MANAGING DIRECTORS
MATTHEW PALAVIDIS
VICTOR FATTORETTO

DIRECTORS
MATTHEW SHIELDS
BEN WHITE

30-38 Ironbark Ave, Casula – St George Community Housing

SYDNEY
A: 9 Sarah St Mascot NSW 2020
T: (02) 8339 8000
F: (02) 8338 8399

SYDNEY MELBOURNE BRISBANE CANBERRA
LONDON DUBAI SINGAPORE GREECE

ABN: 11 068 954 343

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1 INTRODUCTION

Acoustic Logic Consultancy (ALC) has been engaged to conduct an assessment of potential noise impacts associated with the residential development to be constructed at 30-38 Ironbark Ave, Casula.

This document addresses noise impacts associated with the following:

- External noise impacts on the site (traffic noise impacts from Kurrajong Road and to a lesser degree from the M5 motorway);
- Noise emissions from the site (primarily mechanical plant);

This assessment has been conducted using the DKO architectural drawings, dated July 2018 (Rev A).

2 SITE DESCRIPTION

The site is located at 30-38 Ironbark Ave, Casula.

The proposed development consists of a four storey residential development (community housing) with a ground level car park incorporated within the building.

The site is bounded to the south by Kurrajong Road, an arterial road.

The nearest noise sensitive developments to the site are:

- Residences adjoining the site to the east and west.
- Residences to the north of the site, on the opposite side of Ironbark Ave.

Noise sources impacting the site are:

- Kurrajong Road, to the south.
- The M5 motorway, to the north and west of the site. Although there is a noise screen along the edge for the motor way (reducing the noise impact from the Motorway to the lower levels of the proposed development), the upper levels of the development will become impacted by the M5 traffic noise.

An aerial photo showing noise measurement positions and surrounding noise receivers is presented below.

Figure 1 – Aerial Photograph

3 EXISTING ACOUSTIC ENVIRONMENT

Acoustic monitoring was conducted at the site to establish the background noise levels which will be used as basis for this assessment.

3.1 ENVIRONMENTAL 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-principle 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.

3.2 BACKGROUND NOISE LEVELS

Background noise levels which will be used as a basis for this assessment are detailed in the following sections.

3.2.1 Measurement Equipment

Unattended noise monitoring was conducted using one Acoustic Research Laboratories Pty Ltd noise loggers. The logger was programmed to store 15-minute statistical noise levels throughout the monitoring period. The equipment 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.

Background noise levels measured at this location are representative of background noise levels at the adjacent residential development.

3.2.2 Measurement Location

The logger was installed on the roof of a shed on the subject site, towards the southern boundary for the site, as shown in the aerial photograph in section 2.

3.2.3 Measurement Period

Unattended noise monitoring was conducted from 10 to 20 April 2018.

3.2.4 Measured Background Noise Levels

The background noise levels established from the unattended noise monitoring are detailed below.

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 noise monitoring. Weather affected data was excluded from the assessment.

Summarised rating background noise levels are presented below.

Table 1 -Summarised Rating Background Noise Level

Location	Time of day	Rating Background Noise Level dB(A)L_{90}
Site	Day	54
	Evening	52
	Night	43

4 EXTERNAL NOISE INTRUSION ASSESSMENT

4.1 NOISE INTRUSION CRITERIA

A traffic noise intrusion assessment has been conducted based off the requirements of the following acoustic noise criteria/standards;

- Liverpool Council DCP 2008;
- The NSW Planning documents *Developments Near Rail Corridors or Busy Roads – Interim Guideline'* and SEPP Infrastructure.

4.1.1 Liverpool Council DCP 2008

Acoustics is addressed in Part 3.7 section 9 of the Liverpool DCP.

Relevant development controls note that:

- Appropriate acoustic treatment must be incorporated for development on Classified Roads and
- The proposed development should comply with relevant EPA and Australian Standards acoustic criteria.

Typically, development near Classified roads should be designed such that compliance with the NSW Planning Document *Developments near Rail Corridors or Busy Roads – Interim Guideline';* is achieved. .

4.1.2 SEPP (Infrastructure) 2007 and Development Near Rail Corridors and Busy Roads Criteria

The Infrastructure SEPP defines busy roads that are subject to an acoustic assessment as:

"Clause 102: development for any of the following purposes that is on land in or adjacent to a road corridor for a freeway, a tollway or a transit way or any other road with an annual average daily traffic volume of more than 40,000 vehicles (based on the traffic volume data available on the website of the RTA) and that the consent authority considers is likely to be adversely affected by road noise or vibration:

- *building for residential use*
- *a place of public worship*
- *a hospital*
- *an educational establishment or childcare."*

The Infrastructure SEPP sets out the following criteria for internal noise levels from airborne traffic noise:

> *"For Clauses 87 (Rail) and 102 (Road):*
>
> *"If the development is for the purpose of a building for residential use, the consent authority must be satisfied that appropriate measures will be taken to ensure that the following L_{Aeq} levels are not exceeded:*
>
> *in any bedroom in the building : 35dB(A) at any time 10pm–7am*
>
> *anywhere else in the building (other than a garage, kitchen, bathroom or hallway): 40dB(A) at any time."*

The acoustic requirements of SEPP Infrastructure are mirrored in the NSW Planning document *Development Near Rail Corridors And Busy Roads – Interim Guideline*.

We note that clause 102 of SEPP (Infrastructure) does not present a time descriptor for the required internal noise level (ie – it does not state if the 35/40dB(A)L_{eq} average noise level should be achieved over a 15 minute, 1 hour, the entire day/night period). However in our experience, it is interpreted that:

- For bedrooms, the 35dB(A)L_{eq} noise level should be achieved when averaged throughout the entire night time period between 10pm and 7am and

- For other areas (living areas), the 40dB(A)L_{eq} noise level should be achieved when averaged throughout the entire daytime time period between 7am and 10pm.

This is consistent with the time descriptors for internal noise levels adopted in the NSW Planning document *Development Near Rail Corridors And Busy Roads – Interim Guideline*.

Corresponding internal noise goals are as follows:

Table 2 – SEPP Internal Traffic Noise Criteria

Type of Space	Time of Day	Internal Noise Level
Bedroom	Night (10pm-7am)	35dB(A)$L_{eq(9hr)}$
Living Area	Day (7am-10pm)	40dB(A)$L_{eq(15hr)}$

4.2 EXTERNAL NOISE MEASUREMENTS

4.2.1 Measurement Equipment

Unattended noise monitoring was conducting using one Acoustic Research Laboratories Pty Ltd noise logger. The logger was programmed to store 15-minute statistical noise levels throughout the monitoring period. The equipment 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 short term measurements of traffic noise which were undertaken by this office, to supplement the unattended 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.

4.2.2 Measurement Location

An unattended noise monitor was installed near the southern boundary of the site, refer to Figure 1 in section 2. This façade is exposed to traffic from Kurrajong Road.

Attended noise measurements were conducted in line with the proposed northern façade of the development. The northern and western facades of the site are impacted by traffic from the M5 motorway. The upper levels of the development will be more impacted, given they begin to overlook the roadside noise screen which runs alongside the M5 carriageway.

4.2.3 Measurement Period

Unattended noise monitoring was conducted from 10 to 20 April 2018.

Attended noise measurements were undertaken between the hours of 4.30pm and 6pm on 10 April 2018.

4.2.4 Results

Attended and unattended noise measurements have been summarised below.

The following table presents the results of the unattended noise monitoring.

Table 3 – Unattended Noise Monitor – Traffic Noise Measurements

Location	Time of day	Long Term Traffic Noise Level
Site – At Logger*	Day	**66**dB(A)$L_{eq(15hr)}$
	Night	**61**dB(A)$L_{eq(9hr)}$

*Note: See figure 1, section 2.

The following table presents the results of the unattended noise monitoring.

Table 4 – Attended Traffic Noise Measurements

Location	Time of Measurement	Measured Noise Level dB(A)$L_{eq(1hr)}$
Site - in line with southern boundary.	5pm (10/4/2018)	66dB(A)
Site - in line with northern boundary.	5.30pm (10/4/2018)	54dB(A)

Using the noise levels measured at the proposed building façade in addition with the day time/might time noise levels measured by the long term noise logger, the following external noise levels impacting the site were determined:

Table 5 – Measured Existing Traffic and Rail Nosie Levels

Location	Summary of Measured Existing Traffic Noise Levels	
	Daytime (7am-10pm)	**Night time (10pm-7am)**
Kurrajong Road (in line with southern façade)	66dB(A)$L_{eq(15hour)}$	61dB(A)$L_{eq(9hour)}$
North-Western Corner of Site – Ground Level	54dB(A)$L_{eq(15hour)}$	52dB(A)$L_{eq(9hour)}$*
North-Western Corner of Site – Level 2 and Above	61dB(A)$L_{eq(15hour)}$**	59dB(A)$L_{eq(9hour)}$ **

*Adjusted based off unattended noise monitoring.

**Calculated noise level due to reduction in acoustic benefit provided by road side noise screens to the upper levels of the proposed development.

4.3 RECOMMENDED CONSTRUCTIONS

Recommended acoustic treatments to the building façade are detailed below.

4.3.1 Glazed Windows and Doors

The following constructions are recommended to comply with the project noise objectives. 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. (**Mohair Seals are unacceptable**).

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 constructions are listed in the table below.

Table 6 – Recommended Glazing Construction

Level	Façade	Space	Recommended Construction	Acoustic Seals
All	South	Living Rooms	6.38mm Laminate	Yes
		Bedrooms – Sliding Doors	10.38mm Laminate	Yes
		Bedrooms – 2 awning windows	10mm	Yes
		Bedrooms – 1 awning window	6.38mm Laminate	Yes
	West	Living Rooms	6.38mm Laminate	Yes
		Bedrooms – Level 2, 3, 4 sliding door	10mm	Yes
		Bedrooms – Remaining windows/doors	6.38mm Laminate	Yes
	East	Living Rooms	6.38mm Laminate	Yes
		Bedrooms	6.38mm Laminate	Yes
	North	Living Rooms – GF and Level 1	6mm	Yes
		Living Rooms – L2 and above	6.38mm Laminate	Yes
		Bedrooms GF and Level 1	6mm	Yes
		Bedrooms – L2 and above	6.38mm Laminate	Yes

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 Table 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 - Minimum R_w of Glazing (with Acoustic Seals)

Glazing Assembly	Minimum R_w of Installed Window
6mm	29
6.38mm Laminate	31
10mm	33
10.38mm Laminate	35

4.3.2 External Roof/Ceiling

Roof/ceiling construction will not require any upgrade for acoustic purposes.

Any light weight roof elements should have 75mm thick 11kg/m3 insulation to the ceiling cavity and a 13mm plasterboard ceiling below.

4.3.3 External Walls

Concrete or masonry external wall construction will not require any upgrade for acoustic purposes.

In the event that light weight building elements are incorporated, minimum 75mm thick 11kg/m^3 glass wool insulation should be incorporated in any external wall cavity. Internal lining (either one or two layers of 13mm plasterboard) will be determined at CC stage following final selection of external cladding material.

4.3.4 Apartment Entry Doors

Any glass door should be constructed using glass equal in thickness to that specified in table 6. Any timber doors should be constructed using minimum 38mm solid timber with acoustic seals to top, sides and bottom (Raven RP 10 to top and sides, Raven RP 38 drop seal to base).

5 NOISE EMISSION ASSESSMENT

The noise emission from the project site shall comply with the requirements of the following documents;

- Liverpool Council DCP 2010); and
- NSW EPA document- *Noise Policy for Industry (NPfI)*.

5.1 NOISE EMISSION CRITERIA

5.1.1 Liverpool Council DCP 2008

Acoustics is addressed in Part 3.7 section 9 of the Liverpool DCP.

The DCP does not set any noise emission goals, however it requires compliance with relevant Australian Standards and EPA documents. In this case, it is the EPA Industrial Noise Policy that is the most commonly adopted acoustic guideline in the assessment of noise generated by a site.

5.1.2 NSW EPA Noise Policy for Industry (NPfI)

The INP 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 INP has two requirements which both have to be complied with, namely an amenity criterion and an intrusiveness criterion.

5.1.2.1 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 5 dB(A).

Table 8 – Intrusiveness Criteria

Receiver	Time of day	Background Noise Level dB(A)L_{90}	Intrusiveness Criteria (Background + 5dB(A)$L_{eq(15min)}$
Residential Receivers	Day	54	59
	Evening	52	57
	Night	43	48

5.1.2.2 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 Industrial Noise Policy sets out acceptable noise levels for various land uses. Table 2.1 of the policy has four categories to distinguish different residential areas. They are rural, suburban, urban and urban/industrial interface.

For the purposes of a conservative assessment, ALC will assess noise emissions in accordance with the 'urban' category.

Table 9 – Project Amenity Criteria

Type of Receiver	Time of day	Recommended Acceptable Noise Level dB(A)$L_{eq(15min)}$
Residential (suburban)	Day	53
	Evening	43
	Night	38

5.1.3 Summarised Plant Noise Emission Criteria

Summary for noise emission criteria for all plant associated with the development has been summarised below (adopting the more stringent of the above two tables).

Table 10 – Resultant Noise Emission Criteria

Receiver	Time of day	Noise Emission Criteria dB(A)$L_{eq(15min)}$
Residential Receivers	Day	53
	Evening	43
	Night	38

5.2 NOISE EMISSION ASSESSMENT/RECOMMENDATIONS

The primary noise source associated with the site will be mechanical plant.

Detailed plant selection has not been undertaken at this stage, as plant selections have not been determined. Detailed acoustic review should be undertaken at CC stage to determine acoustic treatments to control noise emissions to satisfactory levels. Satisfactory levels will be achievable through appropriate plant selection and location and, if necessary, standard acoustic treatments such as duct lining, acoustic silencers and enclosures.

Noise emissions from all mechanical services to the closest residential receiver should comply with the requirements of section 5.1.

6 CONCLUSION

This report presents an acoustic assessment of noise impacts associated with the proposed development at 30-38 Ironbark Ave, Casula.

Provided that the treatments set out in section 4 of this report are employed, internal noise levels shall comply with the requirements below:

- Liverpool Council DCP 2008 and
- SEPP (Infrastructure) and *Development Near Rail Corridors and Busy Roads* acoustic guidelines.

External noise emissions criteria have been set out in this report to satisfy the requirements from the following documents;

- Liverpool Council DCP 2008 and
- NSW EPA document - *Noise Policy for Industry*.

Provided that the recommendations set out in section 4.3 and 5.2 of the report are adopted, noise emission goals for the development will be achieved.

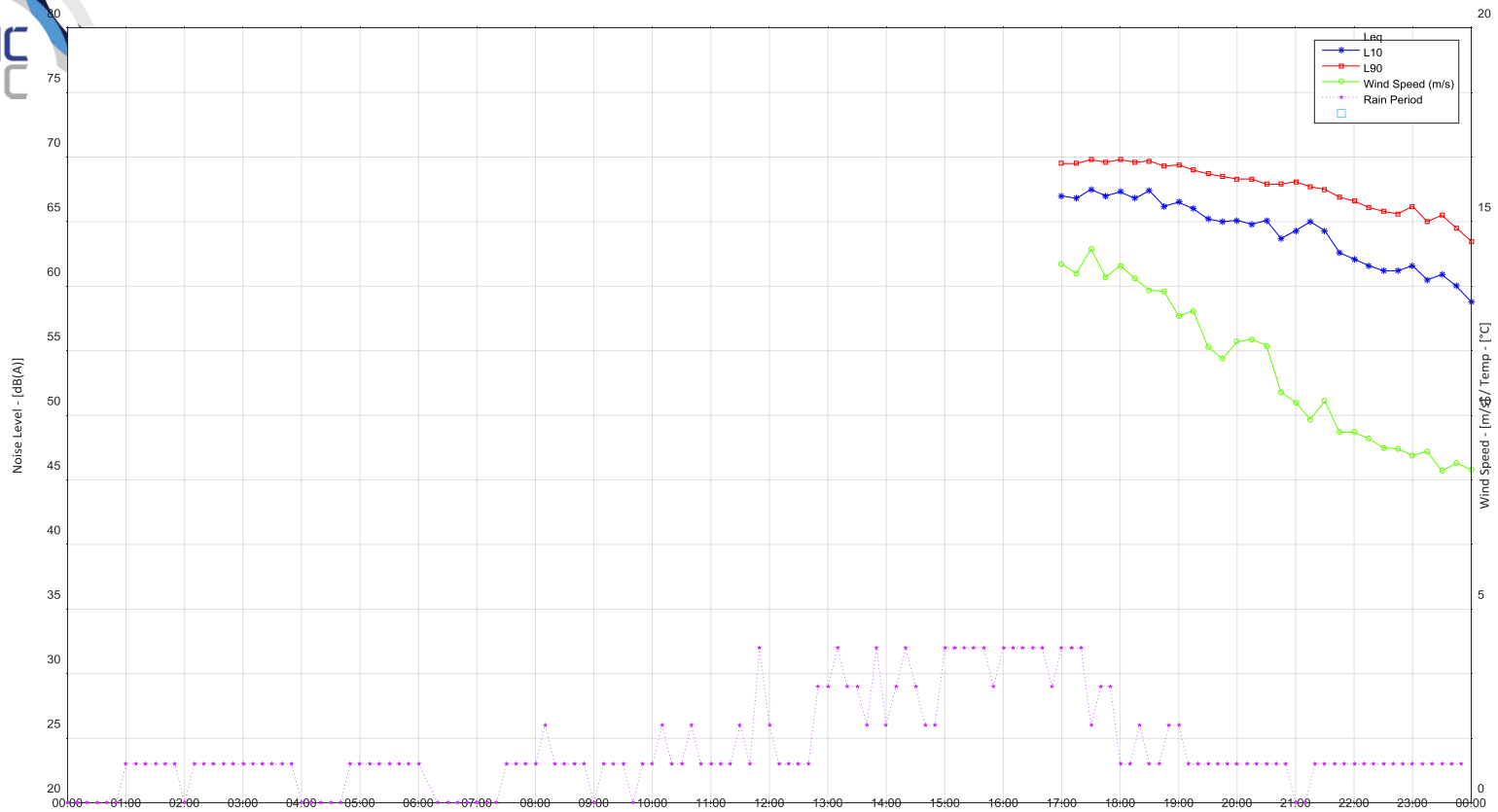
Please contact us should you have any further queries.

Yours faithfully,

Acoustic Logic Consultancy Pty Ltd
Thomas Taylor

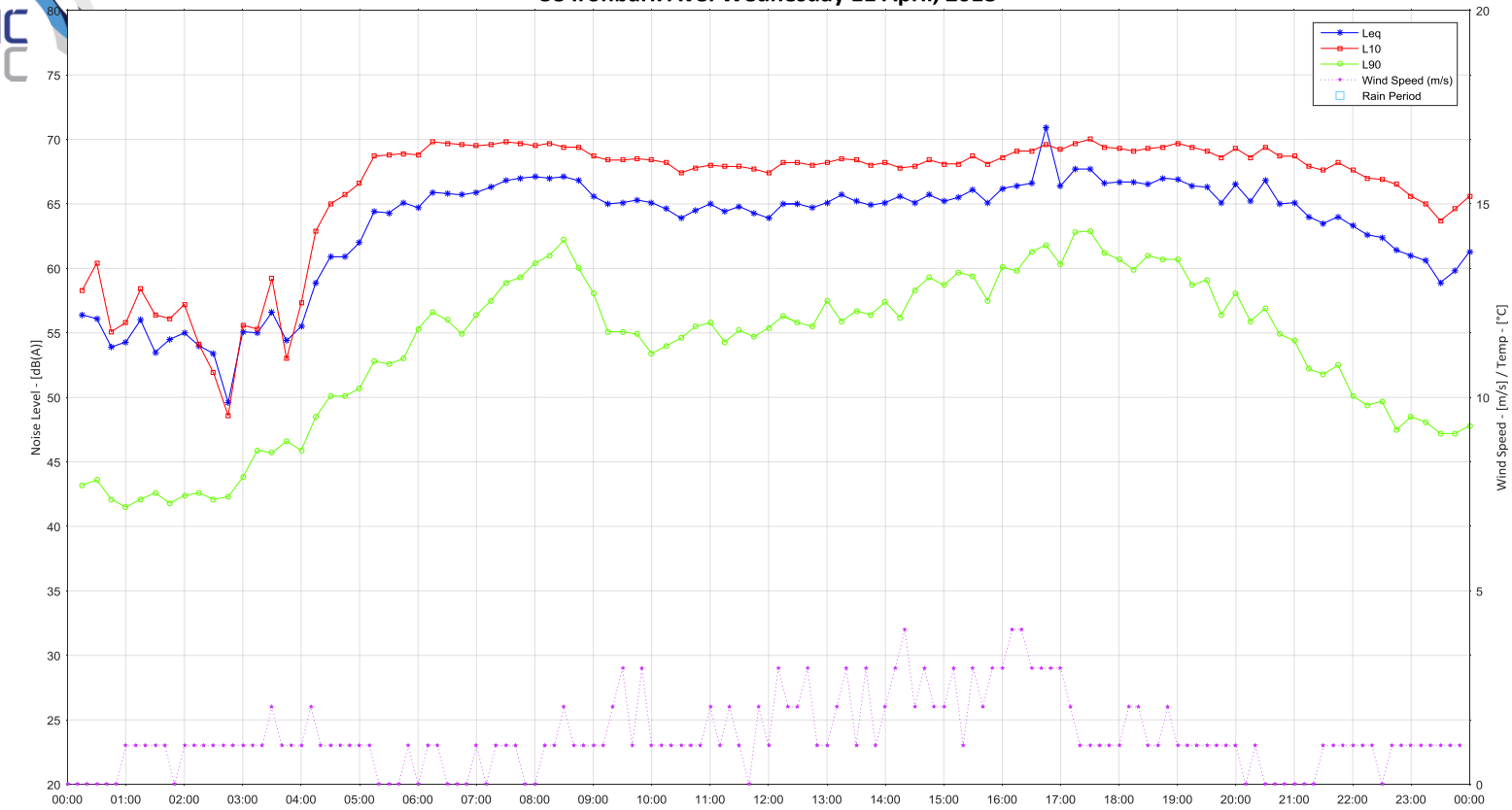
APPENDIX ONE – UNATTENDED NOISE MONITORING DATA

38 Ironbark Ave: Tuesday 10 April, 2018



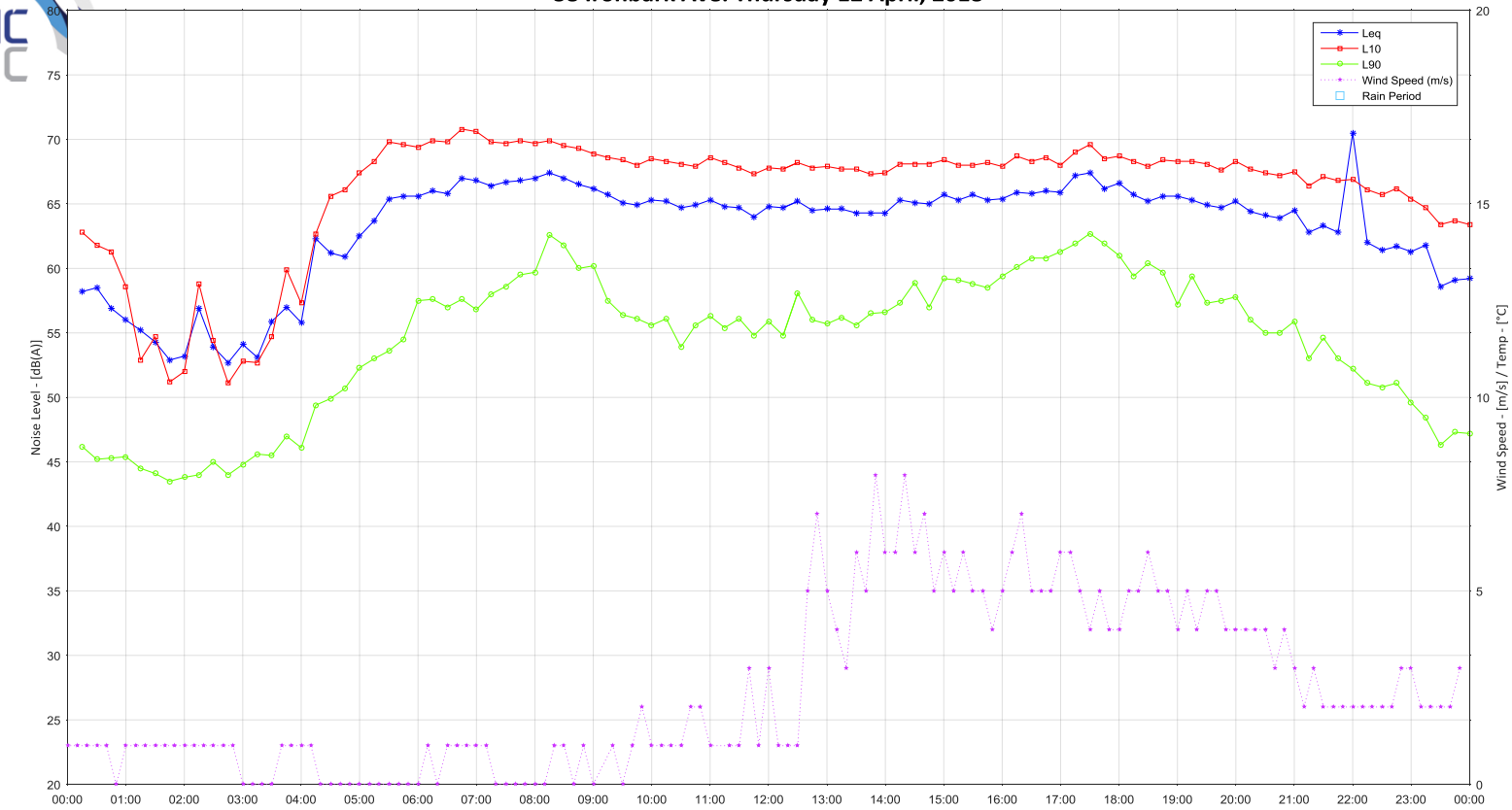
ACOUSTIC LOGIC

38 Ironbark Ave: Wednesday 11 April, 2018



ACOUSTIC LOGIC

38 Ironbark Ave: Thursday 12 April, 2018



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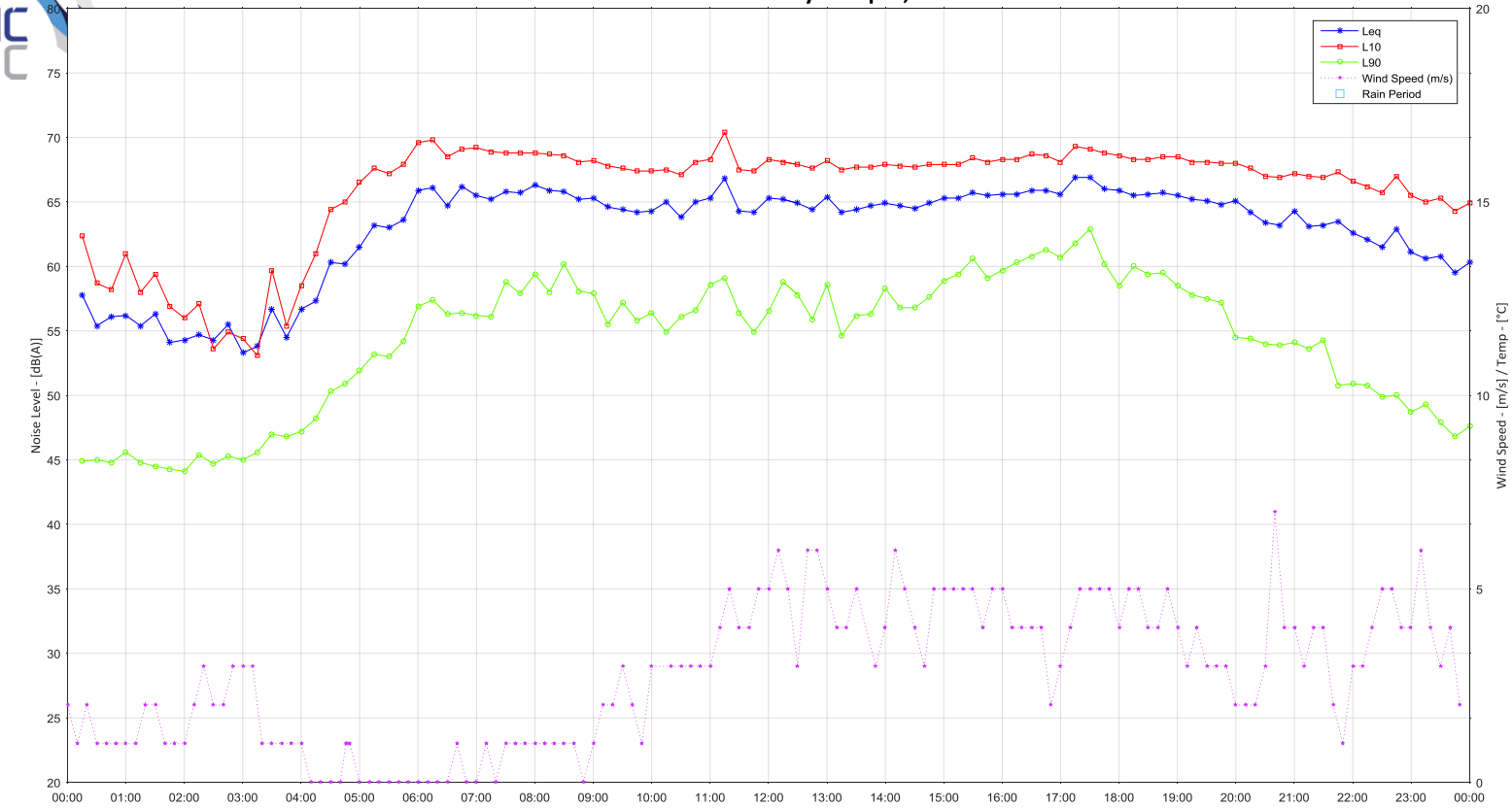
38 Ironbark Ave: Friday 13 April, 2018



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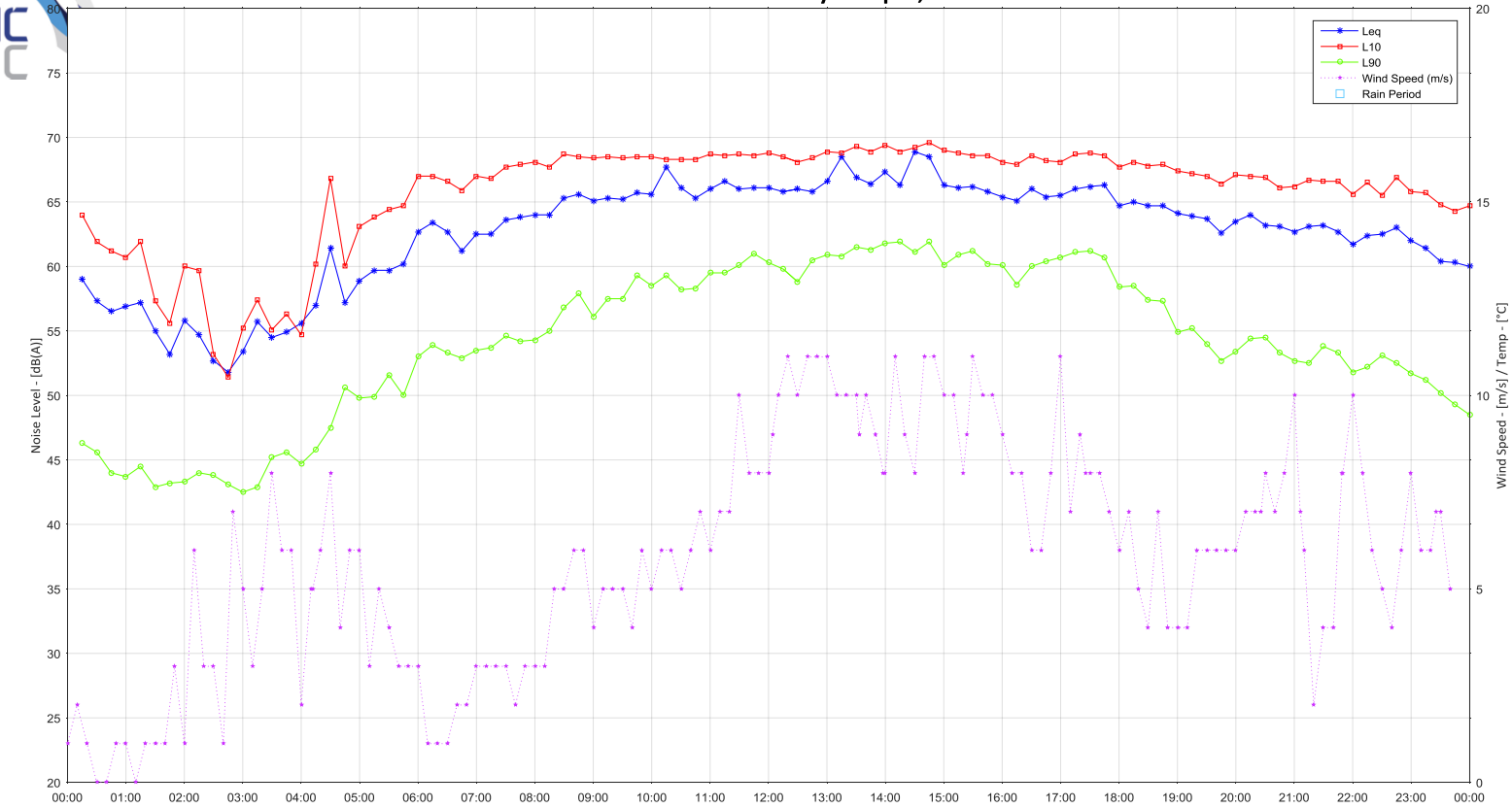
38 Ironbark Ave: Saturday 14 April, 2018



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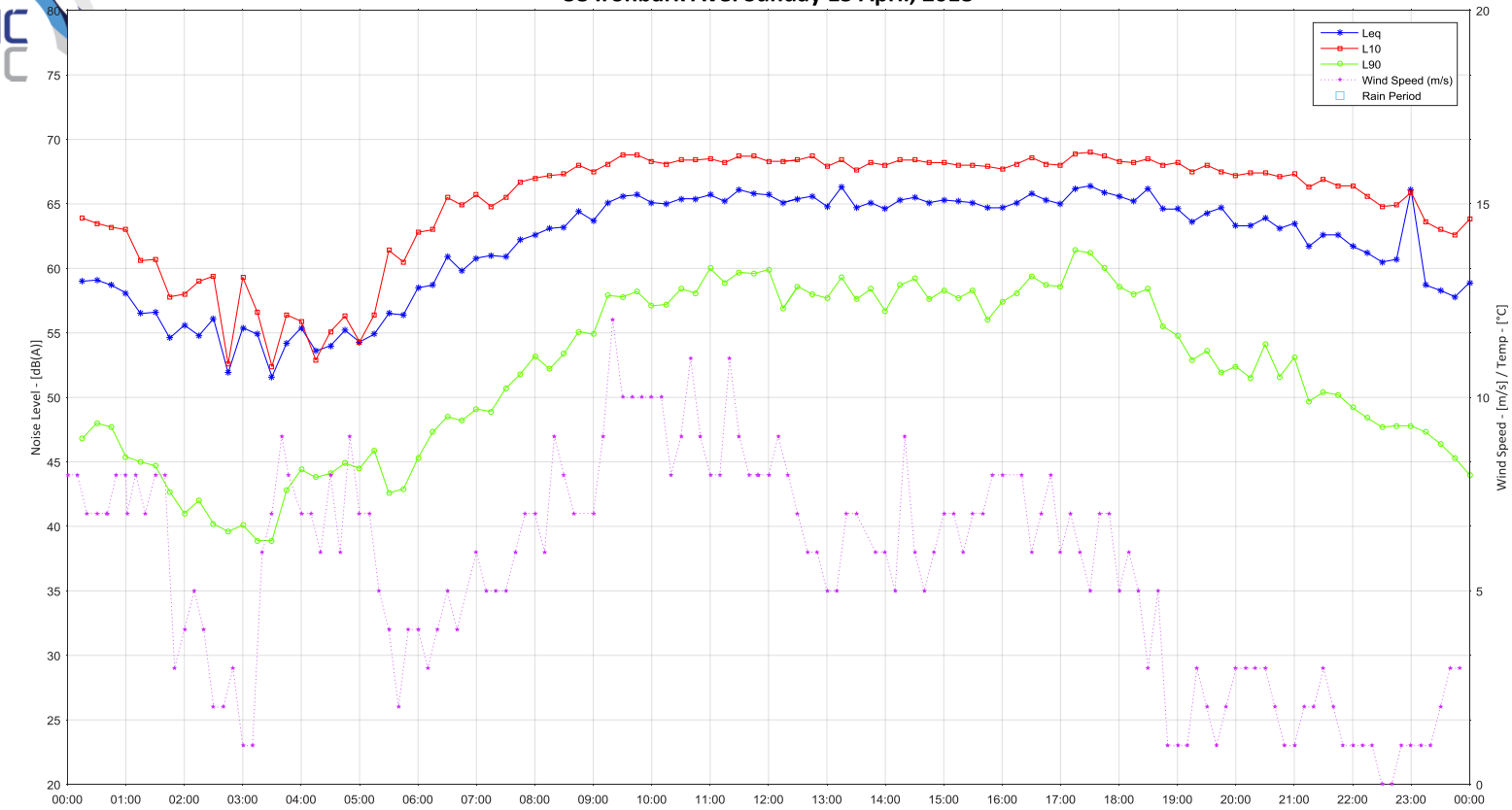
38 Ironbark Ave: Sunday 15 April, 2018



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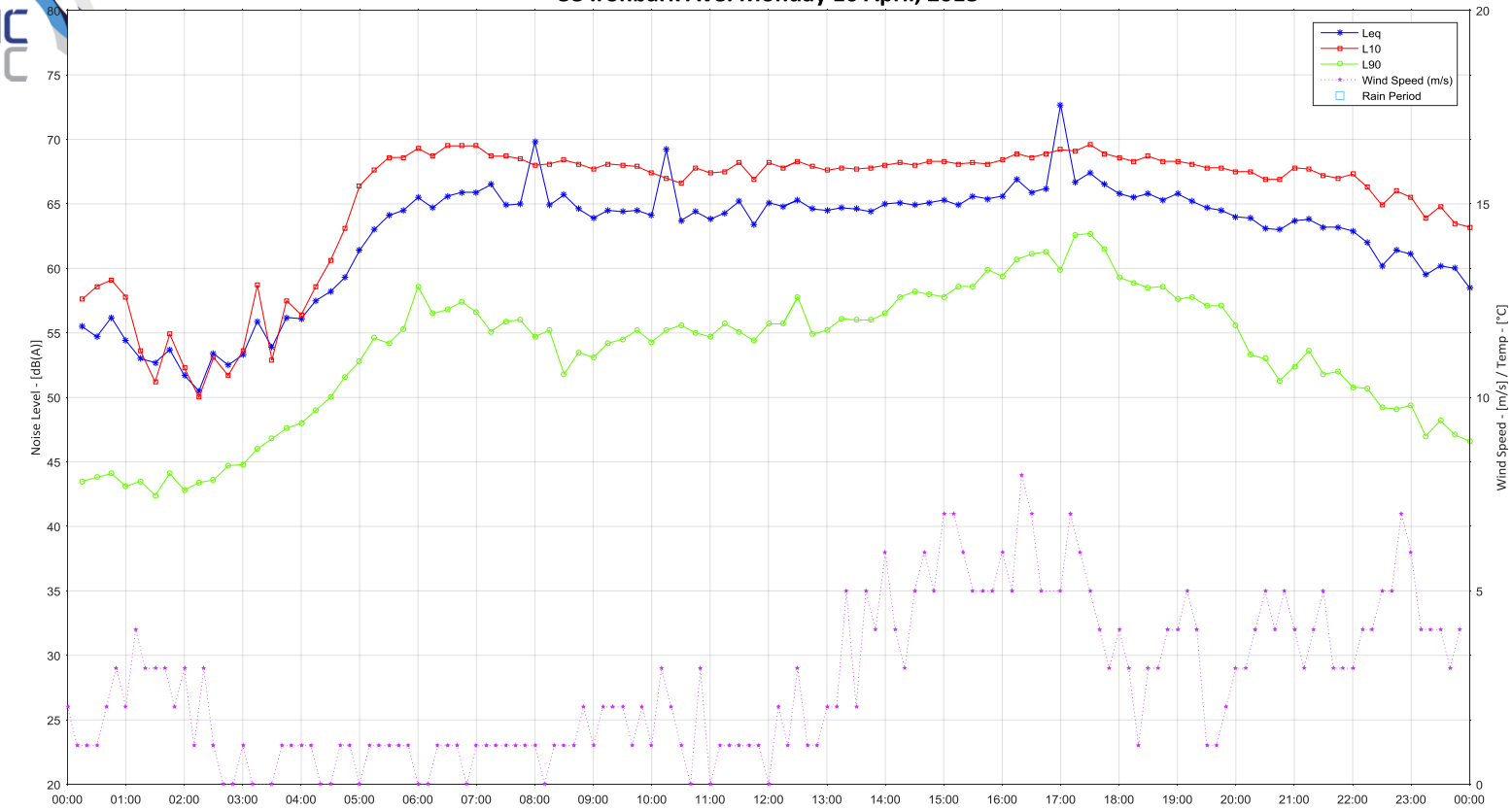

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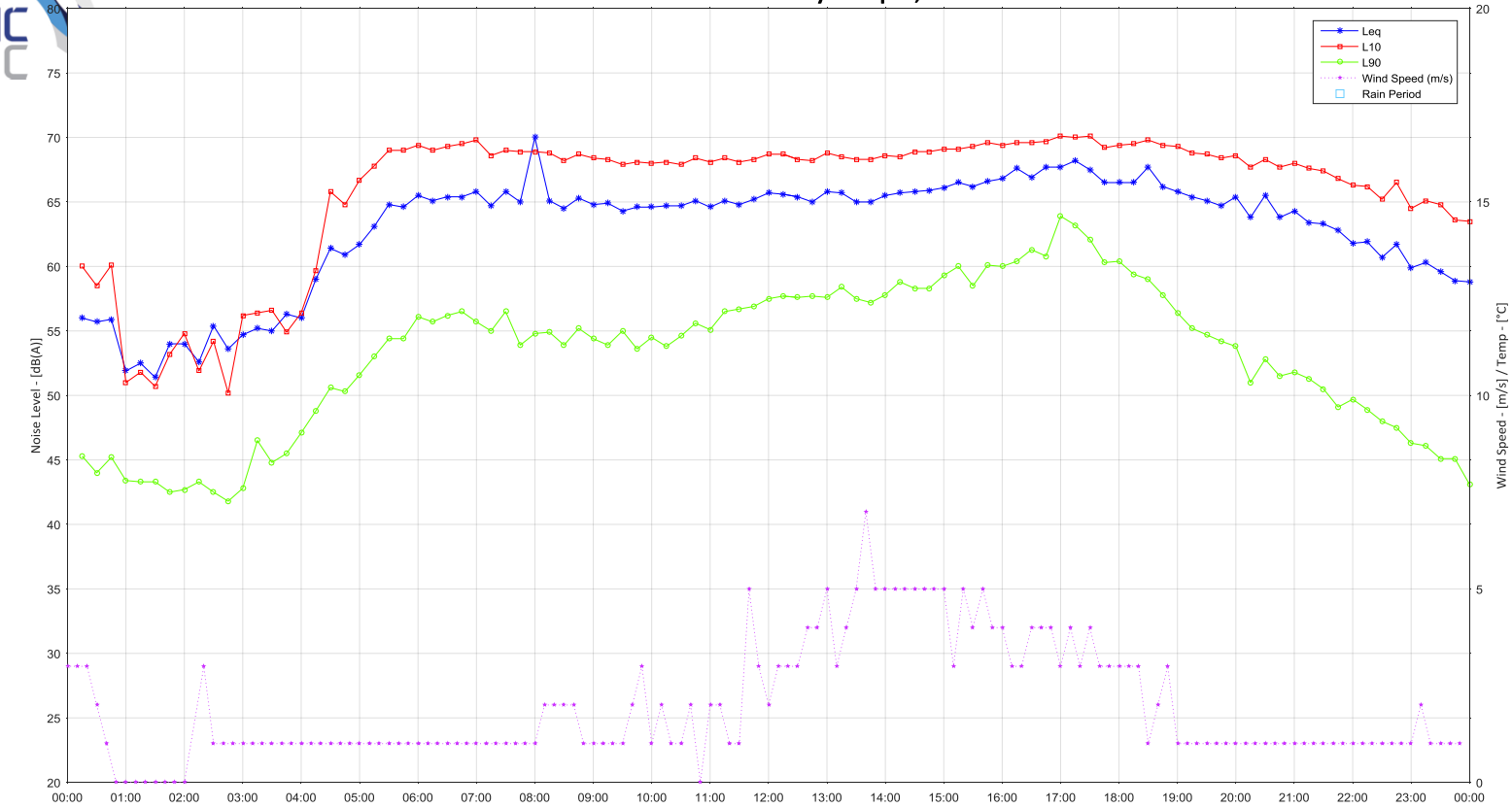

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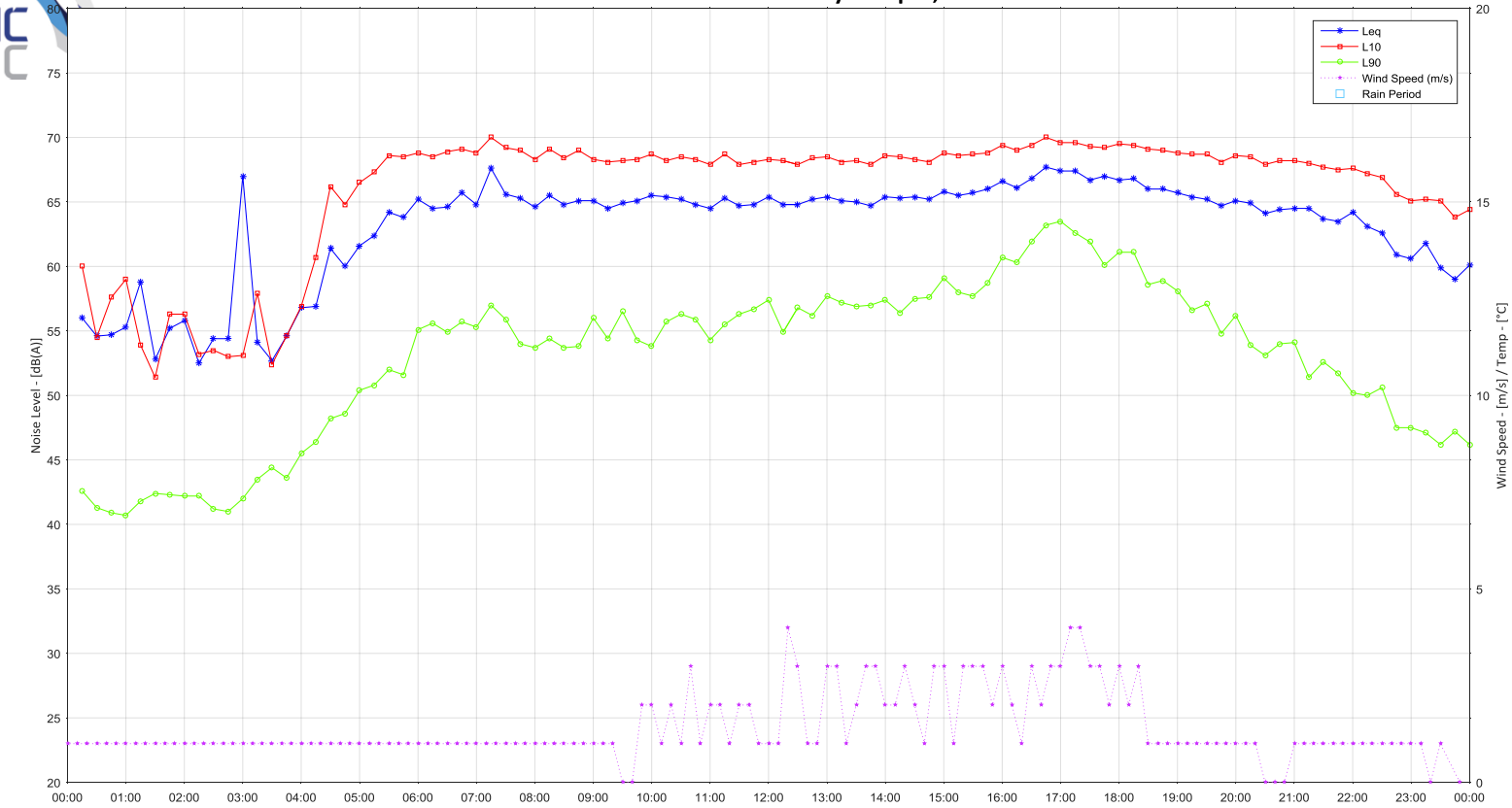

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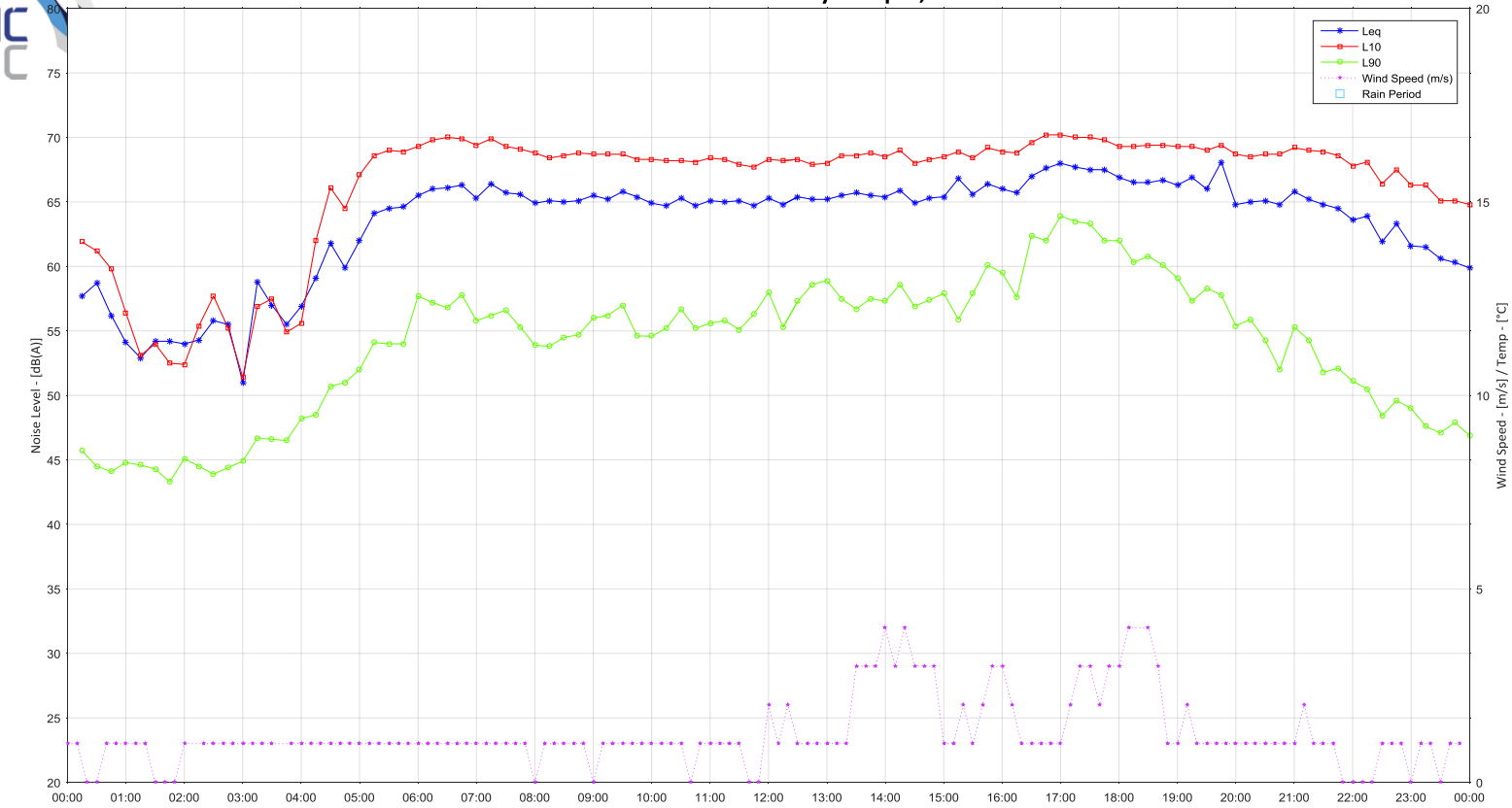
38 Ironbark Ave: Thursday 19 April, 2018



ACOUSTIC LOGIC

38 Ironbark Ave: Friday 20 April, 2018