ACOUSTIC LOGIC

MATTHEW PALAVIDIS
VICTOR FATTORETTO
MATTHEW SHIELDS

Cowra Hospital Redevelopment

Operational Noise Management Plan

SYDNEY
9 Sarah St
MASCOT NSW 2020
(02) 8339 8000

ABN 98 145 324 714
www.acousticlogic.com.au

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1 INTRODUCTION

Acoustic Logic have been engaged to conduct an indicative assessment of the operational noise impacts associated with the proposed, "Cowra Hospital Redevelopment," located at 64 Liverpool Street, Cowra.

This document addresses noise impacts associated with the operation of indicative mechanical plant to be included as part of the proposed development.

- Usage of the on-grade carpark and associated driveway.
- Sleep disturbance from carpark peak intermittent noise events.
- Delivery/Waste Truck movements and associated operation of the loading dock.
- Traffic Generation.
- Indicative mechanical plant operation.

Note that all plant noise levels and locations discussed as part of this assessment are subject to change and should be re-assessed during CC stage.

AL have utilised the following documents and regulations in the noise assessment of the development:

- NSW Environmental Protection Authority (EPA) "*Noise Policy for Industry (NPfI) 2017.*"
- NSW Environmental Protection Authority (EPA) "*Road Noise Policy 2011*"

This assessment is based off of the architectural plans provided by DJRD Architects, Revision Date 09/12/2022.

An assessment of noise impacts associated with the development has determined that the proposal can achieve the requirements of the aforementioned authorities and regulations for all time periods of the day, evening and night.

2 SITE DESCRIPTION

The site is bound by Ina Drive to the east, Liverpool Street to the south and Brisbane Street to the west and is adjacent to the Tresillian Family Aged Care to the north, located at 2 Ina Drive. The proposal is to include demolition and excavation of existing structure and construction of a new 2-storey development to the north of the existing hospital. The existing hospital is proposed to remain fully operational during the construction process.

The closest potentially affected sensitive receivers within the vicinity of the site are as follows:

- **R1:** Multiple residential receivers to the west of the hospital, maintained on Brisbane Street.
- **R2:** Residential dwellings maintained on Liverpool Street, across Ina Drive and to the south-east of the project site.
- **R3:** Residential receivers maintained on Ina Drive, to the east of the project site.
- **C1:** 'Tresillian Family Care Centre,' a commercial receiver adjacent to the site's northern boundary.
- **C2:** Various commercial receivers maintained to the south of the project site, across Liverpool Street.

See an aerial photo in Figure 1 below for detailed receiver locations and monitor locations.

Figure 1: Aerial Site Map with Nearest Sensitive Receivers and Unattended Monitoring Locations (Sourced from Google Maps)

3 NOISE DESCRIPTORS

Environmental noise constantly varies. Accordingly, it is not possible to accurately determine prevailing environmental noise conditions by measuring a single, instantaneous noise level.

To accurately determine the environmental noise a 15-minute measurement interval is utilised. Over this period, noise levels are monitored on a continuous basis and statistical and integrating techniques are used to determine noise description parameters.

In analysing environmental noise, three principal measurement parameters are used, namely L_{10}, L_{90} and L_{eq}. The L_{10} and L_{90} measurement parameters are statistical levels that represent the average maximum and average minimum noise levels respectively, over the measurement intervals.

The L_{10} parameter is commonly used to measure noise produced by a particular intrusive noise source since it represents the average of the loudest noise levels produced by the source.

Conversely, the L_{90} level (which is commonly referred to as the background noise level) represents the noise level heard in the quieter periods during a measurement interval. The L_{90} parameter is used to set the allowable noise level for new, potentially intrusive noise sources since the disturbance caused by the new source will depend on how audible it is above the pre-existing noise environment, particularly during quiet periods, as represented by the L_{90} level.

The L_{eq} parameter represents the average noise energy during a measurement period. This parameter is derived by integrating the noise levels measured over the 15-minute period. L_{eq} is important in the assessment of environmental noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of environmental noise.

4 AMBIENT NOISE SURVEY

Background noise levels have been measured through long-term noise monitoring conducted by this office for the development. The results of this survey are detailed below.

4.1 MEASUREMENT EQUIPMENT

Long-term noise monitoring was undertaken with noise monitors provided Acoustic Research Laboratories Pty Ltd. The loggers were programmed to store 15-minute statistical noise levels throughout the monitoring period and was calibrated at the beginning and the end of each measurement using a Rion NC-73 calibrator; no significant drift was detected. All measurements were taken on A-weighted fast response mode.

Attended internal background noise measurements within the existing hospital were undertaken to supplement the unattended environmental noise monitoring. Measurements were conducted using a Norsonic 140 Sound Analyser. The analyser was set to fast response and calibrated before and after the measurements using a Norsonic Sound Calibrator type 1251. No significant drift was noted.

4.2 MEASUREMENT LOCATIONS

Two unattended noise monitors were installed within the immediate surroundings of the hospital, with detailed monitor locations provided within Figure 1.

4.3 MEASUREMENT PERIOD

Unattended noise monitoring at both monitor locations was conducted between Wednesday 13th of July 2022 and Wednesday 27th of July, 2022.

4.4 MEASURED EXTERNAL BACKGROUND NOISE LEVELS

NSW EPA's RBL assessment procedure requires determination of background noise level for each day (the ABL) then the median of the individual days as set out for the entire monitoring period.

Appendix 1 provides the results of the unattended background noise monitoring. Rain affected data was excluded from the assessment. The wind data presented has been obtained at a height of 10m. Due to surface friction, there is a wind gradient between ground and a 10m height. As the logger was placed in location where there were trees and existing buildings surrounding the noise monitors, the wind speed at 1.5m above ground level (logger microphone height) is estimated to be 1/2 of the 10m wind speeds. This correction factor has been applied before assessing the 5m/s wind criterion for valid background data. The processed Rating Background Noise Levels (lowest 10th percentile noise levels during operation time period) are presented in Table 4.1and 4.2 below.

Based on the monitoring and measurements, the Rating Background Noise Levels (lowest 10th percentile noise levels during operation time period) are established for the surrounding receivers and are presented in the table below.

Table 4-1 – Assessment Background Noise Levels – 2 Ina Drive, Cowra

Location	Date	Assessment Background Noise Level (dB(A) L_{90})*		
		Day (7am – 6pm)	Evening (6pm – 10pm)	Night (10pm-7am)
2 Ina Drive, Cowra	Wednesday 13th July 2022	-	36	34
	Thursday 14th July 2022	39	36	34
	Friday 15th July 2022	38	37	34
	Saturday 16th July 2022	38	36	33
	Sunday 17th July 2022	38	37	36
	Monday 18th July 2022	42	35	33
	Tuesday 19th July 2022	41	35	33
	Wednesday 20th July 2022	40	35	34
	Thursday 21st July 2022	40	35	33
	Friday 22nd July 2022	39	35	33
	Saturday 23rd July 2022	39	33	33
	Sunday 24th July 2022	38	35	33
	Monday 25th July 2022	38	34	34
	Tuesday 26th July 2022	45	40	33
	Wednesday 27th July 2022	-	-	-
	Median	**39**	**35**	**33**

Note: Periods marked '-' have had more than 20% of data within the nominated period be either not collected or be affected by adverse weather and in accordance with Fact Sheets A and B of the NPfI, have been removed from the assessment.

Table 4-2 – Assessment Background Noise Levels – 66 Liverpool Street, Cowra

Location	Date	Assessment Background Noise Level (dB(A) L_{90})*		
		Day (7am – 6pm)	Evening (6pm – 10pm)	Night (10pm-7am)
66 Liverpool Street, Cowra	Wednesday 13th July 2022	-	37	36
	Thursday 14th July 2022	40	37	36
	Friday 15th July 2022	39	38	36
	Saturday 16th July 2022	40	38	36
	Sunday 17th July 2022	40	36	38
	Monday 18th July 2022	39	36	35
	Tuesday 19th July 2022	39	35	35
	Wednesday 20th July 2022	40	36	35
	Thursday 21st July 2022	40	35	35
	Friday 22nd July 2022	39	35	34
	Saturday 23rd July 2022	39	35	34
	Sunday 24th July 2022	38	36	34
	Monday 25th July 2022	37	35	35
	Tuesday 26th July 2022	40	37	34
	Wednesday 27th July 2022	-	-	-
	Median	**39**	**36**	**35**

Note: Periods marked '-' have had more than 20% of data within the nominated period be either not collected or be affected by adverse weather and in accordance with Fact Sheets A and B of the NPfI, have been removed from the assessment.

The following table summarises the rating background noise levels determined for the day, evening and night periods as defined in the NPfI.

Table 3 – NPfI Rating Background Noise Levels

Location	Rating Background Noise Level (dB(A) L_{90})*		
	Day (7am – 6pm)	Evening (6pm – 10pm)	Night (10pm-7am)
2 Ina Drive, Cowra	39	35	33
66 Liverpool Street, Cowra	39	36	35

5 NOISE EMISSION ASSESSMENT

The noise emissions from the project site shall comply with the requirements of the following documents:

- NSW Environmental Protection Authority (EPA) document, "*Road Noise Policy 2011.*"
- NSW Environmental Protection Authority (EPA) document, "*Noise Policy for Industry (NPfI) 2017.*"

5.1 NSW EPA NOISE POLICY FOR INDUSTRY (NPFI) 2017

The EPA NPfI has two criteria which both are required to be satisfied, namely Intrusiveness and amenity. The NPfI sets out acceptable noise levels for various localities. The policy indicates four categories to assess the appropriate noise level at a site. They are rural, suburban, urban and urban/industrial interface. Under the policy the nearest residential receivers would be assessed against the suburban criteria.

Noise levels are to be assessed at the property boundary or nearby dwelling, or at the balcony or façade of an apartment.

5.1.1 Intrusiveness Criterion

The guideline is intended to limit the audibility of noise emissions at residential receivers and requires that noise emissions measured using the L_{eq} descriptor not exceed the background noise level by more than 5dB(A). Where applicable, the intrusive noise level should be penalised (increased) to account for any annoying characteristics such as tonality.

Background noise levels adopted are presented in Section 4. Noise emissions from the site should comply with the noise levels presented below when measured at nearby property boundary.

Table 5-1 – EPA Intrusiveness Noise Levels

Location	Period/Time	Intrusiveness Noise Level Criteria dB(A)$L_{Aeq(15min)}$
R1 and R2	Day (7am-6pm)	44
	Evening (6pm-10pm)	41
	Night (10pm-7am)	40
R3	Day (7am-6pm)	44
	Evening (6pm-10pm)	40
	Night (10pm-7am)	38

5.1.2 Project Amenity Criterion

The guideline is intended to limit the absolute noise level from all noise sources to a level that is consistent with the general environment.

The EPA's NPfI sets out acceptable noise levels for various localities. The recommended noise amenity area is based upon the measured background noise levels at the sensitive receiver. Based on the measured background noise levels detailed in Section 4, the Noise Policy for Industry suggests the adoption of the 'urban' categorisation.

The NPfI requires project amenity noise levels to be calculated in the following manner:

$L_{Aeq,15min}$ = *Recommended Amenity Noise Level – 5 dB(A) + 3 dB(A)*

The amenity levels appropriate for the receivers surrounding the site are presented in Table 5-2.

Table 5-2 – EPA Amenity Noise Levels

Type of Receiver	Time of day	Recommended Noise Level dB(A)$L_{eq(period)}$	Project Amenity Noise Level dB(A)$L_{eq(15\ minute)}$
Residential – Suburban	Day	55	53
	Evening	45	43
	Night	40	38
Commercial Premises	When in Use	65	63

The NSW EPA Noise Policy for Industry (2017) defines:

- Day as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays.
- Evening as the period from 6pm to 10pm.
- Night as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sundays and Public Holidays.

5.1.3 Sleep Arousal Criteria

The Noise Policy for Industry recommends the following noise limits to mitigate sleeping disturbance:

Where the subject development / premises night -time noise levels at a residential location exceed:

- $L_{eq,15min}$ *40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or*
- L_{Fmax} *52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater,*

a detailed maximum noise level even assessment should be undertaken.

Table 5-3 – Sleep Arousal Criteria for Residential Receivers

Receiver	Emergence Level
R1, R2 and R3 Night (10pm – 7am)	40 dB(A)$L_{eq,\ 15min}$; 52 dB(A)L_{Fmax}

5.2 TRAFFIC GENERATION - NSW EPA ROAD NOISE POLICY 2011

For land use developments with the potential to create additional traffic on public streets the development should comply with the EPA *Road Noise Policy*. Noise levels generated by traffic should not exceed the noise levels set out in the table below when measured at a nearby property.

Table 5-4 – Criteria for Traffic Noise Generated by New Developments

Road Type	Time of day	Permissible Noise Generation
Freeway/ Arterial Roads (Western Distributor)	Day (7am to 10pm)	60 dB(A) $L_{eq(15hr)}$
	Night (10pm to 7am)	55 dB(A) $L_{eq(9hr)}$

In determining what is feasible/reasonable, the Policy notes that an increase of less than 2dB(A) is a minor impact and would be barely perceptible.

5.3 SUMMARISED NOISE EMISSION CRITERIA

The applicable noise emission criteria for the Cowra Hospital redevelopment is summarised in the table below.

Table 5-5 – EPA NPfI Noise Emission Criteria (Residents Surrounding Project Site)

Receiver(s)	Time Period	Assessment Background Noise Level dB(A)L_{90}	Project Amenity Criteria dB(A) $L_{eq(15min)}$	Intrusiveness Criteria $L_{eq(15min)}$	NPI Criteria for Sleep Disturbance
R1 and R2	Day	39	53	**44**	N/A
	Evening	36	43	**41**	N/A
	Night	35	38	**40**	**40 dB(A)$L_{eq, 15min}$; 52 dB(A)L_{Fmax}**
R3	Day	39	53	**44**	N/A
	Evening	35	43	**40**	N/A
	Night	33	38	**38**	**40 dB(A)$L_{eq, 15min}$; 52 dB(A)L_{Fmax}**
C1 and C2	When in Use	N/A	**63**	N/A	N/A

Note: The project noise trigger levels are indicated by the bolded values in the table above.

6 NOISE EMISSION ANALYSIS

As part of this assessment, the following noise impacts have been assessed:

- Usage of the on-grade carpark and associated driveway.
- Sleep disturbance from carpark peak intermittent noise events.
- Delivery/Waste Truck movements and associated operation of the loading dock.
- Increased Traffic Generation.
- Indicative mechanical plant operation.

6.1 ON-GRADE CARPARK AND DRIVEWAY USAGE

Noise generated on site by operation of the proposed southern and northern carparks has been assessed with reference to the requirements outlined within Section 5.

6.1.1 On-Grade Carpark Information and Assumptions

The following information/assumptions have been used as part of this assessment:

- There is proposed to be 10 individual spaces maintained within the northern carpark, connected to Brisbane Street, and a further 45 individual spaces within the southern carpark, with a two-way connection to Liverpool Street.
- Both the southern and northern carparks have been modelled to the assumption that each individual carpark will completely full and completely empty within a given hour period, conservative given the typical stay of a person visiting hospital grounds.
- As such, there is 20 and 90 vehicle movements modelled within the northern and southern carparks respectively within a given hour.
- Note that all emergency vehicle operation is excluded from assessment.

SoundPLAN Noise Modelling has been conducted to assess the noise impacts of the on-grade carpark on surrounding sensitive receivers.

6.1.2 SoundPlan Modelling – On-Grade Carpark

Noise levels have been predicted at the receiver locations using SoundPlan™ 8.0 modelling software implementing the ISO 9613-2:1996 "Acoustics – Attenuation of Sound During Propagation Outdoors – Part 2: General Method of Calculation" noise propagation standard.

Noise enhancing meteorological effects have been adopted as recommended by the NPfI, noting that the ISO 9613 modelling approach assumes that all receivers are 'downwind' (i.e., that noise enhancing wind conditions are in effect at all times).

Ground absorption was conservatively calculated with a ground factor of 0 for all areas except for localised lawns and greenery with a ground factor of 0.6 as recommended in *Engineering Noise Control* (Bies & Hanson).

In line with Factsheet C of the NPfI, penalties for annoying noise characteristics should be applied at the receiver, where applicable. Based on the predicted noise levels, no penalty should be applied (either for tonality, intermittency, or otherwise).

Figure's 2 through 4 present the results of the SoundPlan Noise modelling, and they are summarised in the table below.

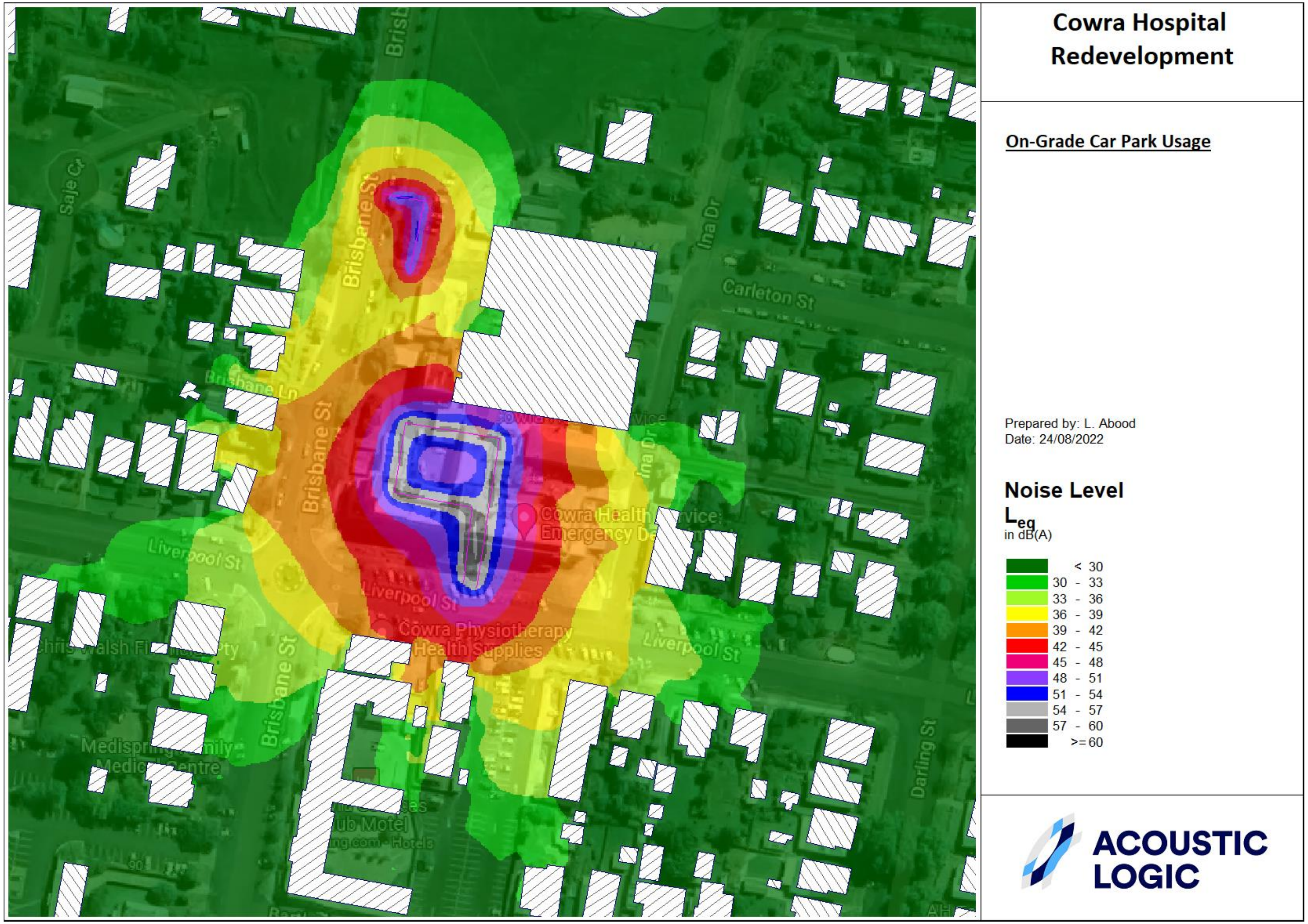


Figure 2: On-Grade Carpark and Driveway Usage

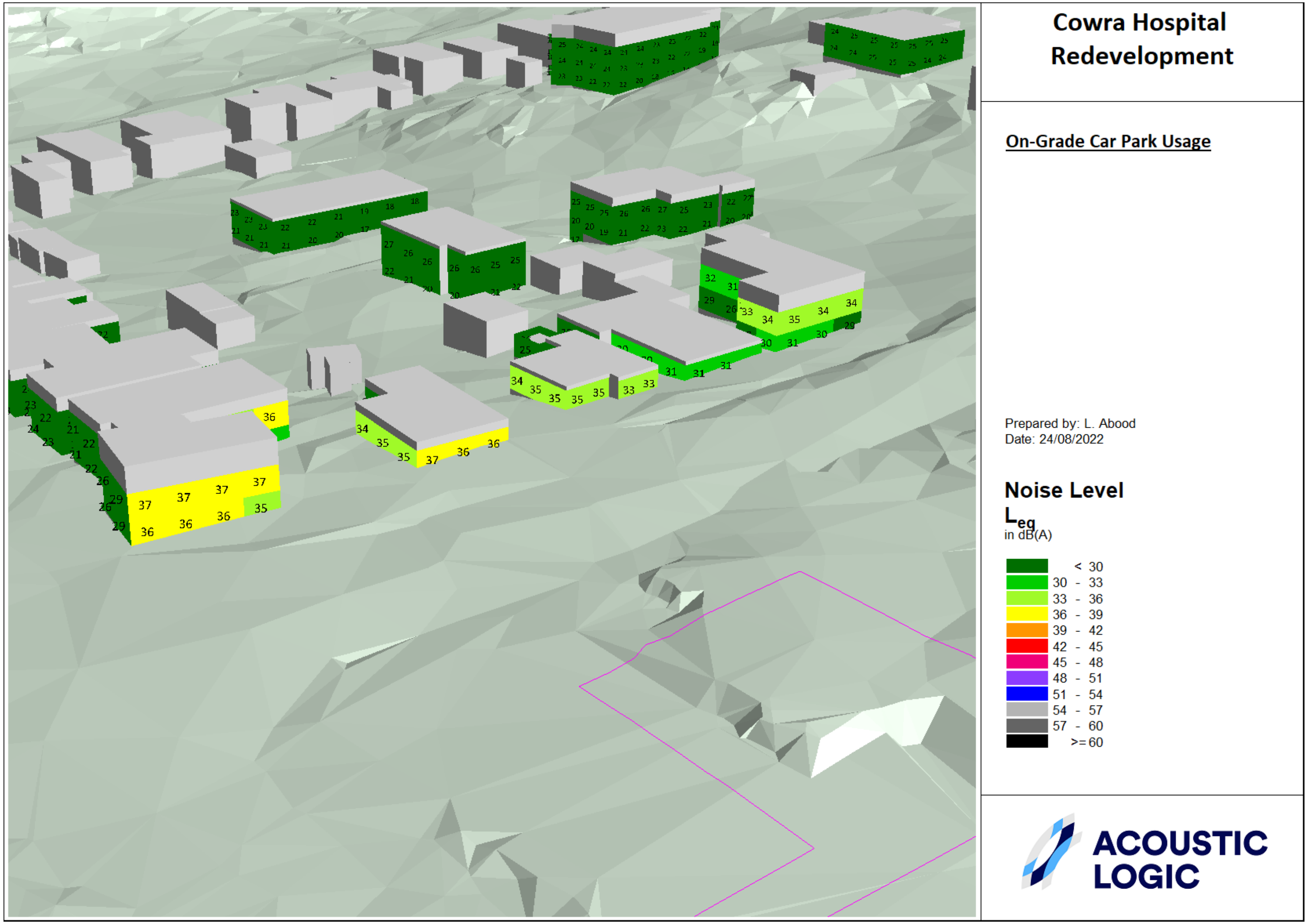


Figure 3: On-Grade Carpark and Driveway Usage – R1

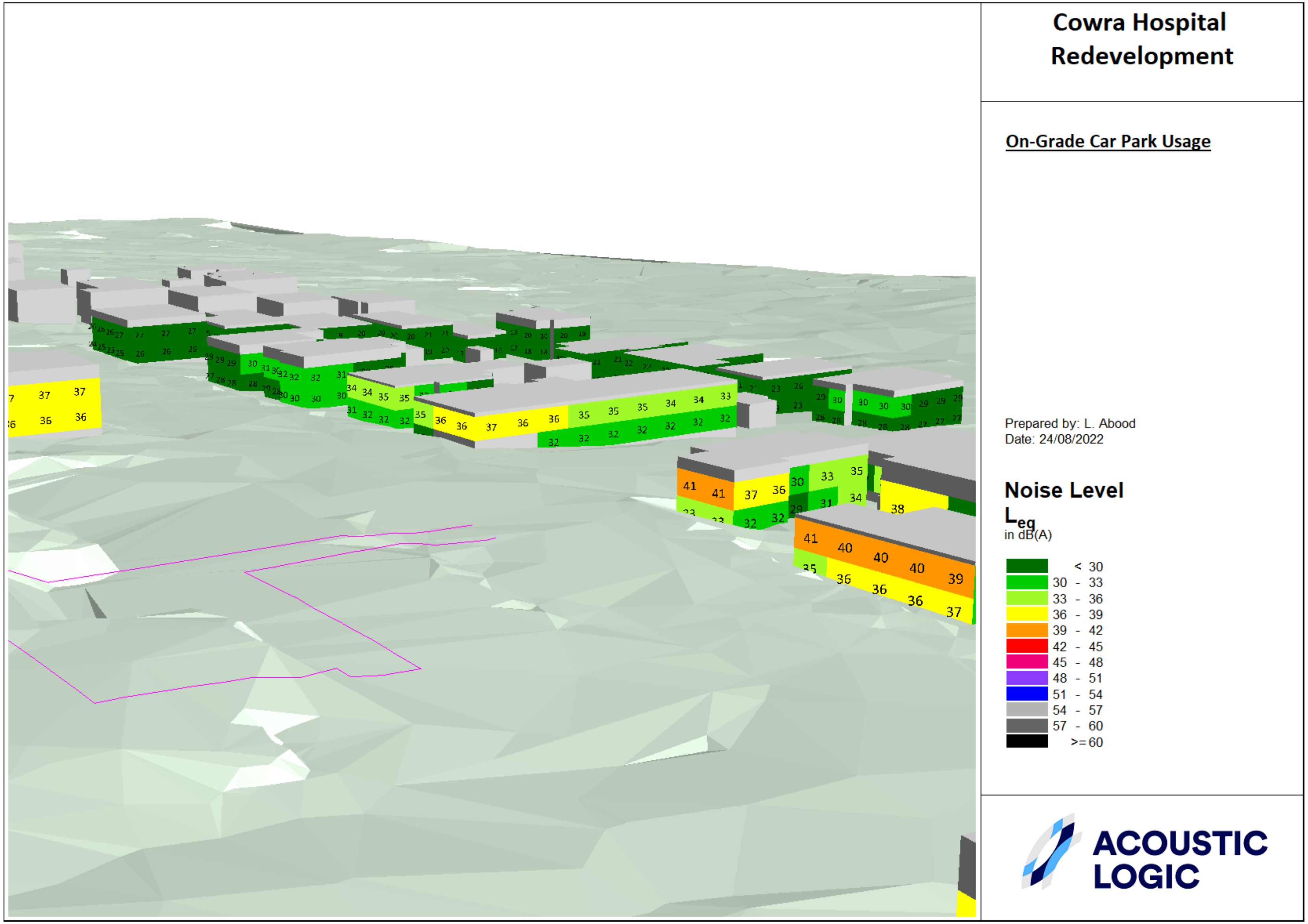


Figure 4: On-Grade Carpark and Driveway Usage – R2 and C2

Table 6-1 – Predicted Noise Levels at Sensitive Receivers from On-Grade Carpark Usage

Receiver	Maximum Predicted Noise Level dB(A)$L_{eq(15min)}$	Time of day	Project Noise Trigger Level dB(A)$L_{eq(15min)}$	Compliance
R1	37	Night (10pm-7am)	40	**Yes**
R2	37			
R3	<25		38	
C1	<25	When in Use	63	
C2	41			

6.2 ON-GRADE CAR PARKS - SLEEP DISTURBANCE (INTERMITTENT) NOISE ASSESSMENT

Short duration noise events (door close/car start) are assessed with reference to EPA Sleep Disturbance Guidelines during the night-time operational period.

The following sleep disturbance assessment is conducted with reference to the guidelines set out in Section 5.1.3.

The assessment is based on the following assumptions:

- Car door Slam/Car Start (night-time peak noise event): 91dB(A)L_{Max} sound power.
- Noise level has been predicted from the nearest car space relative to an individual receiver providing a worst-case scenario.

As noted in Section 5.1.3, sleep disturbance assessment is a two-step process:

Firstly, the peak noise events are assessed with reference to a "Background+15dB(A)" assessment. If this test is passed, the noise emissions should be considered satisfactory.

In the event that the first test cannot be complied with, an assessment is then made of the actual noise level inside the residence (assuming window open) and comparison made to the EPA guidance regarding peak noise events and probability of awakening.

6.2.1 SoundPlan Modelling – Carpark Sleep Disturbance Noise Events

SoundPLAN noise modelling has been conducted to assess the potential for sleep disturbance from the on-grade carpark, and results are presented within Figure's 5 through 7, and summarised in the table below.

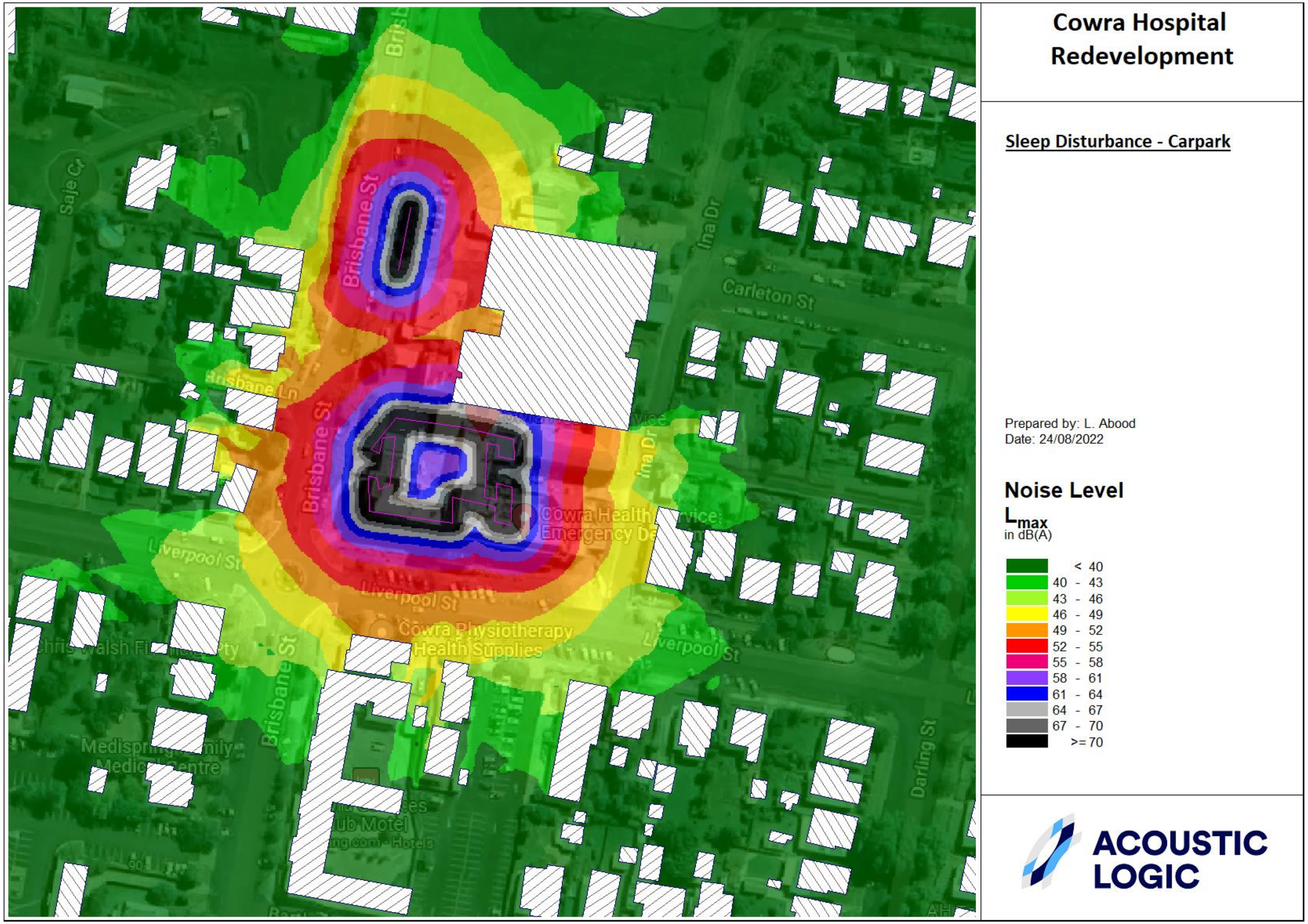


Figure 5: Sleep Disturbance – Car Door Slam

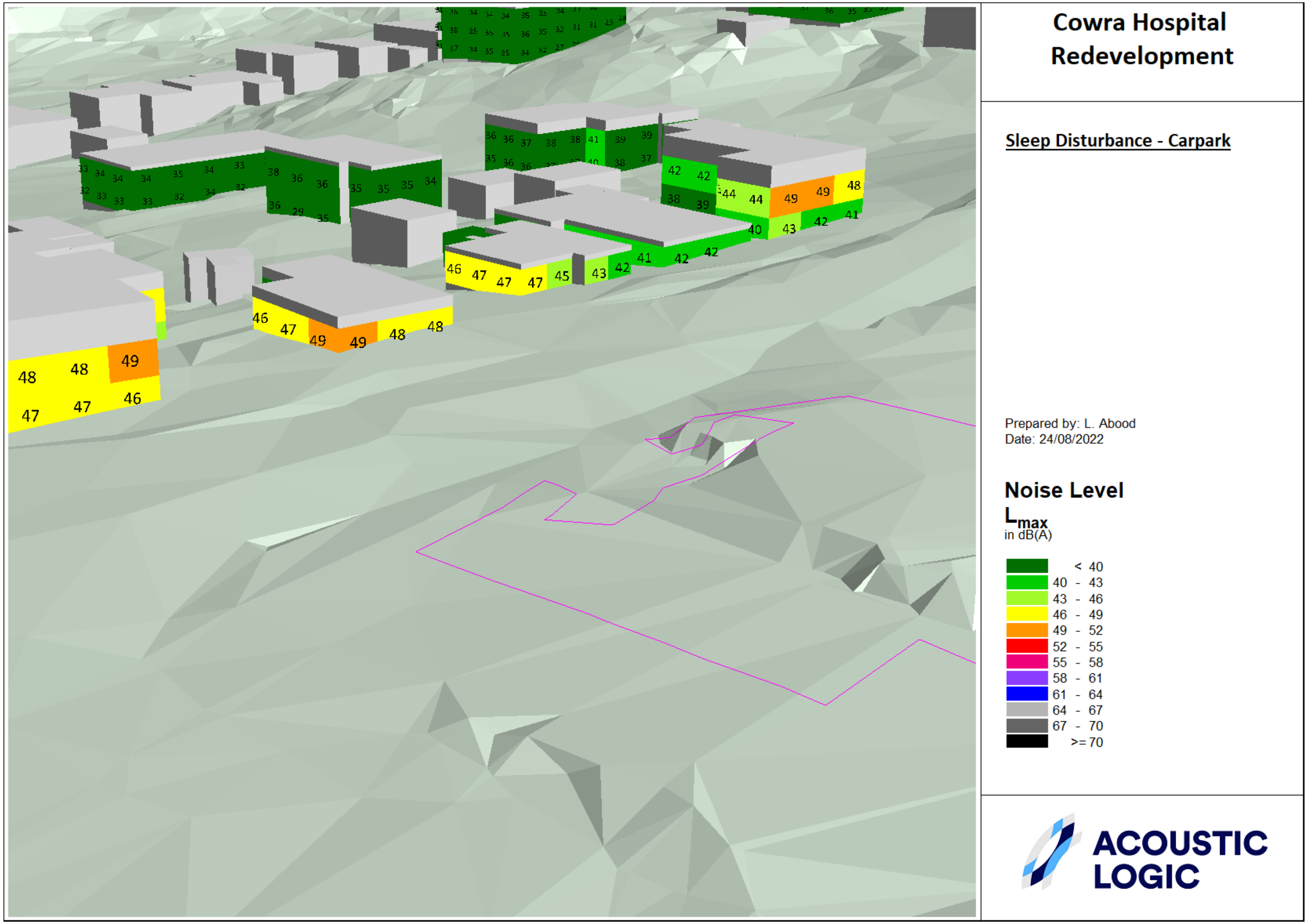


Figure 6: Sleep Disturbance – Car Door Slam – R1

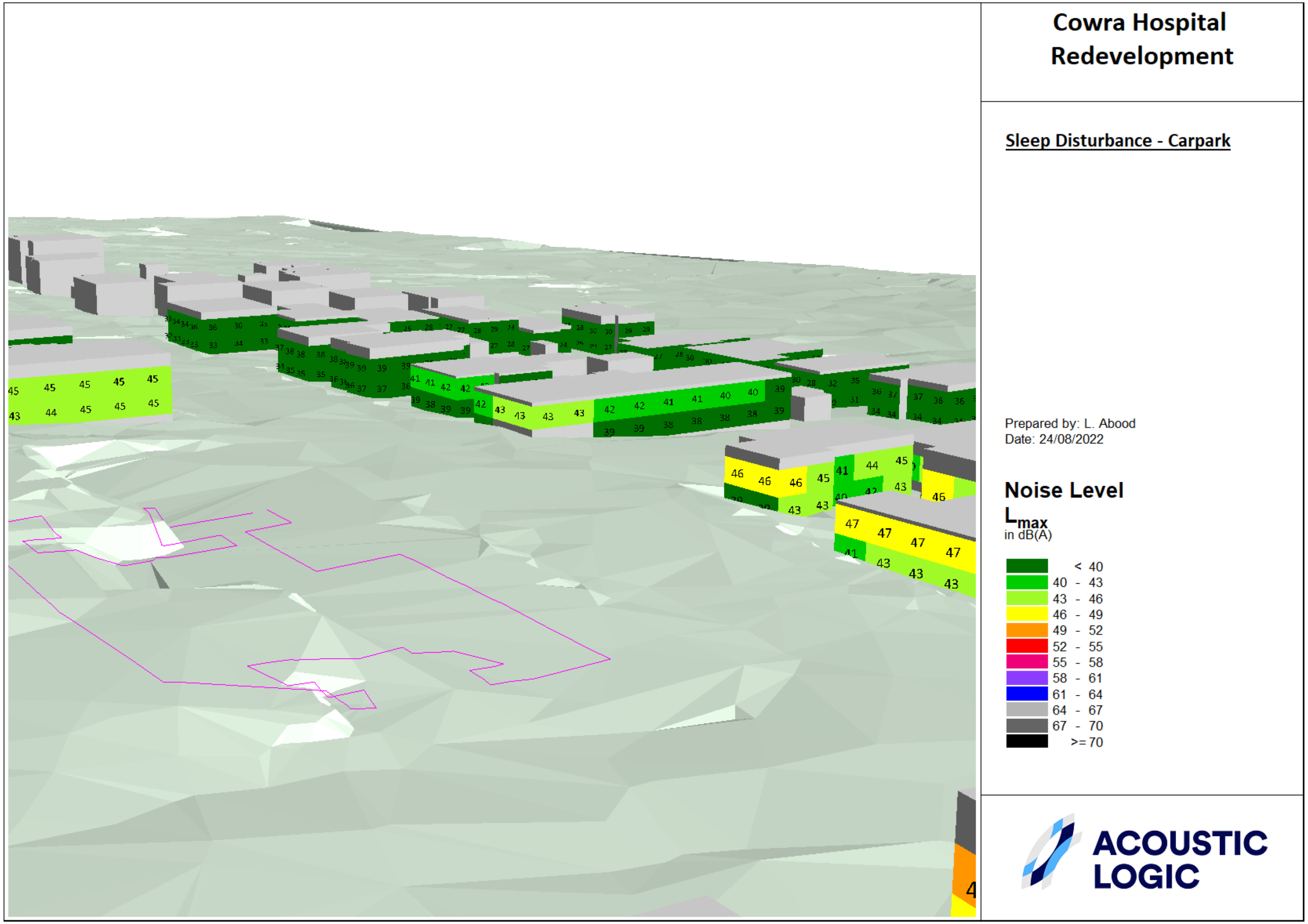


Figure 7: Sleep Disturbance – Car Door Slam – R2 and C2

Table 6-2 – Predicted Sleep Arousal Intermittent Noise Levels from On-Grade Carpark Usage

Receiver	Predicted External Noise Level dB(A)L_{AFMax}	Time of day	Sleep Arousal External Noise Criteria dB(A)L_{AFMax}	Compliance
R1	49	Night 10pm-7am	52	**Yes**
R2	45			
R3	<40			

6.3 DELIVERIES AND WASTE REMOVAL

Deliveries are proposed to be made sharing site access with the northern carpark, connecting to Brisbane Street, and are to be unloaded adjacent to the site's northern boundary.

Noise associated with the use of the loading dock will consist of:

- Trucks moving into or out of the loading dock.
- Materials Handling.

6.3.1 Deliveries/Waste Removal Information and Assumptions

The following information / assumptions have been used within the delivery and loading dock assessment:

- The following noise levels have been used within the SoundPLAN noise model:

Table 6-2 – Loading Dock Activity Associated Sound Power Levels

Noise Source	Sound Power Level dB(A)L_{eq}
Truck engine (large rigid truck/garbage truck at approx 5-10km/h)	100
Materials Handling (pallet jacks or similar)	90

- AL assumes that there are up to four truck movements associated with the site in a peak one-hour period.
- Loading dock activity is to only be conducted within the daytime period (7am-6pm).

Operational noise levels of the loading dock have been assessed with reference to the requirements outlined in Section 5.

6.3.2 SoundPlan Modelling – Deliveries and Loading Dock Operation

SoundPLAN noise modelling has been conducted to assess the impact of deliveries and associated loading dock activity, and results are presented within Figure's 8 through 10, and summarised in the table below.

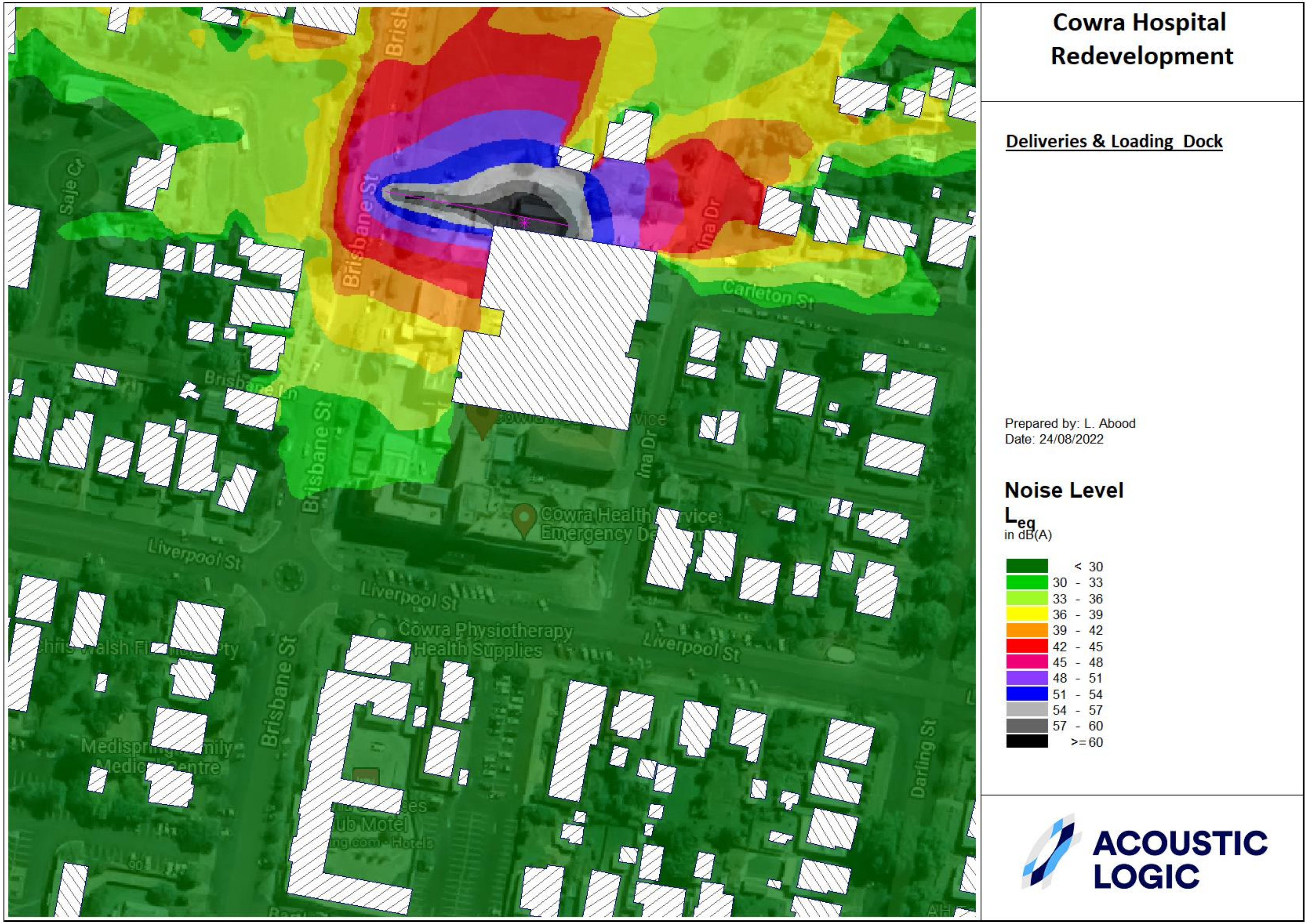


Figure 8: Deliveries / Waste Removal and Associated Loading Dock

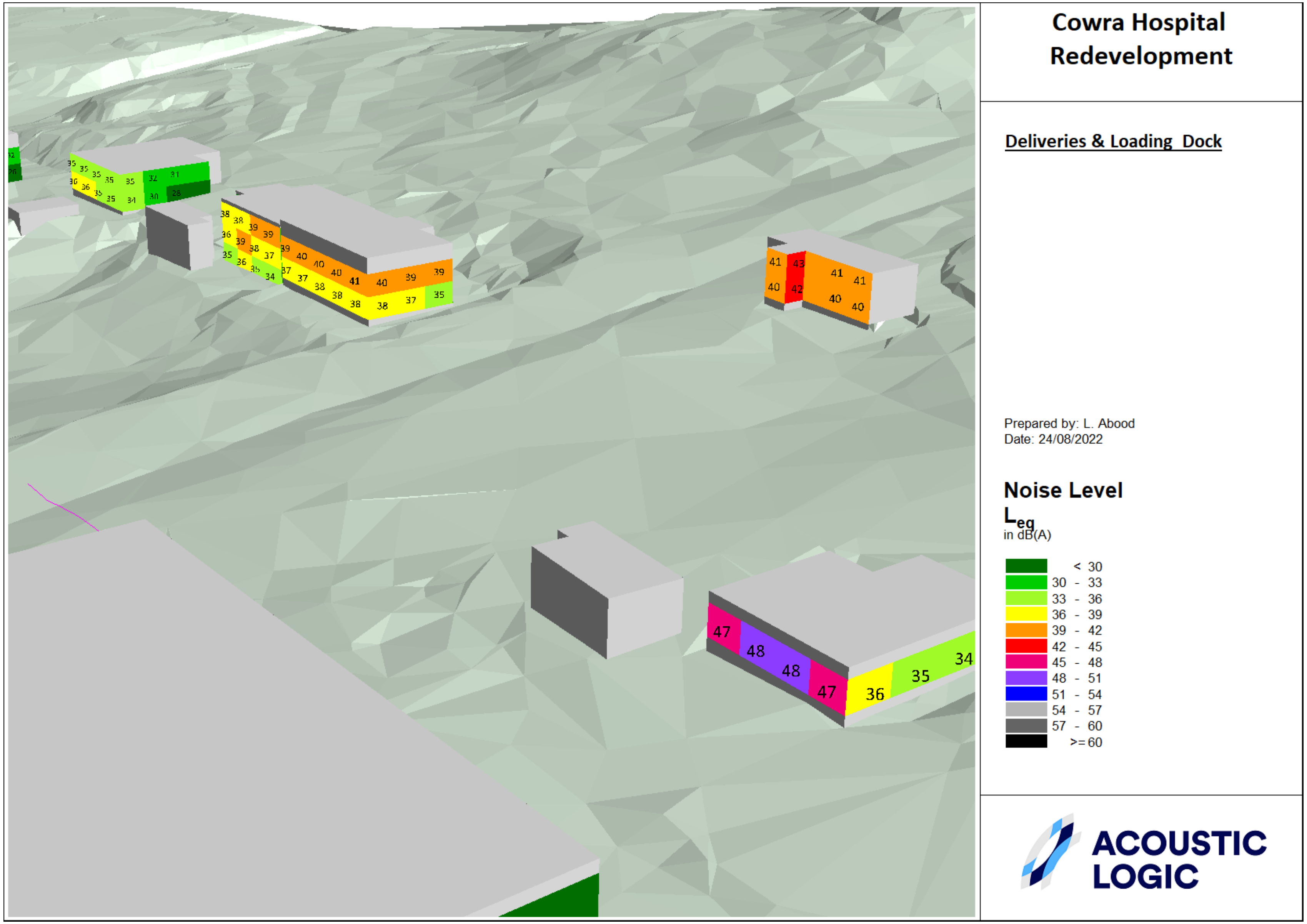


Figure 9: Deliveries / Waste Removal and Associated Loading Dock– R1 and C1

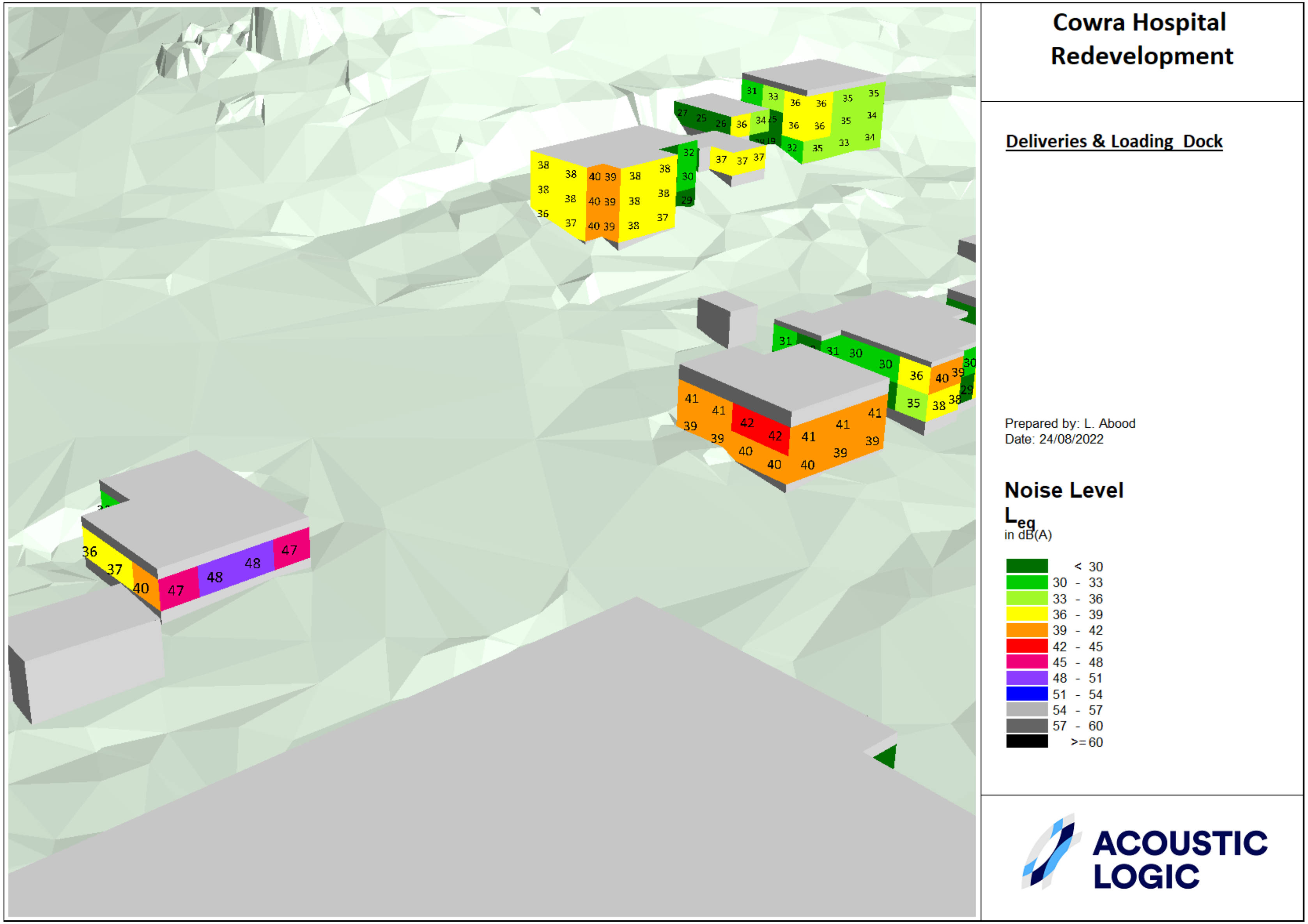


Figure 10 Deliveries / Waste Removal and Associated Loading Dock– R3 and C1

Table 6-3 – Predicted Noise Levels at Sensitive Receivers from Deliveries and Loading Dock

Receiver	Maximum Predicted Noise Level $dB(A)L_{eq(15min)}$	Time of day	Project Noise Trigger Level $dB(A)L_{eq(15min)}$	Compliance
R1	41	Day (7am-6pm)	44	**Yes**
R2	<30			
R3	42			
C1	48	When in Use	63	
C2	<40			

6.4 INCREASED TRAFFIC GENERATION

The traffic report prepared for the proposed redevelopment, authored by Taylor Thomson Whitting and dated 19/07/2022, nominates an expected increased peak hour trip generation of 7 additional trips in the morning and 6 additional trips in the afternoon peak hour periods (Ref: 211721). The following table presents the predicted noise level increases from the predicted traffic generation from the development.

Table 6-4 – Predicted Traffic Generated Noise Levels

Peak Time	Existing Traffic Movements (peak hour)	Predicted Traffic Movements (peak hour)	Predicted Increase in Road Noise Level dB(A)	Compliance
AM	49	56	0.6	**Yes***
PM	46	52	0.5	

**In line with the guidance of the NSW EPA Road Noise Policy, an increase of less than 2dB(A) is a minor impact and would be barely perceptible to the average person, and is therefore considered acceptable.*

6.5 INDICATIVE MECHANICAL PLANT

An indicative assessment of primary mechanical plant items required to be included as part of the development is presented below.

Primary plant items will include:

- Roof-top plantroom inclusive of various plant items such as AHUs, Water-Cooled Chillers, Cooling Towers and other various fans.
- On-grade storage containers and associated pumps.
- Miscellaneous Fans and Air-Conditioning equipment.

With respect to the above, we note:

- Roof top plant:
    - All rooftop plant is to be maintained within plantrooms, as nominated by the ARUP design documentation (Ref: ARUP-MEP-REP-002).
    - There are two current options posed by the design team, noting one option maintains two individual plant rooms, one located in the north-east of the site and another to the south-west side of the building, whilst another locates all plant to the north-east of the development.
    - For either of the two options posed, the mechanical plant will able to be treated to meet the noise emission objectives outlined within Section 5 of this report.
    - Cooling Towers:
        - These are proposed to be located in the north-eastern corner of the roof of the new Hospital.
        - Cooling Towers are proposed to be maintained within a plantroom and will therefore have broken line of sight to the surrounding residential receivers.
        - Indicatively, if cooling towers are found to exceed EPA requirements, attenuation can be achieved through the installation of treatments to the associated plant.
        - To ensure compliance with EPA requirements during day, evening and night-time - all cooling towers are to have variable speed drives, to allow for reduced fan speed during periods of low load. Typically, a fan speed of no more than 50% would be expected at night-time.
    - Water Cooled Chillers:
        - These are proposed to be located in the north-eastern corner of the roof of the new Hospital.
        - Chillers are proposed to be maintained within a plantroom and will therefore have broken line of sight to the surrounding residential receivers.
        - Indicatively, if Chillers are found to exceed EPA requirements, attenuation can be achieved through the installation of treatments to the open area (Acoustic Louvres) of the plantroom in which they are maintained.
    - AHUs maintained within the Northern and Southern plantrooms will be able to be treated with duct attenuation / attenuators where noise levels at receivers are found to exceed EPA requirements. Finalised treatments for AHUs to be determined at CC Stage.
    - Major fans (typically with a sound power over 90(A) – such as kitchen exhaust, major toilet exhaust and major relief air fans) will require acoustic treatment if located externally. Whenever possible, for major fans, it is recommended that axial (as opposed to roof mounted fans) are to be used as this will enable acoustic treatment to be incorporated within ductwork running to atmosphere.

    - Rooftop Plantrooms – loudest typical plant items in this space will be chillers (typically 85dB(A) at 1m distance). Any ventilation opening to the plant rooms is likely to require acoustic treatment (either blanking off inactive louvre openings or treated active louvre openings).

- Emergency power back-up generators:

    - Acoustic Logic note that emergency electricity generation is excluded from Schedule 1 of the POEOA for systems operating less than 200 hours per year and is therefore not required to comply with the requirements of this Management Plan.
    - The emergency back-up generator is proposed to be replaced as part of the redevelopment, and relocated to the site's northern boundary.
    - The location selected for the back-up generator is equally spaced from surrounding sensitive receivers, inherently minimising the noise impact of the generator on one individual receiver.
    - In the event that the generator is located within a plant room (generator sound power of 125dB(A)), acoustic attenuators will be required to the plant room air inlet and air discharge. Additionally, the exhaust gas discharge may also require a muffler.
    - In the event that the generator comes with a proprietary acoustic enclosure (typically 75dB(A) at 7m distance), the length of attenuators will potentially be reduced.
    - Detailed acoustic performance of plant room (or any acoustic enclosure) to be finalised following final generator selection/location.

Compliance with EPA acoustic criteria (as set out in Section 5.1) will be achievable, provided that detailed acoustic review of plant items is undertaken once plant is selected, and acoustic treatments similar to those outlined above are adopted. This is to be conducted during CC Stage.

7 CONCLUSION

This report presents an acoustic assessment of the potential noise impacts associated with the operation of the proposed redevelopment of Cowra Hospital, located at 64 Liverpool Street, Cowra.

Noise impacts assessed within this document have been assessed with reference to the requirements of the following documents:

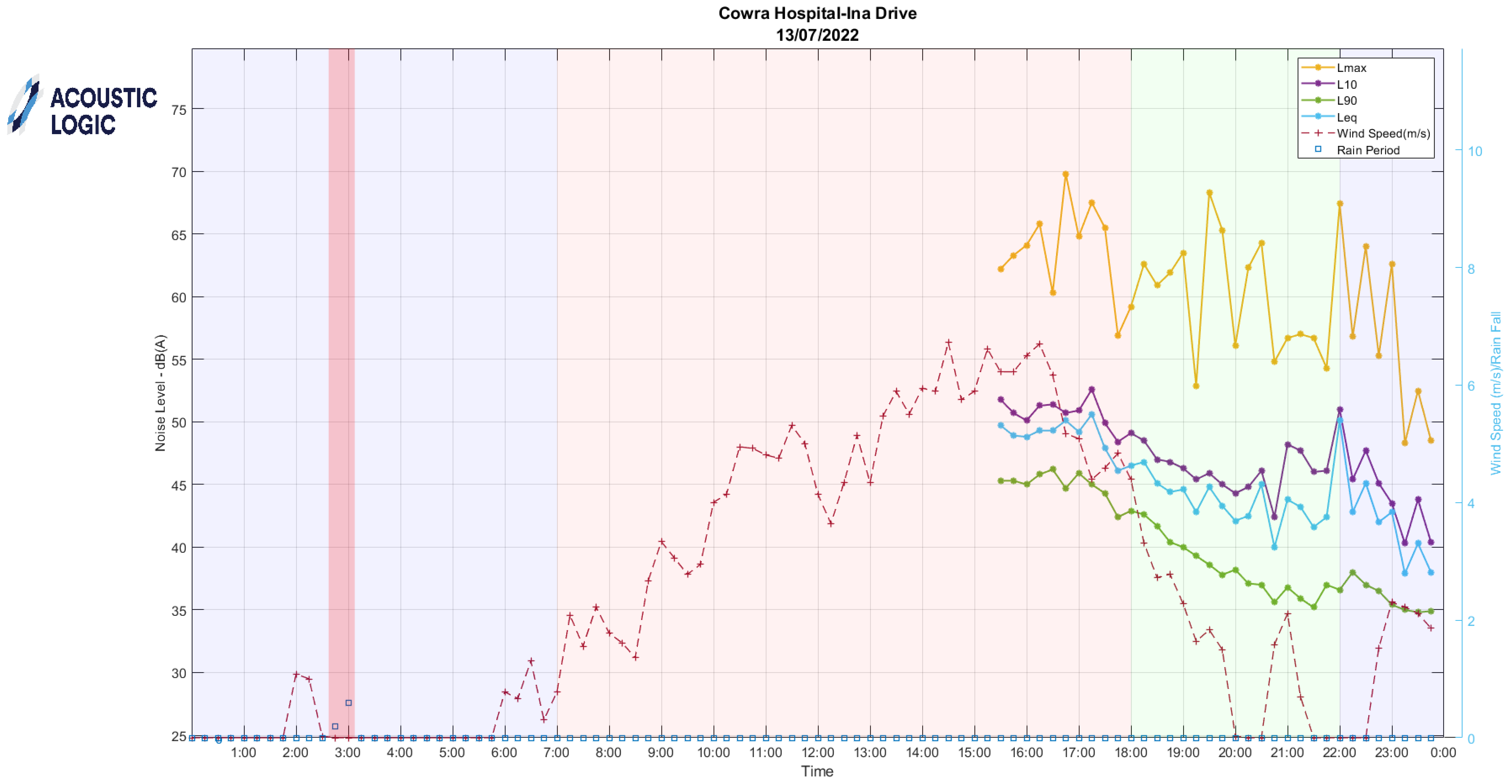
- NSW Environmental Protection Authority (EPA) "*Noise Policy for Industry (NPfI) 2017.*"
- NSW Environmental Protection Authority (EPA) "*Road Noise Policy 2011*"

We trust this information is satisfactory. Please contact us should you have any further queries.

Yours faithfully,

Acoustic Logic Pty Ltd
Lachlan Abood

APPENDIX 1A – UNATTENDED NOISE MONITORING DATA – 2 INA DRIVE, COWRA


Cowra Hospital-Ina Drive
13/07/2022
ACOUSTIC
LOGIC
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
Time
Lmax
L10
L90
Leq
Wind Speed(m/s)
Rain Period
25
30
35
40
45
50
55
60
65
70
75
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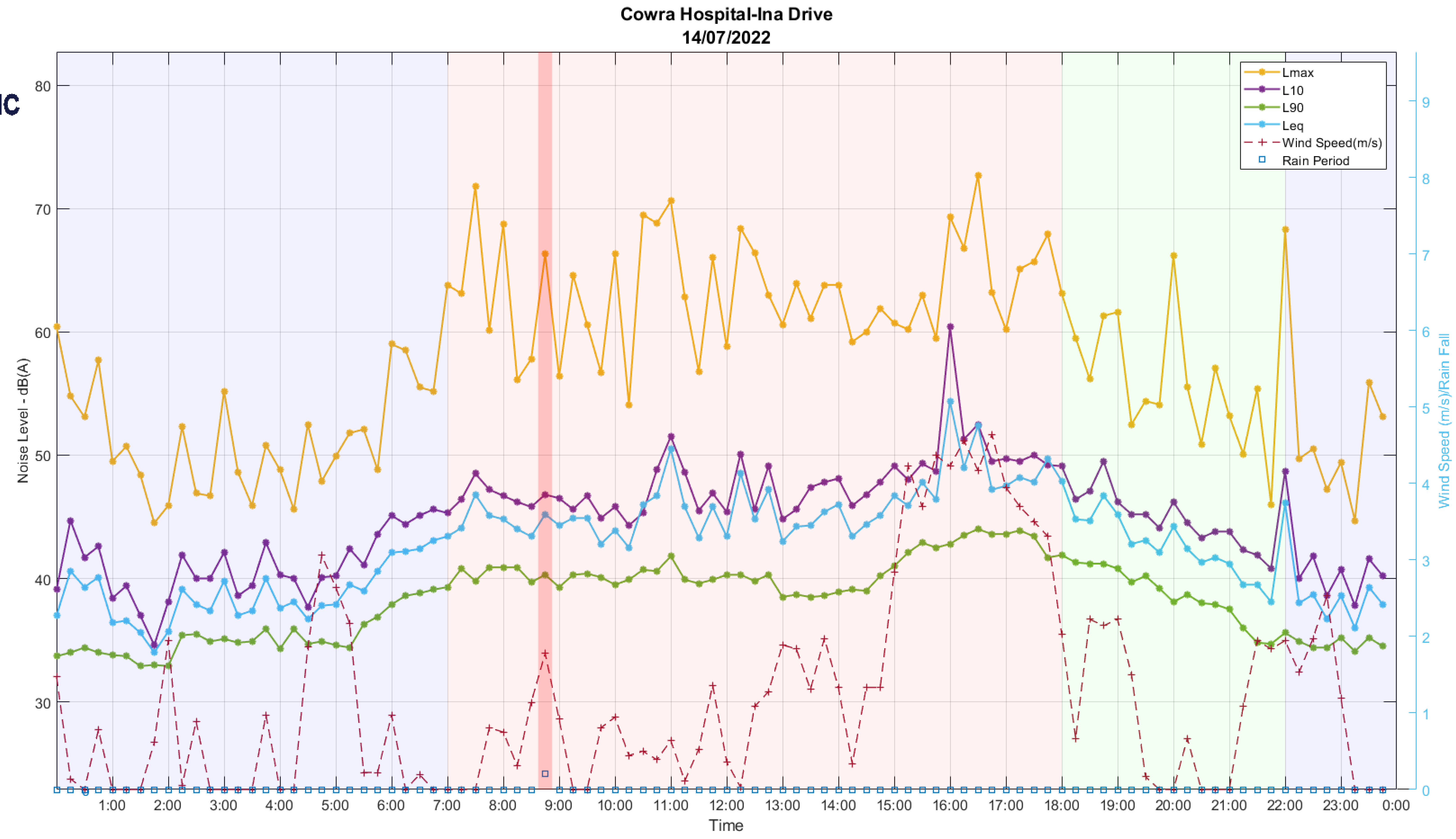
Cowra Hospital-Ina Drive
14/07/2022
Lmax
L10
L90
Leq
Wind Speed(m/s)
Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
Time
80
70
60
50
40
30
9
8
7
6
5
4
3
2
1
0
1:00
2:00
3:00
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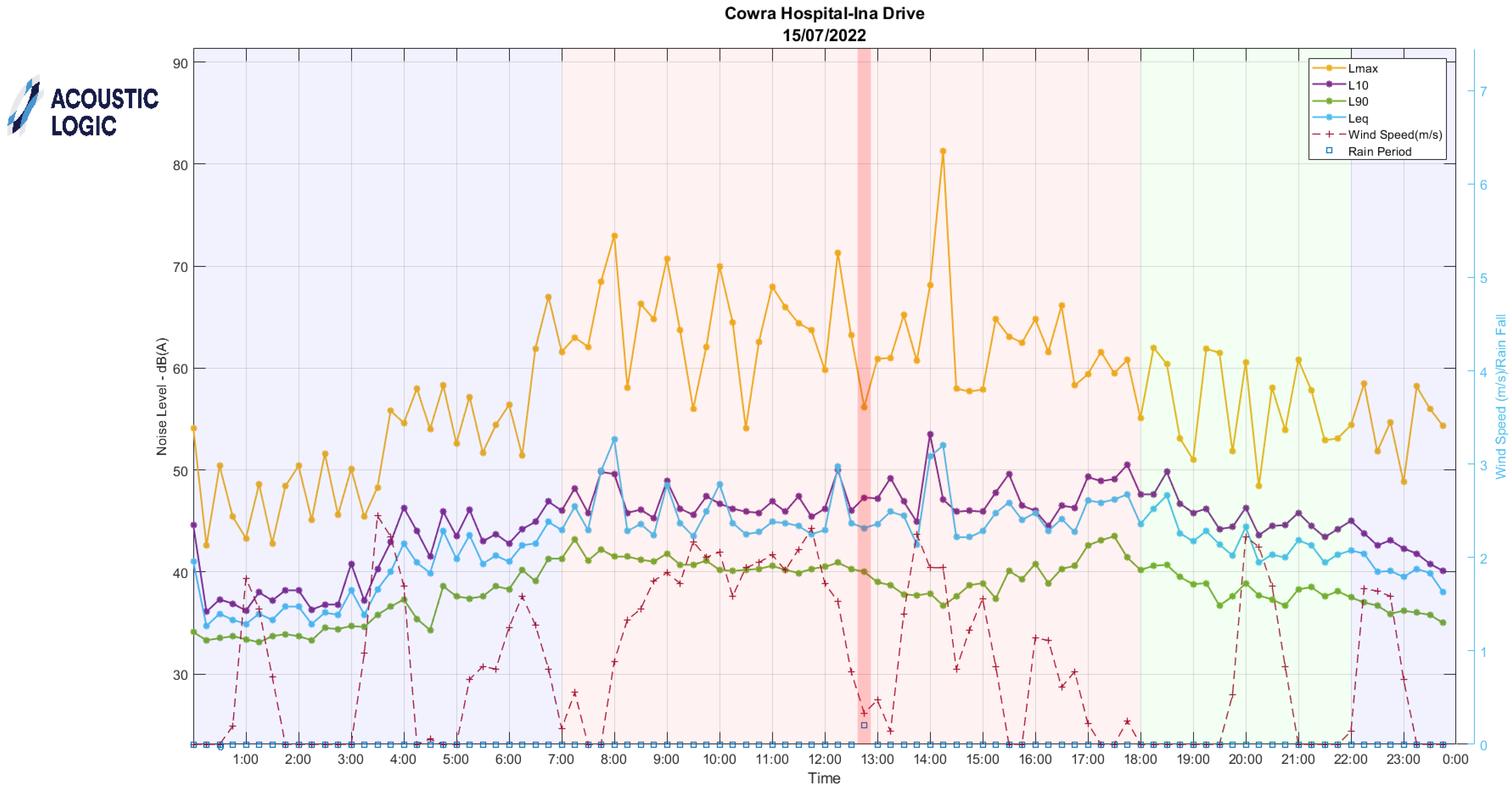
ACOUSTIC LOGIC
Cowra Hospital-Ina Drive
15/07/2022
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
Time
Lmax
L10
L90
Leq
Wind Speed(m/s)
Rain Period
90
80
70
60
50
40
30
7
6
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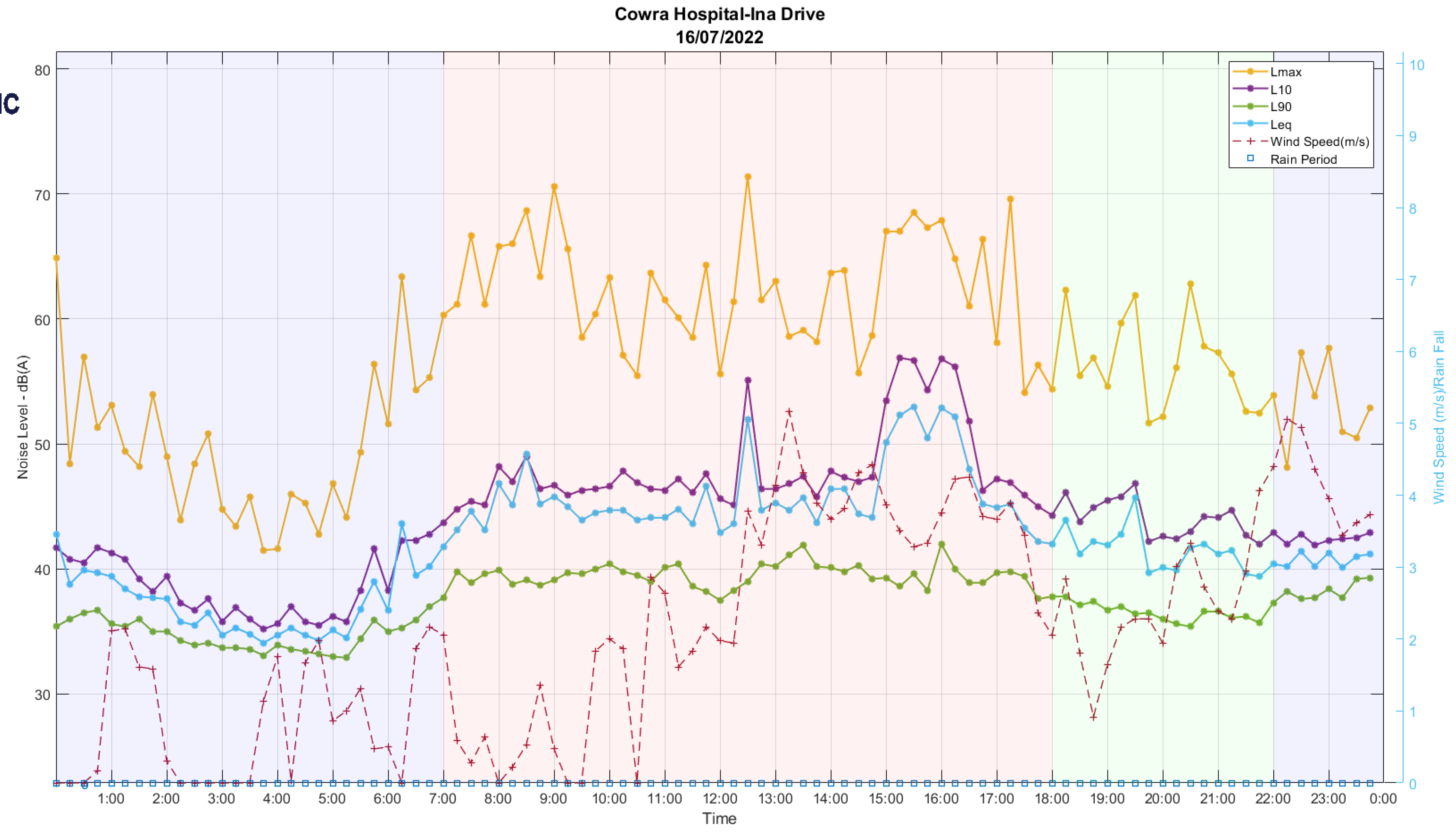
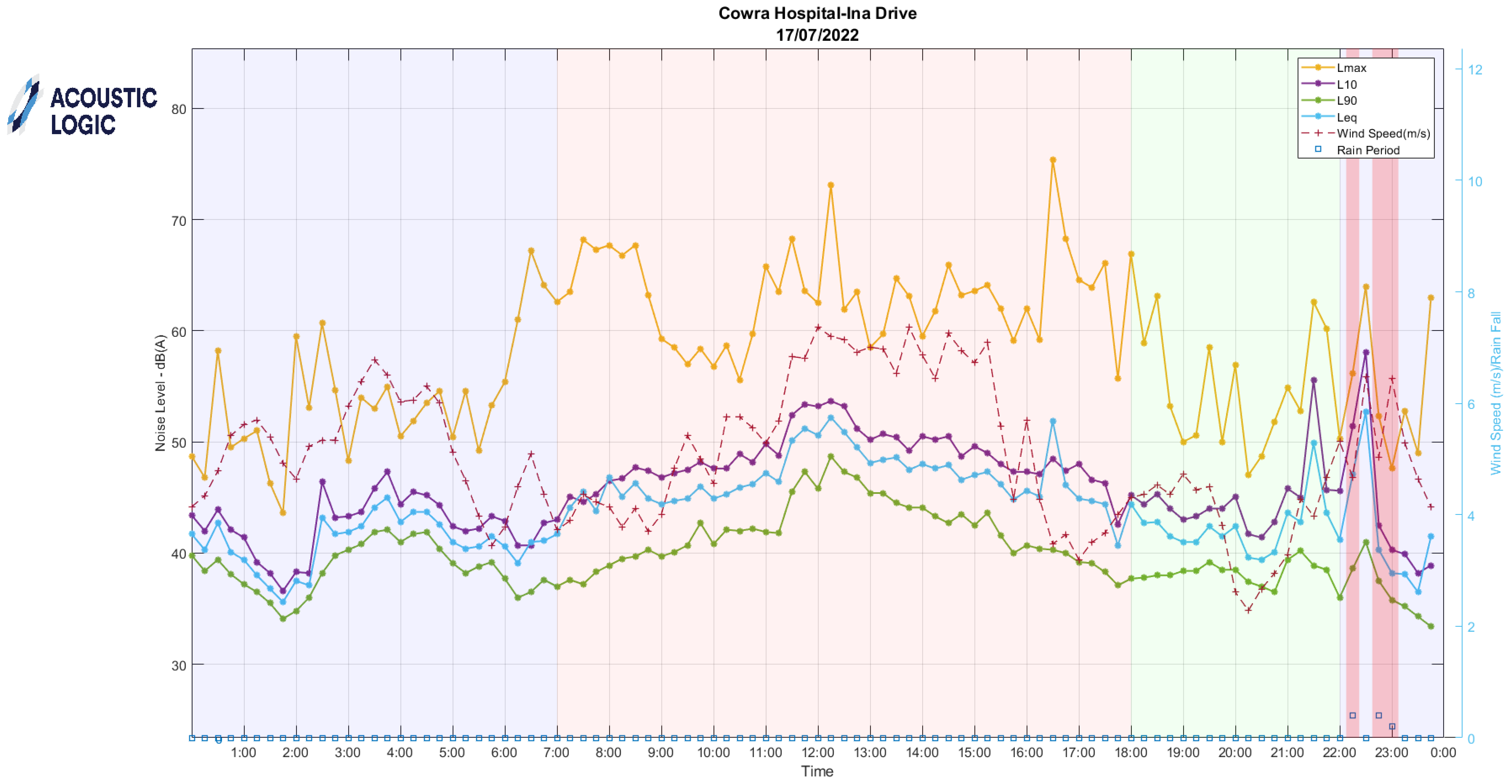
ACOUSTIC LOGIC




Cowra Hospital-Ina Drive
17/07/2022
ACOUSTIC LOGIC
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
Time
Lmax
L10
L90
Leq
Wind Speed(m/s)
Rain Period
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50
60
70
80
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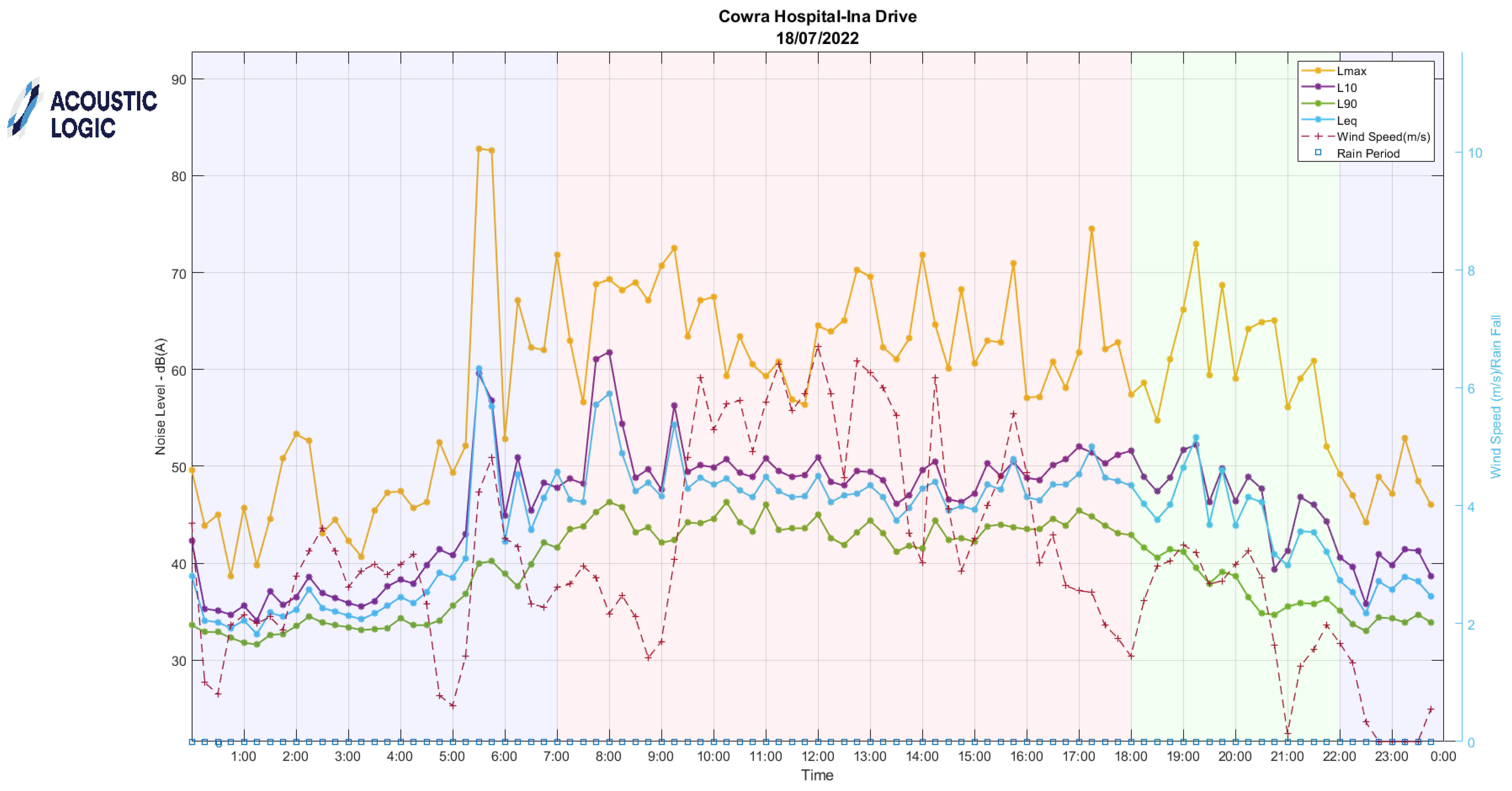

Cowra Hospital-Ina Drive
18/07/2022
ACOUSTIC LOGIC
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
Time
Lmax
L10
L90
Leq
Wind Speed(m/s)
Rain Period
90
80
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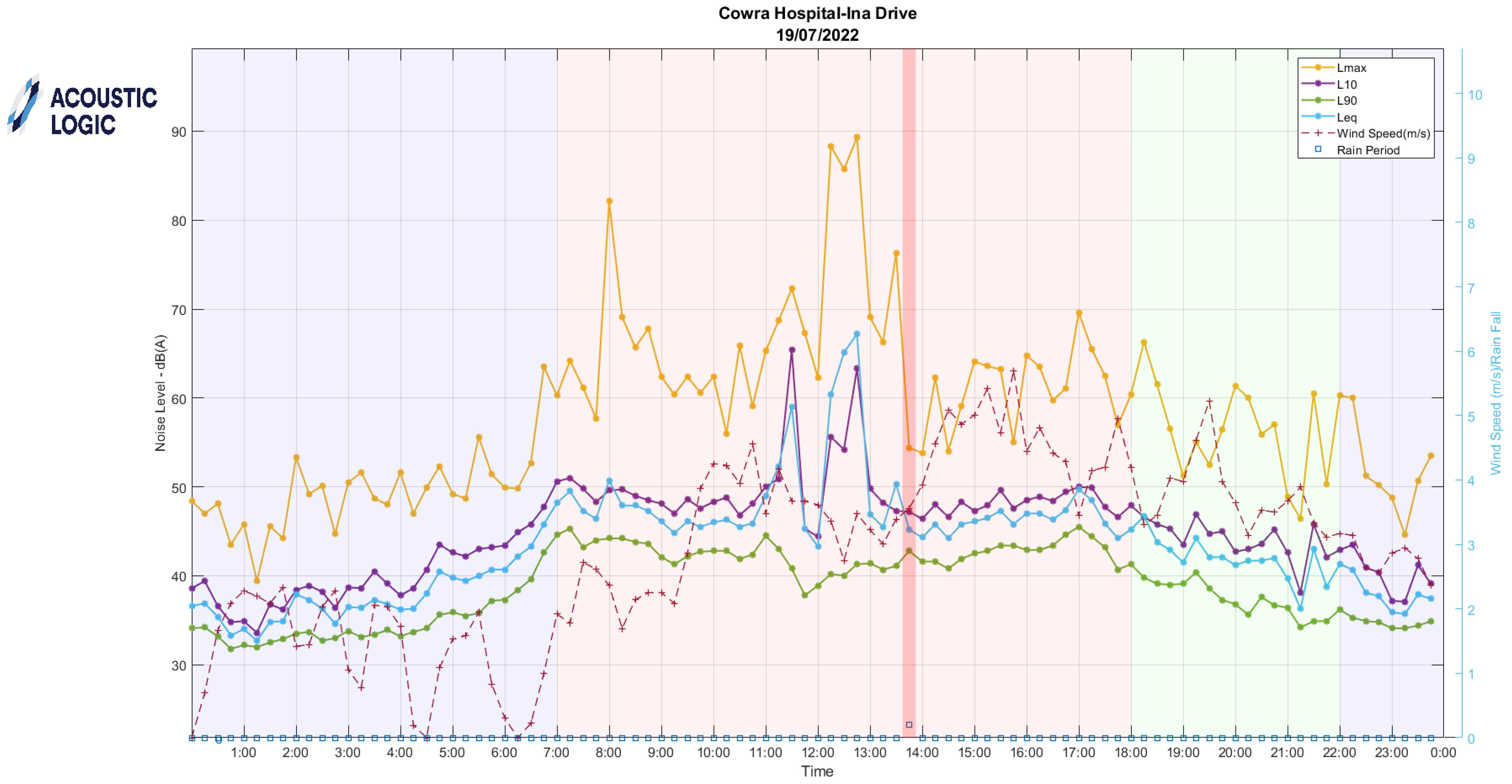
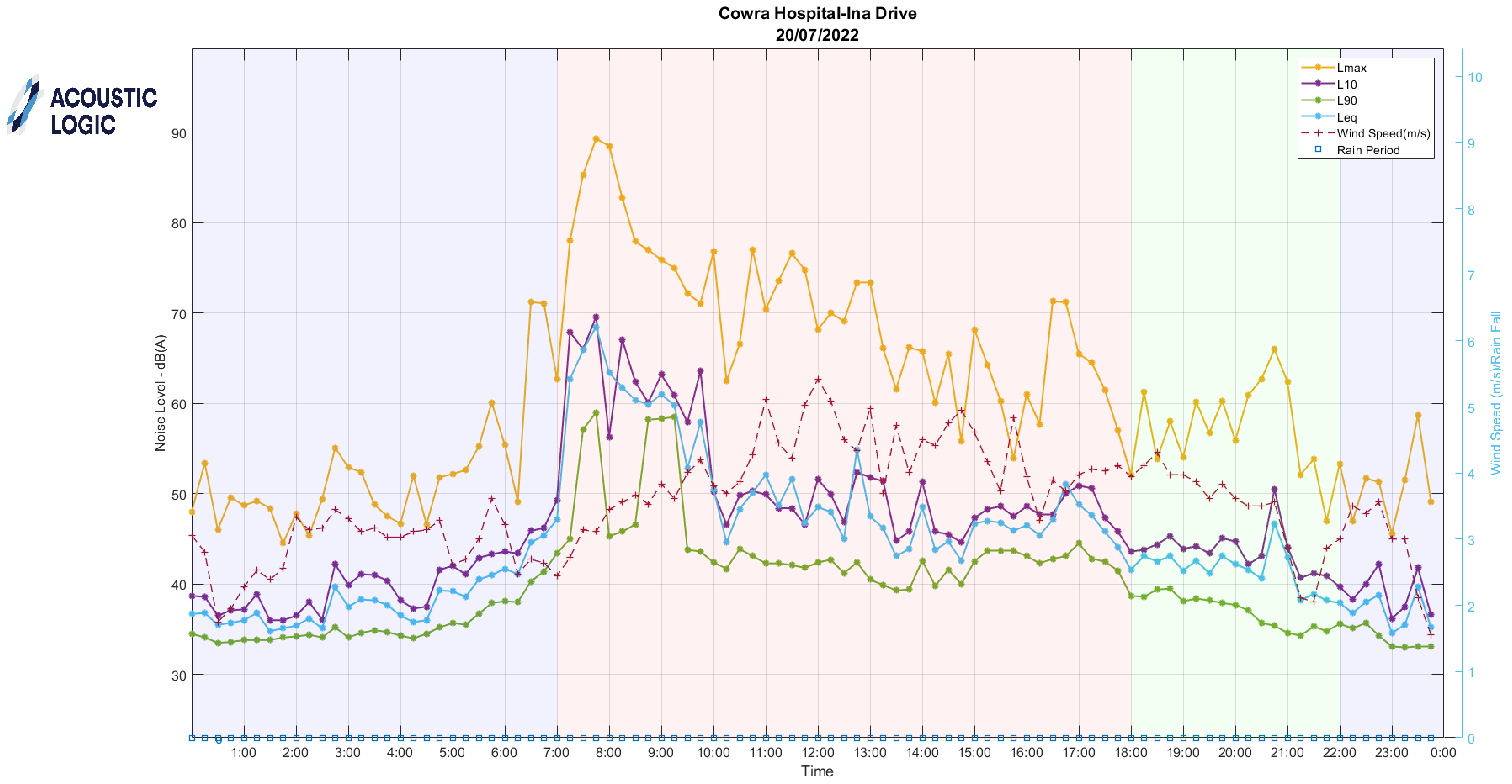


Cowra Hospital-Ina Drive
19/07/2022
ACOUSTIC LOGIC
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
Time
Lmax
L10
L90
Leq
Wind Speed(m/s)
Rain Period



Cowra Hospital-Ina Drive
20/07/2022
ACOUSTIC LOGIC
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
Time
Lmax
L10
L90
Leq
Wind Speed(m/s)
Rain Period
90
80
70
60
50
40
30
10
9
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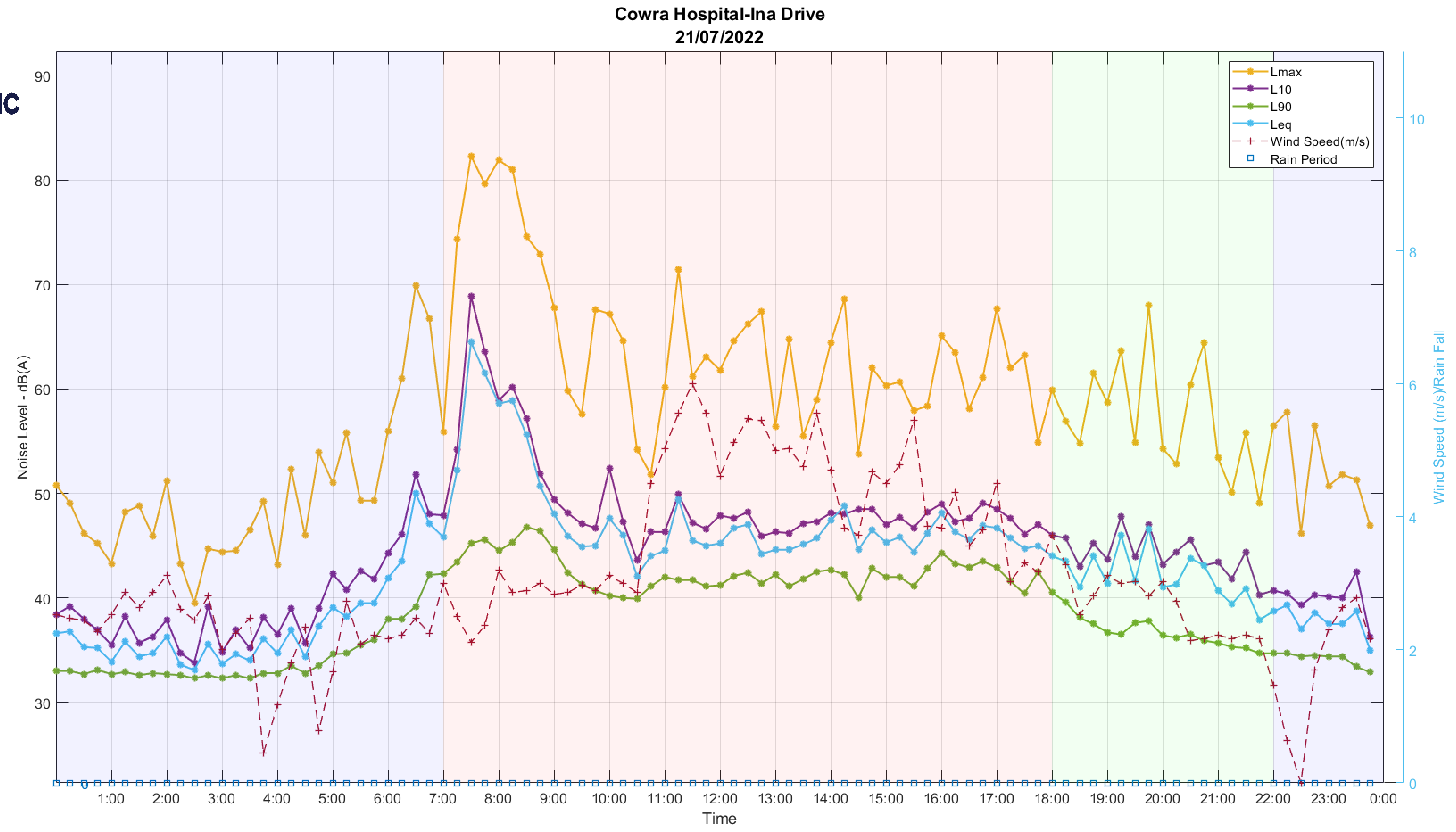

Cowra Hospital-Ina Drive
21/07/2022
Noise Level - dB(A)
90
80
70
60
50
40
30
Wind Speed (m/s)/Rain Fall
10
8
6
4
2
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1:00
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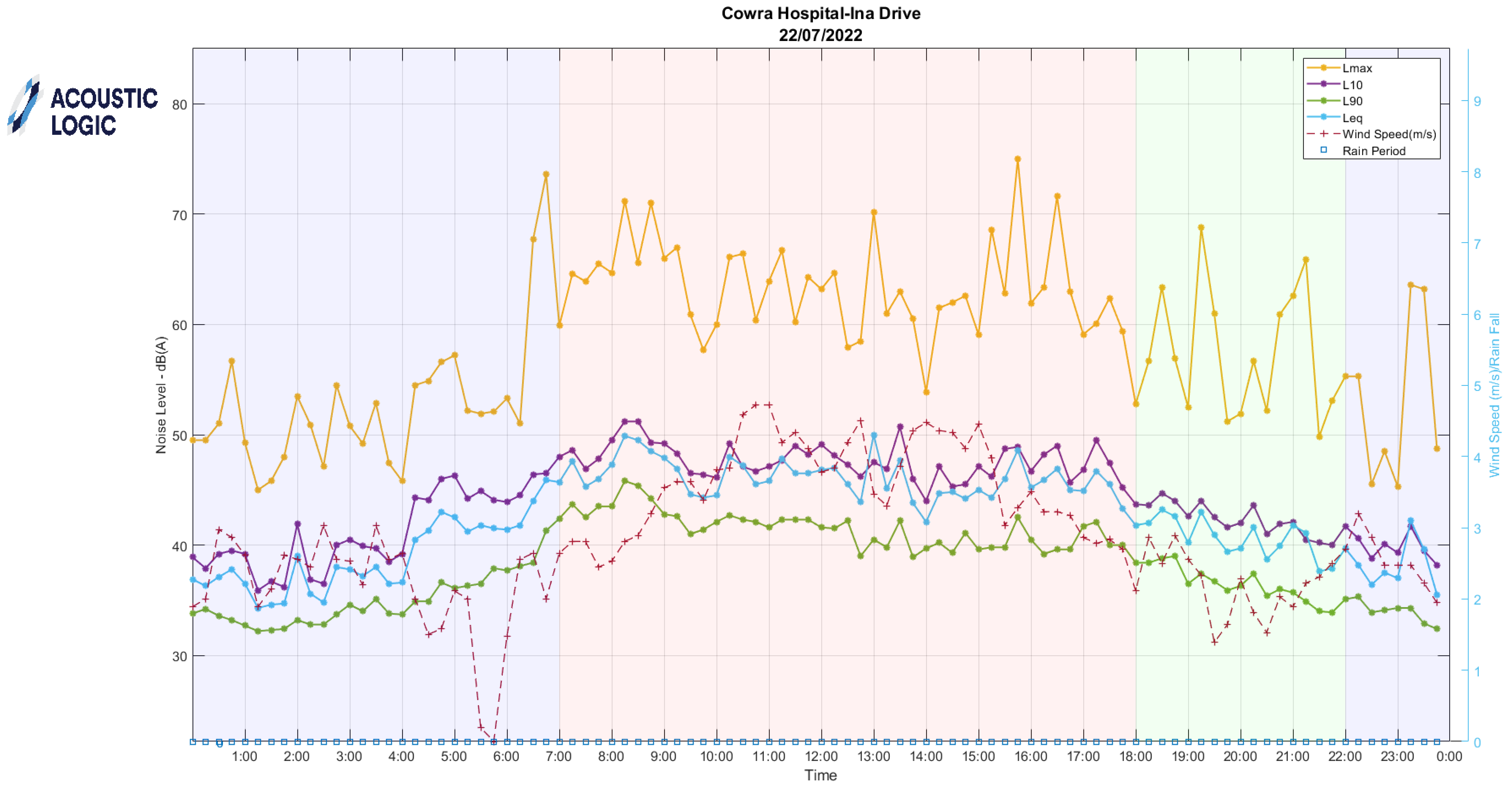
Time
Lmax
L10
L90
Leq
Wind Speed(m/s)
Rain Period


Cowra Hospital-Ina Drive
22/07/2022
ACOUSTIC LOGIC
Lmax
L10
L90
Leq
Wind Speed(m/s)
Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
Time
30
40
50
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70
80
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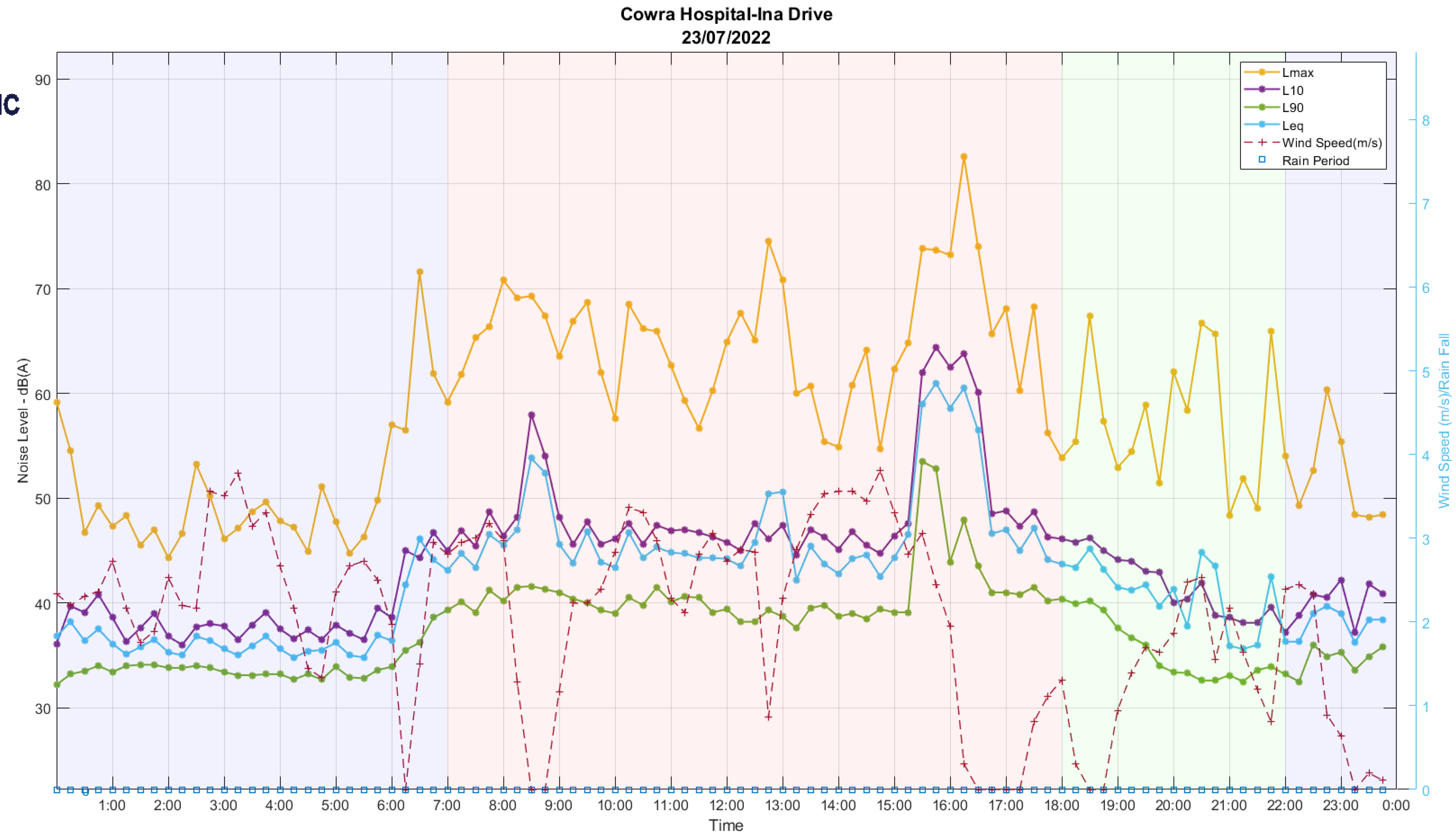

Cowra Hospital-Ina Drive
23/07/2022
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
Time
Lmax
L10
L90
Leq
Wind Speed(m/s)
Rain Period
90
80
70
60
50
40
30
8
7
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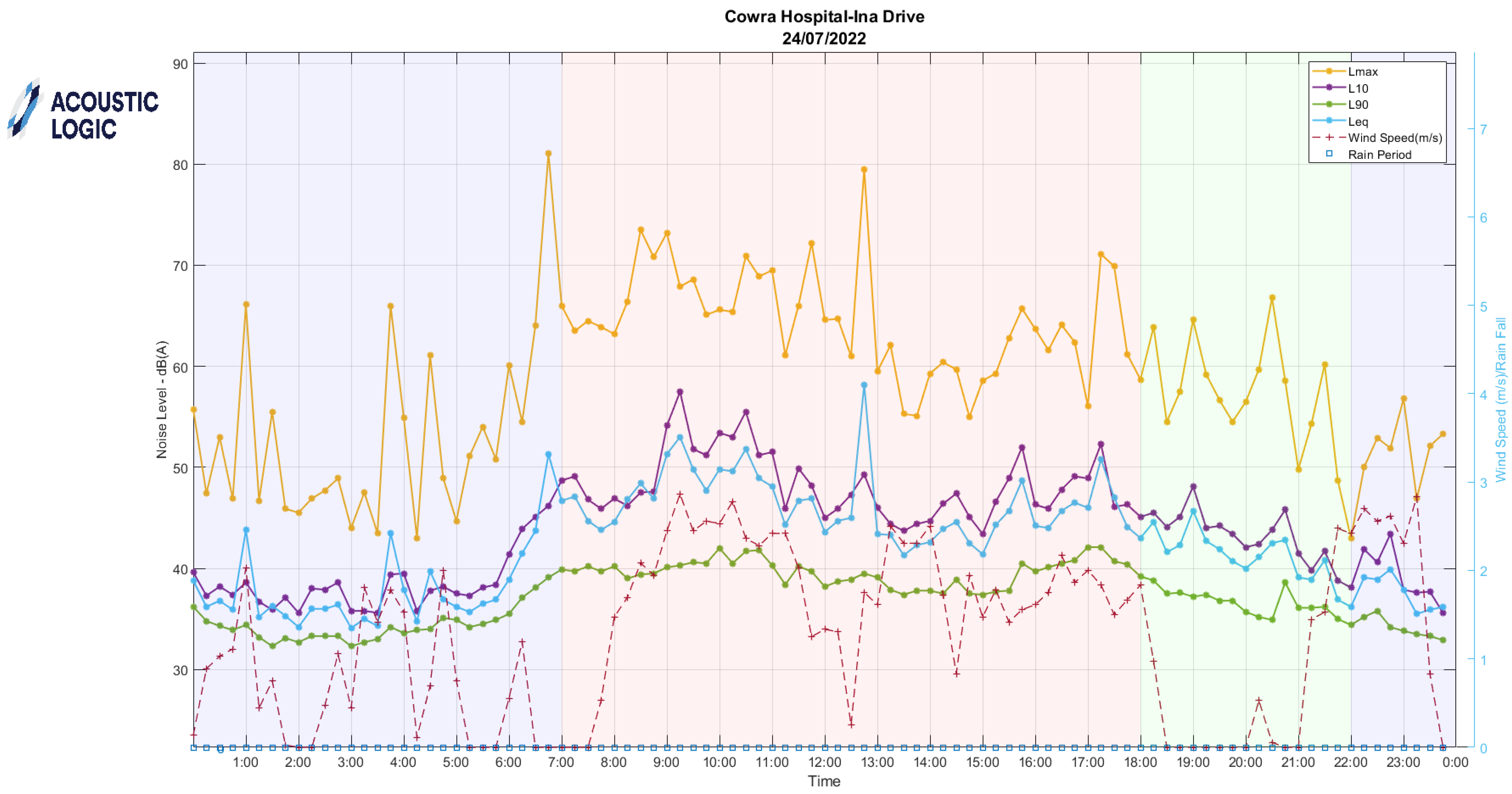
Cowra Hospital-Ina Drive
24/07/2022
ACOUSTIC LOGIC
Lmax
L10
L90
Leq
Wind Speed(m/s)
Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
Time
90
80
70
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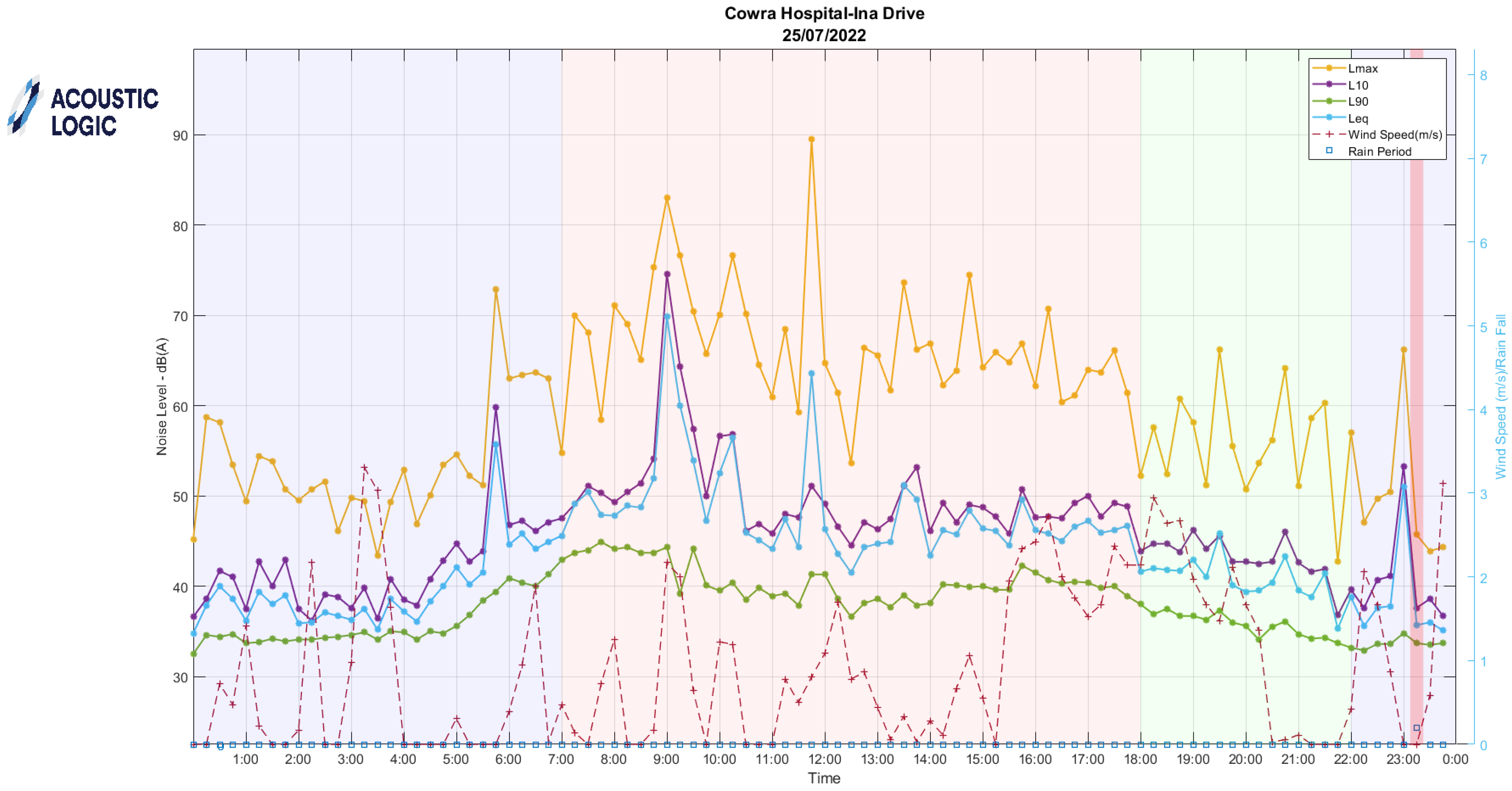

Cowra Hospital-Ina Drive
25/07/2022
ACOUSTIC LOGIC
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
Time
Lmax
L10
L90
Leq
Wind Speed(m/s)
Rain Period
30
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50
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70
80
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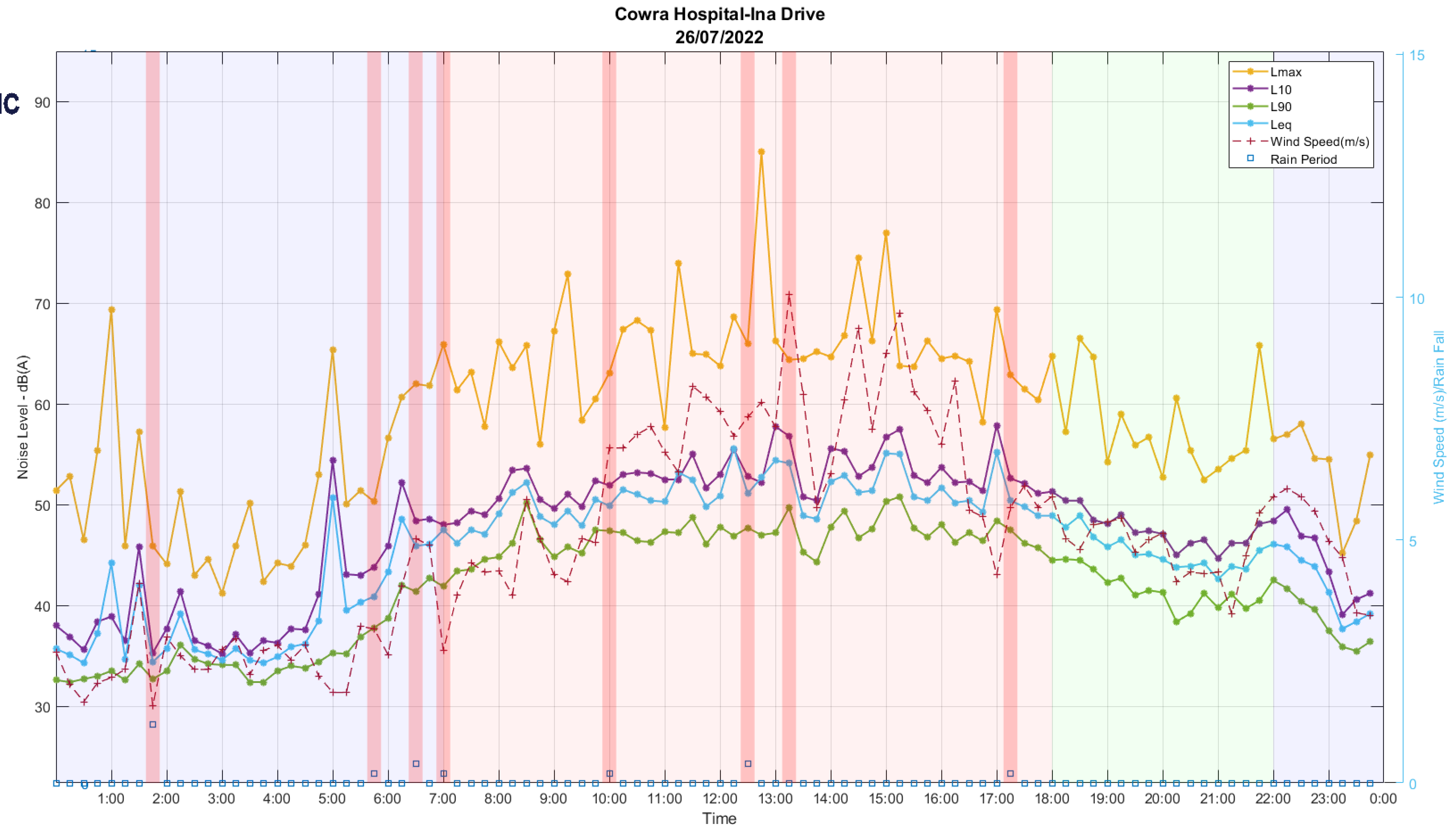

Cowra Hospital-Ina Drive
26/07/2022
ACOUSTIC LOGIC
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
Time
Lmax
L10
L90
Leq
Wind Speed(m/s)
Rain Period
90
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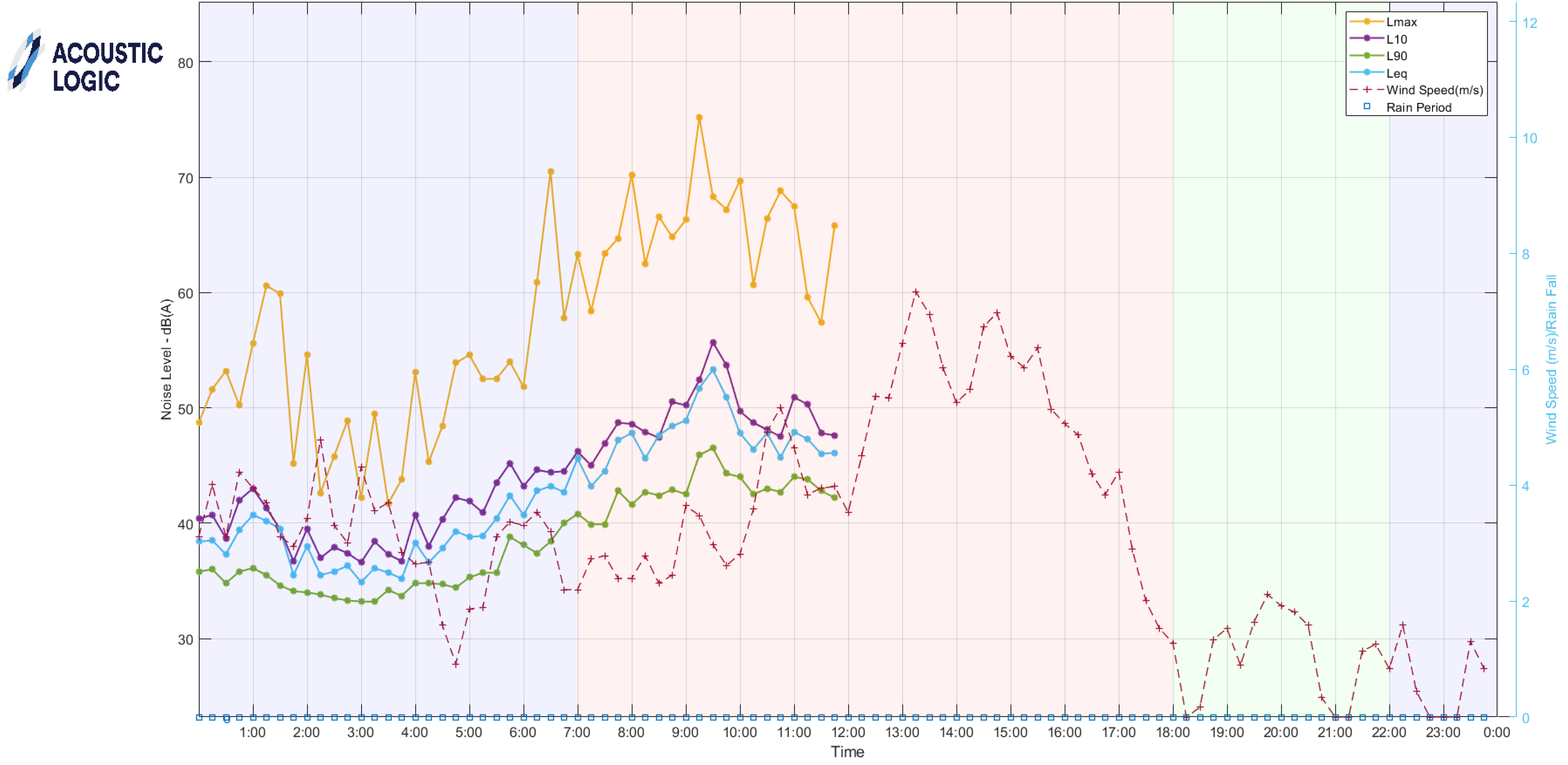
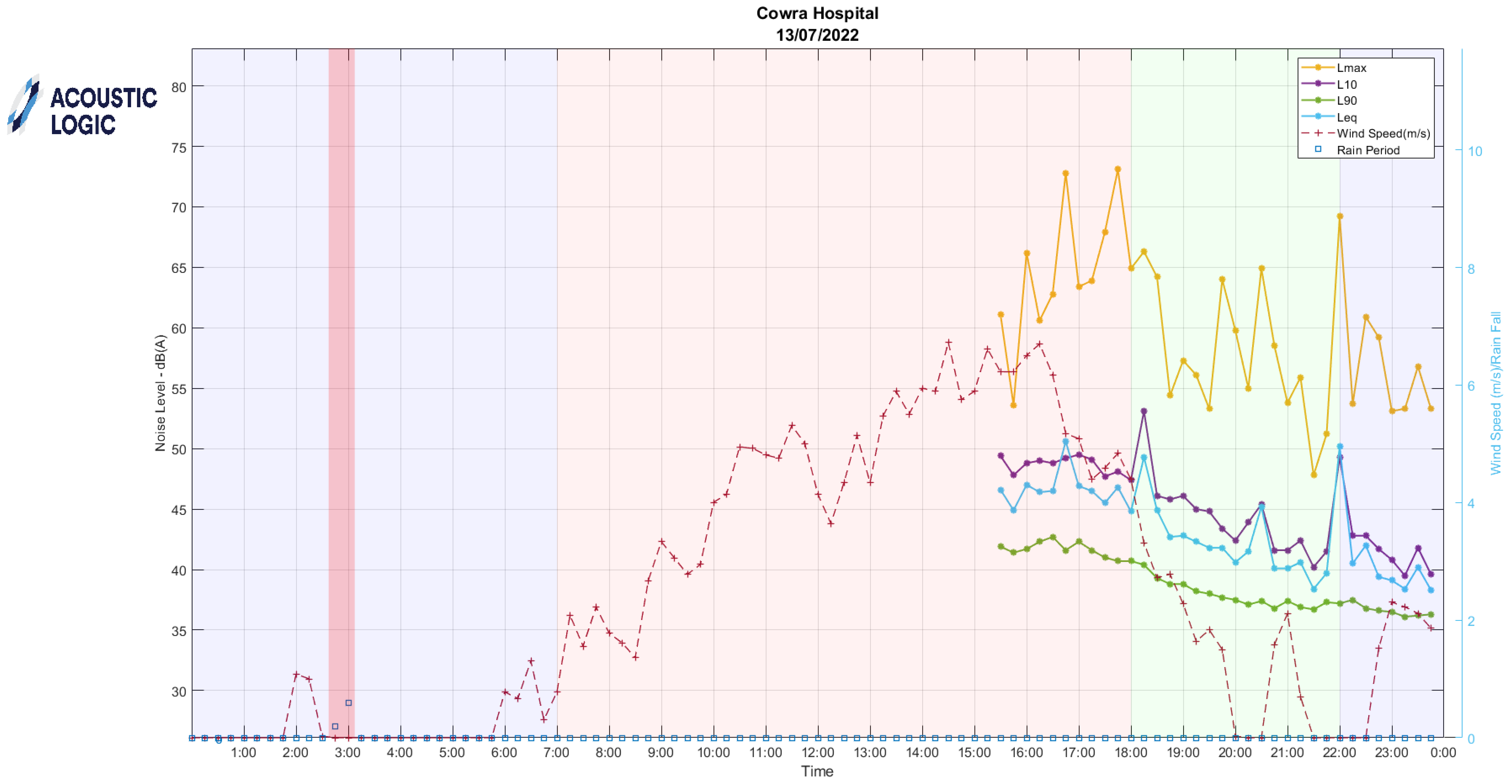
Cowra Hospital-Ina Drive
27/07/2022



APPENDIX 1B – UNATTENDED NOISE MONITORING DATA – 66 LIVERPOOL STREET, COWRA



Cowra Hospital
13/07/2022
ACOUSTIC LOGIC
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
Time
Lmax
L10
L90
Leq
Wind Speed(m/s)
Rain Period
80
75
70
65
60
55
50
45
40
35
30
10
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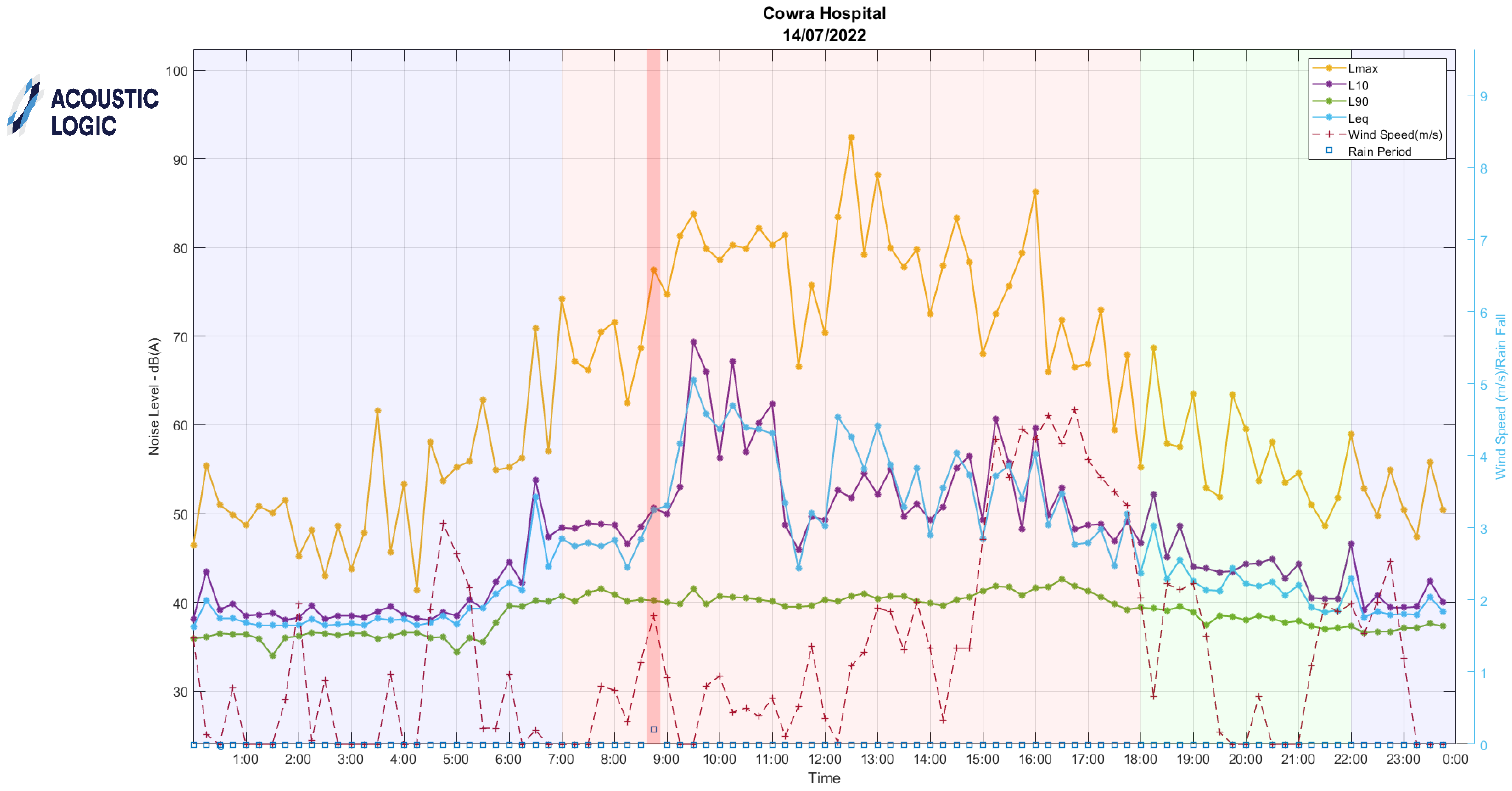

Cowra Hospital
14/07/2022
ACOUSTIC LOGIC
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
Time
Lmax
L10
L90
Leq
Wind Speed(m/s)
Rain Period
100
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80
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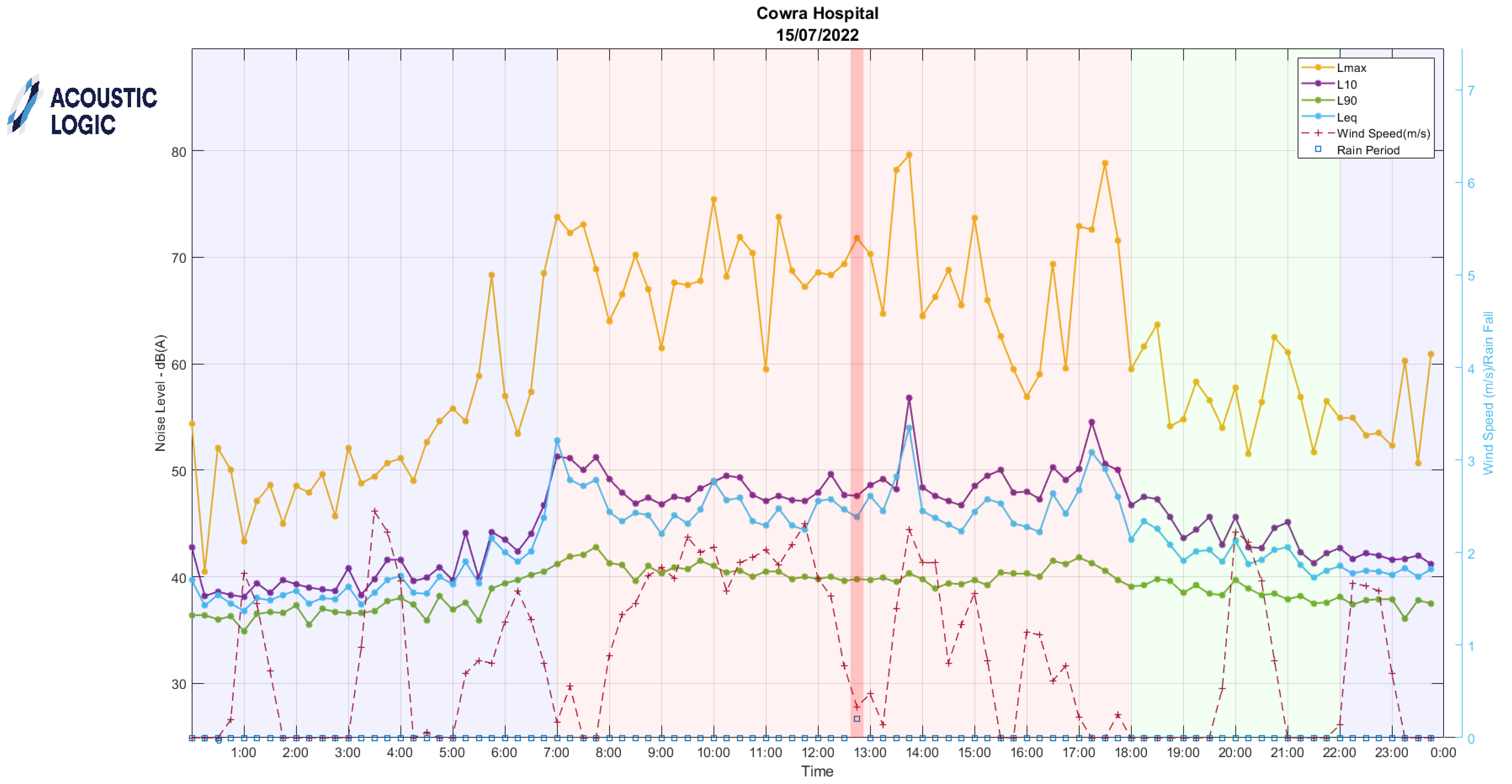

Cowra Hospital
15/07/2022
ACOUSTIC LOGIC
Lmax
L10
L90
Leq
Wind Speed(m/s)
Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
Time
30
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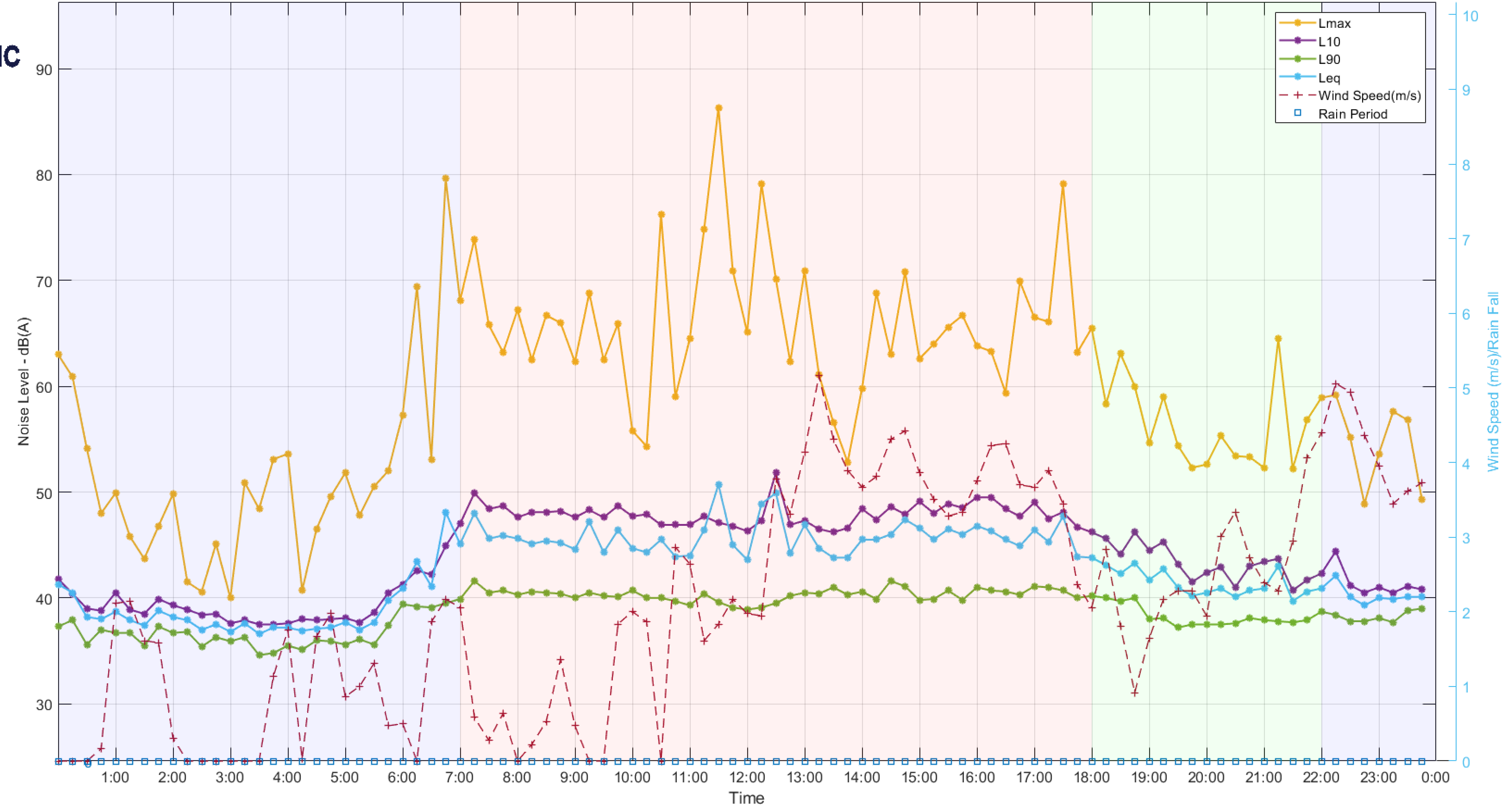
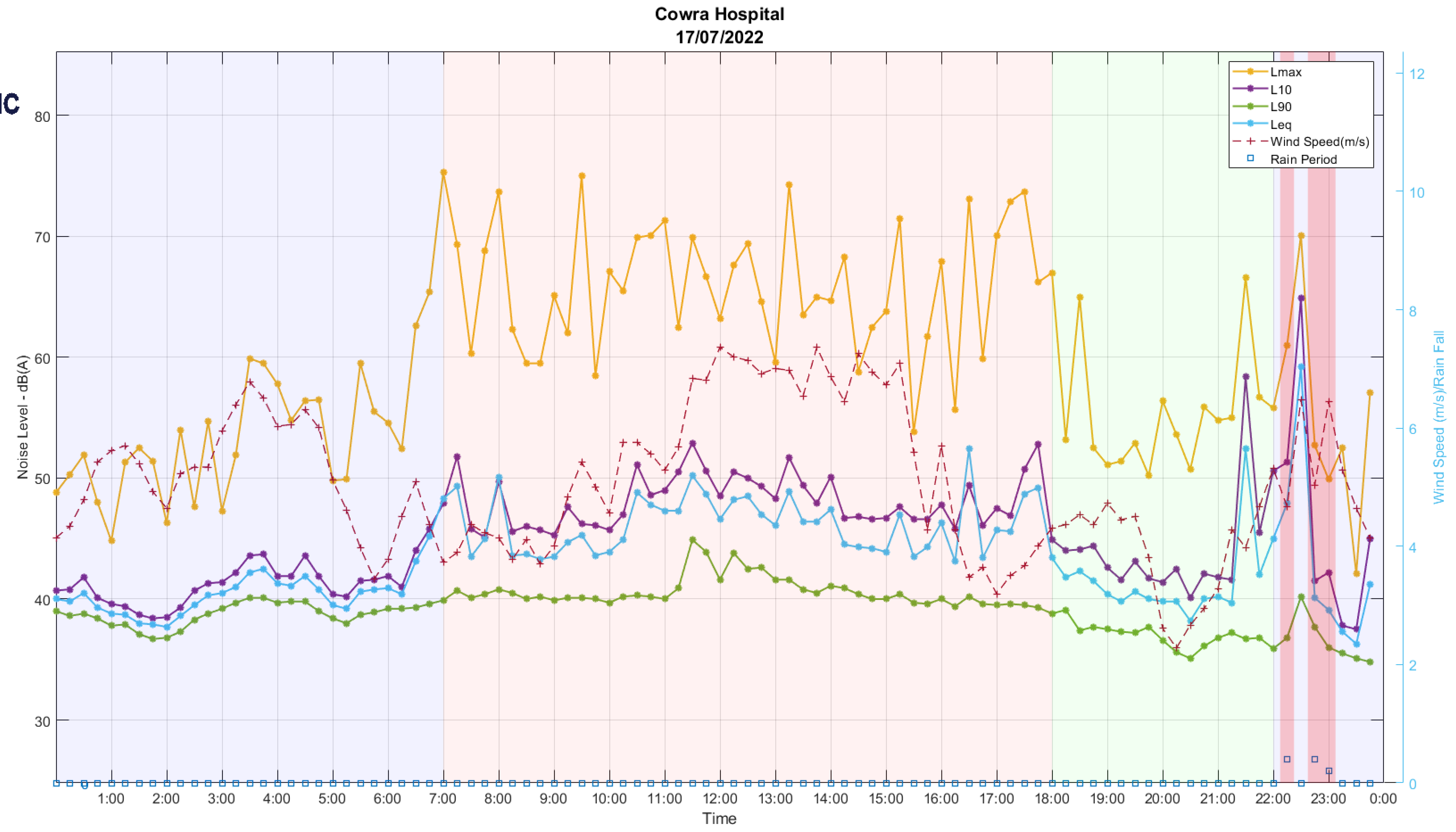
Cowra Hospital
16/07/2022




Cowra Hospital
17/07/2022
Lmax
L10
L90
Leq
Wind Speed(m/s)
Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
Time
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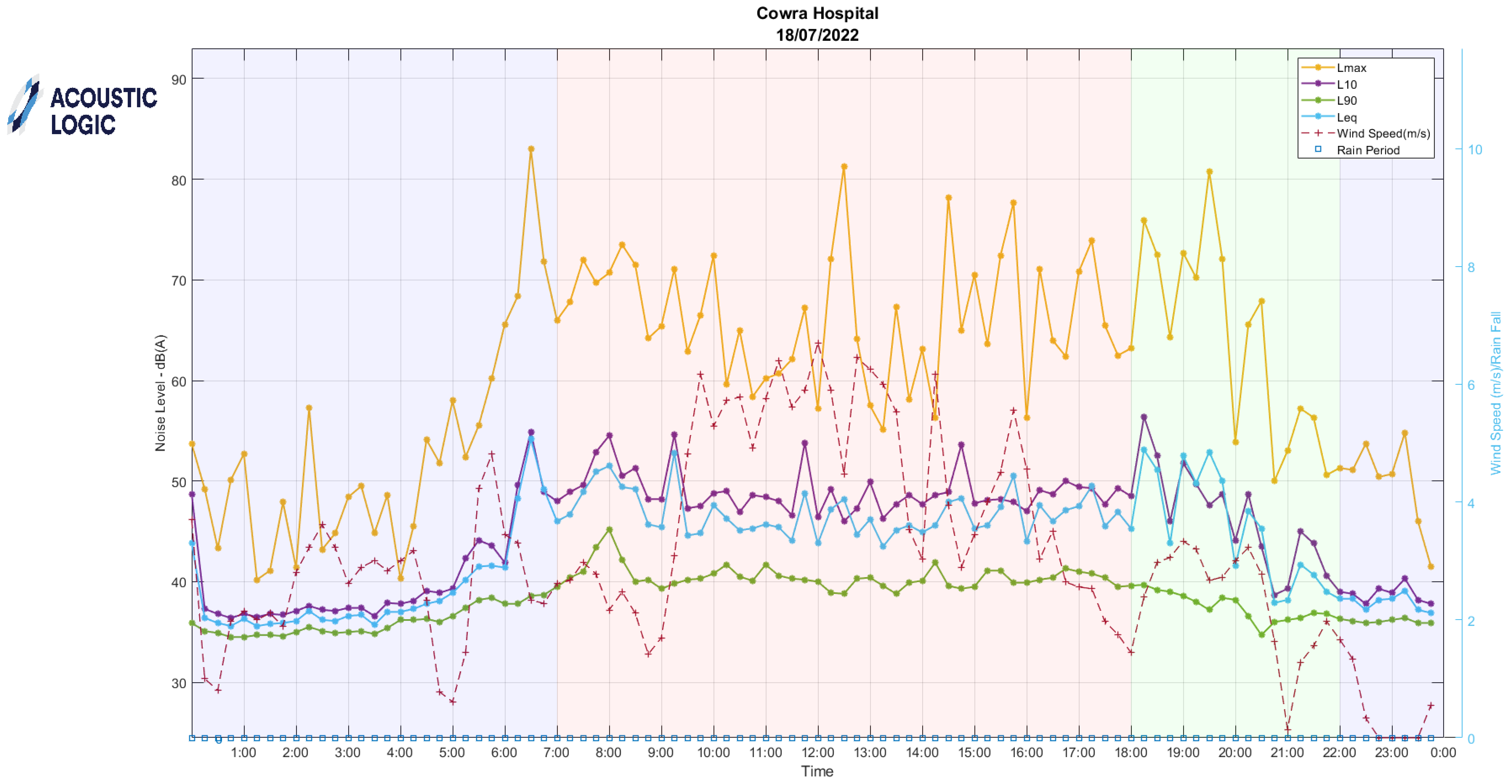
Cowra Hospital
18/07/2022
ACOUSTIC LOGIC
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
Time
Lmax
L10
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Leq
Wind Speed(m/s)
Rain Period
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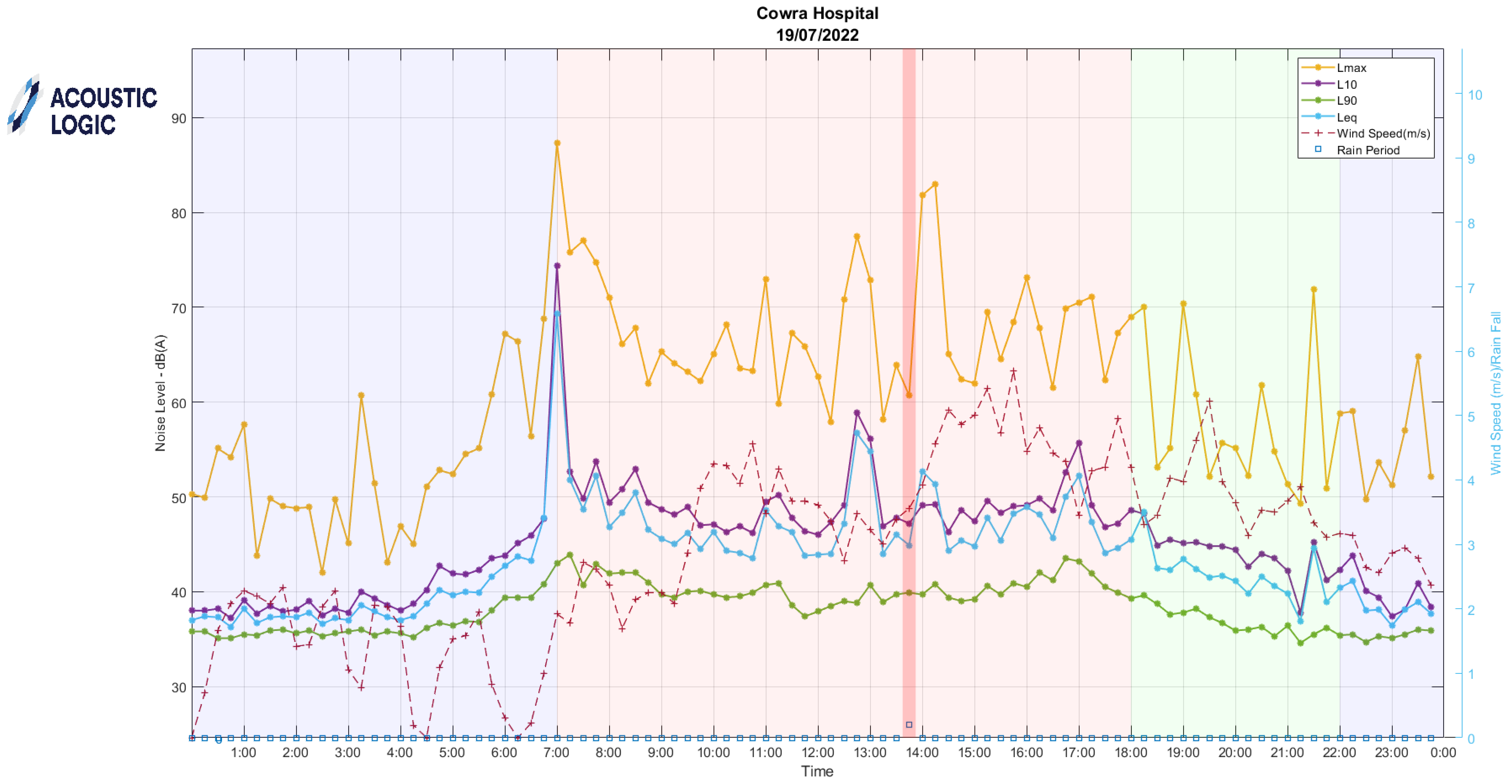
Cowra Hospital
19/07/2022
ACOUSTIC LOGIC
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
Time
Lmax
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L90
Leq
Wind Speed(m/s)
Rain Period
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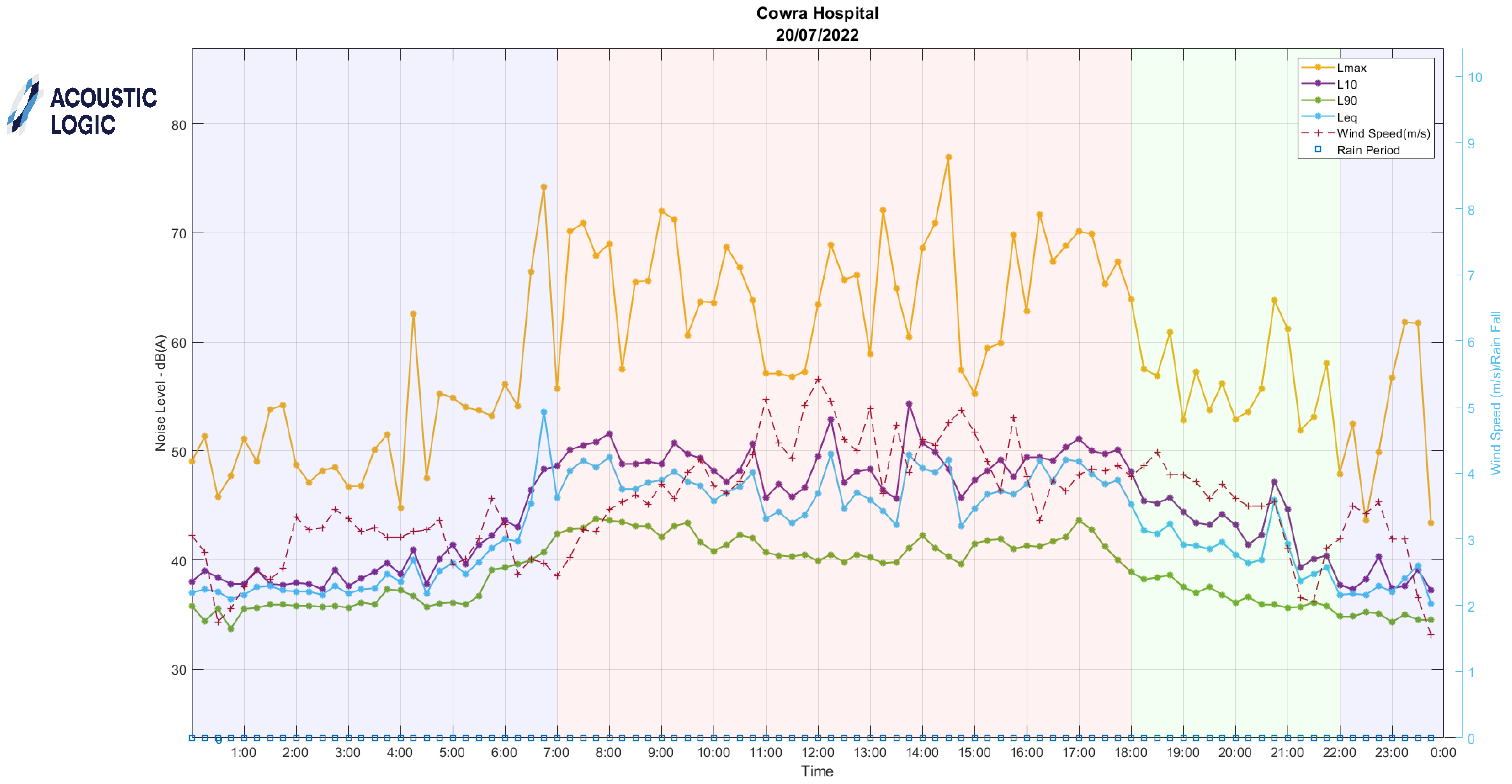

Cowra Hospital
20/07/2022
ACOUSTIC LOGIC
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
Time
Lmax
L10
L90
Leq
Wind Speed(m/s)
Rain Period
30
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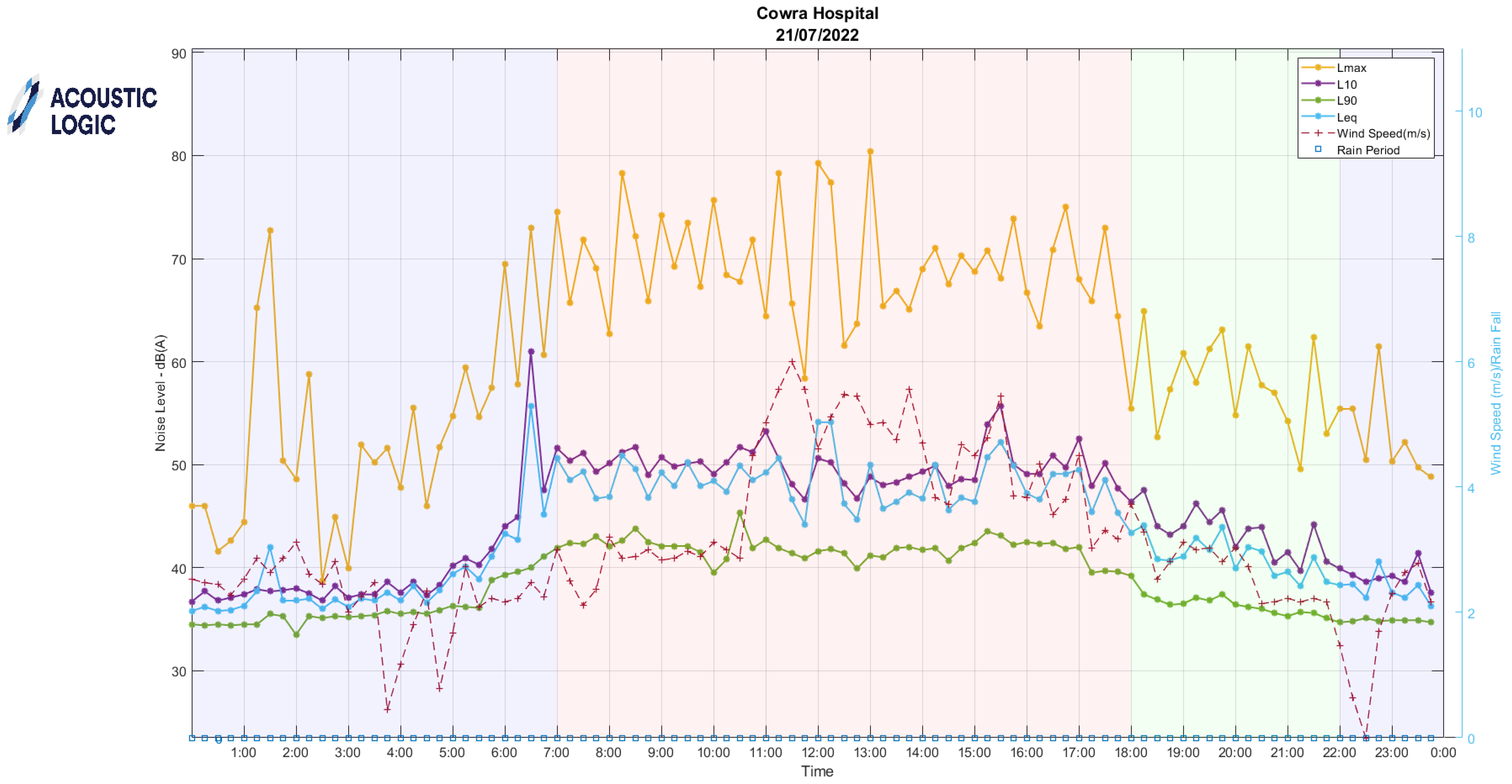
Cowra Hospital
21/07/2022
ACOUSTIC LOGIC
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
Time
Lmax
L10
L90
Leq
Wind Speed(m/s)
Rain Period
90
80
70
60
50
40
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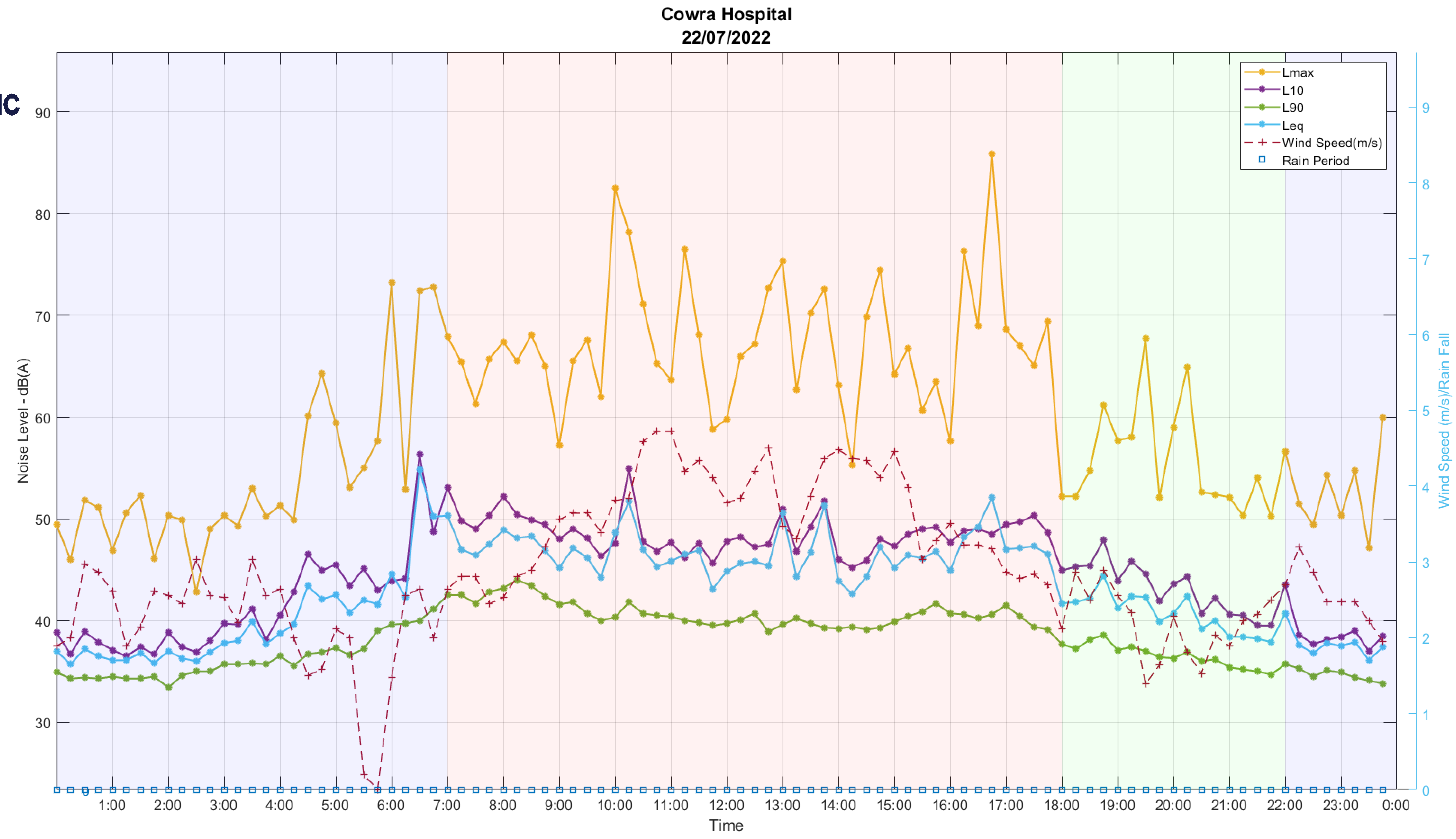
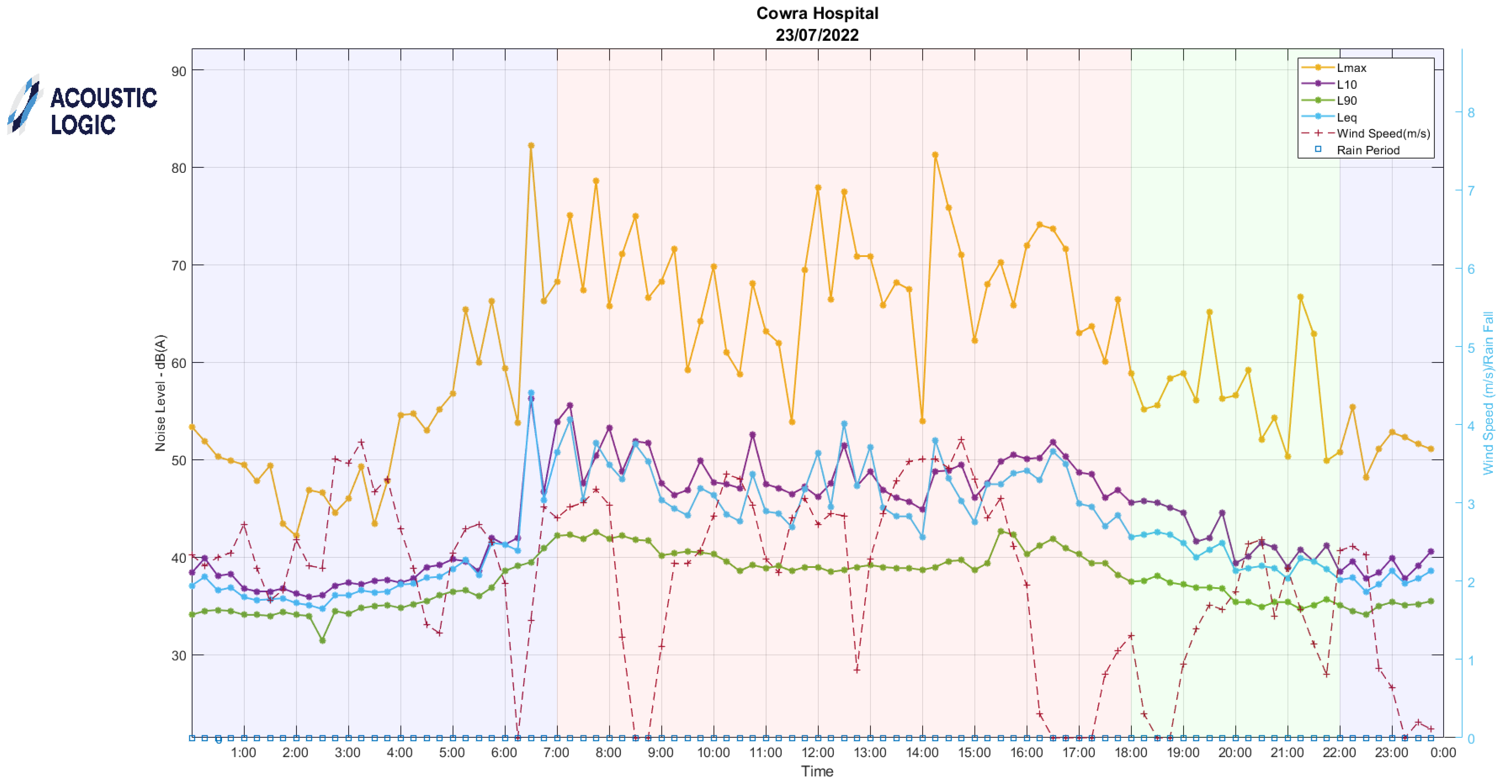
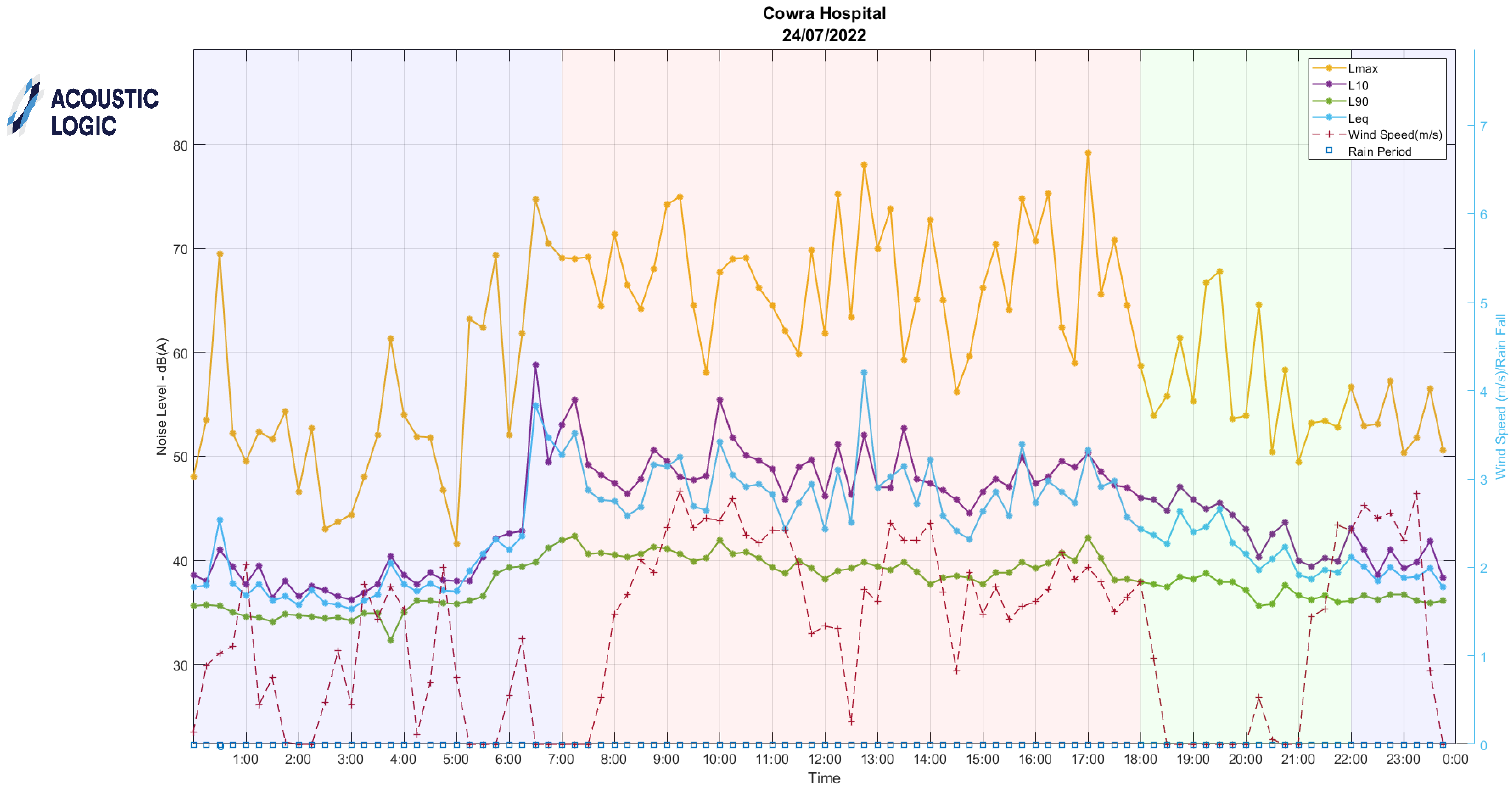
23:00
0:00

ACOUSTIC LOGIC

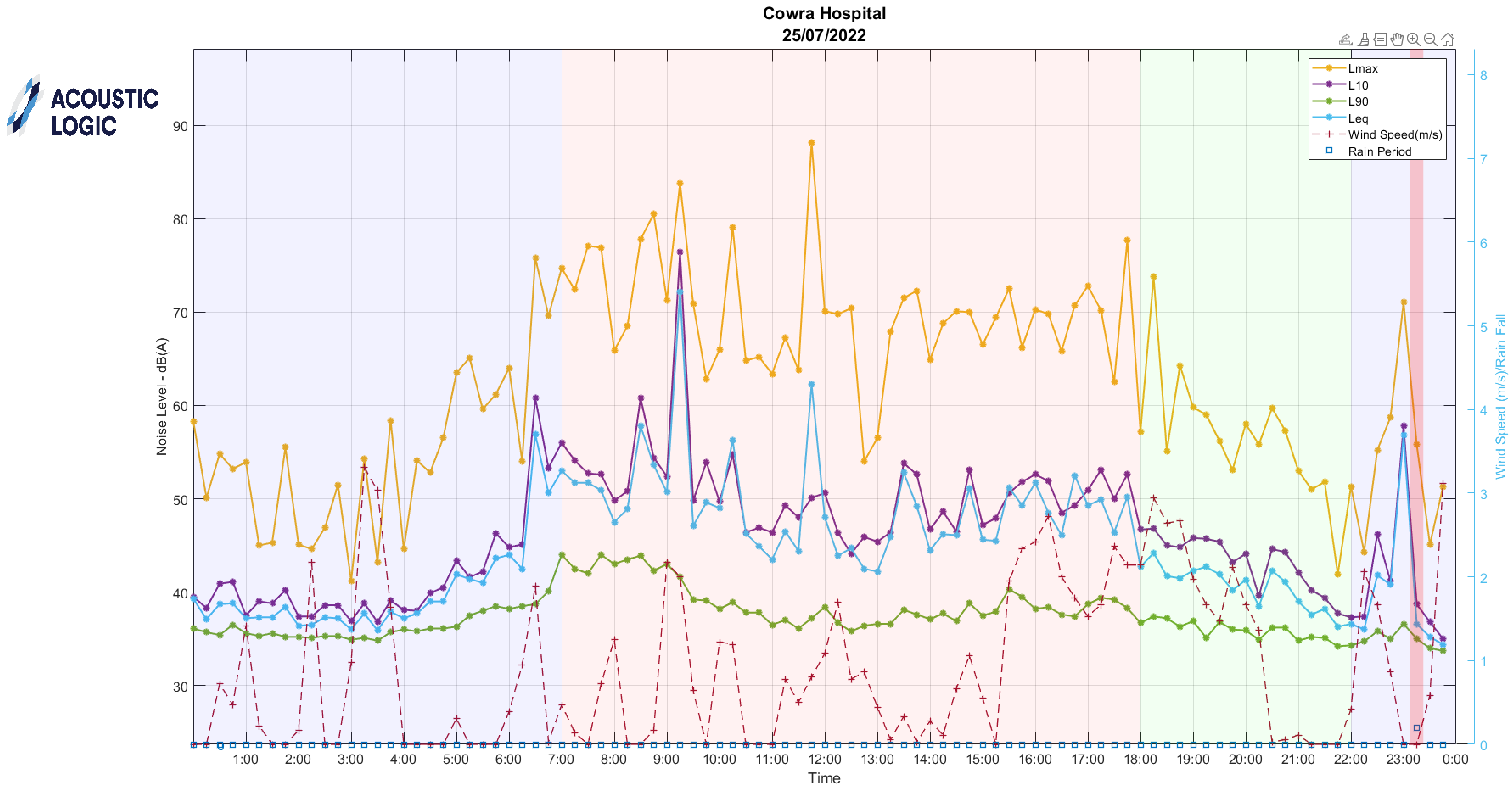


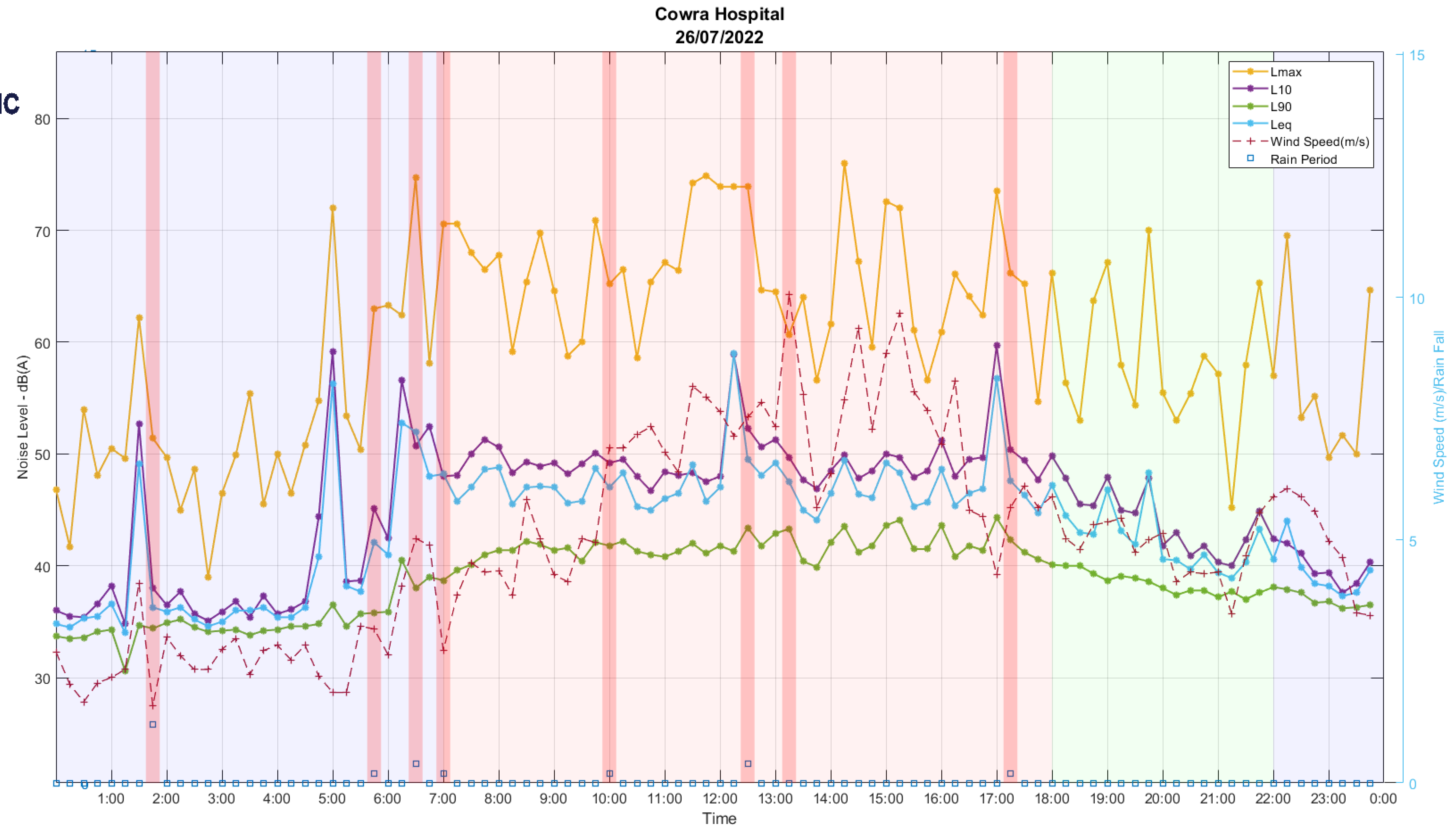


Cowra Hospital
23/07/2022
ACOUSTIC LOGIC
Lmax
L10
L90
Leq
Wind Speed(m/s)
Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
Time
90
80
70
60
50
40
30
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
8
7
6
5
4
3
2
1
0



Cowra Hospital
24/07/2022
ACOUSTIC LOGIC
Lmax
L10
L90
Leq
Wind Speed(m/s)
Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
Time
80
70
60
50
40
30
7
6
5
4
3
2
1
0
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
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
0:00


Cowra Hospital
25/07/2022
ACOUSTIC LOGIC
Lmax
L10
L90
Leq
Wind Speed(m/s)
Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
Time
90
80
70
60
50
40
30
8
7
6
5
4
3
2
1
0
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
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
0:00



Cowra Hospital
26/07/2022
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
Time
Lmax
L10
L90
Leq
Wind Speed(m/s)
Rain Period
80
70
60
50
40
30
15
10
5
0
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
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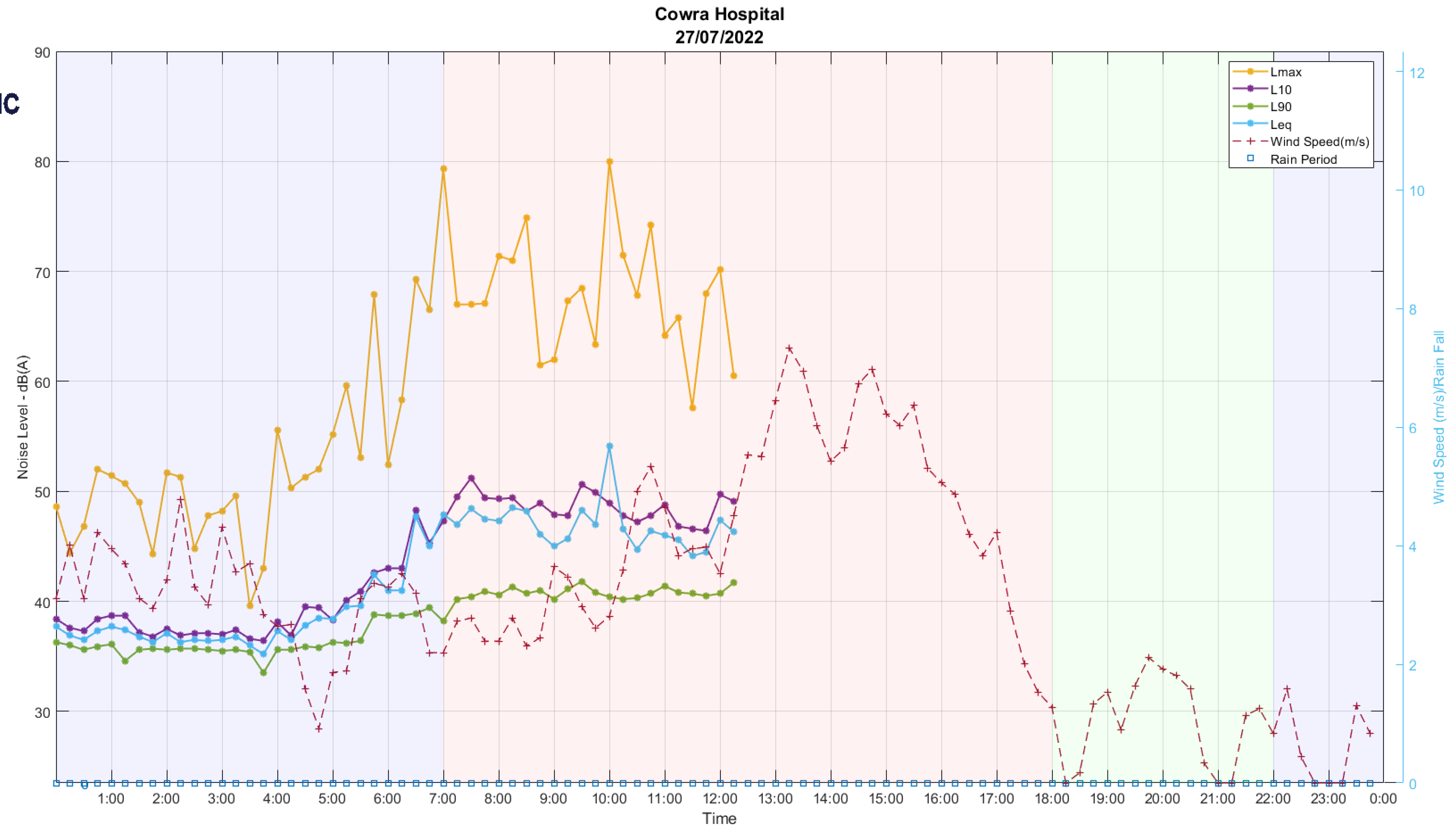
19:00
20:00
21:00
22:00
23:00
0:00



Cowra Hospital
27/07/2022
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
Time
Lmax
L10
L90
Leq
Wind Speed(m/s)
Rain Period
90
80
70
60
50
40
30
12
10
8
6
4
2
0
1:00
2:00
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23:00
0:00