Report

17 June 2026

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From	Matthijs Oosterlaken (GHD)	**Project no.**	12619020
Project name	Waratah Super Battery - Noise Modelling		
Subject	Long-term operational monitoring		

1. Introduction

1.1 Purpose of this report

Following the commissioning noise monitoring conducted during the HP5 test on 17 October 2025, Akaysha Energy requested continuous noise monitoring to capture noise emissions representative of typical plant performance under the Interim SIPS operating mode.

GHD conducted continuous, long term unattended noise monitoring over a 26 day period. The monitoring program was designed to capture noise data across the full range of typical operational conditions, including varying charge and discharge cycles, ambient temperature fluctuations, and diurnal periods.

The purpose of this report is to present the findings of the long-term continuous noise monitoring survey and to characterise the noise emissions from the Waratah Super Battery during representative operational conditions.

1.2 Scope of work

GHD undertook the following scope of works:

– Travelled to site and deployed a total of three noise loggers to measure noise levels continuously for a minimum period of two weeks at the following locations:
  - Two noise loggers at the intermediate locations
  - One noise logger at a nearby residential receiver.
– Retrieved noise loggers and downloaded monitoring data upon completion of the monitoring period.
– Analysed and processed the monitoring data to determine the site's noise contribution at the nearest sensitive receivers, including comparison of noise data against operational data (charge and discharge cycles) supplied by the client.
– Prepared a short-form report detailing the noise monitoring methodology, results, and findings.

1.3 Limitations

This report: has been prepared by GHD for Munmorah Battery Project Co Pty Ltd and may only be used and relied on by Munmorah Battery Project Co Pty Ltd for the purpose agreed between GHD and Munmorah Battery Project Co Pty Ltd as set out in section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than Munmorah Battery Project Co Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

2. Operational noise requirements

2.1 Conditions of approval

The Waratah Super Battery is subject to Infrastructure Approval for State Significant Infrastructure (SSI) number 48492458. Condition B13 (b) provides operational noise limits for the site and is reproduced below. As the battery could be operational at any time, the nighttime noise limit of 35 dB(A) is used to assess compliance.

B13. The Proponent must:

(b) take all reasonable and feasible steps to minimise operational noise and ensure that the noise generated by the operation of the development does not exceed the noise limits in Table 3 below to be determined in accordance with the procedures in the NSW Noise Policy for Industry (EPA, 2017) *at any non-associated residence.*

Table 3: Noise Limit Requirements

Location	Noise Limits in dB(A)		
	Day	Evening	Night
	$L_{Aeq,15min}$	$L_{Aeq,15min}$	$L_{Aeq,15min}$
Any residential receiver	40	40	35

2.2 Waratah Super Battery SIPS functional specification

The *Waratah Super Battery SIPS functional Specification 2022* contains the following requirements related to operational noise:

Noise emissions

As part of the EMP, the Service Provider is required to include in the EMP a plan for minimizing noise emissions during construction and commissioning.

The Service Provider must comply with its obligations under the Occupational Health and Safety Act and Regulations for the protection of its employees against noise-induced hearing damage.

Commissioning activities that can create high noise levels in construction areas and operator areas, as well as elevated environmental noise levels in off-Site areas must be programmed to occur at times to minimize exposure and annoyance to others. If required noise control systems shall be installed for management of noise in close proximity to the major emissions points. The Service Provider is to advise of methods for this control and the expected sound levels in affected operator areas.

Operational noise levels

The Facility shall comply with the requirements of the Environmental Protection (Residential Noise) Regulations.

In addition, the equivalent continuous "A" weighted sound pressure level produced by any plant shall not exceed 85 dB(A) at 1 m and at 1.5 m in elevation during normal plant operations be they continuous, cyclic or intermittent.

The referenced Environmental Protection Regulations are considered to be the operational noise limit as defined in Condition B13 (b) of the conditions of approval.

3. Noise monitoring

3.1 Methodology

Long-term continuous noise monitoring was conducted between 23 April 2026 and 18 May 2026 to quantify noise emissions from the Waratah Super Battery during typical operational conditions. Details of the noise monitoring program and equipment are outlined in Table 1 and locations are shown in Figure 1. Noise sensitive receiver locations from the noise and vibration impact assessment undertaken for the environmental impact statement have been included in the figure for reference and to provide spatial context relative to the current monitoring positions. The monitoring methodology included the following:

- Noise monitoring was undertaken using two Svantek SV977 and one Svantek SV200A environmental noise loggers. Each noise logger was programmed to accumulate L_{A90}, L_{A10}, and L_{Aeq} noise descriptors continuously over the entire monitoring period with a 15-minute integration period. The noise loggers were deployed at the following locations:
  - Two intermediate locations (I1 and I2) were surveyed to quantify noise levels in close proximity to the Waratah Super Battery and correlate operating modes to measured noise levels.
  - One residential receiver location (M1 – 124 Woolana Ave, Halekulani), which was considered a representative receiver location close to the Waratah Super Battery
- A calibration check was performed on the noise monitoring equipment using a sound level calibrator with a sound pressure level of 114 dB(A) at 1 kHz. At completion of the measurements, the meter's calibration was re-checked to ensure the sensitivity of the noise monitoring equipment had not varied. The noise loggers were found to be within the acceptable tolerance of ± 0.5 dB(A).
- All monitoring activities were undertaken with consideration of the specifications outlined in Australian Standard AS 1055 (2018) *Description and Measurement of Environmental Noise*.
- Monitoring at the intermediate locations was carried out in the free field with microphones positioned at a height of 1.5 metres above the ground. The noise logger at the residential receiver was positioned at a height of 2.2 metres to reduce attenuation from the adjacent hedge and fence as much as reasonably possible.
- The data collected by the loggers was downloaded and analysed, and any invalid data was removed. Invalid data generally refers to periods of time where average wind speeds were greater than 5 m/s (adjusted for ground level), or when rainfall occurred.
- Meteorological data was sourced from Norah Head AWS (ID: 61366), which is approximately 8 km from the monitoring site.
- Operational data detailing the charge and discharge rates was provided by the client and correlated against the measured noise levels to characterise noise emissions during various operating modes.

Table 1 Noise monitoring details

Location	Equipment details	Equipment settings	Site photos
I1: East of the site Designated Waratah 1	**Sound Level Meters** Svan 977 Class 1 sound level meter IEC 61672-3:2013 compliant Manufactured prior to 2019 Svan 200 Class 1 sound level meter IEC 61672-3:2013 compliant Manufactured prior to 2019	Serial Number: 97592 A-weighted Fast time response 15-minute intervals Pre and post calibration variation: 0.23 dB(A)	

Location	Equipment details	Equipment settings	Site photos
I2: South of the site Designated Waratah 2	**Calibrator** Svantek SV30A Class 1 sound level calibrator IEC 61672-3:2013-compliant Manufactured prior to 2017 SN: 29030	Serial Number: 170892 A-weighted Fast time response 15-minute intervals Pre and post calibration variation: 0.13 dB(A)	
M1: In the backyard of 124 Woolana Ave, Halekulani Designated Waratah 3		Serial Number: 65115 A-weighted Fast time response 15-minute intervals Automatic calibration conducted	



Legend

- Project Site
- Sensitive receivers

Monitoring locations

- Intermediate
- Residential

Paper Size ISO A4

0 200 400 m

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

Akaysha Energy
Waratah Super Battery
Long term noise monitoring

Project site and noise monitoring locations

Project No.	**12619020**
Revision No.	**1**
Date.	**04/06/2026**

FIGURE 1

Document Path: \\ghdnet\ghd\AU\Sydney\Projects\21\12619020\Tech\03_GIS\WSB.qgz

Data Source: Nearmap imagery

Created By: moosterlaken

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Whilst every care has been taken to prepare this map, GHD, LIST and Nearmap™ make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the map being inaccurate, incomplete, or unsuitable in any way and for any reason.

3.2 Results

Analysis of the noise data at the intermediate locations demonstrates a clear correlation between Waratah Super Battery operational activity and measured noise levels at I1 and I2. Noise levels at both positions are observed to rise and fall in response to charge and discharge cycles, with charging events producing more pronounced increases in maximum noise levels than charging periods.

This pattern is evident throughout the entire monitoring period. A notable example occurred on 29 April 2026, when a sustained high-power charging event between approximately 9:00 am and 12:00 pm produced a corresponding gradual rise and subsequent decline in measured noise levels at both intermediate locations. Figure 2 overlays the noise levels from each monitoring location to show this consistent response, with full comparison charts presented in Appendix A.

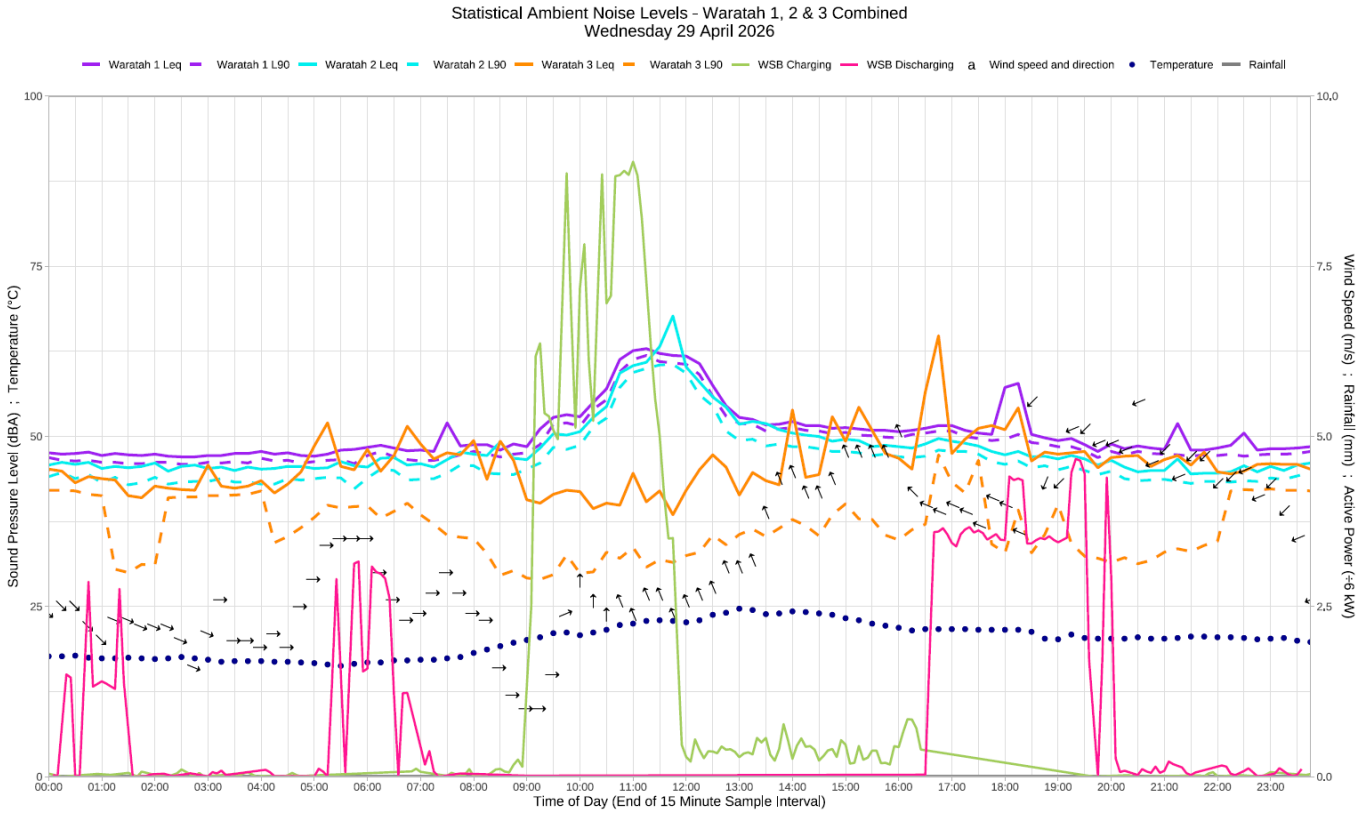


Figure 2 Comparison of noise measurements on 29 April 2026

A similar response is apparent on 16 May 2026 between 8:00 am and 12:00 pm, where an extended charging cycle again aligns with elevated noise at I1 and I2. Both examples correspond to periods of calm weather conditions where wind and rainfall did not influence the measured levels.

To determine whether noise emissions from Waratah Super Battery propagate to nearby sensitive receivers at levels sufficient to affect the ambient noise environment, simultaneously measured noise levels at I2 and M1 were compared.

While noise at I2 fluctuates in direct response to operational cycling, levels at M1 remain relatively stable throughout the day and do not exhibit the same rise-and-fall pattern associated with charging events. A comparison of the 29 April 2026 case is shown in Figure 2. Noise levels at the intermediate locations (purple and cyan) track the charge cycle, whereas noise at M1 (shown in orange) maintains a consistent baseline with no discernible contribution from Waratah Super Battery operations.

This pattern is consistent across all observed charge and discharge cycles presented in Appendix A, confirming that operational noise from Waratah Super Battery does not produce a measurable increase in ambient noise levels at the nearest sensitive receiver. Additionally, charging events would typically occur during the daytime period, when background noise levels are elevated and applicable noise criteria are higher.

A review of the Waratah Super Battery operational data shows the maximum charging output during the monitoring period reached approximately 560 MW on 13 May 2026, with most charging events approximately 300-400 MW. Discharging rates were generally lower, peaking at around 300 MW. This is significantly lower than the site's 850 MW rated capacity.

The monitoring therefore captured a reasonable range of operational activity, but the site did not operate at or near full capacity at any point during the assessment. The results are considered representative of normal day-to-day operations rather than a worst-case scenario. If the site routinely operates at higher power levels in future, further monitoring may be appropriate to confirm that noise levels at the nearest receivers remain consistent with the findings of this assessment.

4. Conclusion

Unattended noise monitoring was conducted at two intermediate locations and one representative sensitive receiver between 23 April and 18 May 2026 to assess the operational noise contribution of the Waratah Super Battery.

The results show a clear relationship between the operation of Waratah Super Battery and noise levels at the intermediate positions, with both I1 and I2 responding to charge and discharge cycles. Charging events are notably louder than discharging at both locations.

Importantly, when levels at I2 are compared against simultaneous measurements at M1, there is no corresponding response at the receiver. Noise levels at M1 remain steady regardless of whether Waratah Super Battery is operating, idle, charging, or discharging. This is consistent across the full monitoring period, including during calm conditions where wind and rain do not obscure the results.

It is noted that the BESS did not operate at full capacity during the monitoring period, with a peak charging of approximately 560 MW against a rated capacity of 850 MW. The findings are considered representative of normal day-to-day operations, and further monitoring may be warranted if the site regularly operates at higher output levels.

The monitoring confirms that noise from the Waratah Super Battery does not materially affect the noise environment at the nearest residential receivers under the operational conditions observed.

Appendices

Appendix A

Operational noise comparison charts

Statistical Ambient Noise Levels - Waratah 1, 2 & 3 Combined
Thursday 23 April 2026

Waratah 1 Leq | Waratah 1 L90 | Waratah 2 Leq | Waratah 2 L90 | Waratah 3 Leq | Waratah 3 L90 | WSB Charging | WSB Discharging | a Wind speed and direction | Temperature | Rainfall

Sound Pressure Level (dBA) ; Temperature (°C)

100
75
50
25
0

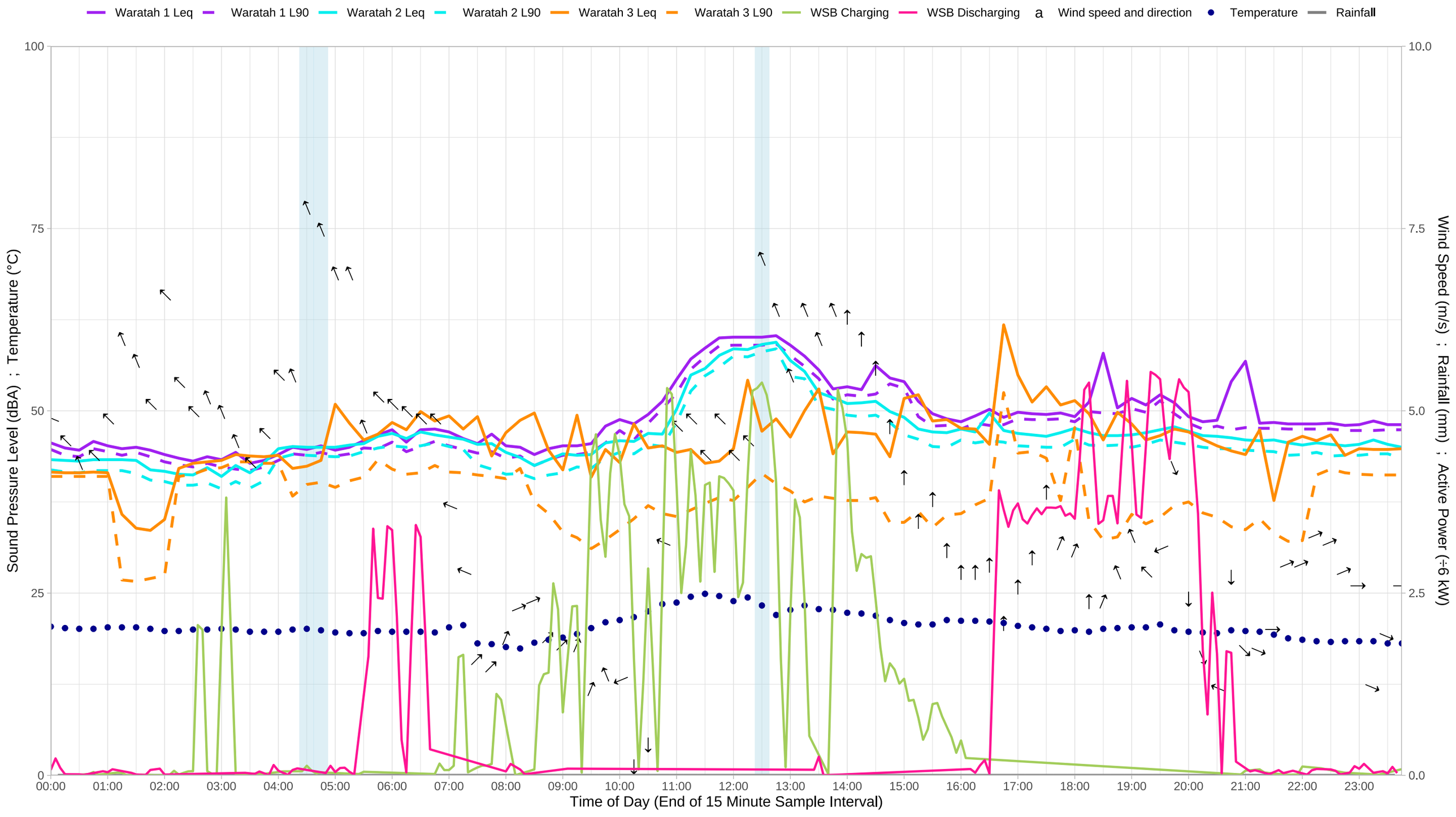
Wind Speed (m/s) ; Rainfall (mm) ; Active Power (÷6 kW)

10.0
7.5
5.0
2.5
0.0

00:00 01:00 02:00 03:00 04:00 05:00 06:00 07:00 08:00 09:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00

Time of Day (End of 15 Minute Sample Interval)

Statistical Ambient Noise Levels - Waratah 1, 2 & 3 Combined
Friday 24 April 2026



Statistical Ambient Noise Levels - Waratah 1, 2 & 3 Combined
Saturday 25 April 2026

Waratah 1 Leq | Waratah 1 L90 | Waratah 2 Leq | Waratah 2 L90 | Waratah 3 Leq | Waratah 3 L90 | WSB Charging | WSB Discharging | a Wind speed and direction | Temperature | Rainfall

Sound Pressure Level (dBA) ; Temperature (°C)

Wind Speed (m/s) ; Rainfall (mm) ; Active Power (÷6 kW)

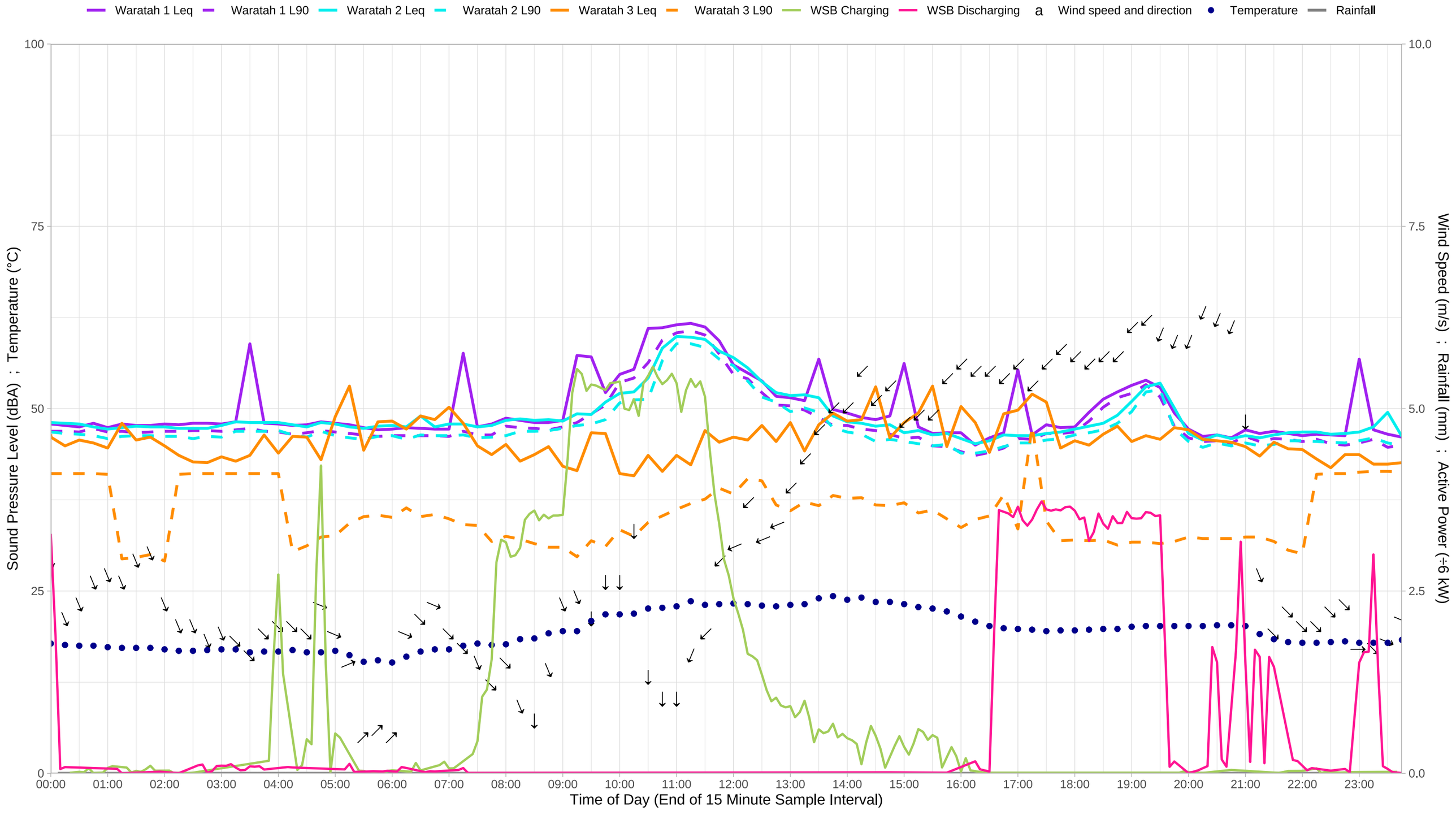
100
75
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25
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10.0
7.5
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2.5
0.0

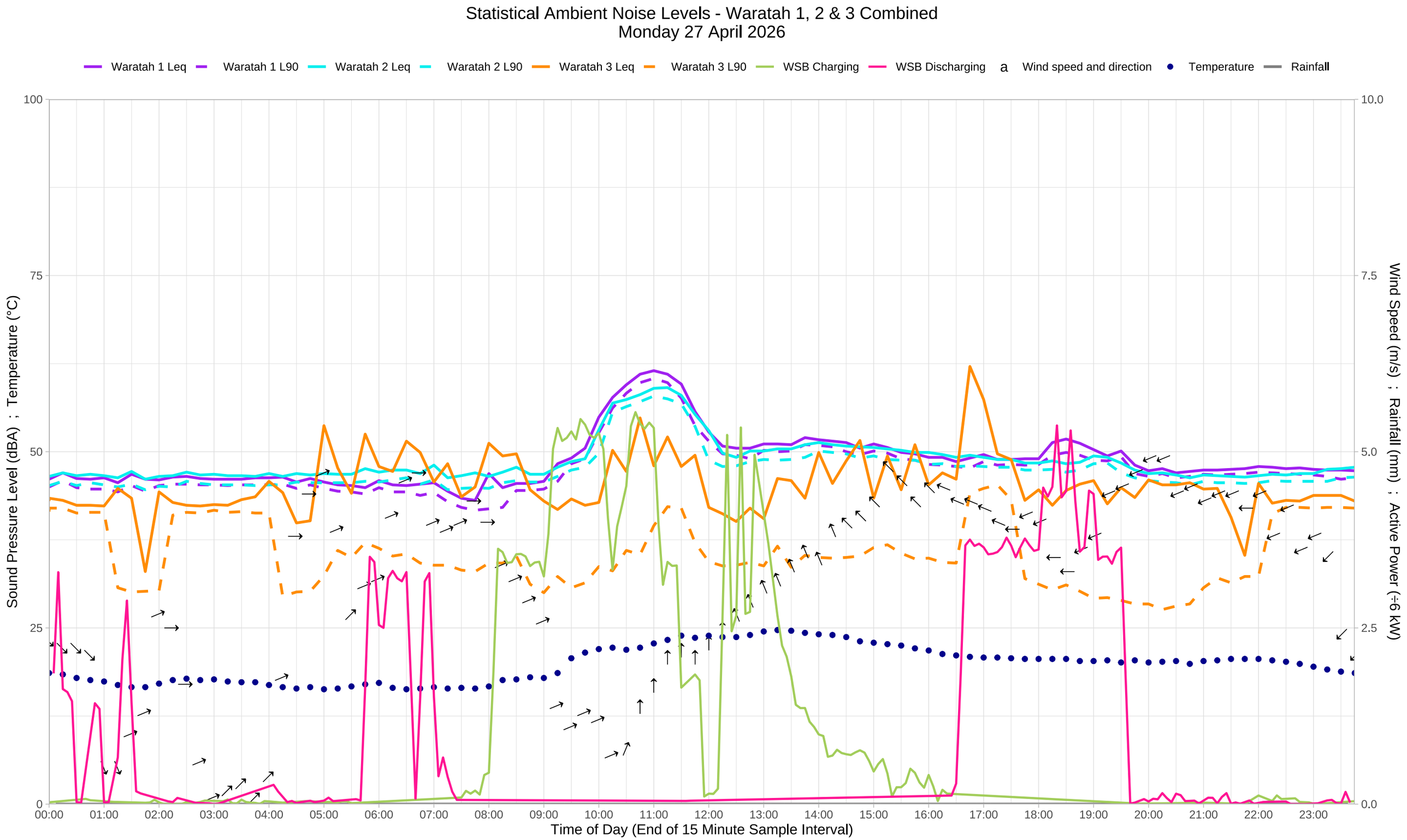
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Time of Day (End of 15 Minute Sample Interval)

Statistical Ambient Noise Levels - Waratah 1, 2 & 3 Combined
Sunday 26 April 2026



Statistical Ambient Noise Levels - Waratah 1, 2 & 3 Combined
Monday 27 April 2026



Statistical Ambient Noise Levels - Waratah 1, 2 & 3 Combined
Tuesday 28 April 2026

Waratah 1 Leq | Waratah 1 L90 | Waratah 2 Leq | Waratah 2 L90 | Waratah 3 Leq | Waratah 3 L90 | WSB Charging | WSB Discharging | Wind speed and direction | Temperature | Rainfall

Sound Pressure Level (dBA) ; Temperature (°C)

Wind Speed (m/s) ; Rainfall (mm) ; Active Power (÷6 kW)

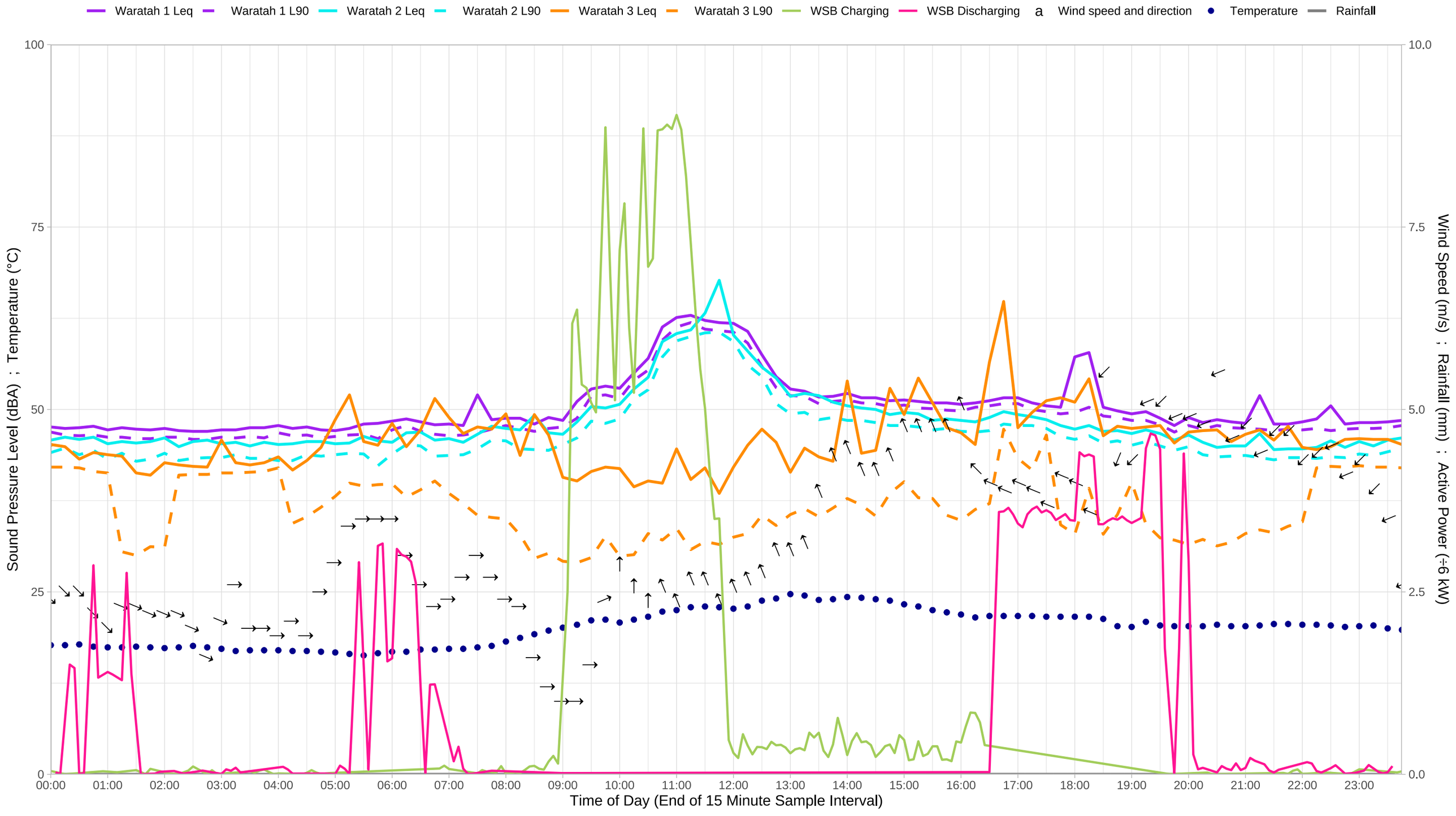
100
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10.0
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5.0
2.5
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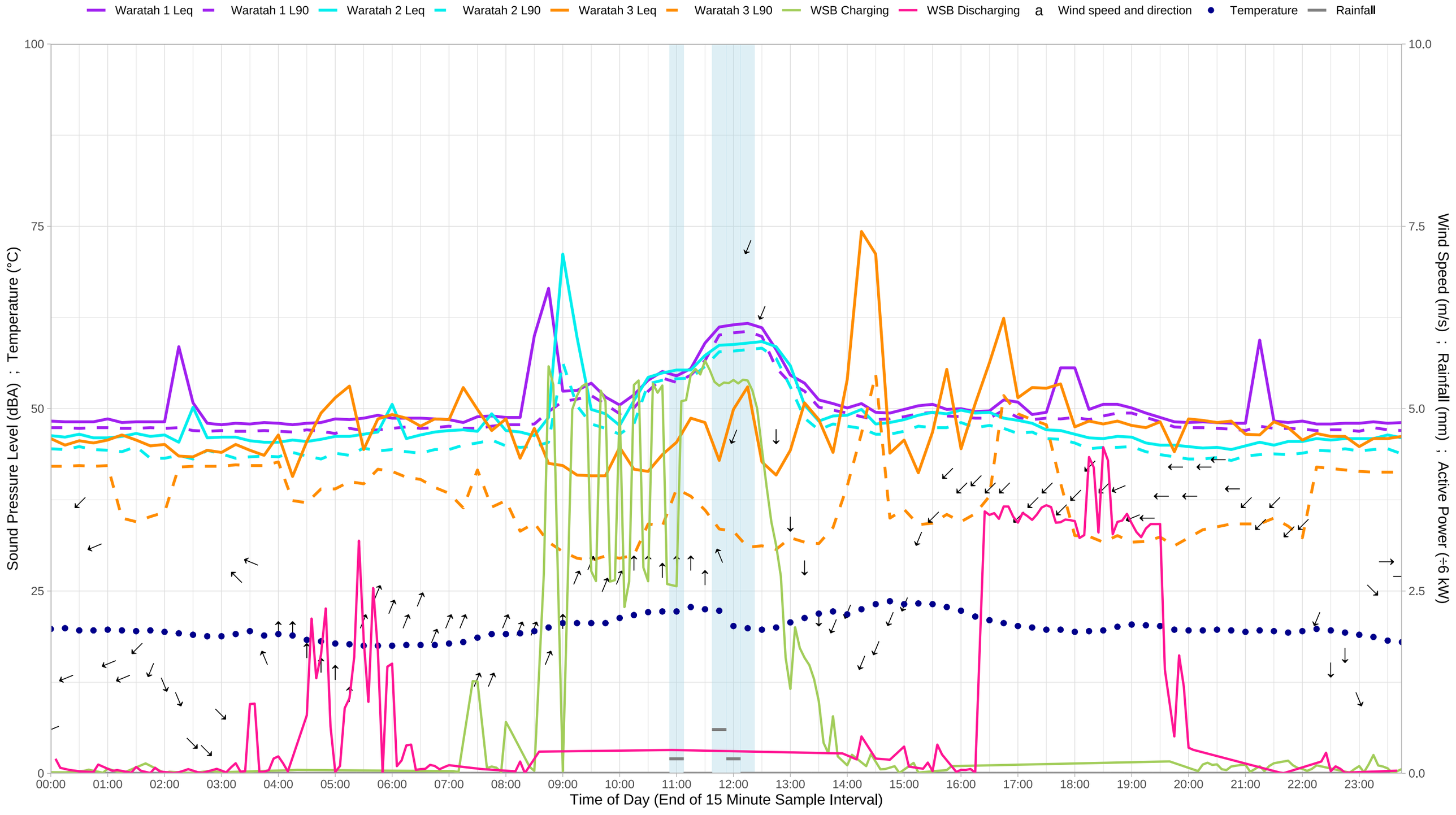
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Time of Day (End of 15 Minute Sample Interval)

Statistical Ambient Noise Levels - Waratah 1, 2 & 3 Combined
Wednesday 29 April 2026



Statistical Ambient Noise Levels - Waratah 1, 2 & 3 Combined
Thursday 30 April 2026



Statistical Ambient Noise Levels - Waratah 1, 2 & 3 Combined
Friday 01 May 2026

Waratah 1 Leq | Waratah 1 L90 | Waratah 2 Leq | Waratah 2 L90 | Waratah 3 Leq | Waratah 3 L90 | WSB Charging | WSB Discharging | Wind speed and direction | Temperature | Rainfall

Sound Pressure Level (dBA) ; Temperature (°C)

Wind Speed (m/s) ; Rainfall (mm) ; Active Power (÷6 kW)

Time of Day (End of 15 Minute Sample Interval)

Statistical Ambient Noise Levels - Waratah 1, 2 & 3 Combined
Saturday 02 May 2026

Waratah 1 Leq | Waratah 1 L90 | Waratah 2 Leq | Waratah 2 L90 | Waratah 3 Leq | Waratah 3 L90 | WSB Charging | WSB Discharging | Wind speed and direction | Temperature | Rainfall

Sound Pressure Level (dBA) ; Temperature (°C)

Wind Speed (m/s) ; Rainfall (mm) ; Active Power (÷6 kW)

100
75
50
25
0

10.0
7.5
5.0
2.5
0.0

00:00 01:00 02:00 03:00 04:00 05:00 06:00 07:00 08:00 09:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00

Time of Day (End of 15 Minute Sample Interval)

Statistical Ambient Noise Levels - Waratah 1, 2 & 3 Combined
Sunday 03 May 2026

Waratah 1 Leq | Waratah 1 L90 | Waratah 2 Leq | Waratah 2 L90 | Waratah 3 Leq | Waratah 3 L90 | WSB Charging | WSB Discharging | a Wind speed and direction | Temperature | Rainfall

Sound Pressure Level (dBA) ; Temperature (°C)

Wind Speed (m/s) ; Rainfall (mm) ; Active Power (÷6 kW)

100
75
50
25
0

10.0
7.5
5.0
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00:00 01:00 02:00 03:00 04:00 05:00 06:00 07:00 08:00 09:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00

Time of Day (End of 15 Minute Sample Interval)

Statistical Ambient Noise Levels - Waratah 1, 2 & 3 Combined
Monday 04 May 2026

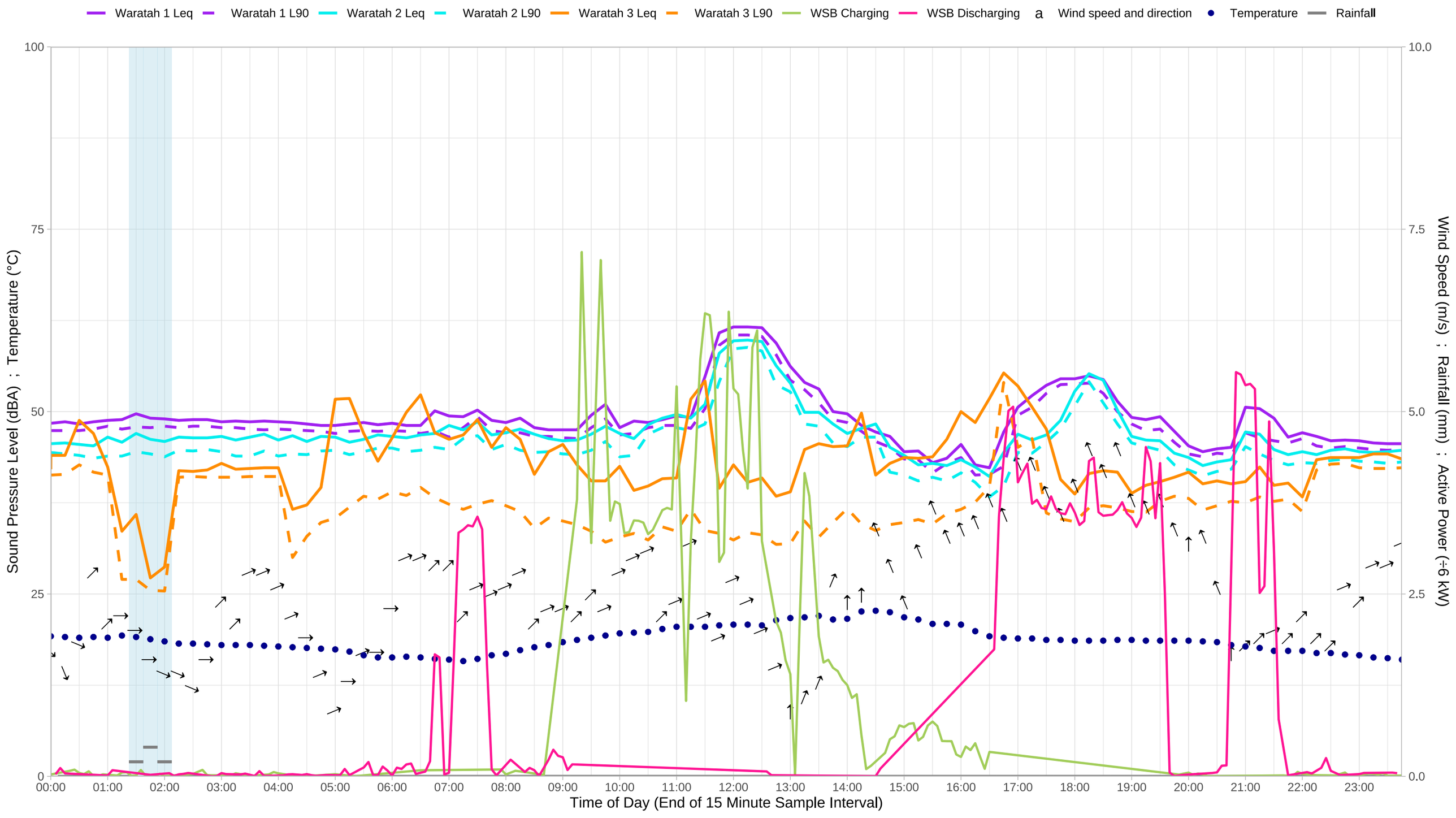
Waratah 1 Leq | Waratah 1 L90 | Waratah 2 Leq | Waratah 2 L90 | Waratah 3 Leq | Waratah 3 L90 | WSB Charging | WSB Discharging | Wind speed and direction | Temperature | Rainfall

Sound Pressure Level (dBA) ; Temperature (°C)

Wind Speed (m/s) ; Rainfall (mm) ; Active Power (÷6 kW)

Time of Day (End of 15 Minute Sample Interval)

Statistical Ambient Noise Levels - Waratah 1, 2 & 3 Combined
Tuesday 05 May 2026



Statistical Ambient Noise Levels - Waratah 1, 2 & 3 Combined
Wednesday 06 May 2026

Waratah 1 Leq | Waratah 1 L90 | Waratah 2 Leq | Waratah 2 L90 | Waratah 3 Leq | Waratah 3 L90 | WSB Charging | WSB Discharging | a Wind speed and direction | Temperature | Rainfall

Sound Pressure Level (dBA) ; Temperature (°C)

Wind Speed (m/s) ; Rainfall (mm) ; Active Power (÷6 kW)

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Time of Day (End of 15 Minute Sample Interval)

Statistical Ambient Noise Levels - Waratah 1, 2 & 3 Combined
Thursday 07 May 2026

Waratah 1 Leq | Waratah 1 L90 | Waratah 2 Leq | Waratah 2 L90 | Waratah 3 Leq | Waratah 3 L90 | WSB Charging | WSB Discharging | a Wind speed and direction | Temperature | Rainfall

Sound Pressure Level (dBA) ; Temperature (°C)

Wind Speed (m/s) ; Rainfall (mm) ; Active Power (÷6 kW)

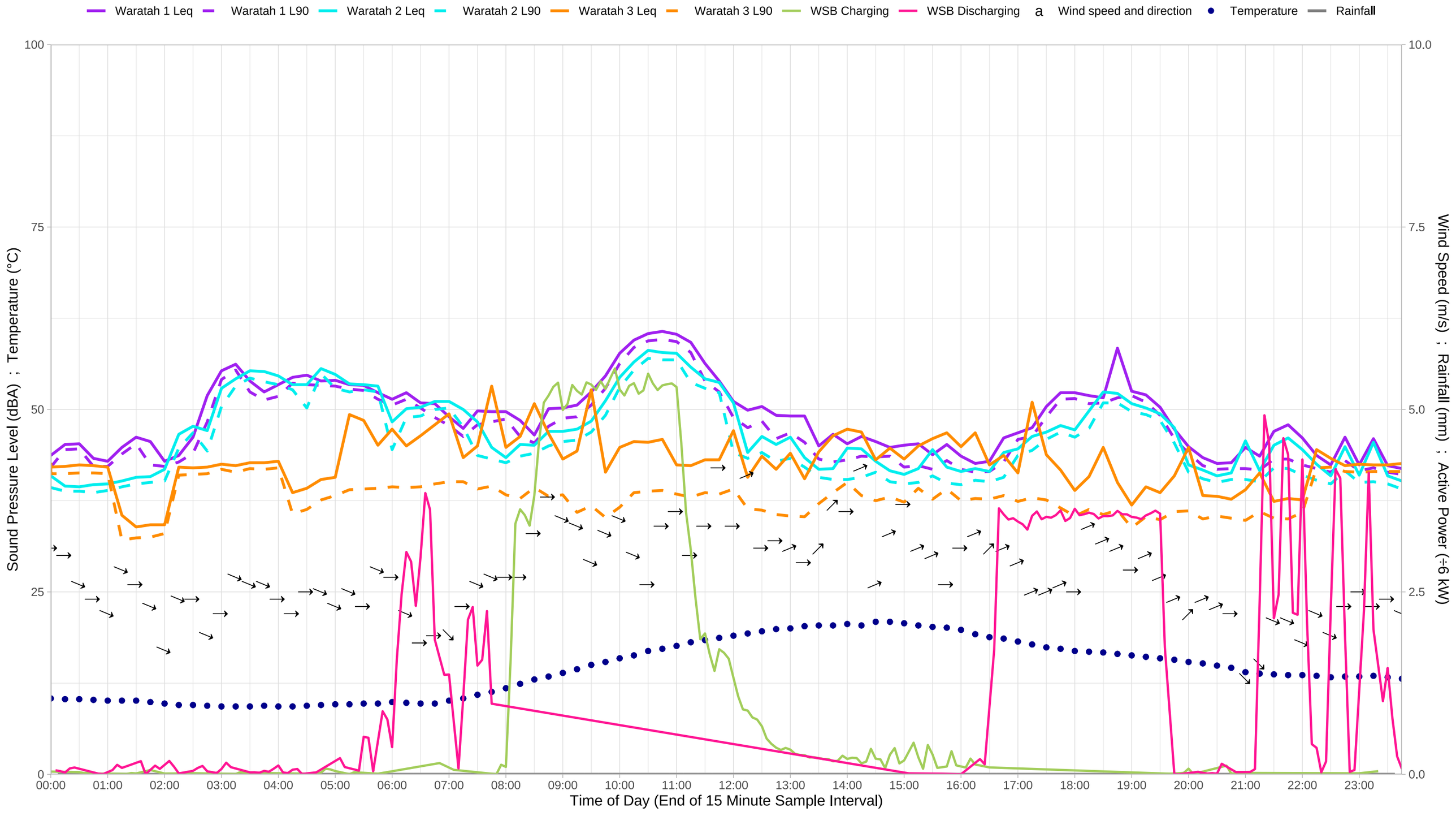
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Time of Day (End of 15 Minute Sample Interval)

Statistical Ambient Noise Levels - Waratah 1, 2 & 3 Combined
Friday 08 May 2026



Statistical Ambient Noise Levels - Waratah 1, 2 & 3 Combined
Saturday 09 May 2026

Waratah 1 Leq | Waratah 1 L90 | Waratah 2 Leq | Waratah 2 L90 | Waratah 3 Leq | Waratah 3 L90 | WSB Charging | WSB Discharging | a Wind speed and direction | Temperature | Rainfall

Sound Pressure Level (dBA) ; Temperature (°C)

Wind Speed (m/s) ; Rainfall (mm) ; Active Power (÷6 kW)

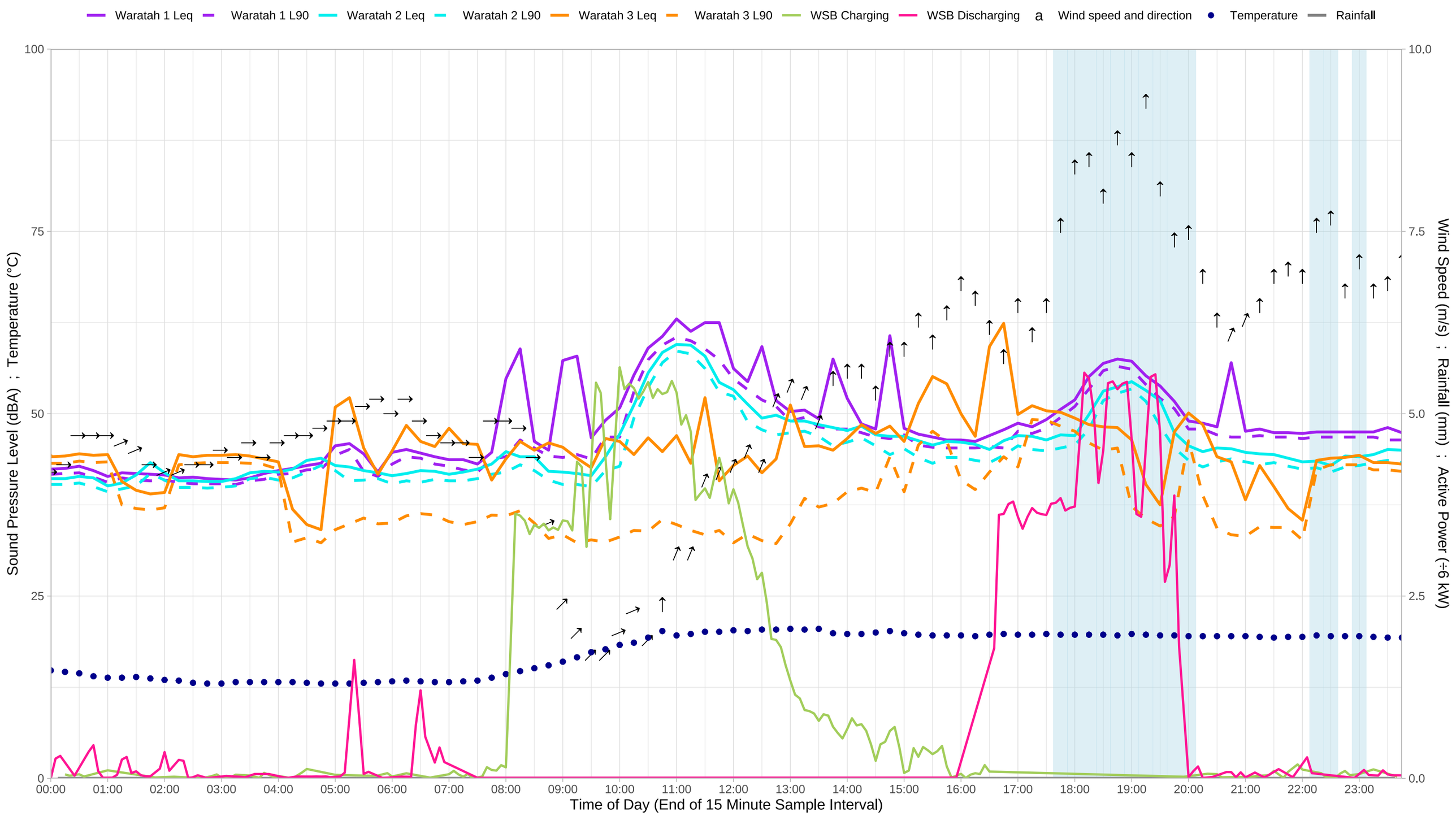
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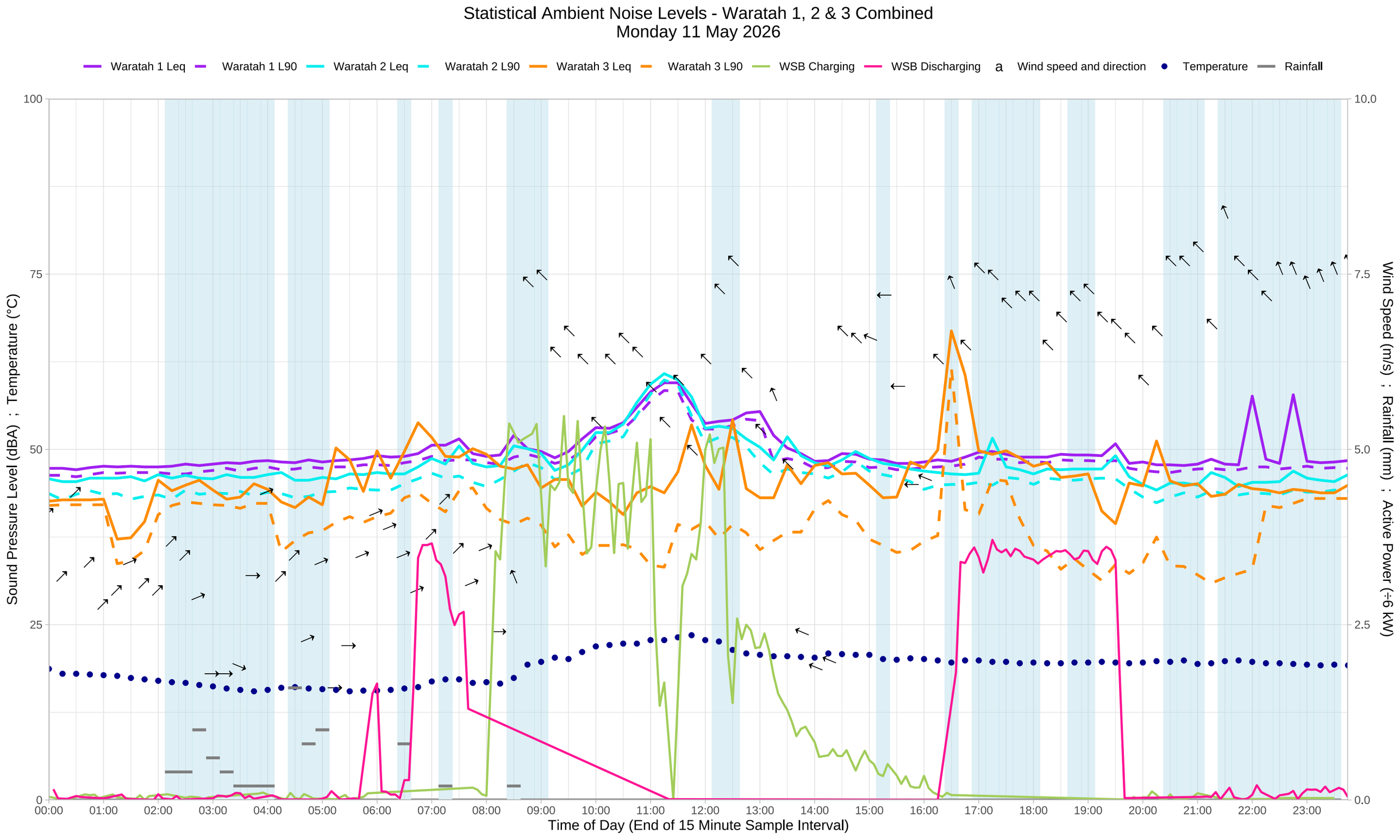
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Time of Day (End of 15 Minute Sample Interval)

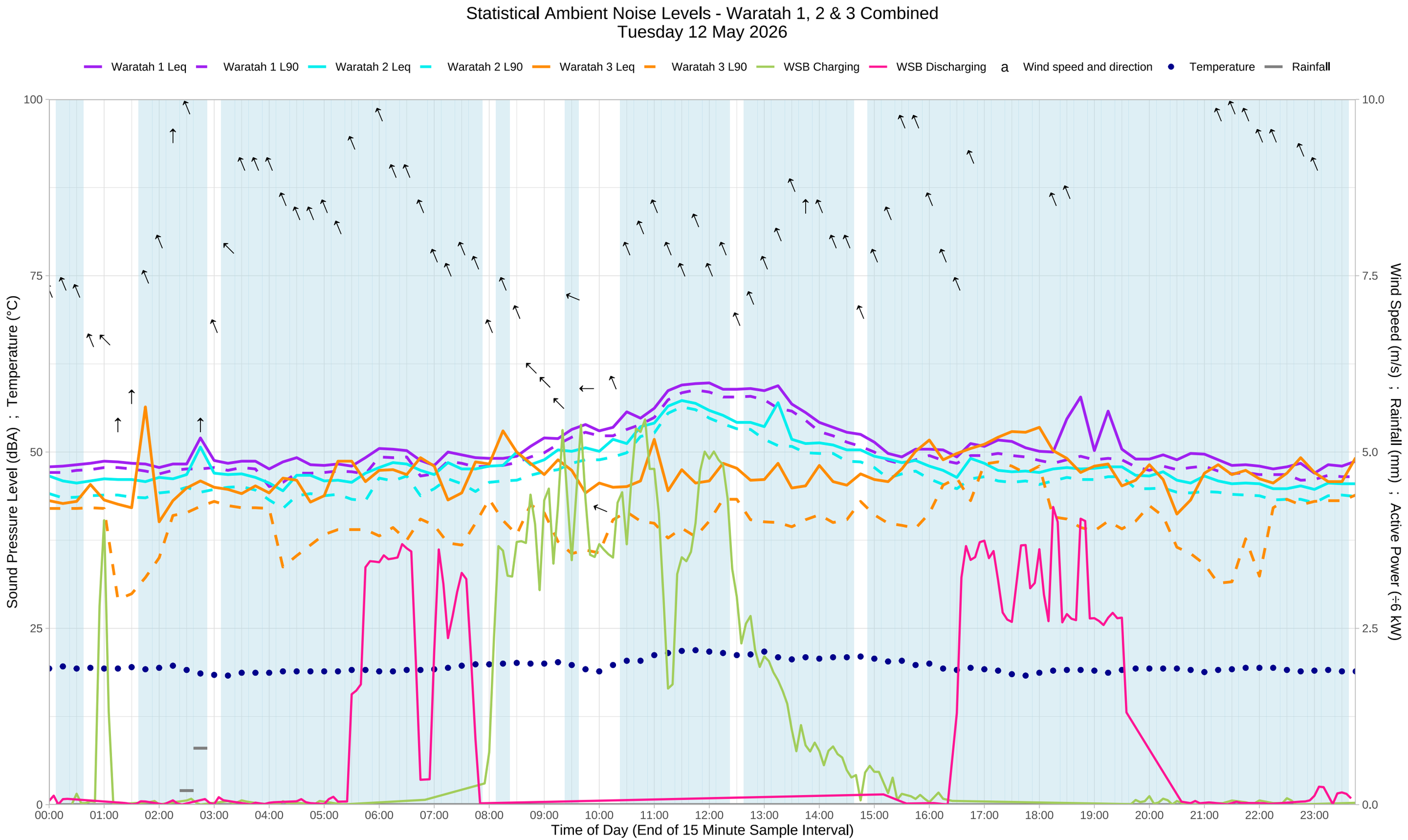
Statistical Ambient Noise Levels - Waratah 1, 2 & 3 Combined
Sunday 10 May 2026



Statistical Ambient Noise Levels - Waratah 1, 2 & 3 Combined
Monday 11 May 2026



Statistical Ambient Noise Levels - Waratah 1, 2 & 3 Combined
Tuesday 12 May 2026



Statistical Ambient Noise Levels - Waratah 1, 2 & 3 Combined
Wednesday 13 May 2026

Waratah 1 Leq | Waratah 1 L90 | Waratah 2 Leq | Waratah 2 L90 | Waratah 3 Leq | Waratah 3 L90 | WSB Charging | WSB Discharging | a Wind speed and direction | Temperature | Rainfall

Sound Pressure Level (dBA) ; Temperature (°C)

Wind Speed (m/s) ; Rainfall (mm) ; Active Power (÷6 kW)

100 | 75 | 50 | 25 | 0

10.0 | 7.5 | 5.0 | 2.5 | 0.0

00:00 | 01:00 | 02:00 | 03:00 | 04:00 | 05:00 | 06:00 | 07:00 | 08:00 | 09:00 | 10:00 | 11:00 | 12:00 | 13:00 | 14:00 | 15:00 | 16:00 | 17:00 | 18:00 | 19:00 | 20:00 | 21:00 | 22:00 | 23:00

Time of Day (End of 15 Minute Sample Interval)

Statistical Ambient Noise Levels - Waratah 1, 2 & 3 Combined
Thursday 14 May 2026

Waratah 1 Leq | Waratah 1 L90 | Waratah 2 Leq | Waratah 2 L90 | Waratah 3 Leq | Waratah 3 L90 | WSB Charging | WSB Discharging | a Wind speed and direction | Temperature | Rainfall

Sound Pressure Level (dBA) ; Temperature (°C)

Wind Speed (m/s) ; Rainfall (mm) ; Active Power (÷6 kW)

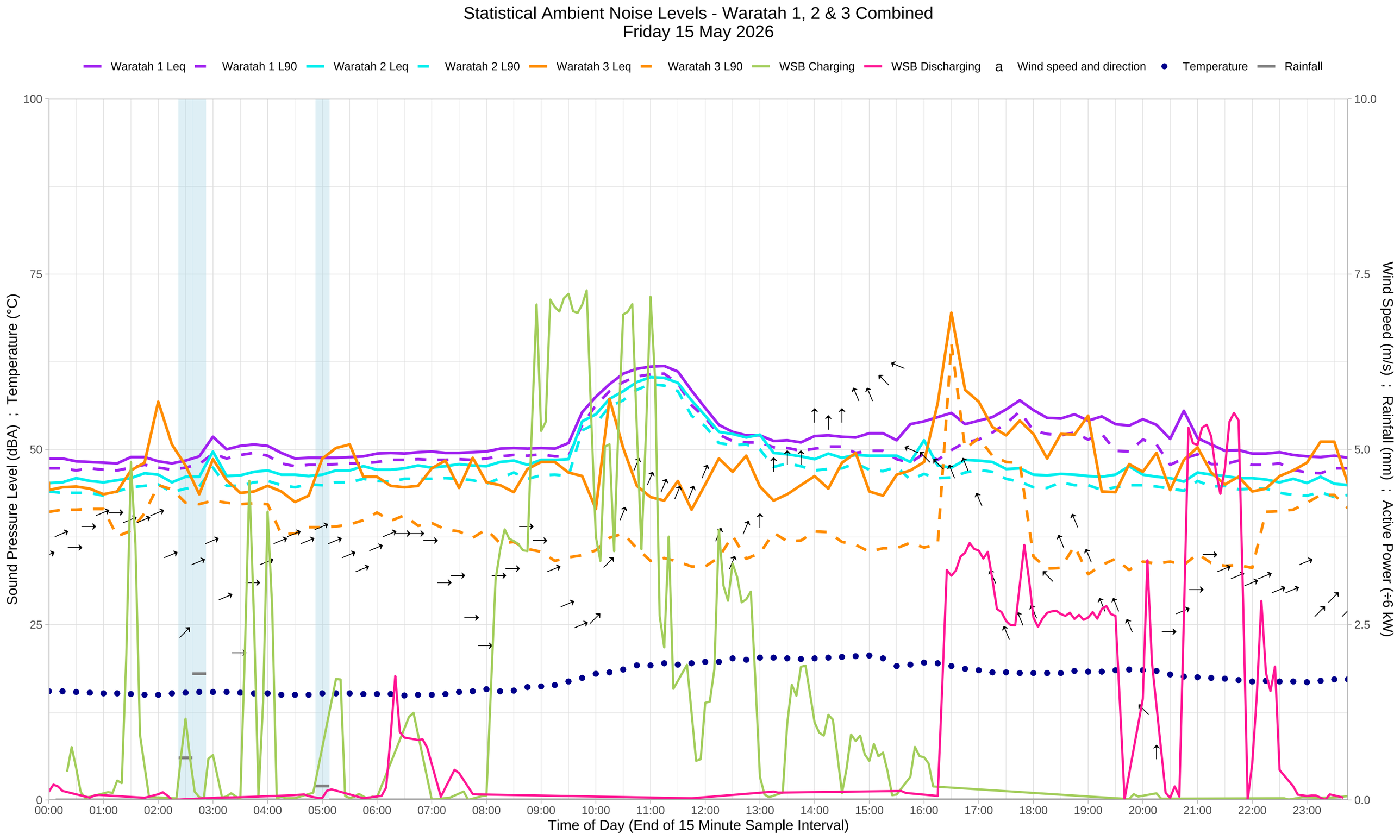
100 | 75 | 50 | 25 | 0

10.0 | 7.5 | 5.0 | 2.5 | 0.0

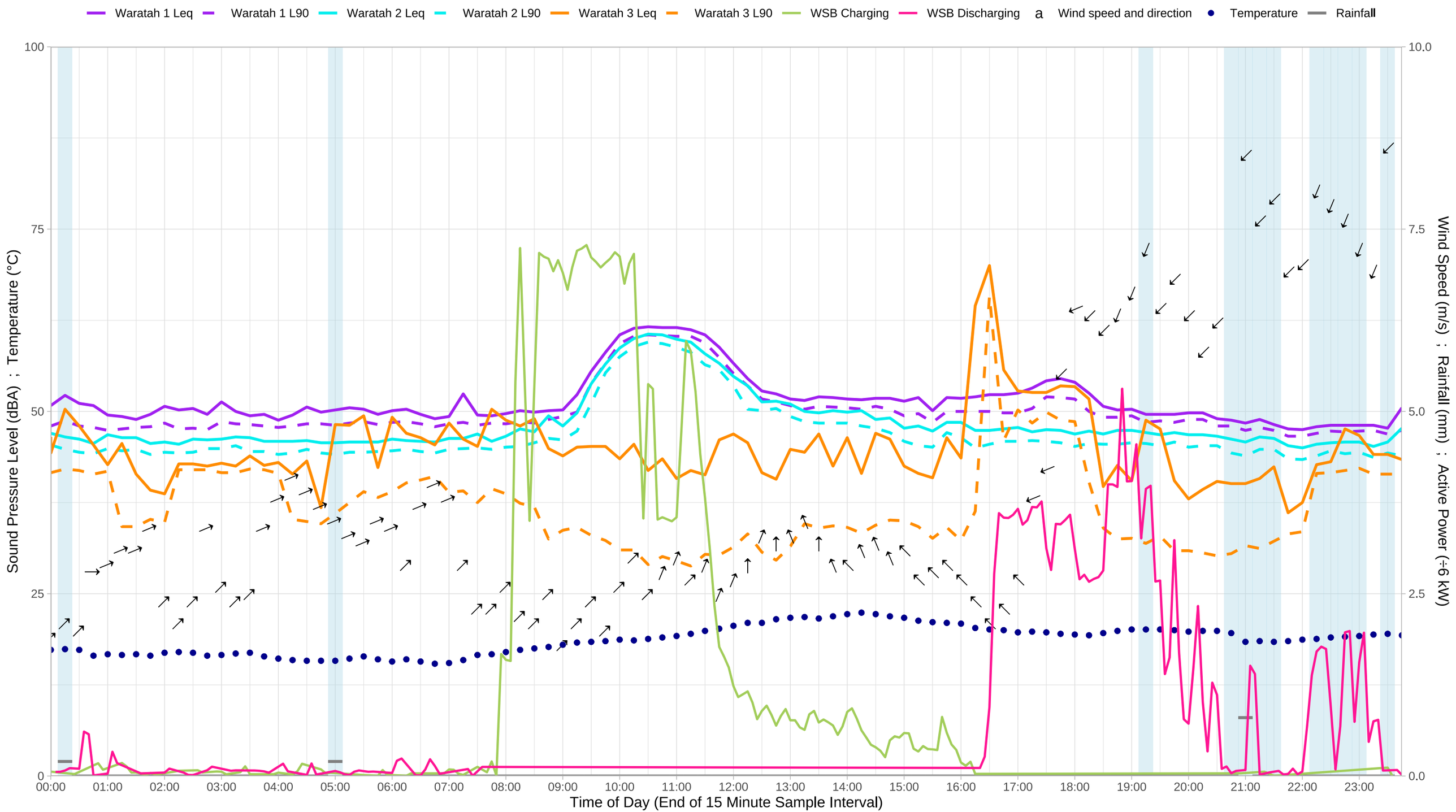
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Time of Day (End of 15 Minute Sample Interval)

Statistical Ambient Noise Levels - Waratah 1, 2 & 3 Combined
Friday 15 May 2026



Statistical Ambient Noise Levels - Waratah 1, 2 & 3 Combined
Saturday 16 May 2026



Statistical Ambient Noise Levels - Waratah 1, 2 & 3 Combined
Sunday 17 May 2026

Waratah 1 Leq | Waratah 1 L90 | Waratah 2 Leq | Waratah 2 L90 | Waratah 3 Leq | Waratah 3 L90 | WSB Charging | WSB Discharging | Wind speed and direction | Temperature | Rainfall

Sound Pressure Level (dBA) ; Temperature (°C)

Wind Speed (m/s) ; Rainfall (mm) ; Active Power (÷6 kW)

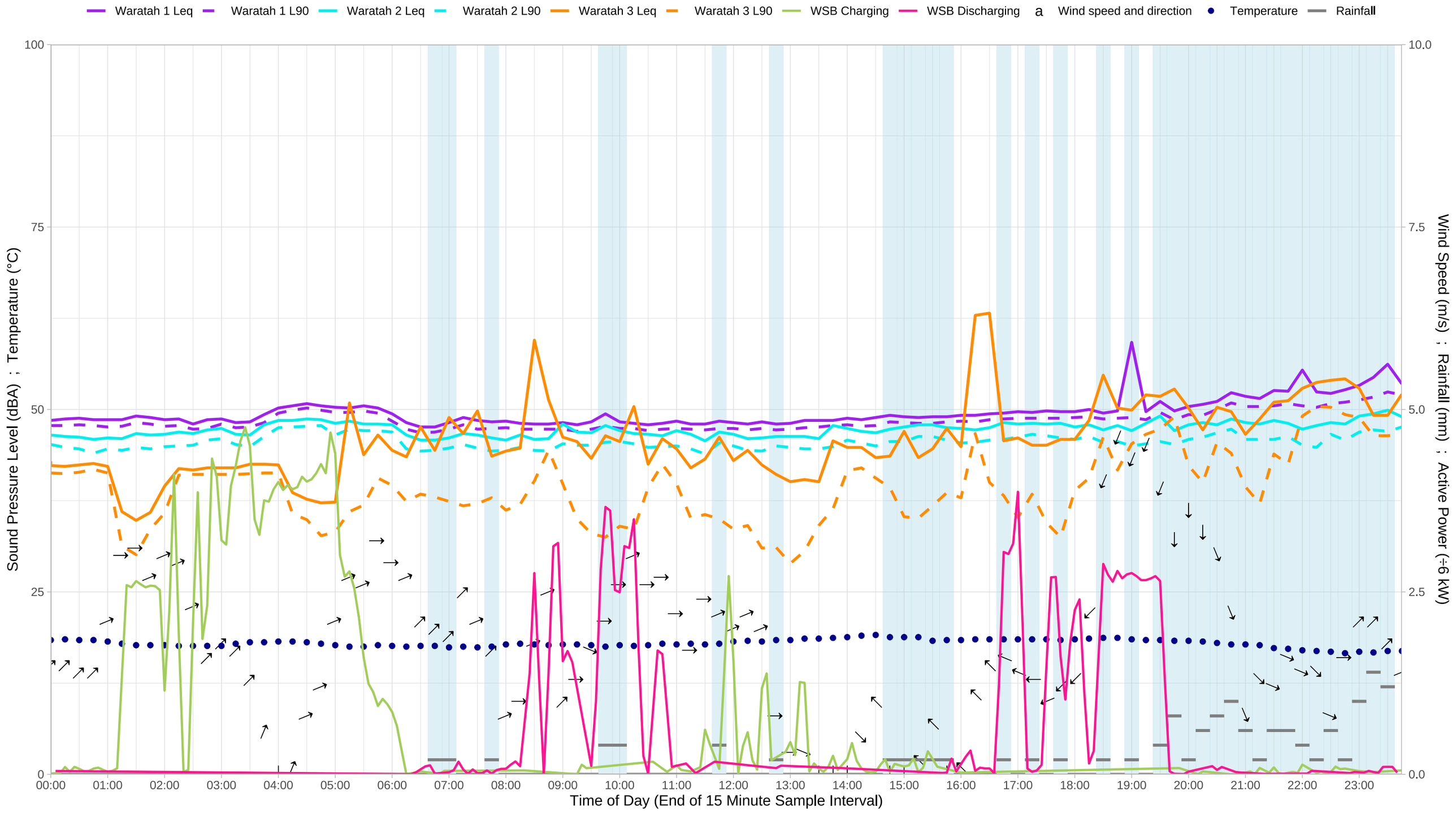
100 75 50 25 0

10.0 7.5 5.0 2.5 0.0

00:00 01:00 02:00 03:00 04:00 05:00 06:00 07:00 08:00 09:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00

Time of Day (End of 15 Minute Sample Interval)

Statistical Ambient Noise Levels - Waratah 1, 2 & 3 Combined
Monday 18 May 2026



Project name	Waratah Super Battery - Noise Modelling
Document title	Report | Long-term operational noise monitoring
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S4	0	A Willis	M Oosterlaken		E Milton		17/06/2026

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