

EVERGLADES HOUSE & GARDENS

37 EVERGLADES AVE, LEURA NSW

NOISE IMPACT ASSESSMENT

RWDI # 2200086.04

13 November 2024

SUBMITTED TO

National Trust of Australia (NSW)

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GLOSSARY OF ACOUSTIC TERMS

Most environments are affected by environmental noise which continuously varies, largely as a result of road traffic. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are demonstrated in the graph below, are here defined.

Sound - A dynamic (fluctuating) pressure

Airborne Sound - Sound that reaches the point of interest by propagation through air.

Noise - Generally defined as the unwanted portion of sound.

Noise Level - This is the same as sound level except that it is applied to unwanted sounds, general the sound level at a point of reception.

Ambient noise or sound - All noises that exist in an area and are not related to a facility under study. Ambient noise may include sound from other existing industrial facilities, transportation sources, animals, and nature. Context for ambient noise should be defined for each project.

Attenuation - The reduction of sound intensity by various means (e.g., air, humidity, porous materials, etc.)

dB (decibel) - A unit of measure of sound pressure that compresses a large range of numbers into a more meaningful scale. Hearing tests indicate that the lowest audible pressure is approximately 2×10^{-5} Pa (0 dB), while the sensation of pain is approximately 2×10^2 Pa (120 dB). Generally, an increase of 10 dB is perceived as twice as loud.

dBA - The decibel (dB) sound pressure level filtered through the A filtering network to approximate human hearing response at low frequencies.

dB C - The decibel (dB) sound pressure level filtered through the C filtering network to highlight low and middle frequencies.

A-Weighting - Follows the frequency sensitivity of the human ear at low levels. This is the most commonly used weighting scale, as it also predicts quite well the damage risk of the ear. Sound level meters set to the A-weighting scale will filter out much of the low-frequency noise they measure, similar to the response of the human ear.

C-Weighting - Follows the frequency sensitivity of the human ear at high noise levels. The C-weighting scale is quite flat, and therefore includes much more of the low-frequency range of sounds than the A scales.

The resultant sound pressure level with the associated unit "dBA" is therefore a representative of the subjective response of the human ear. The weightings are assigned in a way to reflect the higher sensitivity of human ear to sound in the mid and high frequency band as shown in the curve labelled A-weighting in Figure 1.

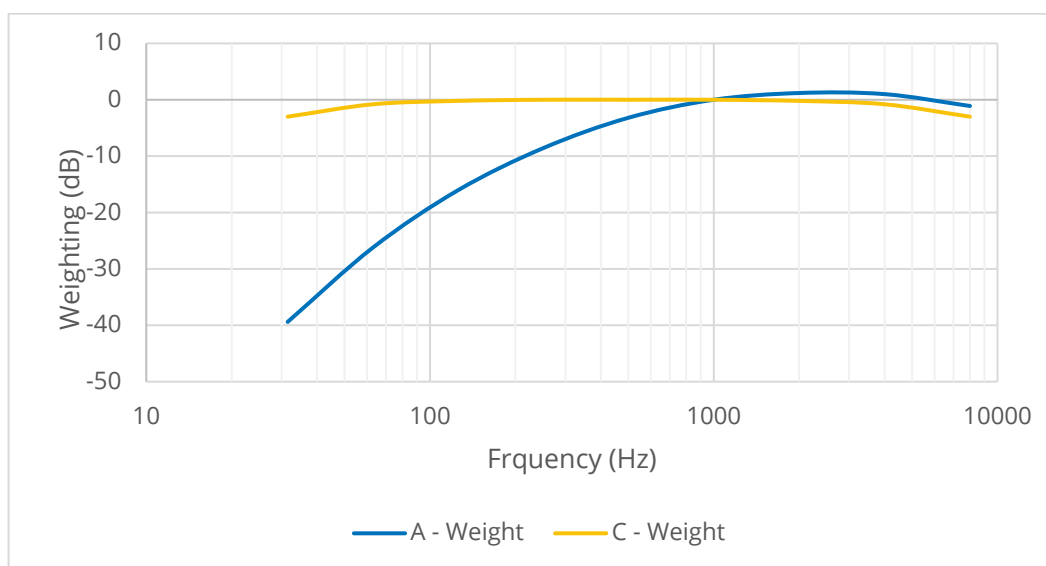


Figure 1 Weighting curves

Human Perception of Sound - The human perception of noise impact is an important consideration in qualifying the noise effects caused by projects. The following table presents a general guideline.

Table 1 Human perception of sound

Increase in Noise Level (dBA)	Perception
1 to 3	Imperceptible to possibly perceptible
4 to 5	just-noticeable difference
6 to 9	marginally significant
10 or more	significant, perceived as a doubling of sound level

Sound Pressure Level (SPL) - The logarithmic ratio of the RMS sound pressure to the sound pressure at the threshold of hearing. The sound pressure level is defined by equation (1) where P is the RMS pressure due to a sound and P_{ref} is the reference pressure. P_{ref} is usually taken as 2×10^{-5} Pascals.

$$(1) \text{ SPL (dB)} = 20 \log(P_{RMS}/P_{ref})$$

Sound Power Level (SWL) - The logarithmic ratio of the instantaneous sound power (energy) of a noise source to that of an international standard reference power. The sound power level is defined by equation (2) where W is the sound power of the source in watts, and W_{ref} is the reference power of 10^{-12} watts.

$$(2) \text{ SWL (dB)} = 10 \log(W/W_{ref})$$

Interrelationships between sound pressure level (SPL) and sound power level (SWL) depend on the location and type of source.

Sound level meter (SLM) - An instrument designed and calibrated to respond to sound and to give objective, reproducible measurements of sound pressure level. It normally has several features that would enable its frequency response and averaging times to be changed to make it suitable to simulate the response of the human ear.

Calibration - The procedure used for the adjustment of a sound level meter using a reference source of a known sound pressure level and frequency. Calibration must take place before and after the sound level measurements.

ABL - The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening and night time) for each day. It is determined by calculating the 10th percentile (lowest 10th percent) background level (L_{A90}) for each period.

RBL - The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period – daytime, evening and night time.

Maximum Noise Level (L_{Amax}) - The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

L_{A1} - The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

L_{A10} - The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

L_{A90} - The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

L_{Aeq} - The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

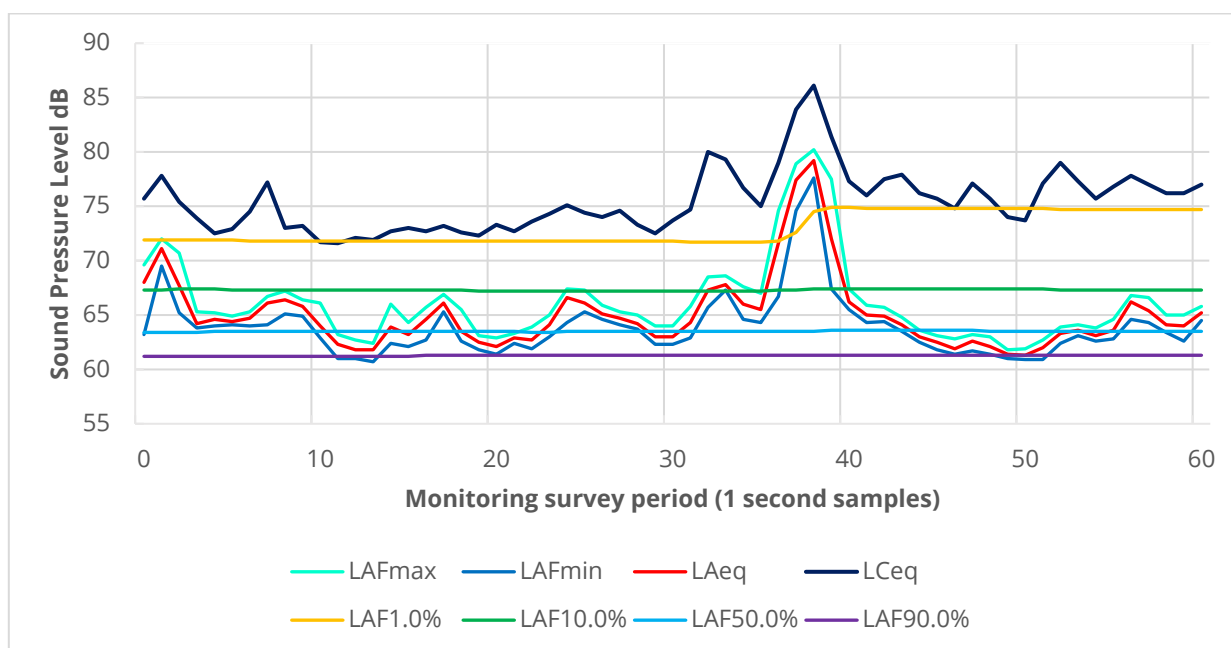


Figure 2 Typical graph of sound pressure level vs time

RELATIONSHIP BETWEEN EVERYDAY SOUNDS (TYPICAL SOUND PRESSURE LEVELS AT MEASUREMENT POINT)

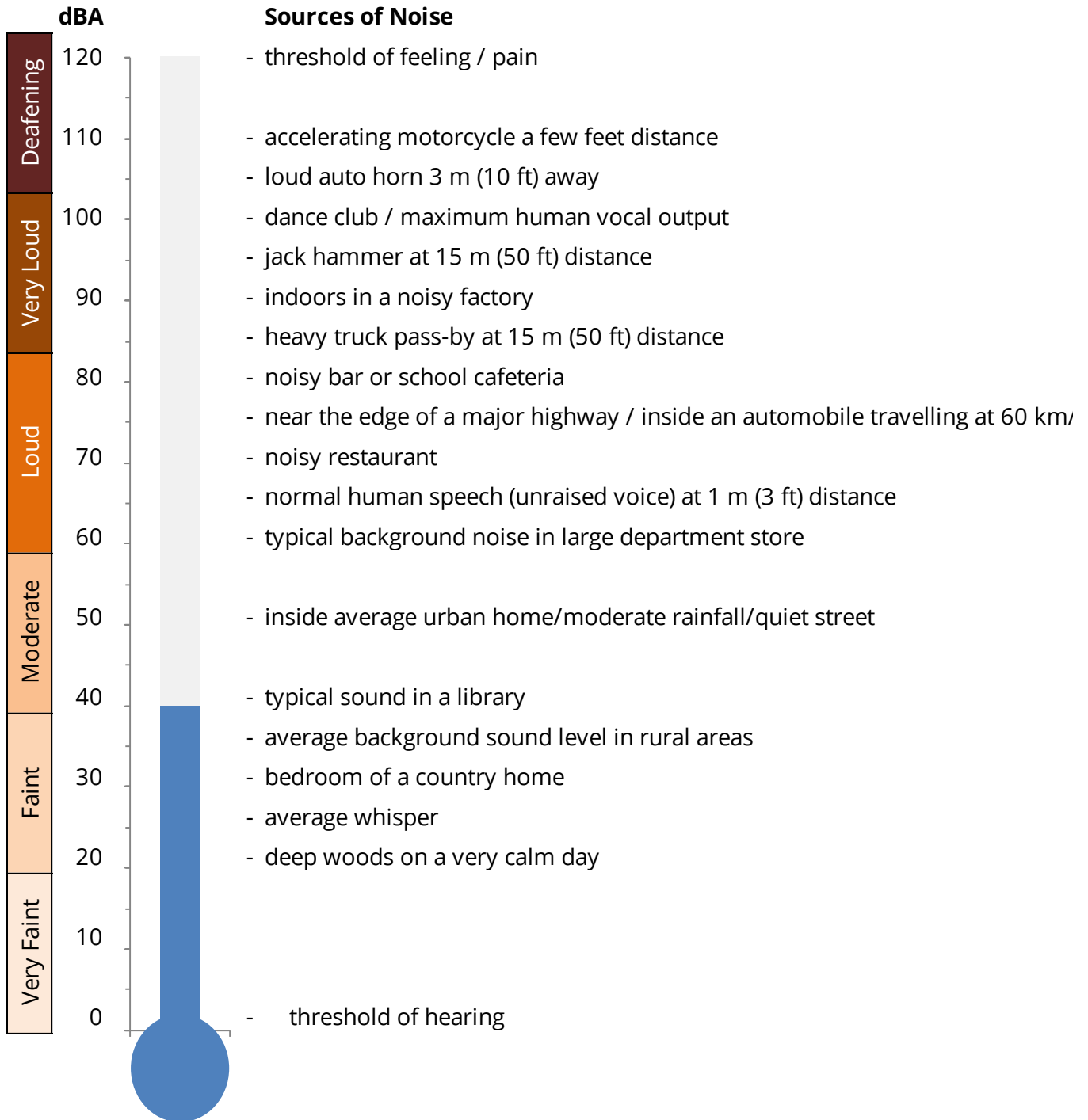




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1 INTRODUCTION

RWDI Australia Pty Ltd has been engaged by National Trust of Australia (NSW)(the Client) to conduct a Noise Impact Assessment for noise emissions associated with the proposed activities at Everglades House & Gardens located at 37 Everglades Avenue, Leura NSW (presented in **Figure 1-1**).



Figure 1-1 Site Location

This report accompanies a Development Application that seeks ongoing approval for Open Days, Performance Activities and Small Activities at the site in accordance with

Table 1-1.

Public activities were previously approved by Blue Mountains City Council (BCC) (**the Council**), as Temporary Activities, for 28 days annually, pursuant to Council consent X/534/2016 issued on 25 July 2016.

1.1 Proposed Activities

Three types of activities are proposed - Open Days, Performance Activities and Small Activities. The proposed activities and locations advised by the client are presented in

Table 1-1 and Figure 1-2. None of these proposed activity types would occur simultaneously.

Table 1-1 Proposed Activity Types and Descriptions

Activity type	Example activities
Open Days Activities	<p>Open days (no more than two days per year) such as performances, art/sculpture exhibition, garden fair, art deco fair, family fun day e.g., Easter Fun Day.</p> <p>Maximum capacity would be 600 patrons throughout the day. This means that the maximum number of patrons on the site is approximately 250-300 in the peak hour. This noise assessment has taken a conservative peak hour scenario assumption of there being 300 people at the Main Stage in The Glades plus 114 people across the remainder of the site.</p>
Performance Activities	<p>Performance activities such as theatre or music performance (e.g., Leura Shakespeare Festival). Performance activities might include fair, art related activities (e.g., photography / sculpture show). Maximum capacity is 250 patrons. These activities may occur during the daytime/evening, up to 20 days annually.</p>
Small Activities	<p>Small activities such as marriage ceremonies (no reception), wakes, naming days, birthdays, and activations such as workshops, picnic lunches, meetings, seminars, team building activities. These small activities will not occur simultaneously and will be limited to a maximum of 90 days per year.</p>

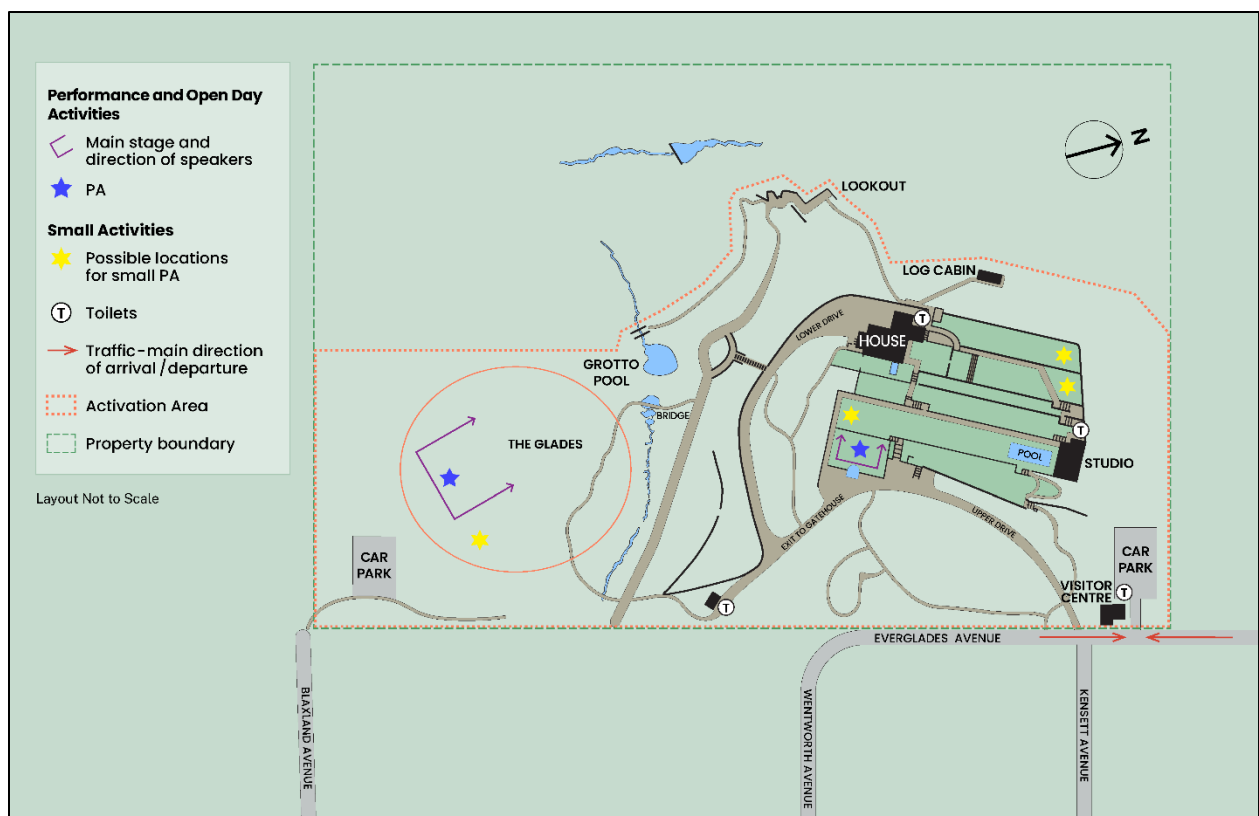


Figure 1-2 Proposed Locations of Activity Types



The activity types have been grouped into categories ranging from 1 to 3 based on the patron size and frequency and are presented in Table 1-2.

Table 1-2 Proposed Activity Types and Categories

Category	Activity Type	Patrons	Maximum frequency	Hours of operation
Category 1	Open Days Activities	600	2 days per year	9am to 7pm (Daylight Hours)
Category 2	Performance Activities	250	20 days per year	9am to 10.30pm (Amplified sound to cease at 10pm)
Category 3	Small Activities	120	90 days per year	9am to 7pm (Daylight hours)

2 SITE DESCRIPTION AND SENSITIVE RECEIVERS

Everglades House & Gardens is located on the western side of Everglades Avenue within the Blue Mountains City Council LGA. The site is surrounded by residential development to the north, and east, with Blue Mountains National Park located to the south and west of the site, with residential receivers also located further west.

The nearest sensitive receivers are presented in **Figure 2-1** and **Table 2-1**.



Figure 2-1 Nearest Sensitive Receivers

Table 2-1 Receiver Description

Receiver ID	Type	Description
R1	Residential	35 Everglades Ave, Leura NSW 2780
R2	Residential	1 Kensett Avenue Leura NSW 2780
R3	Residential	36 Everglades Avenue Leura NSW 2780
R4	Residential	1 Wentworth Avenue Leura NSW 2780
R5	Residential	3 Wentworth Avenue Leura NSW 2780
R6	Residential	2 Blaxland Avenue Leura NSW 2780
R7	Residential	20 to 30 Balmoral Road Leura NSW 2780

3 AMBIENT NOISE MONITORING

To characterise the existing noise environment of the project location, RWDI personnel attended site to conduct short and long-term unattended noise measurements as described in the sub-section below.

The monitoring positions are presented in Figure 3-1 below.



Figure 3-1 Long-term (L) and Attended Short-term (A) Ambient Monitoring

3.1 Unattended Noise Monitoring

Unattended noise monitors were installed at positions L1 and L2 to measure the ambient background noise levels. Monitoring was completed between 13 October 2022 and 25 October 2022.

The unattended noise measurements were conducted using ARL NGARA noise monitors, which were programmed to measure A-weighted, statistical noise levels stored at 15-minute intervals on fast response mode. The noise monitor was calibrated at the beginning and end of the monitoring period, with no significant drift being observed.

The results of the unattended monitoring are presented in **Table 3-1**.

Refer to **Appendix A** for a graph of the unattended noise monitoring data.

The unattended noise monitoring data has been analysed in conjunction with weather data obtained from Katoomba (sourced from Weatherzone). Any noise measurement data that has been adversely affected by inclement weather as defined by the EPA Noise Policy for Industry (i.e., periods where average wind speeds exceed 5 m/s and periods that are rain affected) have been excluded in determining the existing noise levels on site.

Table 3-1 Unattended Noise Monitoring Results

Monitoring Location	Period	Measured L_{A90} dB	Measured L_{Aeq} dB
L1	Day (7am to 6pm)	33	44
	Evening (6pm to 10pm)	27	43
	Night (10pm to 7am)	23	45
L2	Day (7am to 6pm)	34	46
	Evening (6pm to 10pm)	36	54
	Night (10pm to 7am)	37	53

3.2 Attended Noise Monitoring

RWDI personnel also conducted short-term (15-min period) attended noise measurements (A1 and A2) around the site to supplement the long-term unattended noise monitoring. The measurements were conducted between 15:30 and 16:30 on 13 October 2022 using a Class 1 NTi sound level meter.

The sound level meter was calibrated at the beginning and end of the measurement period and no significant drift was observed. Results are presented in Table 3-2.

Table 3-2 Attended Monitoring Results

Monitoring Location	Date/Time	L_{Aeq}	L_{A10}	L_{A90}	Notes
A1	13/10/22 15:45	50	52	44	Audible noise sources: <ul style="list-style-type: none"> • Pedestrians conversing • Bus picking up people from the site • Occasional road traffic noise • Birds
A2	13/10/22 16:21	43	43	42	Audible noise sources: <ul style="list-style-type: none"> • Occasional road traffic noise • Birds • Insects

4 NOISE CRITERIA

4.1 Operational Noise Criteria

These criteria are applicable to the assessment of operational noise such as the use of a small PA system for small activities and for carpark movements.

4.1.1 Continuous Noise - NSW EPA Noise Policy for Industry 2017

The NSW EPA Noise Policy for Industry 2017 provides guidance for the assessment and control of noise emissions from industrial sources and activities. The policy nominates the project noise trigger level that should be satisfied, namely the more restrictive of the project intrusiveness noise level and project amenity noise level.

The project intrusiveness noise criterion aims to protect residential receivers against significant changes in the noise environment due to new development. The project intrusiveness noise criterion states that noise emissions from new development should be no more than 5 dB(A) above the rated background noise level. Based on the rated background noise levels measured on site, the project intrusiveness noise levels have been calculated.

The project amenity noise criterion is intended to protect receivers against continuing increases in cumulative noise levels from all "industrial" noise sources. The project amenity criterion for any specific receiver is dependent on the land use of the receiver (e.g., residential, commercial, industrial etc.). Residential receivers also need to be classified as rural, suburban or urban depending on the existing noise environment of the residences, with guidance for determining the residential classification provided in Table 2.3 of the policy. The NPfI defines rural residential as an area with an acoustical environment that is dominated by natural sounds, having little or no road traffic noise and generally characterised by low background noise levels. The receivers in this project are thus considered "rural residential" and the associated project amenity noise levels are summarised in Table 4-1.

The applied noise criteria are the lower of the project intrusiveness and the project amenity noise level criteria.

Table 4-1 NPfI Operational Noise Criteria (For application to small PA system for the Small activities and carpark movements)

Receiver	Period	Project Intrusiveness			Project Amenity Criteria	Recommended Operational Noise Criteria
		Measured RBL	Adopted RBL	Intrusiveness Criteria		
R1 to R6	Day (7am to 6pm)	33	35 ¹	40	50	40
	Evening (6pm to 10pm)	27	30 ¹	35	45	35
	Night (10pm to 7am)	23	30 ¹	35	40	35
R7	Day (7am to 6pm)	34	35 ¹	40	50	40
	Evening (6pm to 10pm)	36	35 ²	40	45	40
	Night (10pm to 7am)	37	35 ²	40	40	40

Note 1: Minimum RBLs specified in Table 2.1 NPfI adopted. Measured RBL lower than the minimum NPfI RBL.



Note 2: Day RBL used for evening and night. As specified in the NPfl, the performance generally expects greater control of noise during the more sensitive evening and night-time periods than during the less sensitive daytime period. Therefore, in determining project noise trigger levels for a particular development, it is generally recommended that the project intrusiveness noise level for evening be set at no greater than the project intrusiveness noise level for daytime. The project intrusiveness noise level for night-time should be no greater than the project intrusiveness noise level for day or evening.

4.1.2 Maximum Noise (Sleep Disturbance)

The maximum noise level criteria aim to protect receivers against sleep disturbances from maximum noise level activities from premises during the night-time period. For this purpose, noise sources of short duration and high level that may cause disturbance to sleep if occurring during the night-time need to be considered. Sleep disturbance is considered to be both awakenings and disturbance to sleep stages.

The approach recommended by the NPfl is to apply initial screening noise levels. Where the subject development/premises night-time noise levels at a residential location exceed:

- $L_{Aeq,15min}$ **40 dB(A)** or the prevailing **RBL + 5dB**, whichever is the greater; **and/or**
- L_{Amax} **52 dB(A)** or the prevailing **RBL + 15dB**, whichever is the greater,

a detailed maximum noise level activity assessment should be undertaken.

The sleep disturbance screening noise levels apply outside bedroom windows during the night. If required the detailed assessment should cover the maximum noise level, the extent to which the maximum noise level exceeds the rating background noise level, and the number of times this happens during the night-time period.

Table 4-2 presents the initial screening noise level sleep disturbance criteria relevant for the project for applicable receivers. These criteria apply to residential receivers only.

Table 4-2 Project maximum noise level activity level screening criteria

Applicable receivers	Period	$L_{Aeq,15min}$ dB	L_{Amax} dB
R1 to R6	Night	40	52
R7	Night	45	55

4.1.3 Additional traffic generated by the site

Additional road traffic movements generated by the proposed activity location will result in increased traffic noise that may potentially impact residential receivers along Everglades Avenue, Easter Street, Wentworth Avenue, Kensett Avenue, Fitzroy Street and Gladstone Road. The assessment will be based on the road traffic noise assessment criteria for residential land uses contained within Table 3 of the NSW EPA *Road Noise Policy* (RNP). Using the RNP, the applicable criteria during the daytime (when vehicular movements associated with this proposed activity location will occur) is as presented in **Table 4-3**.

Table 4-3 Noise criteria for additional traffic generated by the activities

Road category	Type of project/land use	Assessment criteria, dBA Daytime 7am-10pm ¹	Assessment criteria, dBA Night time 10pm-7am ¹
Local Roads	Existing residences affected by additional traffic on existing local roads generated by land use developments	L _{Aeq} , (1 hour) 55 (external)	L _{Aeq} , (1 hour) 50 (external)

Note 1 These criteria are for assessment against façade-corrected noise levels when measured in front of a building façade.

4.2 Outdoor Event Noise Limits

Outdoor Event Noise Limits apply to amplified noise and the associated patron noise.

4.2.1 Blue Mountains City Council Development Control Plan

Blue Mountains City Council (BMCC) does not provide guidance on noise management of outdoor activities with amplified sound. City of Sydney Guidelines have been referred to in this noise management plan as they have a comprehensive events guideline that is relevant to Everglades House & Gardens.

4.2.2 City of Sydney Event Guidelines

The City of Sydney Event Guidelines document (September 2020) provides standard approval conditions for noise from events in parks, open spaces, or streets under the ownership and/or control of the City of Sydney Council. No guidance is provided on the timing and duration of outdoor events. Below are the relevant noise conditions:

54. Noise from any amplified music or notification system used at the event must not exceed LAeq 15 minute ≤ 65 dB(A) when measured [at the nearest affected receiver].

55. The sound generated by the event shall be controlled and activity must not result in the transmission of 'offensive noise' as defined in the Protection of the Environment Operations Act 1997 [at the nearest affected receiver].

56. If, during the event, substantiated complaints or breaches of noise conditions occur, the event organiser must immediately reduce the noise to ensure the event complies with the noise levels specified in the noise conditions above.

4.2.3 Event Noise Limits at other Relevant Venues in NSW

With respect to managing noise from music events, there are no specific regulatory limits in NSW for noise emissions from outdoor amplified events. Review of the usage of existing outdoor music venues indicates that management of amplified noise involves a combination of noise limits, at-source noise controls (Front-of-house noise limiters), and restrictions on the duration and number of events. Front-of-house (FoH) refers to the location where the sound engineer and sound mixing console / desk are located. Sound levels for live performances (singer, instrumentalists etc) are controlled from the FoH.

Noise limits for these venues have been developed based on site specific factors, such as vicinity of sensitive receptors, as well as the ability to provide a reasonable patron experience.

4.2.3.1 Barangaroo Headland Park Cultural Cutaway Space

The approach to the management of event noise at the Cultural Cutaway space below Barangaroo Headland Park (DA/2015/938) is relevant. Noise management at this space was completed by applying limits on the duration of noisy events, the number of events, and the noise emission levels, based on the size of the event.

Table 4-4 presents the noise and operational limits stipulated in the Consent Conditions for the Temporary Events at Barangaroo Cultural Cutaway.

Table 4-5 presents a comparison of the ambient monitoring data of the nearest residential receiver to the Barangaroo Cultural Cutaway and Everglades House & Gardens.

Table 4-4 Barangaroo Cultural Cutaway Noise Limits

Category	Description	Noise Limits	Operation Limits
Category 1 Major Events	New Year's Eve	10am-12am 65 dBA, 75dBC 7am-10am, 12am-2am 55 dBA, 65 dBC	Permitted Hours 7am-12am (till 2am for NYE) Number of Events 5 per calendar year (including NYE) Duration Single day event
	Australia Day, Symphony Orchestra	10am-10pm 65 dBA, 75dBC 7am-10am, 10pm-11pm 55 dBA, 65 dBC	
Category 2 Arts and Cultural Festivals	Vivid, Sydney Festival	10am-10pm 55 dBA, 65dBC	Permitted Hours 10am-10pm Number of Events 6 per calendar year
Category 3 Community Events	Community markets, Tropfest Live	8am-6pm Background + 5 dB in octave bands	Permitted Hours 8am-6pm Number of Events No limit
Category 4 Private	Commercial launches, Private	10am-10pm 55 dBA, 65dBC	Permitted Hours 10am-11pm

Category	Description	Noise Limits	Operation Limits
Events	functions	10pm-11pm 50 dBA, 60 dBC	Number of Events 15 per calendar year Duration Maximum of 5 hours

Note Decibel measurements made with the A-weighting scale are denoted as dBA; those with the C-weighting scale as dBC. There are other weighting scales to account for the range between A-weighting (soft) and C-weighting (loud), but they are not used much anymore. Depending on the weighting scale selected when measuring predominantly-low-frequency sound, a different reading will result. Because the A-weighting scale filters out low-frequency energy, the reading will be several decibels lower than if the measurement were made using the C-weighting scale

Table 4-5 Comparison of Ambient Monitoring Results of Barangaroo Cutaway and Everglades

Monitoring Period	Barangaroo Cutaway RBL dBA	Everglades House & Gardens RBL dBA	Difference dB
Day	56	35	21
Evening	48	30	18
Night	44	30	14

4.3 Noise Limits for Proposed Activities

The Category 1 Open Days Activities at Everglades, consisting of 600 patrons and occurring up to 2 days per year, are most similar to the Barangaroo Category 2 events. The noise limits for the Barangaroo Category 2 events are 55 dBA, 65 dBC. These levels are considered too high for the Everglades activities, given the much quieter rural residential environment. Recognizing this, RWDI recommends that the corresponding noise limits for Everglades be set at a level that is 10dB quieter than for events at Barangaroo, given the difference in RBLs (See Table 4-5). This adjustment, which is equivalent to a halving of perceived loudness, recognizes quieter ambient noise environment of the Everglades House & Gardens. The noise limit for Category 1 activities at Everglades House & Gardens is thus 45 dBA, 55 dBC. The same noise limit is applied to Category 2 activities at Everglades House & Gardens given that a lower noise limit may be detrimental to a satisfactory patron experience and also that these activities will occur infrequently.

A 5-minute noise measurement period is applied to music/theatre performances given that the duration of a song or short performance is typically about 5 mins.

Table 4-6 presents the proposed activity noise limits. Noise limits refer to the maximum amount of sound that is allowed in a particular environment. These limits are typically set by local governments or regulatory bodies in order to protect people from excessive noise that could potentially cause harm to their health or well-being.

It should be noted that noise levels measured when wind speeds exceed 5 m/s (at microphone height) are not suitable for measuring compliance with the noise limits, as wind generated noise may limit measurement accuracy. During periods of average wind speeds greater than 5 m/s or 9.7 knots, all reasonable and feasible actions should be taken to minimise noise.

Table 4-6 Activity Noise Limits

Category	Event Type	Noise Limit
Category 1	Open Days (600 patrons)	45 dBA, 55 dBC (LAeq 5-minute)



Category 2	Performance Activities (250 Patrons)	45 dBA, 55 dBC (L _{Aeq} 5-minute)
Category 3	Small Activities (120 Patrons)	Refer to Operational Noise Criteria



5 NOISE EMISSION ASSESSMENT

To review the potential noise impact from proposed activities, noise modelling was completed using the CadnaA noise prediction software with the ISO 9613 algorithm. Factors addressed in the noise modelling are:

- Activity noise level emissions and locations;
- Shielding from ground topography and structures;
- Noise attenuation due to geometric spreading;
- Ground absorption; and
- Atmospheric absorption.

Topographical data for the site and nearby surrounding area have been sourced from NSW Spatial Services as 10m contours and has been incorporated in the model.

A ground absorption factor of 0.6 has been applied to the entire model. This global ground absorption value represents the mix of hard ground (absorption = 0) and soft ground (absorption = 1) on and around the site.

Directivity has been applied to all speakers and small PA systems modelled whereby amplified sound is directed to the respective audience areas.

5.1 Amplified Noise

Table 5-1 presents the recommended sound pressure levels measured at setback distances from the speakers in the absence of FoH. These sound pressure levels relate to Open Days and Performance Activities where a main stage is set up. Recommended noise levels are based on consideration of the quiet background noise levels at the site and the noise limits applied to similar activity types at other locations in NSW.

The noise limits are applicable from 9am to 10pm in conjunction with the proposed operating hours of the activities. All amplification should cease at 10 pm. Please refer to Glossary of Acoustic Terms for details on similar typical noise levels.

Table 5-1 Recommended Maximum Speaker Sound Pressure Levels

Category/Activity	10m from the speakers dBA/dBC SPL	1m from each speaker dBA/dBC SPL
Category 1 Open Days	69 dBA 79 dBC	One speaker setup - 89 dBA 99 dBC per speaker Two speaker setup - 86 dBA 96 dBC per speaker
Category 2 Performance Activities		
Category 3 Small Activities	Refer to operational noise criteria in Section 4.1	

5.2 Noise Sources and Modelled Scenarios

Noise source data relevant to this assessment are presented in **Table 5-2**.

Table 5-2 Noise Sound Levels – dBA

Noise Source	Noise Characteristic	Sound Power Level dBA	Source
Amplified sound (ODA, PA) ¹	Quasi-steady	97 L _{Aeq}	RWDI/Wilkinson Murray
Small PA system (SA)	Quasi-steady	90 L _{Aeq}	RWDI/Wilkinson Murray
400 patrons on site (1 in 2 talking) (ODA)	Quasi-steady	93 L _{Aeq}	RWDI/Wilkinson Murray
350 patrons on site (1 in 2 talking) (ODA)	Quasi-steady	92 L _{Aeq}	RWDI/Wilkinson Murray
250 patrons on site (1 in 2 talking) (PA)	Quasi-steady	91 L _{Aeq}	RWDI/Wilkinson Murray
120 patrons on site (1 in 2 talking) (SA)	Quasi-steady	88 L _{Aeq}	RWDI/Wilkinson Murray
120 patrons on site (1 in 10 talking) (SA)	Quasi-steady	81 L _{Aeq}	RWDI/Wilkinson Murray
1 patron – normal voice	Quasi-steady	70 L _{Aeq}	RWDI/Wilkinson Murray
Light Vehicles (20 km/hr)	Quasi-steady	85 L _{Aeq}	RWDI/Wilkinson Murray
Car Door Closures ²	Instantaneous	94 L _{Amax}	RWDI/Wilkinson Murray
General Construction (Installation and Decommission)	Quasi-steady	107 L _{Aeq}	RWDI/Wilkinson Murray

Note 1 maximum allowable speaker sound power level (SWL) to meet applicable noise limits at the nearest receiver

Note 2 Sound Pressure Level 69dBA at 7m.

ODA – Open Days Activities

PA - Performance Activities

SA - Small Activities

Modelled noise scenarios relevant to this assessment are presented in **Table 5-3**. It is important to note that each scenario will not occur simultaneously.

Table 5-3 Modelled Scenarios

Noise Scenario ID	Noise Activity	Noise Sources and Assumptions
ODA	Open Day Activities	<ul style="list-style-type: none"> Active at one location Amplified sound (Main stage in the Glades area) 2 speakers 600 patrons (over the course of the day) <ul style="list-style-type: none"> 300 patrons max at Main stage additional 114 patrons spread over the entire Everglades House & Gardens area. Peak hour vehicle arrivals/departures: 100 (3 people

Noise Scenario ID	Noise Activity	Noise Sources and Assumptions
		<ul style="list-style-type: none"> per car) cars + two coaches ○ Parking requirement for 100 parking spaces
PA	Performance Activities	<ul style="list-style-type: none"> • Active at one location • Amplified sound (outdoor theatre stage) 2 speakers OR amplified sounds (stage in the Glades area) 2 speakers • 250 patrons <ul style="list-style-type: none"> ○ • Peak hour vehicle departures: 84 (100% at conclusion of activity (3 people per car) ○ • An expected peak in arrivals where 50% of patrons will arrive at the site in the hour preceding the performance commencement i.e. (42 vehicles) in each of the two hours prior to performance (e.g. 5 – 6 pm and 6 -7 pm) ○ • Parking requirement for 84 parking spaces.
SA	Small Activities	<ul style="list-style-type: none"> • Active in the Glades or the Studio terrace • Small PA System – SWL 94dBA during the day period and SWL 90 dBA during the evening/night period • 120 patrons maximum • Peak hour might include one third of the daily BAU average of 150 patrons (50 patrons in 17 cars with the remainder arriving over the course of the day) plus the patrons associated with a small Activity (120 patrons with 50 cars arriving). Therefore, the total parking demand is 67 spaces. • For the scenario of the Small PA System & Patron noise, it has been assumed that 1 in 10 patrons to be talking at any given time. • For the scenario of Patron noise only, when the small PA is not operational, it has been assumed that 1 in 2 patrons are talking at any given time. • Parking requirement of 50 parking spaces for Small Activity.

5.3 Noise Predictions

Noise modelling has been prepared to determine the likely worse case noise emissions from the site while meeting the recommended noise levels for the respective activity types.

Speaker noise levels have been established to meet the recommended levels and can be measured/monitored at 10m or 1m away from the speaker or small PA system.

5.3.1 Open Day Activities

Noise sources associated with the Open Day Activities at the site consist of amplified sound (modelled facing north west) and 600 patrons (300 patrons in the Glades area, and 114 patrons additional spread over the entire Everglades House & Gardens area).

Table 5-4 presents the predicted noise levels at the residential receivers during open day activities.

Exceedances of the noise limits are highlighted in orange. Compliance with the noise limits is highlighted in green.

Table 5-4 Predicted Noise Levels – Open day activities

Receiver	Predicted Noise Level dBA	Noise Limit at Receiver dBA/dBC	Noise Limit 10m away from speakers (Main stage Glades Area) dBA/dBC	Noise Limit 1m away from speakers (Main stage Glades Area) dBA/dBC
R1	41	45 dBA / 55 dBC	69 dBA / 79 dBC	One speaker setup - 89 dBA / 99 dBC per speaker
R2	42	45 dBA / 55 dBC		
R3	42	45 dBA / 55 dBC		
R4	43	45 dBA / 55 dBC		
R5	43	45 dBA / 55 dBC		
R6	43	45 dBA / 55 dBC		
R7	30	45 dBA / 55 dBC		

Compliance is predicted at all the nearest receivers during Open day activities.

5.3.2 Performance Activities

Noise sources associated with Performance activities at the site consist of:

- amplified sound (modelled facing west towards the house) and 250 patrons located on the terraces near the house shown in Figure 1-2.
- Or amplified sound (stage in the Glades area) and 250 patrons located in the Glades.

Table 5-5 presents the predicted noise levels at the residential receivers during Performance activities.

Compliance of the noise limits are highlight in green.

Table 5-5 Predicted Noise Levels – Performance activities

Receiver	Predicted Noise Level dBA		Noise Limit at Receiver dBA/dBC	Noise Limit 10m away from speakers (Stage near the House) dBA/dBC	Noise Limit 1m away from speakers (Main stage Glades Area) dBA/dBC
	On the terraces	In the Glades Area			
R1	44	42	45 dBA / 55 dBC	69 dBA / 79 dBC	One speaker setup - 89 dBA / 99 dBC per speaker
R2	43	43	45 dBA / 55 dBC		
R3	44	43	45 dBA / 55 dBC		
R4	43	44	45 dBA / 55 dBC		
R5	41	44	45 dBA / 55 dBC		
R6	39	44	45 dBA / 55 dBC		
R7	30	31	45 dBA / 55 dBC		

Compliance is predicted at all the nearest receivers during Performance Activities.

5.3.3 Small Activities

Noise sources associated with small activities at the site occur:

- In the Studio Terrace area near the house
 - 3x Small PA systems as per Figure 1-2 (modelled facing north east towards the studio)
 - 120 patrons located on the studio terraces near the house
- (Or) In the Glades area
 - Small PA system (modelled facing west)
 - 120 patrons located in the glades area shown in Figure 1-2.

Small activities at both the Glades and the Studio Terrace are proposed to occur during the day time period only; however not simultaneously

Table 5-6 presents the predicted noise levels at the residential receivers during small activities in the Studio Terrace area only, with and without a small PA system.

Table 5-7 presents the predicted noise levels at the residential receivers during small activities in the Glades area only, with and without a small PA system.

Exceedances of the noise limits are highlighted in orange. Compliance with the noise limits is highlighted in green.

Table 5-6 Predicted Noise Levels –Small Activities (Near Studio Terrace only)

Receiver	Small PA System + Patrons ¹					Patrons only ²			
	Predicted Noise Levels dBA		Noise Limits at Receiver			Predicted Noise Levels dBA	Noise Limits at Receiver		
	Day	Evening/Night	Day	Evening	Night		Day	Evening	Night
R1	39	35	40	35	35	33	40	35	35
R2	37	34	40	35	35	30	40	35	35
R3	37	33	40	35	35	29	40	35	35
R4	35	31	40	35	35	23	40	35	35
R5	33	29	40	35	35	20	40	35	35
R6	32	28	40	35	35	20	40	35	35
R7	22	18	40	40	40	<20	40	40	40

Note 1: 1 in 10 patrons speaking.

Note 2: 1 in 2 patrons speaking.

Table 5-7 Predicted Noise Levels – Small Activities (Glades Area only)

Receiver	Small PA System + Patrons ¹					Patrons only ²			
	Predicted Noise Levels dBA		Noise Limits at Receiver			Predicted Noise Levels dBA	Noise Limits at Receiver		
	Day	Evening/Night	Day	Evening	Night		Day	Evening	Night

Receiver	Small PA System + Patrons ¹					Patrons only ²			
	Predicted Noise Levels dBA		Noise Limits at Receiver			Predicted Noise Levels dBA	Noise Limits at Receiver		
	Day	Evening/Night	Day	Evening	Night		Day	Evening	Night
R1	29	25	40	35	35	<20	40	35	35
R2	32	28	40	35	35	<20	40	35	35
R3	36	31	40	35	35	29	40	35	35
R4	40	35	40	35	35	35	40	35	35
R5	39	34	40	35	35	35	40	35	35
R6	40	35	40	35	35	34	40	35	35
R7	25	21	40	40	40	<20	40	40	40

Note 1: 1 in 10 patrons speaking.

Note 2: 1 in 2 patrons speaking.

Summary of Predicted Noise Levels for Small activities

The predictions indicate:

- **Small Activities (Near Studio Terrace only)** – Compliance is achieved at all receivers during all periods.
- **Small Activities (Glades Area only)** – Compliance is achieved at all receivers during all periods.

The following restrictions are recommended to achieve strict compliance with the recommended limits:

- There should be a noise limiting device fitted to ensure that the sound power level of the small PA system is:
 - no greater than 94 dBA during the day time;
 - no greater than 90 dBA during the evening/night time for activities;

The recommendations are stringent because the surrounding area is very quiet.

5.3.4 Onsite Car Park Movements

Since the worst case car parking activity is likely to occur at a different time compared to the actual activities, car park movements have been modelled separately using a noise model built via CadnaA. All visitor vehicles for all activities will enter and exit via the car park entry on Everglades Avenue. The worst-case car park movements have been modelled for a 15 minute period as follows:

- Up to 15 cars parking in the visitor car park
- Up to 14 cars parking in the staff car park

Car movements have been assumed to occur at a speed of 20km per hour when entering/leaving the site, and emitting an average sound power level of 85dBA at a 0.5m height.

Table 5-6 presents the predicted noise levels for the car park activities described above.

Table 5-6 Predicted Noise Level for Car Park Movements – Worst-Case Scenario

Receiver	Predicted Noise Level – dBA	Criteria dBA Day/Evening/Night
R1	35	40/35/35
R2	22	40/35/35
R3	24	40/35/35
R4	23	40/35/35
R5	24	40/35/35
R6	31	40/35/35
R7	<20	40/40/40

Compliance is achieved during the worst-case car park movements with the noise limits specified in the table.

5.3.5 Additional Traffic Noise Generated on Public Roadways

It is assumed that the proposed activities will generate up to 100 vehicles per hour during the daytime peak hour and up to 83 vehicles per hour during the night time peak hour period. It is expected that most traffic would access the site and surrounding on-street and off-street parking via Everglades Avenue. It would be reasonable to assume outside the peak hours, there would be minimal traffic movements associated with the activities.

CadnaA noise modelling software was used to assess and predict noise impacts on surrounding receivers caused by additional traffic generated by the development. The model uses the CoRTN algorithm with cars modelled at 0.5 m source height and travelling at 40 km/hr to search for a suitable parking location on the streets close to the activity location. The road surface has been assumed to be Dense Graded Asphalt with a surface correction of 0 dB.

Façade-reflected noise levels have been predicted to range from 44 to 52 dB L_{Aeq} (1-hour) along Everglade Avenue for the most affected residences during daytime and between 41 and 49 dB L_{Aeq} (1-hour) during the night time peak hours, in compliance with the RNP noise criteria. For the other adjacent roads, it is expected that the façade reflected noise levels would be below this level.

5.3.6 Maximum Noise Activities (Sleep Disturbance)

Maximum noise activities with the potential to cause sleep disturbance during the night period consist only of the following:

- Car door closures occurring when patrons leave the grounds after 10pm.

Predicted noise levels are presented in **Table 5-7**.

Exceedances are highlighted in orange. Compliances are highlight in green.

Table 5-7 Predicted Maximum Noise Level – Car Door Closures

Receiver	Predicted Maximum Noise Level - dBA	Maximum Criteria dBA L_{Amax}
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Receiver	Predicted Maximum Noise Level - dBA	Maximum Criteria dBA L _{Amax}
R1	52	52
R2	40	52
R3	43	52
R4	23	52
R5	20	52
R6	20	52
R7	25	55

Compliance is achieved during maximum noise level activities expected during the night period.

6 CONCLUSIONS AND RECOMMENDATIONS

RWDI Australia Pty Ltd (RWDI) was engaged by National Trust of Australia (NSW) on behalf of National Trust of Australia (NSW) to conduct a noise impact assessment for the activities proposed at Everglades House & Gardens located at 37 Everglades Avenue, Leura NSW.

A summary of the noise impact assessment is presented in the sections below.

Open Day Activities

Compliance with the applied activity noise limit is predicted at all the nearest receivers during Open Day Activities.

The speaker system/stage should be orientated as shown in **Figure 1-2**.

The applied activity noise limits should be enforced to achieve and maintain compliance.

There should be a noise limiting device fitted to ensure that the sound power level of the speaker system is below 97 dBA or less than 69dBA/79 dBC at 10m. Alternatively, monitoring needs to be conducted during every Open Days Activities to ensure that the measured Sound Pressure Levels at 10m from the speaker are less than 69dBA/79 dBC.

Performance Activities

Compliance of the activity noise limit is predicted at all of the nearest receivers during Performance Activities.

The speaker system/stage should be orientated as shown in **Figure 1-2**.

The applied activity noise limits should be enforced to achieve and maintain compliance.

There should be a noise limiting device fitted to ensure that the sound power level of the speaker system is below 97 dBA or less than 69dBA/79 dBC at 10m. Alternatively, monitoring needs to be conducted during every performance activity to ensure that the measured Sound Pressure Levels at 10m from the speaker are less than 69dBA/79 dBC.

Small Activities

The predictions indicate that for all Scenarios, compliance is achieved at all receivers during all periods.

On this basis, the following restrictions are recommended to achieve strict compliance with the recommended limits:

- There should be a noise limiting device fitted at FoH or noise monitoring performed during small activities to ensure that the sound power level of the small PA system is:
 - no greater than 94 dBA during the day time;
 - no greater than 90 dBA during the evening/night time for activities;

The recommendations are stringent because the surrounding area is very quiet.

Onsite Car Park Movements



Predictions of the worst-case scenario car park movements for off-street parking indicate compliance with the operational noise criteria.

Off-site Car Park Movements

Predictions of the worst-case scenario car park movements for on-street parking indicate compliance with the relevant road noise criteria.

Maximum Noise Activities (Sleep Disturbance)

Compliance is achieved during maximum noise level activities expected during the night period.



7 STATEMENT OF LIMITATIONS

This report entitled Everglades House & Gardens Noise Impact Assessment was prepared by RWDI Australia Pty Ltd ("RWDI") for National Trust of Australia (NSW) ("Client"). The findings and conclusions presented in this report have been prepared for the Client and are specific to the project described herein ("Project"). The conclusions and recommendations contained in this report are based on the information available to RWDI when this report was prepared. Because the contents of this report may not reflect the final design of the Project or subsequent changes made after the date of this report, RWDI recommends that it be retained by Client during the final stages of the project to verify that the results and recommendations provided in this report have been correctly interpreted in the final design of the Project.

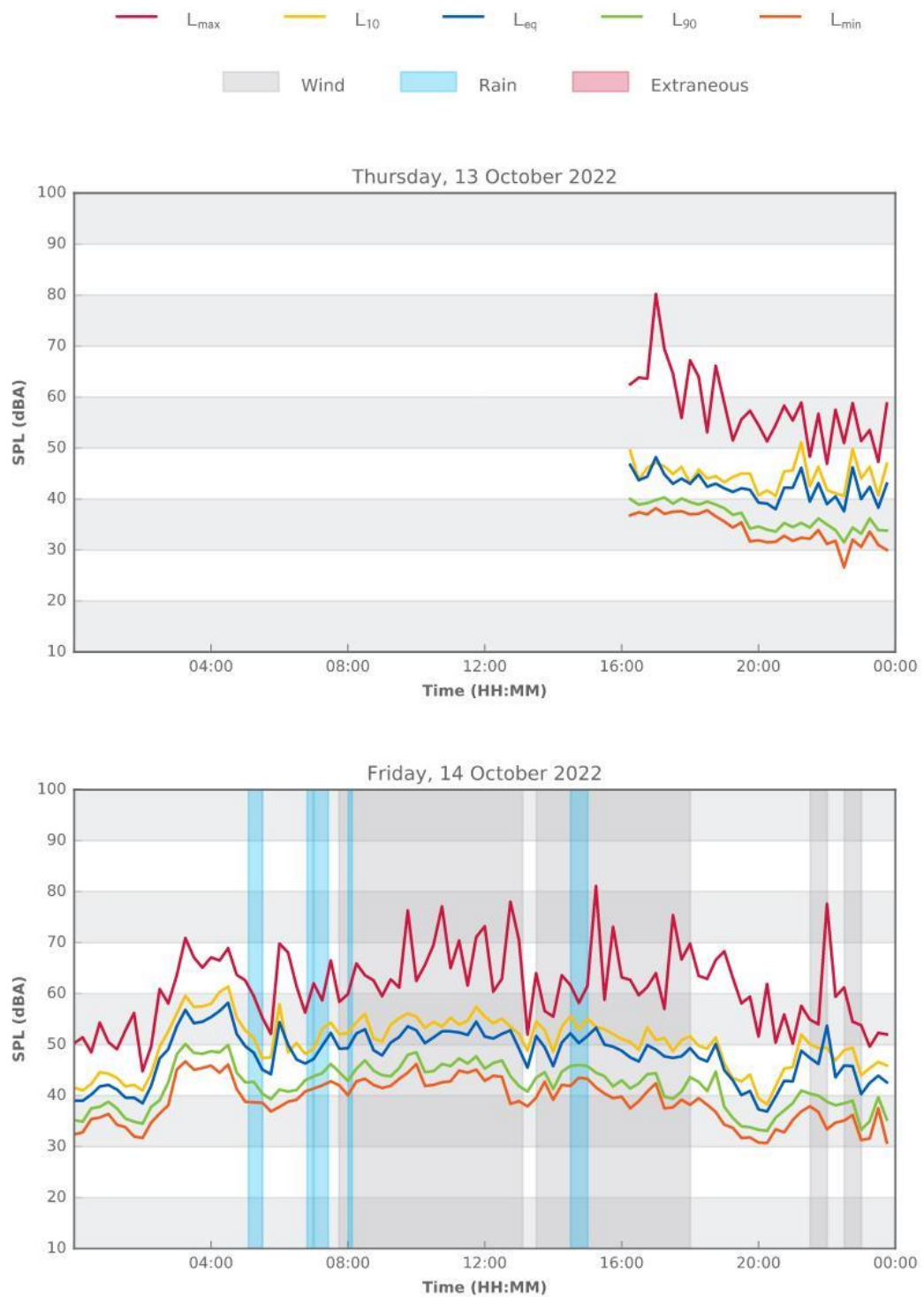
The conclusions and recommendations contained in this report have also been made for the specific purpose(s) set out herein. Should the Client or any other third party utilize the report and/or implement the conclusions and recommendations contained therein for any other purpose or project without the involvement of RWDI, the Client or such third party assumes any and all risk of any and all consequences arising from such use and RWDI accepts no responsibility for any liability, loss, or damage of any kind suffered by Client or any other third party arising therefrom.

Finally, it is imperative that the Client and/or any party relying on the conclusions and recommendations in this report carefully review the stated assumptions contained herein and to understand the different factors which may impact the conclusions and recommendations provided.

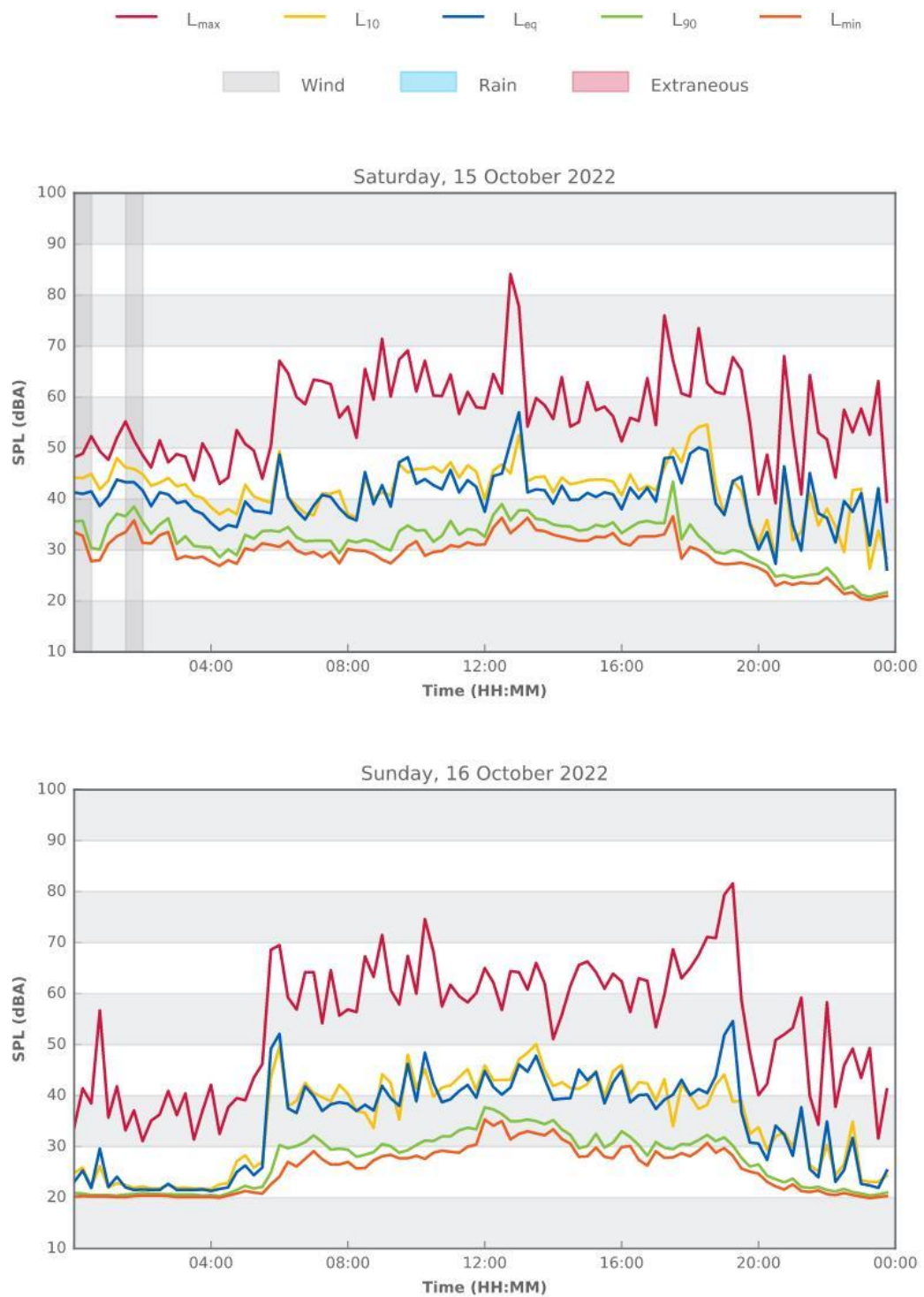
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APPENDIX A – NOISE MONITORING GRAPHS

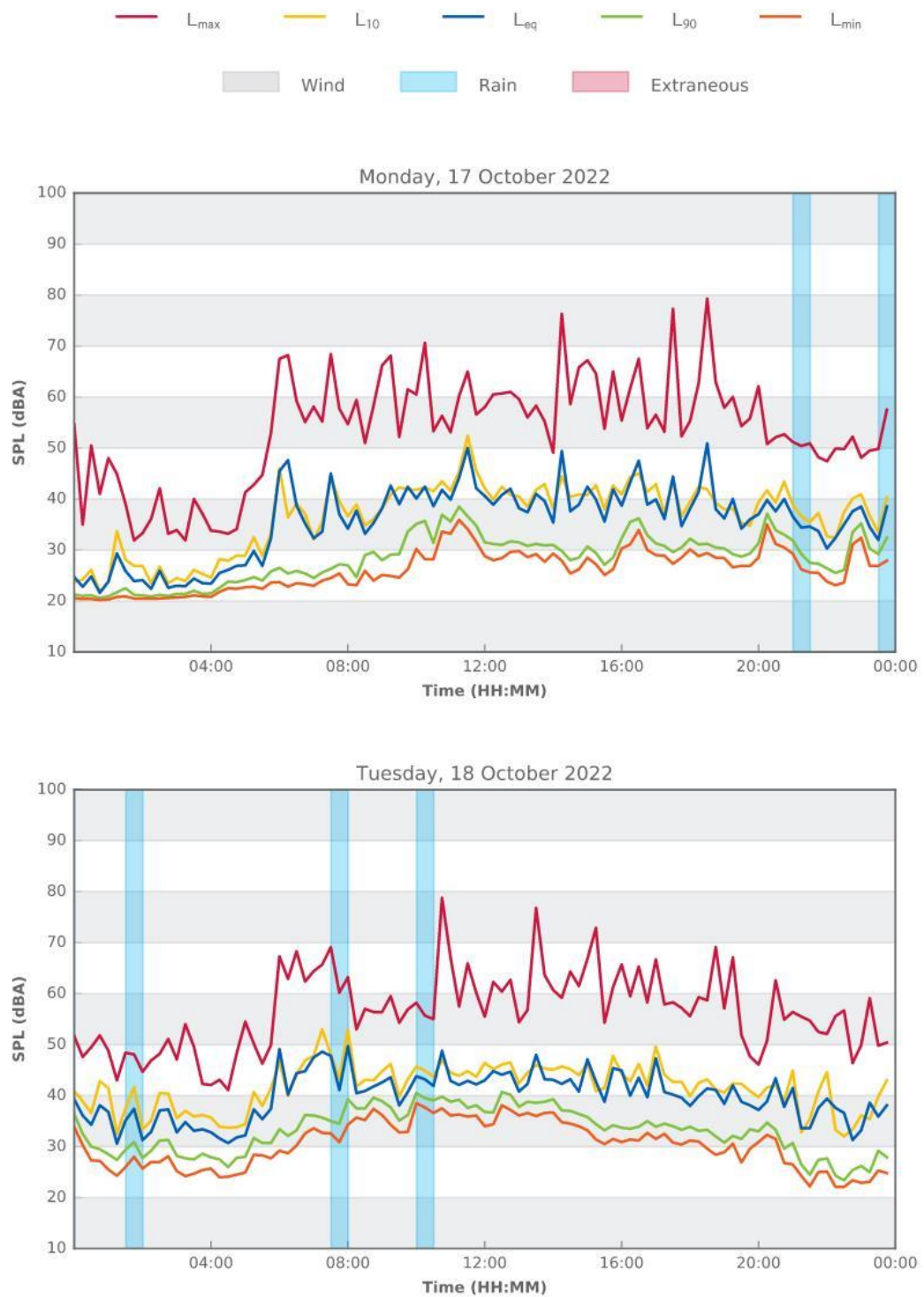
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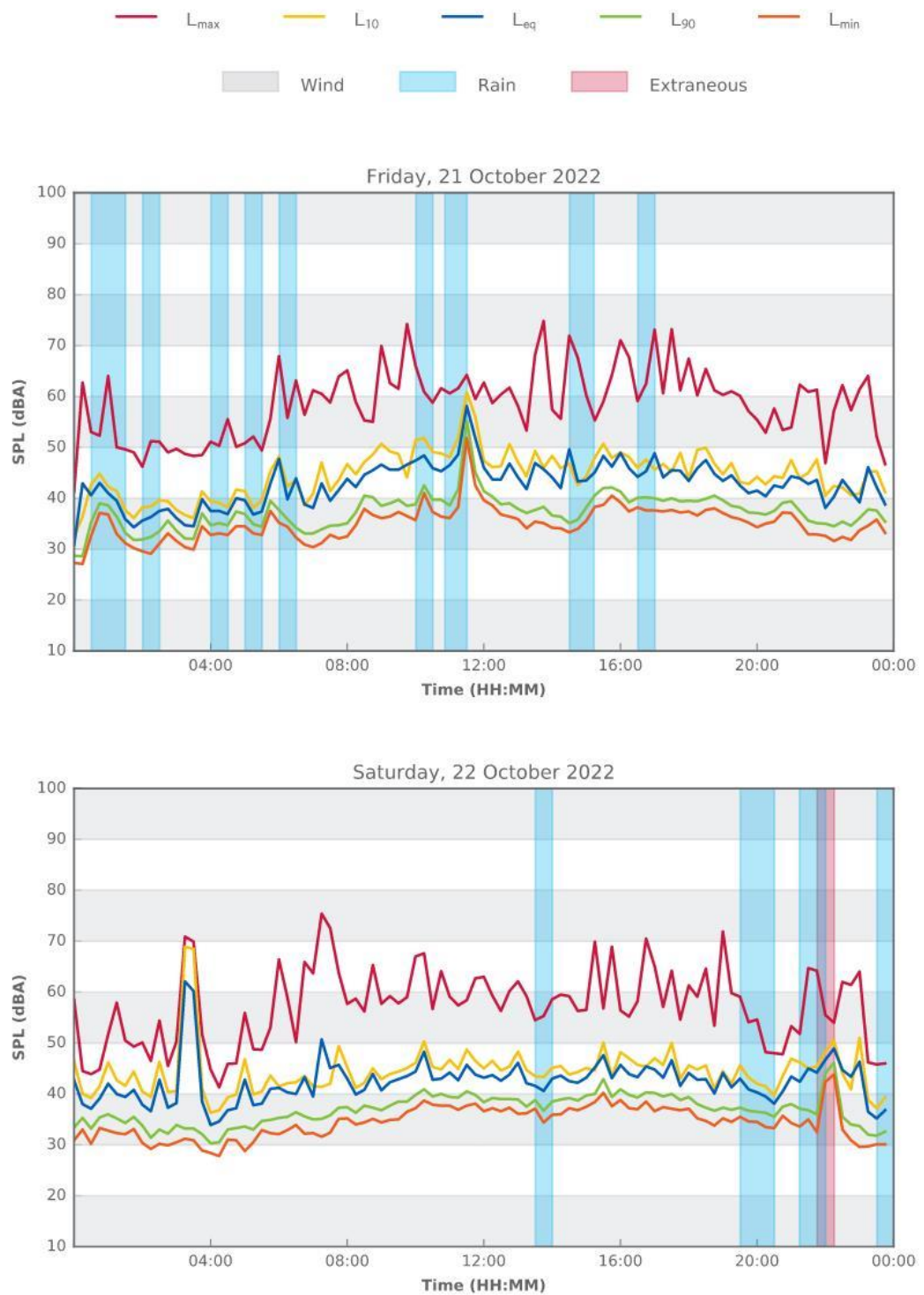
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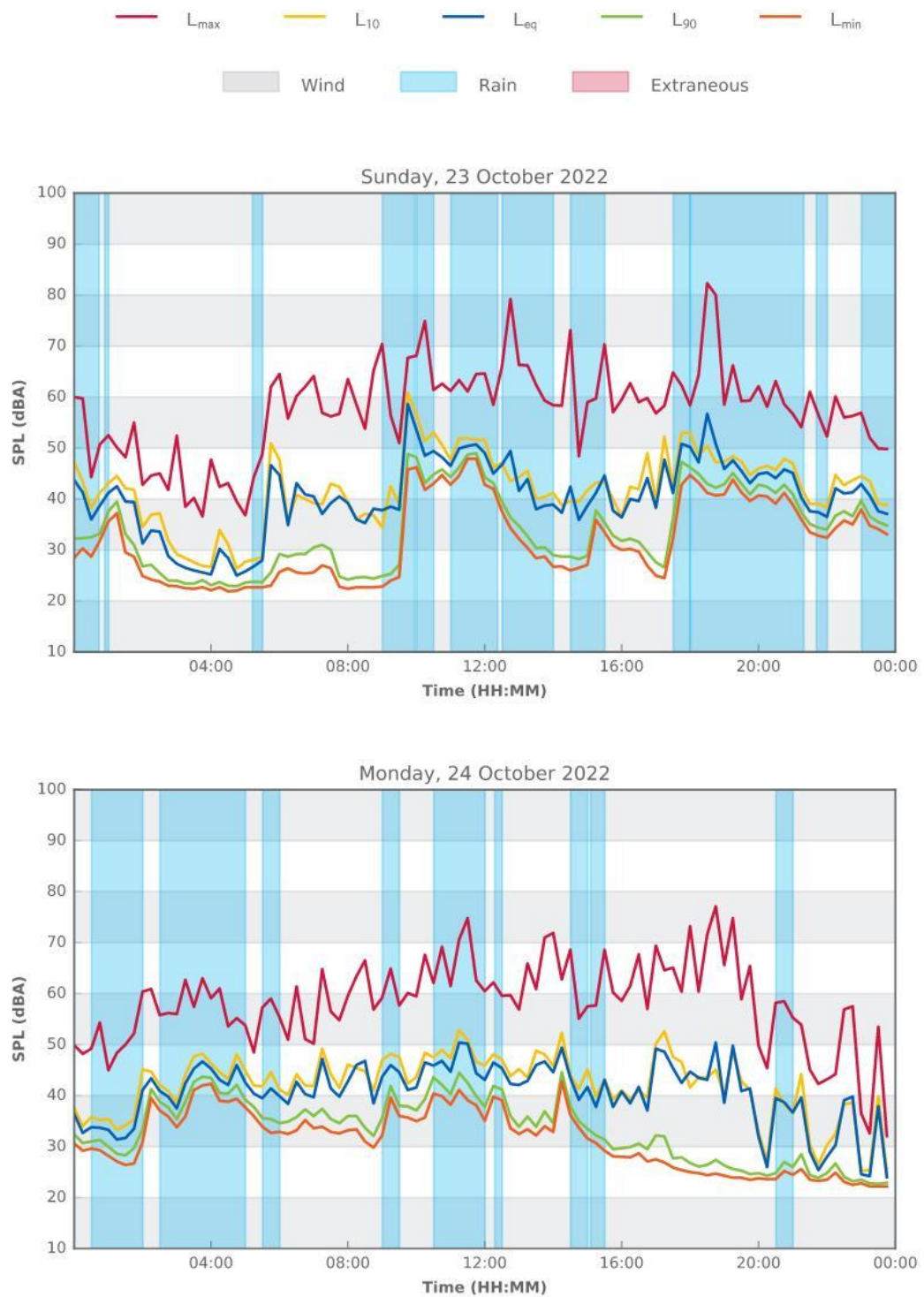
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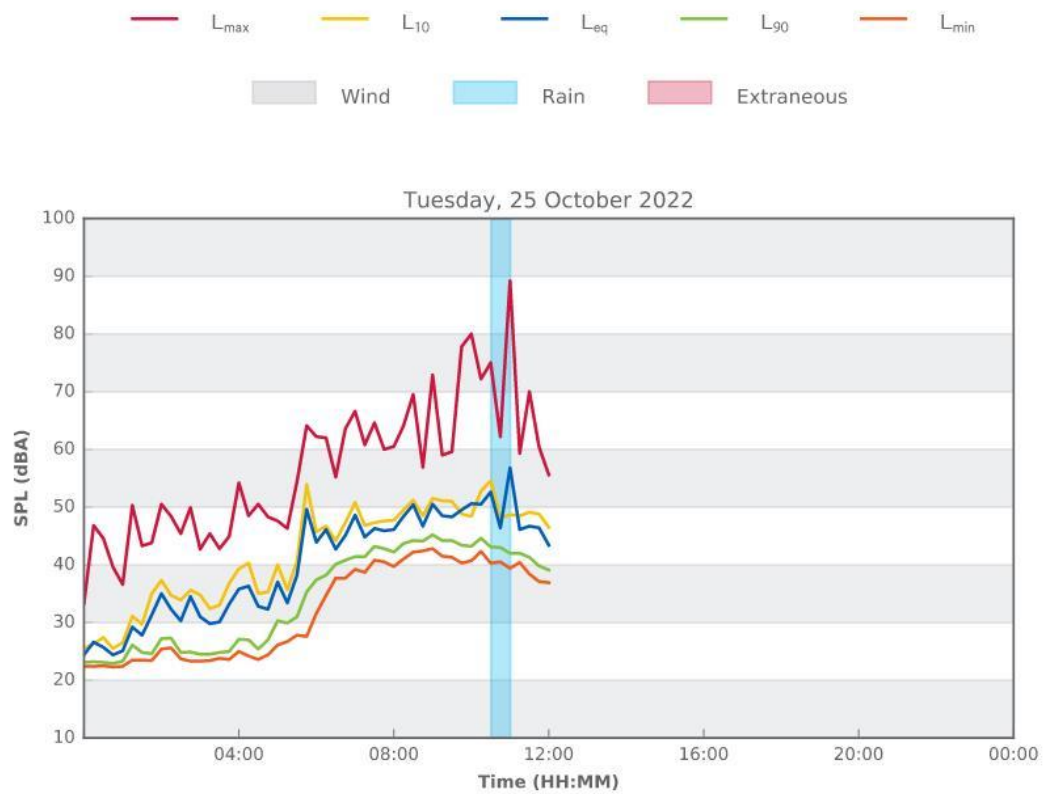
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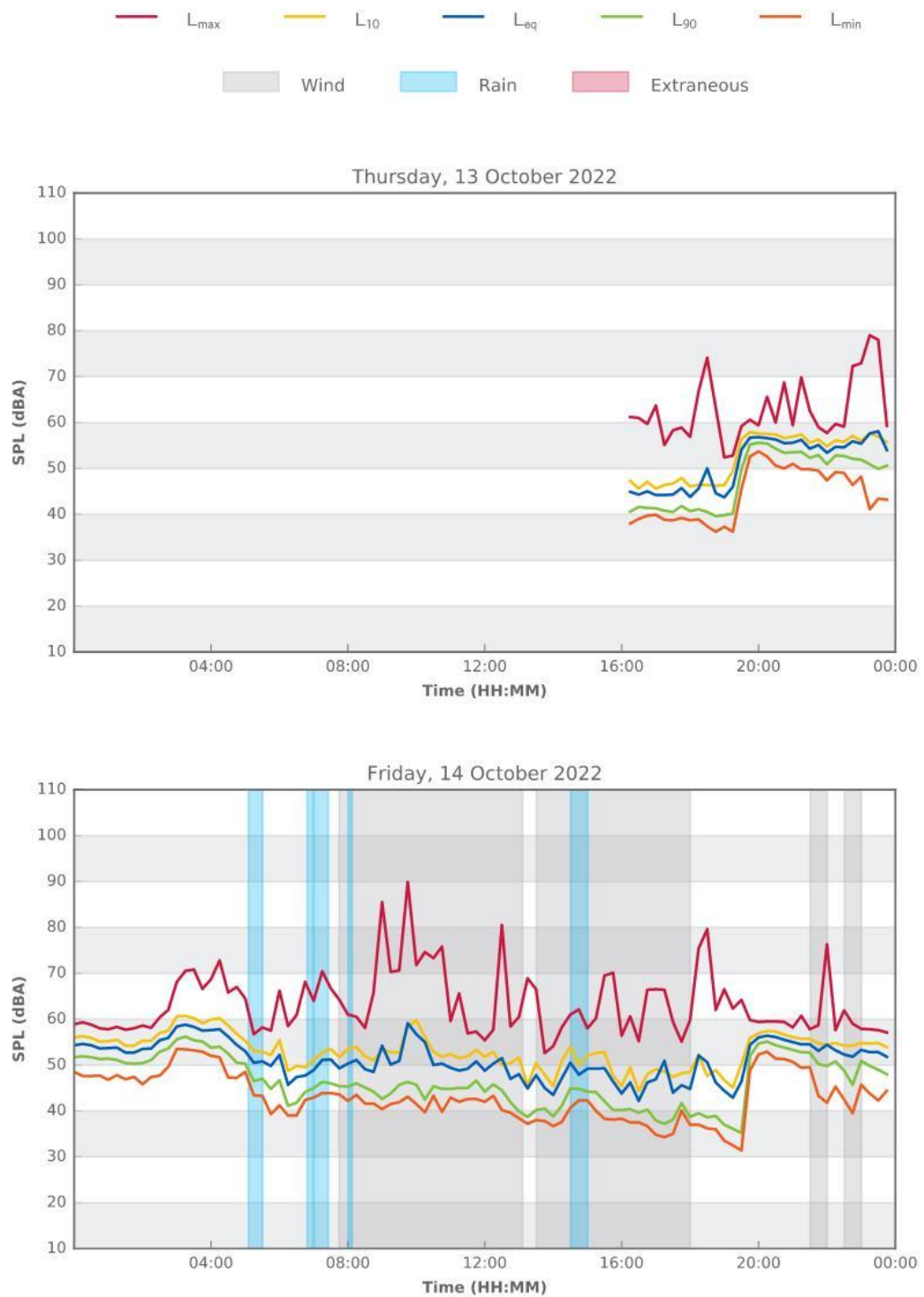
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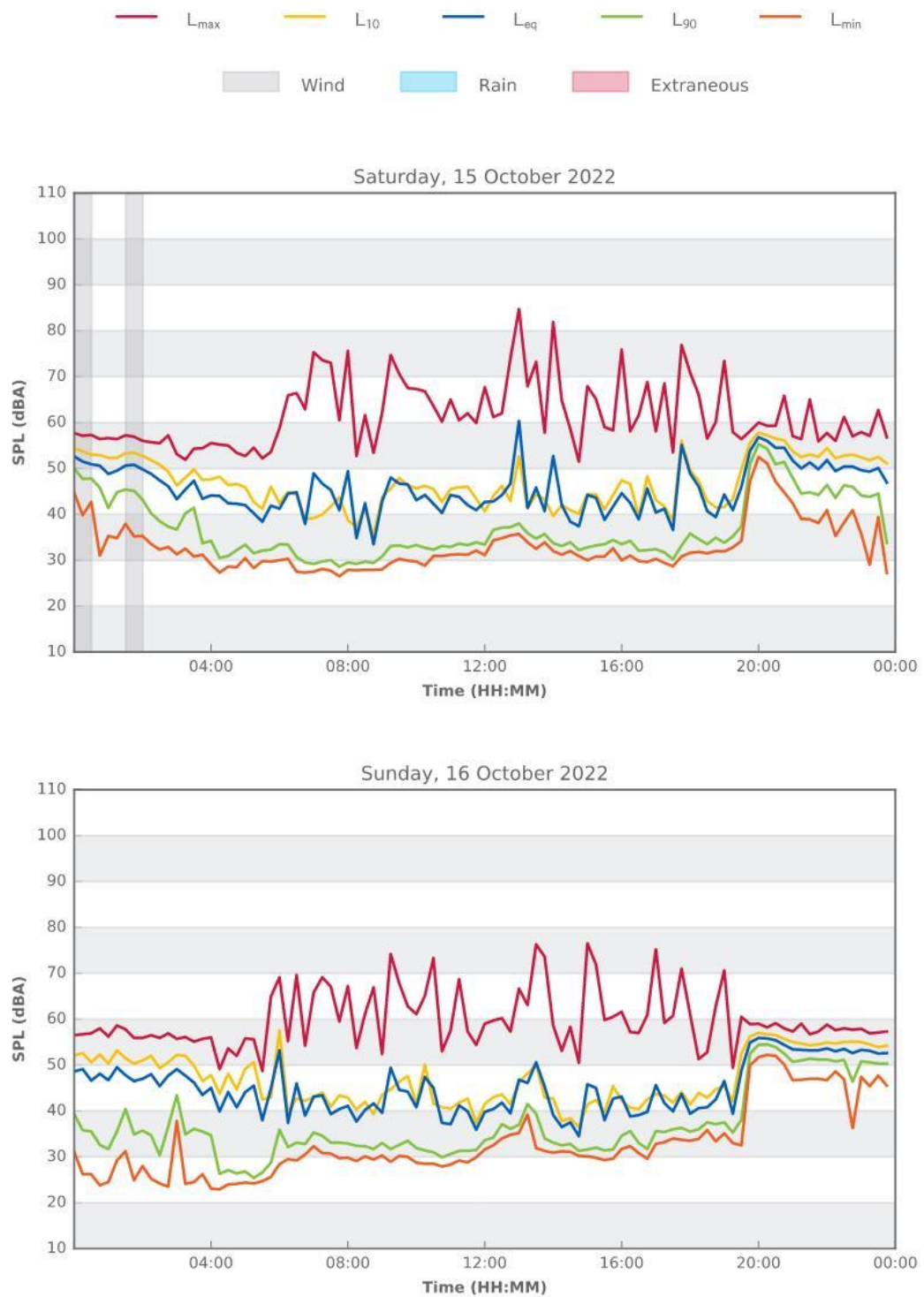
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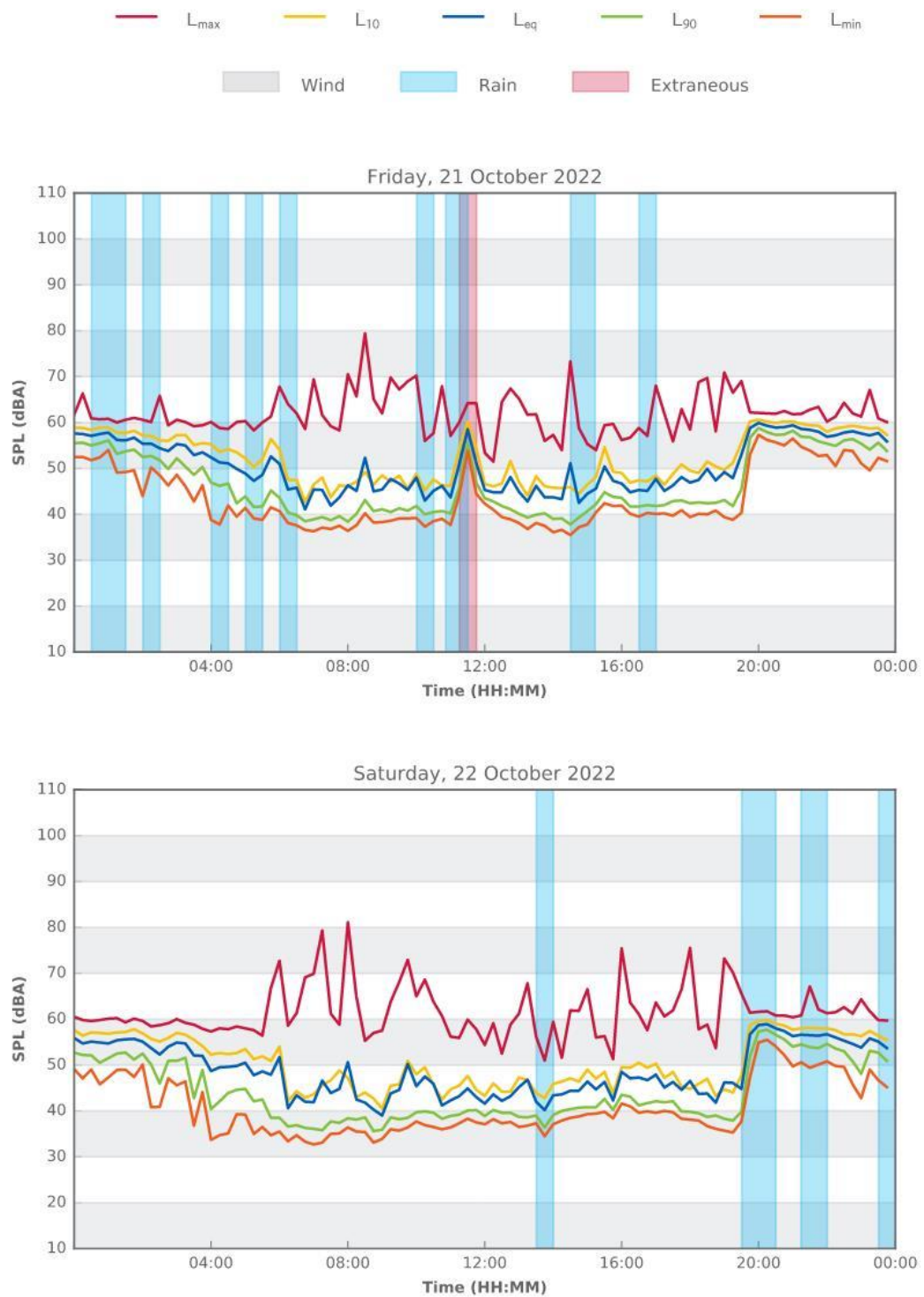
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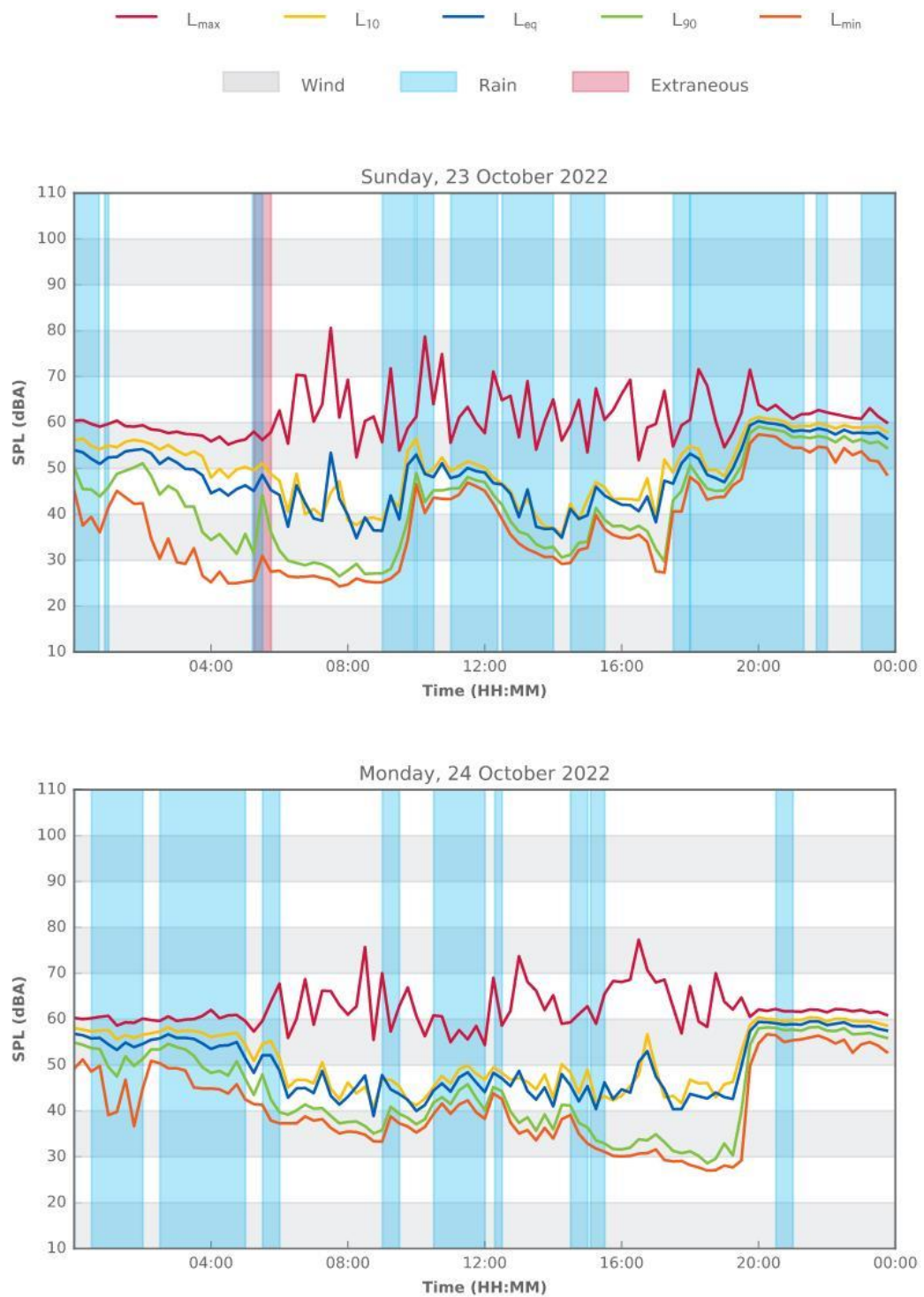
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