MATTHEW PALAVIDIS
VICTOR FATTORETTO
MATTHEW SHIELDS

20 Heritage Drive, Chisholm

DA Acoustic Assessment

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

This report has been prepared to assess noise impacts associated with the proposed residential subdivision located at 20 Heritage Drive, Chisholm. The subject site and local context are indicated in Figure 2.

The report has been prepared for the sole purpose of a development application assessment and should not be used or relied on for any other purpose.

2 REFERENCED DOCUMENTS

2.1 BACKGROUND INFORMATION USED

The assessment is based on the following drawings, reports and other information:

- BN Architecture concept design drawings: 'Building Envelope Plan', dated 12/10/2021; and 'Subdivision Plan' dated 17/12/2021.
- Draft Traffic and Parking Impact Assessment prepared by McClaren traffic Engineering and Road Safety Consultants (doc ref: 210550.02DA, dated 6/12/2021)

2.2 PLANNING GUIDELINES

The following planning instruments and guidelines have been used in the assessment:

- Maitland Development Control Plan (DCP) 2011;
- NSW EPA – 'Noise Policy for Industry' ("NPfI") October 2017;

3 SITE DESCRIPTION AND THE PROPOSAL

The project site is located at 20 Heritage Drive, Chisholm. The proposed residential subdivision consists of medium density units, 5 semi detached dwellings and 7 terrace houses as detailed in Figure 1 below.

Figure 1 – Proposed Subdivision Plan

3.1 NEAREST SENSITIVE RECEIVERS

The following table lists the nearest sensitive receivers surrounding the site. An aerial photo of the site indicating nearby noise sensitive receivers and measurement locations is presented in Figure 2.

Table 1 – Sensitive Receivers

Receiver (Refer Figure 1)	Land Use	Comment
R1	Residential	Residential development located along Whitewater Drive to the west
R2	Residential	Residential development located along Duskdarter Street to the south
R3	Residential	Residential development located along Swiftwing Close to the south east
R4	Residential	Future residential development to the south
C1	Commercial	Proposed Chisholm Retail Centre
C2	Commercial	Commercial premises located along Heritage Drive to the north west
P1	Passive Recreation	Whitewater Park to the west
CC1	Childcare Centre	Childcare Centre to the south
S1	School	Primary School located to the north

3.2 ENVIRONMENTAL NOISE AND VIBRATION SOURCES

The following significant environmental noise sources have been identified:

- Traffic noise from Heritage Drive and other surrounding roadways
- Operational noise from nearby Childcare Centre
- Operational noise from nearby school.

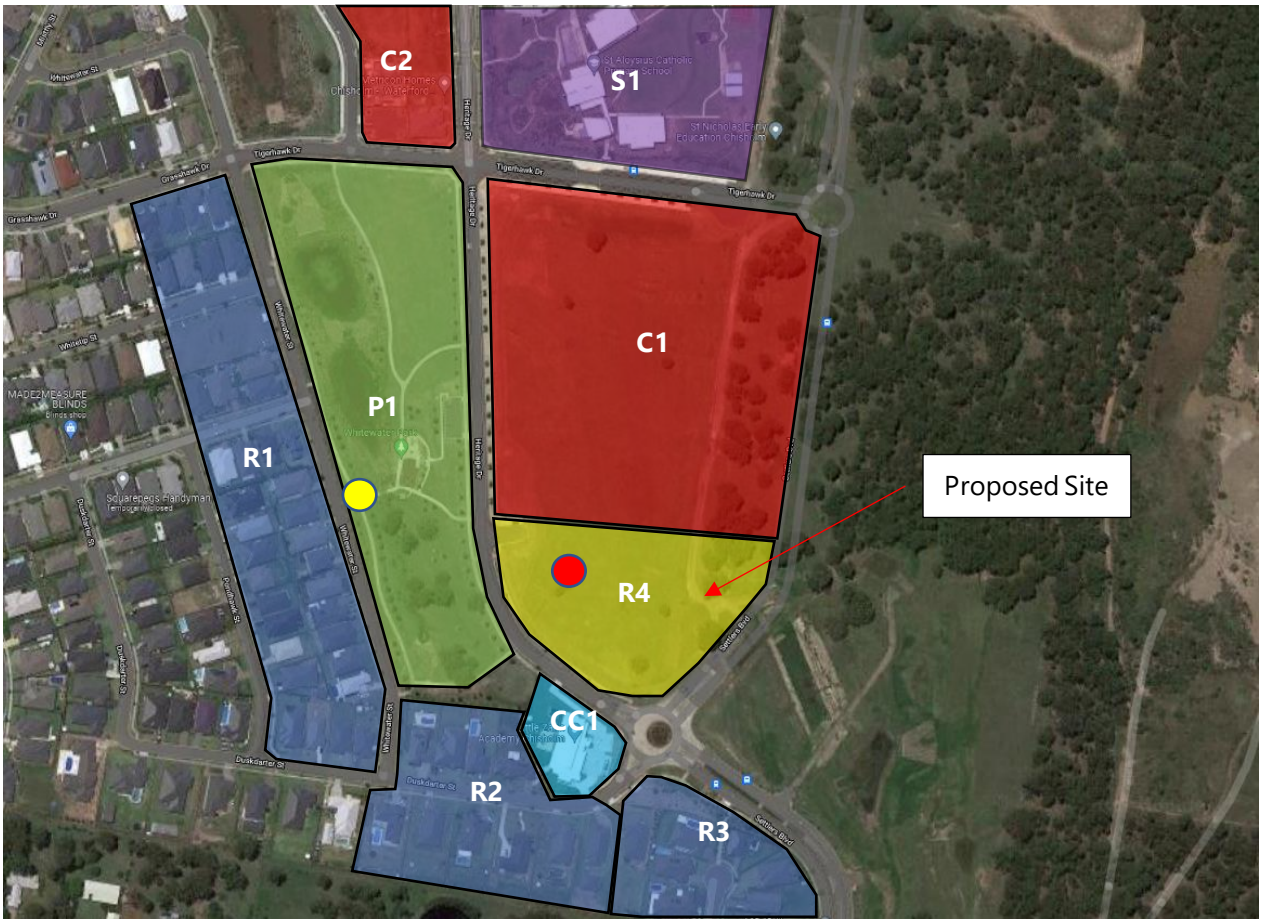


Figure 2 – Site Plan Showing Monitoring Locations and Surrounding Land Uses/Receivers

(SOURCE: Google Maps)

- Unattended Noise Monitoring Location	- Residential	- Childcare Centre
- Attended Noise Monitoring Location	- Commercial	- School
	- Passive Recreation	

4 AMBIENT NOISE MONITORING

Monitoring has been undertaken to obtain the following background noise levels at the surrounding residential properties.

Figure 2 above shows the monitoring locations used.

4.1 NOISE DESCRIPTORS

Ambient noise constantly varies in level from moment to moment, so it is not possible to accurately determine prevailing noise conditions by measuring a single, instantaneous noise level.

To quantify ambient noise, a 15 minute measurement interval is typically utilised. Noise levels are monitored continuously during this period, and then statistical and integrating techniques are used to characterise the noise being measured.

The principal measurement parameters obtained from the data are:

L_{eq} - represents the average noise energy during a measurement period. This parameter is derived by integrating the noise levels measured over the measurement period. L_{eq} is important in the assessment of noise impact as it closely corresponds with how humans perceive the loudness of time-varying noise sources (such as traffic noise).

L_{90} – This is commonly used as a measure of the background noise level as it represents the noise level heard in the typical, quiet periods during the measurement interval. The L_{90} parameter is used to set noise emission criteria for potentially intrusive noise sources since the disturbance caused by a noise 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.

L_{10} is used in some guidelines to measure noise produced by an intrusive noise source since it represents the average of the loudest noise levels produced at the source. Typically, this is used to assess noise from licenced venues.

L_{max} is the highest noise level produced during a noise event, and is typically used to assess sleep arousal impacts from short term noise events during the night. It is also used to assess internal noise levels resulting from aircraft and railway ground vibration induced noise.

L_1 is sometimes used in place of L_{max} to represent a typical noise level from a number of high level, short term noise events.

4.2 UNATTENDED LONG TERM NOISE MONITORING

4.2.1 Equipment Used

Unattended noise monitoring was conducted using an Acoustic Research Laboratories Pty Ltd Ngara (Type 1) noise monitor.

The monitoring was continuous, with statistical noise levels recorded at 15-minute intervals throughout the monitoring period. Measurements were taken on "A" frequency weighting and fast time response.

All monitoring equipment used retains current calibration - either manufacturers' calibration or NATA certified calibration. The monitors were field calibrated at the beginning and the end of the measurement with no significant drift in calibration noted.

4.2.2 Locations Monitored

The monitor was installed at the existing vacant land at the location of the proposed site. Refer to Figure 2 for detailed location and Figure 3 below for photograph of the installed monitor.

Figure 3 – Photograph of noise monitor installed on site

4.2.3 Background Noise Levels

Rating background noise levels have been determined from the long term, unattended noise monitoring data based on the methodology in the Noise Policy for Industry Fact Sheet B. Appendix A contains the data collected, and the periods identified as being affected by adverse weather conditions or extraneous noise (as defined by INP Fact Sheet B).

Weather data was obtained from records provided by the Bureau of Meteorology for the weather station located at Maitland Airport.

The NPfI day, evening and night periods are:

- Day - period from 7 am to 6 pm Monday to Saturday or 8 am to 6 pm on Sundays and public holidays
- Evening - the period from 6 pm to 10 pm
- Night - the remaining periods

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

Table 2 – NPfI Rating Background Noise Levels

Location	**Rating Background Noise Level (dB(A) L_{90})**		
	Day	Evening	Night
Residences Surrounding Site	**39**	**38**	**31**

4.2.4 Calculated Traffic Noise Levels

Traffic noise levels have been calculated from the long term, unattended noise monitoring data in Appendix A.

Periods affected by adverse weather conditions or extraneous noise potentially impacting the measurements are also indicated. Weather data was obtained from records provided by the Bureau of Meteorology for the weather station located at Maitland.

Representative traffic noise levels have been calculated using the guidelines in the EPA Road Noise Policy.

4.2.4.1 Traffic Noise Levels

The data for the day and night periods have been processed to determine the ambient noise levels at the monitoring locations.

Table 3 – Measured Traffic Noise Levels

Location	**Noise Level (dB(A) L_{eq})**	
	Day	**Night**
Whitewater Drive	52	46

5 EXTERNAL NOISE INTRUSION ASSESSMENT

5.1 NOISE INTRUSION CRITERIA

A noise intrusion assessment has been conducted based on the requirements of the following documents:

- Maitland Development Control Plan (DCP) 2011;
- Australian and New Zealand AS/NZS 3671:1989 'Acoustics—Road traffic noise intrusion—Building siting and construction'; and
- Australian and New Zealand AS/NZS 2107:2016 'Recommended design sound levels and reverberation times for building interiors'.

5.1.1 Maitland Development Control Plan (DCP) 2011

The Maitland DCP 2011 contains no specific numerical controls for noise intrusion for residential development, as such AS/NZS 3761:1989 shall be adopted.

5.1.2 Australian and New Zealand AS/NZS 3671:1989 *'Acoustics—Road traffic noise intrusion — Building siting and construction'*

Australian Standard AS 3671-1989 notes the following in relation to traffic noise:

- Internal noise levels should be determined in accordance with the relevant standard.
- Australian Standard AS/NZS 2107:2016 'Acoustics – Recommended design sound levels and reverberation times for building interiors', is the industry adopted standard.
- A suitable descriptor should be adopted relevant to the use of the development. As AS2107:2016 adopts the L_{eq} descriptor, AL shall also use this descriptor.
- AS3671 does not specifically recommend a time interval. On this basis, AL have adopted the interval used by the EPA Road Noise Policy for main/arterial roads, that being:
    - Day – 7am to 10pm (15 hour); and
    - Night – 10pm to 7am (9 hour).

Internal noise levels have been selected in accordance with AS 2107:2016.

5.1.3 Australian and New Zealand AS/NZS 2107:2016 *'Recommended design sound levels and reverberation times for building interiors'*

Australian Standard AS 2107-2016: Recommended design sound levels and reverberation times for building interiors specifies allowable internal noise levels for internal spaces within residential and commercial buildings. Table 1, in Section 5 of AS 2107-2016, gives the following maximum internal noise levels for project buildings.

Table 4 – Recommended Design Sound Level

Space /Activity Type	Recommended Maximum Design Sound Level dB(A) L_{eq}
Living Areas	30-40 dB(A)L_{eq}
Sleeping Areas	30-35 dB(A)$L_{eq(nightime)}$

5.1.4 Summarised External Noise Intrusion Criteria

The internal noise criteria adopted for each internal space is therefore summarised below based on the relevant State, Council and Australian Standard requirements.

Table 5 – Adopted Internal Noise Levels

Space / Activity Type	Adopted Internal Noise Level
Sleeping Areas	35 dB(A)$L_{eq(9\ hour)}$
Living Areas	40 dB(A)$L_{eq(15\ hour)}$

5.2 INDICATIVE CONSTRUCTIONS

We note that layouts for buildings within the development are not finalised at this stage. As such, the constructions detailed in this section are indicative for the purposes of demonstrating that compliance is feasible, and are to be reviewed at CC stage by the project acoustic consultant.

5.2.1 Glazed Windows and Doors

Indicative treatments to meet the criteria detailed in Section 5.1 have been determined based on architectural plans provided. Aluminium framed/sliding glass doors and windows will be satisfactory provided they meet the following criteria. All external windows and doors listed are required to be fitted with Q-Lon type acoustic seals. (**Note: Mohair Seals are not considered acoustic seals**).

Thicker glazing may be required for structural, safety or other purposes. Where it is required to use thicker glazing than scheduled, this will also be acoustically acceptable.

The recommended glazing constructions are listed in the Table 6 below.

Table 6 – Recommended Glazing Constructions

Space	Building	Glazing Construction	Acoustic Seals
Bedrooms	All	4mm standard glazing	Not required
Living Rooms			

It is recommended that only window systems having test results indicating compliance with the required ratings obtained in a certified laboratory be used where windows with acoustic seals have been recommended.

In addition to complying with the minimum scheduled glazing thickness, the R_w rating of the glazing fitted into open-able frames and fixed into the building opening should not be lower than the values listed in the table below for all rooms. Where nominated, this will require the use of acoustic seals around the full perimeter of open-able frames and the frame will need to be sealed into the building opening using a flexible sealant.

Table 7 – Indicative Rw of Glazing (with Acoustic Seals)

Glazing Assembly	Minimum Rw of Installed Window
4mm standard glazing	24

5.2.2 External Wall Construction

Masonry or concrete wall structures will be acceptable without any further acoustic treatment required. Where lightweight walls are proposed, it is recommended that the following constructions are adopted.

Table 8 -Recommended Wall Constructions

Space	Internal Lining	Stud System	External Lining
All	1 x 10mm layer of plasterboard	92mm stud with 75mm thick, 11kg/m^3 glasswool insulation	9mm FC sheet

Any penetrations through the ceiling are to be acoustically sealed to maintain the required acoustic rating of the façade structure.

5.2.3 External Roof/Ceiling Construction

Concrete roof construction will be acceptable without any further acoustic treatment required. Where metal deck roofs are proposed, Roof/ceiling is to be constructed as per Table 9 below.

Table 9 -Recommended Roof Constructions

Space	Internal Lining	Truss System	External Roof
All	1 x 10mm layer of plasterboard	Minimum 250mm airgap filled with 75mm thick, 11kg/m^3 glasswool insulation	0.5mm Metal sheet

Any penetrations through the ceiling are to be acoustically sealed to maintain the required acoustic rating of the façade structure.

5.2.4 Ventilation and Air Conditioning

The NSW Department of Planning's 'Development near Rail Corridors and Busy Roads (Interim Guideline)' specifies the following controls regarding natural ventilation:

- With respect to natural ventilation of a dwelling the allowable internal noise goal is permitted to be 10 dB(A) higher than when the windows are closed (i.e. – allowable level in bedrooms becomes 45 dB(A), and 50 dB(A) in living rooms). Where noise levels would exceed this, the NSW Planning guideline recommends that a ventilation system be provided to achieve the ventilation requirements of the BCA with windows closed.

We note that all facades in this development are capable of achieving the criteria above with doors/windows open to 5% of the floor area and supplementary ventilation will not be required.

6 NOISE EMISSION ASSESSMENT

6.1 CRITERIA

Noise emission goals for the assessment of the various uses within the development have been determined in accordance with the requirements of the following:

- Maitland DCP 2011;
- NSW EPA 'Noise Policy for Industry' (NPfI) 2017.

6.1.1 Maitland DCP 2011

The Maitland DCP 2011 contains no specific numerical controls for noise emissions from residential development.

6.1.2 NSW Environmental Protection Authority (EPA) Noise Policy for Industry (NPfI) 2017

The NSW EPA NPfI provides guidelines for assessing noise impacts from developments. The recommended assessment objectives vary depending on the potentially affected receivers, the time of day and the type of noise source. The NPfI has two requirements which must both be complied with, namely an intrusiveness criterion and amenity criterion.

6.1.2.1 Intrusiveness Criteria

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). The intrusiveness criteria applicable to the development are presented in the table below.

Table 10 – NPfI Intrusiveness Criteria

Time of Day	Rating Background Noise Level dB(A)$L_{90(15min)}$	Project Noise Trigger Level (Intrusiveness) dB(A)$L_{eq(15min)}$
Day (7am – 6pm)	39	44
Evening (6pm-10pm)	38	43
Night (10pm – 6am)	31	36

6.1.2.2 Amenity Criteria

The guideline is intended to limit the absolute noise level from all plant 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 and zoning, the NPfI suggests the adoption of the 'suburban' 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 project site are presented in Table 11 below.

Table 11 – NPfI Amenity Criteria

Type of Receiver	Time of day	Recommended Noise Level dB(A)$L_{eq(period)}$	Project Amenity Noise Level dB(A)$L_{eq(15min)}$
Residential (Suburban)	Day (7:00am-6:00pm)	50	48
	Evening (6:00pm-10:00pm)	45	43
	Night (10:00pm-6:00am)	40	38
Commercial	When in use	65	63
Passive Recreation	When in use	50	48
Active recreation area (school playground)	Active recreation area (school playground)	55	53
School classroom – external*	Noisiest 1 hour when in use	45	43

***External noise levels account for the 10dB façade reduction described in the EPA Noise Policy for Industry.**

6.1.2.3 Sleep Disturbance (Maximum Noise Level Event Assessment)

The potential for sleep disturbance from maximum noise level events from premises during the night-time period must be considered as the proposed operation extends into night-time hours. Sleep disturbance is considered to be both awakenings and disturbance to sleep stages. Where the subject development night-time noise levels at a residential location exceed:

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

A detailed maximum noise level event assessment should be undertaken.

Table 12 - Sleep Arousal Emergence Criteria (Night)

Location	Rating Background Noise Level - dB(A)L90	Emergence Level
All Potentially Affected Residential Receivers	31 (10:00pm – 12:00am)	40 dB(A)$L_{eq, 15min}$; 52 dB(A)L_{Fmax}

If there are noise events that could exceed the emergence levels detailed in the table above, then an assessment of sleep arousal impact is required to be carried out, taking into account the level and frequency of noise events during the night, existing noise sources, etc. This more detailed sleep arousal test is conducted using the guidelines in the EPA Road Noise Policy. Most relevantly, the Road Noise Policy states:

For the research on sleep disturbance to date it can be concluded that:

- *Maximum internal noise levels below 50-55dB(A) are unlikely to awaken people from sleep.*
- *One to two noise events per night with maximum internal noise levels of 65-70dB(A) are not likely to affect health and wellbeing significantly.*

6.1.3 Summarised Noise Policy for Industry Requirements

Table 13 – EPA NPI Project Noise Trigger Level (Residential)

Receiver	Time Period	Rating Background Noise Level dB(A)L_{90}	Project Amenity Criteria dB(A) L_{eq}	Intrusiveness Criteria dB(A) $L_{eq(15min)}$	NPI Criteria for Sleep Disturbance
Surrounding Residential development (R1/R2/R3)	Day	39	48	**44**	-
	Evening	38	43	**43**	-
	Night	31	38	**36**	**40 dB(A)$L_{eq, 15min}$; 52 dB(A)L_{Fmax}**

Note: Project Noise Trigger Levels (PNTL) for each receiver/time period are indicated in bold.

Table 14 – EPA NPI Project Noise Trigger Level (Non-Residential)

Receiver	Time of Day	Amenity Criteria dB(A) $L_{eq, 15min}$
School classroom – external	Noisiest 1 hour when in use	43
Place of worship – external	When in use	48
Passive recreation area	When in use	48
Active recreation area (school playground)	When in use	53
Commercial	When in use	63
Industrial	When in use	68

6.2 NOISE EMISSIONS FROM MECHANICAL PLANT

Detailed plant selection and location has not been undertaken at this stage. Satisfactory levels will be achievable through appropriate plant selection, location and if necessary, standard acoustic treatments such as duct lining, acoustic silencers, barriers and enclosures.

Noise emissions from all mechanical services to the closest residential receiver should comply with the requirements of Section 6.

6.3 NOISE FROM TRAFFIC GENERATION

Predicted traffic volumes generated by the development are detailed in the Draft Traffic and Parking Impact Assessment prepared by McClaren traffic Engineering and Road Safety Consultants (doc ref: 210550.02DA, dated 6/12/2021). Based on predicted traffic volumes, noise from traffic generated by the development is not expected to adversely impact surrounding residential receivers or the childcare centre to the south.

7 NOISE INTRUSION FROM CHILD CARE CENTRE

Regarding noise impacts from the nearby childcare centre (see Figure 2) we note that the subject site is already zoned for residential use and the child care centre operates close to existing residents located adjacent to the childcare centre. These would be subject to significantly higher noise levels than those that would be experienced within the proposed development site. As such, the location of the development in proximity to the childcare centre is considered reasonable, and no significant noise impacts on the development are expected.

8 CONCLUSION

This report presents our investigation into noise emissions from the proposed residential subdivision to be located at 20 Heritage Drive, Chisholm.

Internal noise level requirements for the project will be achieved provided the recommendations in Section 5.2 of this report are implemented. A review of proposed constructions is to be undertaken at CC stage to ensure compliance with project criteria, however typically, no specific upgrading is expected to be required.

Mechanical plant should be installed to comply with project noise emission criteria outlined in Section 6 of this report.

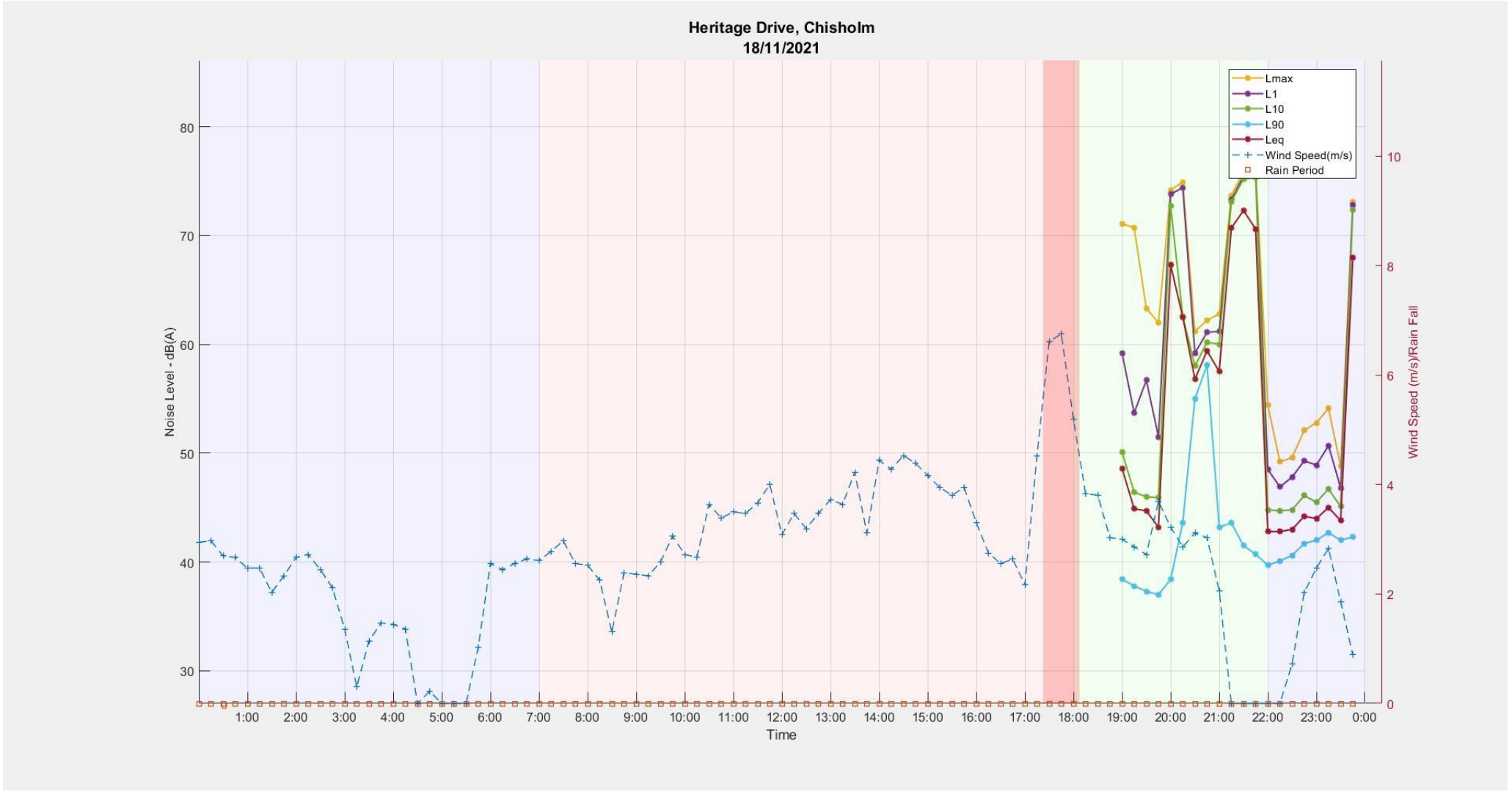
The additional traffic on local roads generated by the proposed dwellings will be consistent with the number of movements expected for a residential subdivision and will not produce noise impacts.

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

Yours faithfully,

Acoustic Logic Pty Ltd
Ross Ferraro

APPENDIX A - UNATTENDED NOISE MONITORING DATA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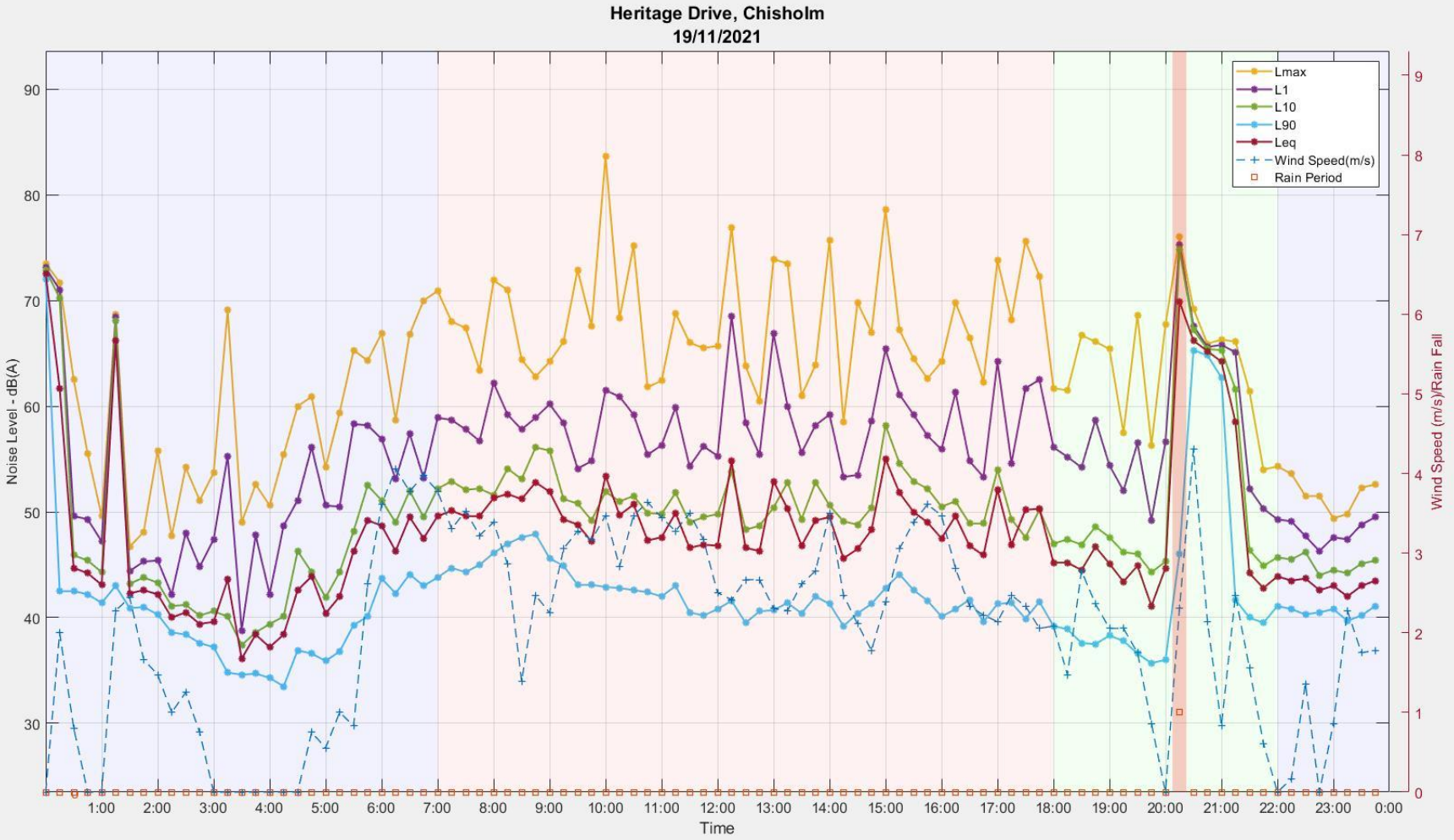
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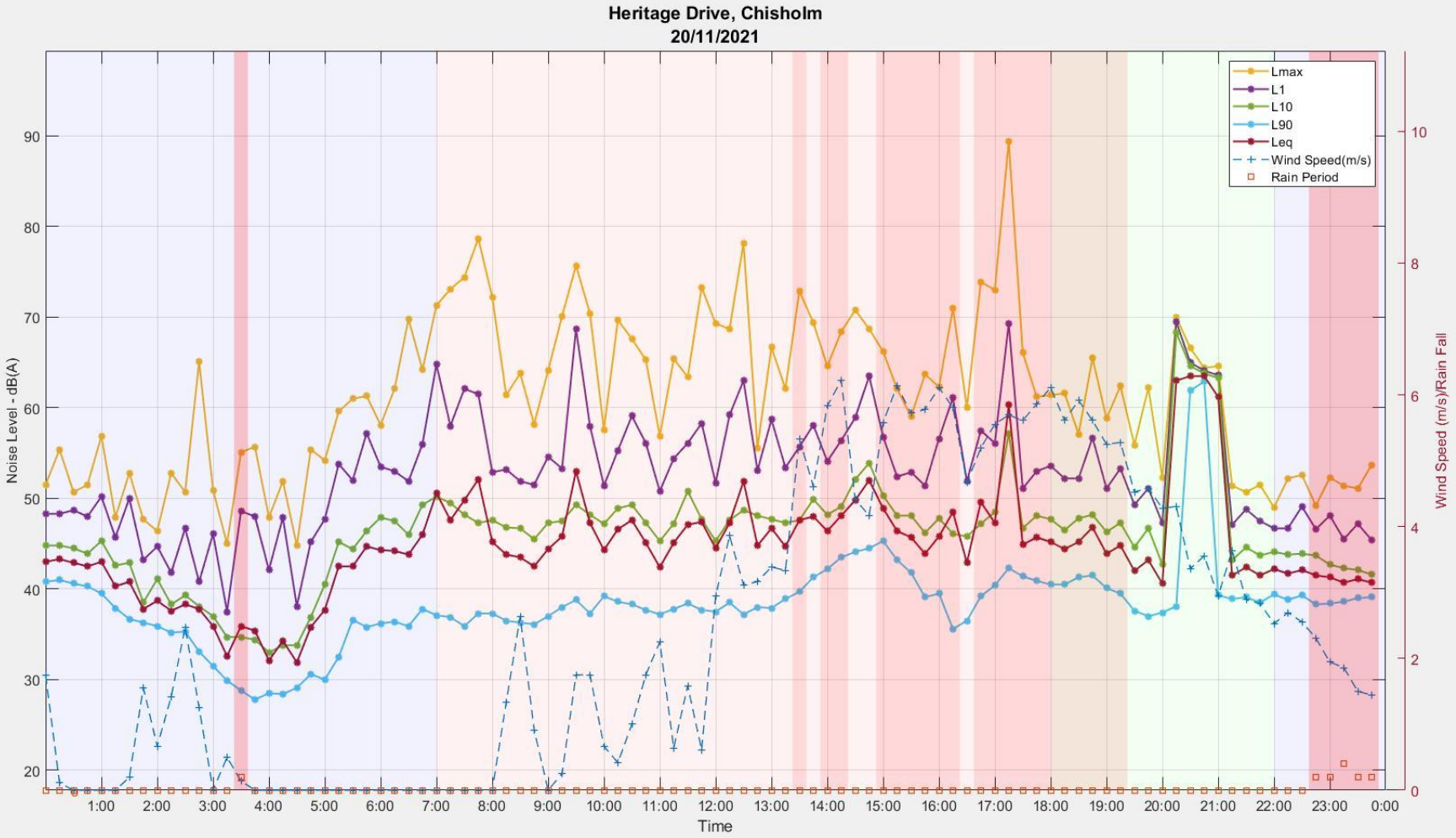
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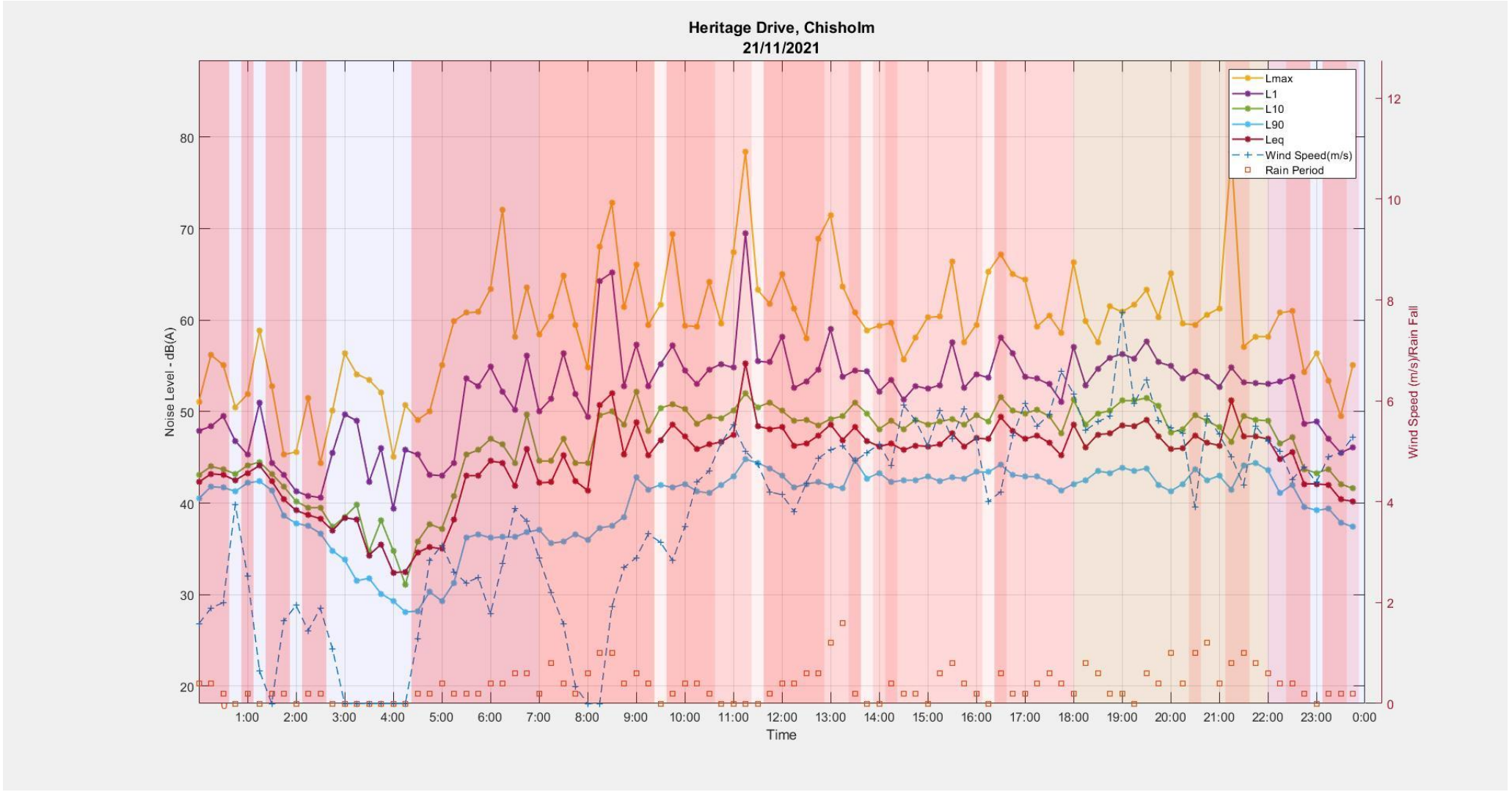
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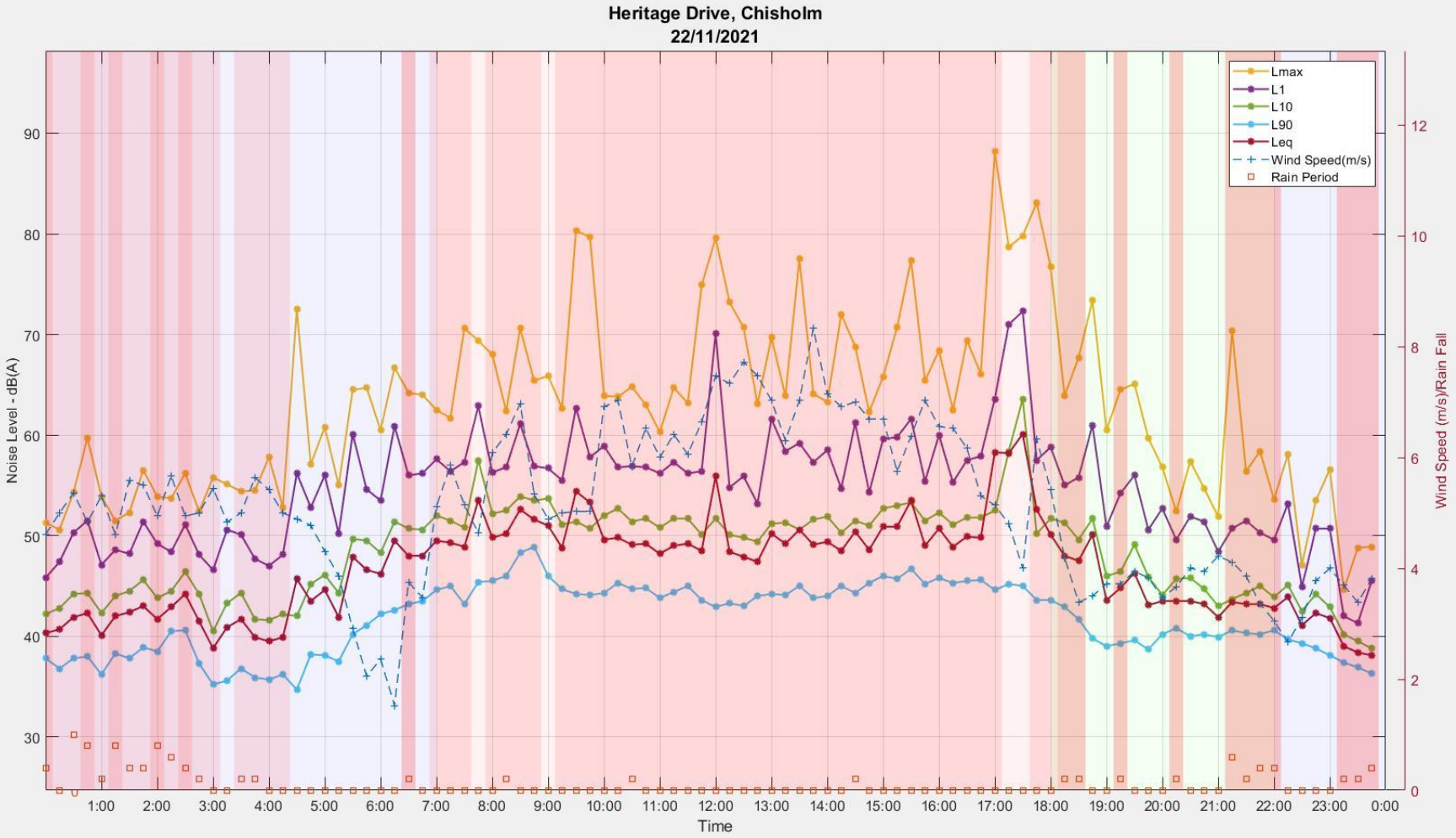
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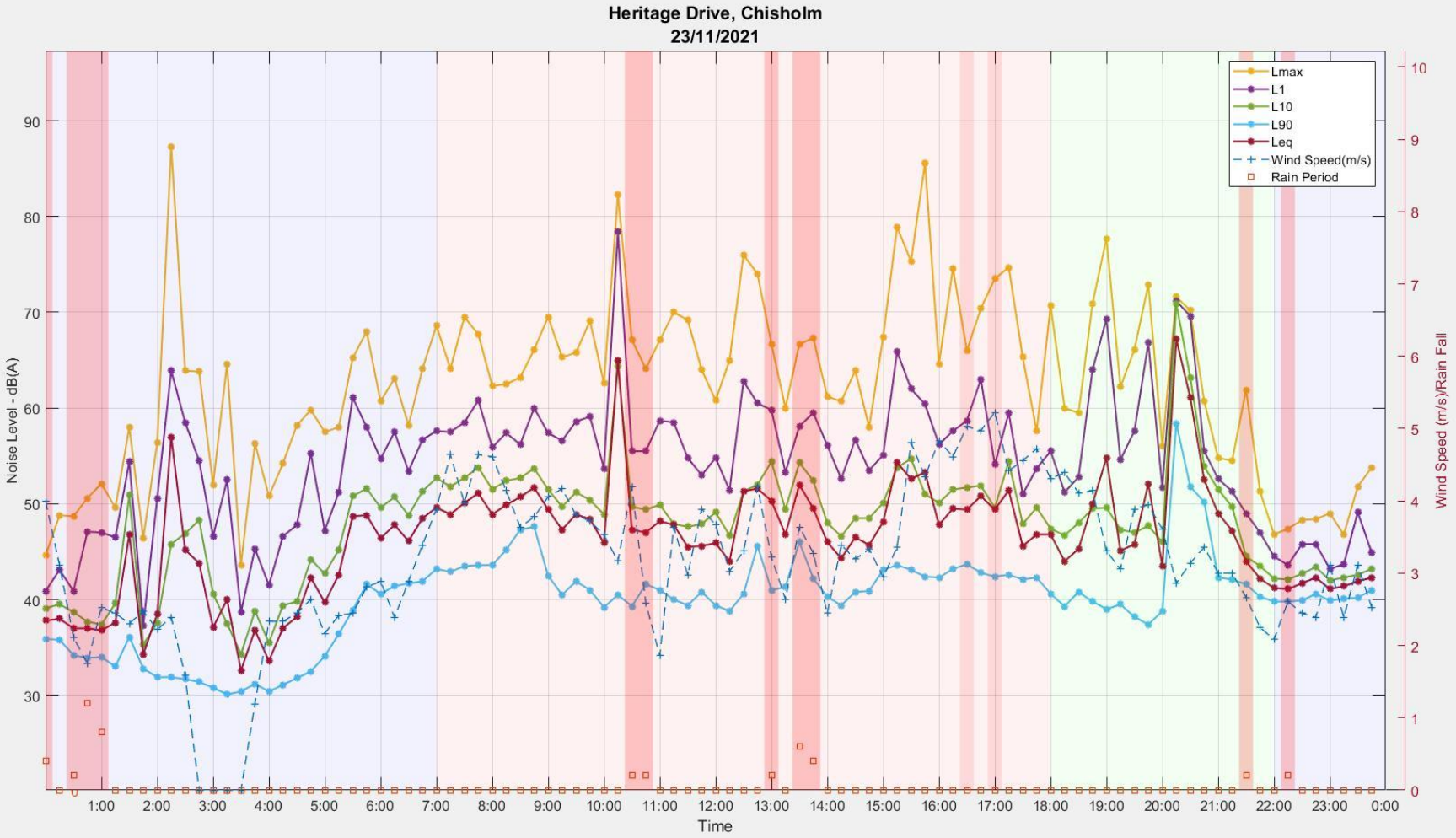
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