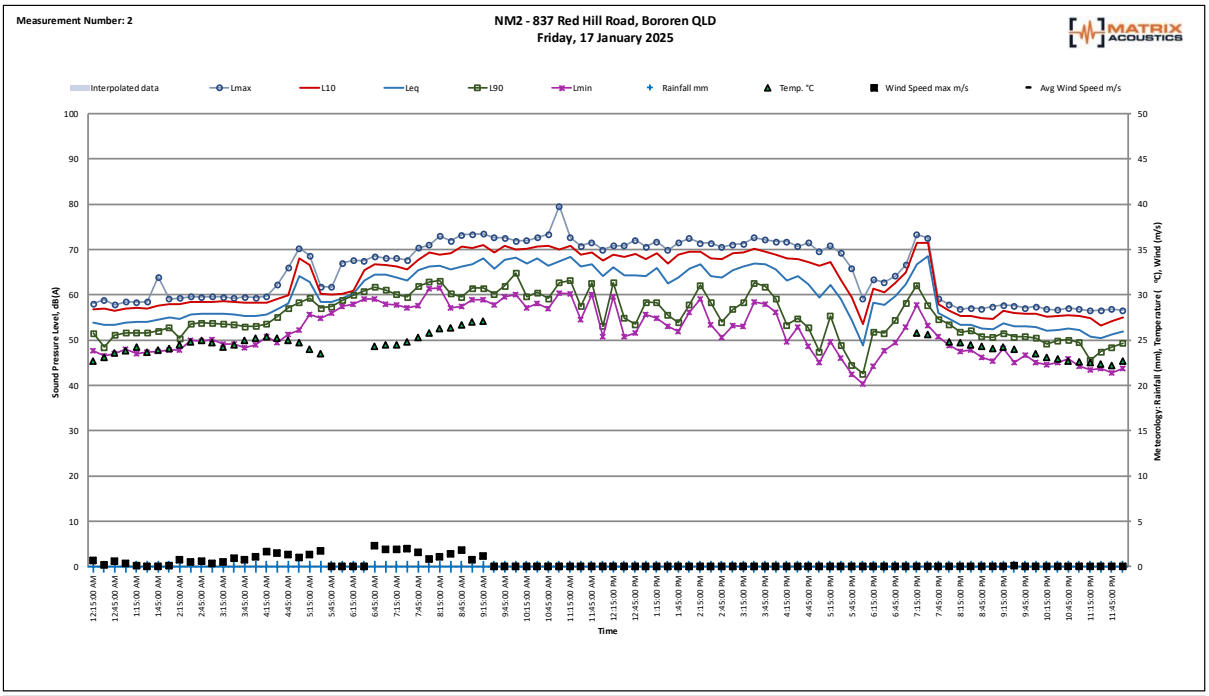

Measurement Number: 2
NM2 - 837 Red Hill Road, Bororen QLD
Sunday, 12 January 2025
MATRIX ACOUSTICS
Interpolated data
Lmax
L10
Leq
L90
Lmin
Rainfall mm
Temp. °C
Wind Speed max m/s
Avg Wind Speed m/s
Sound Pressure Level, dB(A)
Meteorology: Rainfall (mm), Temperature (°C), Wind (m/s)
Time

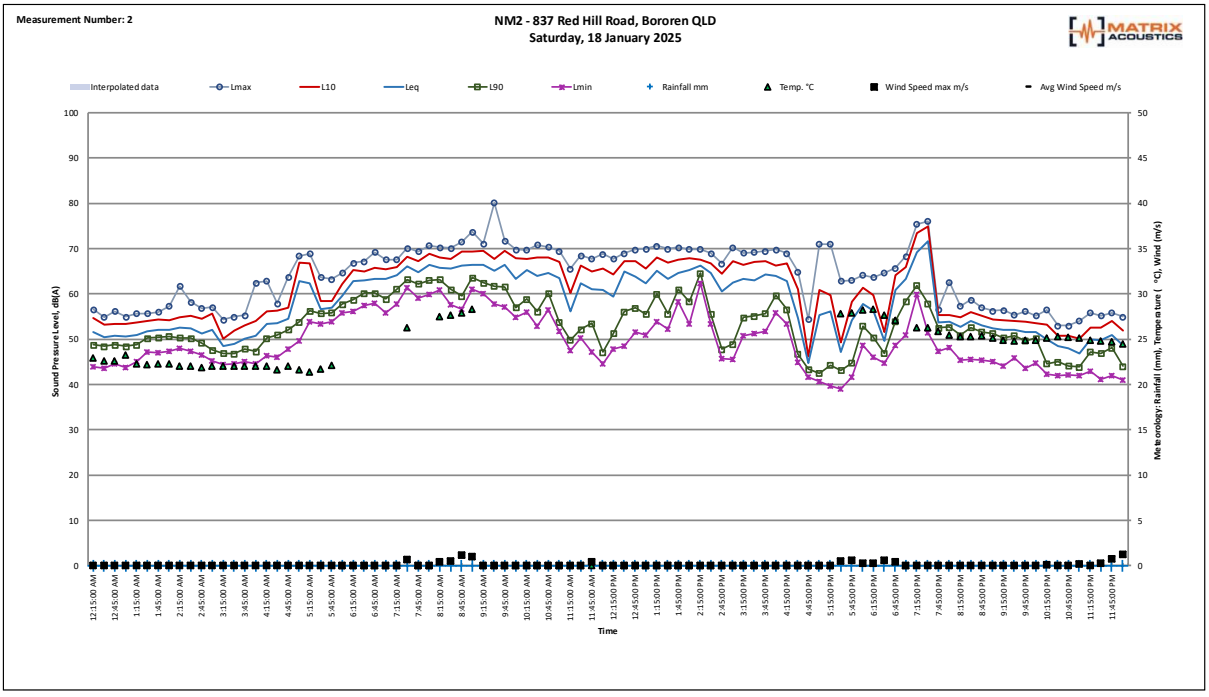

Measurement Number: 2
NM2 - 837 Red Hill Road, Bororen QLD
Monday, 13 January 2025
MATRIX ACOUSTICS
Interpolated data
Lmax
L10
Leq
L90
Lmin
Rainfall mm
Temp. °C
Wind Speed max m/s
Avg Wind Speed m/s
Sound Pressure Level, dB(A)
Meteorology: Rainfall (mm), Temperature (°C), Wind (m/s)
Time

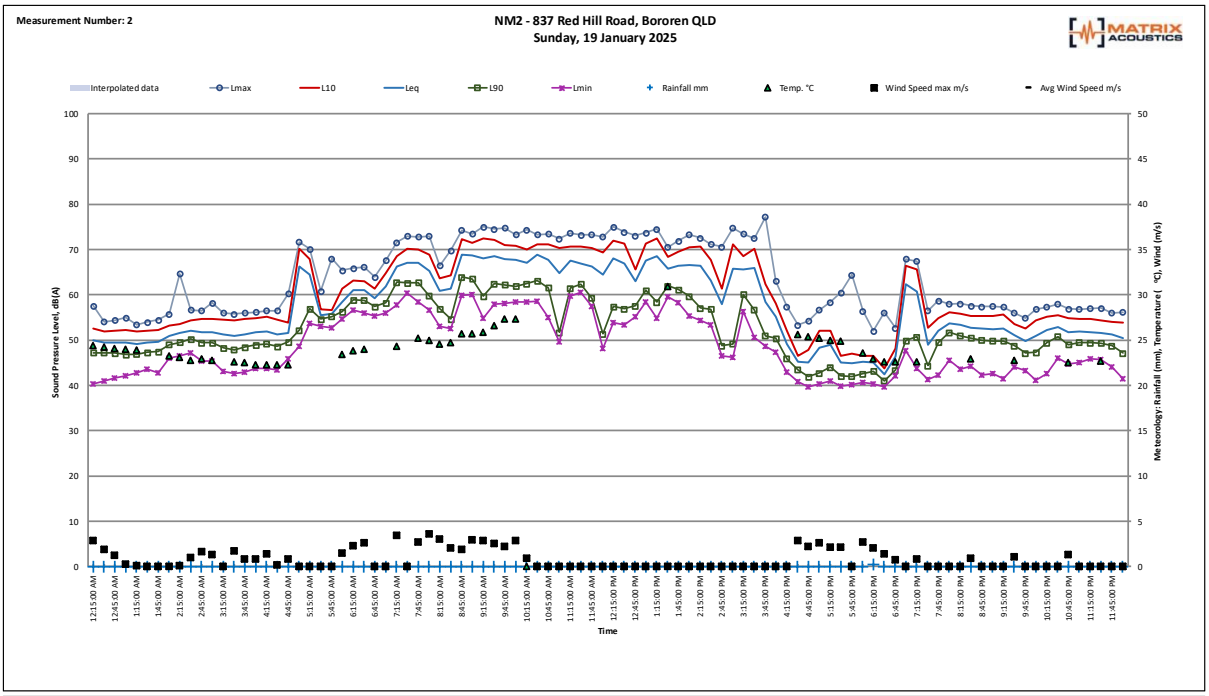

Measurement Number: 2
NM2 - 837 Red Hill Road, Bororen QLD
Tuesday, 14 January 2025
MATRIX ACOUSTICS
Interpolated data
Lmax
L10
Leq
L90
Lmin
Rainfall mm
Temp. °C
Wind Speed max m/s
Avg Wind Speed m/s
Sound Pressure Level, dB(A)
Meteorology: Rainfall (mm), Temperature (°C), Wind (m/s)
Time

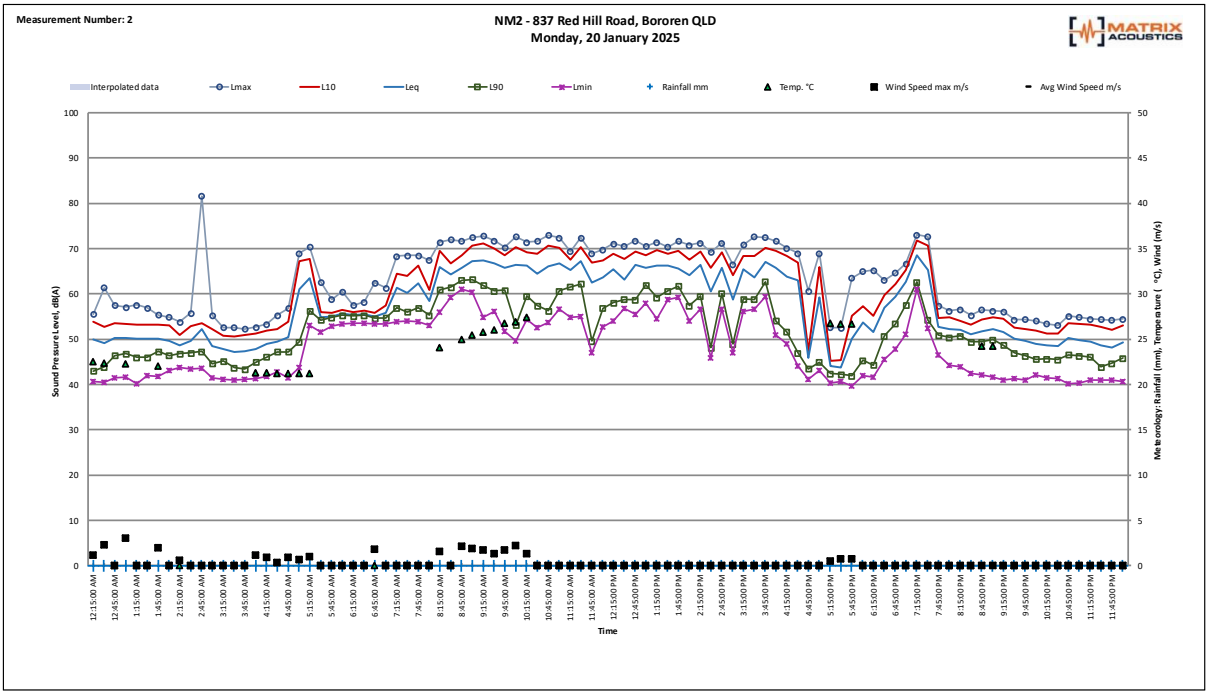

Measurement Number: 2
NM2 - 837 Red Hill Road, Bororen QLD
Wednesday, 15 January 2025
MATRIX ACOUSTICS
Interpolated data
Lmax
L10
Leq
L90
Lmin
Rainfall mm
Temp. °C
Wind Speed max m/s
Avg Wind Speed m/s
Sound Pressure Level, dB(A)
Meteorology: Rainfall (mm), Temperature (°C), Wind (m/s)
Time

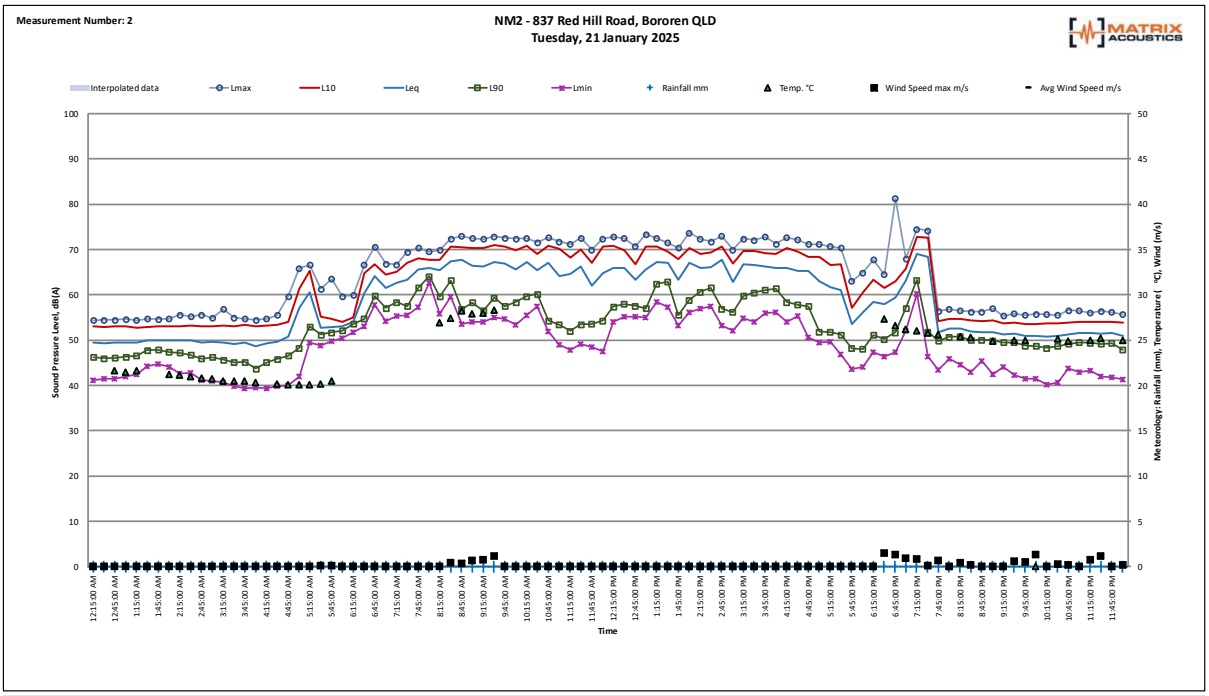

Measurement Number: 2
NM2 - 837 Red Hill Road, Bororen QLD
Thursday, 16 January 2025
MATRIX ACOUSTICS
Interpolated data
Lmax
L10
Leq
L90
Lmin
Rainfall mm
Temp. °C
Wind Speed max m/s
Avg Wind Speed m/s
Sound Pressure Level, dB(A)
Meteorology: Rainfall (mm), Temperature (°C), Wind (m/s)
Time

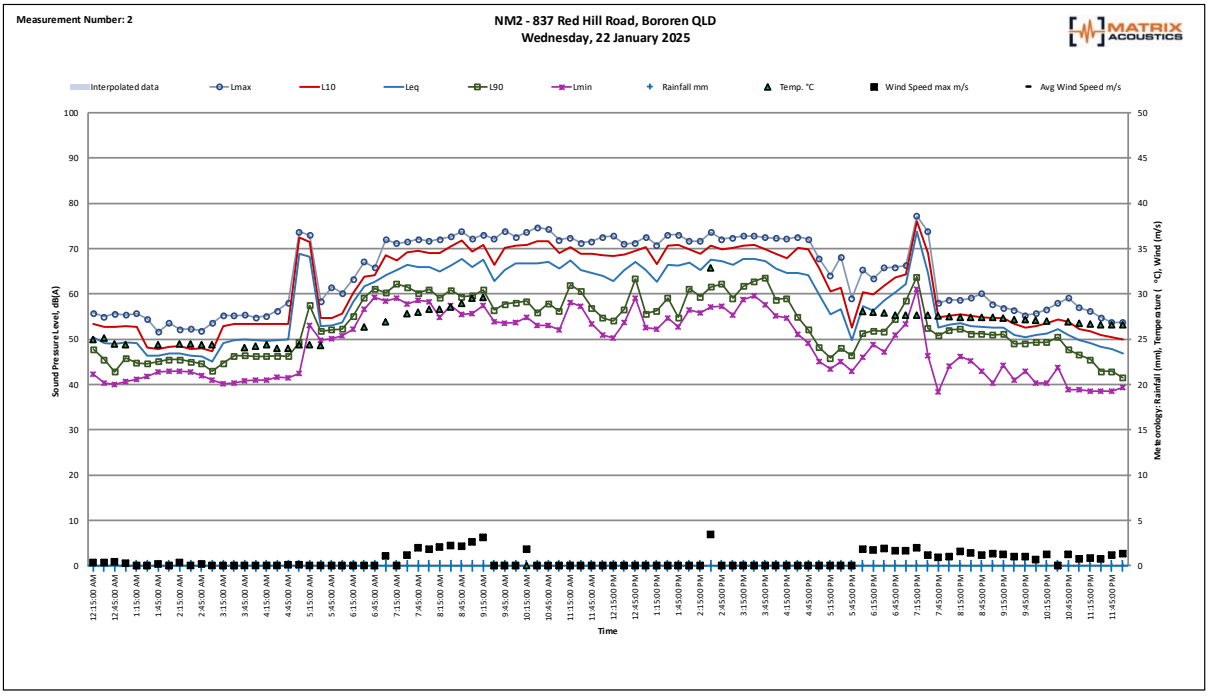

Measurement Number: 2
NM2 - 837 Red Hill Road, Bororen QLD
Friday, 17 January 2025
MATRIX ACOUSTICS
Interpolated data
Lmax
L10
Leq
L90
Lmin
Rainfall mm
Temp. °C
Wind Speed max m/s
Avg Wind Speed m/s
Sound Pressure Level, dB(A)
Meteorology: Rainfall (mm), Temperature (°C), Wind (m/s)
Time

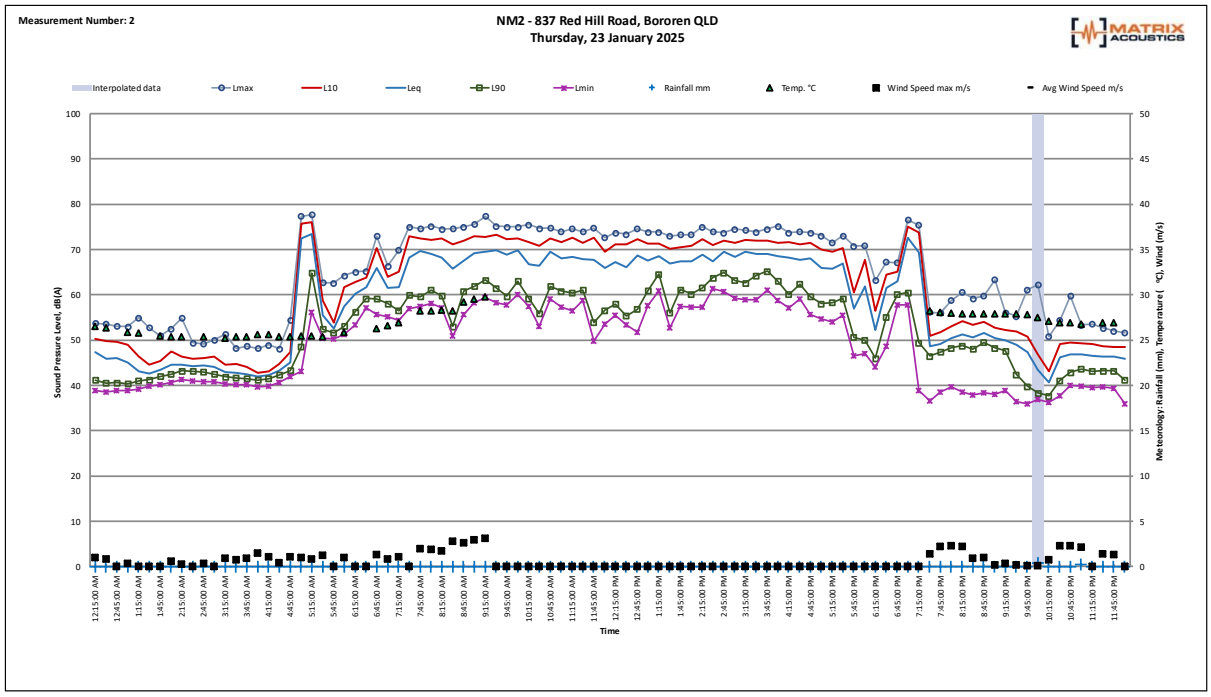

Measurement Number: 2
NM2 - 837 Red Hill Road, Bororen QLD
Saturday, 18 January 2025
MATRIX ACOUSTICS
Interpolated data
Lmax
L10
Leq
L90
Lmin
Rainfall mm
Temp. °C
Wind Speed max m/s
Avg Wind Speed m/s
Sound Pressure Level, dB(A)
Meteorology: Rainfall (mm), Temperature (°C), Wind (m/s)
Time


Measurement Number: 2
NM2 - 837 Red Hill Road, Bororen QLD
Sunday, 19 January 2025
MATRIX ACOUSTICS
Interpolated data
Lmax
L10
Leq
L90
Lmin
Rainfall mm
Temp. °C
Wind Speed max m/s
Avg Wind Speed m/s
Sound Pressure Level, dB(A)
Meteorology: Rainfall (mm), Temperature (°C), Wind (m/s)
Time


Measurement Number: 2
NM2 - 837 Red Hill Road, Bororen QLD
Monday, 20 January 2025
MATRIX ACOUSTICS
Interpolated data
Lmax
L10
Leq
L90
Lmin
Rainfall mm
Temp. °C
Wind Speed max m/s
Avg Wind Speed m/s
Sound Pressure Level, dB(A)
Meteorology: Rainfall (mm), Temperature (°C), Wind (m/s)
Time


Measurement Number: 2
NM2 - 837 Red Hill Road, Bororen QLD
Tuesday, 21 January 2025
MATRIX ACOUSTICS
Interpolated data
Lmax
L10
Leq
L90
Lmin
Rainfall mm
Temp. °C
Wind Speed max m/s
Avg Wind Speed m/s
Sound Pressure Level, dB(A)
Meteorology: Rainfall (mm), Temperature (°C), Wind (m/s)
Time


Measurement Number: 2
NM2 - 837 Red Hill Road, Bororen QLD
Wednesday, 22 January 2025
MATRIX ACOUSTICS
Interpolated data
Lmax
L10
Leq
L90
Lmin
Rainfall mm
Temp. °C
Wind Speed max m/s
Avg Wind Speed m/s
Sound Pressure Level, dB(A)
Meteorology: Rainfall (mm), Temperature (°C), Wind (m/s)
Time


Measurement Number: 2
NM2 - 837 Red Hill Road, Bororen QLD
Thursday, 23 January 2025
MATRIX ACOUSTICS
Interpolated data
Lmax
L10
Leq
L90
Lmin
Rainfall mm
Temp. °C
Wind Speed max m/s
Avg Wind Speed m/s
Sound Pressure Level, dB(A)
Meteorology: Rainfall (mm), Temperature (°C), Wind (m/s)
Time