MATTHEW PALAVIDIS
VICTOR FATTORETTO
MATTHEW SHIELDS

175-177 Wellington Rd, Sefton New South Wales 2162

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 presents our noise impact assessment associated with the residential development at 175-177 Wellington Road, Sefton.

In this report we will:

- Determine treatments to mitigate noise intrusion from surrounding roadways and railway lines.
- Set noise emission goals for any mechanical plant associated with the development.
- Determine if vibration isolation is required to the building structure from nearby train movements.

The noise assessment is based on the architectural drawings supplied by the NSW Department of Planning, Industry and Environment, project number 00-0000, dated December 2020.

2 SITE DESCRIPTION / PROPOSED DEVELOPMENT

The proposed residential development is located at 175-177 Wellington Road, Sefton.

The site is bounded as follows:

- To the north by Wellington Road, carrying low volumes of traffic flow.
- Further to the north (approximately 30m) by a train corridor carrying the T2 Inner West and South Line, the T3 Bankstown Line and freight services. There is a 4.2m high solid masonry barrier between the train line and the proposed development.
- To the east, west and south by surrounding residential development.

Noise sensitive receivers surrounding the project site include:

R1: Residential dwelling located at 173 and 173A Wellington Street east of the site;

R2: Residential dwellings located at 30, 32, 34, 36 and 38 Kara Street south of the site; and

R3: Residential dwelling located at 179 Wellington Street west of the site.

An aerial photo of the existing development and its surroundings is presented below in Figure 1.

Figure 1 – Site Map

Attended Measurement Locations

Unattended Measurement Location

Residential Receivers

3 NOISE DESCRIPTORS

Traffic noise constantly varies in level, due to fluctuations in traffic speed, vehicle types, road conditions and traffic densities. Accordingly, it is not possible to accurately determine prevailing traffic noise conditions by measuring a single, instantaneous noise level. To accurately determine the effects of traffic noise a 15-20 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. These parameters are used to measure how much annoyance would be caused by a particular noise source.

In the case of 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 interval.

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 measurement period. L_{eq} is important in the assessment of traffic noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of traffic noise.

Current practice favours the L_{eq} parameter as a means of measuring traffic noise, whereas the L_{10} parameter has been used in the past and is still incorporated in some codes. For the reasons outlined above, the L_{90} parameter is not used to assess traffic noise intrusion.

4 EXTERNAL NOISE INTRUSION ASSESSMENT

Significant noise sources in the vicinity of the site are as follows:

- The train corridor situated approximately 30m to the north of the development, servicing the T2 Inner West and South Line, the T3 Bankstown Line and freight services.
- To a lesser extent, traffic noise from Wellington Road carrying low volumes of traffic flow.

Noise impacts should comply with the requirements of the Bankstown development Control Plan (DCP) 2015 and the SEPP (Infrastructure) 2007.

4.1 ACOUSTIC CRITERIA

The determination of an acceptable level of traffic noise within the residential spaces requires consideration of the activities carried out within the space and the degree to which noise will interfere with those activities

As sleep is the activity most affected by traffic noise, bedrooms are the most sensitive rooms. Higher levels of noise are acceptable in living areas without interfering with activities such as reading, listening to television, etc. Noise levels in utility spaces such as kitchens, bathrooms, laundries, etc can be higher.

Traffic noise will be assessed to the following criteria:

- Bankstown DCP 2015;
- SEPP (Infrastructure) 2007.

4.1.1 Bankstown development Control Plan (DCP) 2015

The Bankstown DCP 2015 has no specific requirements for noise intrusion, therefore we will refer to the SEPP (Infrastructure) 2007.

4.1.2 State Environmental Planning Policy (Infrastructure) 2007

The State Environmental Planning Policy (Infrastructure) 2007 (the 'Infrastructure SEPP') sets out internal noise levels for developments with the potential to be impacted by traffic or rail noise and vibration.

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

> *"Roads specified in Clause 102 of the Infrastructure SEPP: a freeway, tollway or a transit way or any other road with an average annual traffic (AADT) volume of more than 40,000 vehicles (based on the traffic volume data provided on the website of the RTA).*
>
> *Any other road – with an average annual daily traffic (AADT) volume of more than 20,000 vehicles (based on the traffic volume data published on the website of the RTA).*
>
> *Any other road – with a high level of truck movements or bus traffic."*

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 LAeq 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."*

Internal requirements are for residential units and are measured internally with windows closed.

4.1.3 Resulting Criteria

This assessment shall be conducted in accordance with the criteria set out above from the SEPP (Infrastructure 2007), as shown in the table below.

Table 4-1 –Resulting Noise Intrusion Criteria

Space	Time Period	Criteria
Living Room	All Day	40dB(A) $L_{eq\ (15\ hour)}$
Bedroom	10:00pm – 7:00am	35dB(A) $L_{eq\ (9\ hour)}$

4.2. EXTERNAL NOISE LEVELS

4.2.1. Unattended Noise Measurements

Unattended noise monitoring was conducted from the 8th March 2021 to the 18th March 2021. The noise logger was located at an approximate distance of 2 metres from the northern boundary facing the railway line. It is noted that a 4.2 metre high masonry wall separates the development site from the railway corridor which was approximately 22 metres away from the noise logger. For detailed location refer to Figure 1.

Equipment used consisted of an 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 the measurement using a Rion NC-73 calibrator; no significant drift was detected. All measurements were taken on A-weighted fast response mode. Periods of adverse weather conditions during the measurement period were excluded from the analysis.

4.2.2. Attended Noise Measurements

Attended measurements were undertaken to supplement long term monitoring on the 18th March 2021 between the hours of 8:00am and 9:00am. Measurements were undertaken using a Norsonics Type 140 precision sound level analyser, set to A-weighted fast response. The precision sound level analyser was calibrated before and after the measurements using a Norsonics 1251 precision sound level calibrator. No significant drift was recorded.

4.2.3. Measurement Results

Measurement results have been summarised in Table 4-2 below.

Table 4-2 – Summary of Rail and Traffic Noise Measurements

Measurement Location	Time of Day	Measured Noise Level
Project Site (Northern Boundary)	Day	60dB(A) $L_{Aeq(15hr)}$
	Night	55dB(A) $L_{Aeq(9hr)}$

4.3. RECOMMENDED ACOUSTIC TREATMENTS

Traffic and rail noise intrusion into the proposed development was assessed using the measured external noise levels reported above as a basis.

Calculations were performed taking into account the orientation of windows, the total area of glazing, facade transmission loss and room sound absorption characteristics. In this way the likely interior noise levels can be predicted. Acoustic treatment required to ensure compliance with the assessment criteria are detailed in this section.

Internal noise levels will primarily be as a result of noise transfer through the windows and doors as these are relatively light building elements that offer less resistance to the transmission of sound. Noise transfer through the masonry elements will not be significant and need not be considered further.

The constructions necessary to achieve the noise levels are detailed below. The predicted noise levels have been based on the expected level and spectral characteristics of the external noise, the area of building elements exposed to traffic noise, the absorption characteristics of the rooms and the noise reduction performance of the building elements.

4.3.1. Glazed Windows and Doors

Glazing recommendations are outlined in the tables below, to comply with the noise objectives outlined above in section 4.1. Aluminium framed/sliding glass doors and windows will be satisfactory provided they meet the criteria listed in Table 4-1 below.

Table 4-1 - Glazing Recommendations

Façade	Level	Room Type	Glazing Thickness	Acoustic Seals
Northern	Ground Floor	Bedroom / Living Room	6.38mm laminated	Yes
	Remaining Floors		10.38mm laminated	Yes
Western and Eastern	All	Bedroom / Living Room	6mm float	Yes
Southern	All	Bedroom / Living Room	4mm float	Yes

In addition to meeting the minimum glazing thickness requirements, the design of the window mullions, perimeter seals and the installation of the windows/doors in the building openings shall not reduce the R_w rating of the glazing assembly below the values nominated in Table 4-2. **Note that mohair type seals will not be acceptable for the windows requiring acoustic seals.**

The window/door suppliers should provide evidence that the systems proposed have been tested in a registered laboratory with the recommended glazing thicknesses and comply with the minimum listed R_w requirements. Furthermore, the glazing installer should certify that the windows/doors have been constructed and installed in a manner equivalent to the tested samples.

Table 4-2 – Minimum R_w of Glazing (with Acoustic Seals)

Glazing Assembly	Minimum R_w of Installed Window
4mm float	27
6mm float	29
6.38mm laminated	31
10.38mm laminated	35

4.3.2. External Walls

External walls are proposed to be of a concrete or masonry construction and as such will not require further acoustic treatment.

If lightweight cladding is proposed to be used then further acoustic investigation by an acoustic consultant will be required.

4.3.3. Ceiling/Roof Construction

The recommended roof/ceiling construction is shown in Figure 2 below. Penetrations in all ceilings (such as those required for light fittings etc.) must be acoustically treated and sealed gap free with a flexible sealant.

The recommended roof/ceiling construction is shown in Figure 2.

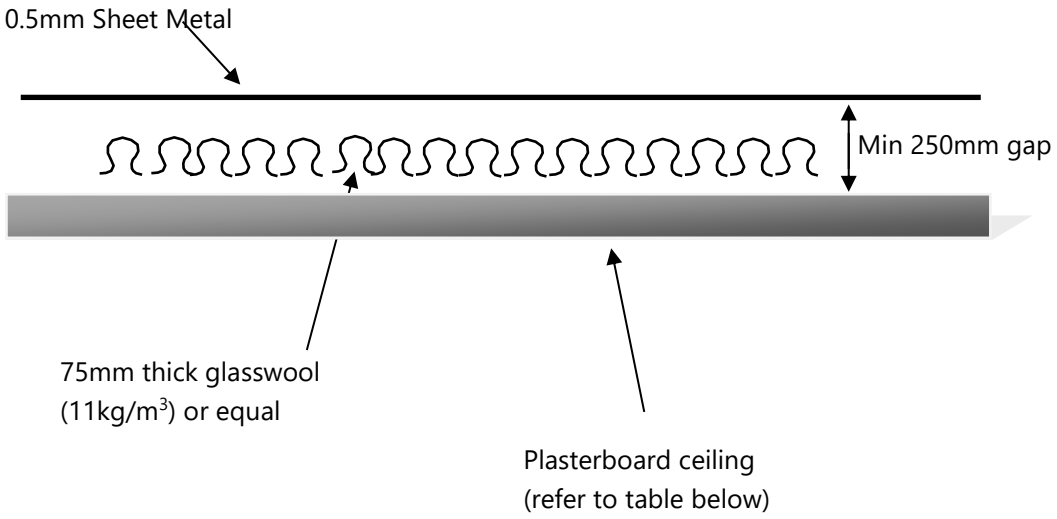


Figure 2 – Roof / Ceiling Construction

Table 4-3 – Recommended Roof/Ceiling Constructions

Space	Internal Lining	Truss System	External Lining
Living Rooms/Bedrooms	1 x 13mm plasterboard	Minimum of 250mm truss with 75mm thick 11kg/m^3 glasswool insulation in cavity	0.5mm metal deck roof

4.3.4. Ventilation requirements

With respect to natural ventilation, the NSW Department of Planning document "Development near Busy Roads and Rail Corridors - Interim Guideline" dictates that:

- *"If internal noise levels with windows or doors open exceed the criteria by more than 10dB(A), the design of the ventilation for these rooms should be such that occupants can leave windows closed, if they so desire, and also to meet the ventilation requirements of the Building Code of Australia."*

With windows open, the allowable internal noise goal is permitted to be 10dB(A) higher than when the windows are closed (ie – allowable level in bedrooms becomes 45dB(A), and 50dB(A) in living rooms).

These internal noise goals may be achieved with windows open within all rooms along the southern, eastern and western facades façades.

All rooms facing Wellington Road will require windows to be closed to achieve these internal noise levels.

Supplementary fresh air (using either mechanical ventilation or fresh air though one of the other facades) is recommended to ensure ventilation requirements of AS1668 are achieved.

The mechanical ventilation system should be acoustically designed to ensure that the acoustic performance of the acoustic treatments outlined above is not reduced and does not exceed Council criteria for noise emission to nearby properties.

5. NOISE EMISSION CRITERIA

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

- Bankstown Development Control Plan (DCP) 2015; and
- NSW Department of Environment and Heritage, Environmental Protection Authority document – '*Noise Policy for Industry*' (NPI) 2017.

5.1 BANKSTOWN DEVELOPMENT CONTROL PLAN (DCP) 2015

The Bankstown DCP 2015 contains no specific numerical controls for noise emissions.

5.2. NSW EPA NOISE POLICY FOR INDUSTRY (NPI) 2017

The EPA NPI has two criteria which both are required to be satisfied, namely Intrusiveness and amenity. The NPI 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.

5.2.1. 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 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 Table 5-1 below. Detailed measurement data is provided in Appendix A of this report.

Table 5-1 – Measured Background Noise Levels

Location	Period/Time	Background Noise Level dB(A) L_{90}
Project Site (Northern Boundary)	Day (7am-6pm)	41
	Evening(6pm-10pm)	44
	Night(10pm-7am)	42

5.2.2. 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 NPI 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 Table 5-1, the Noise Policy for Industry suggests the adoption of the 'suburban' categorisation.

The NPI 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 (7am – 6pm)	55	53
	Evening (6pm – 10pm)	45	43
	Night (10pm – 7am)	40	38

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.

5.2.3. 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	Rating Background Noise Level (Night) dB(A)L_{90}	Emergence Level
Residences Surrounding Site Night (10pm – 7am)	42 dB(A) L_{90}	47 dB(A)$L_{eq,\ 15min}$; 57 dB(A)L_{Fmax}

5.3. SUMMARISED NOISE EMISSION CRITERIA

Table 5-4 – EPA NPFI Noise Emission Criteria

Receiver	Time Period	Assessment Background Noise Level dB(A)L_{90}	Project Amenity Criteria dB(A) L_{eq}	Intrusiveness Criteria $L_{eq(15min)}$	NPI Criteria for Sleep Disturbance
Residential	Day (7am – 6pm)	41	53	**46**	N/A
	Evening (6pm – 10pm)	44	**43**	49	N/A
	Night (10pm – 7am)	42	**38**	47	**47 dB(A)$L_{eq,\ 15min}$; 57 dB(A)L_{Fmax}**

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

6. NOISE EMISSION ASSESSMENT

6.2. NOISE FROM MECHANICAL PLANT WITHIN PROPOSED SITE GENERALLY

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 and enclosures.

Noise emissions from all mechanical services to the closest residential receiver should comply with the requirements of Section 5.

Detailed acoustic review should be undertaken at CC stage to determine acoustic treatments to control noise emissions to satisfactory levels.

7. RAILWAY VIBRATION ASSESSMENT

Trains induce ground borne vibration that is transmitted through the subsoil. These vibrations can be perceptible close to railways, as tactile vibrations and as structure borne noise.

7.2. PROJECT VIBRATION OBJECTIVES

7.2.1. Tactile Vibration

Human comfort is normally assessed with reference to the British Standard BS 7385 Part 2 1993 or Australian Standard AS 2670.2 1990.

The Interim Guideline references the DECCW *Assessing Vibration- A technical guideline* which recommends that habitable rooms should comply with the criteria therein which is in line with the requirements of British Standard BS 6472:1992 "Evaluation of Human Exposure to Vibration in Buildings (1Hz to 80Hz)".

British Standard BS 6472:1992 "Evaluation of Human Exposure to Vibration in Buildings (1Hz to 80Hz)" is recommended by the RIC's and SRA's Interim Guidelines for Councils "Consideration of rail noise and vibration in the planning process" as this standard includes guidance for the assessment of human response to building vibration including intermittent vibrations such as that caused by trains.

Human response to vibration has been shown to be biased at particular frequencies, which are related to the orientation of the person. This standard provides curves of equal annoyance for various orientations. These curves are applied as correction filters such that an overall weighted acceleration level is obtained. As the orientation of the resident is unknown or varying the weighting filter used is based on the combined base curve as given in ISO 2631 & Australian Standard 2670 "Evaluation of Human Exposure to Vibration and Shock in Buildings (1 to 80Hz)" which represents the worst case of the X, Y and Z axes. Filtered measurements are made in all three co-ordinate axes and the highest value axis used.

This standard assesses the annoyance of intermittent vibration by using the Vibration Dose Value (VDV). Alternatively the VDV may be estimated by the eVDV which is derived by a simpler calculation using an empirical factor. The VDV or eVDV is calculated for the two periods of the day being the "Daytime" (6am-10pm) and "Night time" (10pm-6am). The overall value is then compared to the levels in Table 8. For this project the aim will be for a low probability of adverse comment.

Table 8-1 - Vibration Dose Values ($m/s^{1.75}$) above which various degrees of adverse comment may be expected in residential buildings.

Place	Low Probability of adverse comment	Adverse comment possible	Adverse comment probable
Residential buildings 16hr day (Daytime)	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential buildings 8hr night (Night time)	0.13	0.26	0.51

7.2.2. Structure Borne Noise

Typically, the structure borne noise component of train noise when a site lies adjacent to an above ground rail is masked by the airborne noise component of the train pass by. In this regard, we note that the Department of Planning document '*Development Near Rail Corridors and Busy Road – Interim Guideline*' (the Interim Guidelines) state in Section 3.6.2:

"…Where building are constructed over or adjacent to land over tunnels, ground-born noise may be present without the normal masking effects of air born noise. In such cases, residential buildings should be designed so that the 95th percentile of train pass-bys complies with a ground-born LAmax noise limit of 40 dB(A)(daytime and 35 dB(A) (night time)measured using the "slow" response time setting on a sound level meter."

As the proposed development is not located over or adjacent to railway tunnels, no additional assessment of structure borne vibration is required for the proposed development.

8.2. RAIL VIBRATION MEASUREMENTS

The attended train vibration measurement results presented in table 8-2 are taken from report previously prepared by this office for a similar development at 85 Waldron road, Chester Hill in close proximity to the project site (doc ref: *20200765.1/1208A/R0/RG*, dated 12/8/2020). These measurements were conducted at on 11th August 2020, between the hours of 11:30am and 2:30pm. A Svan 958 Vibration Analyser was used for the vibration measurements. The analyser was fitted with a Dytran triaxial accelerometer.

The measured vibration levels, duration of train pass by and the number of rail movements per hour were used to determine the overall vibration dose (VDV) at the proposed development for both daytime and night time periods. The results are presented the table below.

Table 8-2 - Vibration Dose Values

Time Period	Calculated VDV m/s$^{1.75}$	Criteria VDV m/s$^{1.75}$	Complies
Day (7am – 10pm)	0.02	<0.2 to 0.4	Yes
Night (10pm -7am)	0.02	<0.13	Yes

In the event the future train use increases, say by 10%, predicted eVDV will not increase significantly (no more than approximately 0.007 more than the levels predicted in the table above) and will not impact recommended vibration isolation treatments.

The calculated levels comply with the tactile vibration requirements listed in Table 8-1.

8. CONCLUSION

This report presented our acoustic assessment for the proposed residential development at 175-177 Wellington Road, Sefton.

We note the following:

- Noise intrusion impacts from traffic and train movements onto the future occupants of the development has been assessed in accordance with Bankstown City Council DCP 2015 and the SEPP (Infrastructure) 2007.

- External noise emission criteria for the development is presented in Section 5 of this report based on the requirements of NSW EPA Noise Policy for Industry (NPI) 2017. Detailed acoustic treatment will be determined at CC Stage (if required).

- A vibration assessment has been conducted in accordance with in Section 7 of this report. It has been concluded that no vibration isolation treatment is required to the building structure.

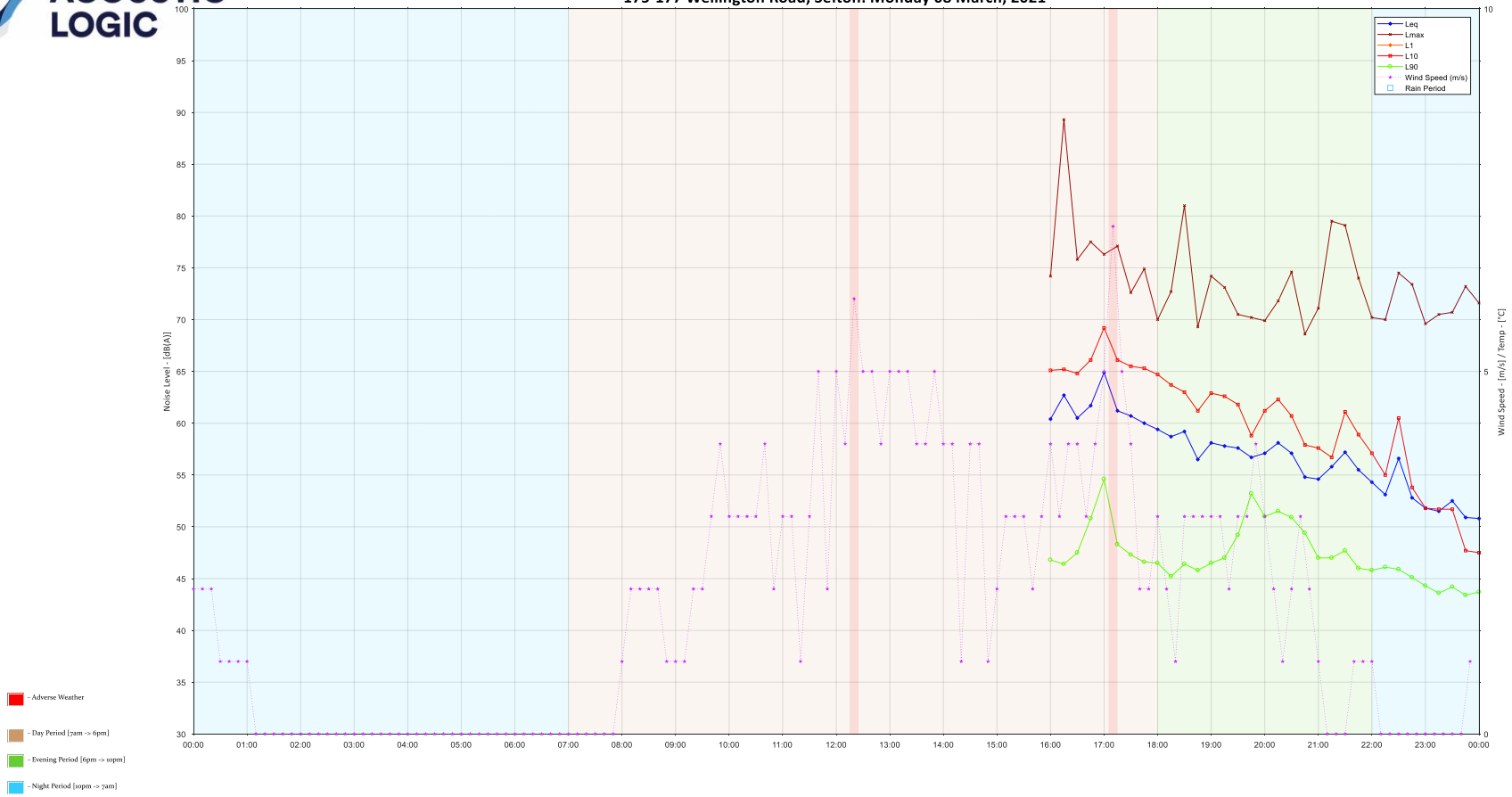
We trust this information is satisfactory. Please contact us should you have any further queries.

Yours faithfully,

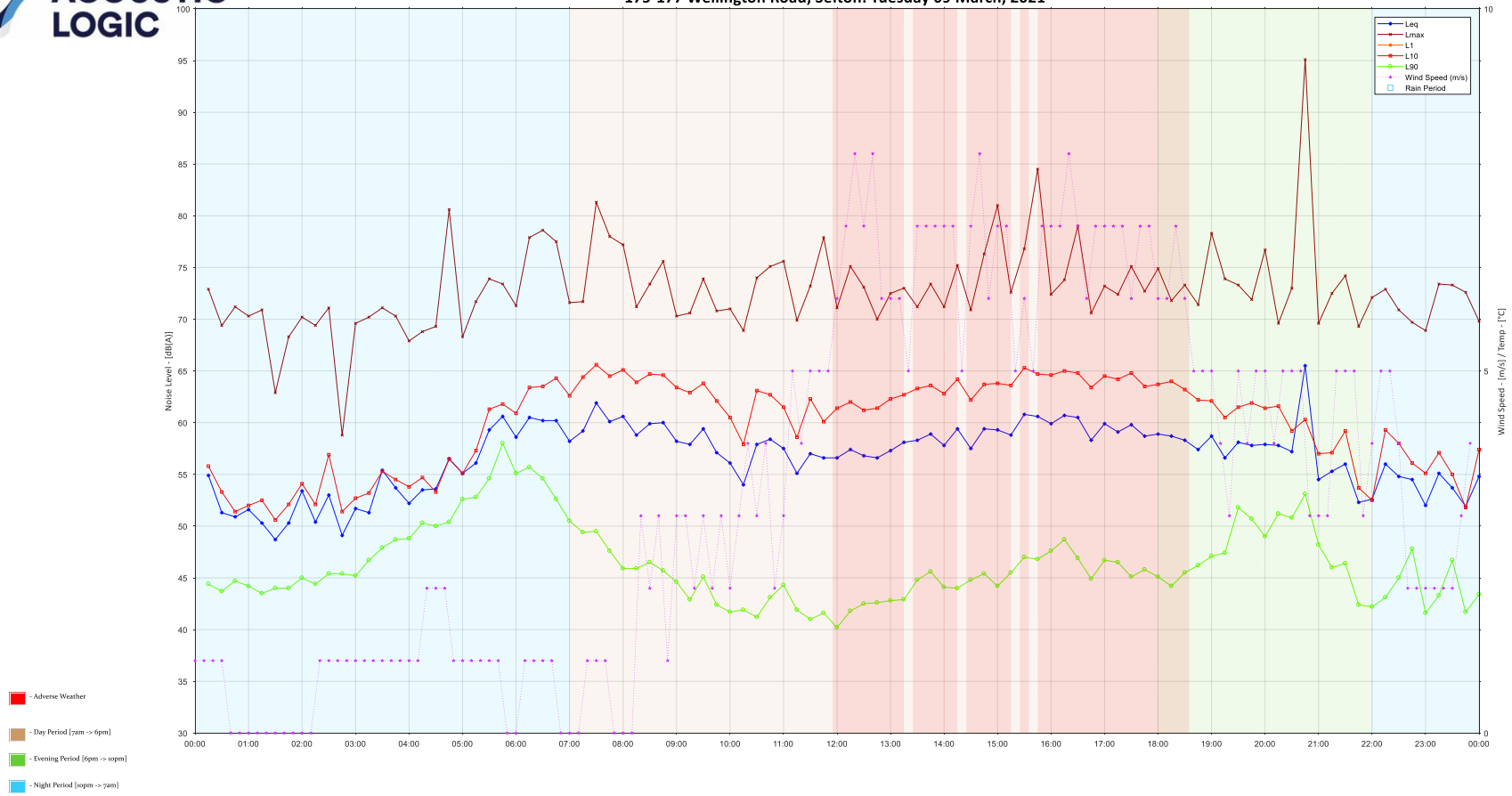
Acoustic Logic Pty Ltd
Ross Ferraro

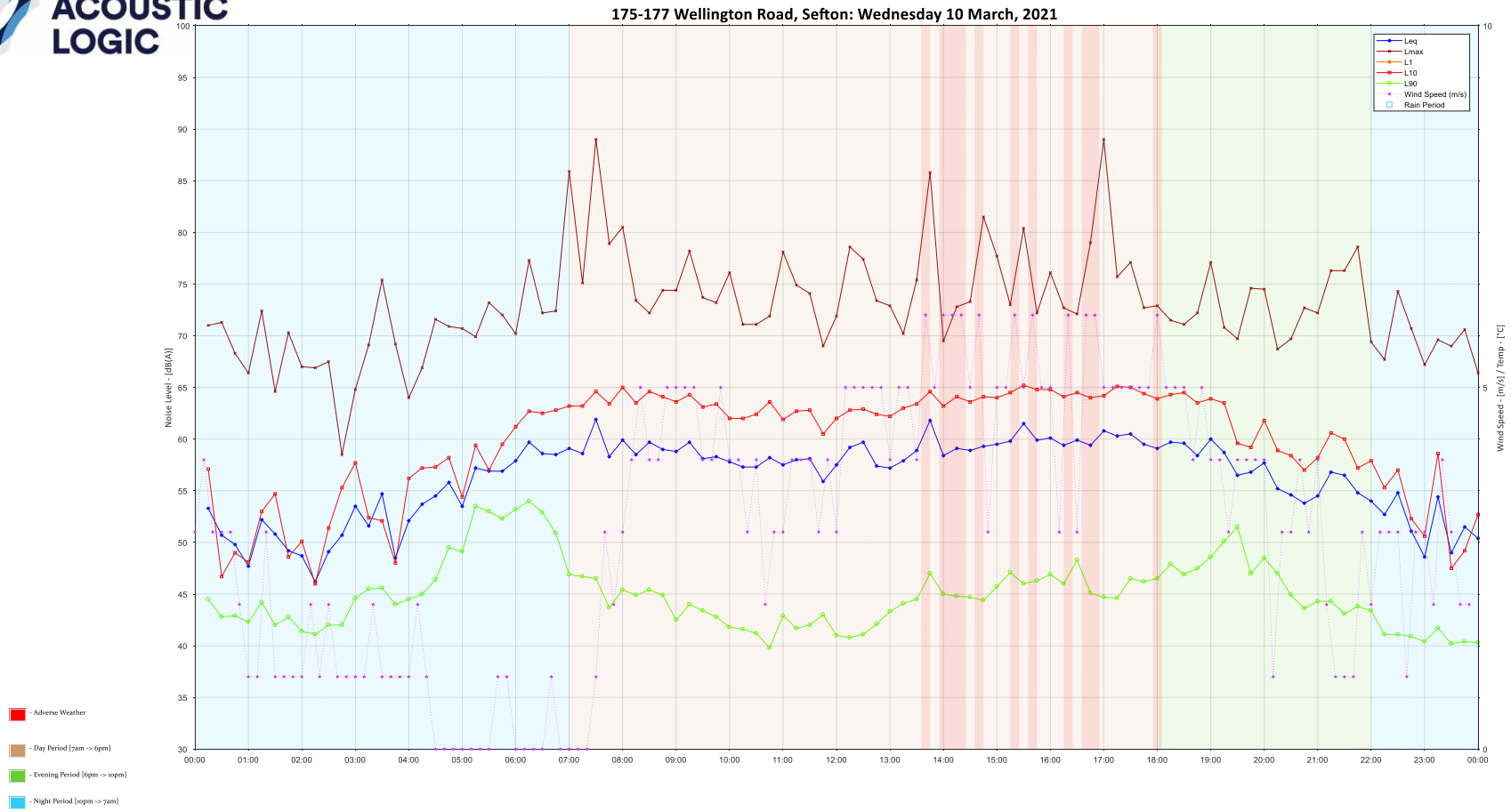
APPENDIX A – UNATTENDED NOISE MONITORING DATA

175-177 Wellington Road, Sefton: Monday 08 March, 2021

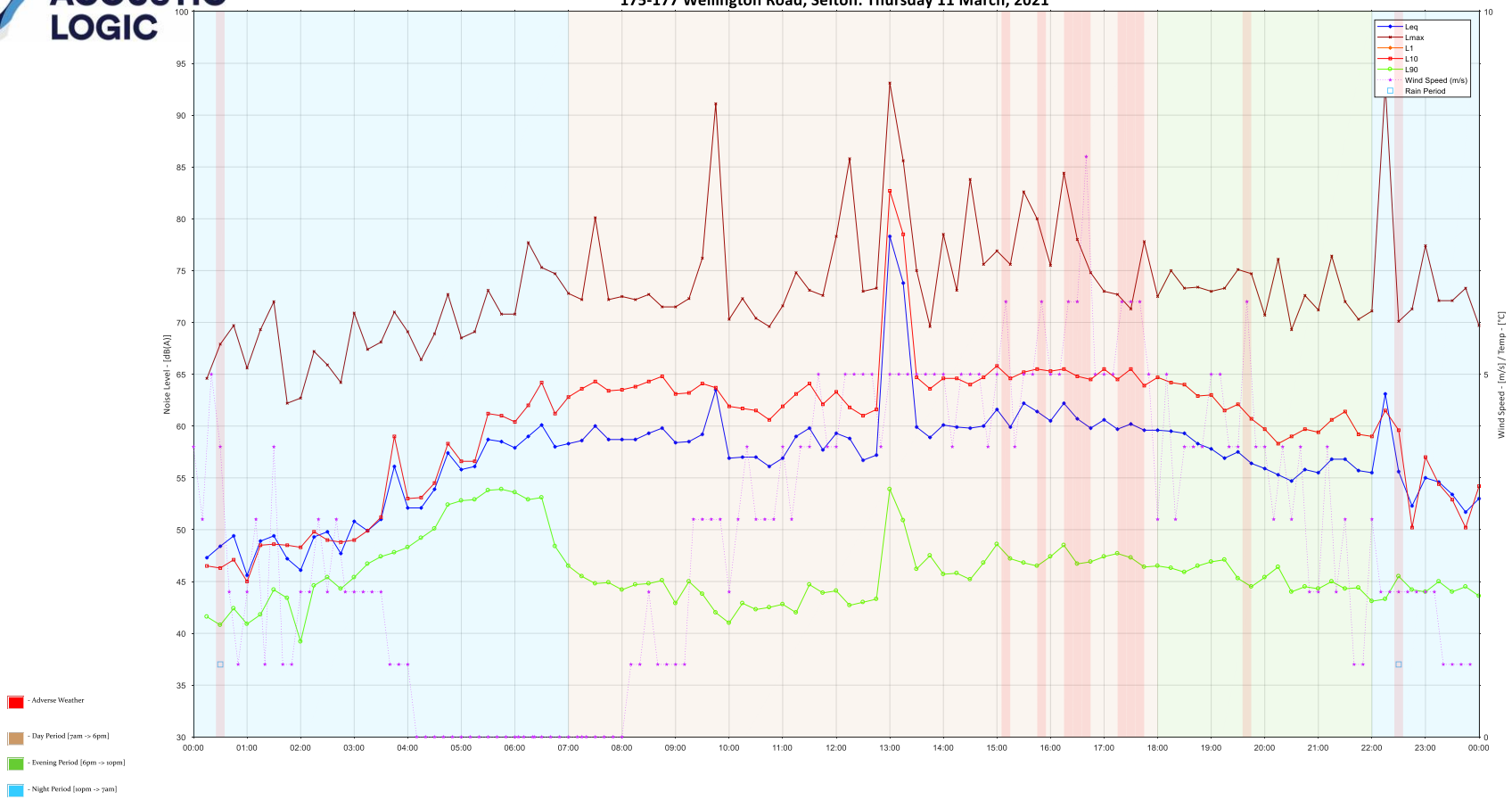


175-177 Wellington Road, Sefton: Tuesday 09 March, 2021

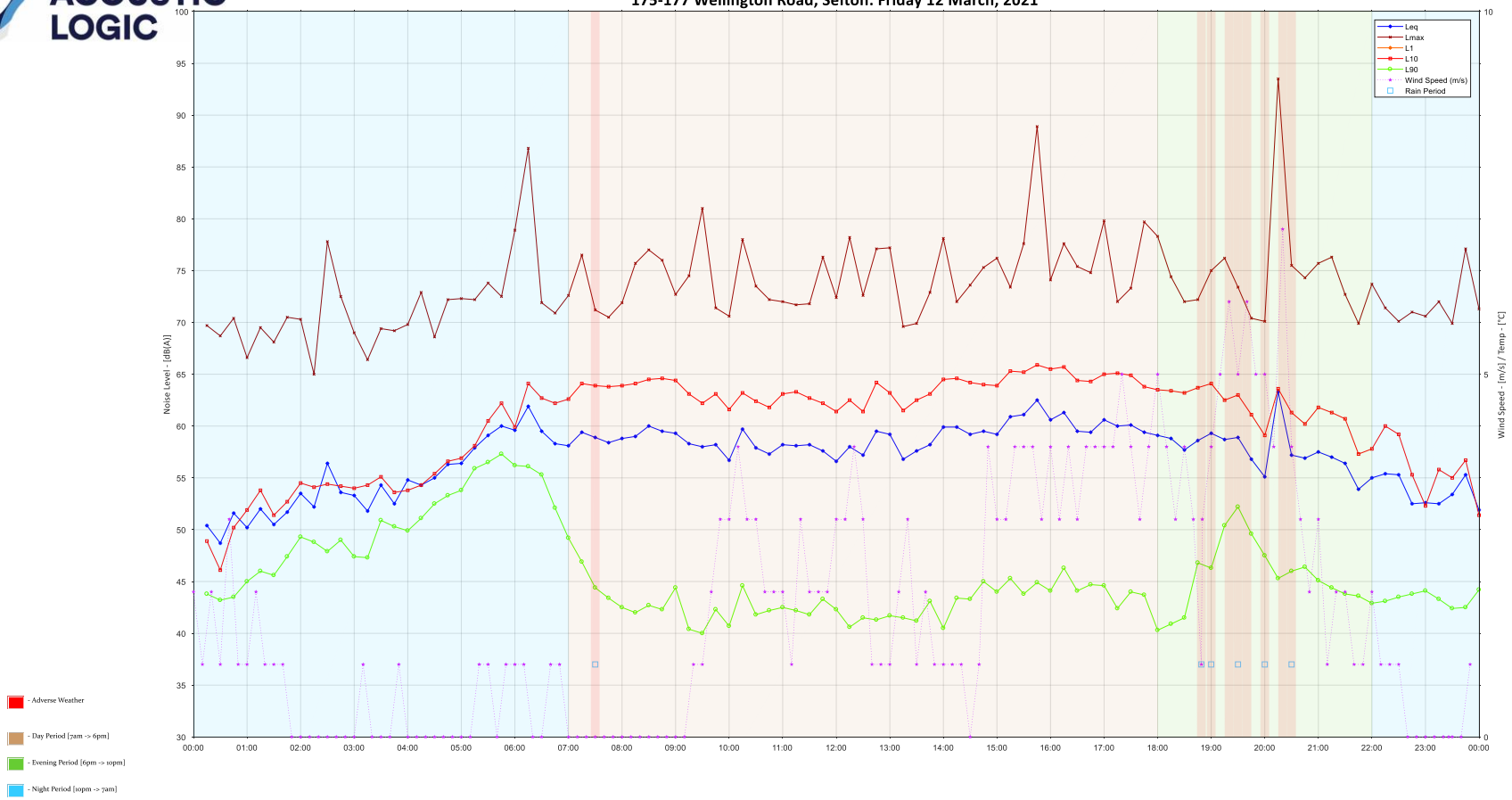



175-177 Wellington Road, Sefton: Wednesday 10 March, 2021
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

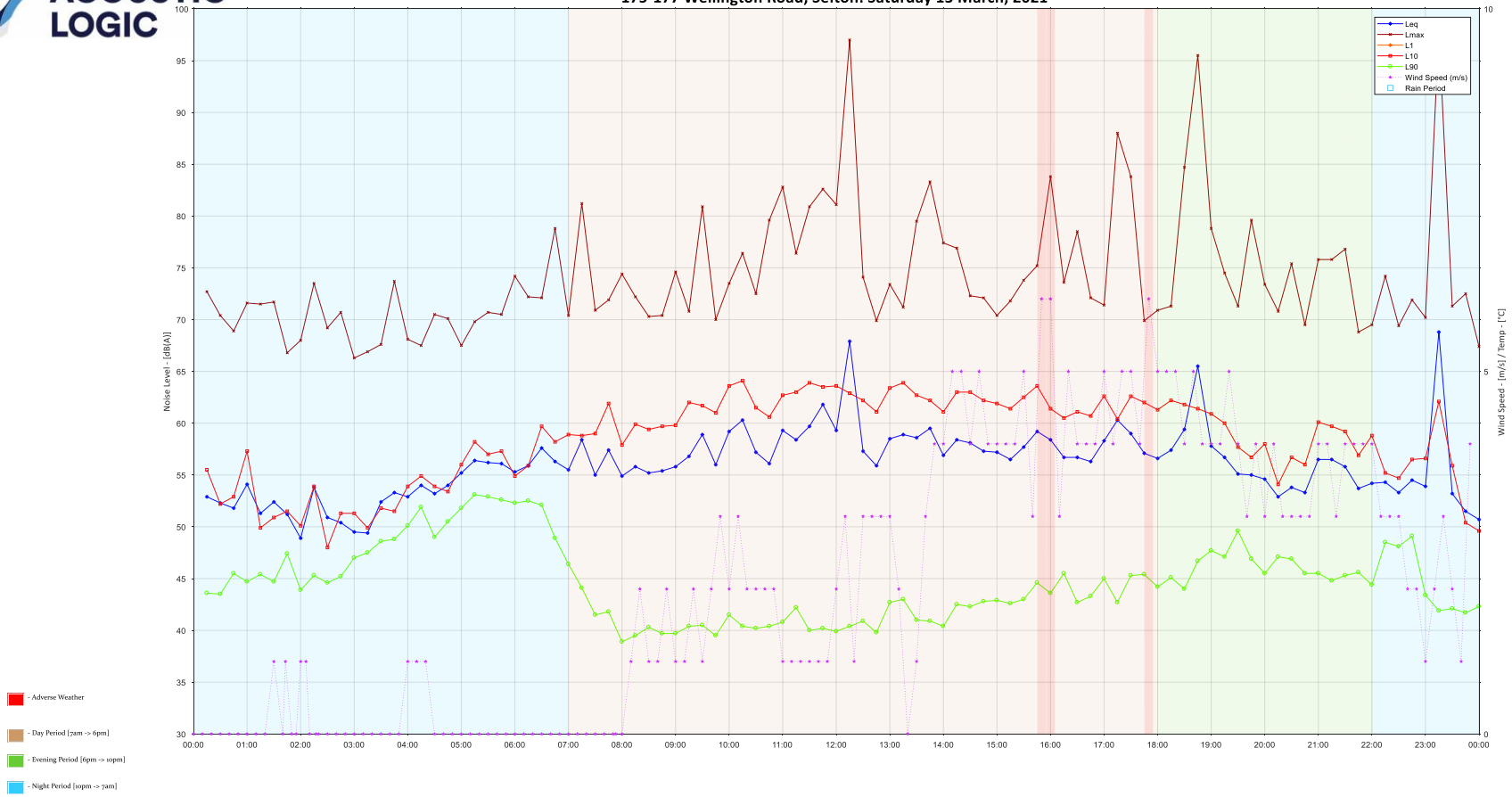
175-177 Wellington Road, Sefton: Thursday 11 March, 2021



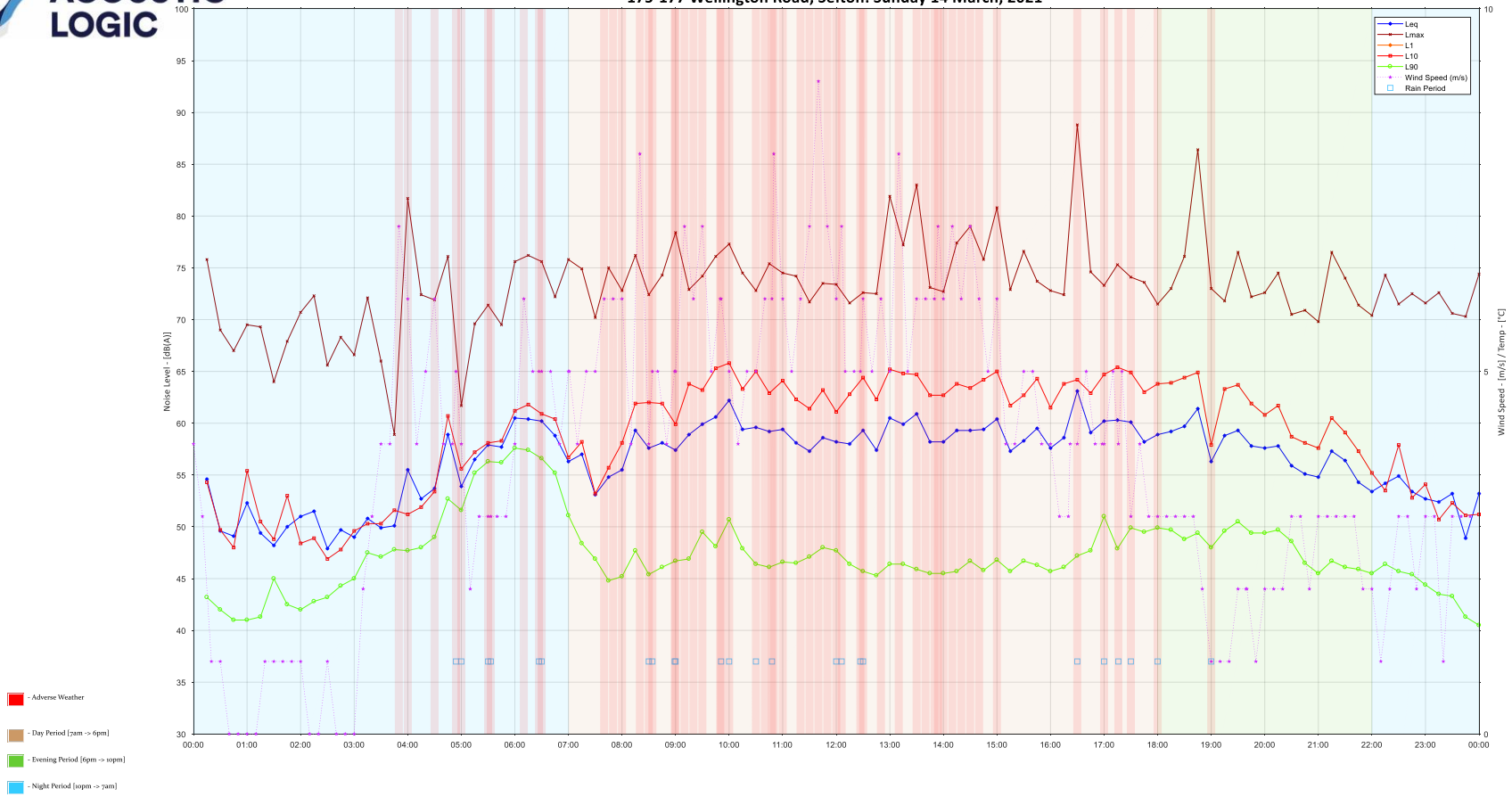
175-177 Wellington Road, Sefton: Friday 12 March, 2021



175-177 Wellington Road, Sefton: Saturday 13 March, 2021

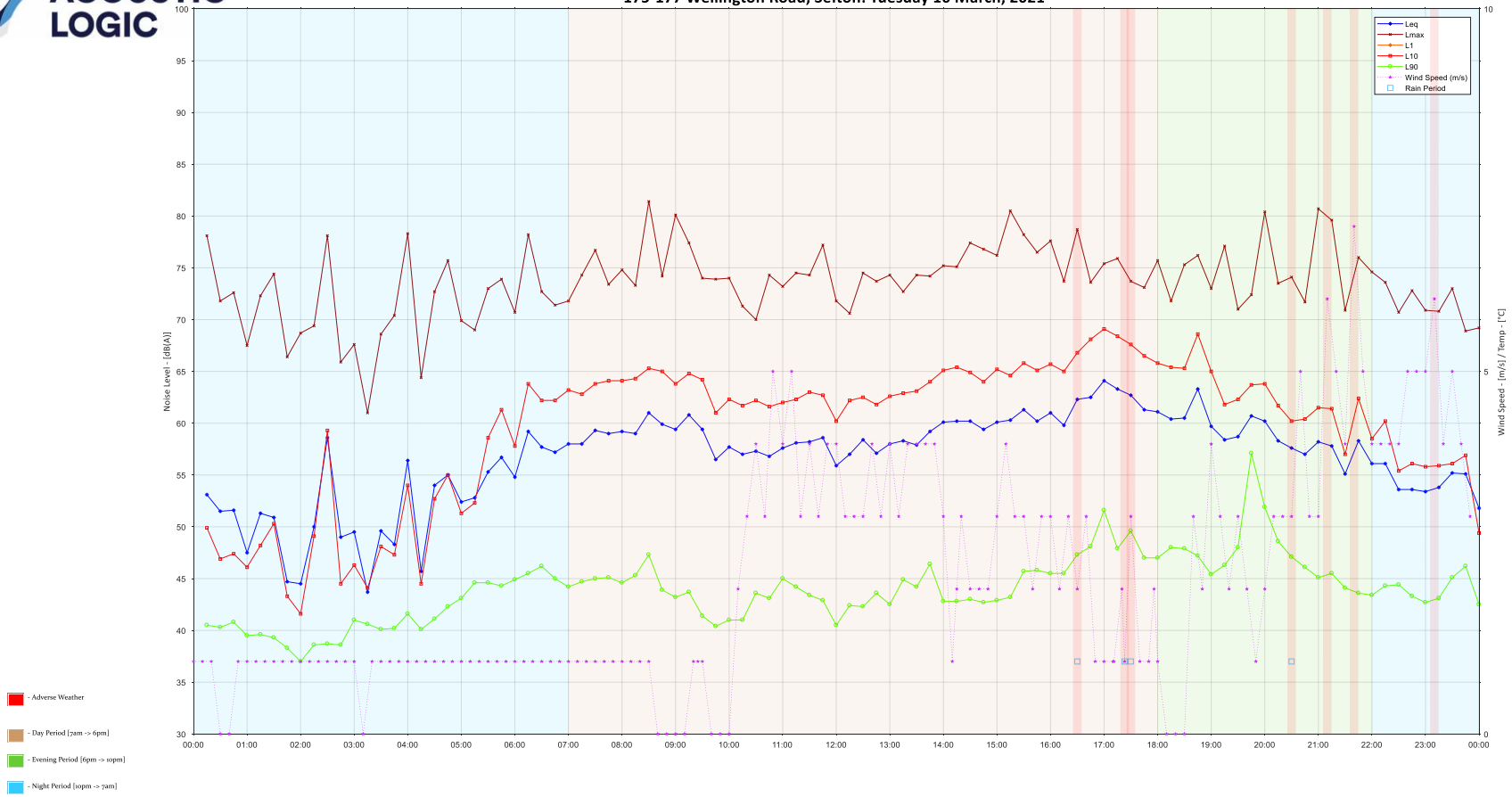


175-177 Wellington Road, Sefton: Sunday 14 March, 2021



175-177 Wellington Road, Sefton: Monday 15 March, 2021

175-177 Wellington Road, Sefton: Tuesday 16 March, 2021



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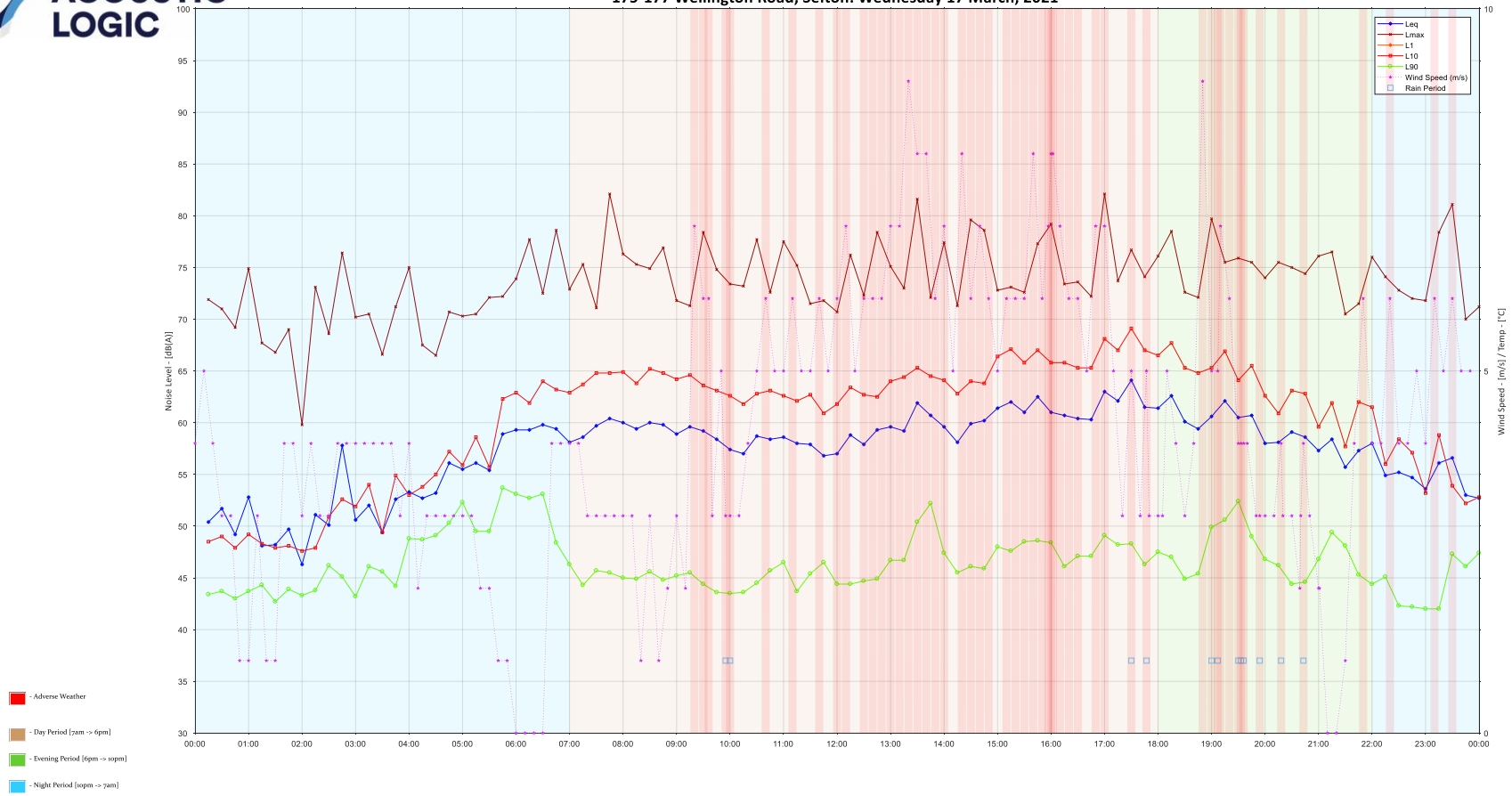

175-177 Wellington Road, Sefton: Thursday 18 March, 2021