

Health Infrastructure NSW  
**Westmead PSB and MSCP  
Construction Noise Monitoring**

Noise monitoring report  
2023-07-01 to 2023-07-31

AC20

v1 | 15 August 2023

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 271985

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**ARUP**

# Document Verification

# ARUP

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# Contents

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	Page
<b>1 Introduction</b>	<b>1</b>
<b>2 Noise logger locations</b>	<b>2</b>
2.1 Noise Logger relocation	3
<b>3 Noise Management Levels</b>	<b>4</b>
3.1 Management Level updates	4
<b>4 Noise monitoring results</b>	<b>5</b>
4.1 Outages	5
4.2 Exceedances	5
4.3 Daily noise monitoring results	6

## Appendices

### Appendix A

Noise Monitoring Daily Results

# 1 Introduction

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Arup has been commissioned by PricewaterhouseCoopers (PwC) on behalf of Health Infrastructure NSW to install noise monitors within the Central Acute Services Building (CASB), Children's Hospital Westmead (CHW) and Kids Research (KR) and Ronald McDonald House (RMH) buildings to monitor construction noise from the Paediatric Service Building (PSB) and Multi Storey Car Park (MSCP) development sites in the Westmead Precinct.

The noise loggers have been setup to send email and SMS notifications to stakeholders when construction Noise Management Levels (NMLs) are exceeded.

This report details noise measurement results from **1 July 2023 to 31 July 2023** inclusive.

## 2 Noise logger locations

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Acoustic Research Labs Ngarra noise loggers have been installed in the locations shown in Figure 1 and Figure 2 below.

The noise loggers were calibrated by Acoustic Research Labs (NATA-accredited calibration) in November 2021.

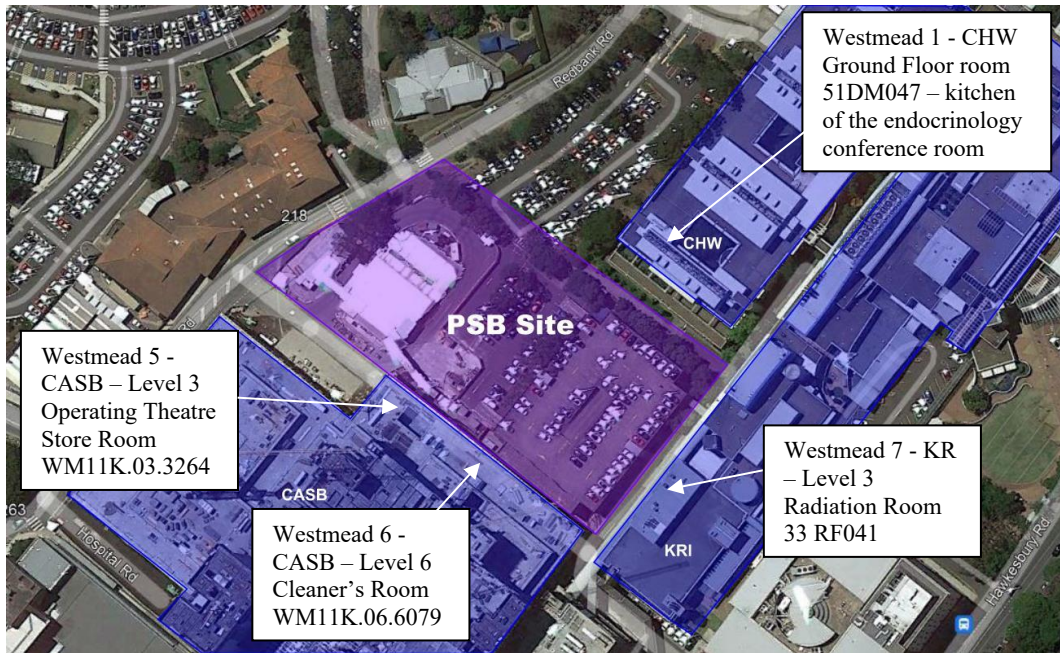


Figure 1: PSB noise monitoring locations.



Figure 2: MSCP noise monitoring locations.

## 2.1 Noise Logger relocation

- No logger relocation to report within this period.

### 3 Noise Management Levels

The current construction Noise Management Levels for each internal monitoring location are set out in Table 1.

Measurement data taken from ‘standard’ construction work hours for the project only are assessed against the Noise Management Level criteria, being:

- 7am-6pm Mon-Fri
- 8am-1pm Sat
- No work on Sundays and Public Holidays.

As part of the previous installation works a baseline noise study was conducted to determine appropriate noise management level. Refer to Arup’s *Baseline noise measurements* report<sup>1</sup> for details regarding how these Management Levels were nominated.

Table 1: Baseline noise measurement results.

Logger ID	Location	Noise Management Level (upper limit), dB L <sub>Aeq,15min</sub>
Westmead 1	CHW Ground Floor room 51DM047 – kitchen of the endocrinology conference room (facing PSB site)	60
Westmead 5	CASB Level 3 Operating Theatre Store Room WM11K.03.3264 (facing PSB site)	50
Westmead 6	CASB Level 6 Cleaner’s Room WM11K.06.6079 (facing PSB site)	52
Westmead 7	KR Level 3 Radiation Room 33 RF041 (facing PSB site)	58
Westmead 2	CHW Level 2 Parent Kitchen 92BW025 (facing MSCP site)	64
Westmead 3	RMH Level 1 Store Room 101 (facing MSCP site)	47

#### 3.1 Management Level updates

The following provides a progressive record of management level updates:

- None to-date.

<sup>1</sup> Arup report reference 271985-AC02.

## 4 Noise monitoring results

### 4.1 Outages

Noise monitoring outages are shown below. This excludes outages related to logger data collection and calibration.

Table 2: Noise logger outages during monitoring period.

Logger Id	Noise logger location	Outages
Westmead 1	CHW Ground Floor room 51DM047 – kitchen of the endocrinology conference room (facing PSB site)	17/07/2023 - 2/08/2023
Westmead 5	CASB Level 3 Operating Theatre Store Room WM11K.03.3264 (facing PSB site)	22/07/2023 (11:30 -17:30)
Westmead 6	CASB Level 6 Cleaner’s Room WM11K.06.6079 (facing PSB site)	-
Westmead 7	KR Level 3 Radiation Room 33 RF041(facing PSB site)	10/07/2023 (05:00 -17:30)
Westmead 2	CHW Level 2 Parent Kitchen 92BW025 (facing MSCP site)	21/07/2023 (13:00 -14:30)
Westmead 3	RMH Level 1 Store Room 101 (facing MSCP site)	-

### 4.2 Exceedances

The number of Management Level exceedances recorded at each noise monitoring location during the assessment period are shown below.

Table 3: Recorded Management Level exceedances.

Logger Id	Noise logger location	Noise Management Level exceedance instances
Westmead 1	CHW Ground Floor room 51DM047 – kitchen of the endocrinology conference room (facing PSB site)	29
Westmead 5	CASB Level 3 Operating Theatre Store Room WM11K.03.3264 (facing PSB site)	97
Westmead 6	CASB Level 6 Cleaner’s Room WM11K.06.6079 (facing PSB site)	123
Westmead 7	KR Level 3 Radiation Room 33 RF041(facing PSB site)	1
Westmead 2	CHW Level 2 Parent Kitchen 92BW025 (facing MSCP site)	12
Westmead 3	RMH Level 1 Store Room 101 (facing MSCP site)	19

It is the responsibility of Ford Civils (the Head Contractor) to respond to each Noise Management Level exceedance when it occurs and record the outcome of



the exceedance investigation (cause of NML exceedance, any noise mitigation measures implemented to address the exceedance, etc.).

### **4.3 Daily noise monitoring results**

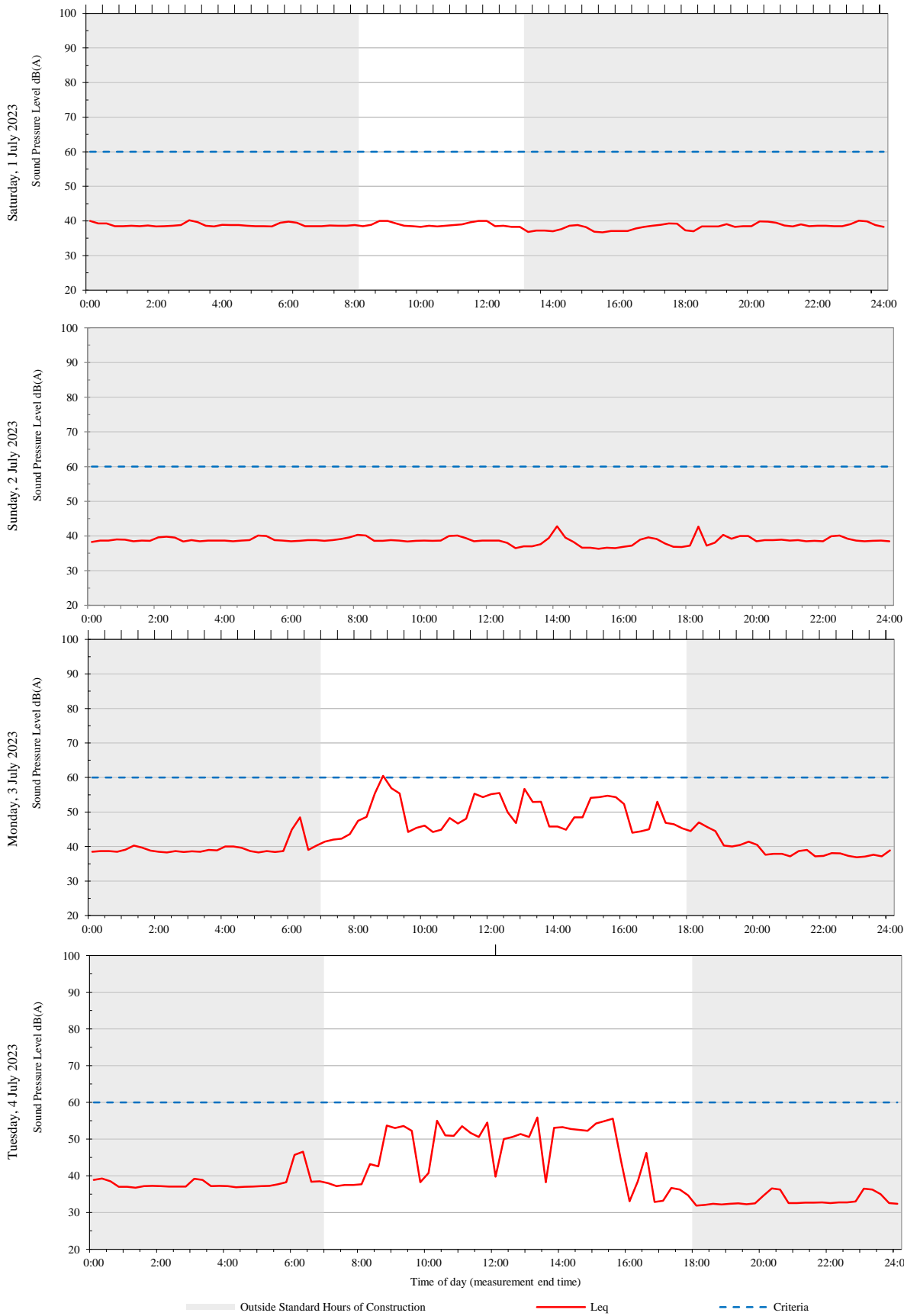
Daily noise monitoring results are showing for each location in Appendix A.

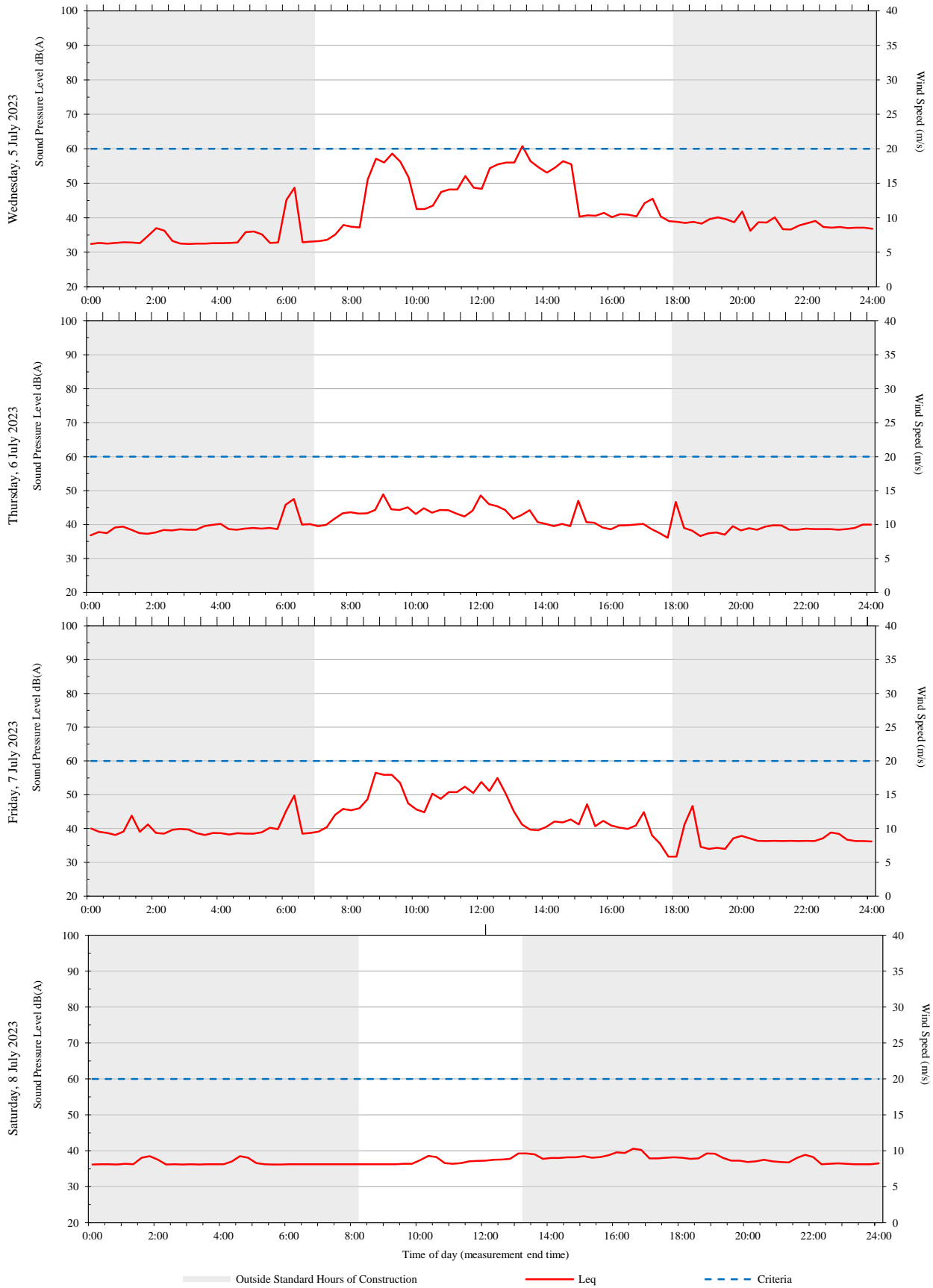
## **Appendix A**

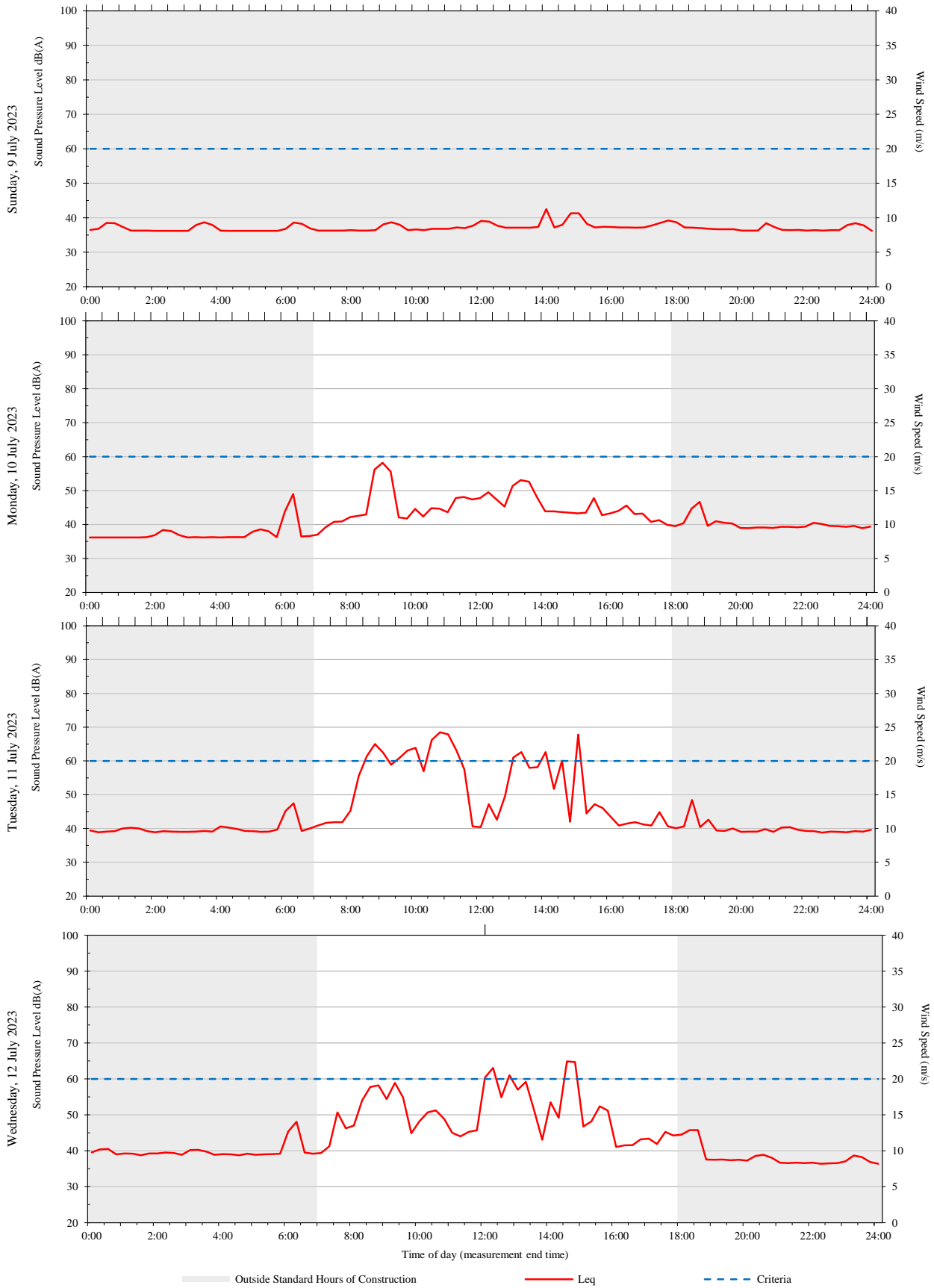
### **Noise Monitoring Daily Results**

# A1 CHW Ground Floor room 51DM047 (Westmead 1)

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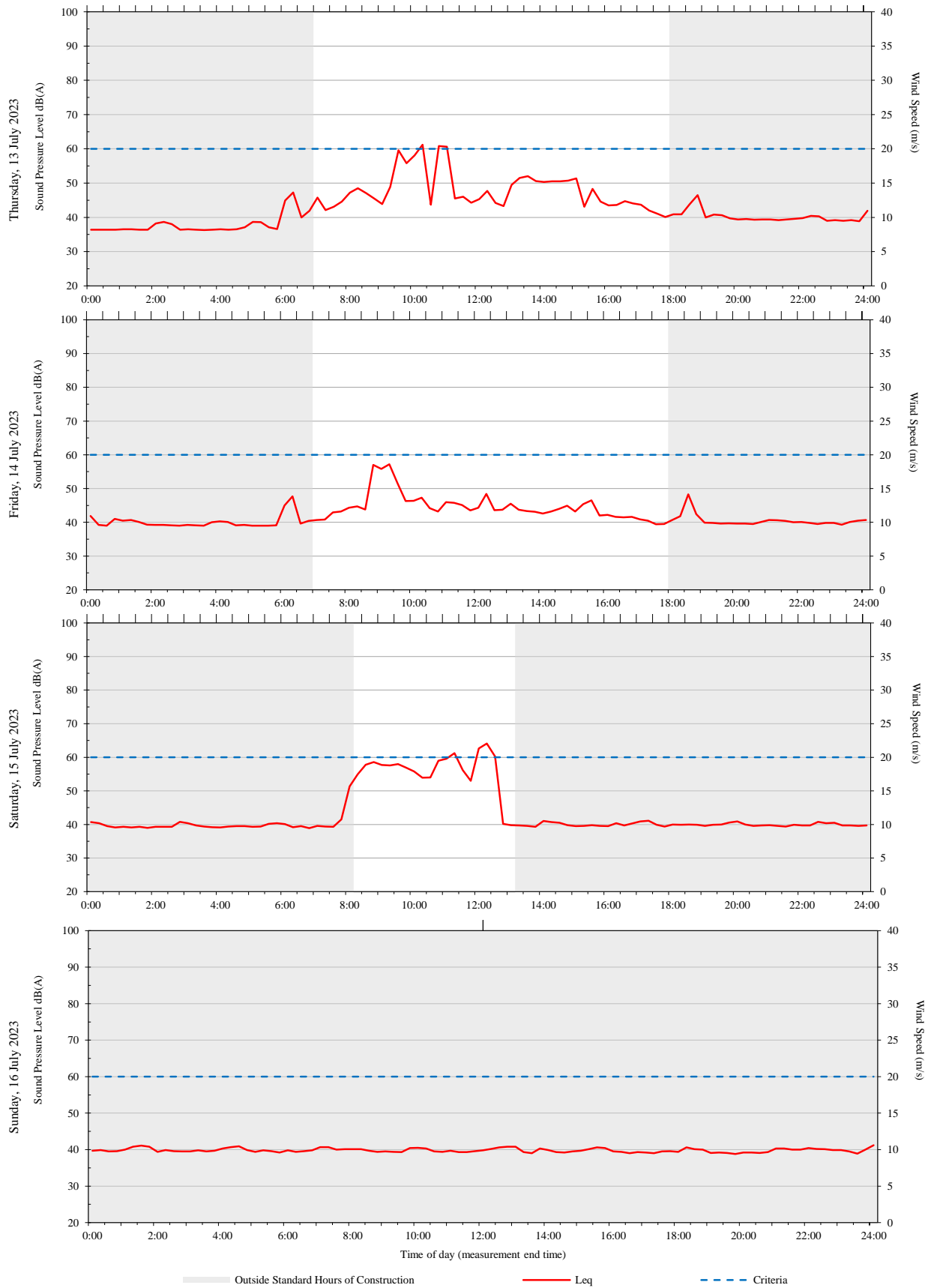






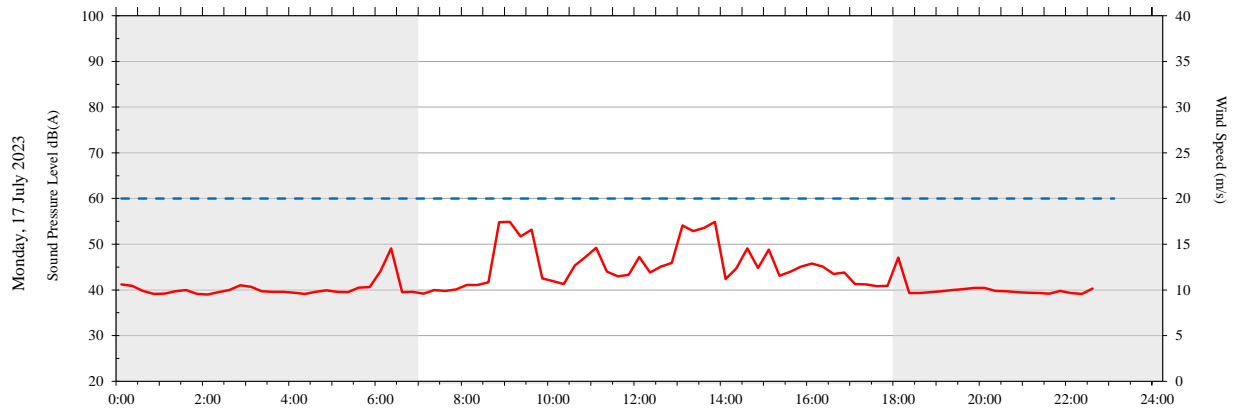
Unattended monitoring: CHW Ground Floor room 51DM047 (Internal)

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Unattended monitoring: CHW Ground Floor room 51DM047 (Internal)

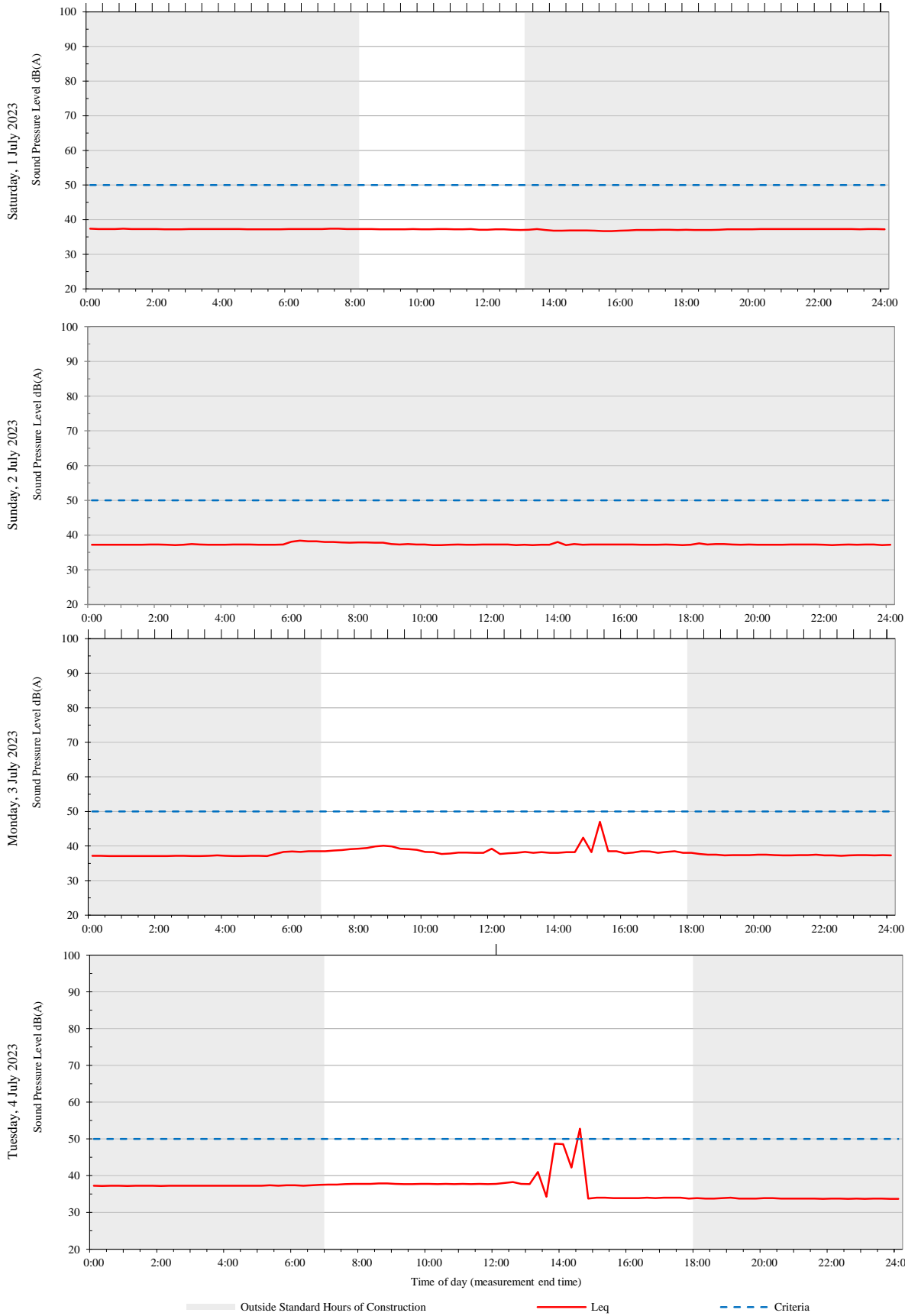
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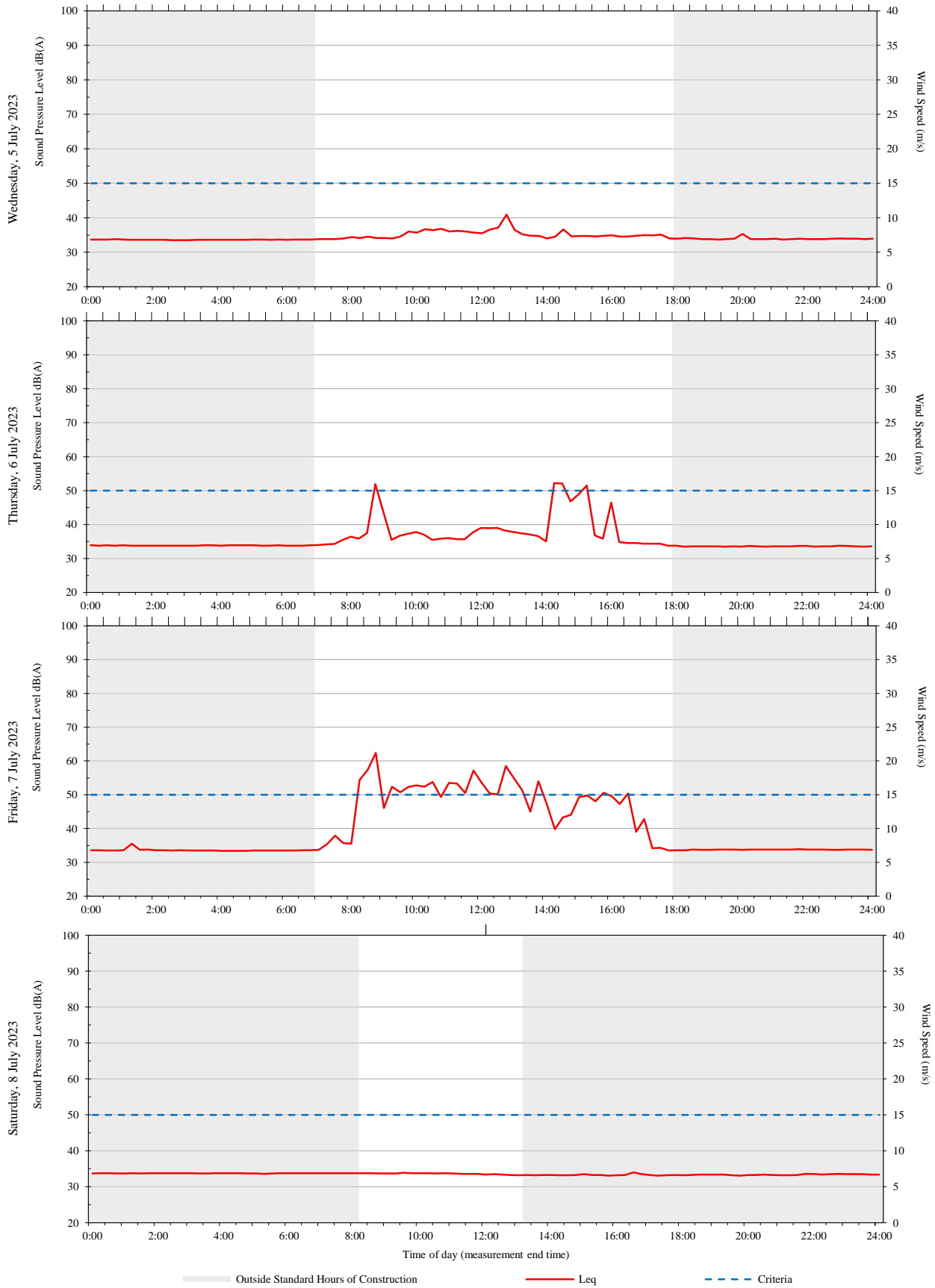


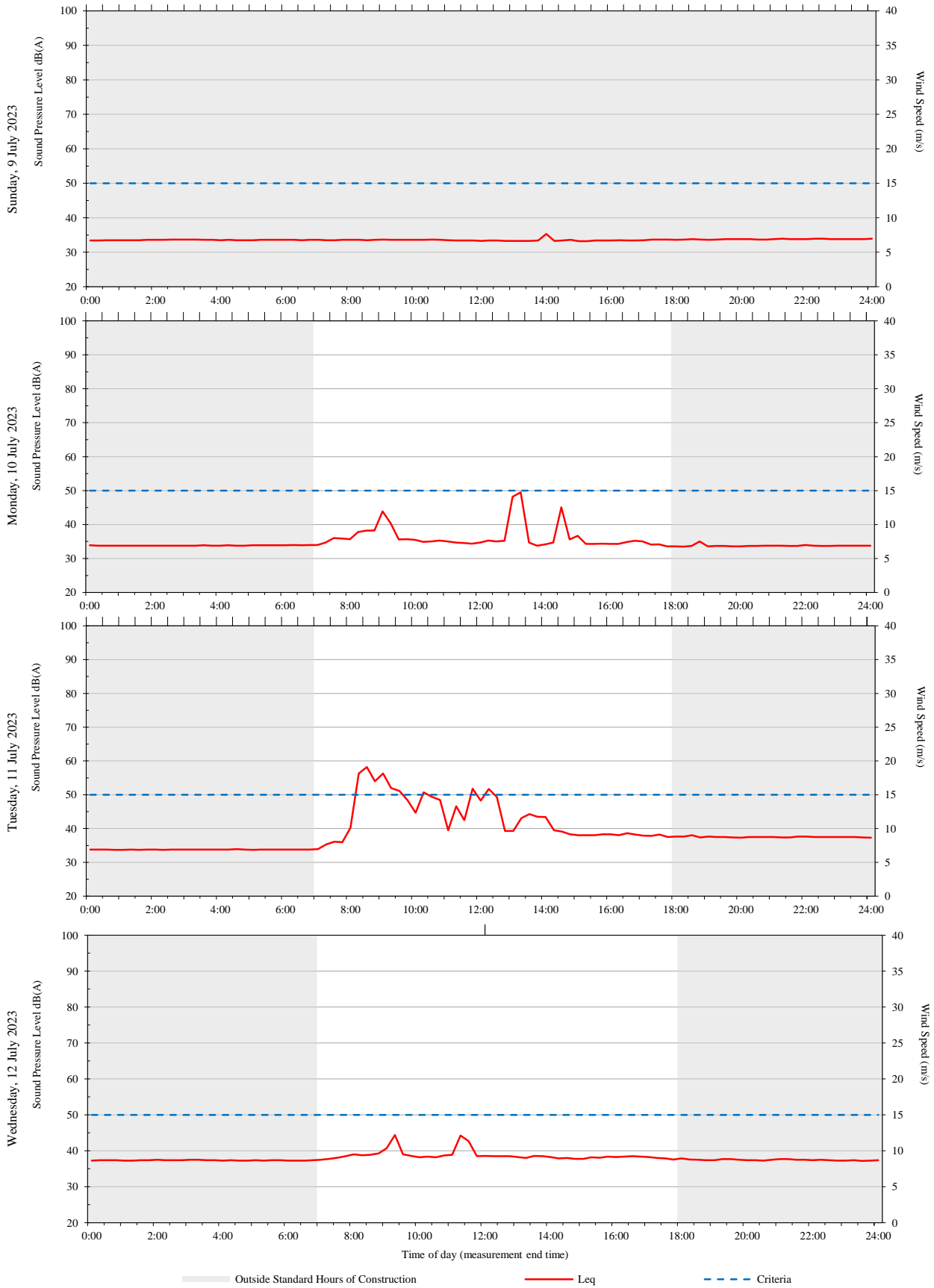


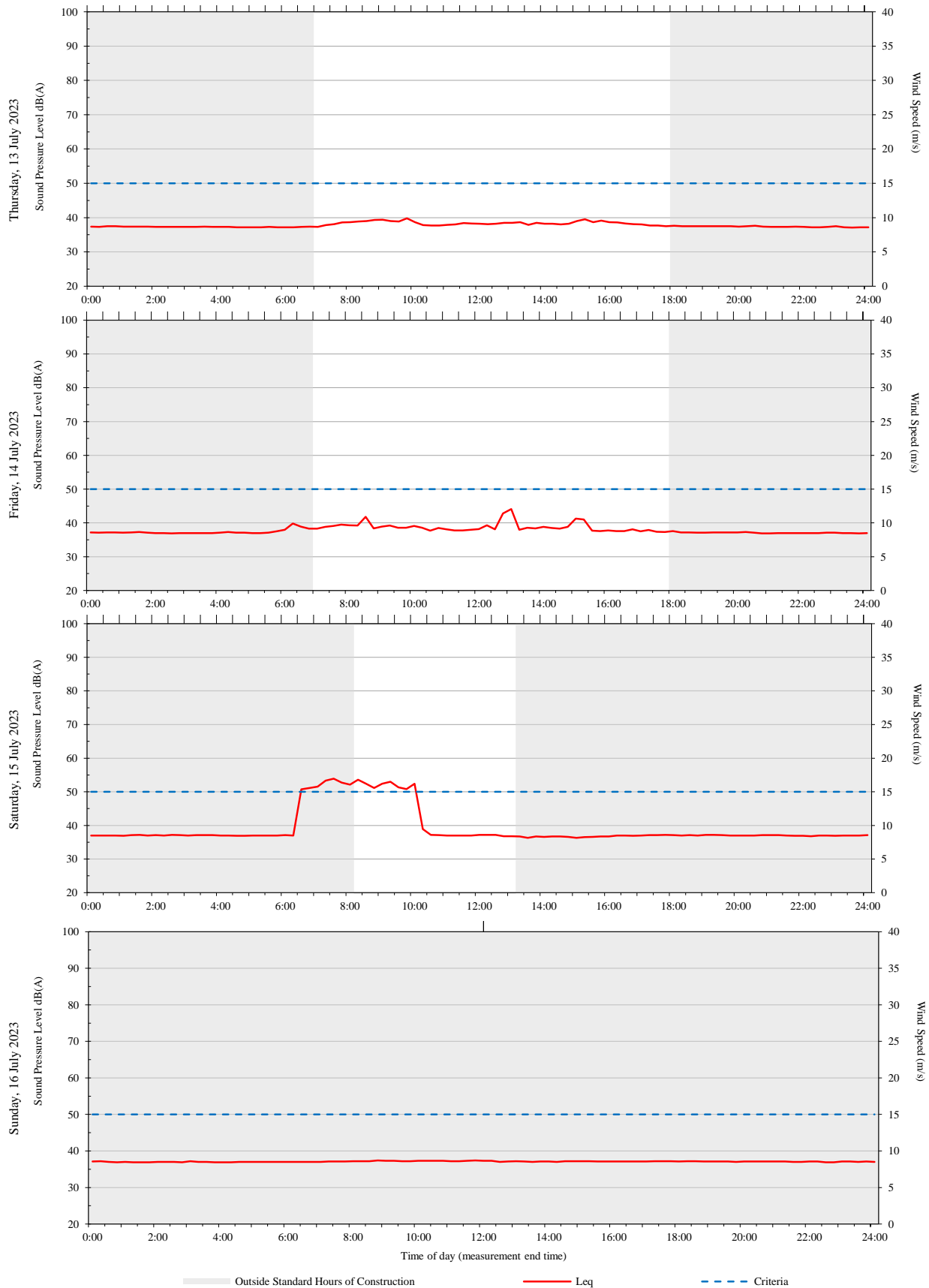
# A2 CASB Level 3 Operating Theatre Store Room WM11K.03.3264 (Westmead 5)

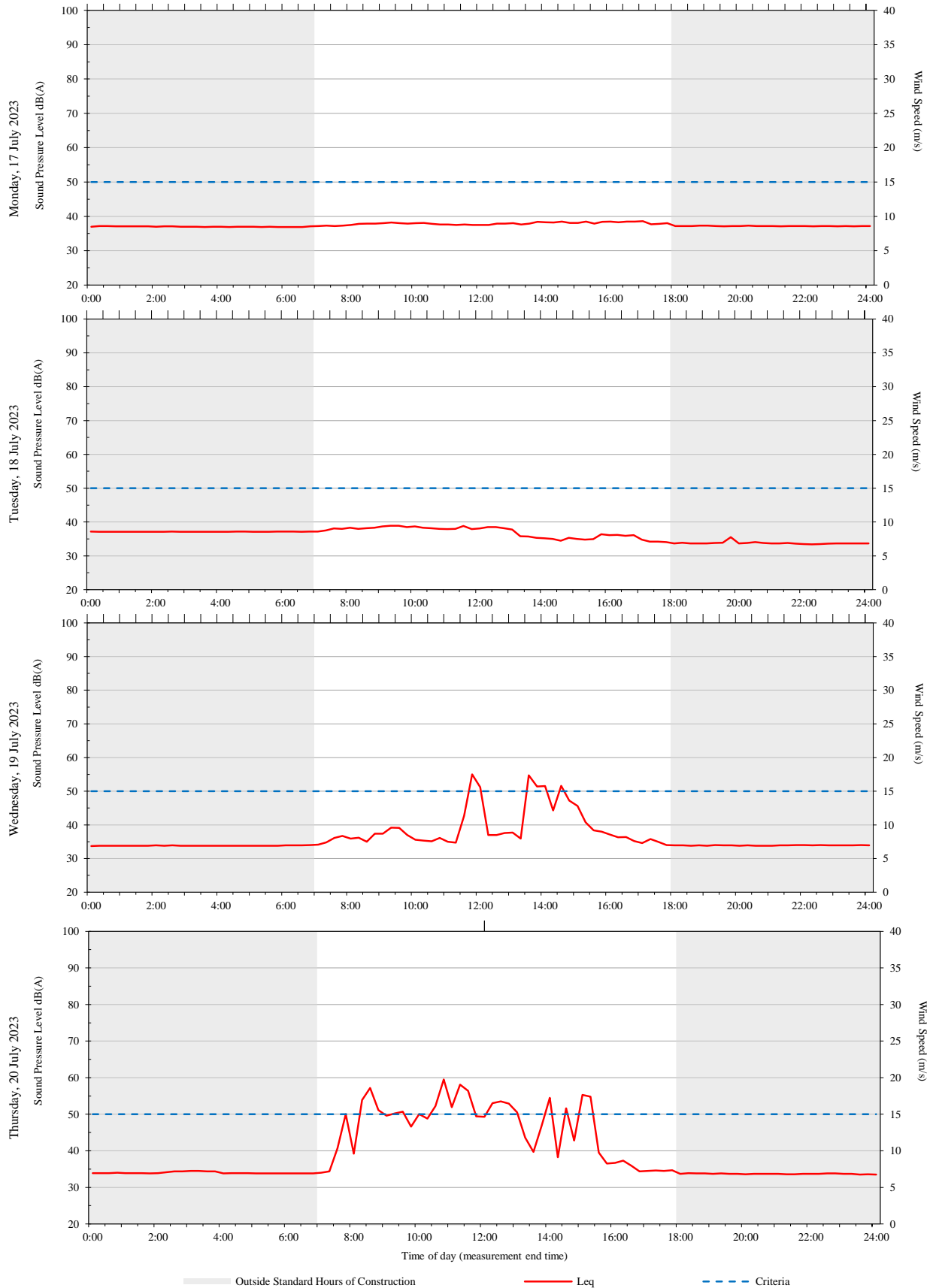
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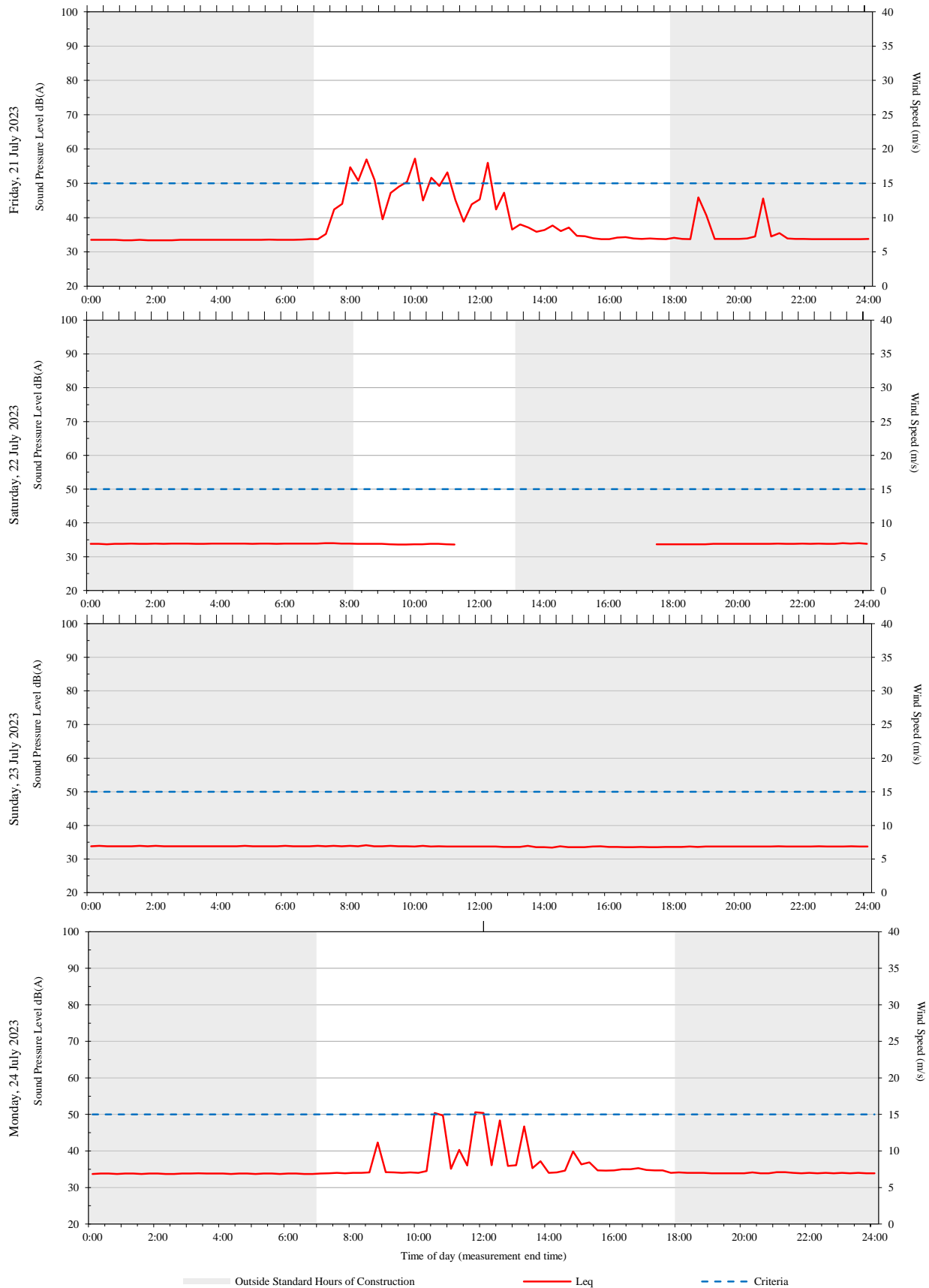


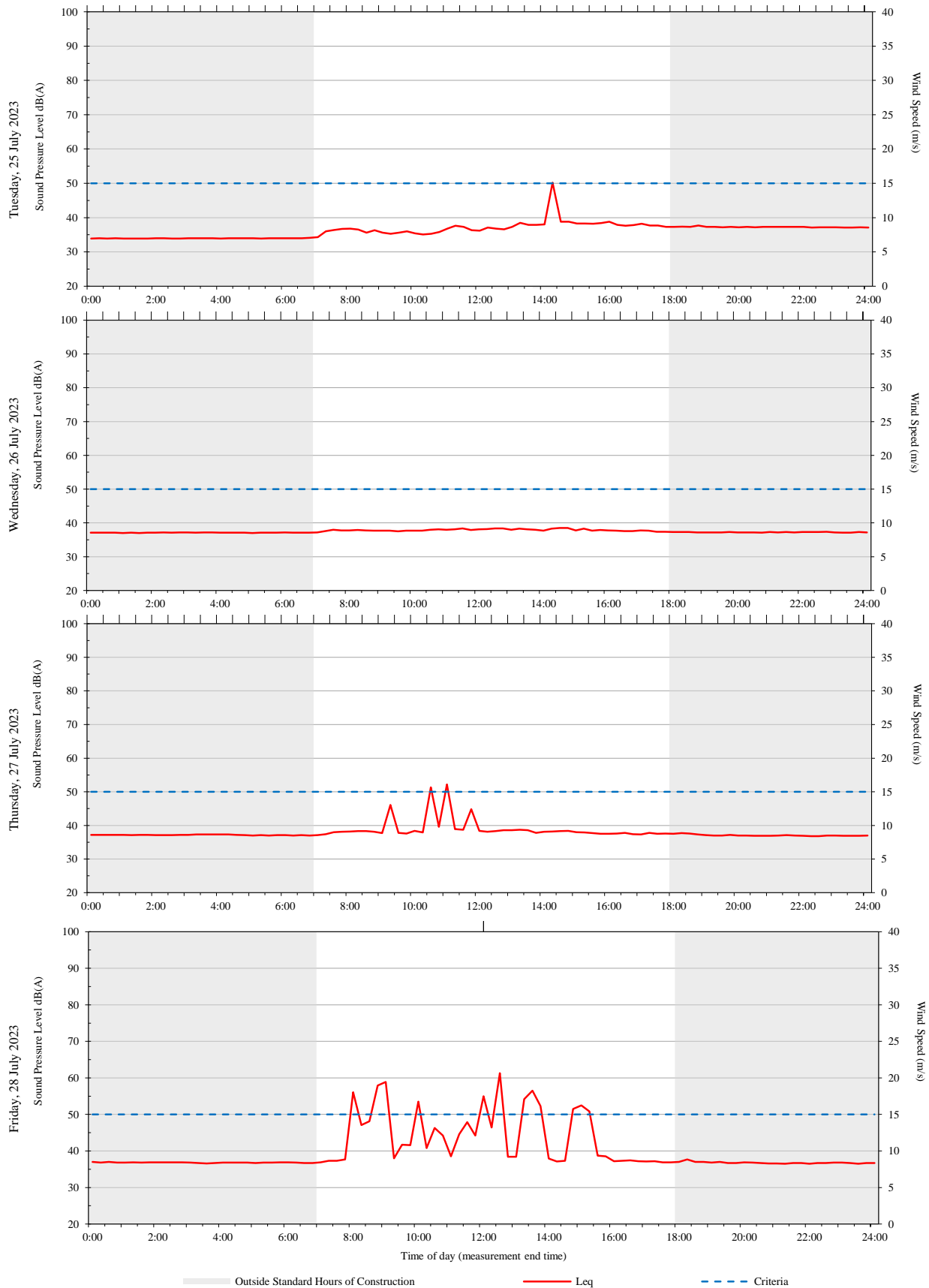




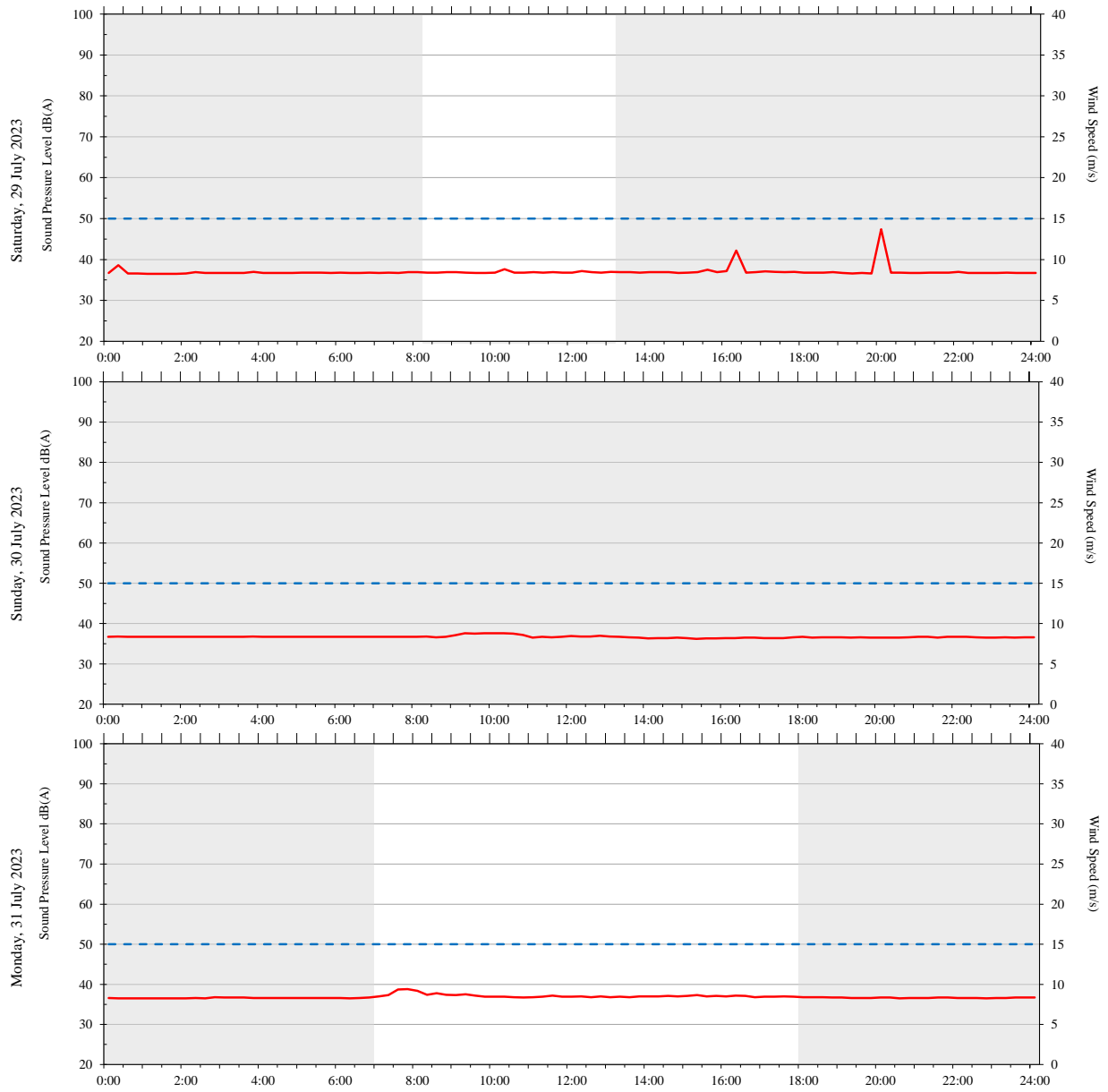






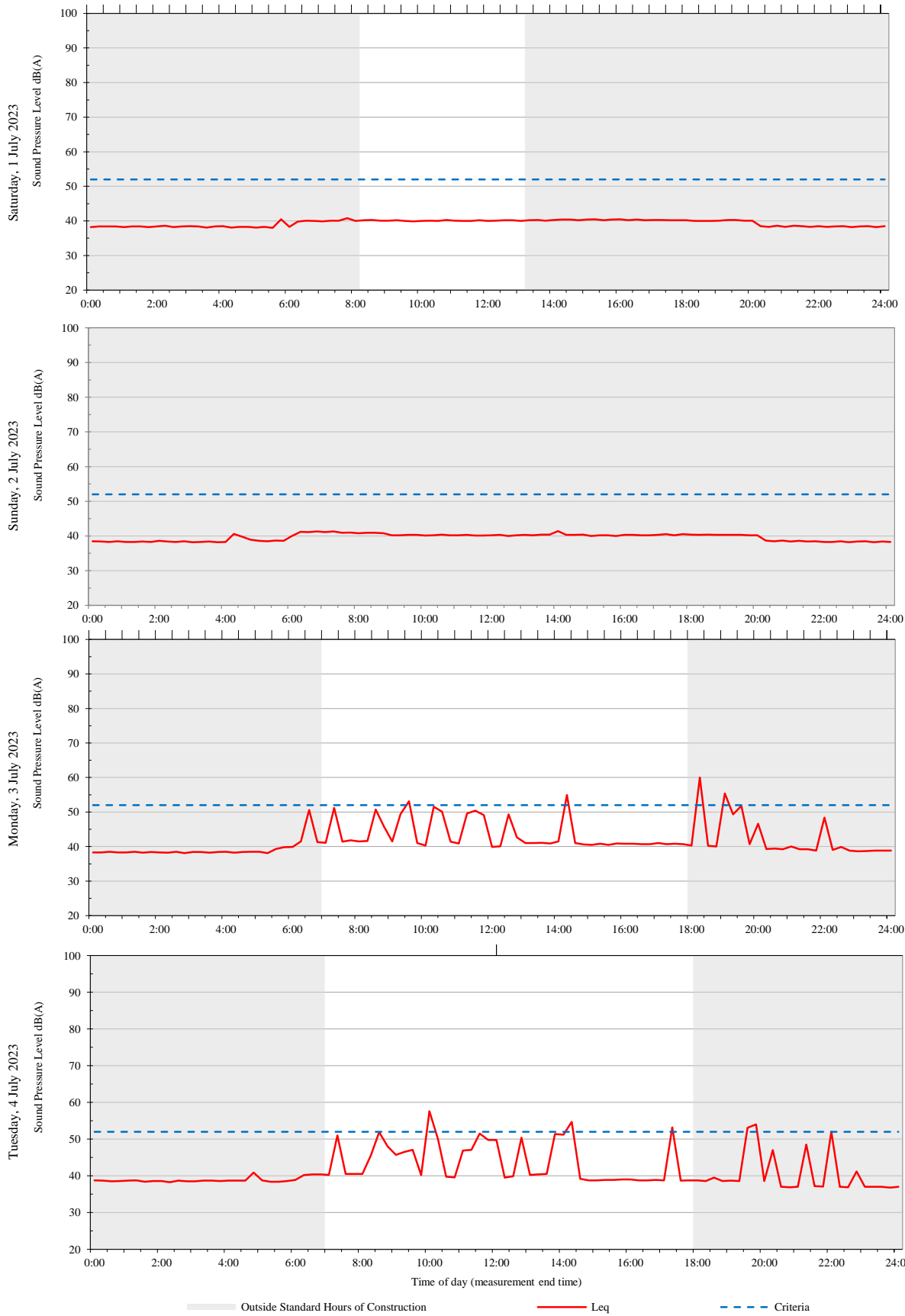


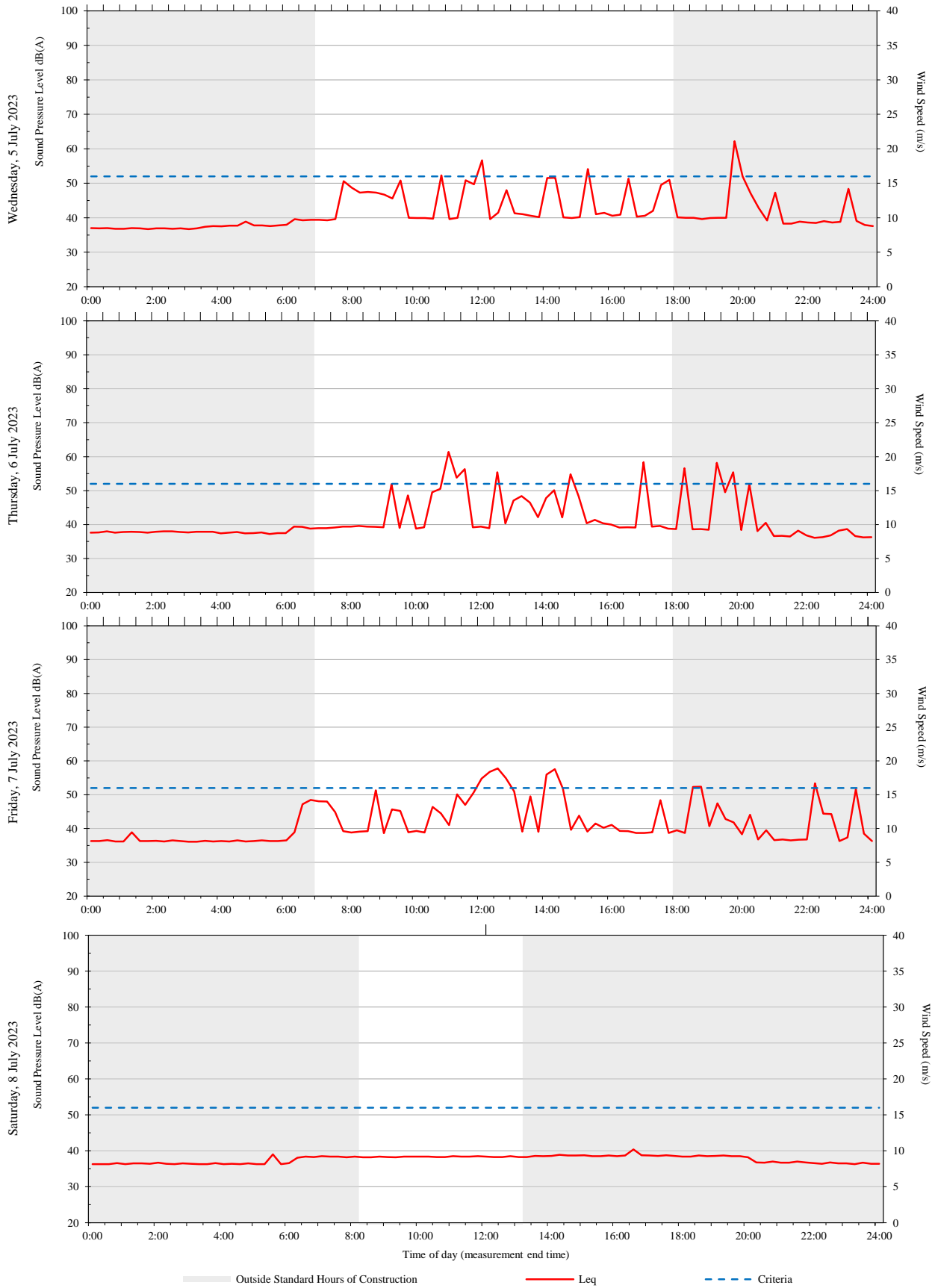


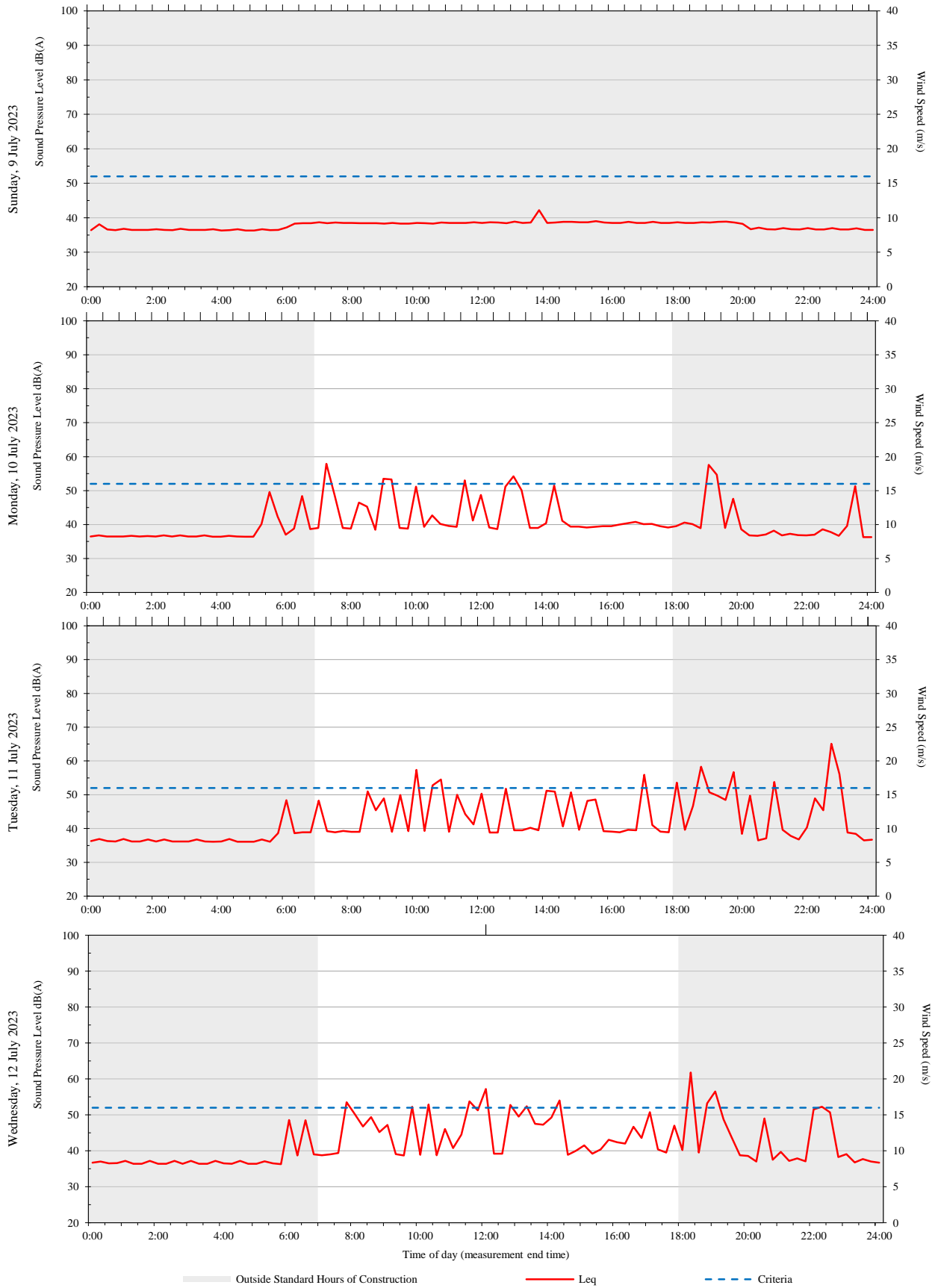


# A3 CASB Level 6 Cleaner's Room WM11K.06.6079 (Westmead 6)

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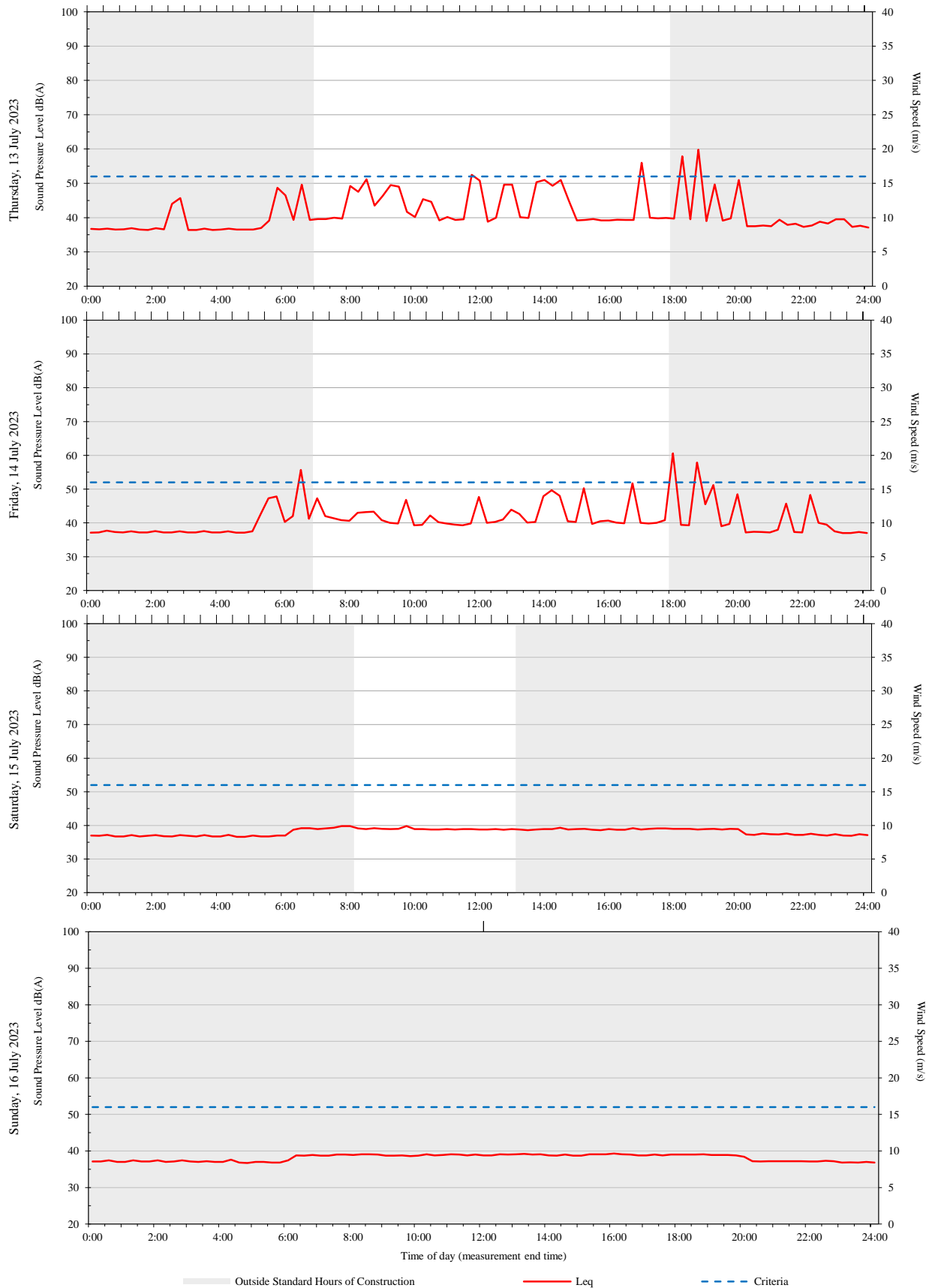






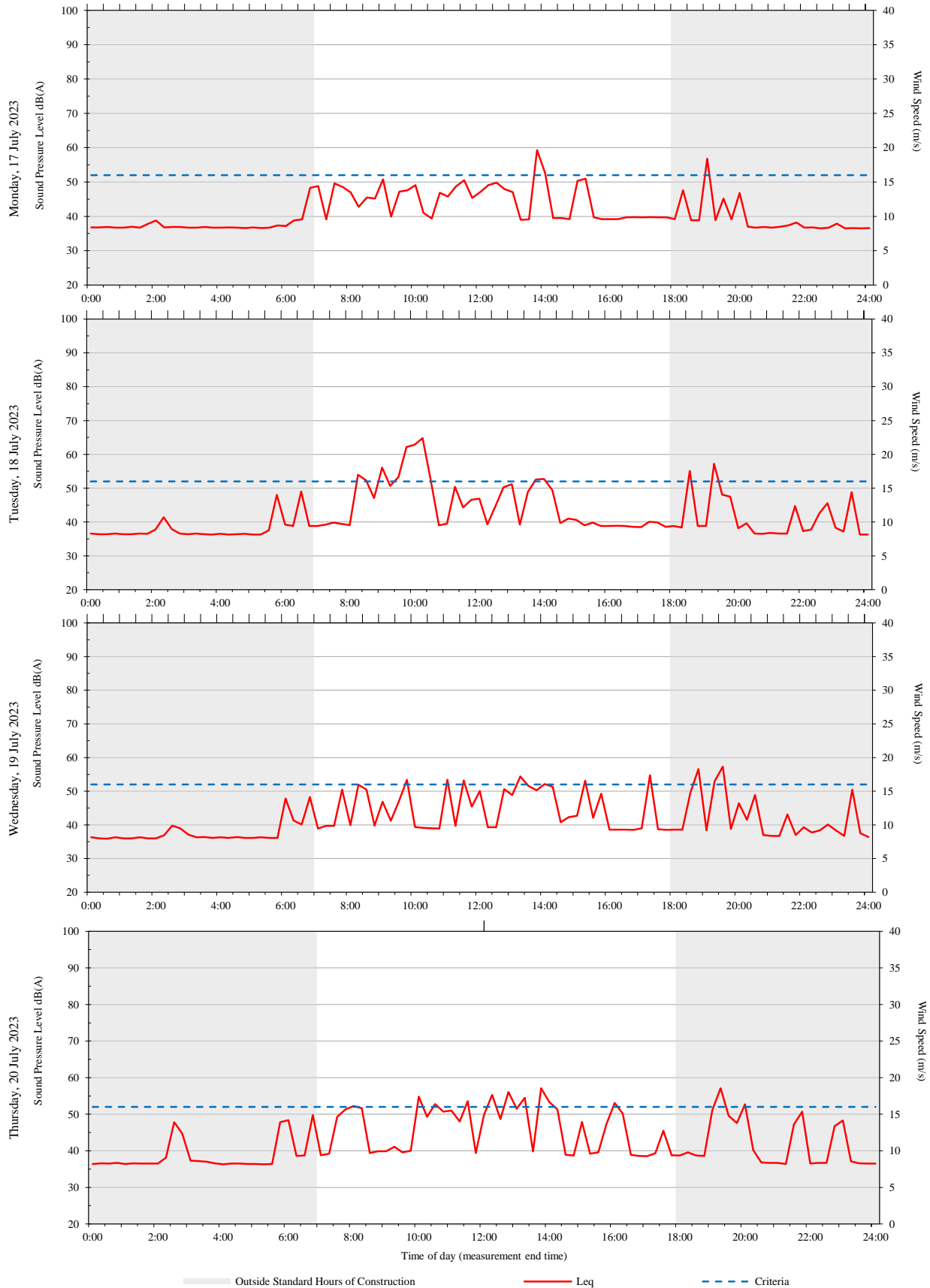
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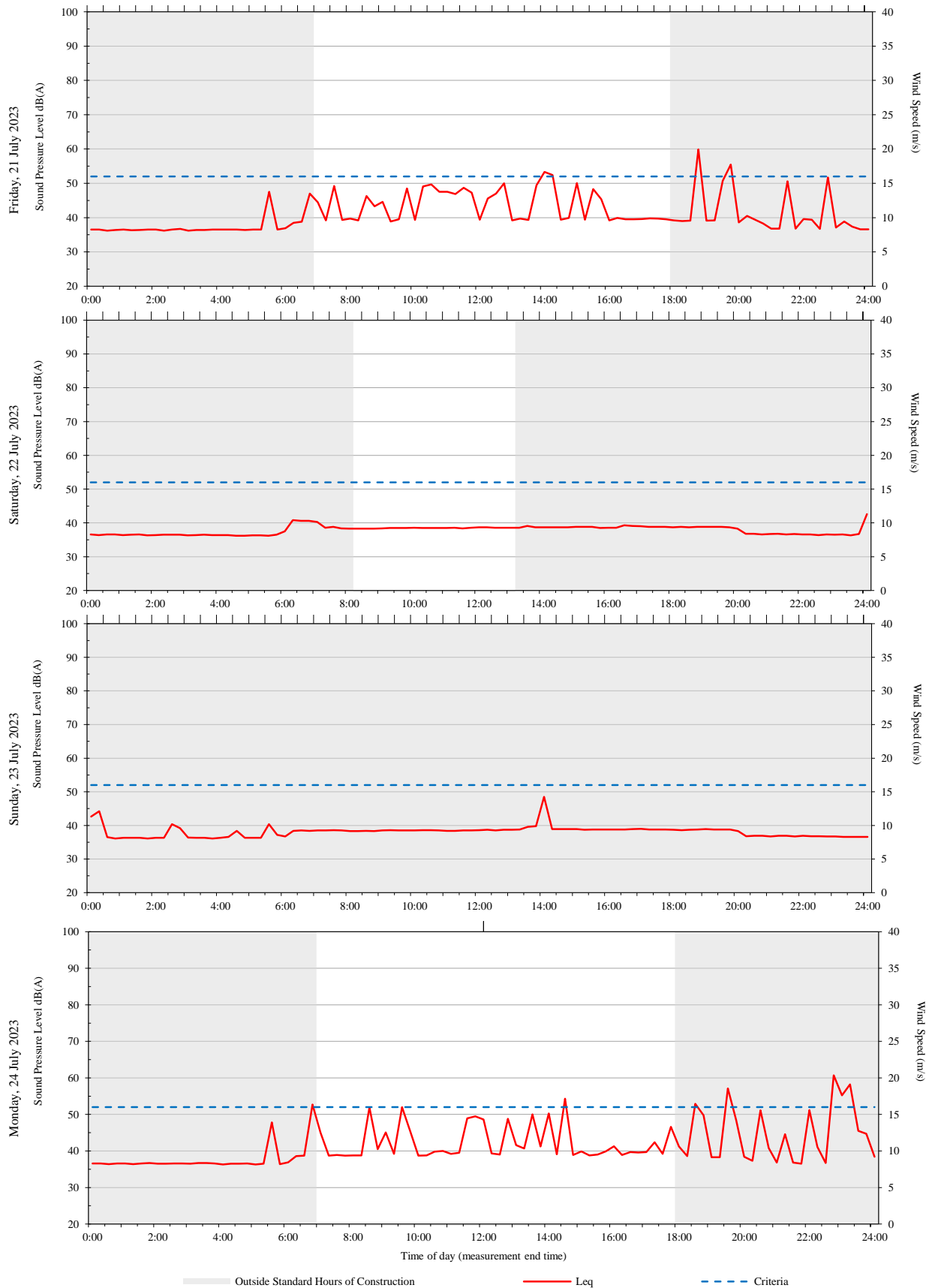
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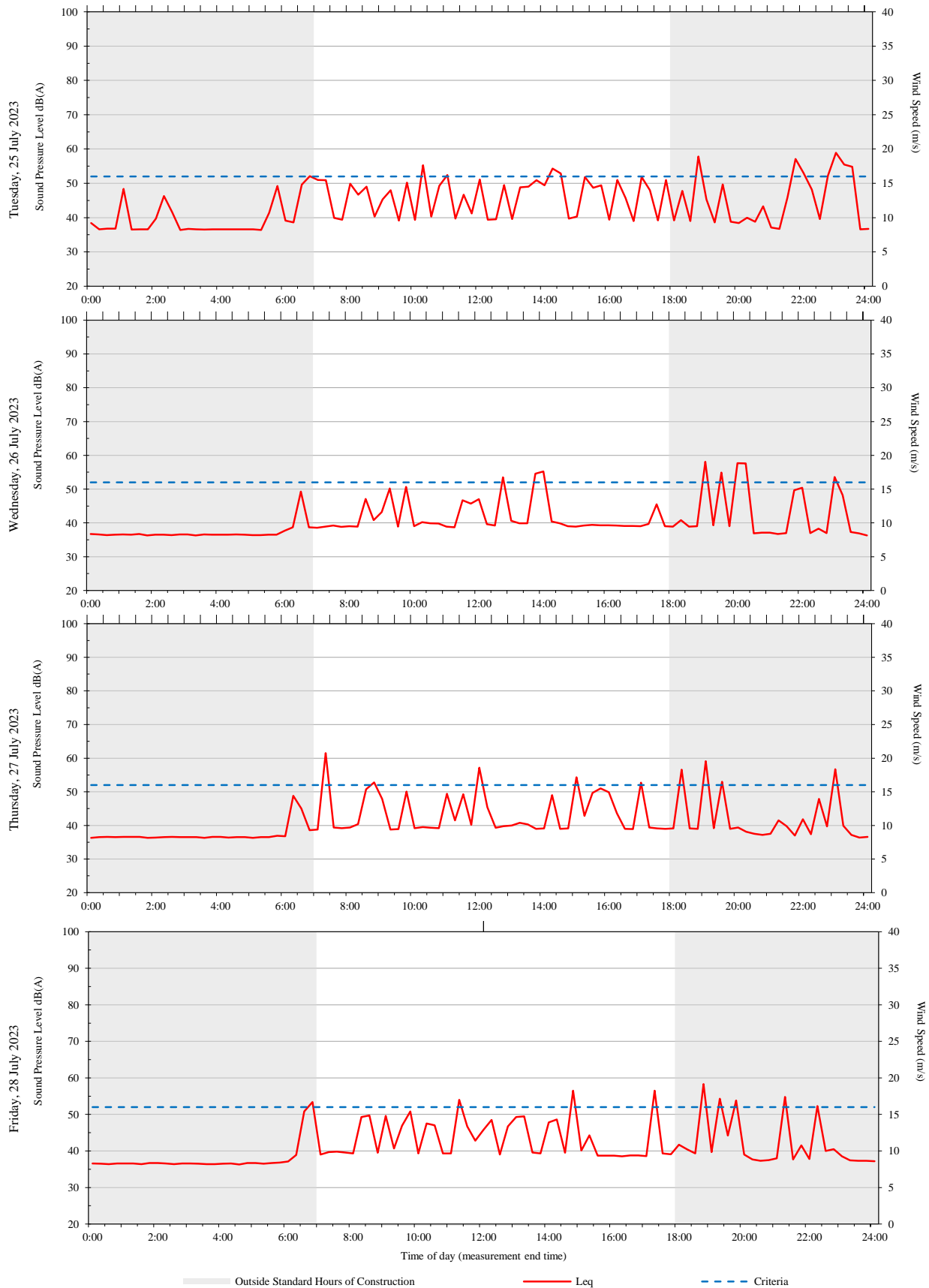


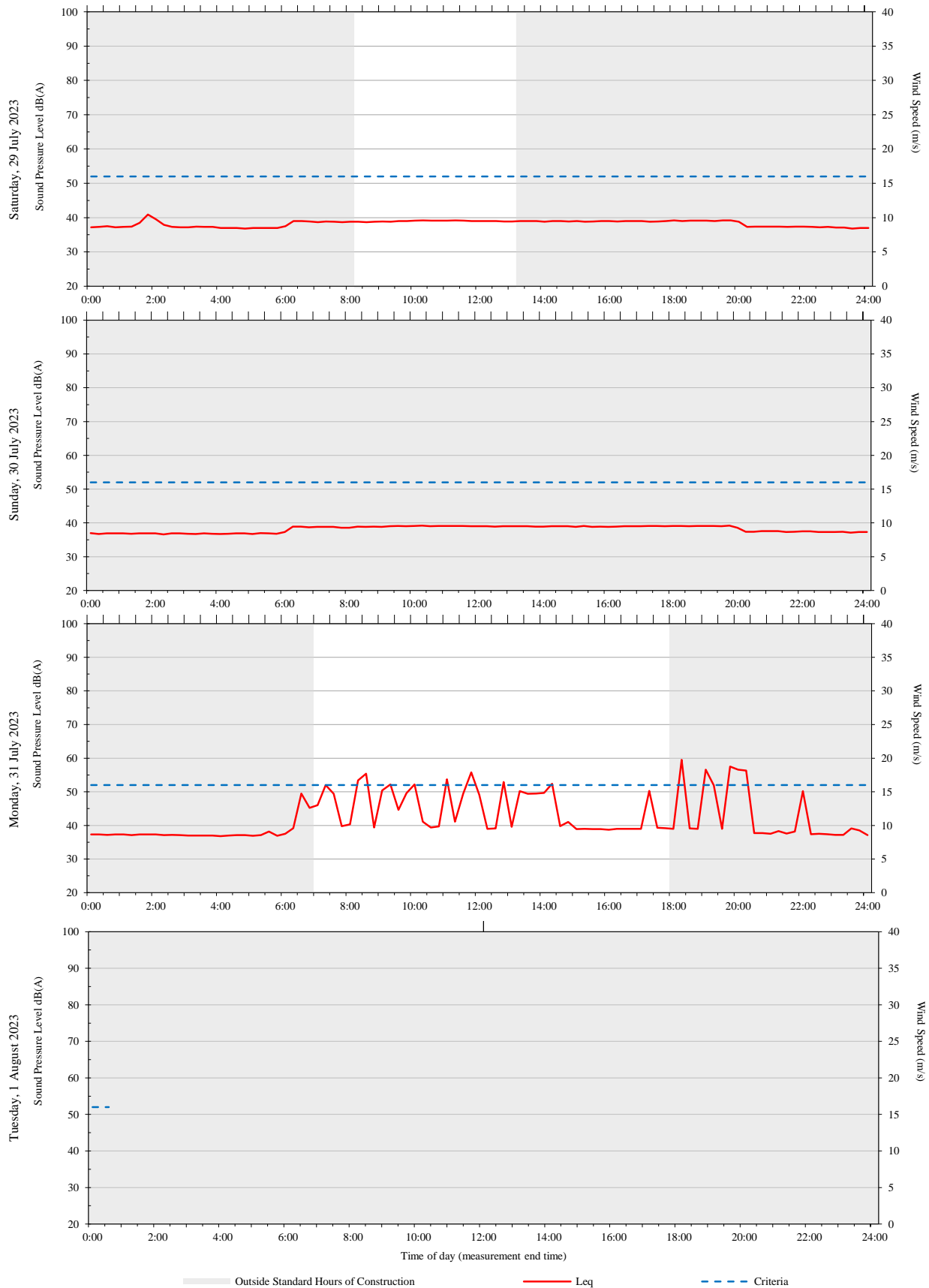
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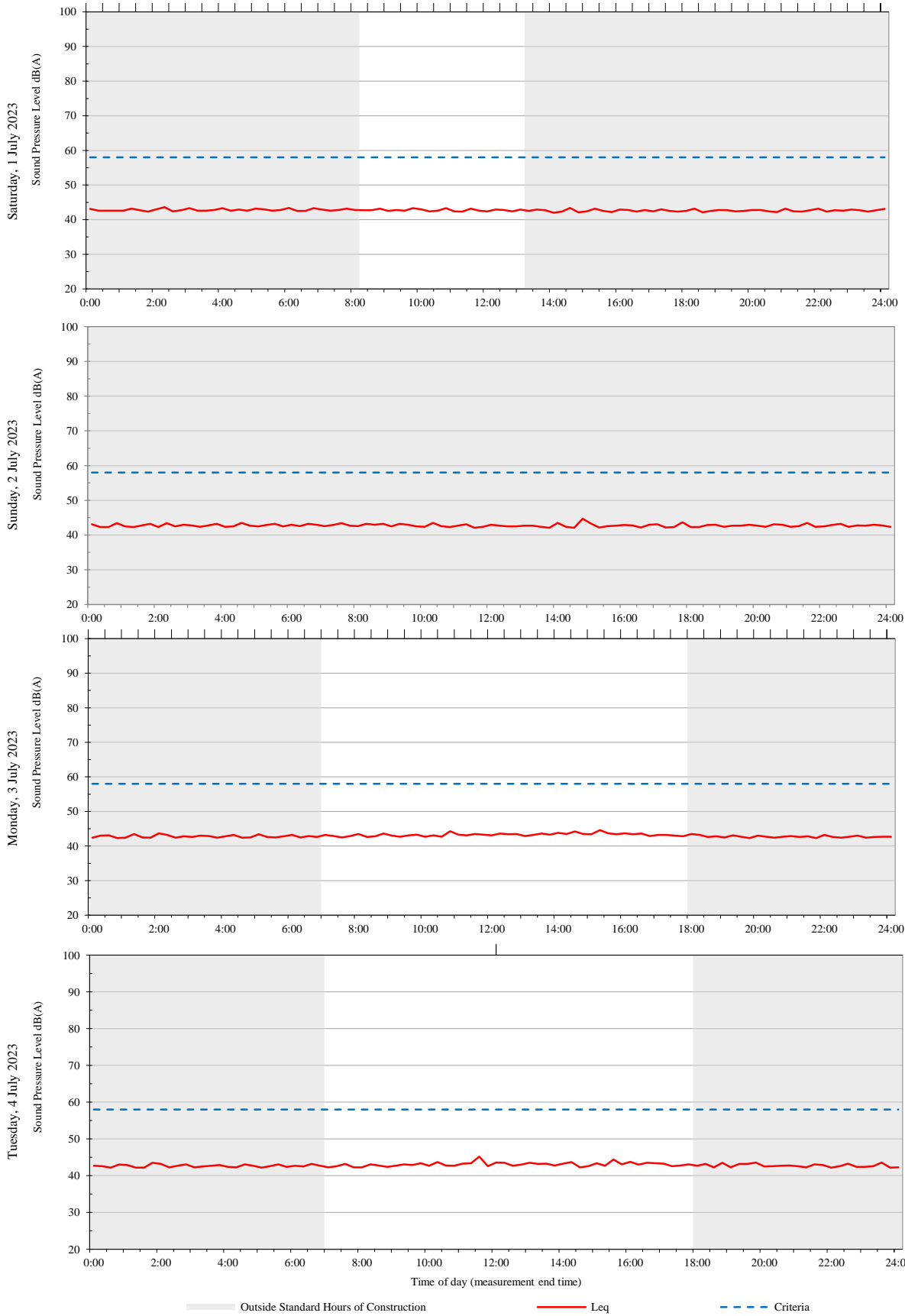




# A4 KR Level 3 Radiation Room 33 RF041 (Westmead 7)

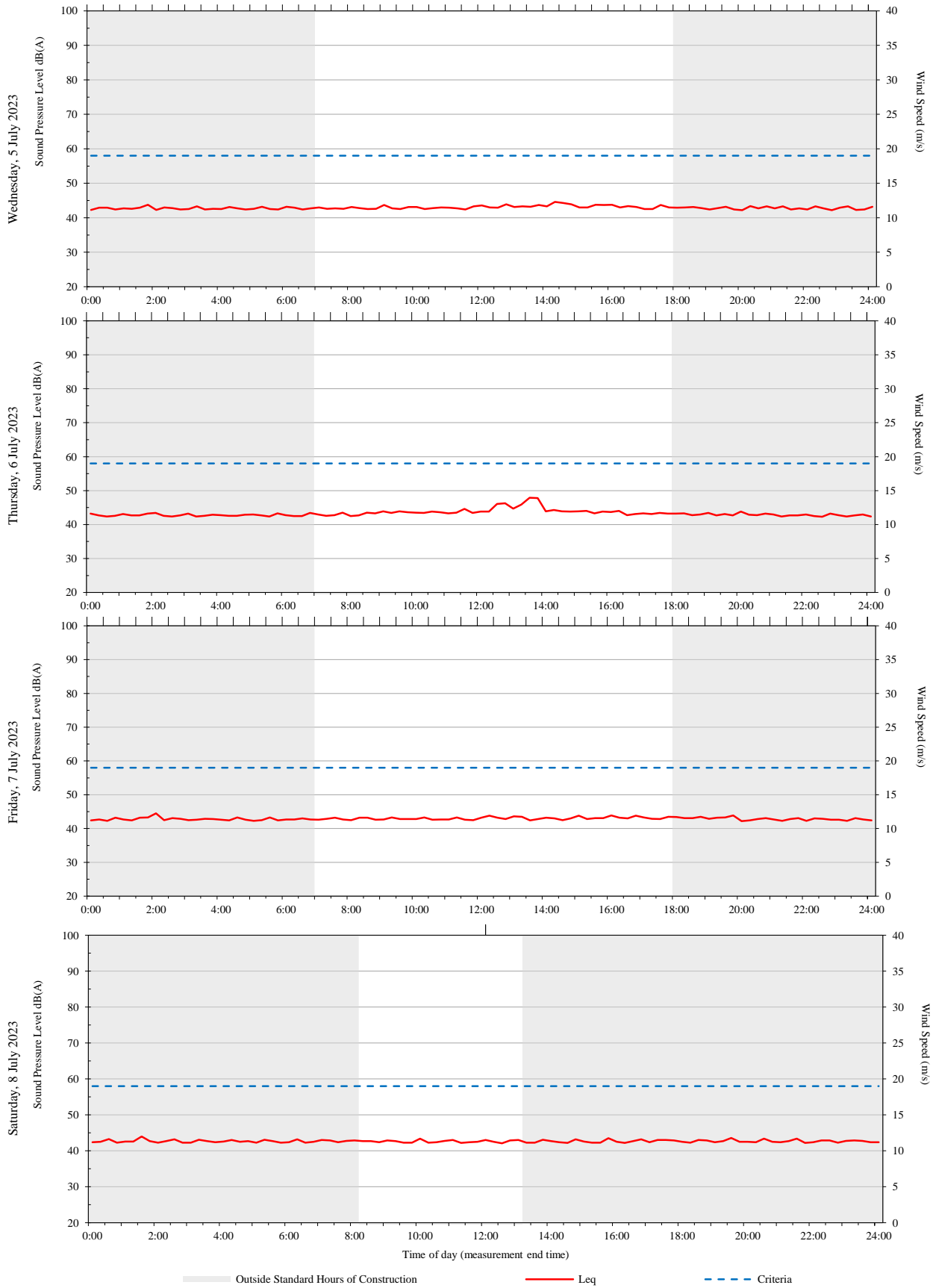
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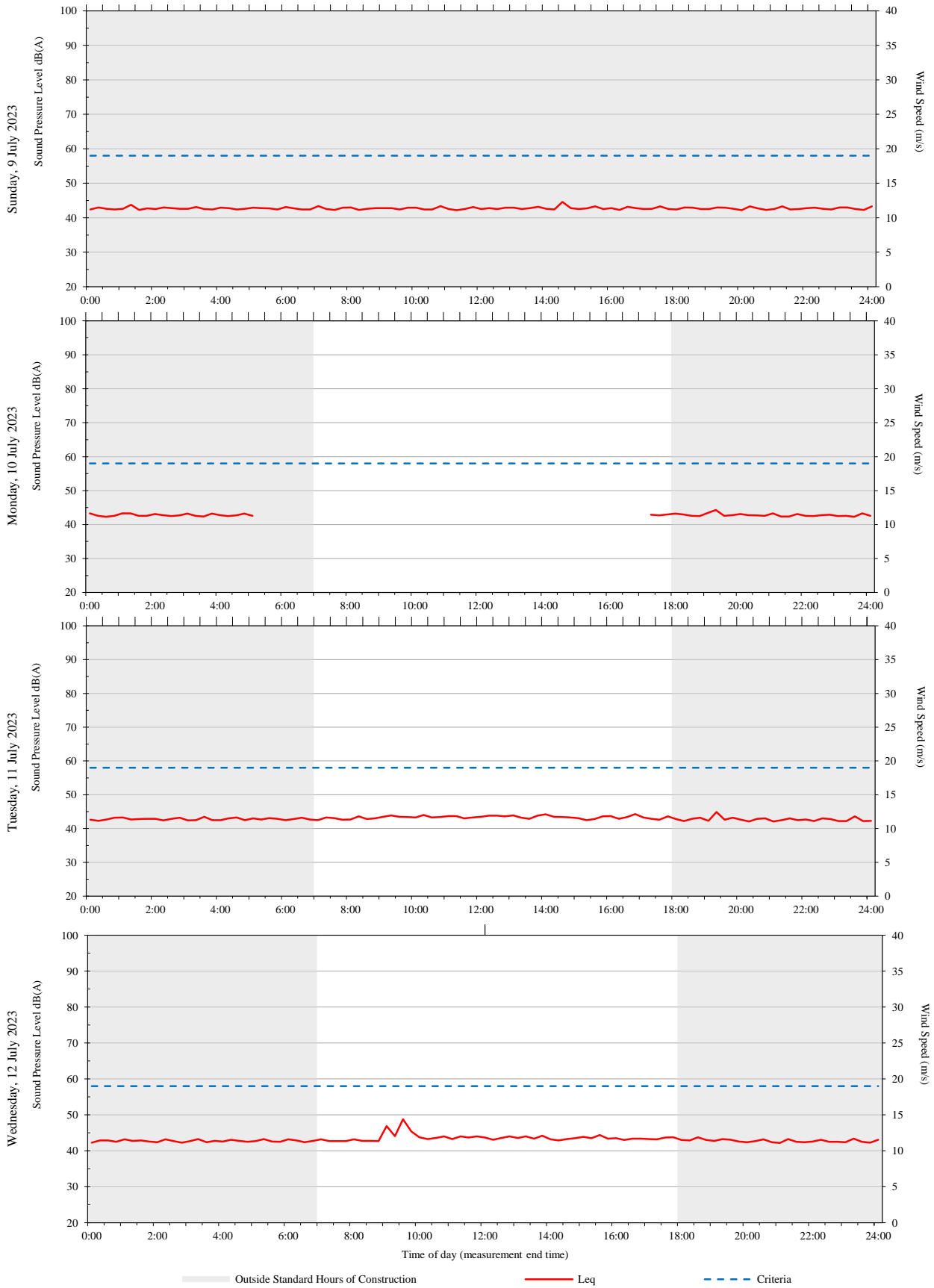
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Unattended monitoring: KR Level 3 Radiation Room 33 RF041 (Internal)

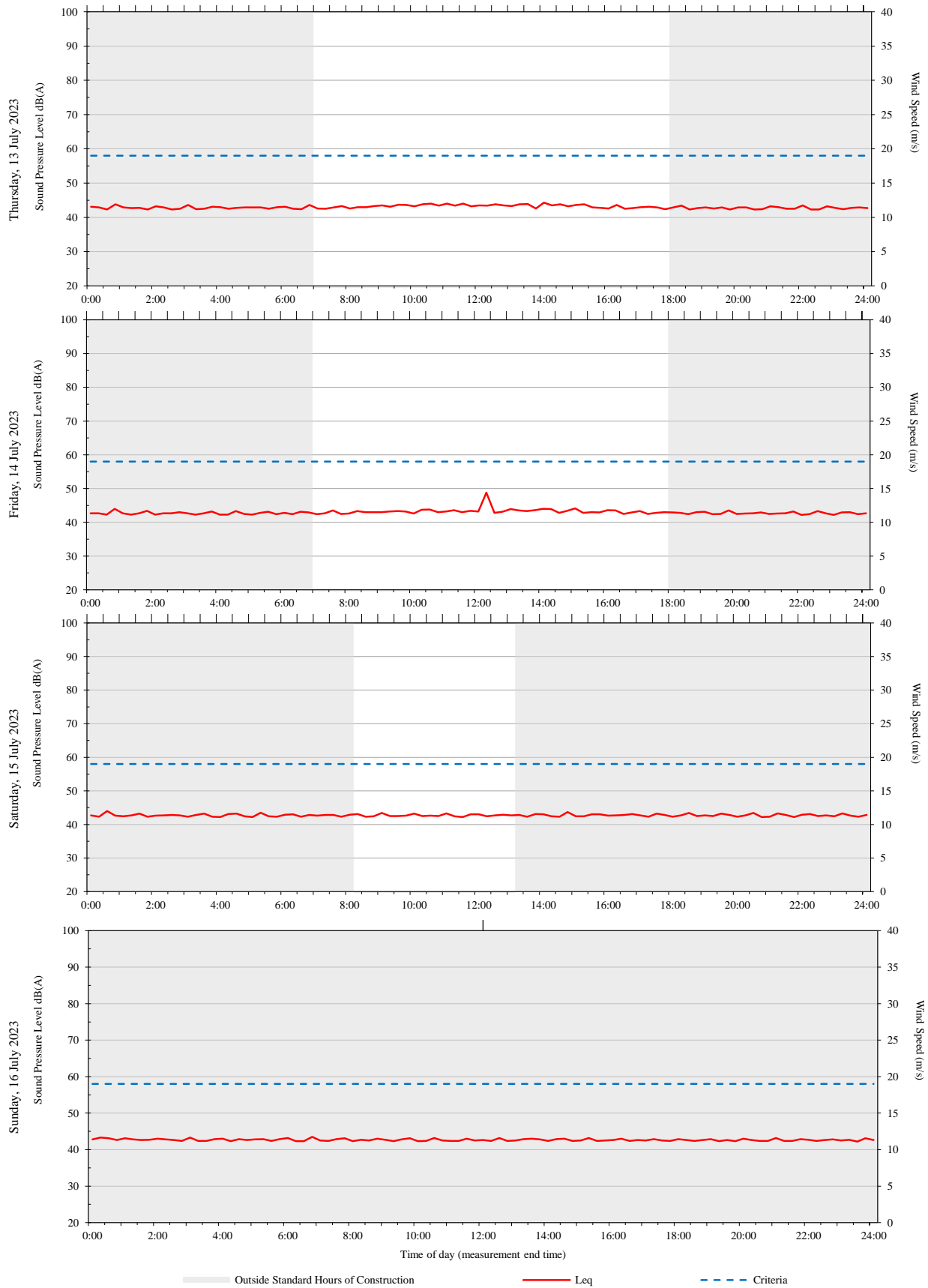
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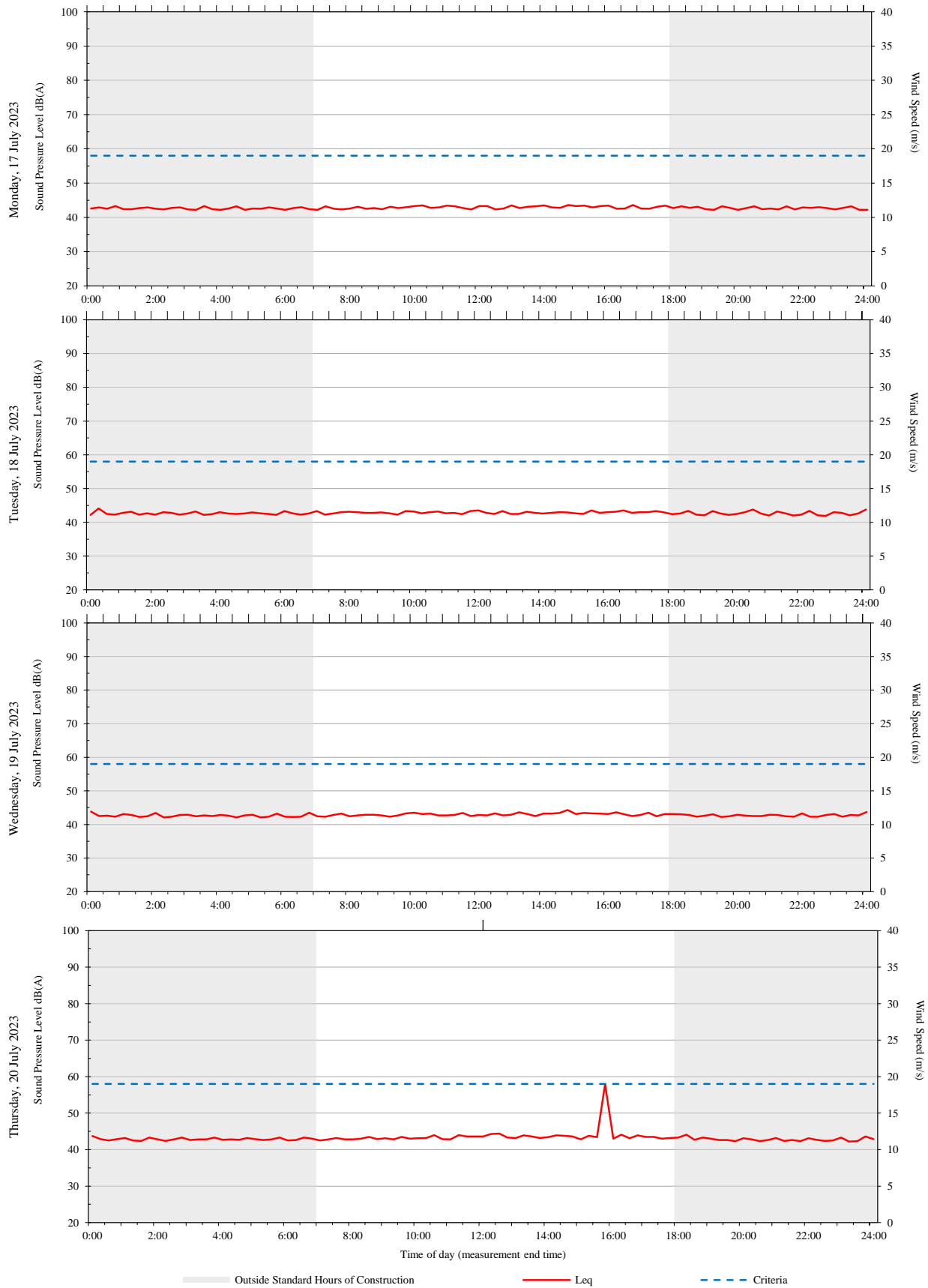
# Unattended monitoring: KR Level 3 Radiation Room 33 RF041 (Internal)

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# Unattended monitoring: KR Level 3 Radiation Room 33 RF041 (Internal)

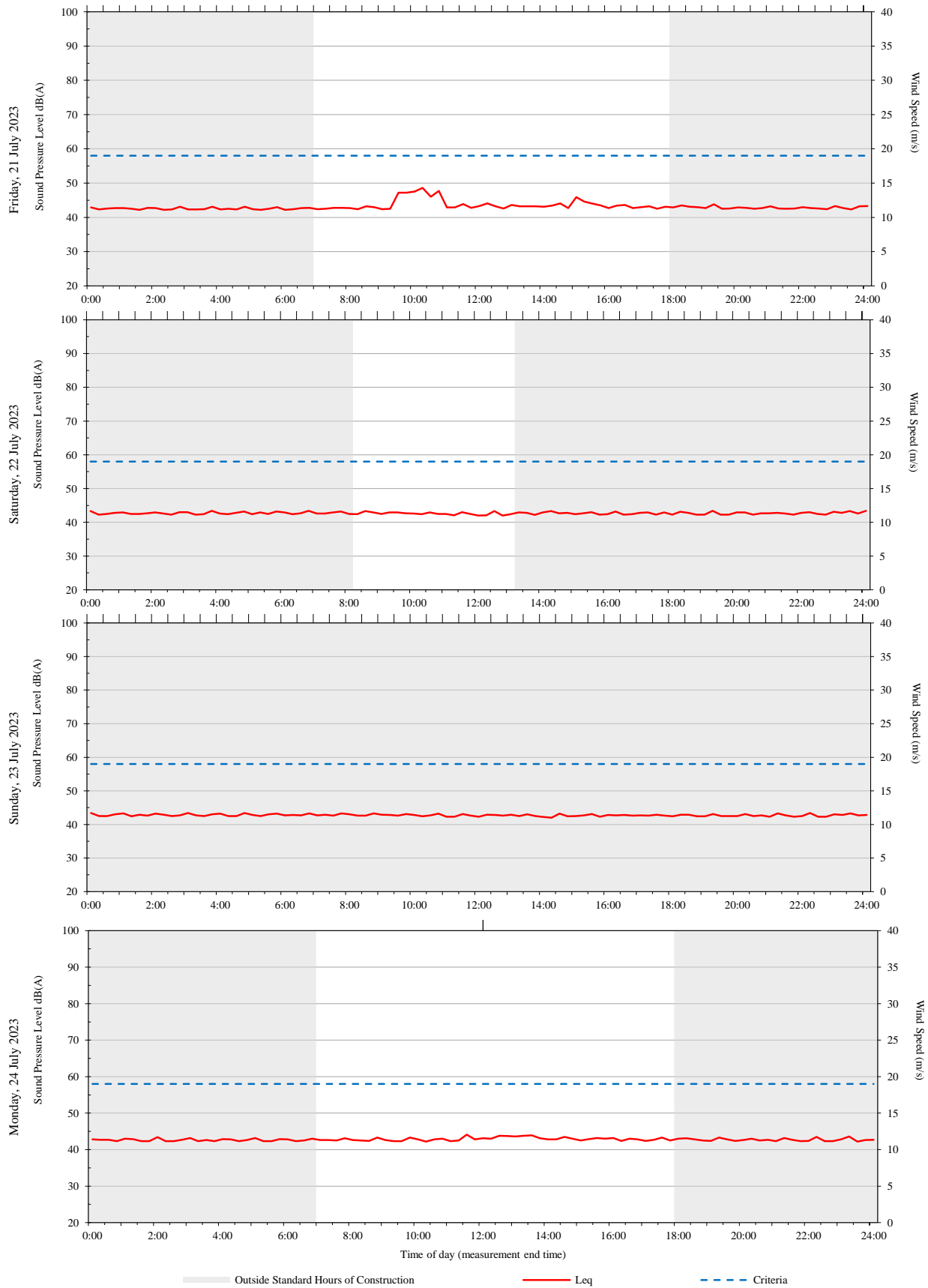
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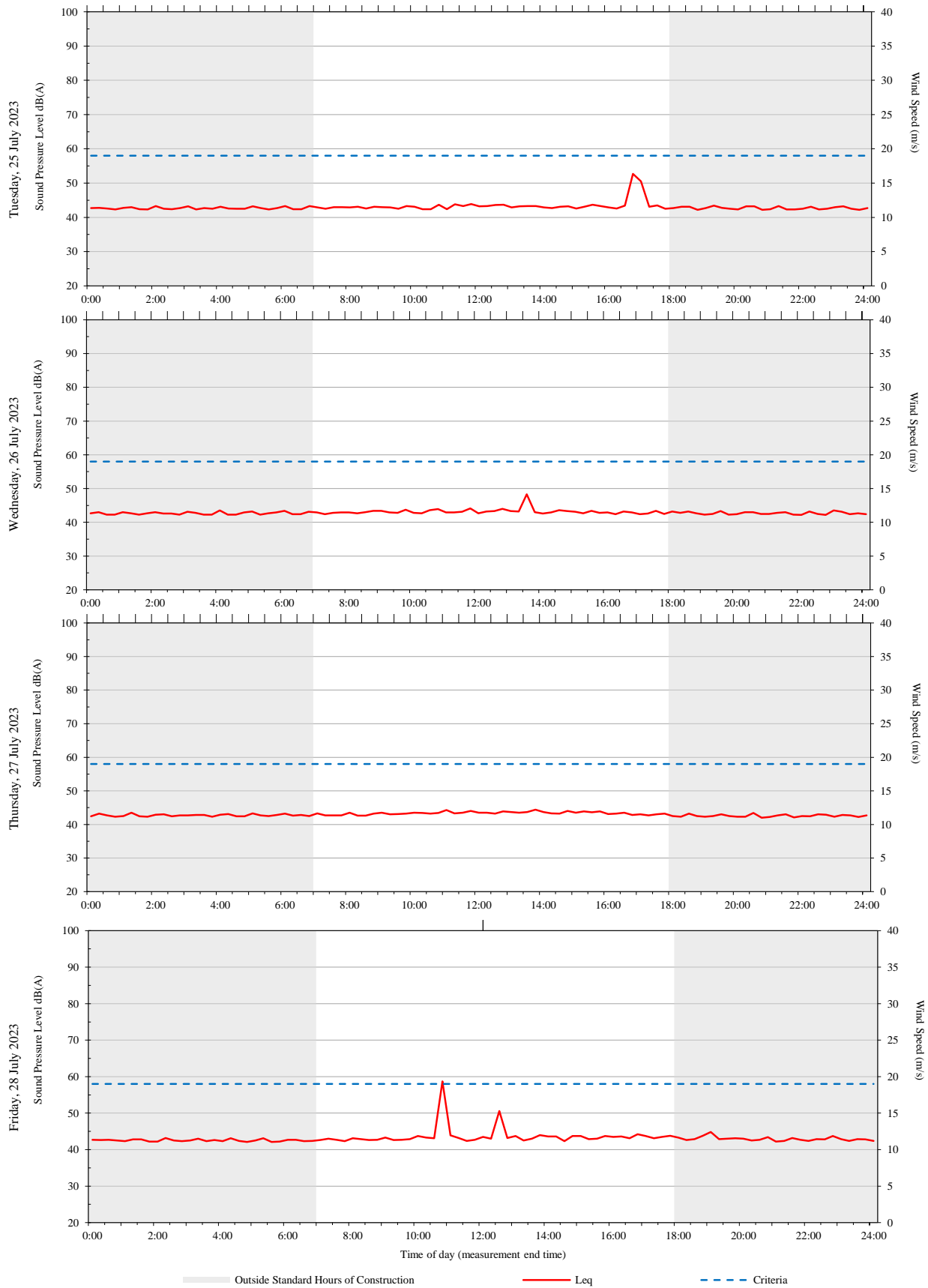
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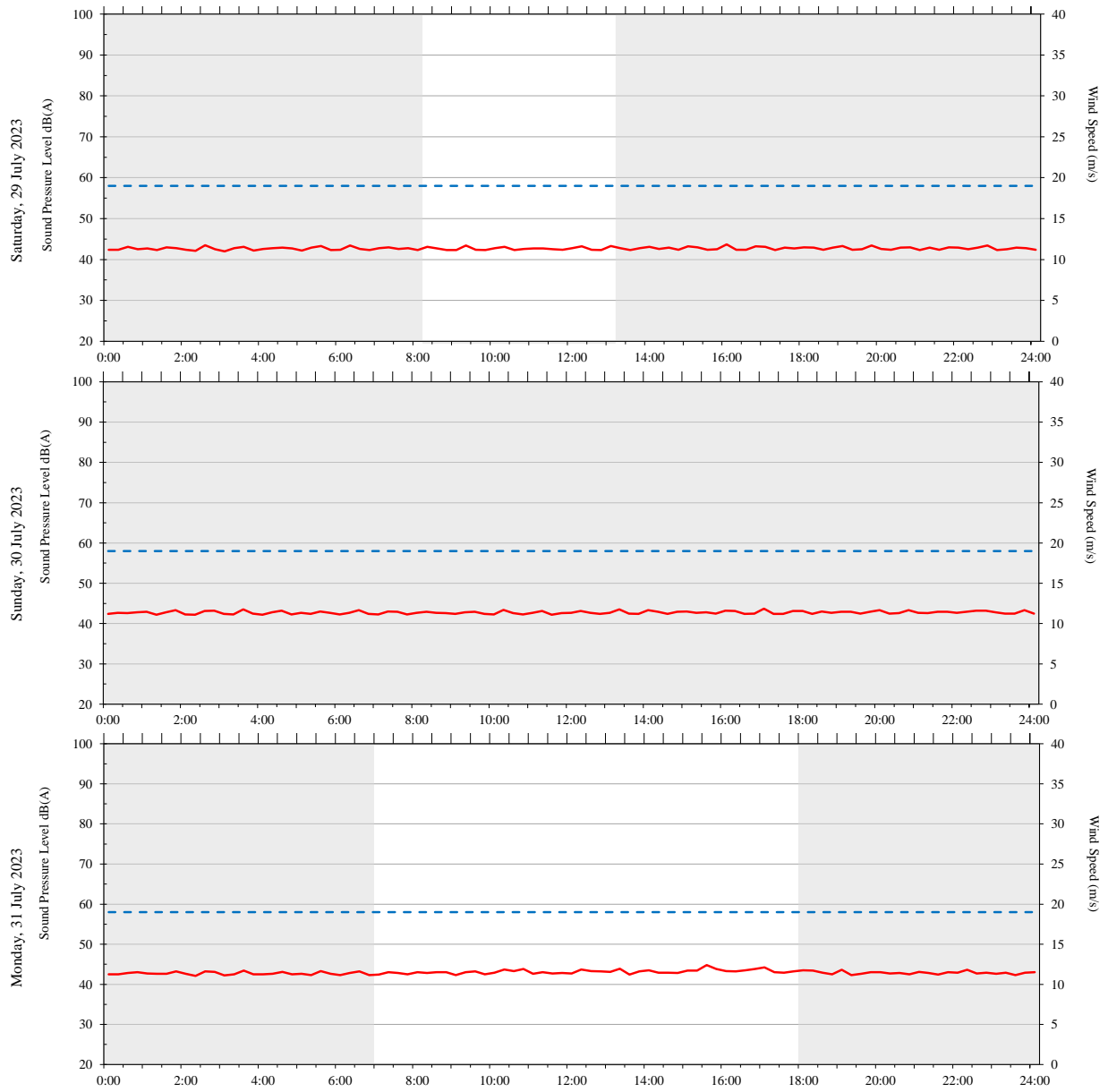
# Unattended monitoring: KR Level 3 Radiation Room 33 RF041 (Internal)

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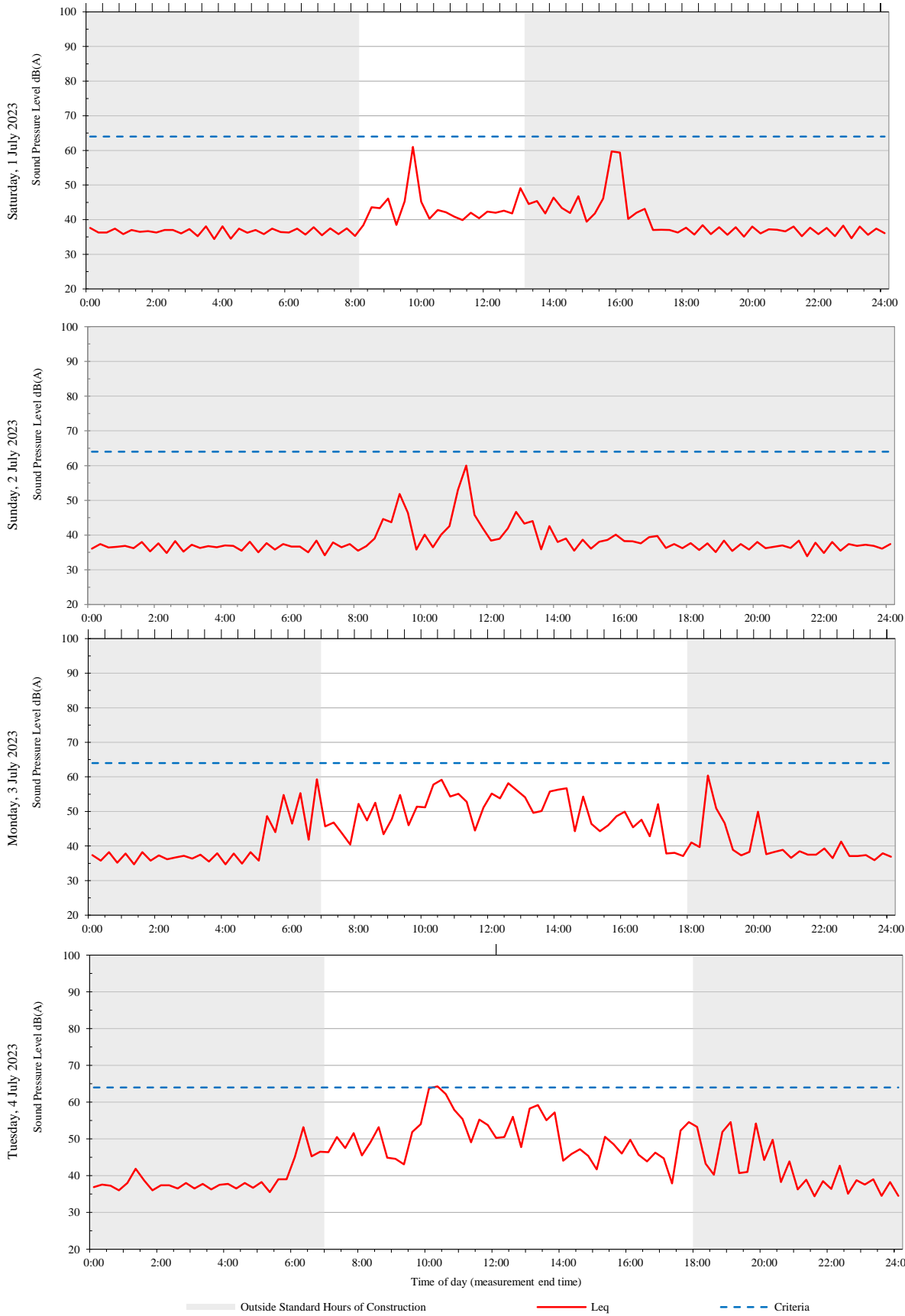
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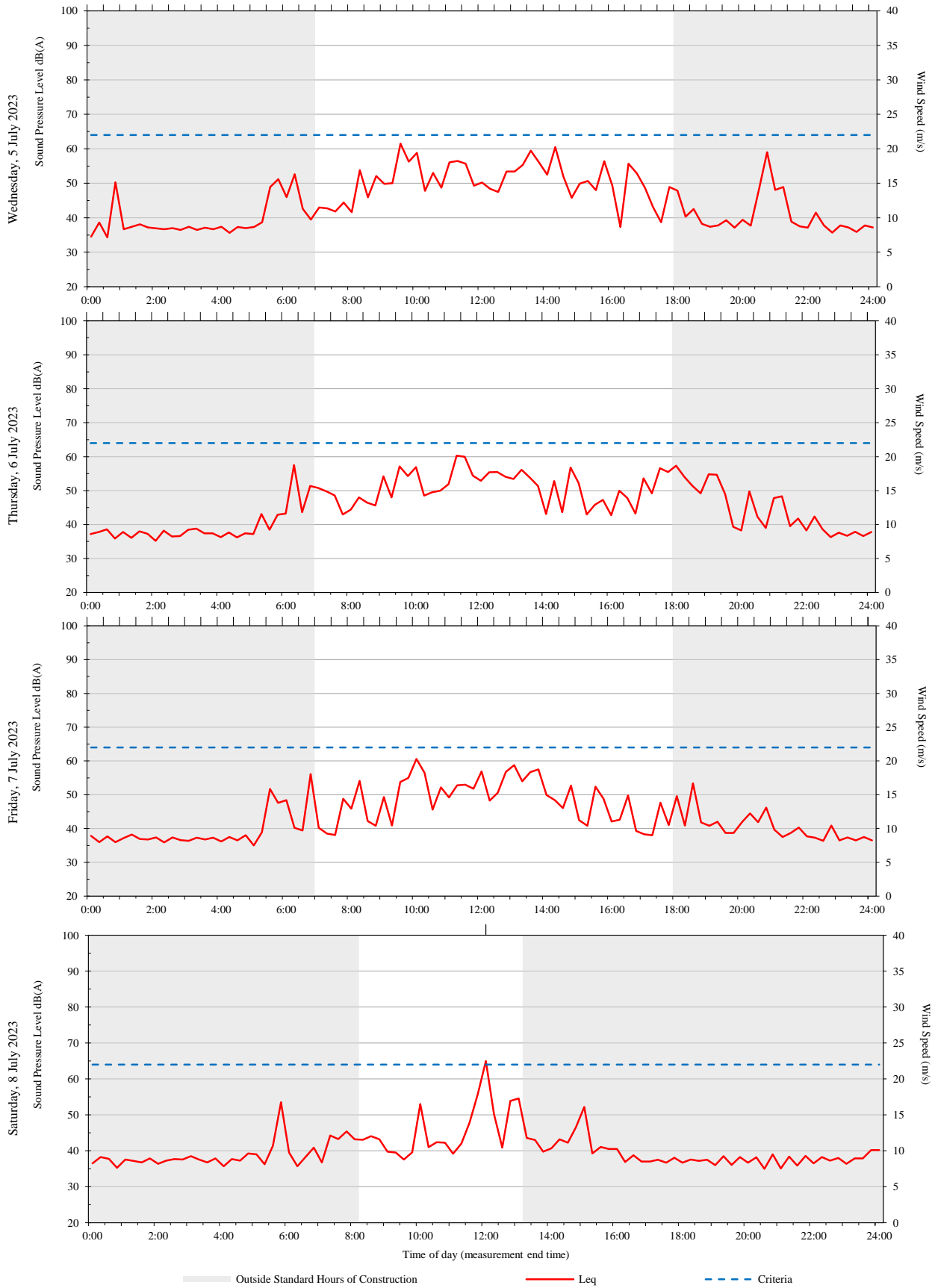


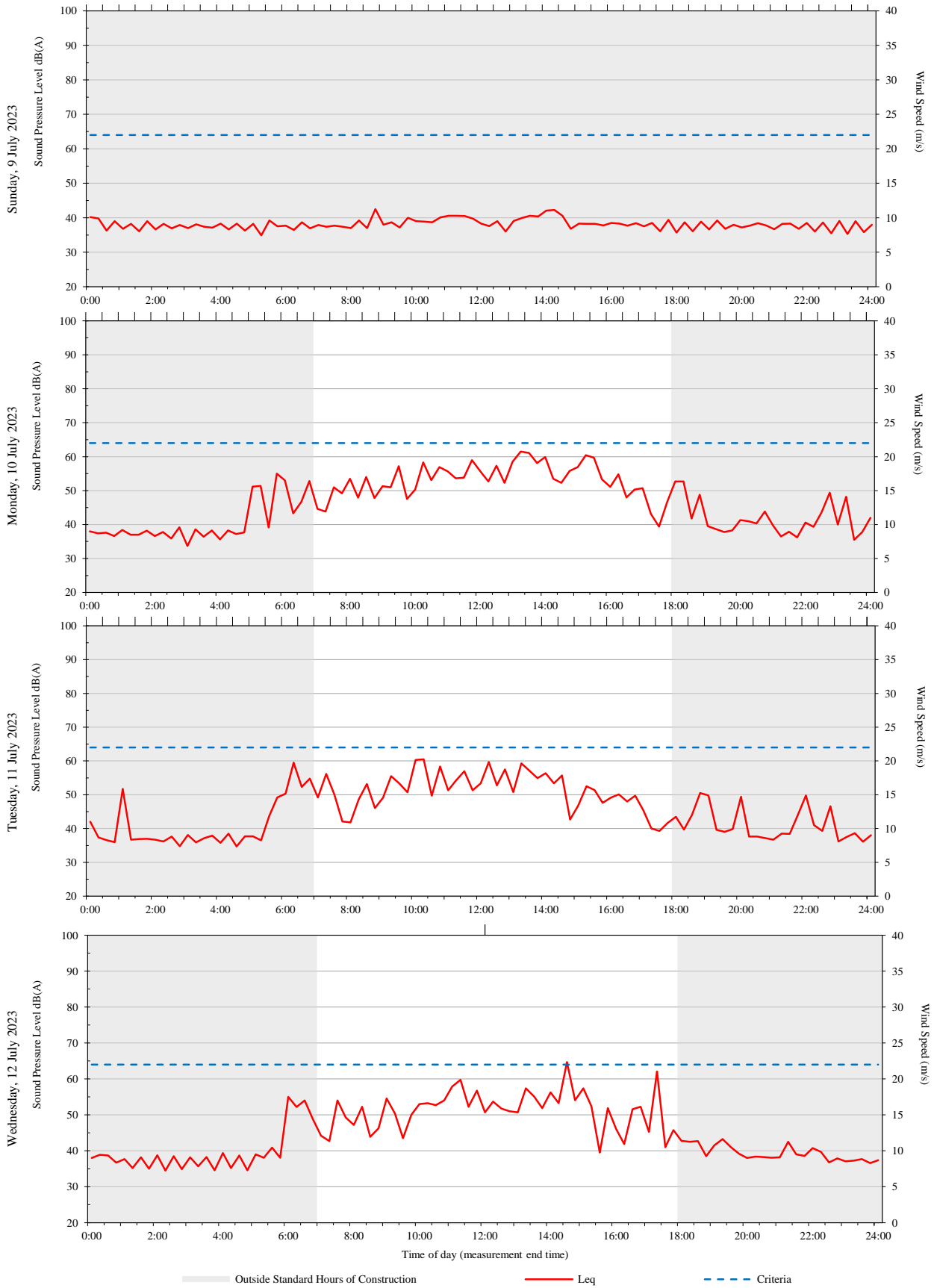
# A5 CHW Level 2 Parent Kitchen 92BW025 (facing MSCP site) (Westmead 2)

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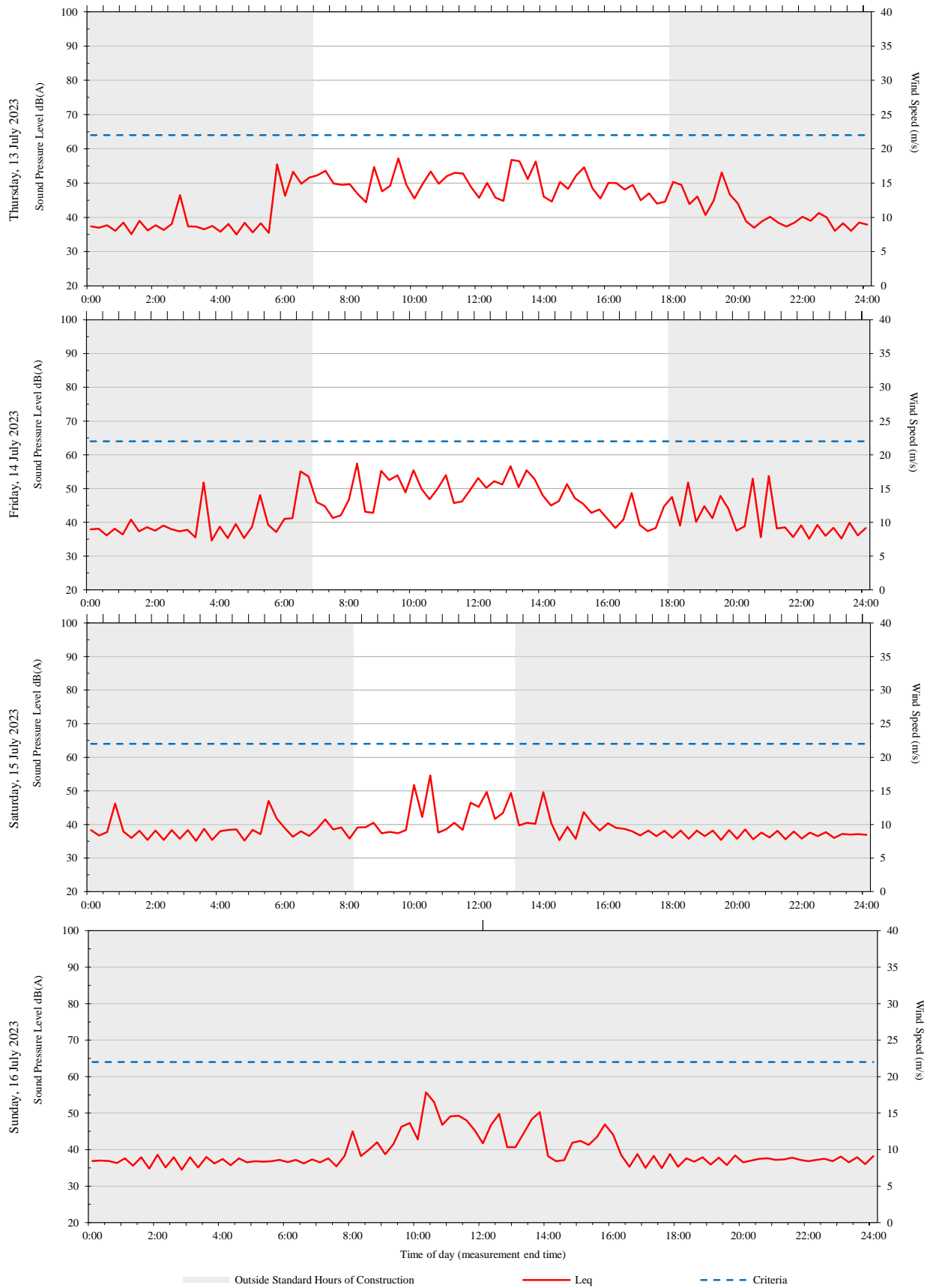
Unattended monitoring: CHW Level 2 Parent Kitchen 92BW025 (Internal)





Unattended monitoring: CHW Level 2 Parent Kitchen 92BW025 (Internal)

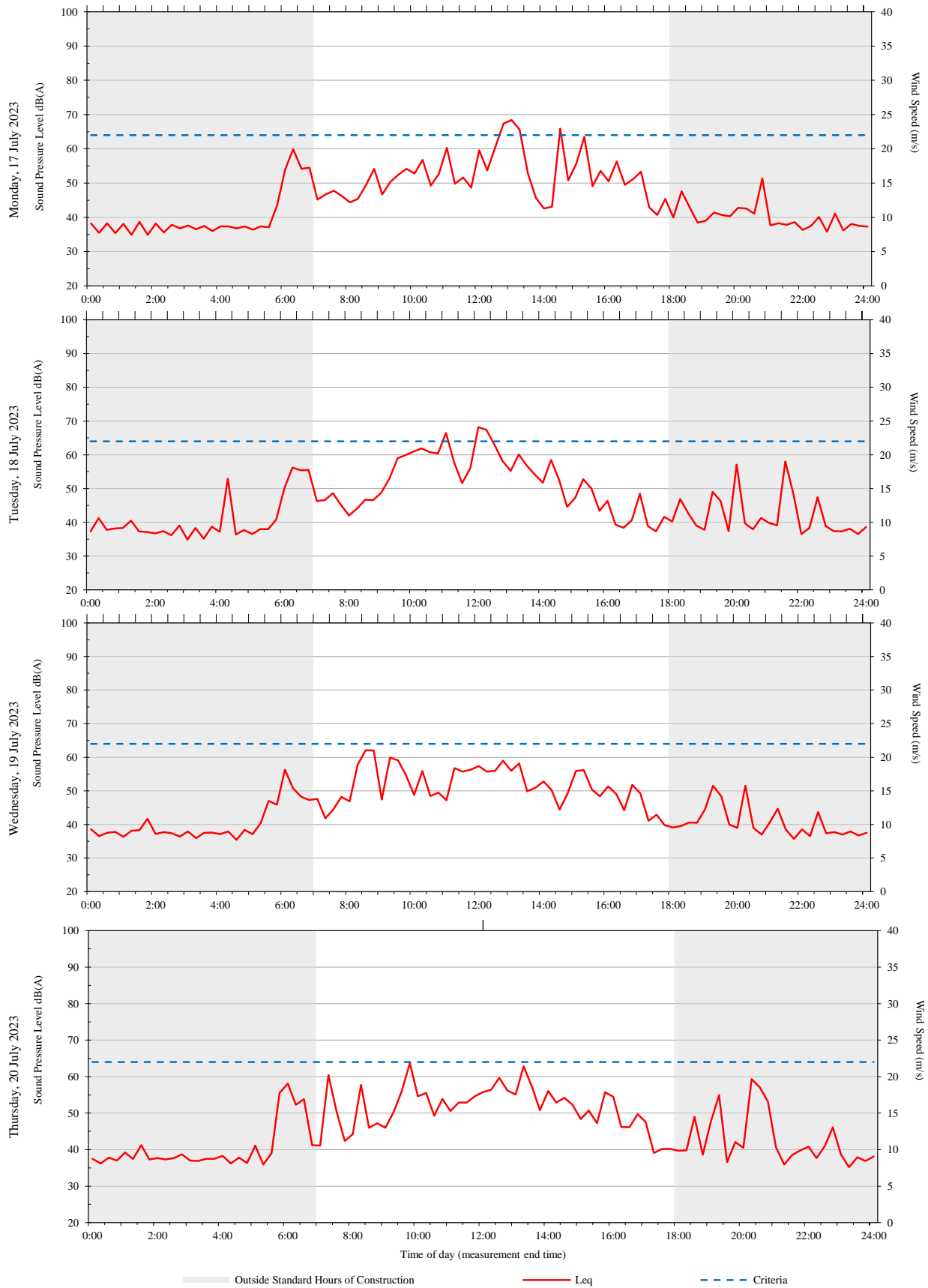
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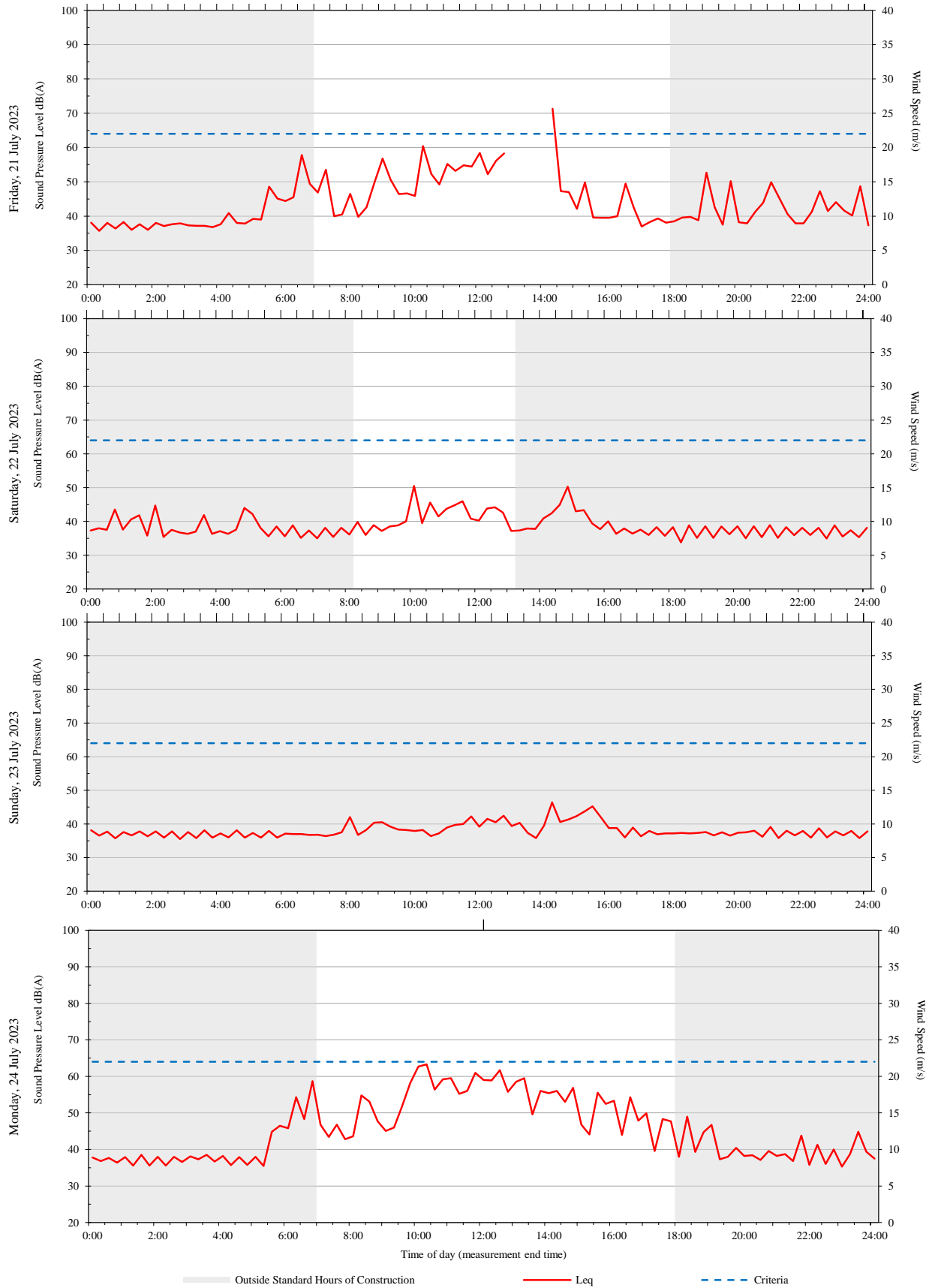
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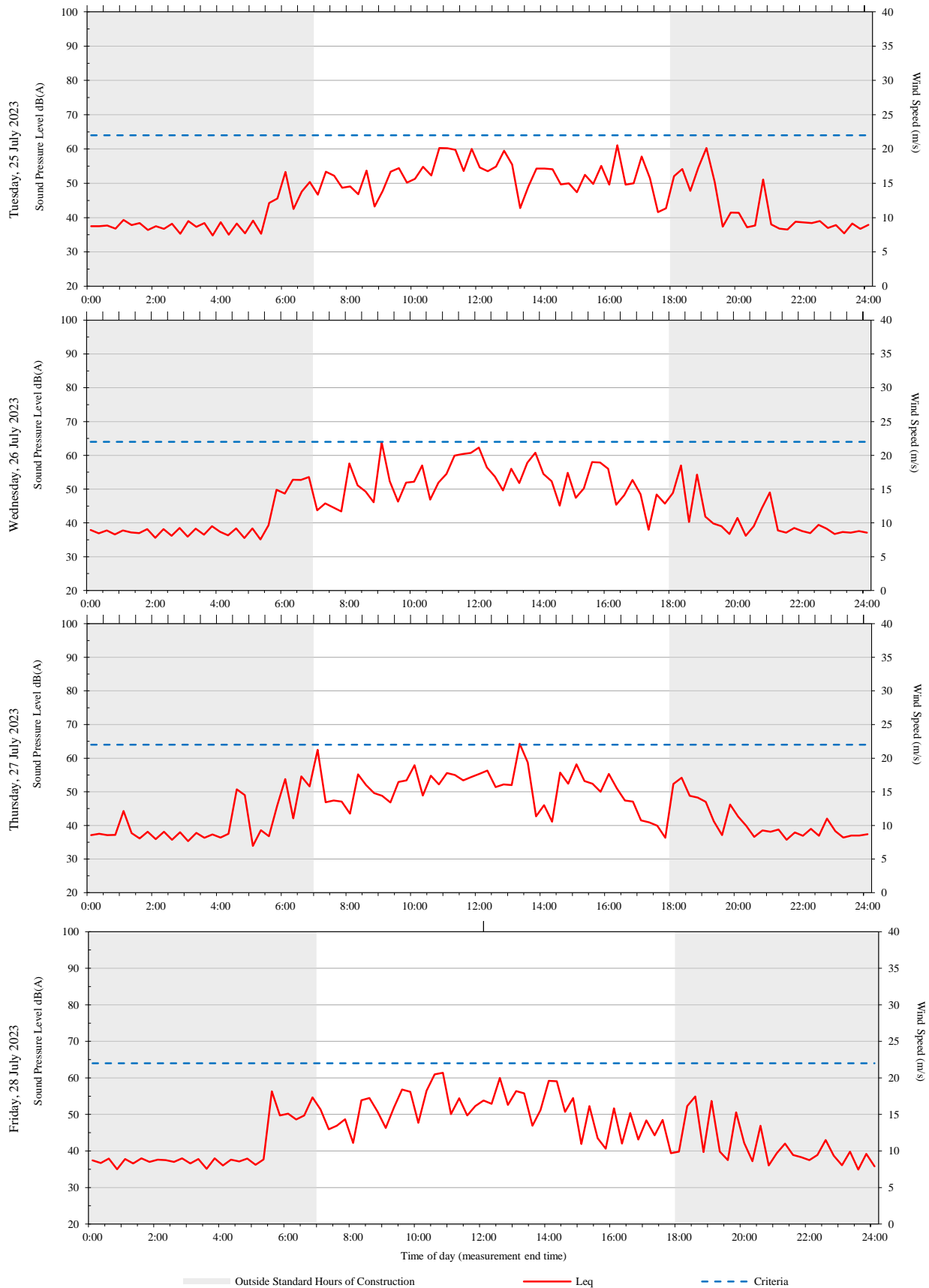
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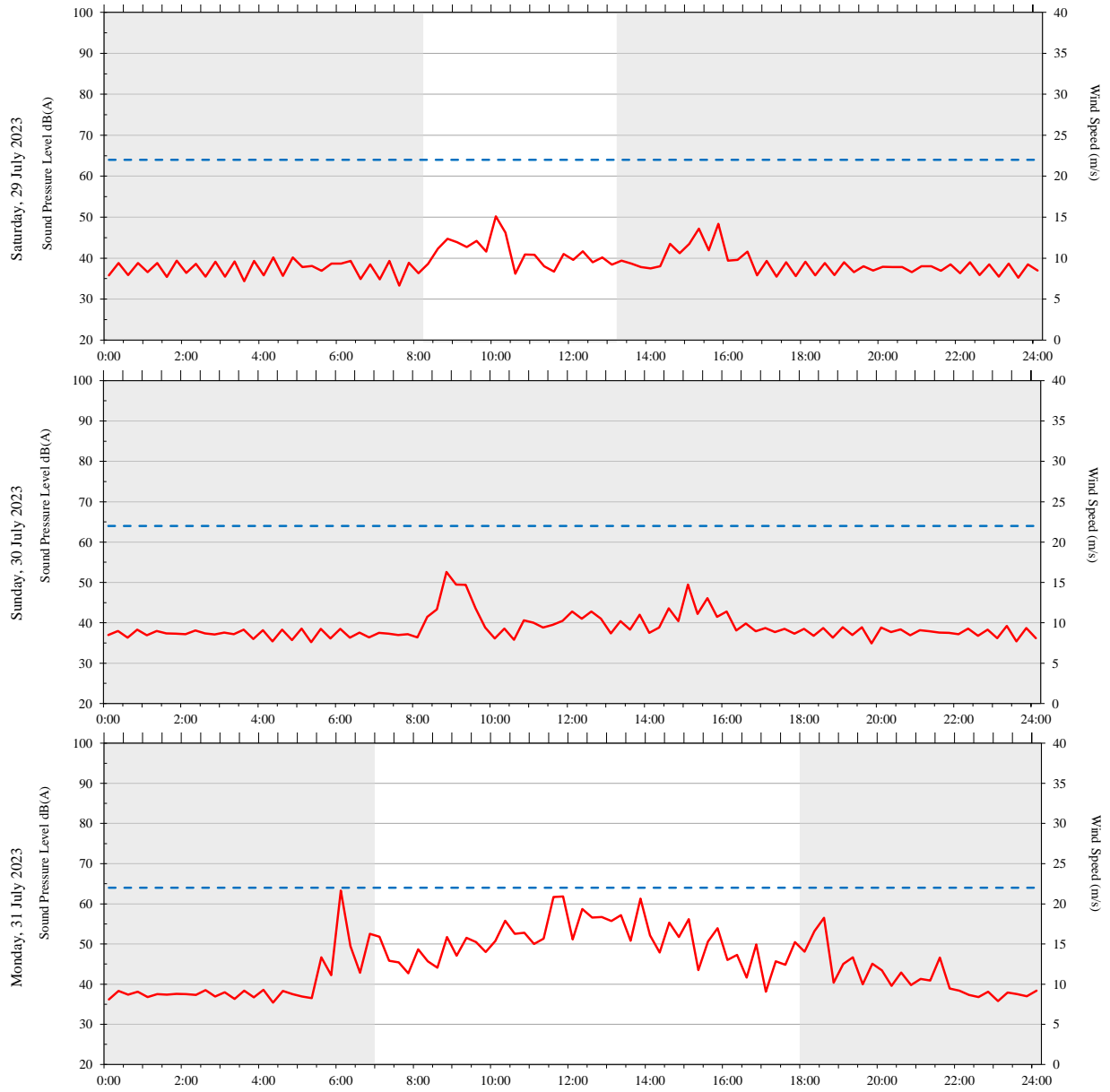
Unattended monitoring: CHW Level 2 Parent Kitchen 92BW025 (Internal)

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Unattended monitoring: CHW Level 2 Parent Kitchen 92BW025 (Internal)

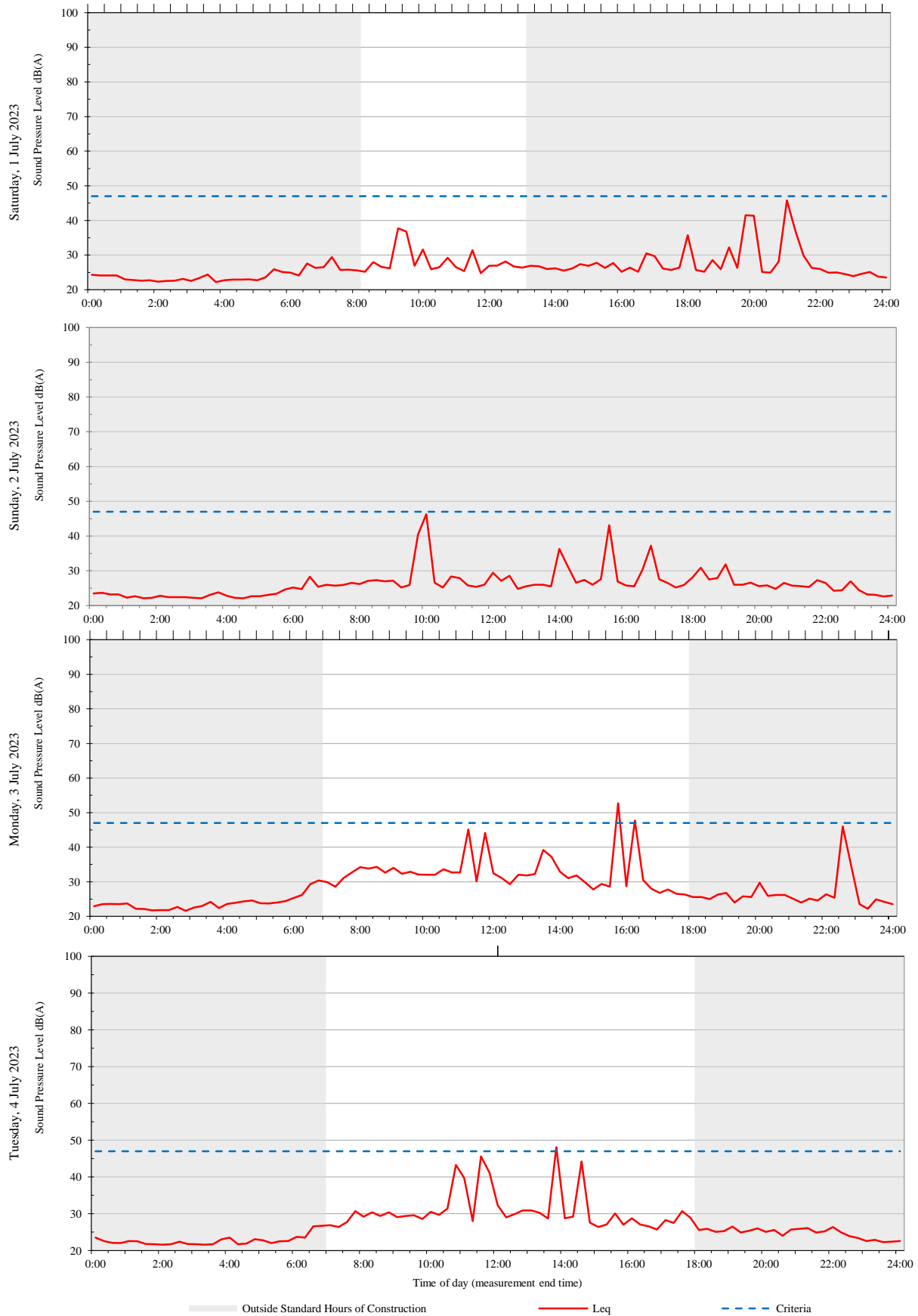
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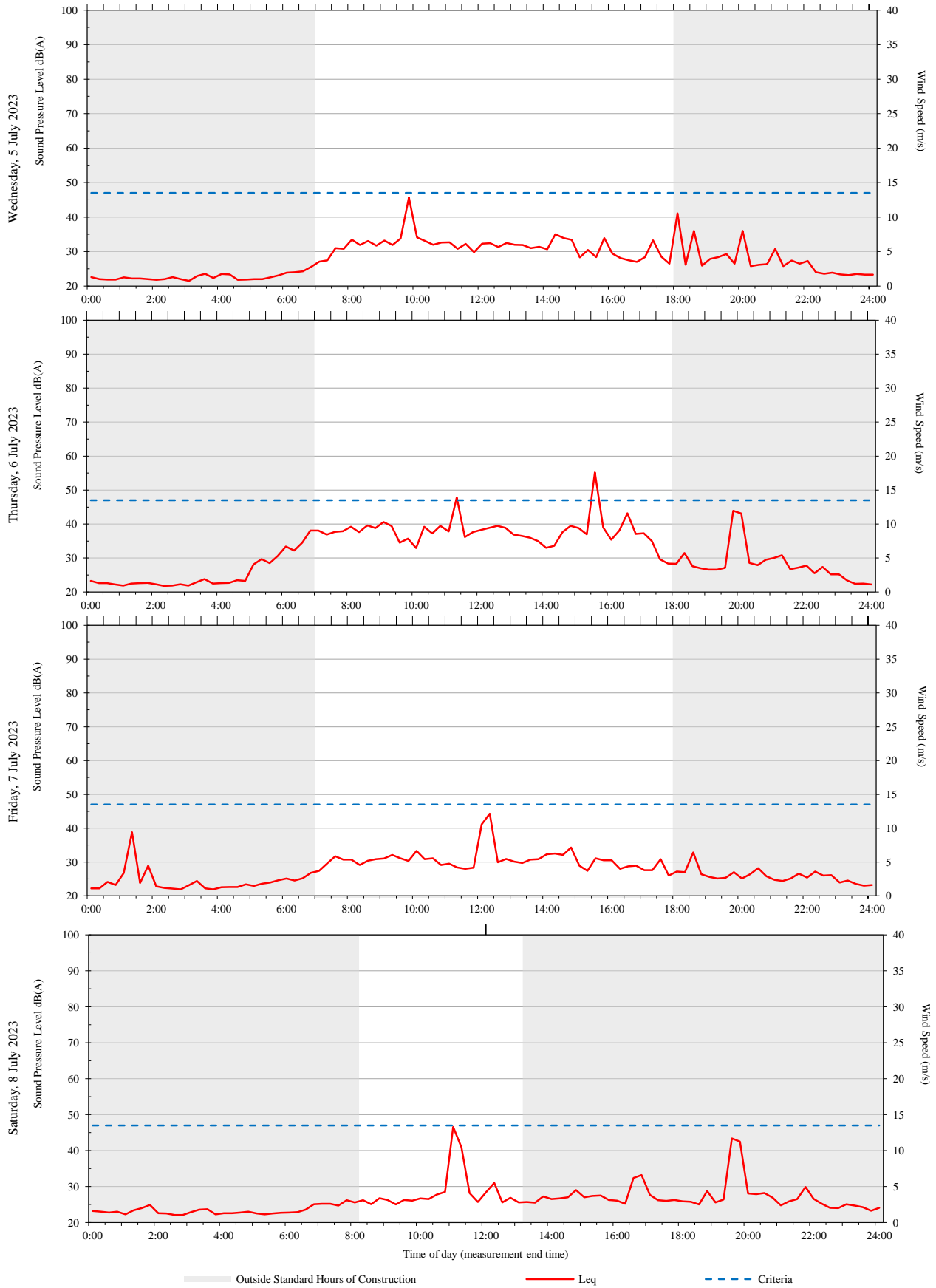
# A6 RMH Level 1 Store Room 101 (Westmead 3)

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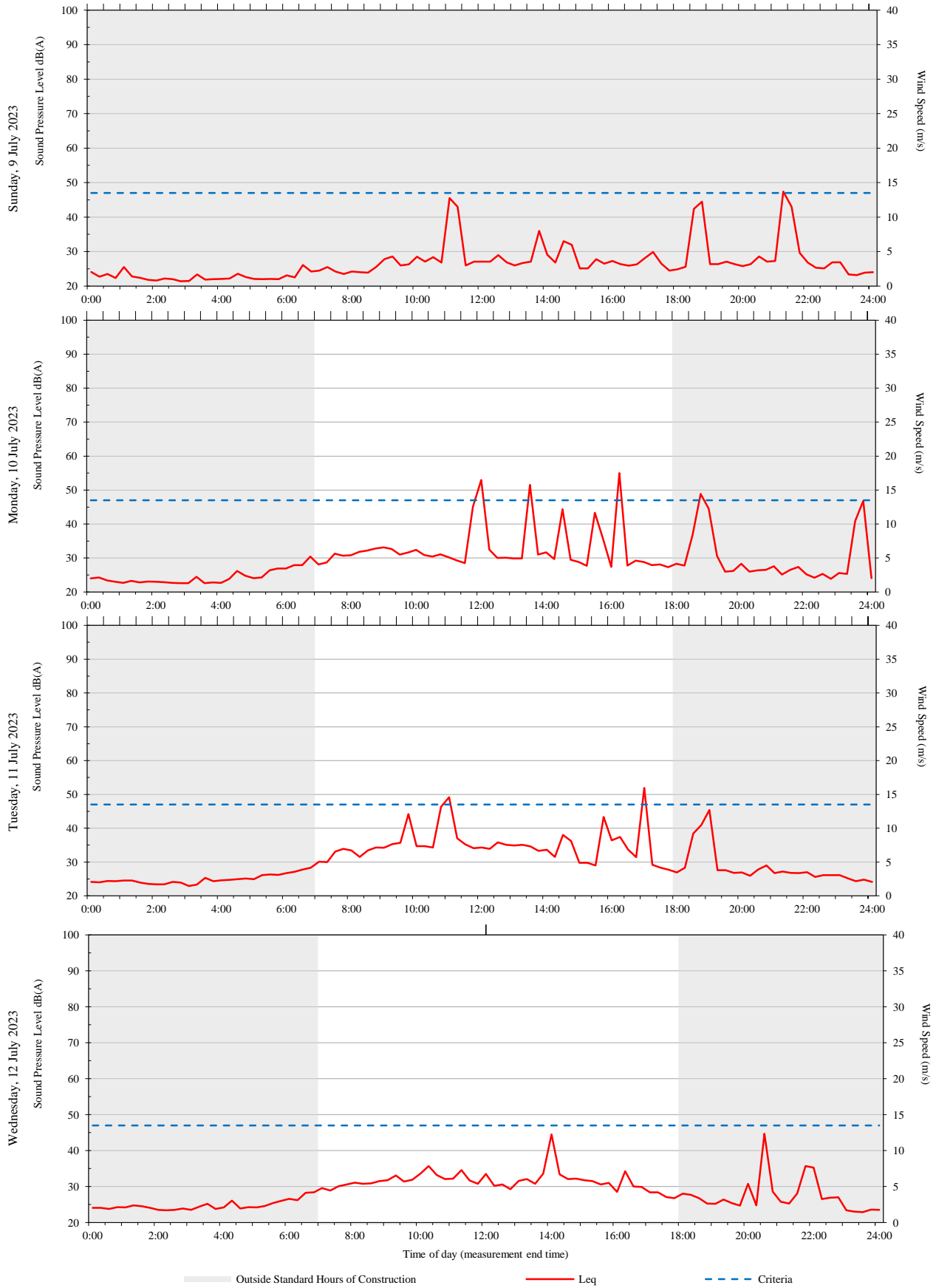
Unattended monitoring: RMH Level 1 Store Room 101 (Internal)



Unattended monitoring: RMH Level 1 Store Room 101 (Internal)



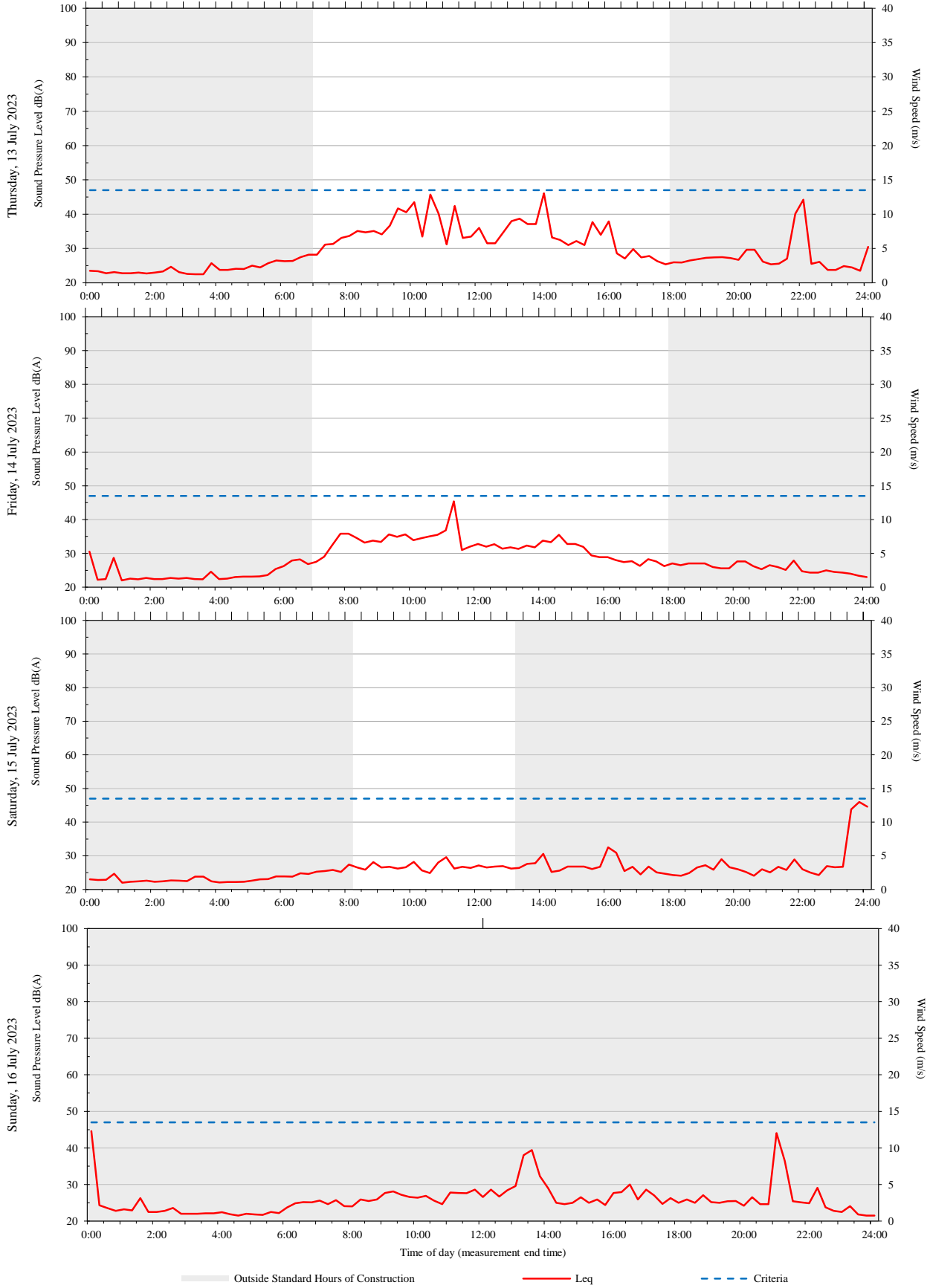
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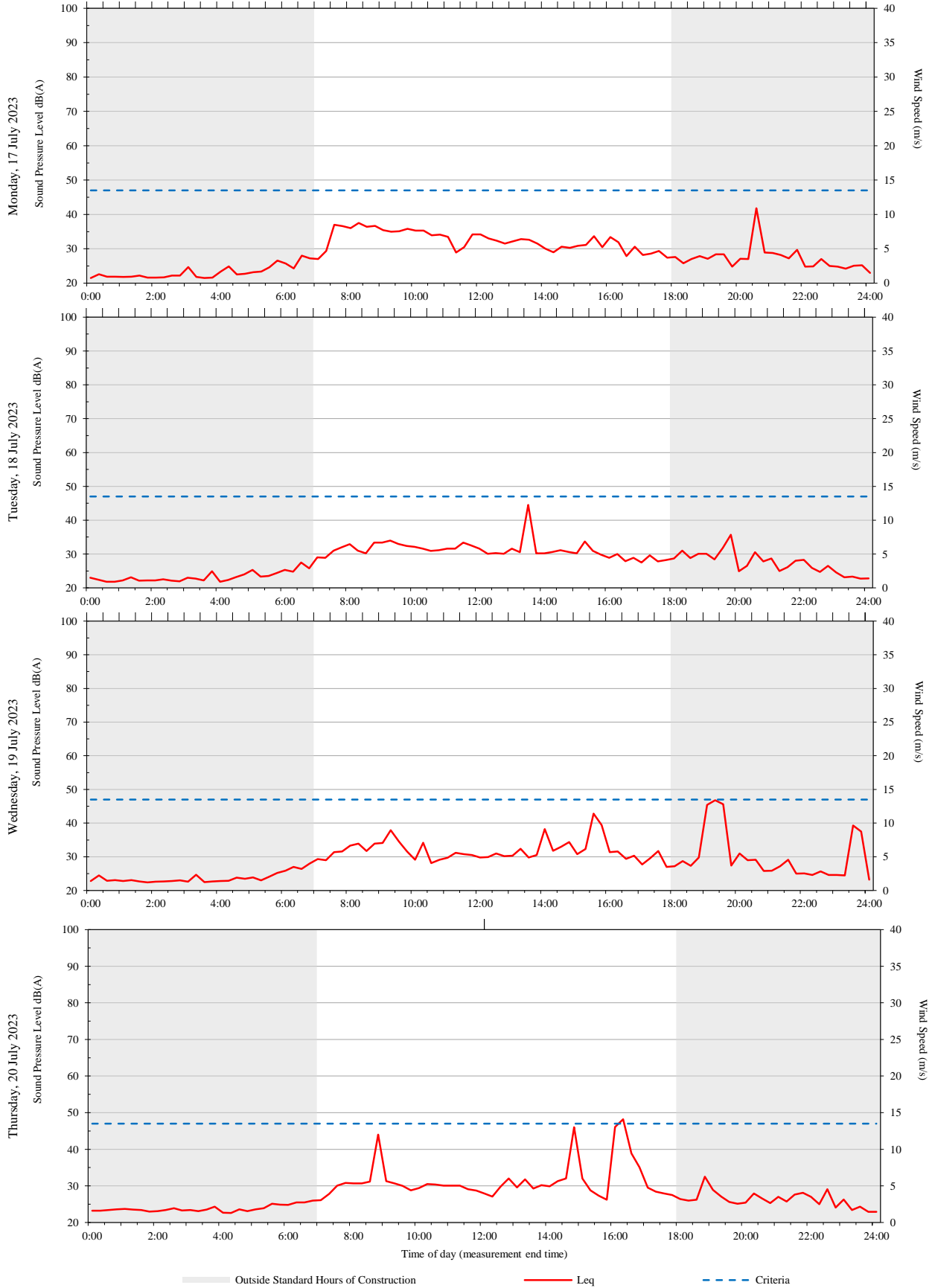


Unattended monitoring: RMH Level 1 Store Room 101 (Internal)

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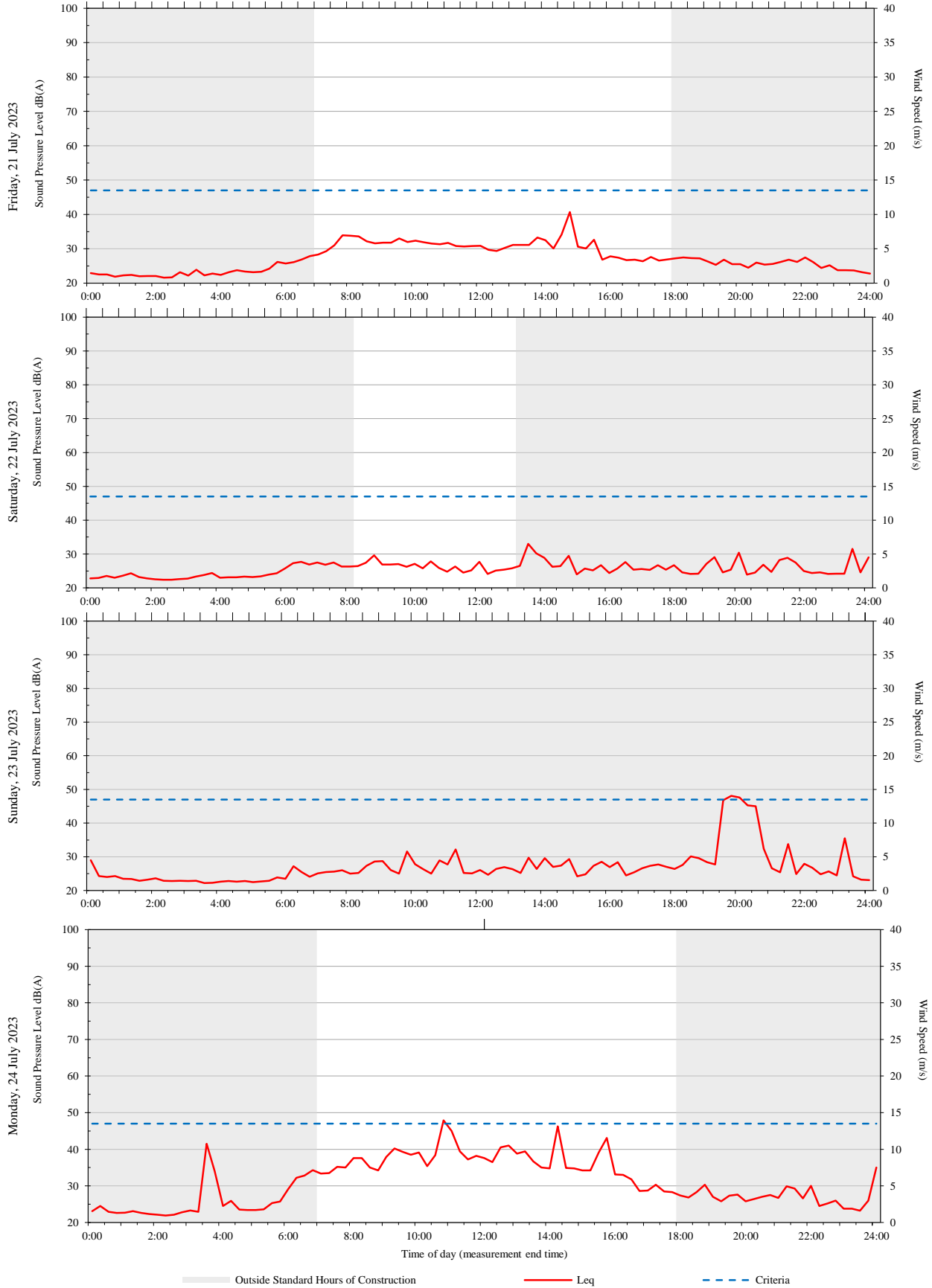


Unattended monitoring: RMH Level 1 Store Room 101 (Internal)

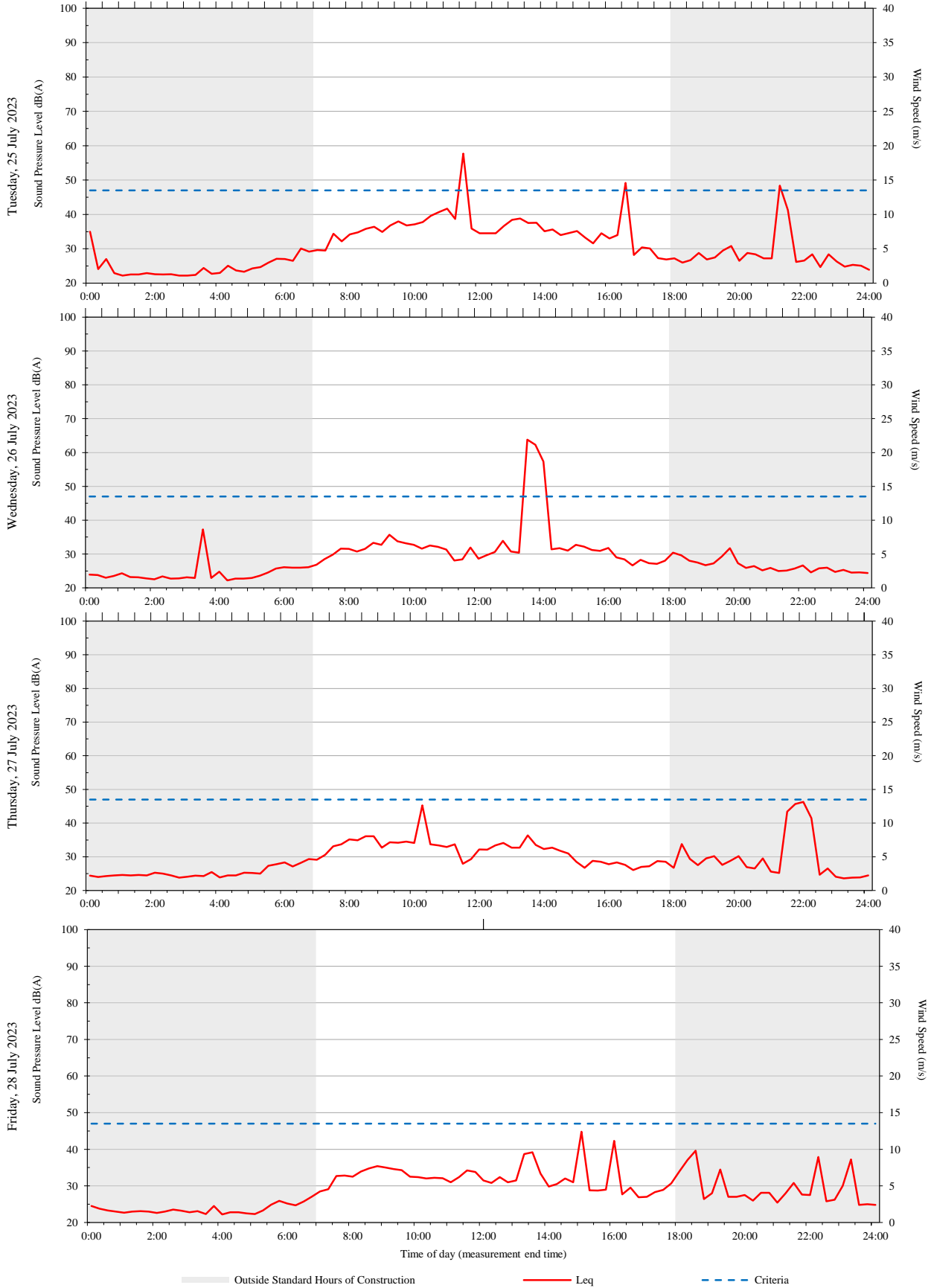


Unattended monitoring: RMH Level 1 Store Room 101 (Internal)

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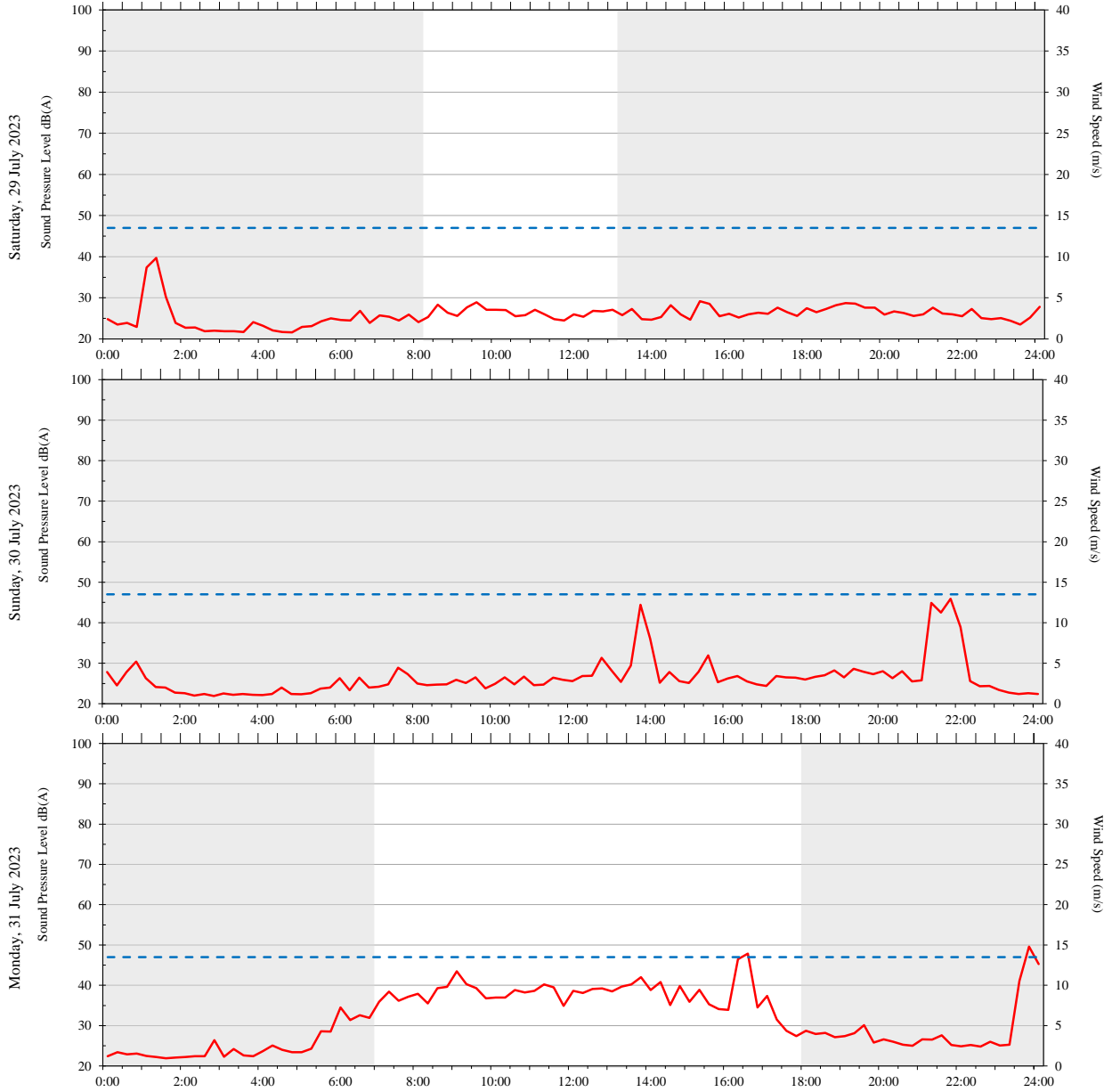


Unattended monitoring: RMH Level 1 Store Room 101 (Internal)



Unattended monitoring: RMH Level 1 Store Room 101 (Internal)

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## Health Infrastructure NSW

# Westmead VVMF Construction Noise Monitoring

Noise monitoring report 2023-07-01 to 2023-07-31

Reference: AC04

v1 | 15 August 2023

This report takes into account the particular instructions and requirements of our client. It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 271985




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**Job number** 271985  
**Document ref** AC04  
**File reference**

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	Prepared by	Checked by	Approved by
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Signature			

Filename			
Description			
	Prepared by	Checked by	Approved by
Name			
Signature			

Filename			
Description			
	Prepared by	Checked by	Approved by
Name			
Signature			

Issue Document Verification with Document

## Contents

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1.	Introduction	1
2.	Noise logger location	2
2.1	Noise logger relocation	4
3.	Noise Management Levels	4
3.1	Management Level updates	4
4.	Noise monitoring results	5
4.1	Outages	5
4.2	Exceedances	5

### Tables

Table 2: Noise Management Levels	4
Table 3: Noise logger outages during monitoring period	5
Table 4: Recorded NML exceedances	5

### Figures

Figure 1: VVMF noise monitoring location	3
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### Appendices

Appendix A	A-6
Noise monitoring results	A-6
A.1 WIMR L1 Clean Prep Room (I.1.23)	A-7



# 1. Introduction

Arup has been commissioned by PricewaterhouseCoopers (PwC) on behalf of Health Infrastructure NSW to install a noise monitor within the Westmead Institute for Medical Research (WIMR) to monitor and manage noise from the construction of the Viral Vector Manufacturing Facility (VVMF) in the Westmead Precinct.

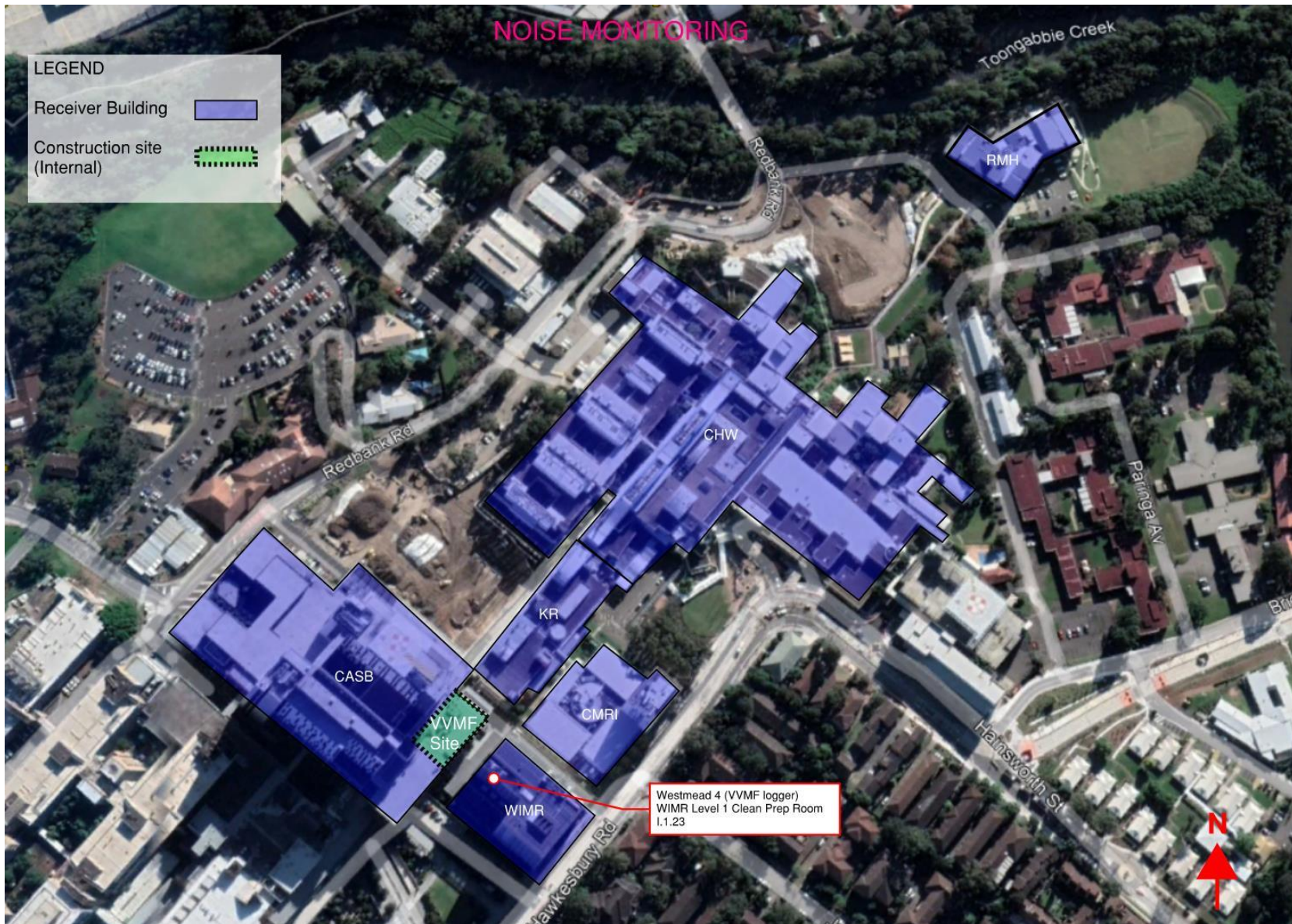
The noise logger was deployed on the 8<sup>th</sup> of March 2023 and has been setup to send email and SMS notifications to stakeholders when construction Noise Management Levels (NMLs) are exceeded.

This report details noise measurement results from **1 July 2023** to **31 July 2023** inclusive.

## 2. Noise logger location

One Acoustic Research Labs Ngara noise logger is installed at the location shown in Figure 1 below.

The noise logger was calibrated by Acoustic Research Labs (NATA accredited calibration) in November 2021.



**Figure 1: VVMF noise monitoring location**

## 2.1 Noise logger relocation

No logger relocation to report within this period.

## 3. Noise Management Levels

The current Construction Noise Management Levels (NMLs) are set out in Table 1. The NMLs have been determined following a baseline noise study conducted in April 2023. (Refer to Arup's *Westmead Hospital N&V Monitoring – Attended Noise Measurements – VVMF Construction Activity*<sup>1</sup> memo for details regarding how these NMLs were nominated.)

Measurement data taken from 'standard' construction work hours for the project only are assessed against the Noise Management Level criteria, being:

- 7am-6pm Mon-Fri
- 8am-1pm Sat
- No work on Sundays and Public Holidays.

The NMLs levels in Table 1 were determined following both the review of current noise levels within the room when no construction was conducted, and available information with regards to the sensitivity to noise of research animals. The NMLs below represent the level of construction noise if exceeded may result in a negative impact on research animals.

**Table 1: Noise Management Levels**

Logger ID	Location	Noise Management Level, dB	Description
Westmead 4	WIMR L1 Clean Prep Room (I.1.23)	$L_{Amax}$ 85	For short duration high noise levels
		$L_{Aeq(1minute)}$ 69	For more continuous noise generation

### 3.1 Management Level updates

The following provides a progressive record of management level updates:

- None-to-date

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<sup>1</sup> Arup report reference: 283812-16

## 4. Noise monitoring results

### 4.1 Outages

Noise monitoring outages are shown below. This excludes outages related to logger data collection and calibration.

**Table 2: Noise logger outages during monitoring period**

Logger ID	Noise logger location	Outages
Westmead 4	WIMR L1 Clean Prep Room (I.1.23)	-

### 4.2 Exceedances

The number of Noise Management Level exceedances recorded during the assessment period are shown below.

**Table 3: Recorded NML exceedances**

Logger Id	Noise logger location	Noise Management Level exceedance instances	
		Short duration $L_{Amax}$ criteria	Continuous $L_{Aeq(1minute)}$ criteria
Westmead 4	WIMR L1 Clean Prep Room (I.1.23)	47	66

It is noted that the exceedances of the NMLs may be the result of noise generated by either internal activities unrelated to construction, or by construction activities.

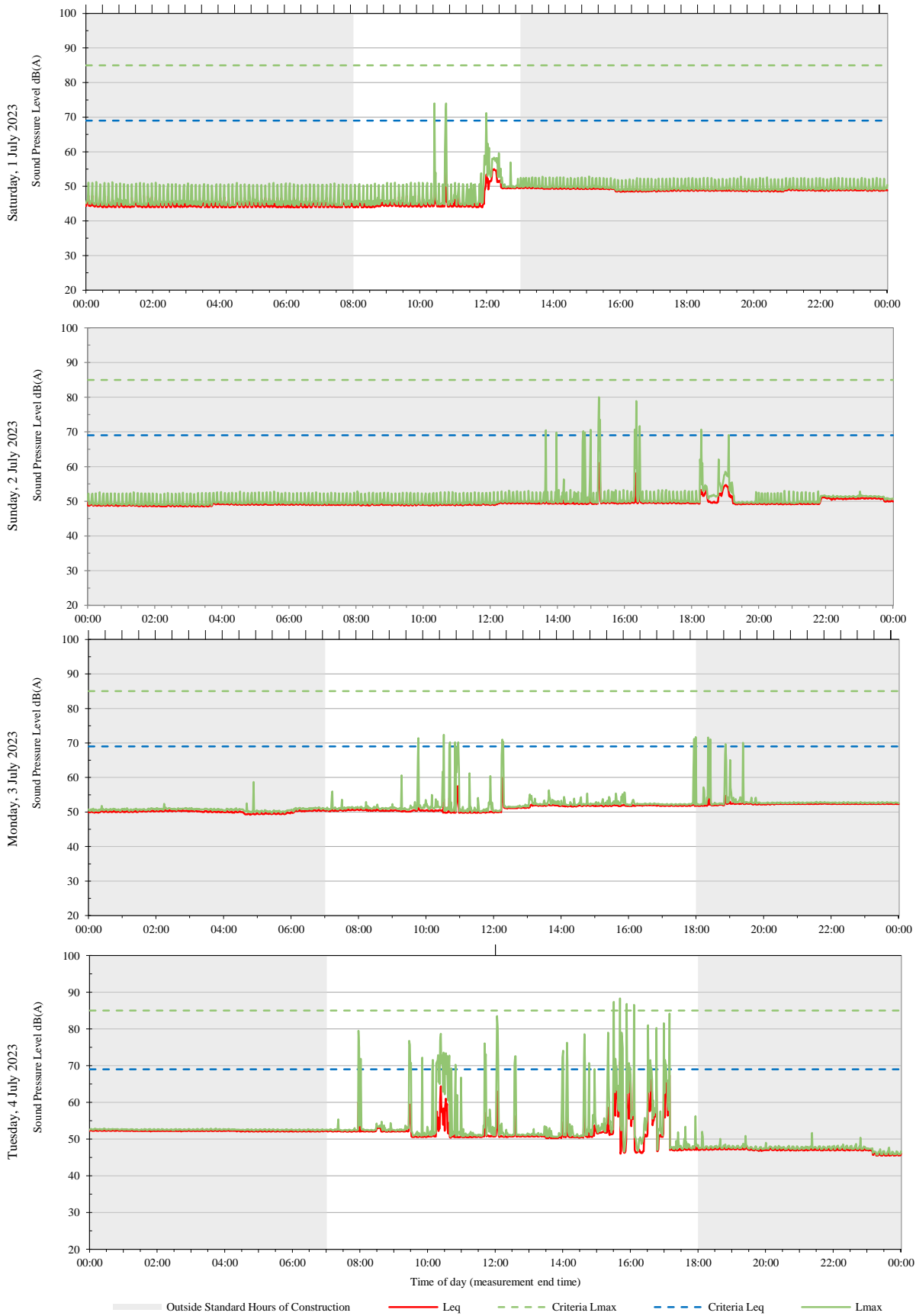
It is the responsibility of Ford Civils (the Head Contractor) to respond to each NML exceedance when it occurs and record the outcome of the exceedance investigation (cause of NML exceedance, any noise mitigation measures implemented to address the exceedances, etc.).

# Appendix A

## Noise monitoring results

# A.1 WIMR L1 Clean Prep Room (I.1.23)

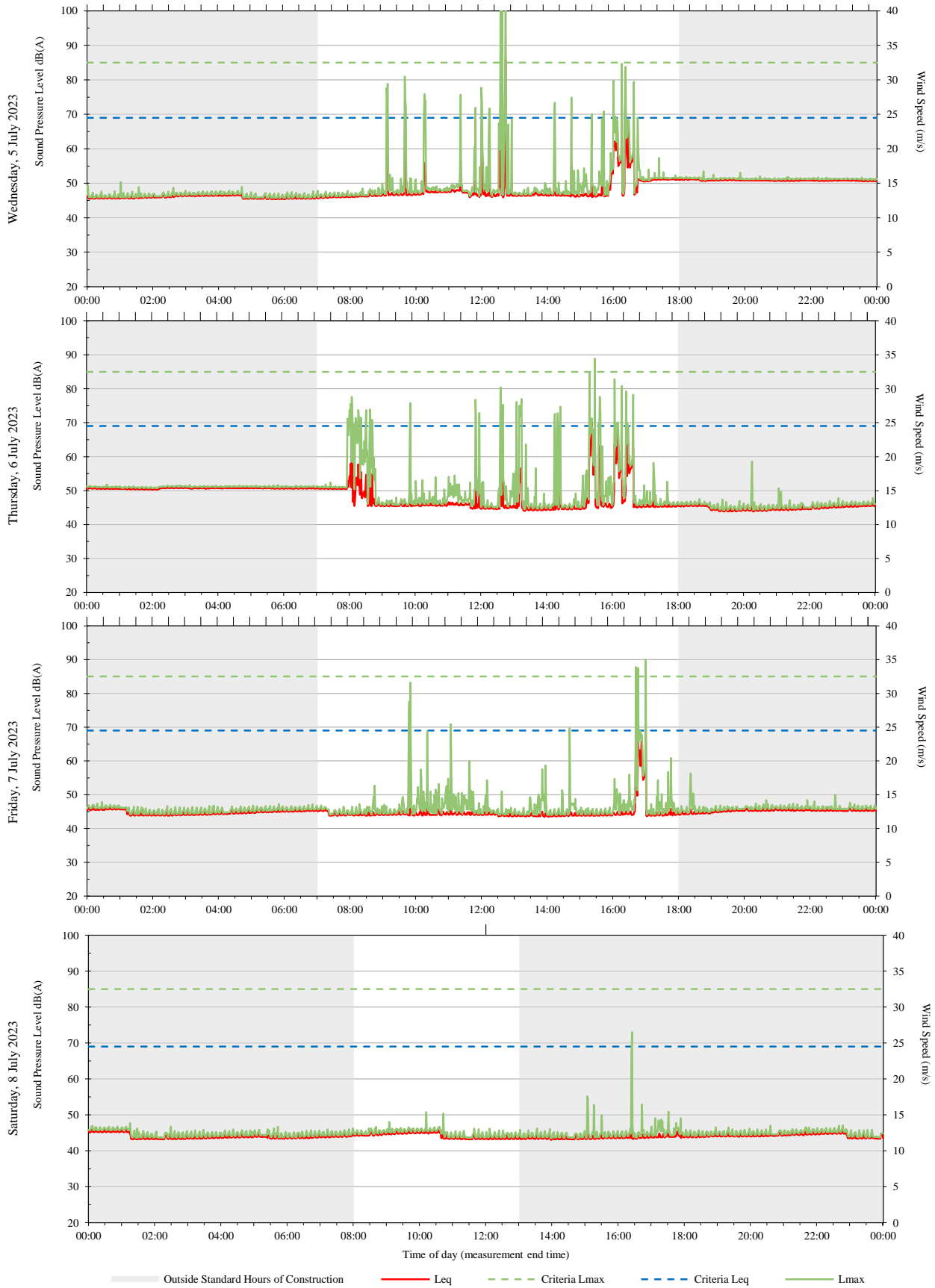
Unattended monitoring: Clean prep room (Westmead 4) (Internal)



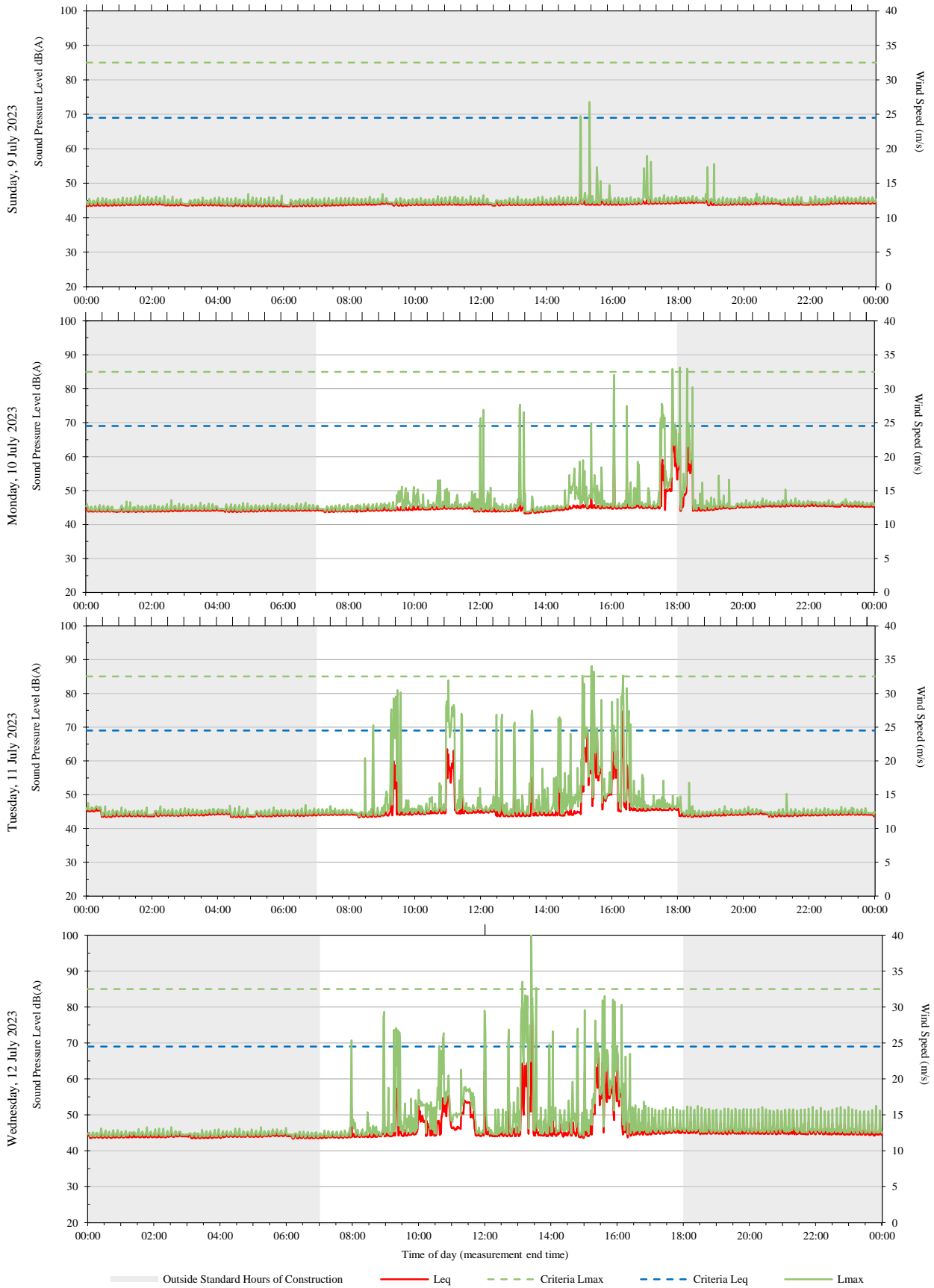


Unattended monitoring: Clean prep room (Westmead 4) (Internal)

ARUP



Unattended monitoring: Clean prep room (Westmead 4) (Internal)



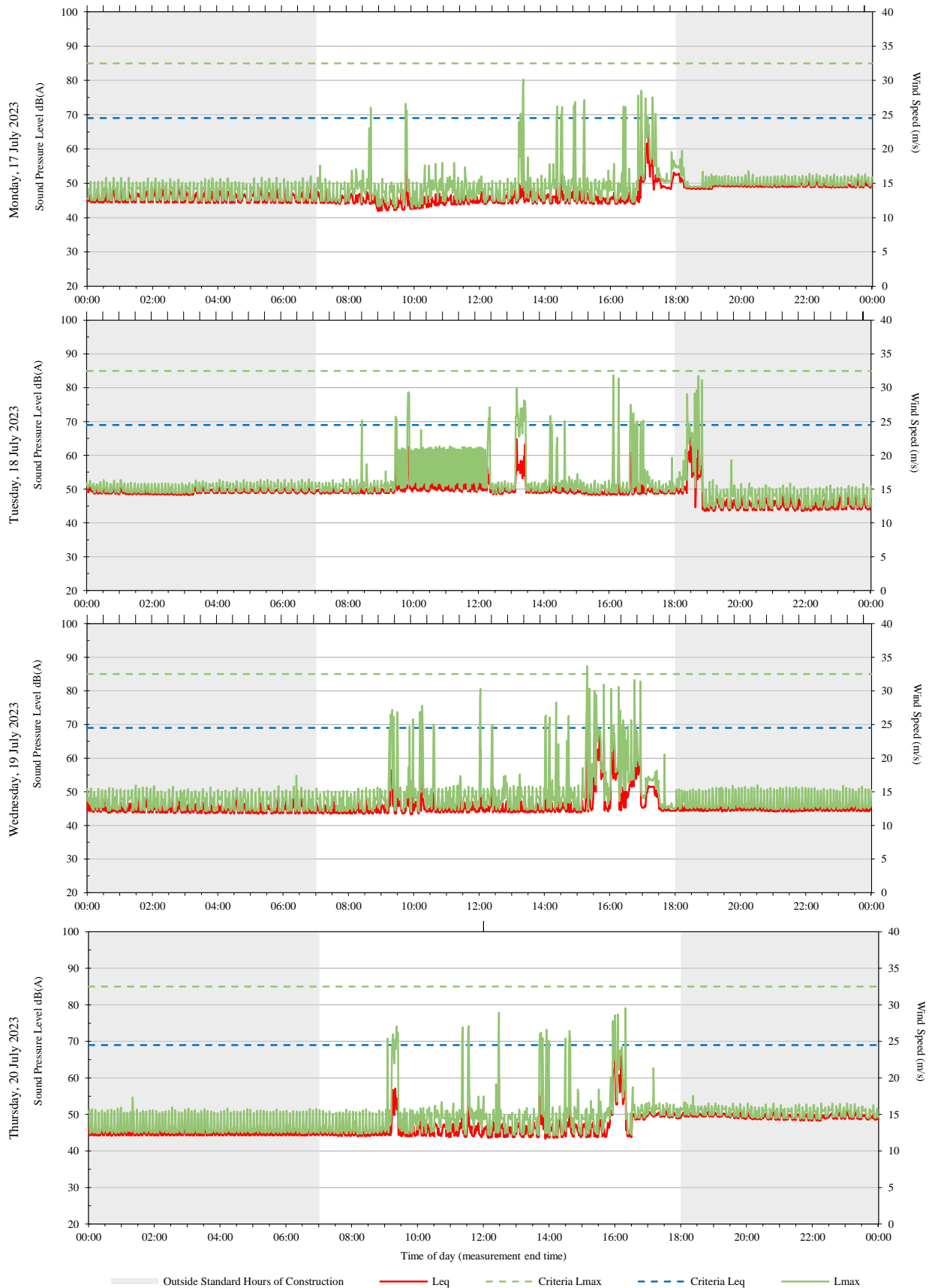
# Unattended monitoring: Clean prep room (Westmead 4) (Internal)

ARUP



# Unattended monitoring: Clean prep room (Westmead 4) (Internal)

ARUP



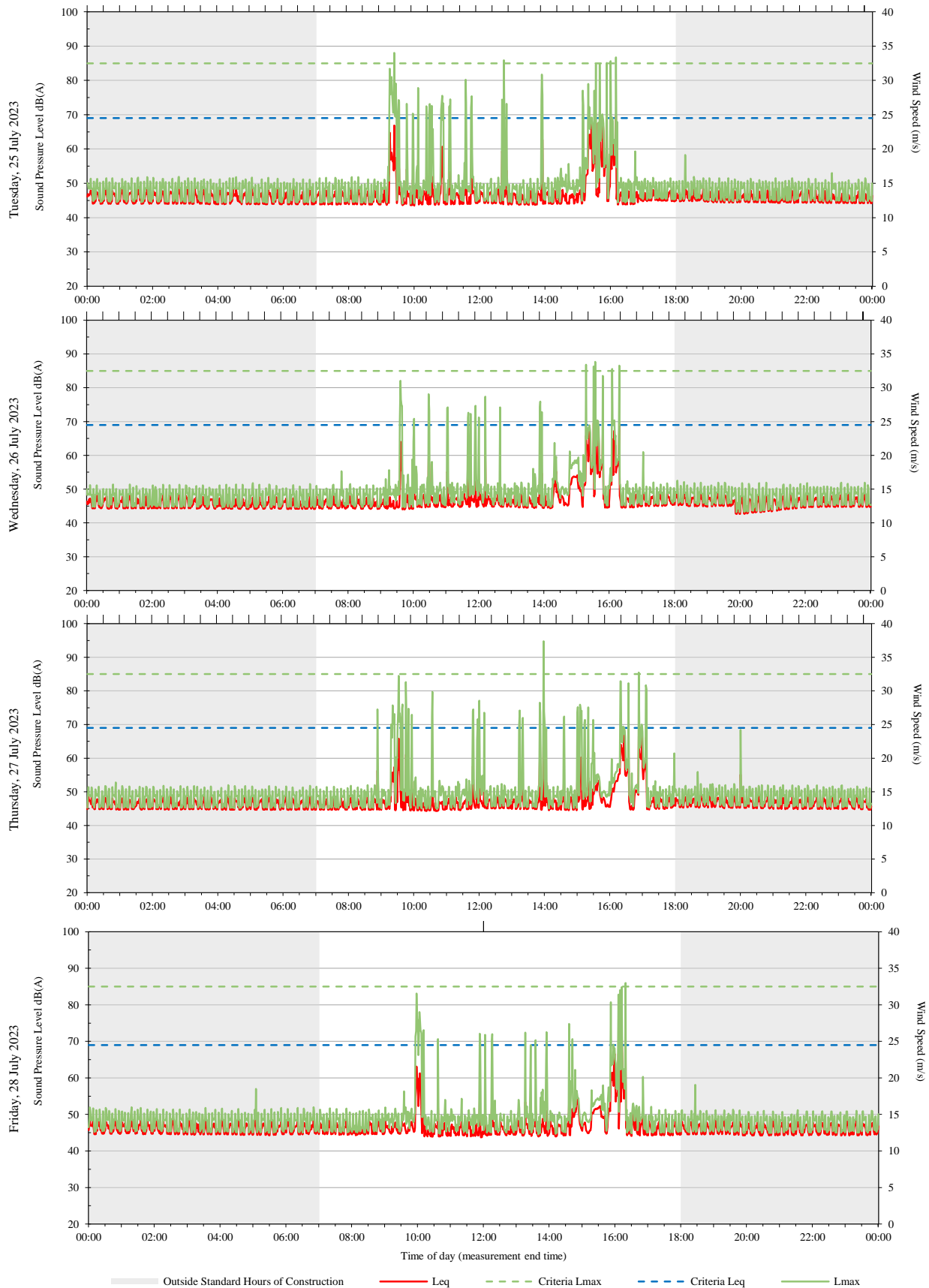
# Unattended monitoring: Clean prep room (Westmead 4) (Internal)

ARUP



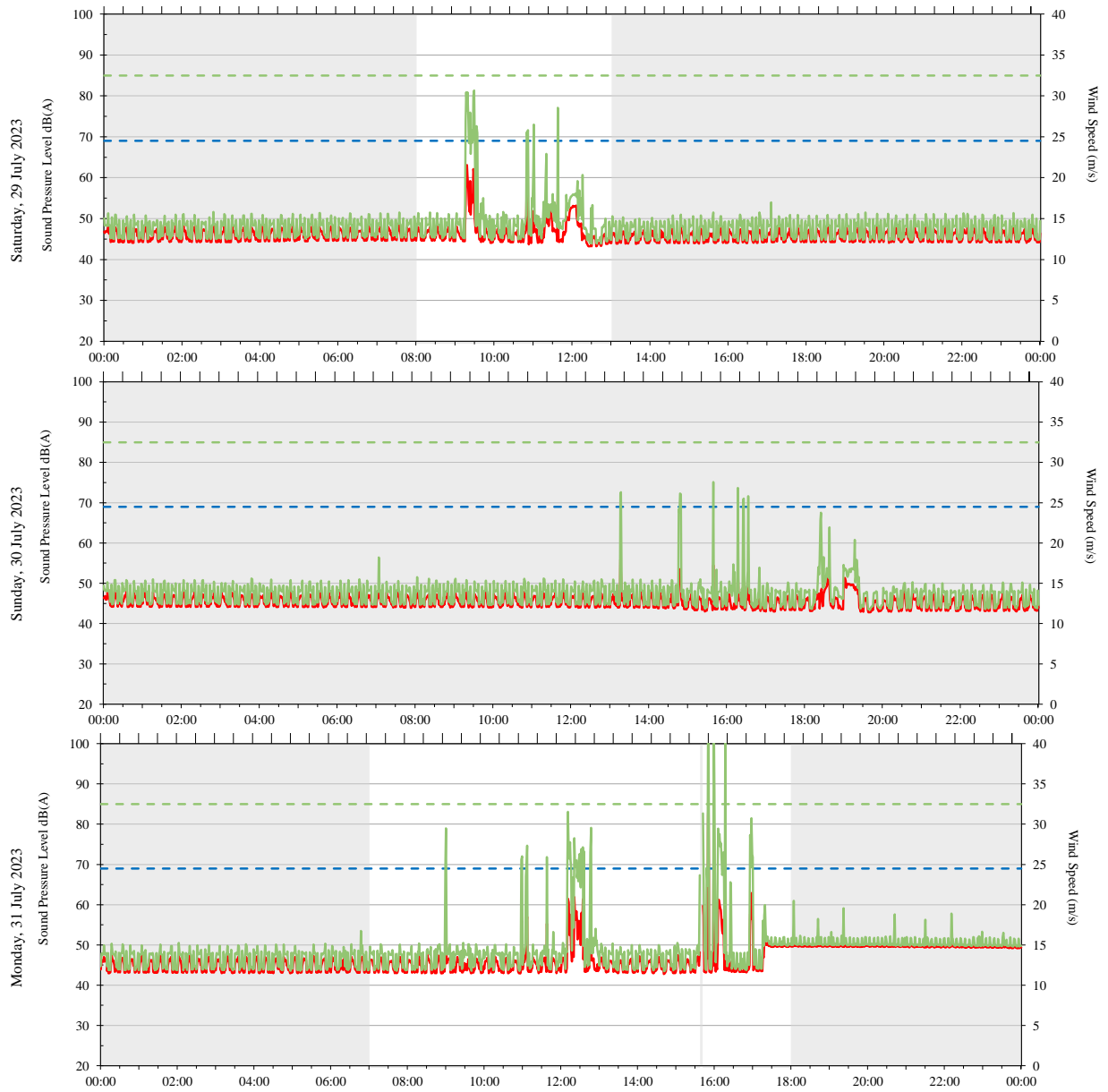
# Unattended monitoring: Clean prep room (Westmead 4) (Internal)

ARUP



Unattended monitoring: Clean prep room (Westmead 4) (Internal)

ARUP





**Health Infrastructure**

# **Children's Hospital Westmead**

**Vibration Monitoring - KR - Gait Lab -  
July 2023**

CVM/ KR/202307

Issue 1 | 08/08/2023

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 271985

Arup Pty Ltd ABN 18 000 966 165

**Arup Pty Ltd**

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## Document Verification

**Project title** Children's Hospital Westmead  
**Document title** Monthly Vibration Monitoring Report  
**Job number** 271985  
**Document ref** CVM/KR/202307  
**File reference** -

Revision	Date	Filename	
		Westmead Hospital – 103156 KR - Gait Lab - Summary of Recent Vibration Measurements (01-07 to 31-07).docx	
Issue 1	08/08/2023	Description	Issue

	Prepared by	Checked by	Approved by
<b>Name</b>	PR	MJW	MJW
<b>Signature</b>			

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Description	

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<b>Name</b>			
<b>Signature</b>			

Issue Document Verification with Document

# Contents

---

Executive Summary.....	3
<b>1.</b> Introduction .....	5
<b>2.</b> Monitor Location .....	5
<b>3.</b> Recorded Data .....	6
Appendix A: Calibration Certificates.....	9

# Executive Summary

This report summarises the vibration monitoring data recorded at KR - Gait Lab, over one month – from 01/07/2023 to 31/07/2023. Graphs in this report show the recorded data in blue, and exceedance trigger levels in red.

## RMSV Vibration Levels

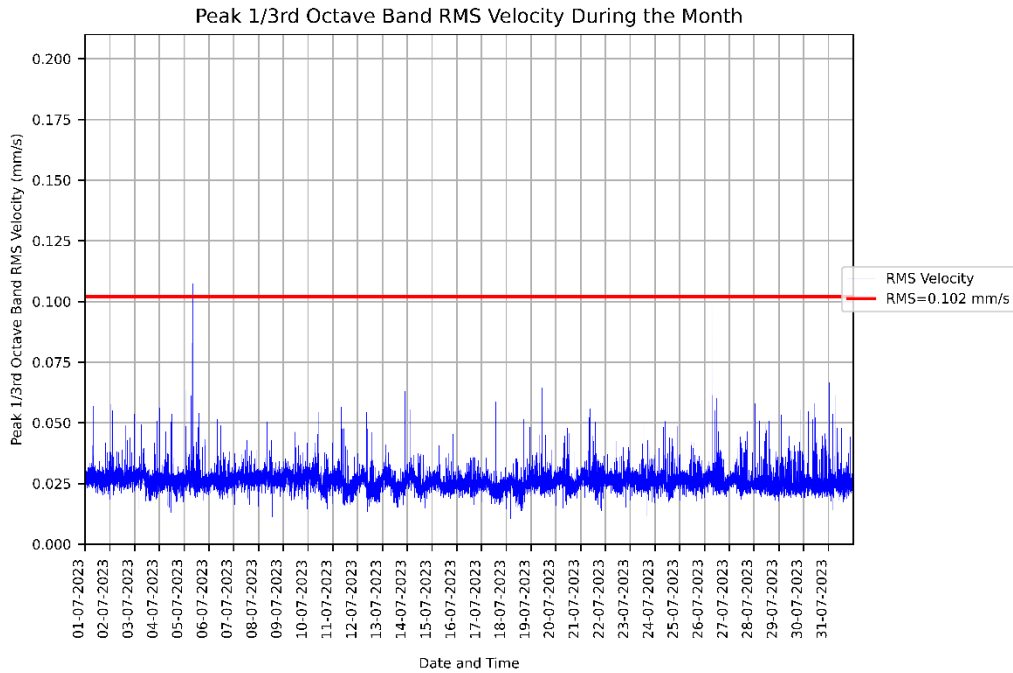


Figure 1: Measured RMSV vibration levels for 01/07/2023 to 31/07/2023 at the KR - Gait Lab.

The table below summarises the number of Root-Mean-Square Velocity (RMSV) limit exceedances recorded during and outside of construction hours.

During Construction Hours	Outside of Construction Hours
2	0

## PPV Vibration Levels

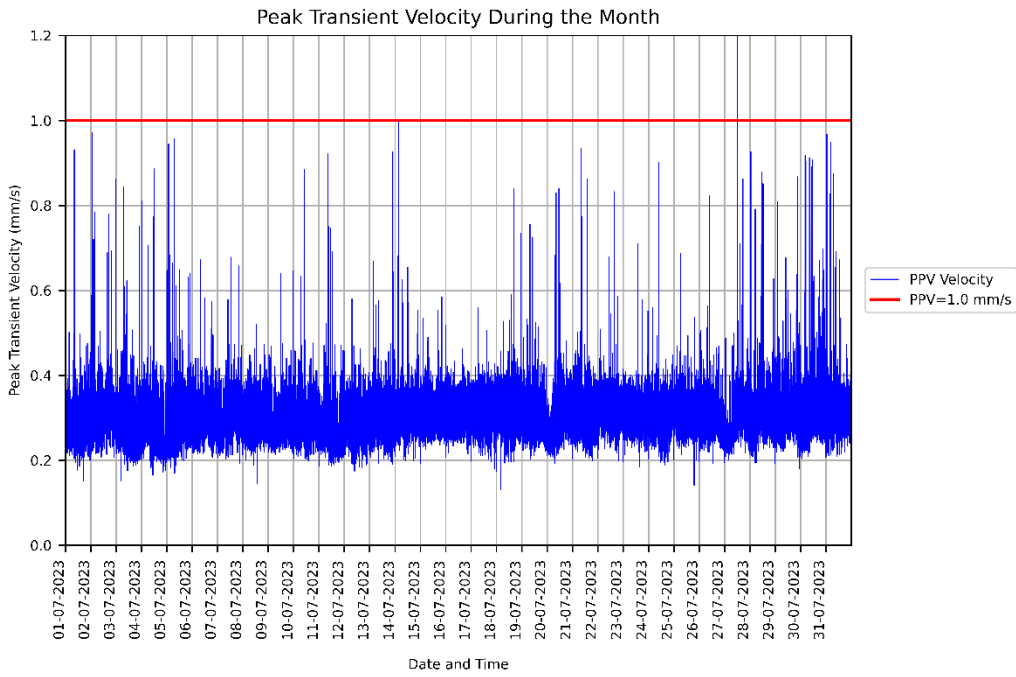


Figure 2: Measured vibration levels for 01/07/2023 to 31/07/2023 at the KR - Gait Lab.

The table below summarises the number of Peak Particle Velocity (PPV) limit exceedances recorded during and outside of construction hours.

During Construction Hours	Outside of Construction Hours
1	1

## 1. Introduction

---

Arup has been commissioned by PricewaterhouseCoopers (PwC) on behalf of NSW Health Infrastructure to monitor vibration levels in facilities adjacent to the Forecourt development sites to ensure facility operations are not excessively impacted by the construction works. This report summarises the vibration monitoring data recorded at KR - Gait Lab during the period of the 01/07/2023 to 31/07/2023.

For the purposes of reporting, construction works are considered to be occurring at the following times:

Day	Construction Hours
Monday to Friday	7:00am to 6:00pm
Saturday	8:00am to 1:00pm
Sunday	No works
Public Holidays	No works

## 2. Monitor Location

---

The location of this monitor is shown below in Figure 3Figure .

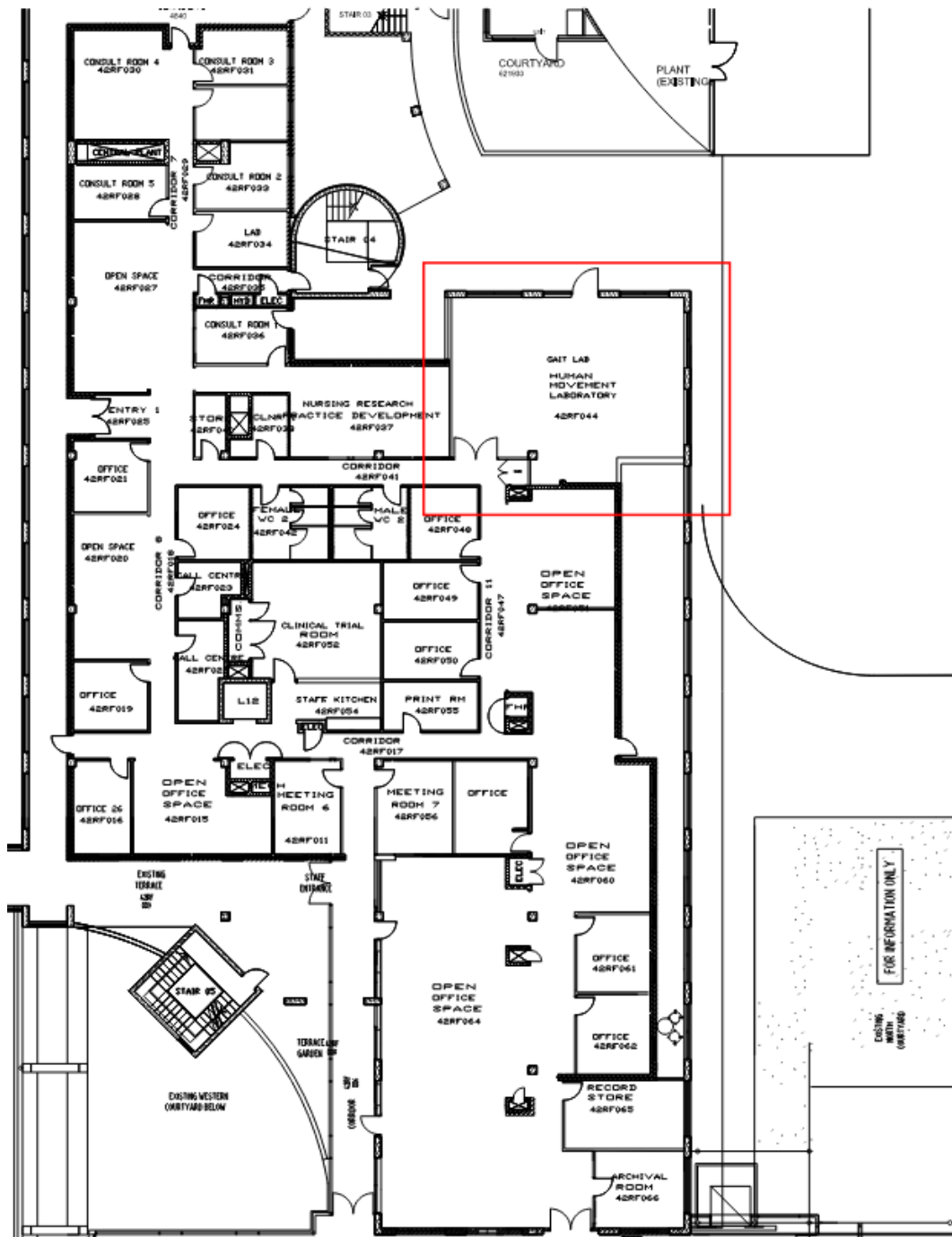


Figure 3: KR - Gait Lab vibration monitor location

Monitoring at this location utilises a GeoSIG GMSplus with a GeoSIG VE-11 geophone. The calibration certificate for the geophone is included in Appendix A.

### 3. Recorded Data

Figure 4 below shows the vibration levels (RMS velocity) recorded between 01/07/2023 and 31/07/2023. The recorded data is shown in blue, while the limit of 0.102mm/s ( $V_{RMS}$ ) is shown in red.

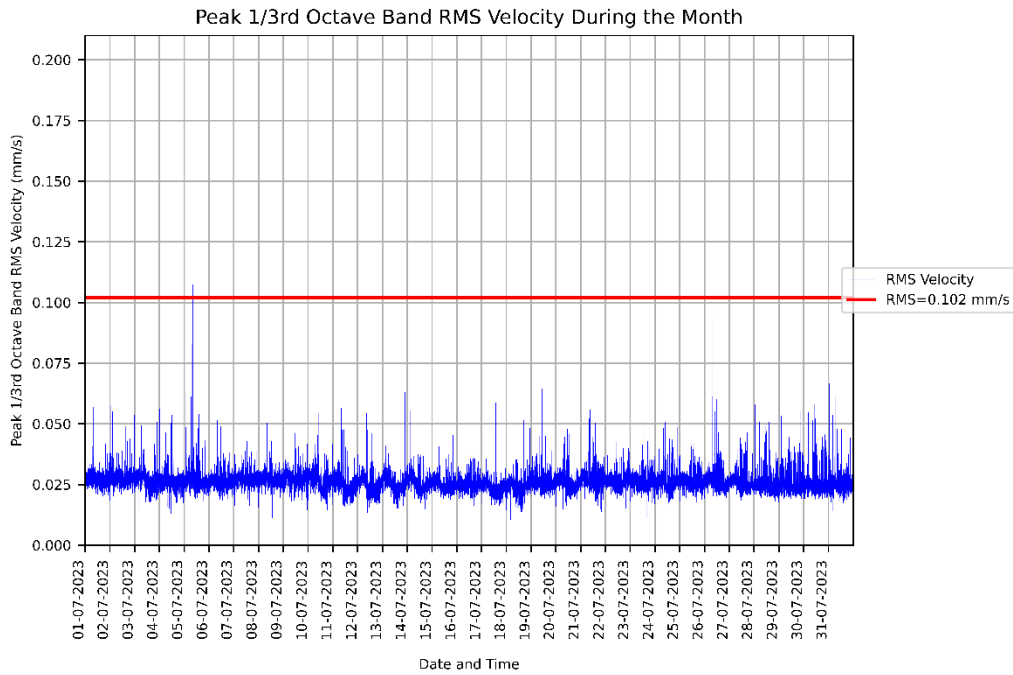


Figure 4: Measured RMSV vibration levels for 01/07/2023 to 31/07/2023 at the KR - Gait Lab.

The table below summarises the number of RMS Velocity limit exceedances recorded during and outside of construction hours.

During Construction Hours	Outside of Construction Hours
2	0

Figure 5 below shows the peak particle vibration levels (PPV velocity) recorded between 01/07/2023 and 31/07/2023. The recorded data is shown in blue, while the limit of 1.0mm/s ( $V_{PPV}$ ) is shown in red.

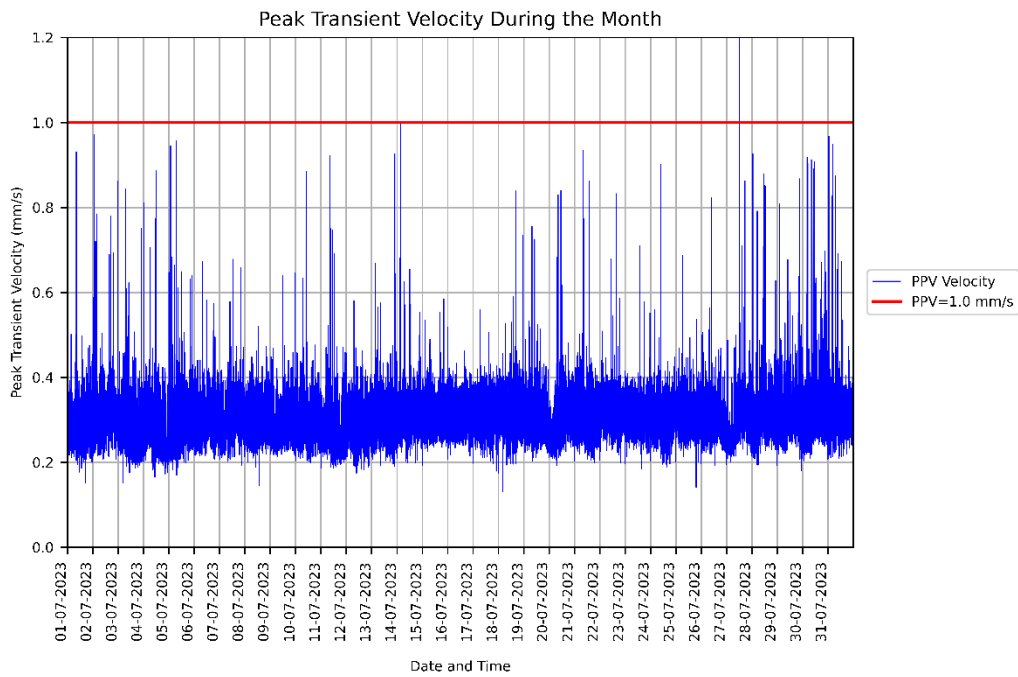


Figure 5: Measured PPV vibration levels for 01/07/2023 to 31/07/2023 at the KR - Gait Lab.

The table below summarises the number of PPV limit exceedances recorded during and outside of construction hours.

During Construction Hours	Outside of Construction Hours
1	1



## Appendix A: Calibration Certificates

### CERTIFICATE OF CALIBRATION

**CERTIFICATE No: G30982**

**EQUIPMENT TESTED :** Geophone

**Manufacturer:** GeoSIG  
**Geophone Type:** VE-11 **Serial No:** 55908

**Owner:** Arup Services Pty Ltd  
 Barrack Place, Level 5, 151 Clarence Street  
 Sydney NSW 2000

**Tests Performed:** Frequency Response, Linearity & Sensitivity at Selected Frequencies  
**Comments:** Detailed overleaf.

**CONDITION OF TEST:**


<b>Temperature</b>	23 °C ±1° C	<b>Date of Receipt :</b>	25/10/2021
<b>Relative Humidity</b>	44 % ±5%	<b>Date of Calibration :</b>	01/11/2021
		<b>Date of Issue :</b>	01/11/2021

**Acu-Vib Test Procedure:** AVP15 (Low Frequency Transducer, Geophone) based on AS2187.2 & DIN45669-1

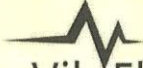
**CHECKED BY:** \_\_\_\_\_ **AUTHORISED SIGNATURE:** \_\_\_\_\_  
*Hein Soc*

Accredited for compliance with ISO/IEC 17025 - Calibration  
 Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

This report applies only to the item identified in the report and may not be reproduced in part.  
 The uncertainties quoted are calculated in accordance with the methods of the ISO Guide to the Uncertainty of Measurement and quoted at a coverage factor of 2 with a confidence interval of approximately 95%.



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Acoustic and Vibration Measurements



**Acu-Vib Electronics**  
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Head Office & Calibration Laboratory  
Unit 14, 22 Hudson Ave. Castle Hill NSW 2154  
(02) 9680 8133  
www.acu-vib.com.au

Page 1 of 2 Calibration Certificate  
AVCERT15 Rev.2.0 14.04.2021

Frequency response and linearity characteristics for  
GeoSIG Velocity Geophone **VE-11** Serial No. **55908**  
Constant velocity of 10 mm/sec Peak applied for response  
(Except at 200.0 Hz where applied level limited to 1.0 mm/s peak)  
For amplitude linearity applied level varied at 15.92 Hz

12VDC Power Supply

Geophone Orientation.: Vertical

Frequency		Velocity mm/sec Peak	Indicated Sensitivity $\text{mV/mm s}^{-1}$ Vertical Sensitivity	Expanded uncertainty $U_{95} \%$
Hz	Radians/sec			
3.00	18.85	10.0	110.73	1.00%
4.00	25.13	10.0	110.65	0.90%
6.00	37.70	10.0	107.04	0.90%
10.00	62.83	10.0	101.63	0.90%
15.00	94.25	10.0	99.12	0.90%
15.92	94.25	1.0	N/A	0.90%
15.92	94.25	5.0	93.34	0.90%
<b>15.92</b>	<b>94.25</b>	<b>10.0</b>	<b>93.15</b>	<b>0.90%</b>
15.92	94.25	50.0	93.10	0.90%
15.92	94.25	100	N/A	0.50%
30.00	188.50	10.0	97.57	0.50%
60.00	376.99	10.0	98.58	0.50%
120.00	753.98	10.0	110.55	0.50%
150.00	942.48	10.0	125.20	0.50%
Hz	Radians/sec	Velocity mm/sec Peak	Vertical Sensitivity	$U_{95} \%$

**Note1:**

The laboratory has accreditation under ISO/IEC 17025 from NATA for calibration to ISO 16063-21 at frequencies from 0.5 Hz. Measurements at all frequencies and levels shown in the table above are made using reference equipment traceably calibrated to Australian National Standards.

**Note2:**

The uncertainties quoted are estimated at a confidence level of 95% and a coverage factor of  $k=2$  applies unless otherwise stated.



**Health Infrastructure**

# **Children's Hospital Westmead**

**Vibration Monitoring - WIMR - BSF  
Mice Holding Room - Floor - July 2023**

CVM/ WIMR/202307

Issue 1 | 08/08/2023

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 271985

Arup Pty Ltd ABN 18 000 966 165

**Arup Pty Ltd**

Level 5

151 Clarence Street

Sydney NSW 2000

Australia

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## Document Verification

**Project title** Children's Hospital Westmead  
**Document title** Monthly Vibration Monitoring Report  
**Job number** 271985  
**Document ref** CVM/WIMR/202307  
**File reference** -

Revision	Date	Filename
		Westmead Hospital – 103158 WIMR - BSF Mice Holding Room - Floor - Summary of Recent Vibration Measurements (01-07 to 31-07).docx

Issue 1 08/08/2023 **Description** Issue

	Prepared by	Checked by	Approved by
<b>Name</b>	PR	MJW	MJW
<b>Signature</b>			

Filename
Description

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<b>Name</b>			
<b>Signature</b>			

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Description

	Prepared by	Checked by	Approved by
<b>Name</b>			
<b>Signature</b>			

Issue Document Verification with Document

# Contents

---

Executive Summary.....	3
<b>1.</b> Introduction .....	5
<b>2.</b> Monitor Location .....	5
<b>3.</b> Recorded Data .....	6
Appendix A: Calibration Certificates.....	8

# Executive Summary

This report summarises the vibration monitoring data recorded at WIMR - BSF Mice Holding Room - Floor, over one month – from 01/07/2023 to 31/07/2023. Graphs in this report show the recorded data in blue, and exceedance trigger levels in red.

## RMSV Vibration Levels

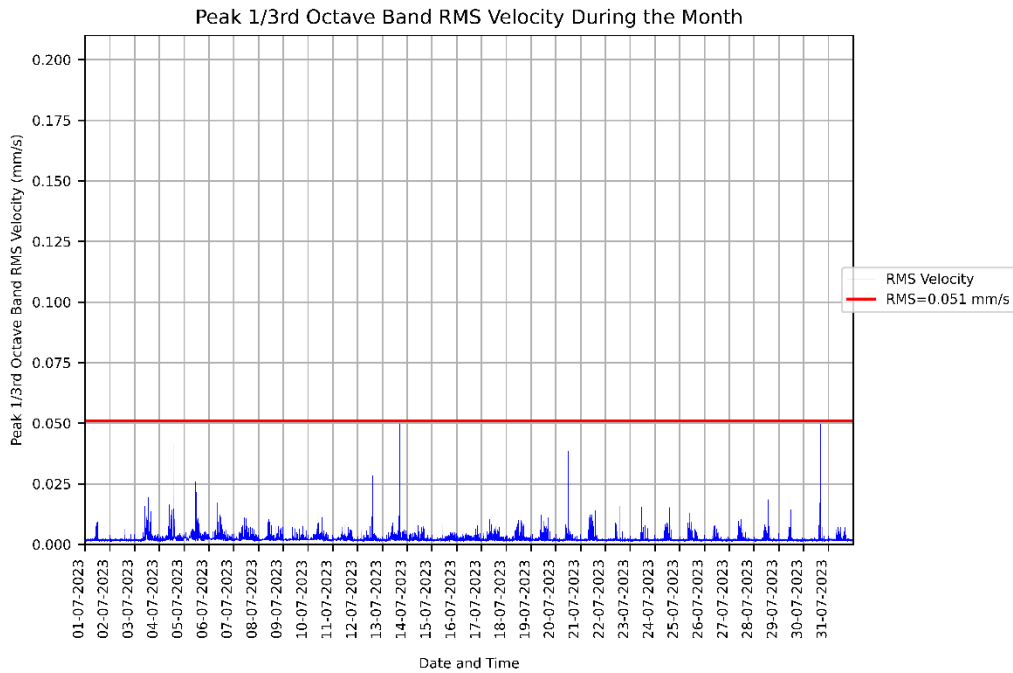


Figure 1: Measured RMSV vibration levels for 01/07/2023 to 31/07/2023 at the WIMR - BSF Mice Holding Room - Floor.

The table below summarises the number of Root-Mean-Square Velocity (RMSV) limit exceedances recorded during and outside of construction hours.

During Construction Hours	Outside of Construction Hours
0	0

## PPV Vibration Levels

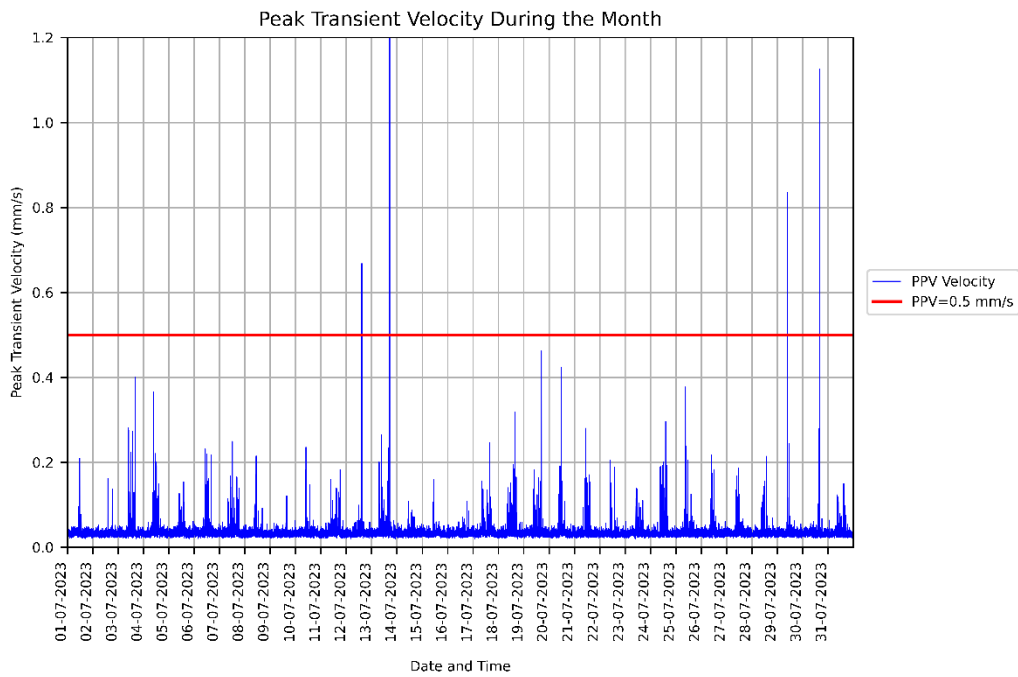


Figure 2: Measured vibration levels for 01/07/2023 to 31/07/2023 at the WIMR - BSF Mice Holding Room - Floor.

The table below summarises the number of Peak Particle Velocity (PPV) limit exceedances recorded during and outside of construction hours.

During Construction Hours	Outside of Construction Hours
3	1

# 1. Introduction

Arup has been commissioned by PricewaterhouseCoopers (PwC) on behalf of NSW Health Infrastructure to monitor vibration levels in facilities adjacent to the VVMF development sites to ensure facility operations are not excessively impacted by the construction works. This report summarises the vibration monitoring data recorded at WIMR - BSF Mice Holding Room - Floor during the period of the 01/07/2023 to 31/07/2023.

For the purposes of reporting, construction works are considered to be occurring at the following times:

Day	Construction Hours
Monday to Friday	7:00am to 6:00pm
Saturday	8:00am to 1:00pm
Sunday	No works
Public Holidays	No works

# 2. Monitor Location

The location of this monitor is shown below in Figure 3 Figure .

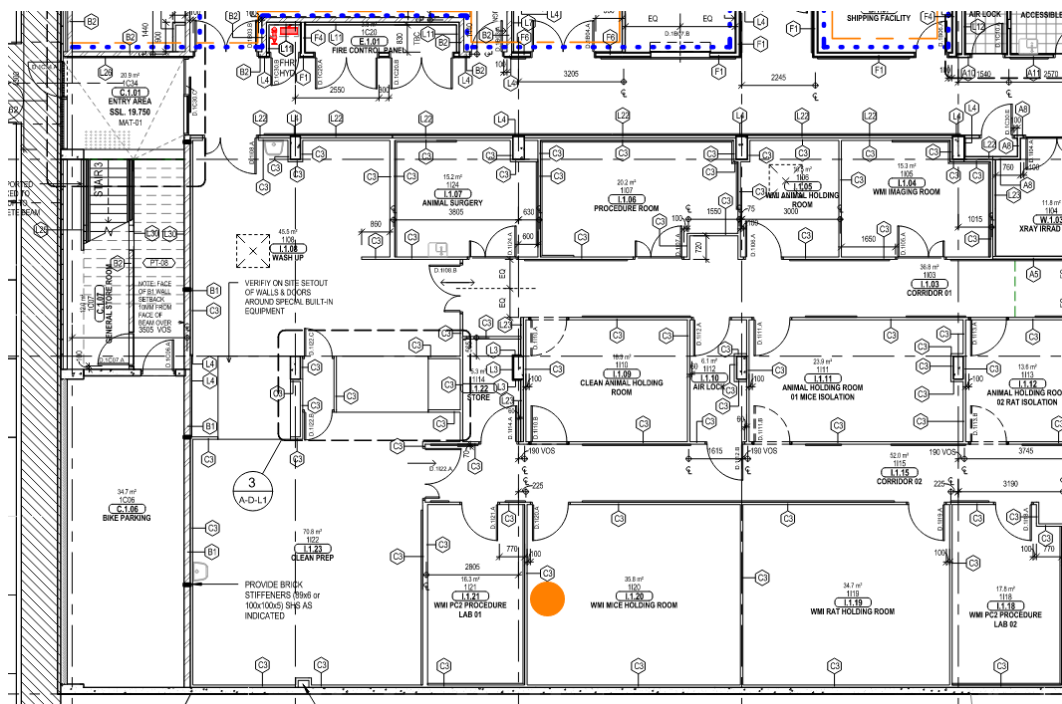


Figure 3: WIMR - BSF Mice Holding Room - Floor vibration monitor location

Monitoring at this location utilises a GeoSIG GMSplus with a GeoSIG VE-11 geophone. The calibration certificate for the geophone is included in Appendix A.



### 3. Recorded Data

Figure 4 below shows the vibration levels (RMS velocity) recorded between 01/07/2023 and 31/07/2023. The recorded data is shown in blue, while the limit of 0.051mm/s ( $V_{RMS}$ ) is shown in red.

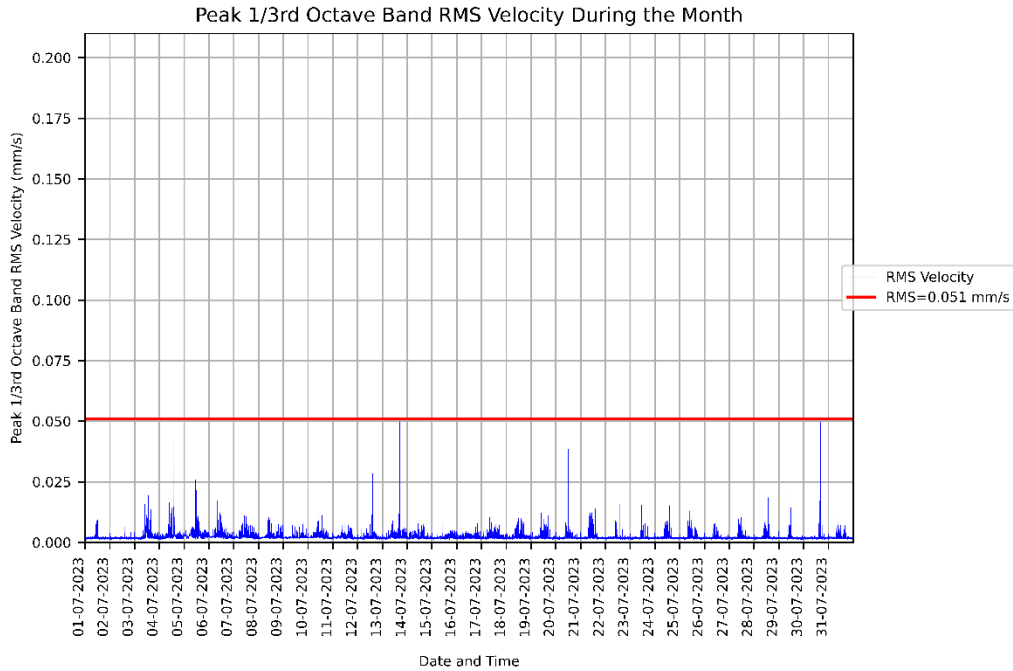


Figure 4: Measured RMSV vibration levels for 01/07/2023 to 31/07/2023 at the WIMR - BSF Mice Holding Room - Floor.

The table below summarises the number of RMS Velocity limit exceedances recorded during and outside of construction hours.

During Construction Hours	Outside of Construction Hours
0	0

Figure 5 below shows the peak particle vibration levels (PPV velocity) recorded between 01/07/2023 and 31/07/2023. The recorded data is shown in blue, while the limit of 0.5mm/s ( $V_{PPV}$ ) is shown in red.

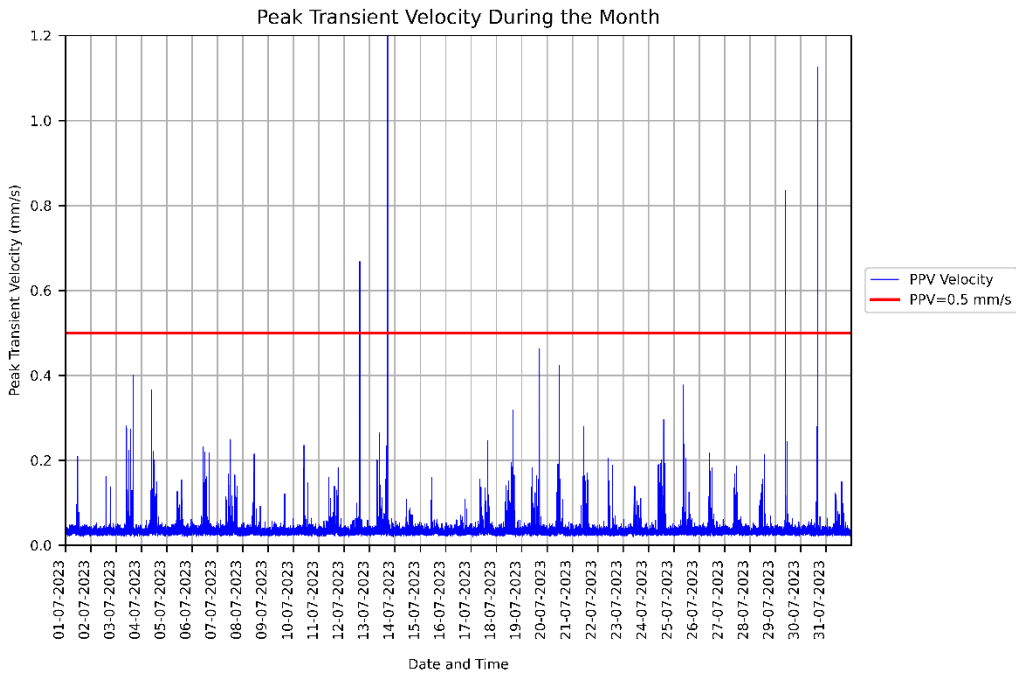


Figure 5: Measured PPV vibration levels for 01/07/2023 to 31/07/2023 at the WIMR - BSF Mice Holding Room - Floor.

The table below summarises the number of PPV limit exceedances recorded during and outside of construction hours.

During Construction Hours	Outside of Construction Hours
3	1



Frequency response and linearity characteristics for  
GeoSIG Velocity Geophone **VE-11** Serial No. **55911**  
Constant velocity of 10 mm/sec Peak applied for response  
(Except at 200.0 Hz where applied level limited to 1.0 mm/s peak)  
For amplitude linearity applied level varied at 15.92 Hz

12VDC Power Supply

Geophone Orientation.: Vertical

Frequency		Velocity mm/sec Peak	Indicated Sensitivity $\text{mV}/\text{mms}^{-1}$	Expanded uncertainty
Hz	Radians/sec		Vertical Sensitivity	$U_{95}$ %
3.00	18.85	10.0	112.66	1.00%
4.00	25.13	10.0	112.97	0.90%
6.00	37.70	10.0	108.80	0.90%
10.00	62.83	10.0	101.91	0.90%
15.00	94.25	10.0	98.58	0.90%
15.92	94.25	1.0	N/A	0.90%
15.92	94.25	5.0	92.57	0.90%
<b>15.92</b>	<b>94.25</b>	<b>10.0</b>	<b>92.49</b>	<b>0.90%</b>
15.92	94.25	50.0	92.48	0.90%
15.92	94.25	100	N/A	0.50%
30.00	188.50	10.0	95.98	0.50%
60.00	376.99	10.0	96.13	0.50%
120.00	753.98	10.0	106.11	0.50%
150.00	942.48	10.0	116.46	0.50%
Hz	Radians/sec	Velocity mm/sec Peak	Vertical Sensitivity	$U_{95}$ %

**Note1:**

The laboratory has accreditation under ISO/IEC 17025 from NATA for calibration to ISO 16063-21 at frequencies from 0.5 Hz. Measurements at all frequencies and levels shown in the table above are made using reference equipment traceably calibrated to Australian National Standards.

**Note2:** The uncertainties quoted are estimated at a confidence level of 95% and a coverage factor of  $k=2$  applies unless otherwise stated.



**Health Infrastructure**

# **Children's Hospital Westmead**

**Vibration Monitoring - CMRI Animal  
Holding Facility - July 2023**

CVM/ CMRI/202307

Issue 1 | 08/08/2023

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 271985

Arup Pty Ltd ABN 18 000 966 165

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## Document Verification

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**Document title** Monthly Vibration Monitoring Report  
**Job number** 271985  
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**File reference** -

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<b>Name</b>	PR	MJW	MJW
<b>Signature</b>			

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<b>Name</b>			
<b>Signature</b>			

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<b>Name</b>			
<b>Signature</b>			

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# Contents

---

Executive Summary.....	3
<b>1.</b> Introduction .....	5
<b>2.</b> Monitor Location .....	5
<b>3.</b> Recorded Data .....	6
Appendix A: Calibration Certificates.....	9

# Executive Summary

This report summarises the vibration monitoring data recorded at CMRI Animal Holding Facility, over one month – from 01/07/2023 to 31/07/2023. Graphs in this report show the recorded data in blue, and exceedance trigger levels in red.

## RMSV Vibration Levels

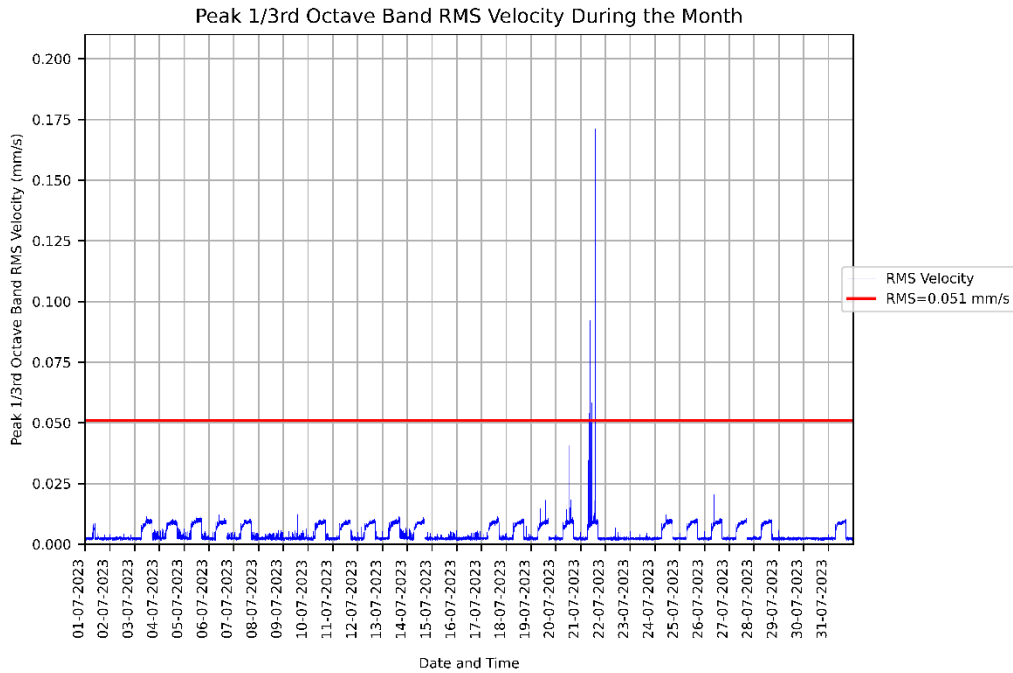


Figure 1: Measured RMSV vibration levels for 01/07/2023 to 31/07/2023 at the CMRI Animal Holding Facility.

The table below summarises the number of Root-Mean-Square Velocity (RMSV) limit exceedances recorded during and outside of construction hours.

During Construction Hours	Outside of Construction Hours
9	0

## PPV Vibration Levels



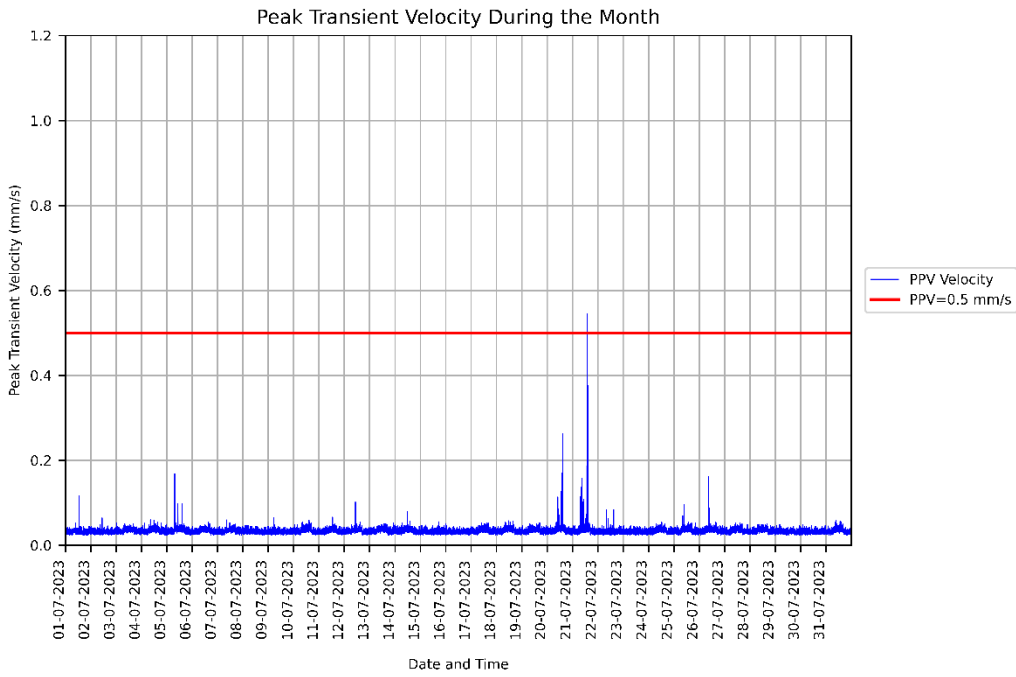


Figure 2: Measured vibration levels for 01/07/2023 to 31/07/2023 at the CMRI Animal Holding Facility.

The table below summarises the number of Peak Particle Velocity (PPV) limit exceedances recorded during and outside of construction hours.

During Construction Hours	Outside of Construction Hours
0	1

## 1. Introduction

---

Arup has been commissioned by PricewaterhouseCoopers (PwC) on behalf of NSW Health Infrastructure to monitor vibration levels in facilities adjacent to the Forecourt development sites to ensure facility operations are not excessively impacted by the construction works. This report summarises the vibration monitoring data recorded at CMRI Animal Holding Facility during the period of the 01/07/2023 to 31/07/2023.

For the purposes of reporting, construction works are considered to be occurring at the following times:

Day	Construction Hours
Monday to Friday	7:00am to 6:00pm
Saturday	8:00am to 1:00pm
Sunday	No works
Public Holidays	No works

## 2. Monitor Location

---

The location of this monitor is shown below in Figure 3Figure .



Figure 3: CMRI Animal Holding Facility vibration monitor location

Monitoring at this location utilises a GeoSIG GMSplus with a GeoSIG VE-11 geophone. The calibration certificate for the geophone is included in Appendix A.

### 3. Recorded Data

---

Figure 4 below shows the vibration levels (RMS velocity) recorded between 01/07/2023 and 31/07/2023. The recorded data is shown in blue, while the limit of 0.051mm/s ( $V_{RMS}$ ) is shown in red.

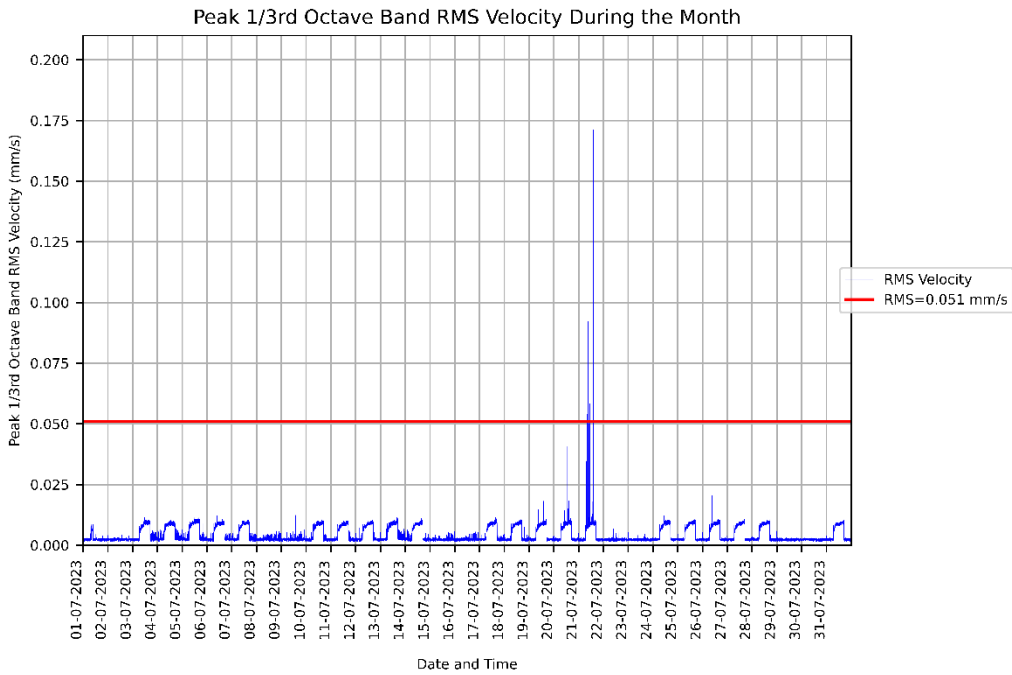


Figure 4: Measured RMSV vibration levels for 01/07/2023 to 31/07/2023 at the CMRI Animal Holding Facility.

The table below summarises the number of RMS Velocity limit exceedances recorded during and outside of construction hours.

During Construction Hours	Outside of Construction Hours
9	0

Figure 5 below shows the peak particle vibration levels (PPV velocity) recorded between 01/07/2023 and 31/07/2023. The recorded data is shown in blue, while the limit of 0.5mm/s ( $V_{PPV}$ ) is shown in red.

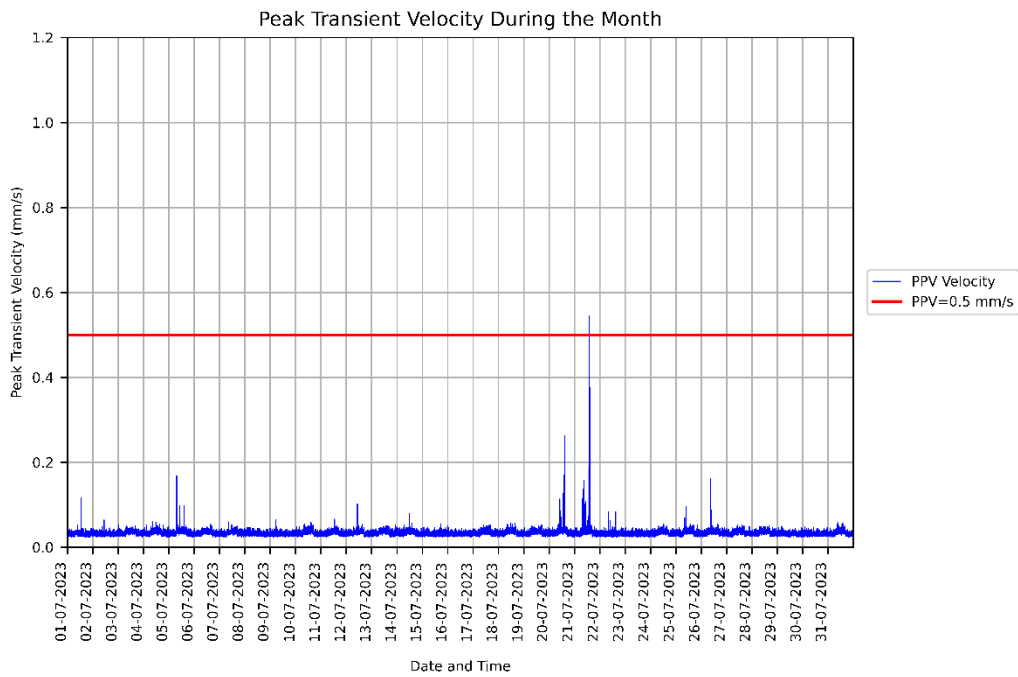
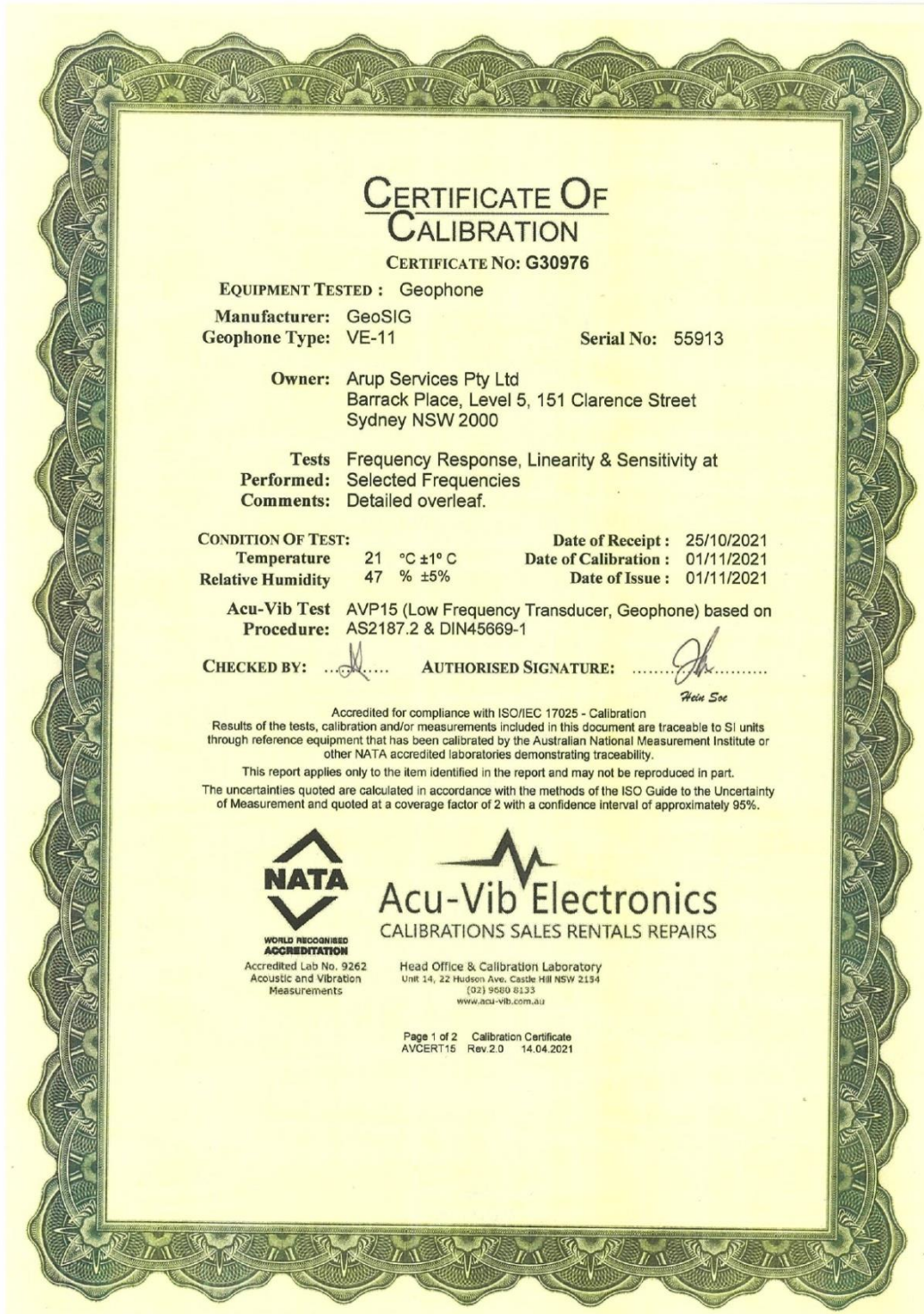


Figure 5: Measured PPV vibration levels for 01/07/2023 to 31/07/2023 at the CMRI Animal Holding Facility.

The table below summarises the number of PPV limit exceedances recorded during and outside of construction hours.

During Construction Hours	Outside of Construction Hours
0	1

# Appendix A: Calibration Certificates



Frequency response and linearity characteristics for  
GeoSIG Velocity Geophone **VE-11** Serial No. **55913**  
Constant velocity of 10 mm/sec Peak applied for response  
(Except at 200.0 Hz where applied level limited to 1.0 mm/s peak)  
For amplitude linearity applied level varied at 15.92 Hz

12VDC Power Supply

Geophone Orientation.: Vertical

Frequency		Velocity mm/sec Peak	Indicated Sensitivity mV/mms <sup>-1</sup> Vertical Sensitivity	Expanded uncertainty U <sub>95</sub> %
Hz	Radians/sec			
3.00	18.85	10.0	106.24	1.00%
4.00	25.13	10.0	105.59	0.90%
6.00	37.70	10.0	100.69	0.90%
10.00	62.83	10.0	94.25	0.90%
15.00	94.25	10.0	91.31	0.90%
15.92	94.25	1.0	N/A	0.90%
15.92	94.25	5.0	85.93	0.90%
<b>15.92</b>	<b>94.25</b>	<b>10.0</b>	<b>85.77</b>	<b>0.90%</b>
15.92	94.25	50.0	85.76	0.90%
15.92	94.25	100	N/A	0.50%
30.00	188.50	10.0	89.27	0.50%
60.00	376.99	10.0	90.17	0.50%
120.00	753.98	10.0	100.67	0.50%
150.00	942.48	10.0	115.82	0.50%
Hz	Radians/sec	Velocity mm/sec Peak	Vertical Sensitivity	U <sub>95</sub> %

**Note1:**

The laboratory has accreditation under ISO/IEC 17025 from NATA for calibration to ISO 16063-21 at frequencies from 0.5 Hz. Measurements at all frequencies and levels shown in the table above are made using reference equipment traceably calibrated to Australian National Standards.

**Note2:**

The uncertainties quoted are estimated at a confidence level of 95% and a coverage factor of k=2 applies unless otherwise stated.



**Health Infrastructure**

# **Children's Hospital Westmead**

**Vibration Monitoring - WIMR - BSF  
Mice Holding Room - Rack - July 2023**

CVM/ WIMR/202307

Issue 1 | 08/08/2023

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 271985

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## Document Verification

**Project title** Children's Hospital Westmead  
**Document title** Monthly Vibration Monitoring Report  
**Job number** 271985  
**Document ref** CVM/WIMR/202307  
**File reference** -

Revision	Date	Filename
		Westmead Hospital – 103678 WIMR - BSF Mice Holding Room - Rack - Summary of Recent Vibration Measurements (01-07 to 31-07).docx

Issue 1 08/08/2023 **Description** Issue

	Prepared by	Checked by	Approved by
<b>Name</b>	PR	MJW	MJW
<b>Signature</b>			

**Filename**  
**Description**

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<b>Name</b>			
<b>Signature</b>			

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<b>Name</b>			
<b>Signature</b>			

Issue Document Verification with Document

# Contents

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Executive Summary.....	3
<b>1.</b> Introduction .....	5
<b>2.</b> Monitor Location .....	5
<b>3.</b> Recorded Data .....	6
Appendix A: Calibration Certificates.....	8

# Executive Summary

This report summarises the vibration monitoring data recorded at WIMR - BSF Mice Holding Room - Rack, over one month – from 01/07/2023 to 31/07/2023. Graphs in this report show the recorded data in blue, and exceedance trigger levels in red.

## RMSV Vibration Levels

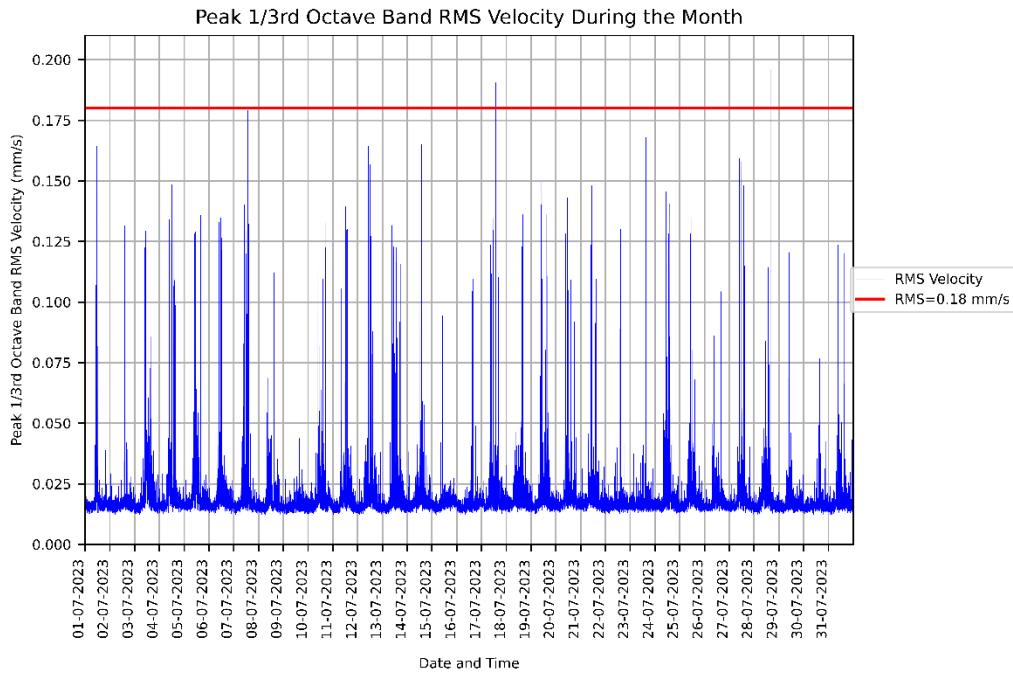


Figure 1: Measured RMSV vibration levels for 01/07/2023 to 31/07/2023 at the WIMR - BSF Mice Holding Room - Rack.

The table below summarises the number of Root-Mean-Square Velocity (RMSV) limit exceedances recorded during and outside of construction hours.

During Construction Hours	Outside of Construction Hours
2	0

## PPV Vibration Levels

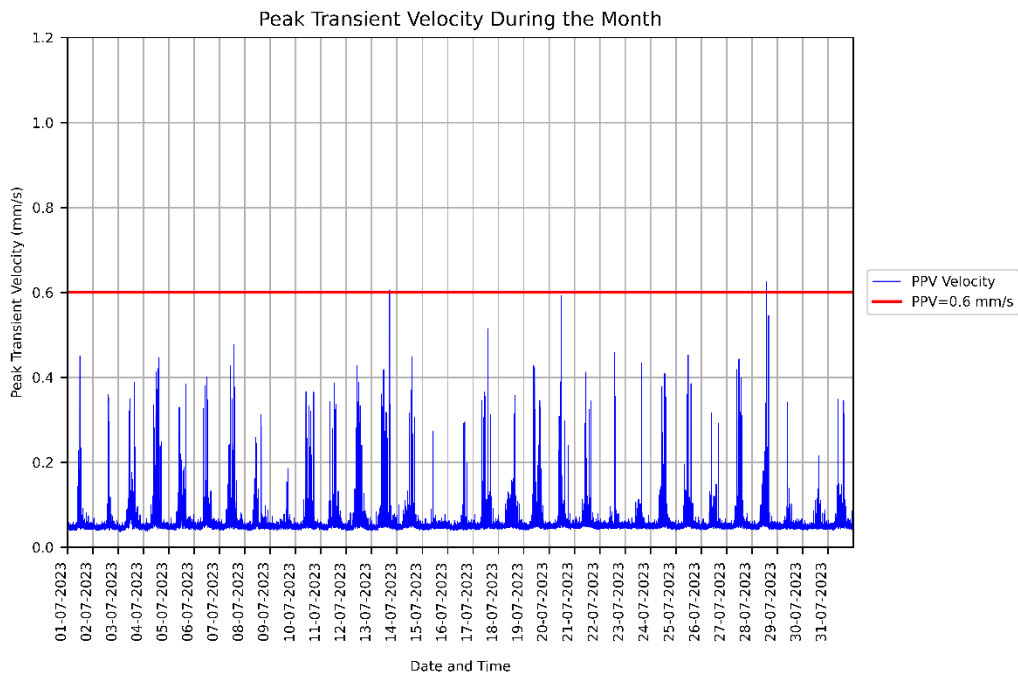


Figure 2: Measured vibration levels for 01/07/2023 to 31/07/2023 at the WIMR - BSF Mice Holding Room - Rack.

The table below summarises the number of Peak Particle Velocity (PPV) limit exceedances recorded during and outside of construction hours.

During Construction Hours	Outside of Construction Hours
0	2

# 1. Introduction

Arup has been commissioned by PricewaterhouseCoopers (PwC) on behalf of NSW Health Infrastructure to monitor vibration levels in facilities adjacent to the VVMF Innovation Centre development sites to ensure facility operations are not excessively impacted by the construction works. This report summarises the vibration monitoring data recorded at WIMR - BSF Mice Holding Room - Rack during the period of the 01/07/2023 to 31/07/2023.

For the purposes of reporting, construction works are considered to be occurring at the following times:

Day	Construction Hours
Monday to Friday	7:00am to 6:00pm
Saturday	8:00am to 1:00pm
Sunday	No works
Public Holidays	No works

# 2. Monitor Location

The location of this monitor is shown below in Figure 3.

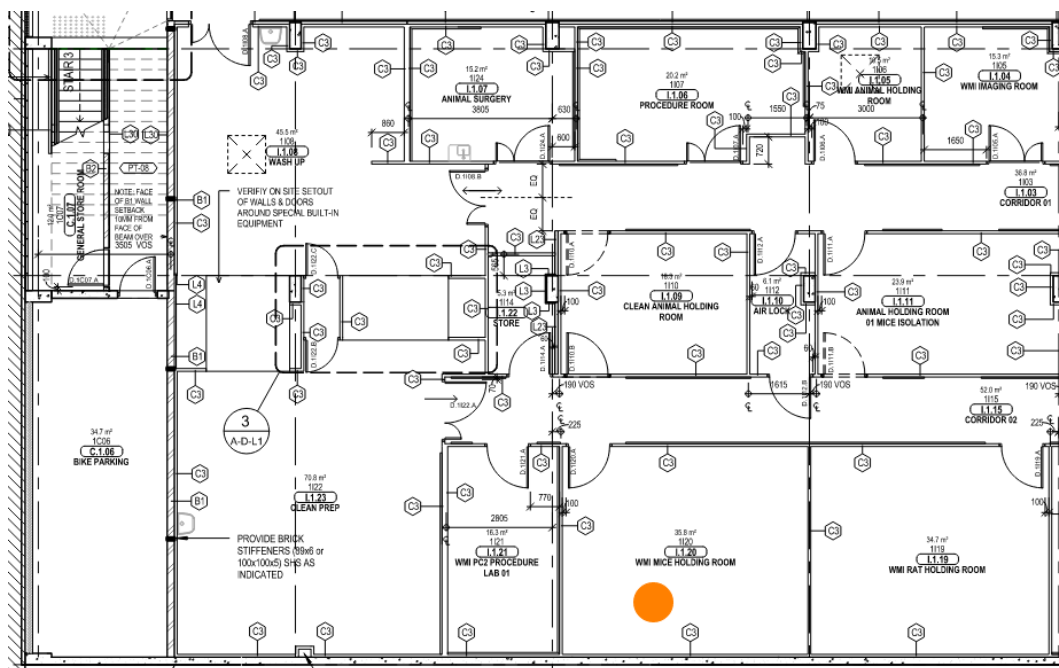


Figure 3: WIMR - BSF Mice Holding Room - Rack vibration monitor location

Monitoring at this location utilises a GeoSIG GMSplus with a GeoSIG VE-11 geophone. The calibration certificate for the geophone is included in Appendix A.

### 3. Recorded Data

Figure 4 below shows the vibration levels (RMS velocity) recorded between 01/07/2023 and 31/07/2023. The recorded data is shown in blue, while the limit of 0.18mm/s ( $V_{RMS}$ ) is shown in red.

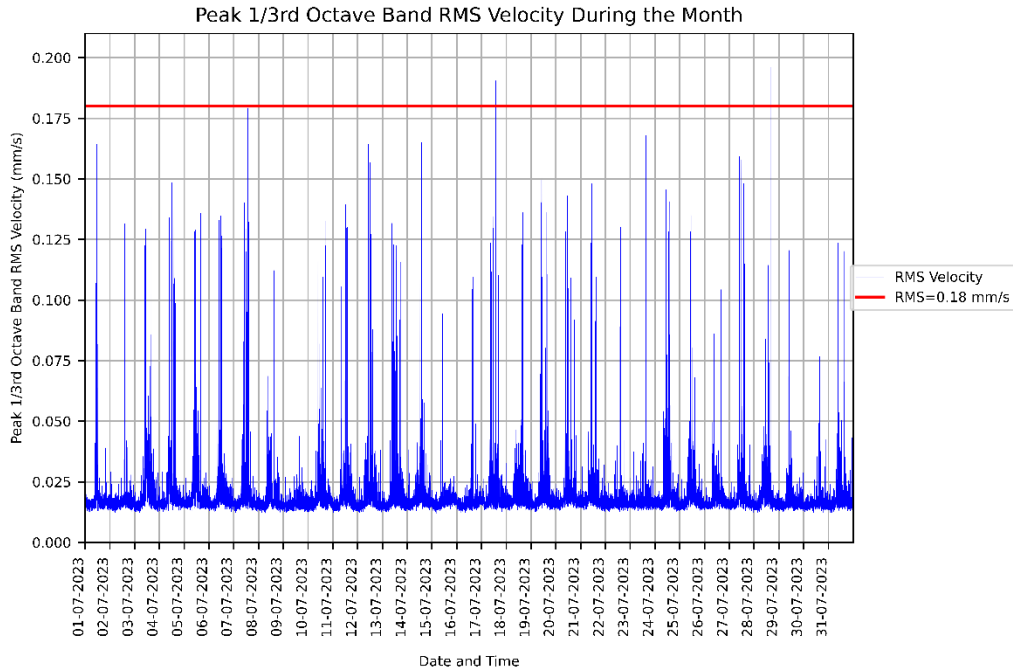


Figure 4: Measured RMSV vibration levels for 01/07/2023 to 31/07/2023 at the WIMR - BSF Mice Holding Room - Rack.

The table below summarises the number of RMS Velocity limit exceedances recorded during and outside of construction hours.

During Construction Hours	Outside of Construction Hours
2	0

Figure 5 below shows the peak particle vibration levels (PPV velocity) recorded between 01/07/2023 and 31/07/2023. The recorded data is shown in blue, while the limit of 0.6mm/s ( $V_{PPV}$ ) is shown in red.

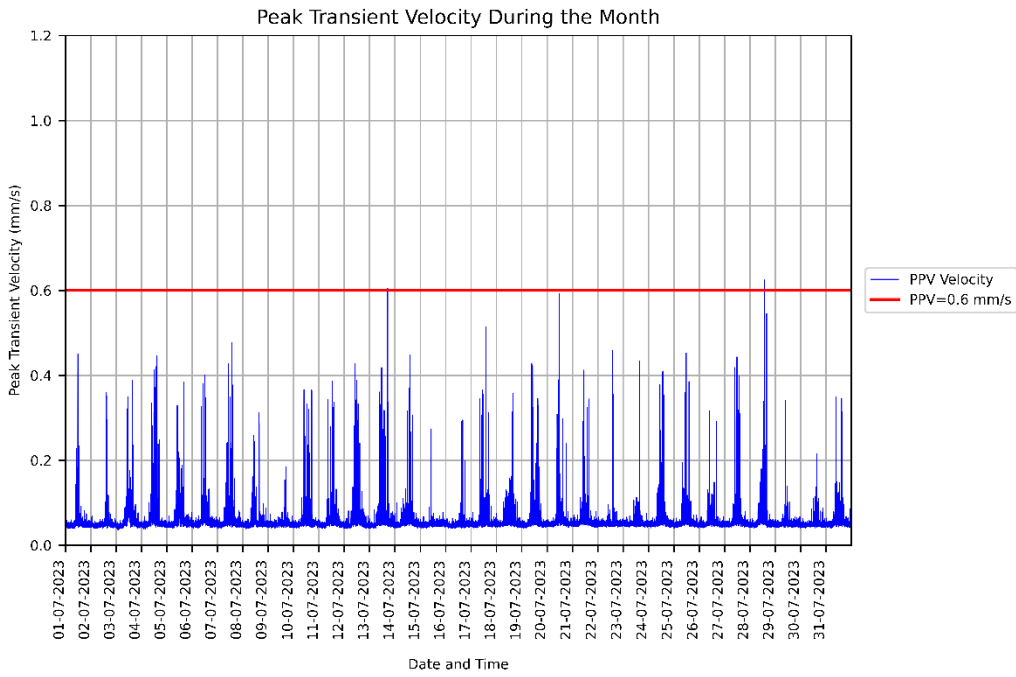


Figure 5: Measured PPV vibration levels for 01/07/2023 to 31/07/2023 at the WIMR - BSF Mice Holding Room - Rack.

The table below summarises the number of PPV limit exceedances recorded during and outside of construction hours.

During Construction Hours	Outside of Construction Hours
0	2

## Appendix A: Calibration Certificates

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**Test Record GMSplus**

<b>Test Record</b>	1	<b>Job</b>	31057
<b>S/N</b>	103677	<b>Test Procedure</b>	GS_GMSplus_TestProcedure_V01

<b>Customer</b>	AU_ARUP_Riddet	<b>Date</b>	01.02.2018
		<b>Tested by</b>	Ross Baradoy

<b>Model</b>	GMSplus	103677	<b>Option 1</b>		
<b>Type</b>	3Ch		<b>Option 2</b>		
<b>Description</b>	Recorder		<b>Option 3</b>		
<b>Main board</b>	GS_IA18_S-MN.V06.H2	160281	<b>Option 4</b>		
<b>Conn. board</b>	GS_IA18_S-MN.V06.H2	160305	<b>Option 5</b>		
<b>Input range</b>	± 10 V DIFF		<b>Option 6</b>		
<b>Sensor 1</b>	VE-11	56865	<b>Ext. Option 1</b>	GXX-3GUE	17738
<b>Sensor 2</b>	0		<b>Ext. Option 2</b>		
<b>Power</b>	15 VDC		<b>Ext. Option 3</b>		
<b>Armdas/Predas</b>	21.12.16		<b>MAC</b>	8C:8E:76:00:C2:01	
<b>Linux</b>	gms-linux-firmware-r121_20170321.gsfw		<b>DSP</b>	51.03.05	
			<b>RTC</b>	80.02.03	

**Remarks:**

**1. Test Equipment**

1.1. Test equipment is as per list and ready	<input checked="" type="checkbox"/> Ok
--	--

**2. Visual Check**

2.1. No defects found during visual check	<input checked="" type="checkbox"/> Ok
---	--

**3. Configuration**

3.1. Description	GMSplus GeoSIG Ltd
3.2. Memory	8 GB
3.3. Station	GSGMS
3.4. Location	Australia
3.5. Sampling rate	200 SPS
3.6. Units	mm/s
3.7. LSB value	0.0000132500000mm/s /count
3.8. Pre event	5 s
3.9. Post event	10 s
3.10. Trigger level	2 and 3 mm/s
3.11. Alarms Trigger level	n/a

**4. Sensor input test**

4.1. AC input test	<input checked="" type="checkbox"/> Ok
4.2. DC input test	<input checked="" type="checkbox"/> Ok
4.3. Noise test	<input checked="" type="checkbox"/> Ok

**5. Real sensor test**

5.1. Test pulse	<input checked="" type="checkbox"/> Ok	<input type="checkbox"/> n/a
5.2. Event X-Y-Z	<input checked="" type="checkbox"/> Ok	<input type="checkbox"/> n/a
5.3. Tilt	<input checked="" type="checkbox"/> Ok	<input type="checkbox"/> n/a
5.4. Over range	<input checked="" type="checkbox"/> Ok	<input type="checkbox"/> n/a

**6. Options testing**

6.1. GMS-Wi-Fi	<input type="checkbox"/> Ok	<input checked="" type="checkbox"/> n/a
6.2. GMS-GPS	<input type="checkbox"/> Ok	<input checked="" type="checkbox"/> n/a
6.3. GXX-3GUM	<input checked="" type="checkbox"/> Ok	<input type="checkbox"/> n/a
6.4. ALC, Config:	<input type="checkbox"/> Ok	<input checked="" type="checkbox"/> n/a
6.5. GMS-Interconnection	<input type="checkbox"/> Ok	<input checked="" type="checkbox"/> n/a
6.6. Serial modem	<input type="checkbox"/> Ok	<input checked="" type="checkbox"/> n/a
6.7. Ethernet modem	<input type="checkbox"/> Ok	<input checked="" type="checkbox"/> n/a
6.8. Sensor junction box	<input type="checkbox"/> Ok	<input checked="" type="checkbox"/> n/a

**7. Physical inspection**

7.1. Housing	<input checked="" type="checkbox"/> Ok
7.2. Fixation and screws	<input checked="" type="checkbox"/> Ok
7.3. Cables and connectors	<input checked="" type="checkbox"/> Ok
7.4. Labels	<input checked="" type="checkbox"/> Ok
7.5. Cleanness	<input checked="" type="checkbox"/> Ok


**8. Configuration backup**

8.1. Instrument configuration (*.xml)	<input checked="" type="checkbox"/> Ok
8.2. Software configuration (*.gsc)	<input checked="" type="checkbox"/> Ok
8.3. Test files archived	<input checked="" type="checkbox"/> Ok

**Final Acceptance**

All tests were executed according to the test procedure and all results were checked and are according to the specifications.

Tested by                      Ross Baradoy                                            on                      26.02.2018

Approved by                      Tobias Liesching                                            on                      02.03.2018