

Attachment A16

Noise Impact Assessment



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923-935 Bourke Street, Waterloo

Noise Impact Assessment

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Project ID	20210229.1
Document Title	Noise Impact Assessment
Attention To	Fabcot Pty Ltd

Revision	Date	Document Reference	Prepared By	Checked By	Approved By
0	18/03/2021	20210229.1/1803A/R0/RG	RG		
1	1/10/2021	20210229.1/0110A/R1/RG	RG		
2	13/10/2021	20210229.1/1310A/R2/RG	RG		AW
3	4/11/2021	20210229.1/0411A/R3/RG	RG		RG
4	5/11/2021	20210229.1/0511A/R4/RG	RG		RG
5	30/08/2022	20210229.1/3008A/R5/RG	RF		GW
6	31/08/2022	20210229.1/3108A/R6/RG	RG		GW
7	31/08/2022	20210229.1/3108A/R7/RG	RG		GW

TABLE OF CONTENTS

1	INTRODUCTION	5
2	SITE DESCRIPTION AND MAJOR ACOUSTIC ISSUES	7
3	NOISE DESCRIPTORS	9
4	EXTERNAL NOISE SURVEY	10
4.1	MEASUREMENT POSITION	10
4.1.1	Measurement Period	10
4.1.2	Measurement Equipment	10
4.1.3	Summarised Long Term Noise Measurement Results	11
4.1.4	Summarised Traffic Noise Levels	11
5	TRAFFIC NOISE INTRUSION ASSESSMENT	12
5.1	CRITERIA	12
5.1.1	City of Sydney DCP 2012	12
5.2	NOISE INTRUSION ANALYSIS	13
5.3	RECOMMENDED CONSTRUCTIONS	13
5.3.1	Glazed Windows and Door Construction	13
5.3.2	External Roof/Ceiling Construction	14
5.3.3	External Wall Construction	14
6	NOISE EMISSIONS ASSESSMENT	15
6.1.1	City of Sydney Council Development Control Plan (DCP) 2012	15
6.2	NSW EPA NOISE POLICY FOR INDUSTRY (NPMI) 2017	16
6.2.1	Intrusiveness Criterion	16
6.2.2	Project Amenity Criterion	17
6.2.3	Sleep Arousal Criteria	17
6.3	NOISE FROM INCREASED TRAFFIC GENERATION ON PUBLIC STREETS	18
6.4	SUMMARY OF NOISE EMISSION GOALS	19
6.4.1	Overall Noise Emission dB(A) _{Leq 15min}	19
7	NOISE EMISSION ASSESSMENT	20
7.1	NOISE EMISSION FROM LOADING DOCK AND CAR PARK	20
7.1.1	Noise sources associated with use of site	20
7.1.2	Predicted Noise Emissions from the Loading Dock	20
7.1.3	Predicted Noise Emissions from the Carpark	21
7.1.4	Waste Collection	21
7.1.5	Supermarket	21
7.2	CUMULATIVE NOISE IMPACTS	21
7.3	NOISE FROM MECHANICAL PLANT	22
7.4	FUTURE RETAIL USES OF THE SITE	22
7.4.1	Preliminary Assessment of Noise Emissions from Retail/Café Use	22
8	TRAFFIC NOISE INCREASE BY THE PROPOSED DEVELOPMENT	24
9	INTERNAL NOISE ISOLATION	26
9.1	FLOORS	26
9.2	INTERTENANCY WALL	26
9.3	INTERTENANCY WALL BETWEEN WET AND HABITABLE AREAS	26
9.4	FOR STAIRWAY, PUBLIC CORRIDOR, PUBLIC LOBBY, ETC – BCA CLAUSE F5.5A	26
9.5	FOR LIFT WALL TO APARTMENT – BCA CLAUSE F5.5A	26
9.6	TREATMENT OF ENTRY DOORS	26
9.7	WASTE, STORMWATER AND DOMESTIC SUPPLY PIPING	27
9.8	MECHANICAL SERVICE DUCTING	27

9.9 SOUND ISOLATION OF PUMPS27
9.10 RECOMMENDATION27
10 CONCLUSION.....28
11 APPENDIX A – UNATTENDED NOISE MONITORING DATA.....29

1 INTRODUCTION

This report relates to 923-935 Bourke Street, Waterloo and is submitted to the City of Sydney in support of a request for Planning Proposal seeking amendments to the Sydney Local Environmental Plan 2012. The broad intent of the Planning Proposal is to achieve a mixed-use development outcome, including a supermarket, which facilitates a suitable urban form to support local strategic planning intent for the establishment of a new 'neighbourhood centre' within the site. The Planning Proposal seeks amendment to maximum building height mapping and to introduce a site-specific criteria based exemption to the retail floor area cap outside of Green Square Town Centre and other planned centres. The indicative reference scheme in support of the proposal accommodates a mixed-use development including a subterranean supermarket, retail, commercial, residential apartments on podium and rooftop communal facilities. Basement parking is accommodated for all uses, with ground level loading and 'Direct to Boot' pick up facilities.

This report will:

- Identify relevant noise emission criteria applicable to the development.
- Identify nearby noise sensitive receivers and the operation noise sources with the potential to adversely impact them.
- Predict noise emissions at the nearest residential receivers and assess the predicted noise levels against the relevant acoustic criteria.
- Determine building and/or management controls necessary to ensure ongoing compliance with the noise emission goals.
- Determine indicative building shell constructions necessary to comply with internal noise levels as a result of traffic noise

Acoustic Logic have utilised the following documents and regulations in the noise assessment of the development;

- City of Sydney Development Control Plan (DCP) 2012
- Australian Standard AS2107:2016 – *'Recommended Design Sound Levels and Reverberation Times for Building Interiors,'* and
- NSW Department of Environment and Heritage, Environmental Protection Agency document – *'Noise Policy for Industry'* (NPI) 2017.
- NSW Department of Environment, Climate Change and Water - *Road Noise Policy 2011*
- JMT Consulting Transport Assessment – *'923-925 Bourke Street, Waterloo'* dated 5th of November 2021.

This assessment has been conducted using the Bates Smart drawings titled 'Woolworths Waterloo, 923-925 Bourke Street, Indicative Concept Scheme' provided for the purpose of a planning proposal. Drawing details are summarised in the table below.

Table 1 – Architectural Drawings

Drawing Number	Title	Revision	Plot Date
SK.000	Cover Page	1	31/08/2022
SK.001	Basement 02		
SK.002	Basement 01		
SK.003	Lower Ground		
SK.004	Ground Level		
SK.005	Level 01		
SK.006	Level 02		
SK.007	Level 03		
SK.008	Level 04		
SK.009	Level 05		
SK.010	Level 06		
SK.011	Level 07		
SK.012	GFA Area Plans		
SK.013	Sections		
SK.014	Elevations		
SK.015	Elevations		
SK.016	ADG Diagrams Solar		
SK.017	ADG Diagrams Cross Ventilation		

2 SITE DESCRIPTION AND MAJOR ACOUSTIC ISSUES

The site is located at 923-925 Bourke Street, Waterloo. The proposed development includes:

- 2 levels of basement parking for residential, retail, supermarket and commercial,
- Woolworths supermarket on lower ground/first level of basement
- Ground floor retail tenancies and loading dock
- "Direct to Boot" drive through service for the supermarket on Ground floor
- Three residential buildings
- One commercial building with ground floor retail tenancies
- Communal space on roof

The nearest receivers surrounding the site are as follows:

R1: Four storey residential apartments across Young Street to the west.

R2: Commercial receivers across Young Street to the west

R3: Neighbouring commercial receivers and ground floor retail to the south of the site

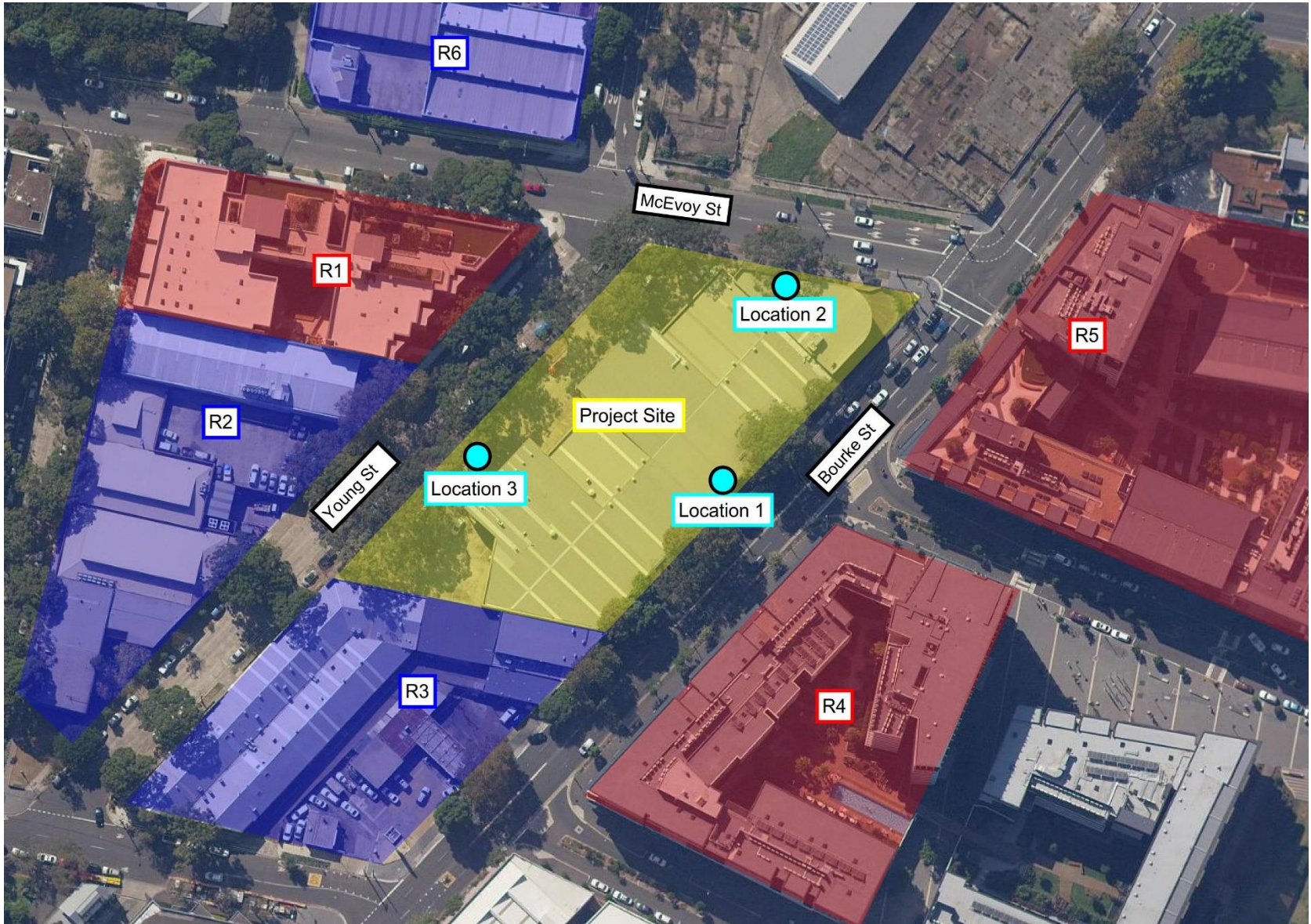
R4: Six storey residential apartments across Bourke Street to the east with ground floor commercial use

R5: Five to ten storey apartments across Bourke Street to the east with ground floor commercial use

The major acoustic issues related to the proposed development are below:

- Traffic noise intrusion into the proposed development.
- Noise emissions from car and truck movements into and out of the loading dock and carpark
- Noise emission from plant to service the project buildings.
- Acoustic separation between retail and residential sections.
- Traffic noise increase generated by the operation of the project buildings.

A site map with receiver locations is detailed below in Figure 1.



- Commercial receiver
- Residential receiver

**Figure 1 – Site Map
(Sourced SixMapsNSW)**

- Unattended noise monitor

3 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 on a continuous basis over this period, and statistical and integrating techniques are used to characterise the noise being measured.

The principal measurement parameters are:

Leq - represents the average noise energy during a measurement period. This parameter is derived by integrating the noise levels measured over the measurement period. Leq is important in the assessment of noise impact as it closely corresponds with how humans perceive the loudness of steady state and quasi-steady state noise sources (such as traffic noise).

L90 – This is commonly used as a measure of the background noise level as it represents the noise level heard in the quieter periods during the measurement interval. The L90 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 L90 level.

L10 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.

Lmax 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.

L1 is sometimes used in place of Lmax to represent a typical noise level from a number of high level, short term noise events.

4 EXTERNAL NOISE SURVEY

Acoustic survey has been carried out by setting up 3 long term noise monitors around the project site to record the existing ambient and background noise levels for 12 days.

NSW EPA's Rating Background Noise Level (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.

Appendices in this report present results of unattended noise monitoring conducted at the project site. Weather affected data was excluded from the assessment. The processed RBL (lowest 10th percentile noise levels during operation time period) are presented in Table 1.

4.1 MEASUREMENT POSITION

Three unattended noise monitors were placed around the project site. The detailed locations are below:

- Location 1- Unattended noise monitor was placed on the rooftop of the existing building near Bourke Street with line of sight of the road.
- Location 2-The monitor was placed on the rooftop of the existing building near McEvoy Street also with line of sight of the road and the intersection of McEvoy/Bourke Street.
- Location 3-. The monitor was located near Young street approximately three metres from the kerb.

Detailed monitor locations have been marked in Figure 1 above.

Attended measurements were undertaken at McEvoy Street, Bourke Street and Young Street. All measurements were taken approximately 3m from the kerb at street level in front of their respective noise monitor locations.

4.1.1 Measurement Period

Unattended noise monitoring was conducted from 4th to the 16th of March 2021.

Attended measurements were undertaken on site on Tuesday the 16th of March 2021 between 3:30 and 4:30pm.

The measurement were conducted prior to lockdown restrictions and reflect the intended levels of the surrounds.

4.1.2 Measurement Equipment

Unattended noise monitors

Equipment used consisted of four Acoustic Research Laboratories Pty Ltd noise loggers. The loggers were set to A-weighted fast response and were programmed to store 15-minute statistical noise levels throughout the monitoring period. The monitors were calibrated at the start and end of the monitoring period using a Rion NC-73 calibrator. No significant drift was noted. Noise logger data is provided in Appendix A.

Attended Noise Measurement

Noise measurements were obtained using a Norsonic type SA140 Sound Analyser. The analyser was set to fast response and calibrated before and after the measurements using a Norsonics Sound Calibrator type 1251. No significant drift was noted.

4.1.3 Summarised Long Term Noise Measurement Results

Table 2 - Measured Background Noise Levels RBL

Monitor Locations	Time of day	Rating Background Noise Level dB(A) _{L90(Period)}
Location 1- Bourke Street	Day (7am – 6pm)	57
	Evening (6pm – 10pm)	52
	Night (10pm – 7am)	42
Location 2-McEvoy Street	Day (7am – 6pm)	58
	Evening (6pm – 10pm)	54
	Night (10pm – 7am)	45
Location 3-Young Street	Day (7am – 6pm)	51
	Evening (6pm – 10pm)	47
	Night (10pm – 7am)	41

4.1.4 Summarised Traffic Noise Levels

Table 3 - Measured Traffic Noise Levels

Monitor Locations	Time	Measured Traffic Noise Level	
		Worst 1 Hour	Period
Location 1- Bourke Street	Day (7am-10pm)	68dB(A) L_{eq} (1hr)	67dB(A) L_{eq} (15hr)
	Night (10pm-7am)	65dB(A) L_{eq} (1hr)	62dB(A) L_{eq} (9hr)
Location 2-McEvoy Street	Day (7am-10pm)	66dB(A) L_{eq} (1hr)	65dB(A) L_{eq} (15hr)
	Night (10pm-7am)	63dB(A) L_{eq} (1hr)	60dB(A) L_{eq} (9hr)
Location 3-Young Street	Day (7am-10pm)	61dB(A) L_{eq} (1hr)	59dB(A) L_{eq} (15hr)
	Night (10pm-7am)	55dB(A) L_{eq} (1hr)	52dB(A) L_{eq} (9hr)

5 TRAFFIC NOISE INTRUSION ASSESSMENT

5.1 CRITERIA

5.1.1 City of Sydney DCP 2012

Section 4.2.3.11 Acoustic Privacy

- (7) The repeatable maximum L_{Aeq} (1 hour) for residential buildings and serviced apartments must not exceed the following levels:
- (a) for closed windows and doors:
 - (i) 35dB for bedrooms (10pm-7am); and
 - (ii) 45dB for main living areas (24 hours).
 - (b) for open windows and doors:
 - (i) 45dB for bedrooms (10pm-7am); and
 - (ii) 55dB for main living areas (24 hours).
- (8) Where natural ventilation of a room cannot be achieved, the repeatable maximum $L_{Aeq(1hour)}$ level in a dwelling when doors and windows are shut and air conditioning is operating must not exceed:
- (a) 38dB for bedrooms (10pm-7am); and
 - (b) 48dB for main living areas (24 hours).
- (9) These levels are to include the combined measured level of noise from both external sources and the ventilation system operating normally.

Summarised internal noise criteria for each space are summarised below.

Table 4 - Summarised Internal Noise Criteria

Scenario	Space /Activity Type	Period	Internal Noise Requirement dB(A) L_{eq} (1 hour)
Closed windows and doors	Living Areas	24 hours	45 dB(A) L_{eq}
	Sleeping Areas	Night (10:00pm–7:00am)	35 dB(A) L_{eq}
Open windows and doors	Living Areas	24 hours	55 dB(A) L_{eq}
	Sleeping Areas	Night (10:00pm–7:00am)	45 dB(A) L_{eq}
Closed windows and doors with air conditioning operating	Living Areas	24 hours	48 dB(A) L_{eq}
	Sleeping Areas	Night (10:00pm–7:00am)	38 dB(A) L_{eq}

5.2 NOISE INTRUSION ANALYSIS

Traffic noise intrusion into the proposed development was assessed using the measured traffic noise levels presented in Table 3 above.

Calculations were undertaken taking into account the orientation of windows, barrier effects (*where applicable*), the total area of glazing, facade transmission loss and room sound absorption characteristics. In this way, the likely interior noise levels can be predicted.

5.3 RECOMMENDED CONSTRUCTIONS

5.3.1 Glazed Windows and Door Construction

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-Ion 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.

No detailed elevations are available at this stage, noise intrusion analysis has been carried out based on assumptions of full height glazing and room finish being carpet for both living and bedrooms. The indicative acoustic treatments are detailed below.

Table 5 -Indicative Glazing Requirements

Façade	Space	Glazing	Acoustic Seals
Bourke Street Building	Living	6.38mm laminate	Yes
	Bedroom	10.38mm laminate	Yes
Young Street Building (near McEvoy St)	Living	6.38mm laminate	Yes
	Bedroom	10.38mm laminate	Yes
Young St Building	Living	6.38mm laminate	Yes
	Bedroom	10.38mm laminate	Yes
Internal Facades	Living	6.38mm laminate	Yes
	Bedroom	10.38mm laminate	Yes

5.3.2 External Roof/Ceiling Construction

The proposed external roof is to be constructed with masonry elements and thus will be acoustically acceptable and will not require further treatment. Penetrations in all ceilings (such as for light fittings etc.) must be acoustically treated and sealed gap free with a flexible sealant. In the event that any penetrations are required through the external skin, an acoustic sealant should be used to minimise all gaps.

5.3.3 External Wall Construction

The proposed external walls are to be constructed with masonry elements and thus will be acoustically acceptable and will not require further treatment. There should not be vents on the internal skin of external walls. All penetrations in the internal skin of external walls should be acoustically sealed.

6 NOISE EMISSIONS ASSESSMENT

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

- NSW Department of Environment and Heritage, Environment Protection Authority (EPA) – *Noise Policy for Industry (NPfI) 2017*.
- City of Sydney Council Development Control Plan (DCP) 2012

6.1.1 City of Sydney Council Development Control Plan (DCP) 2012

NOISE – COMMERCIAL PLANT / INDUSTRIAL DEVELOPMENT

- (a) *Noise from commercial plant and industrial development must not exceed a project amenity/intrusiveness noise level or maximum noise level in accordance with relevant requirements of the NSW EPA Noise Policy for Industry 2017 (NPfI) unless agreed to by the City's Area Planning Manager. Further:*
- (i) *Background noise monitoring must be carried out in accordance with the long-term methodology in Fact Sheet B of the NPfI unless otherwise agreed by the City's Area Planning Manager.*
 - (ii) *Commercial plant is limited to heating, ventilation, air conditioning, refrigeration and energy generation equipment.*
- (b) *An LAeq, 15 minute (noise level) emitted from the development must not exceed the LA90, 15 minute (background noise level) by more than 3dB when assessed inside any habitable room of any affected residence or noise sensitive commercial premises at any time. Further:*
- (i) *The noise level and the background noise level shall both be measured with all external doors and windows of the affected residence closed.*
 - (ii) *Background noise measurements must not include noise from the development but may include noise from necessary ventilation at the affected premise.*
- (c) *Corrections in Fact Sheet C of the NPfI are applicable to relevant noise from the development measured in accordance with this condition, however duration corrections are excluded from commercial noise*

6.2 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.

6.2.1 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 8. Noise emissions from the site should comply with the noise levels presented below when measured at nearby property boundary.

Table 6 - Project Intrusiveness Criterion

Location	Time of day	Rating Background Noise Level dB(A) $L_{90}(\text{period})$	Project Intrusiveness Noise Level dB(A) $L_{eq}(15\text{min})$
Residential Receivers on Young Street (R1)	Day	51	56
	Evening	47	52
	Night	41	46
Residential Receivers on Bourke Street (R4 & R5)	Day	57	62
	Evening	52	57
	Night	42	47

6.2.2 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 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 Table 1, 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;

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

The amenity levels appropriate for the receivers surrounding the project site are presented in Table 9.

Table 7 - EPA Amenity Noise Levels

Type of Receiver	Time of day	Recommended Noise Level dB(A) $L_{eq}(\text{period})$	Project Amenity Noise Level dB(A) $L_{eq}(\text{period})$
Residential – Urban	Day	60	58
	Evening	50	48
	Night	45	43
Commercial	When in use	-	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

6.2.3 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:

- $L_{Aeq,15min}$ 40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or
- L_{AFmax} 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 8 - Sleep Arousal Criteria for Residential Receivers

Receiver	Rating Background Noise Level (Night) dB(A)L₉₀	Emergence Level
Residential receivers on Young Street Night (10pm – 7am) (R1)	41dB(A) L ₉₀	46dB(A)L _{eq, 15min} ; 56dB(A)L _{Fmax}
Residential Receivers on Bourke Street Night (10pm – 7am) (R4 & R5)	42dB(A) L ₉₀	47dB(A)L _{eq, 15min} ; 57dB(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.*

6.3 NOISE FROM INCREASED TRAFFIC GENERATION ON PUBLIC STREETS

For land 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 9 -Criteria for Traffic Noise Generated by New Development

Category	Time of Day	Permissible Noise Generation
Local Road Existing residences affected existing local roads generated developments	Day (7am-10pm)	55 L _{Aeq(1hour)}
	Night (10pm-7am)	50 L _{Aeq(1hour)}

6.4 SUMMARY OF NOISE EMISSION GOALS

The noise emission goals for the surrounding commercial and residential receivers are summarised below.

6.4.1 Overall Noise Emission dB(A) L_{eq} 15min

Table 10 - Noise Emission Criteria for Residential and Commercial Receivers

Receiver Location	Time of Day	Rating background noise level dB(A) L_{90} (Young Street)	Project Intrusiveness Noise Level (LAeq,15min dB[A])	Project Amenity Noise Level dB(A) L_{eq} (period)	Sleep Disturbance
Residential receivers on Young Street (R1)	Day	51	56	58	-
	Evening	47	52	48	-
	Night	41	46	43	46dB(A) L_{eq} , 15min; 56dB(A) L_{Fmax}
Residential receivers on Bourke Street (R4 & R5)	Day	57	62	58	-
	Evening	52	57	48	-
	Night	42	47	43	47dB(A) L_{eq} , 15min; 57dB(A) L_{Fmax}
Commercial	When in use	-	-	63	-

Table 11 -Criteria for Traffic Noise Generated by New Development

Category	Time of Day	Permissible Noise Generation
Local Road (Young Street)	Day (7am-10pm)	63 L_{Aeq} (1hour)
	Night (10pm-7am)	57 L_{Aeq} (1hour)

7 NOISE EMISSION ASSESSMENT

7.1 NOISE EMISSION FROM LOADING DOCK AND CAR PARK

7.1.1 Noise sources associated with use of site

The following noise data was obtained by this office for operation of similar projects:

Table 12 – Sound Power Levels Associated with Proposed Loading Dock and Carpark

Noise Source	Sound Power Level
Truck Slowly Manoeuvring to Loading Dock	100 dB(A) L_{eq}
Truck Reversing Beeper (+5dB tonality penalty added to noise source)	105dB(A) L_{max}
Truck Engine Start	100dB(A) L_{max}
Truck Door Close	95dB(A) L_{max}
Truck Air Brake	114 dB(A) L_{max}
Car moving at 10km/h	84dB(A) L_{eq}

7.1.2 Predicted Noise Emissions from the Loading Dock

A loading dock for the site is proposed to be located near the Eastern Boundary of the site along Bourke Street. Large trucks are proposed to enter the loading dock from Bourke Street and will manoeuvre internally via a turntable to load/unload and will exit back onto Bourke Street.

In this assessment we have assumed delivery times can occur from 7am to 10pm. As such, noise emission predictions have been assessed against the most stringent criteria within this timeframe, being the evening period (6pm-10pm). The assessment has been based on a maximum of two truck movements in a 15minute interval (e.g., one entry and one exit). Noise emissions have been predicted to the nearest surrounding receivers.

Table 13 -Average Loading Dock Noise Emissions

Receiver	Predicted Noise Level	Criteria	Comment
R4: Worst Affected Residential (Apartments across Bourke Street)	47dB(A) $L_{eq(15min)}$	$\leq 48dB(A) L_{eq(15min)}$ (NPI Evening Amenity Criteria)	Achieves noise emission objectives

7.1.3 Predicted Noise Emissions from the Carpark

The main car park entrance/exit is located on Young Street and positioned away from the four storey residential building across the road to reduce noise emissions. We have assessed noise emissions from cars entering and exiting the carpark based on estimated peak period movements referenced in the JMT consulting Transport Assessment dated 5th of November 2021. We have adopted the worst hour being Saturday peak hour estimate of 649 vehicles. Noise emissions have been predicted to the nearest residential receiver against the Evening criteria to represent a worst case scenario.

Table 14 -Carpark Peak Use Noise Emissions

Receiver	Predicted Noise Level	Criteria	Comment
R1: Worst Affected Residential (Units across Young Street)	45dB(A) $L_{eq(15min)}$	$\leq 48dB(A) L_{eq(15min)}$ (NPI Evening Amenity Criteria)	Achieves noise emission objectives

7.1.4 Waste Collection

Council waste collection services are expected to occur during the daytime from 7am-6pm. Noise associated with council waste collection are not expected to generate noise levels approaching or exceeding the daytime noise emission criteria.

7.1.5 Supermarket

As the supermarket is located in the basement level, noise levels from the use of this premise are deemed to be negligible and inaudible at the nearest receivers.

7.2 CUMULATIVE NOISE IMPACTS

The combined noise emissions from carpark peak usage and the loading dock have been considered below. We also note that it would not typically be expected that these uses would occur simultaneously, i.e. significant truck deliveries during peak operational times for the supermarket. However, in order to demonstrate that this would be acceptable in any case, the cumulative noise level from these activities occurring simultaneously is presented below.

Table 15 -Cumulative Noise Emissions from Carpark and Loading Dock Operations

Receiver	Predicted Noise Level	Criteria	Comment
R1: Worst Affected Residential (Units across Young Street)	46dB(A) $L_{eq(15min)}$	$\leq 48dB(A) L_{eq(15min)}$ (NPI Evening Amenity Criteria)	Achieves noise emission objectives

7.3 NOISE FROM 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.

7.4 FUTURE RETAIL USES OF THE SITE

The primary noise generating uses of the retail spaces on ground floor would typically be restaurant/cafes with outdoor seating. In this regard, we note the following:

- Precise operational details such as quantity/location of any outdoor seating, operating hours and licensing requirements are not yet known – as such a detailed assessment cannot currently be undertaken.
- It would be expected that internal use of the tenancy (including the use of amplified background music) would achieve the relevant noise emission requirements during the day and evening period (7am – 10pm).;
- The level of noise emissions from the outdoor dining area would primarily be a result of the quantity of patrons within the outdoor area. In this regard a preliminary assessment is presented in Section 7.4.1.
- If the ground floor restaurant/cafe is proposed to operate during the night time period (10pm – 7am) or be licensed for the service of alcohol, it is assumed that this use would be subject to a separate planning application which would be accompanied by a noise impact assessment of the proposed use. Standard acoustic treatments and management controls could be applied to this use to achieve the relevant noise emission requirements.

A preliminary/indicative assessment of noise emissions from the retail uses of the site has been presented in the following section.

7.4.1 Preliminary Assessment of Noise Emissions from Retail/Café Use

The most significant source of noise likely to be emitted from the proposed retail components of the site will be patron and music noise, especially from outdoor dining areas. In this regard, preliminary assessment of noise emissions to the nearest residential receivers from this use is presented below, noting the following assumptions;

- There is a total of 100 patrons in the outdoor seating area, with one in two talking at any one time. The sound power level of a patron is 75 dB(A) L_{eq} .
- The outdoor seating is spread between 6 retail spaces on the north-eastern side of the site of the development (as indicated on the V2 ground level plan)
- Background music is played outdoors at 65dB(A)

Tenancy operation has been assessed for the period of 7am – 10pm.

- Operation during the night time period is subject to more stringent acoustic criteria and would need to be assessed on a case by case basis.
- Where night time operation is proposed, it is recommended that this be subject to a separate application where compliance with the relevant noise requirements is detailed.

The predicted noise level based on the assumptions detailed above are detailed in Table 16. In the absence of any other noise emission criteria relevant for the assessment of patron/operational noise, restaurant/café operation has been assessed against a 'background + 5 dB(A)' level which is consistent for this type of development.

Table 16 - Predicted Patron Noise Levels

Receiver	Time Period	Predicted Noise Level dB(A) Leq(15min)	Background + 5dB(A) Level dB(A) Leq(15min)	Comments
R1 Residents Located Across Young Street	Evening (6pm-10pm)	46	≤ 52	Achieves noise emission levels
R5 Residents Located Across Bourke Street	Evening (6pm-10pm)	49	≤ 57	Achieves noise emission levels

8 TRAFFIC NOISE INCREASE BY THE PROPOSED DEVELOPMENT

Traffic volumes along Bourke Street and McEvoy St are already high, and the predicted increase of traffic volume from the site would present a negligible increase to traffic noise levels along these roadways.

Traffic noise generation from the proposed development on Young Street has been based on the Transport Assessment prepared by JMT Consulting dated 5th of November 2021. Existing traffic noise levels have been based on the long term unattended monitoring data. Future traffic noise levels have been predicted based on the proposed traffic generation outlined in the traffic assessment. For this assessment we have used the worst one hour Saturday (WE) period.

Table 5 Forecast traffic generation

Scenario	Use	Quantum / Unit		Peak hour traffic generation rate			Forecast Traffic Generation		
				AM Peak Hour	PM Peak Hour	WE Peak Hour	AM peak hour	PM peak hour	WE Peak Hour
Existing site	Light industrial	6,534	m ²	0.5 / 100m ²	0.5 / 100m ²		-32	-32	0
Future site	Residential	125	Units	0.09 / unit	0.11 / unit	0.10 / unit	+11	+14	+13
	Retail	5,825	m ² GLA	4.97 / 100m ²	9.93 / 100m ²	10.92 / 100m ²	+289	+578	+636
	Commercial	26	Parking spaces	0.40 / parking space	0.25 / parking space	0	+7	+22	0
Net Traffic Generation							+281	+573	+649

Figure 2 – Forecast Traffic Generation
(Sourced JMT Consulting Traffic Report)

Traffic noise emission predictions to the nearest receiver R1 have been calculated and presented below in Table 17. Calculations have taken into account the traffic distribution outlined in Section 4.3 of the Preliminary Transport assessment.

Table 17 -Traffic Noise Generation

Location	Traffic Noise Generated from proposed traffic increase only (Saturday Peak) dB(A)_{Leq1hour}	Existing Traffic Noise Measured on Young Street dB(A)_{Leq1hour}	Future Traffic Noise dB(A)_{Leq1hour}
Young Street Residential Receiver R1	61	64*	<66

*Note: Noise levels measured in free-field have been corrected to represent façade-reflected noise levels as per the NSW Road Noise Policy.

Based on the above assessment, we predict an increase in Traffic noise along Young Street at R1 of less than 2dB(A). The NSW Road Noise Policy notes that an increase of less than 2dB(A) is a minor impact and would be barely perceptible.

The above assessment of traffic noise generated by the development has been based on the highest peak hour volume to represent a worst-case scenario. Noise emissions outside of the peak hour times are expected to be significantly lower and thus reduced noise impacts are expected outside of these periods.

9 INTERNAL NOISE ISOLATION

Acoustic separation between internal space should be designed to satisfy the requirements of current NCC BCA which has been summarised below:

9.1 FLOORS

BCA Clause F5.4a: Floors separating sole-occupancy units or a sole occupancy unit from a plant room, lift shaft, stairway, public corridor, public lobby or the like will be required to have a Weighted Sound Reduction Index + Traffic Noise Spectrum Adaptation Term (abbreviated as R_w+C_{tr}) of not less than 50.

9.2 INTERTENANCY WALL

BCA Clause F5.5a(i): Walls separating sole occupancy units will be required to have a Weighted Sound Reduction Index + Traffic Noise Spectrum Adaptation Term (abbreviated as R_w+C_{tr}) of not less than 50.

9.3 INTERTENANCY WALL BETWEEN WET AND HABITABLE AREAS

BCA Clause F5.5a(i & iii): Walls separating a bathroom, sanitary compartment, laundry or kitchen in one sole occupancy unit from habitable room (other than a kitchen) in an adjoining unit will be required to have a Weighted Sound Reduction Index + Traffic Noise Spectrum Adaptation Term (abbreviated as R_w+C_{tr}) of not less than 50 and be of discontinuous construction.

9.4 FOR STAIRWAY, PUBLIC CORRIDOR, PUBLIC LOBBY, ETC – BCA CLAUSE F5.5A

BCA Clause F5.5a (ii & iii): Walls separating sole occupancy units from a plant room, lift shaft, stairway, public corridor, public lobby or the like will be required to have a Weighted Sound Reduction Index (abbreviated as R_w) of not less than 50. In addition, walls separating sole occupancy units from a plant room or lift shaft are required to be of discontinuous construction.

9.5 FOR LIFT WALL TO APARTMENT – BCA CLAUSE F5.5A

BCA Clause F5.5a (ii & iii): Walls separating sole occupancy units from a lift shaft or the like will be required to have a Weighted Sound Reduction Index (abbreviated as R_w) of not less than 50. In addition, walls separating sole occupancy units from a plant room or lift shaft are required to be of discontinuous construction.

9.6 TREATMENT OF ENTRY DOORS

BCA Clause F5.5b: For a door assembly located in a wall that separates a sole-occupancy unit from a stairway, public corridor or the like, will be required to have an R_w of not less than 30. For a door assembly located in a wall that separates 2 dwellings, it will be required to have an R_w+C_{tr} of not less than 50.

9.7 WASTE, STORMWATER AND DOMESTIC SUPPLY PIPING

BCA Clause F5.6: Ducts, Hot and Cold Domestic Water, Stormwater, Soil and Waste pipes which serves or passes through more than one sole occupancy unit must be separated from habitable rooms (other than a kitchen) in any other sole occupancy units by a Weighted Sound Reduction Index + Traffic Noise Spectrum Adaptation Term (abbreviated as $Rw+Ctr$) of not less than 40 if it is adjacent to a habitable room, and $Rw+Ctr$ 25 if it is adjacent to a wet area (bathroom, laundry, etc.) or kitchen.

9.8 MECHANICAL SERVICE DUCTING

BCA Clause F5.6: Ducts, Hot and Cold Domestic Water, Stormwater, Soil and Waste pipes which serves or passes through more than one sole occupancy unit must be separated from habitable rooms (other than a kitchen) in any other sole occupancy units by a Weighted Sound Reduction Index + Traffic Noise Spectrum Adaptation Term (abbreviated as $Rw+Ctr$) of not less than 40 if it is adjacent to a habitable room, and $Rw+Ctr$ 25 if it is adjacent to a wet area (bathroom, laundry, etc.) or kitchen.

9.9 SOUND ISOLATION OF PUMPS

BCA Clause F5.7: For all pumps a flexible coupling must be used at the point of connection between the service pipes in a building and any circulating pumps or other pump.

9.10 RECOMMENDATION

Detailed acoustic design of internal noise isolation including noise controls from operation of retail to residential apartment within the project site will be carried out at CC stage based on requirements above.

10 CONCLUSION

This report presents an acoustic assessment of noise impacts associated with the proposed mixed-use development to be located at 923-925 Bourke Street, Waterloo.

Noise intrusion criteria has been set up in this report to satisfy the requirements from the following documents

- City of Sydney Development Control Plan (DCP) 2012, and
- Australian Standard AS2107:2016 – '*Recommended Design Sound Levels and Reverberation Times for Building Interiors,*'

Indicative constructions have been presented in section 5.3.

External noise emissions criteria have been established in this report to satisfy the requirements from the following documents:

- City of Sydney Development Control Plan (DCP) 2012
- NSW Environmental Protection Authority (EPA) document – *Noise Policy for Industry (NPfI) 2017.*

Noise impacts from the proposed use of the development has been assessed with reference to the requirements of the NSW EPA Noise Policy for Industry (2017), City of Sydney Council Development Control Plan (DCP) 2012 and NSW Road Noise Policy (2011), as detailed in Section 7. The assessment of specific plant items should be undertaken as part of the construction certificate process.

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

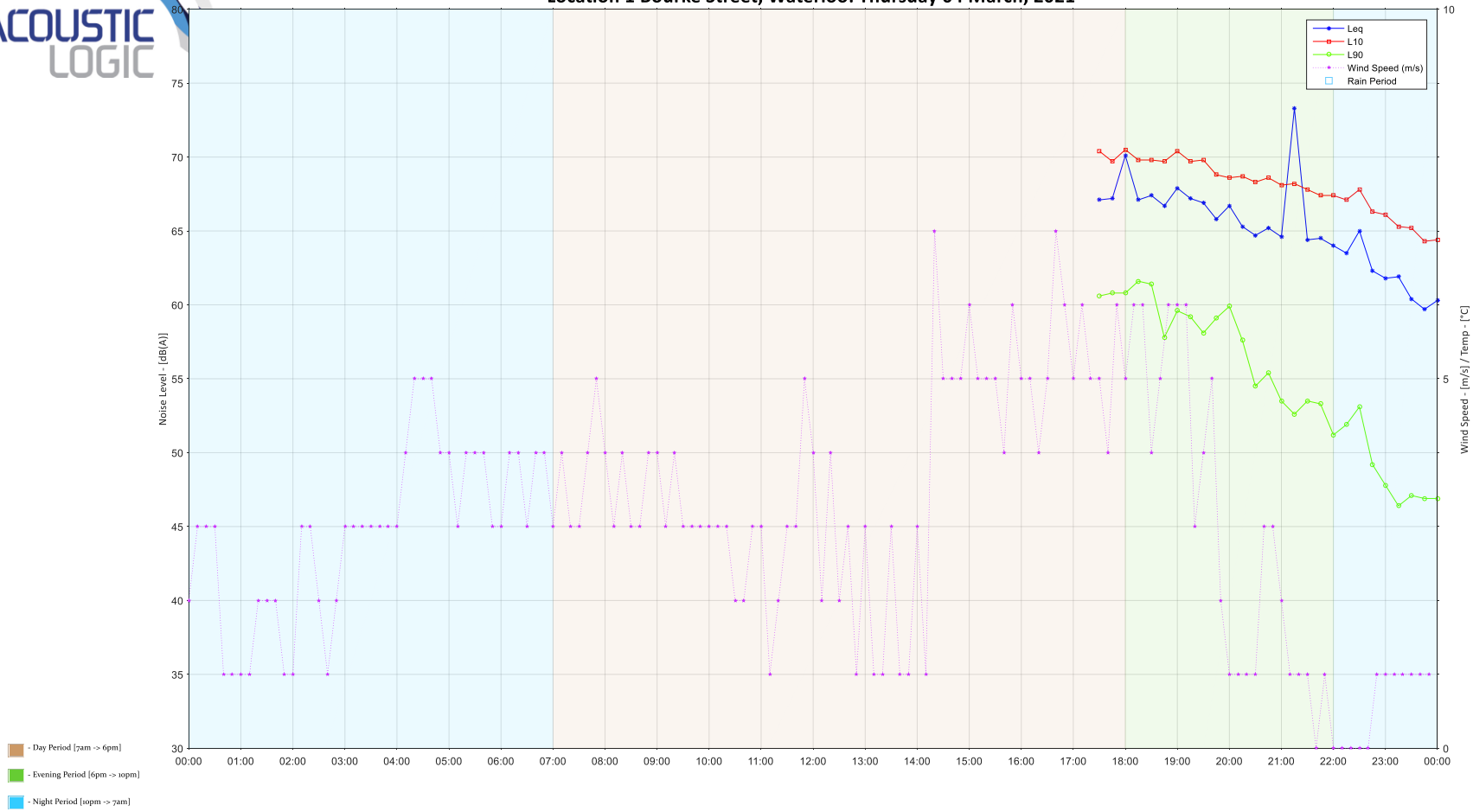
Yours faithfully,



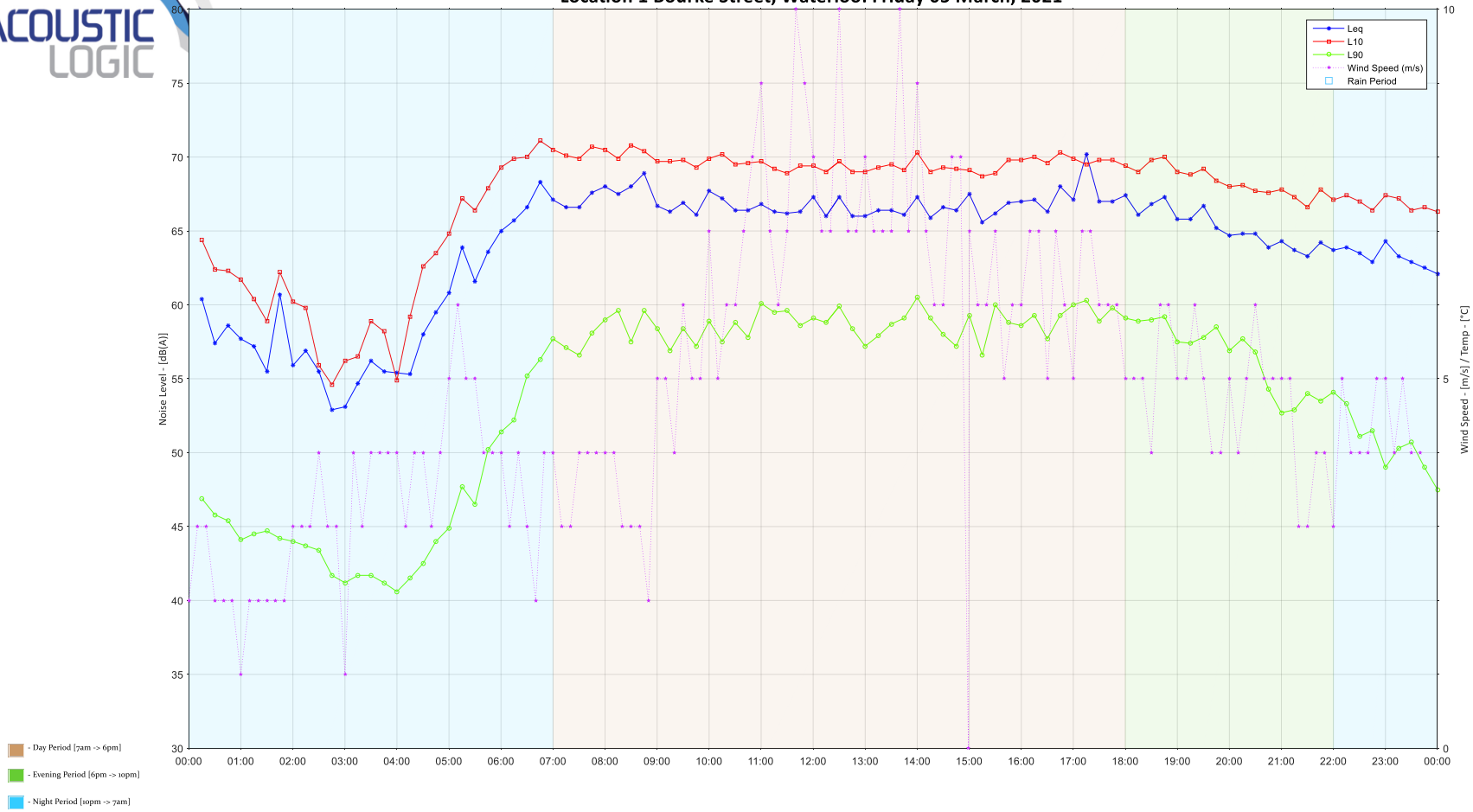
Acoustic Logic Pty Ltd
Ruben Ghannoum

11 APPENDIX A – UNATTENDED NOISE MONITORING DATA

Location 1 Bourke Street, Waterloo: Thursday 04 March, 2021



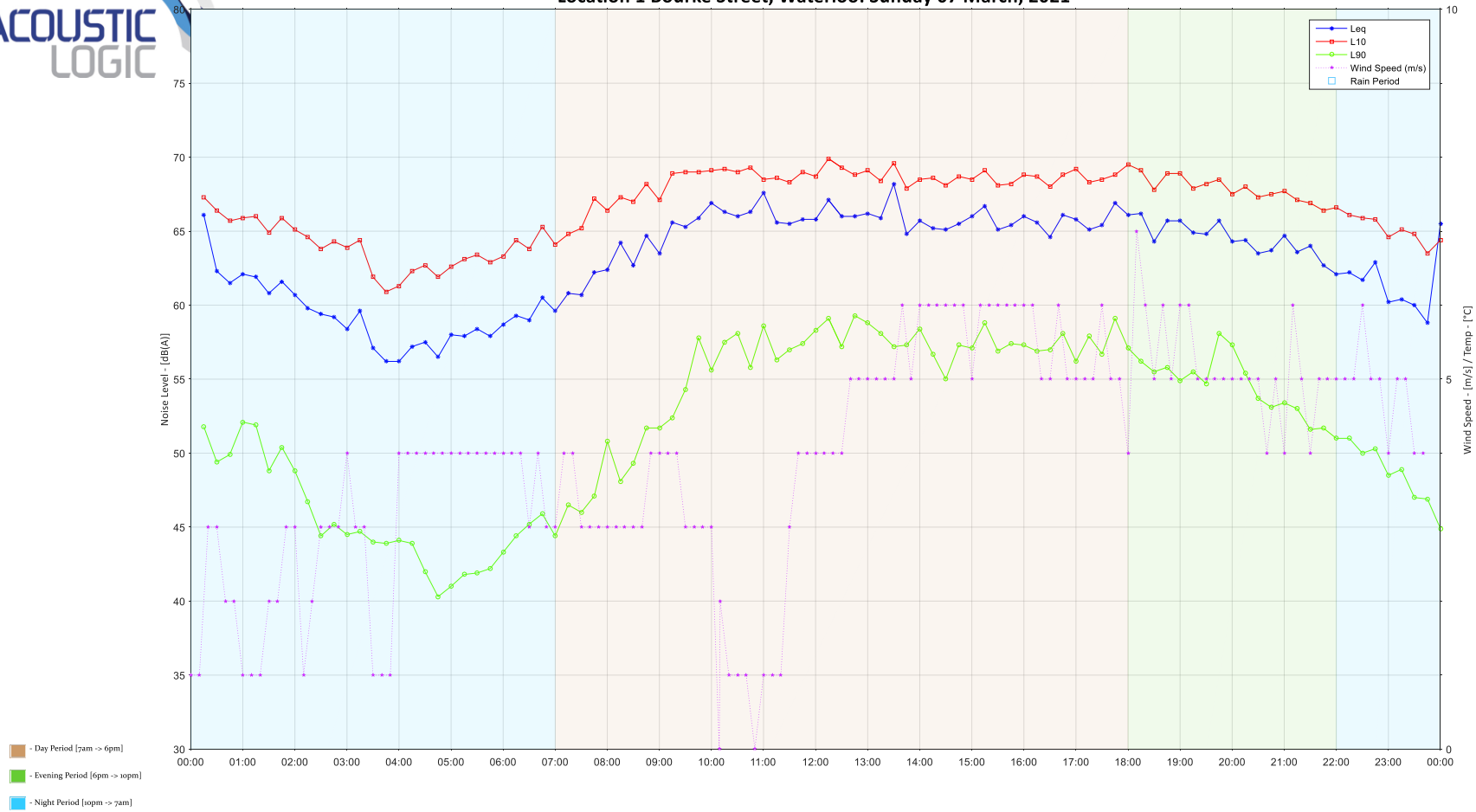
Location 1 Bourke Street, Waterloo: Friday 05 March, 2021



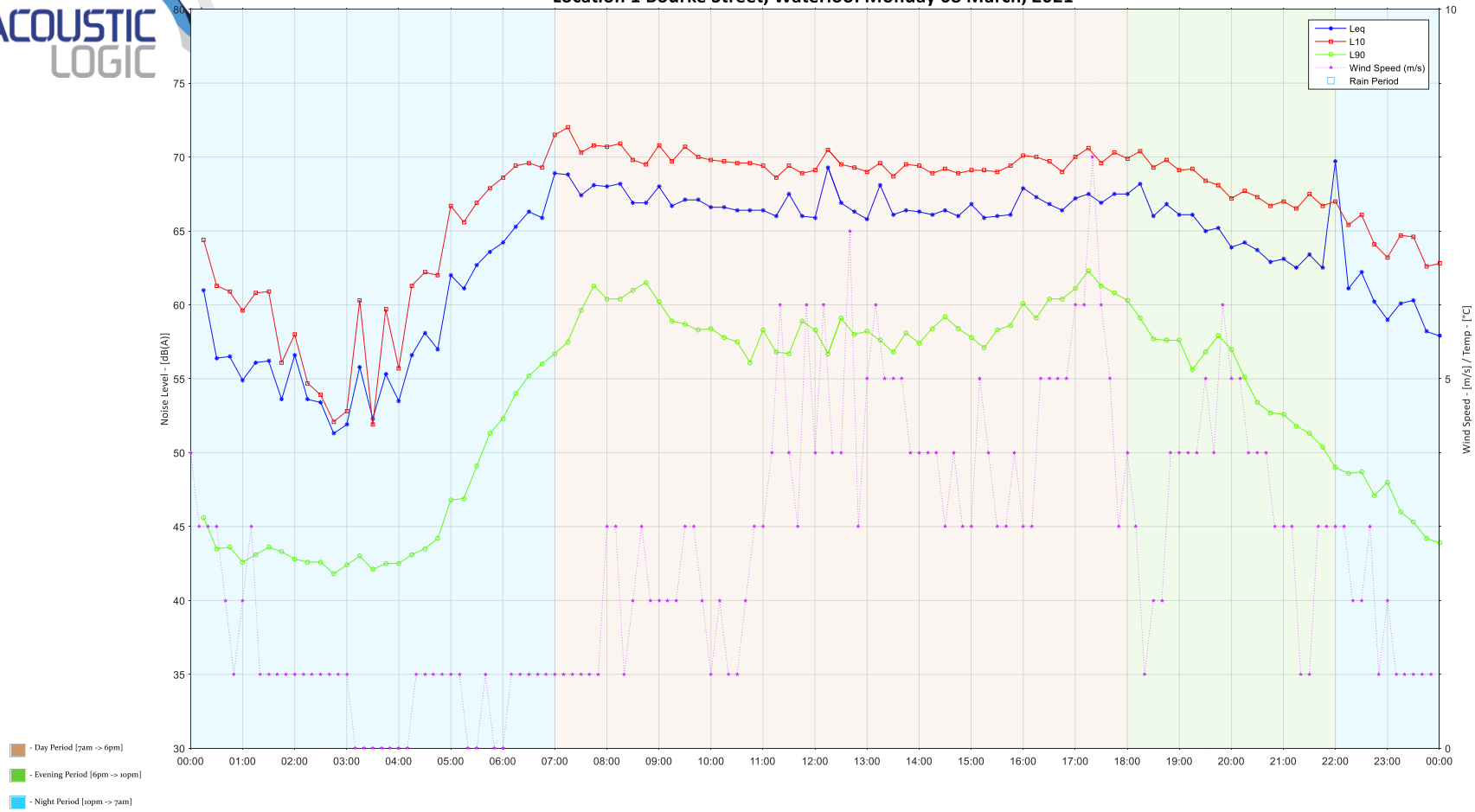
Location 1 Bourke Street, Waterloo: Saturday 06 March, 2021



Location 1 Bourke Street, Waterloo: Sunday 07 March, 2021



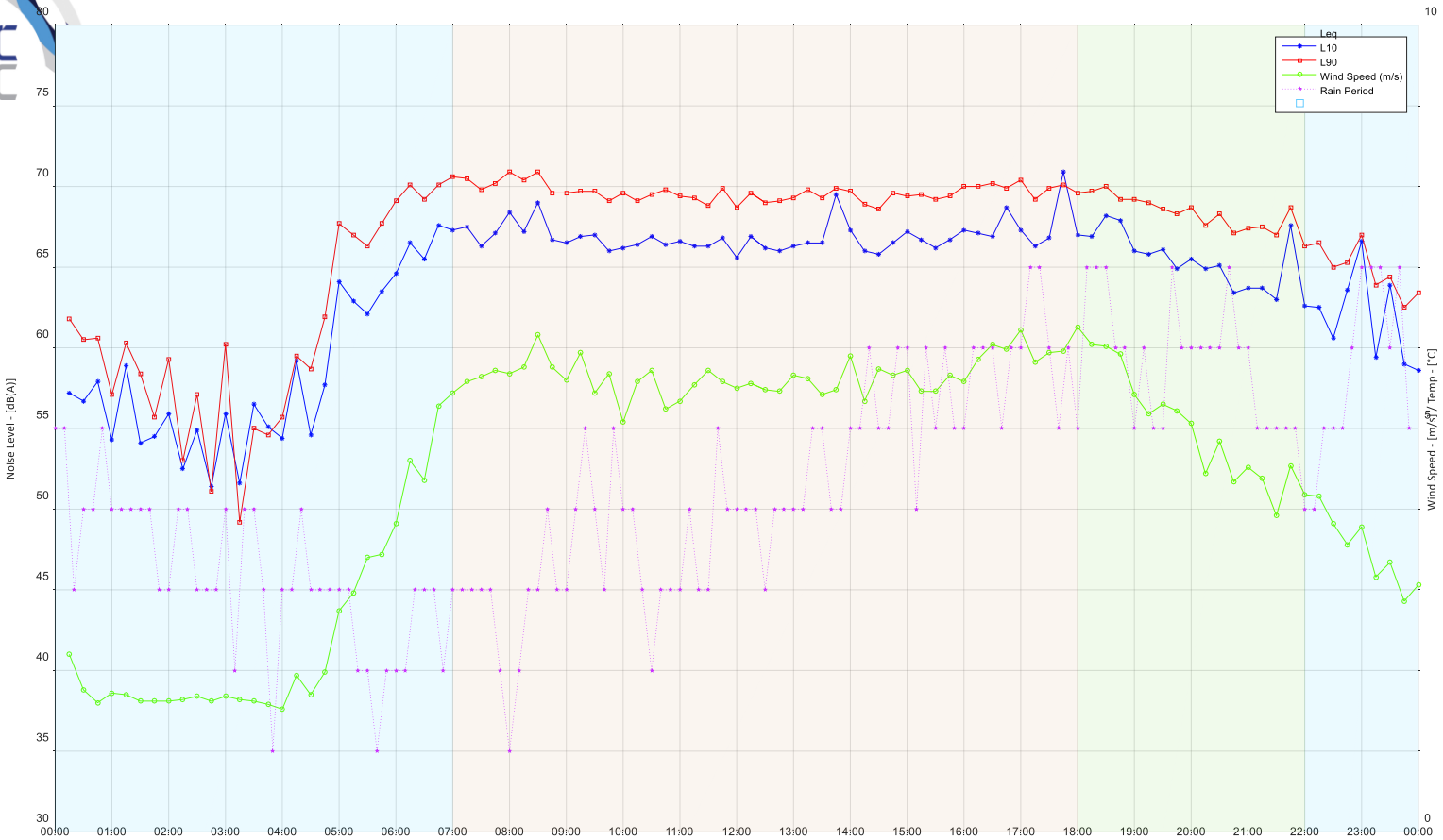
Location 1 Bourke Street, Waterloo: Monday 08 March, 2021



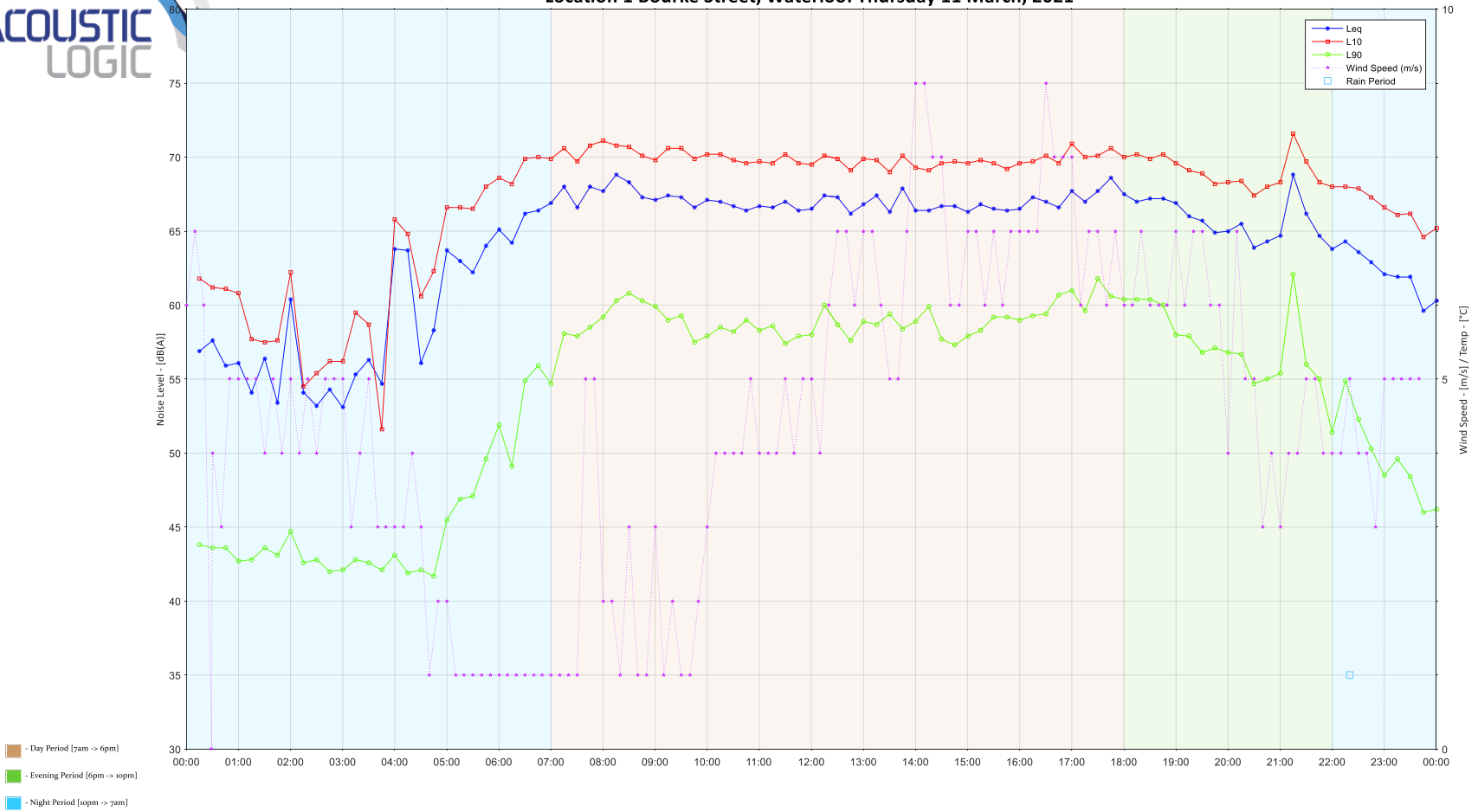
Location 1 Bourke Street, Waterloo: Tuesday 09 March, 2021



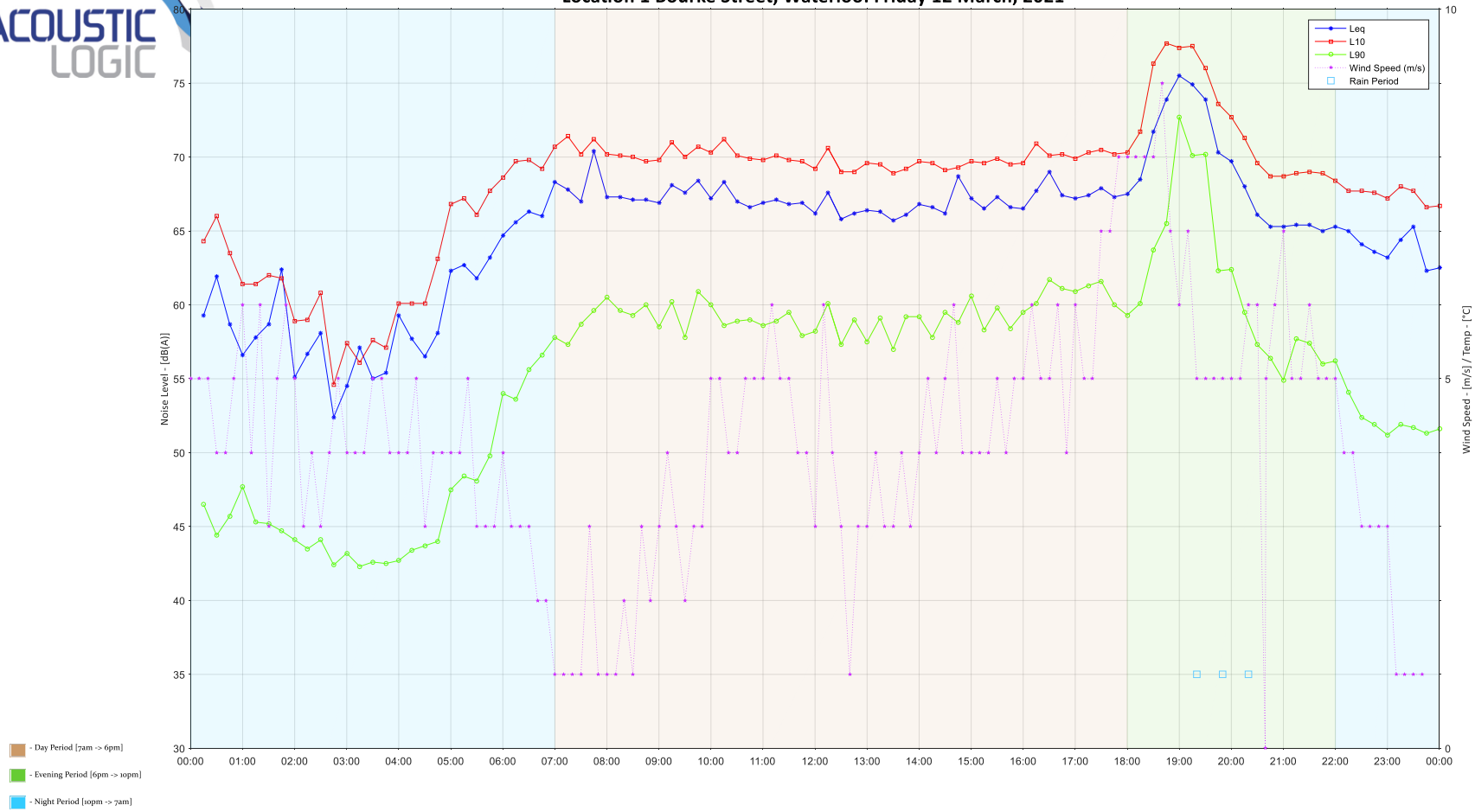
Location 1 Bourke Street, Waterloo: Wednesday 10 March, 2021



Location 1 Bourke Street, Waterloo: Thursday 11 March, 2021

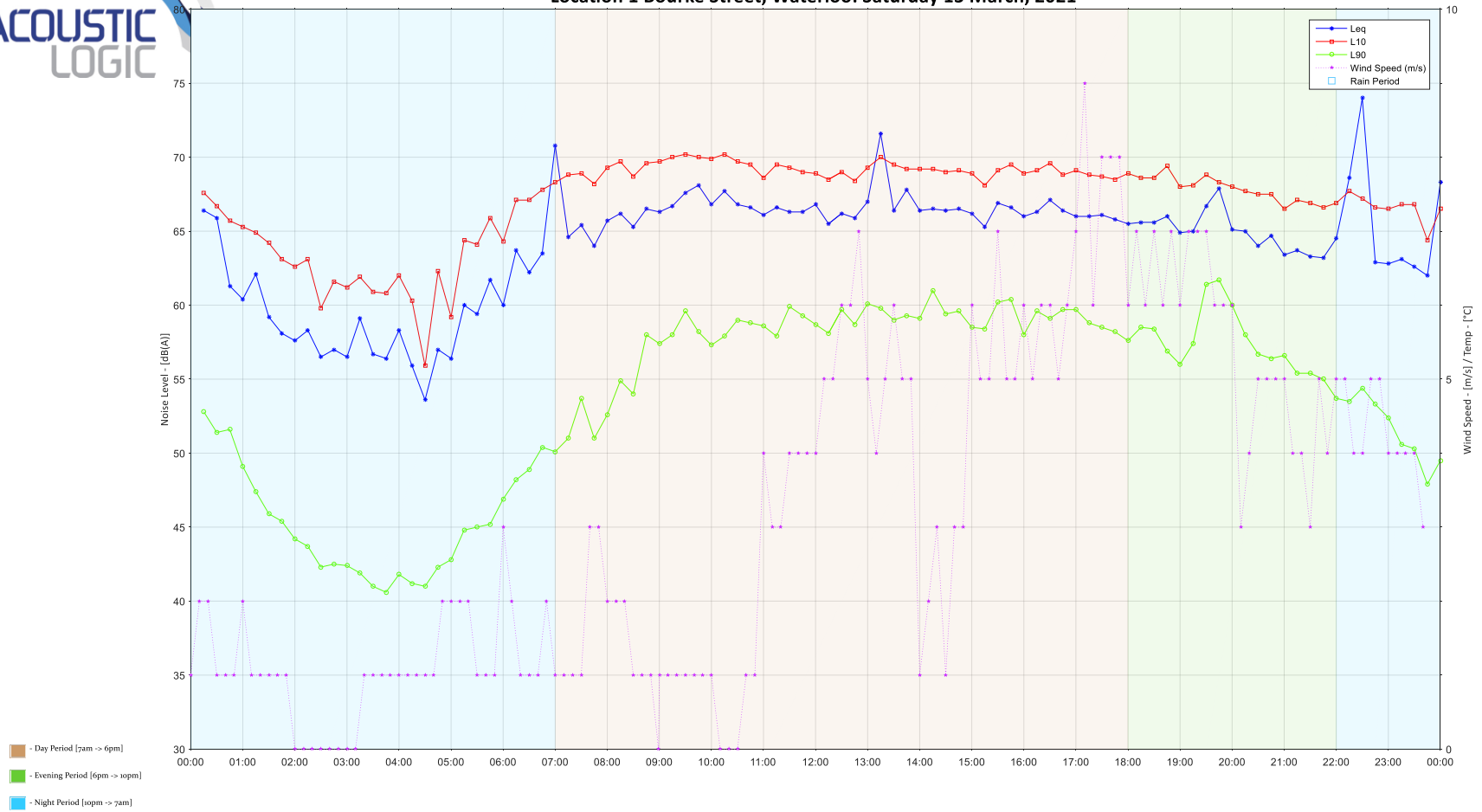


Location 1 Bourke Street, Waterloo: Friday 12 March, 2021

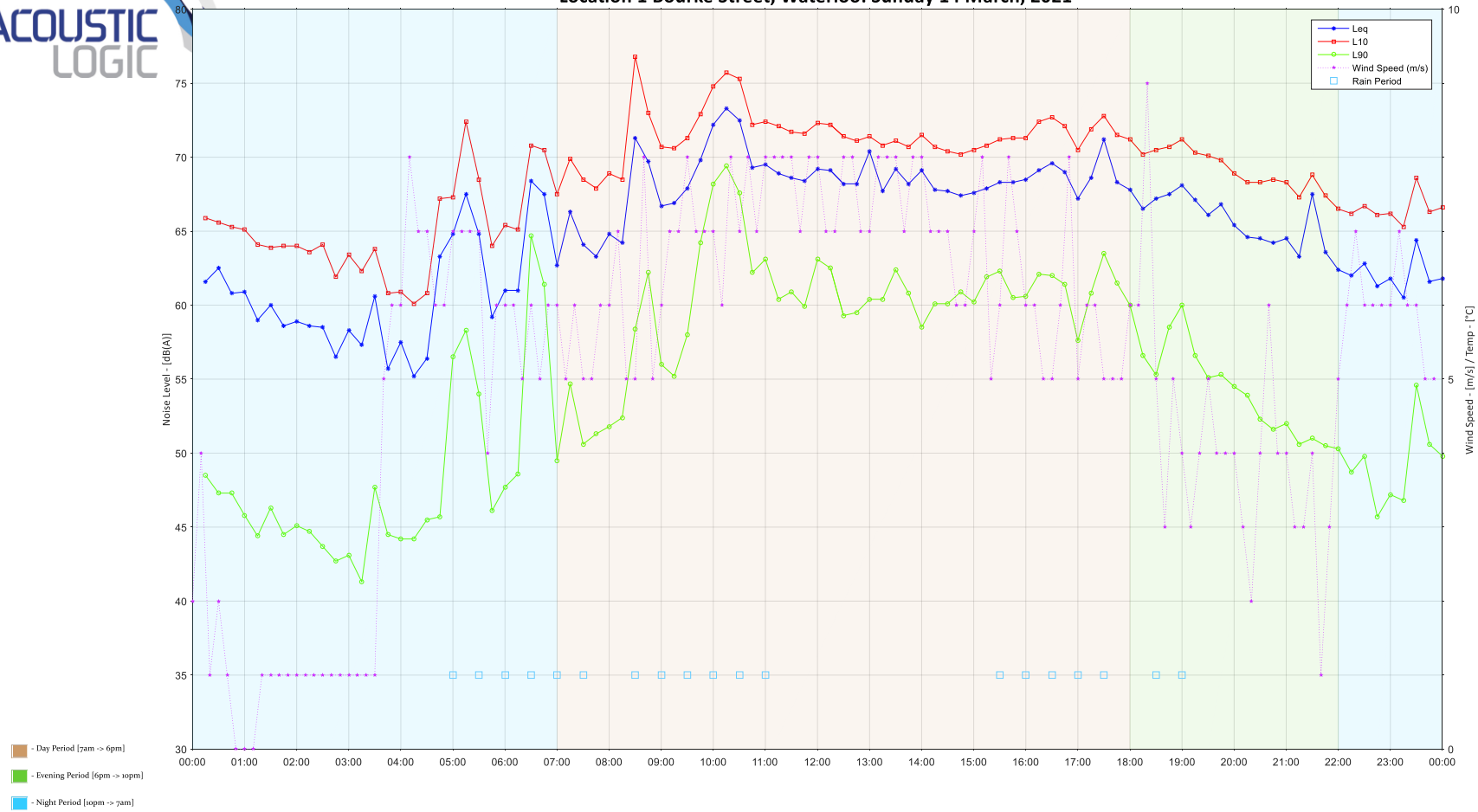




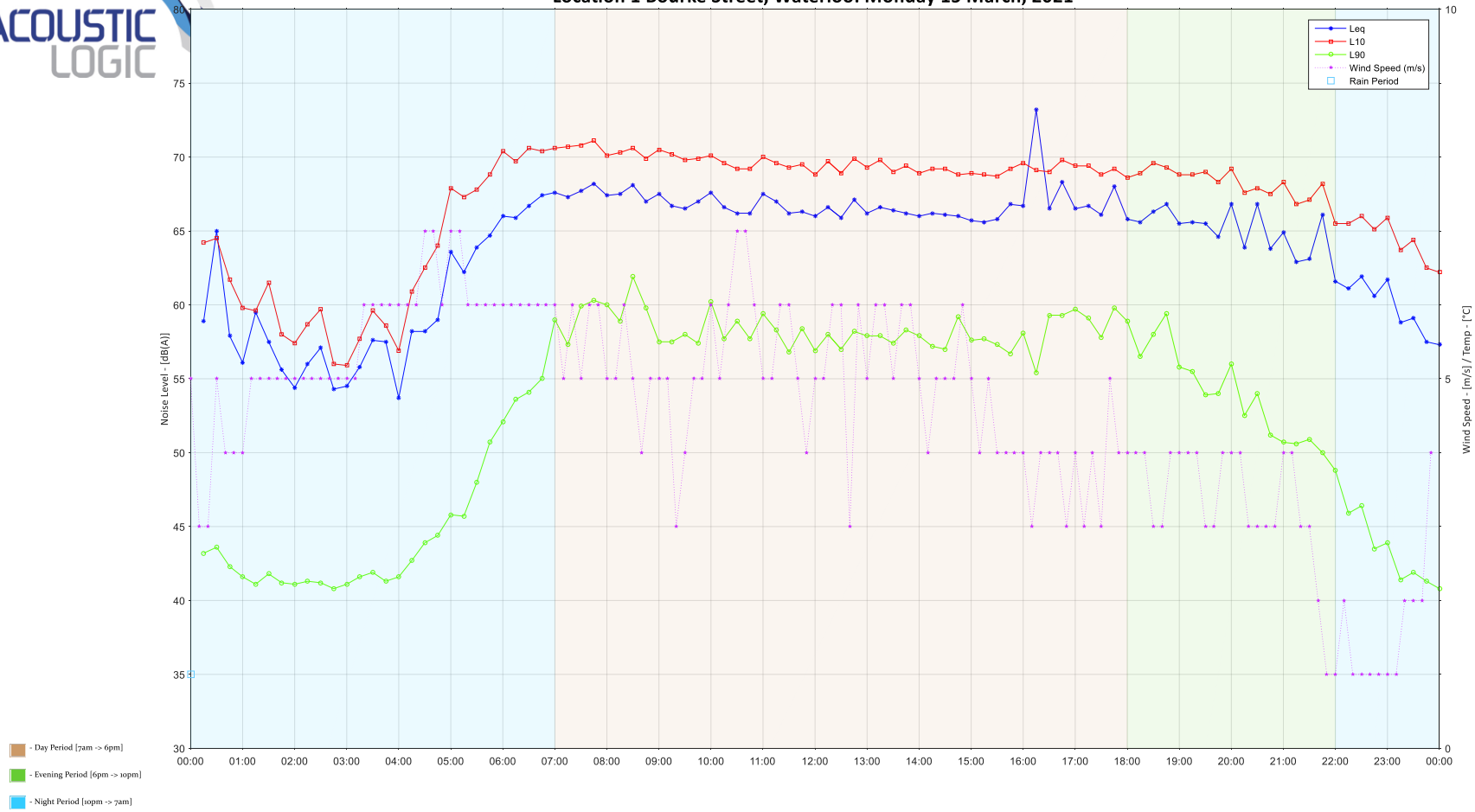
Location 1 Bourke Street, Waterloo: Saturday 13 March, 2021



Location 1 Bourke Street, Waterloo: Sunday 14 March, 2021



Location 1 Bourke Street, Waterloo: Monday 15 March, 2021

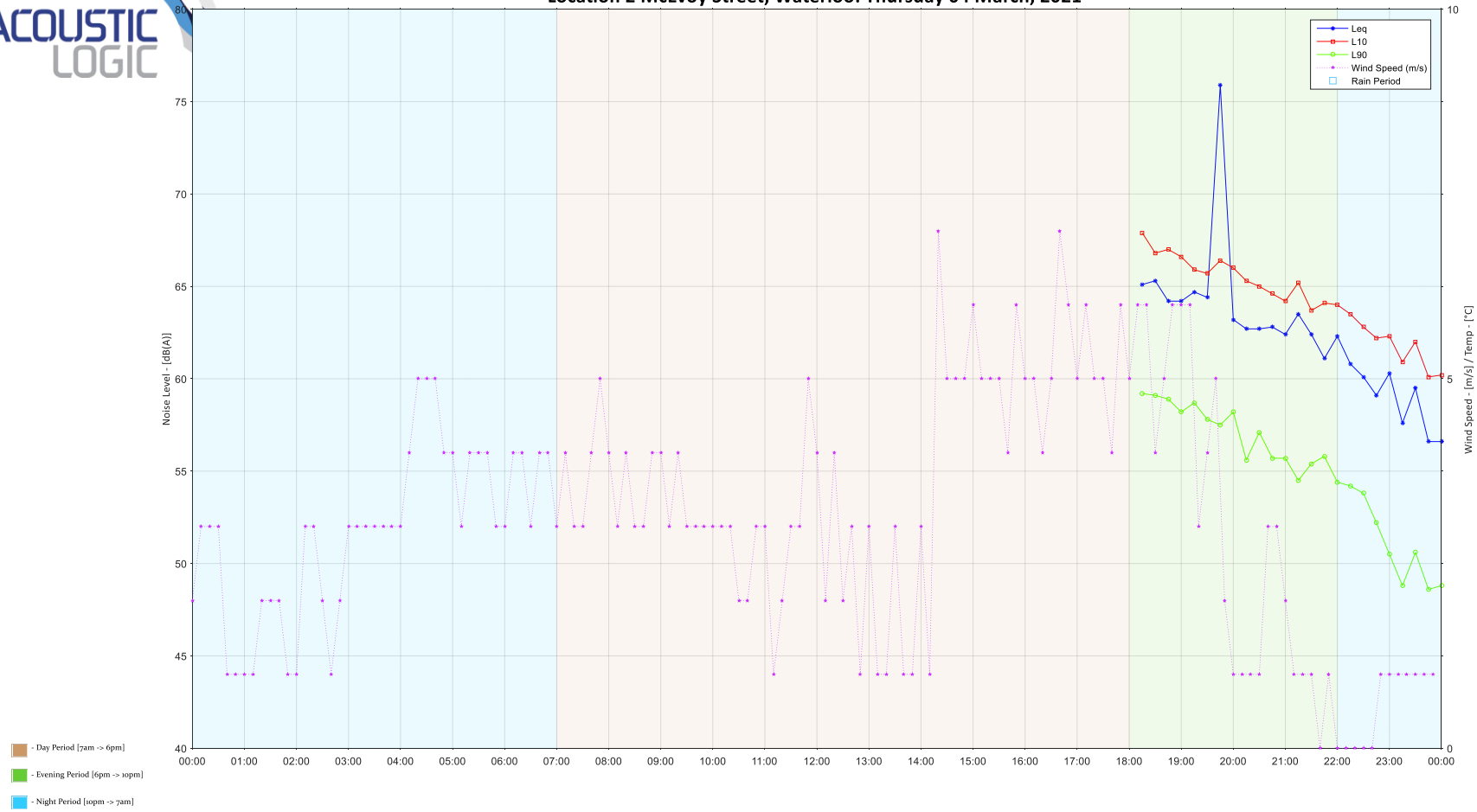


Location 1 Bourke Street, Waterloo: Tuesday 16 March, 2021

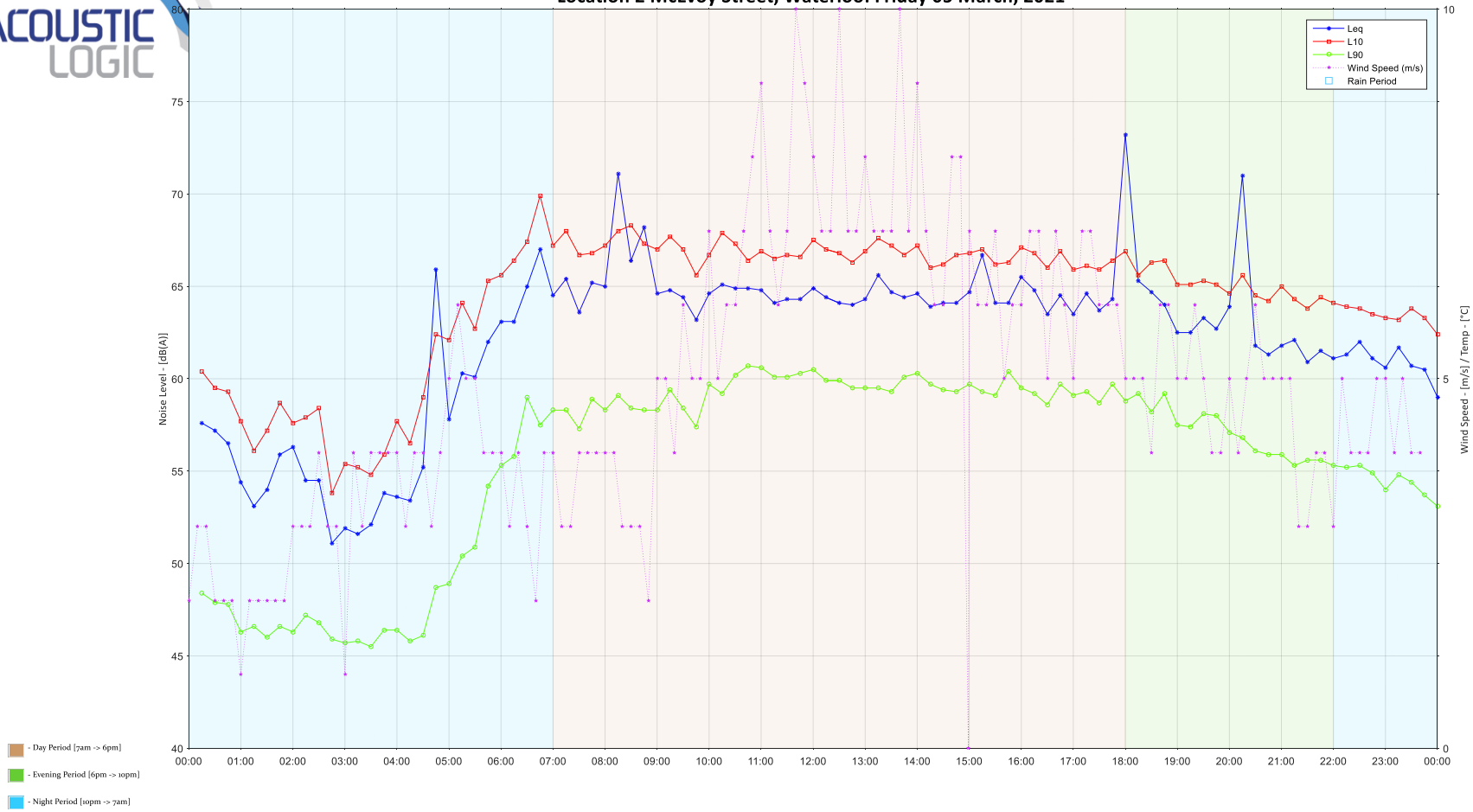




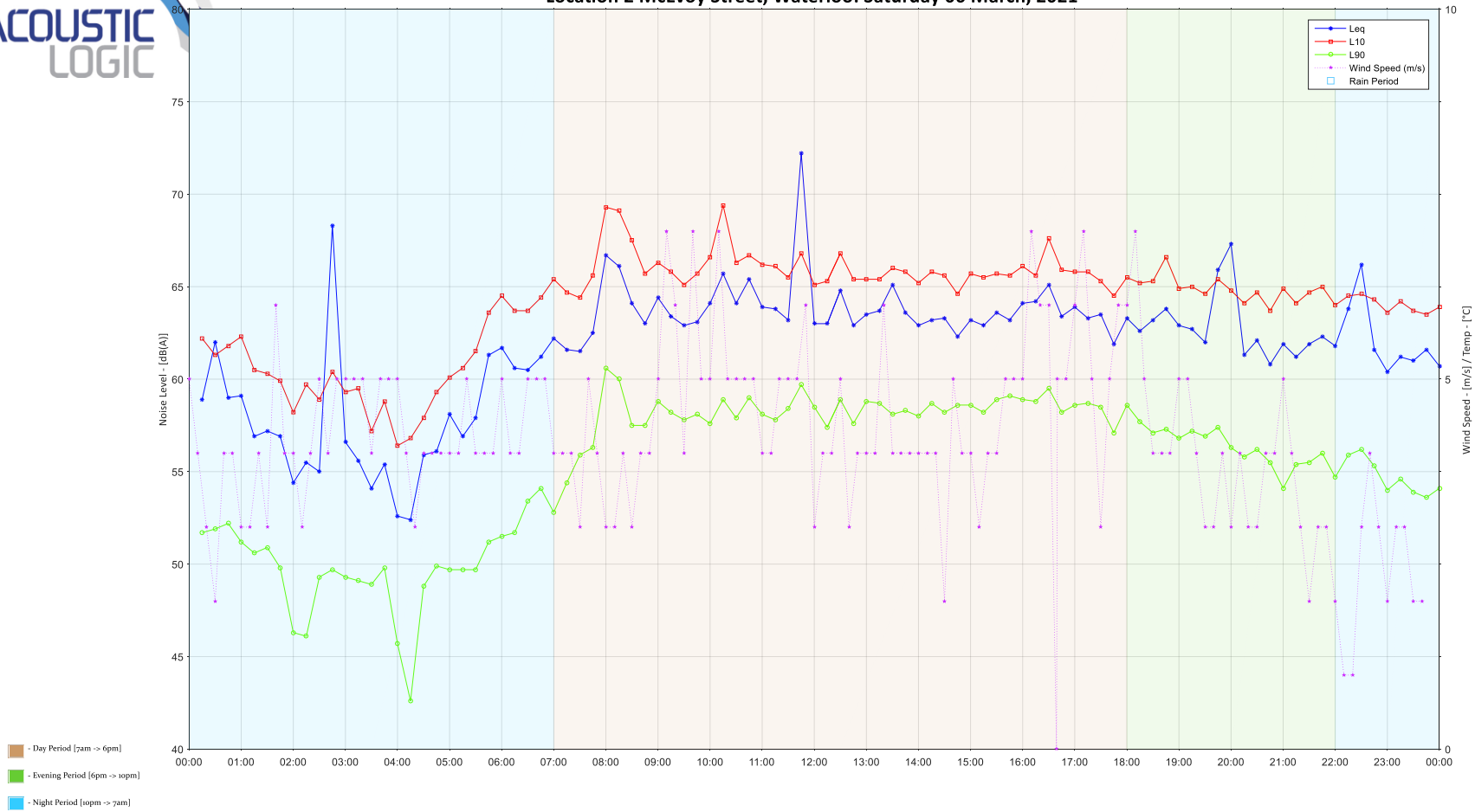
Location 2 McEvoy Street, Waterloo: Thursday 04 March, 2021



Location 2 McEvoy Street, Waterloo: Friday 05 March, 2021



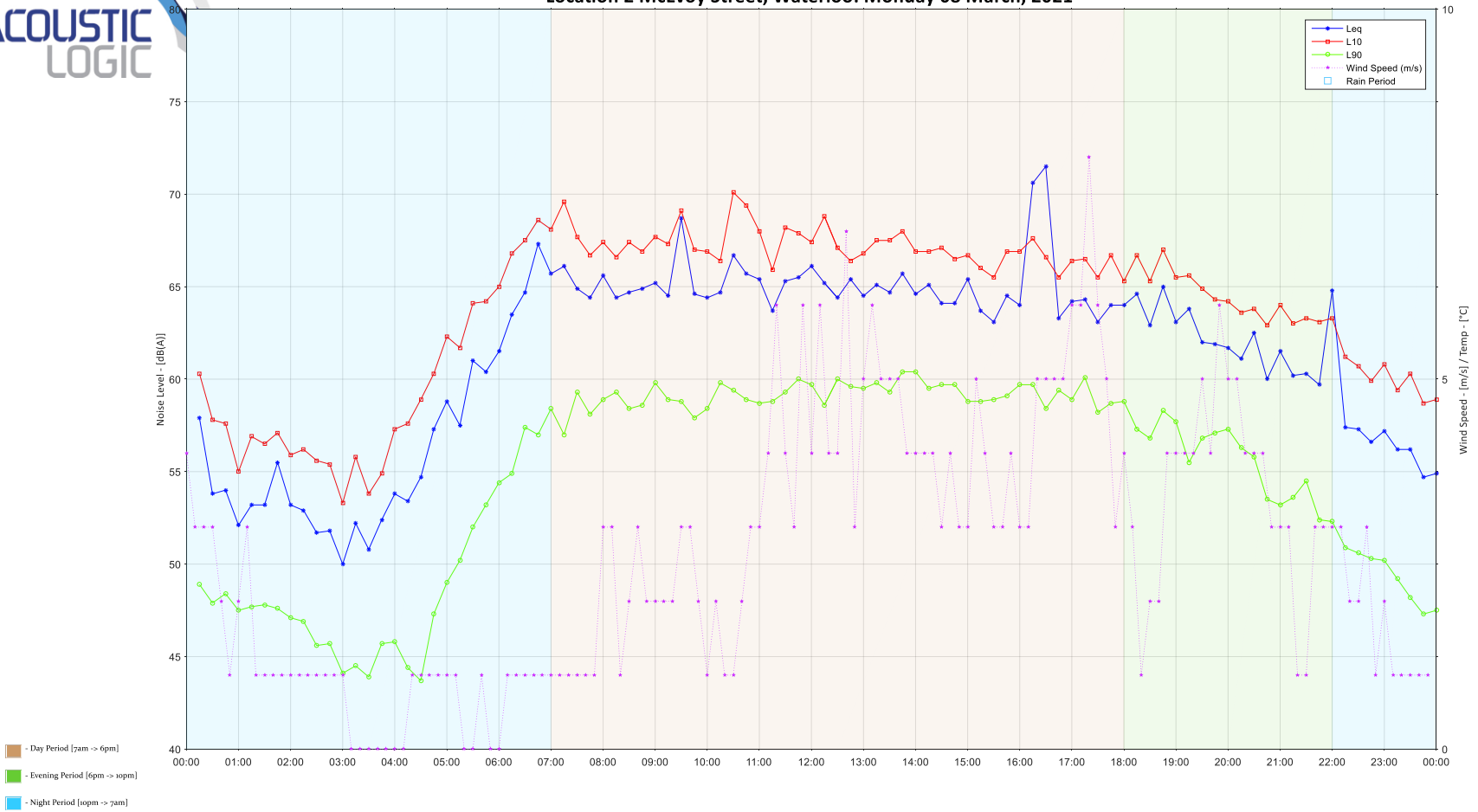
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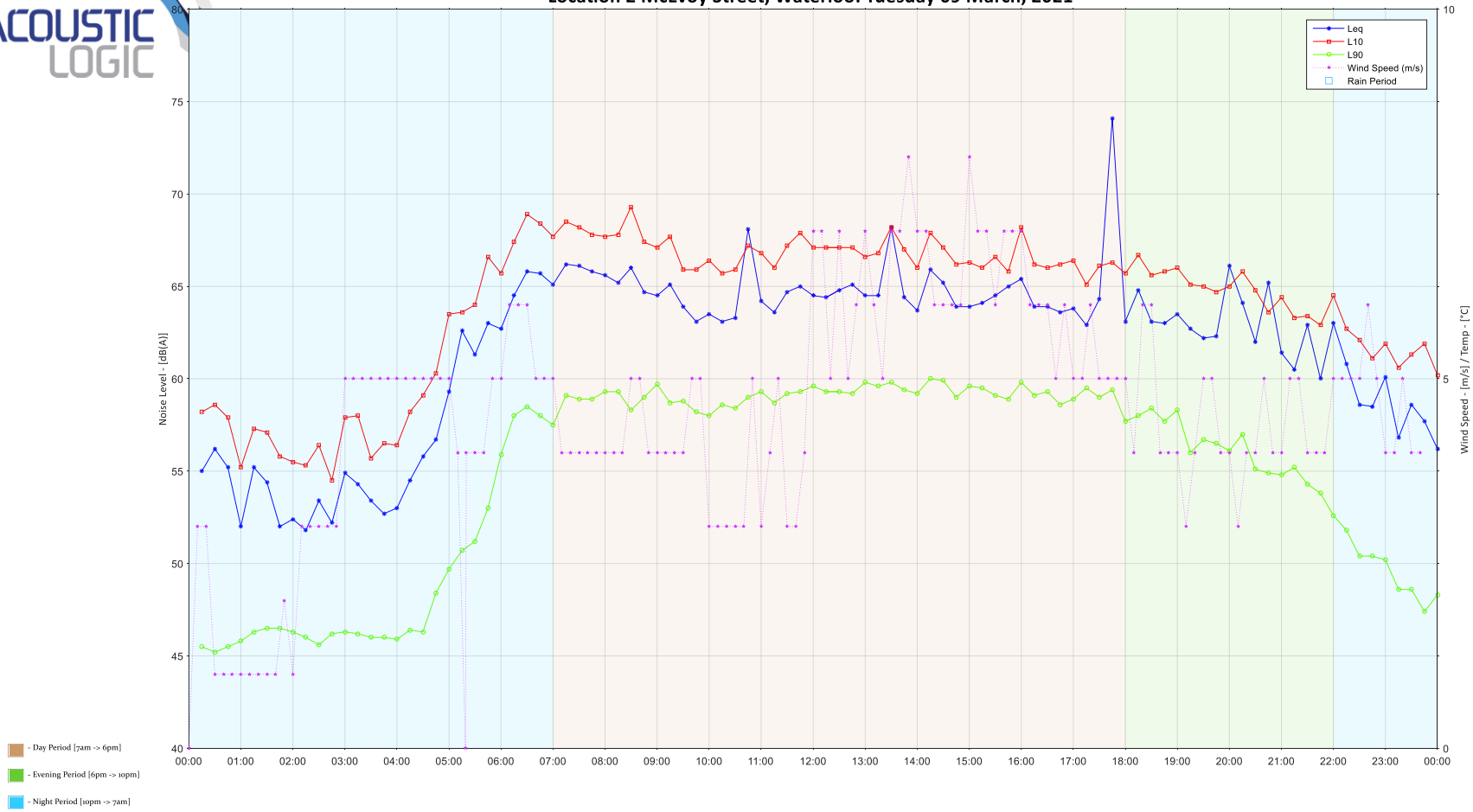
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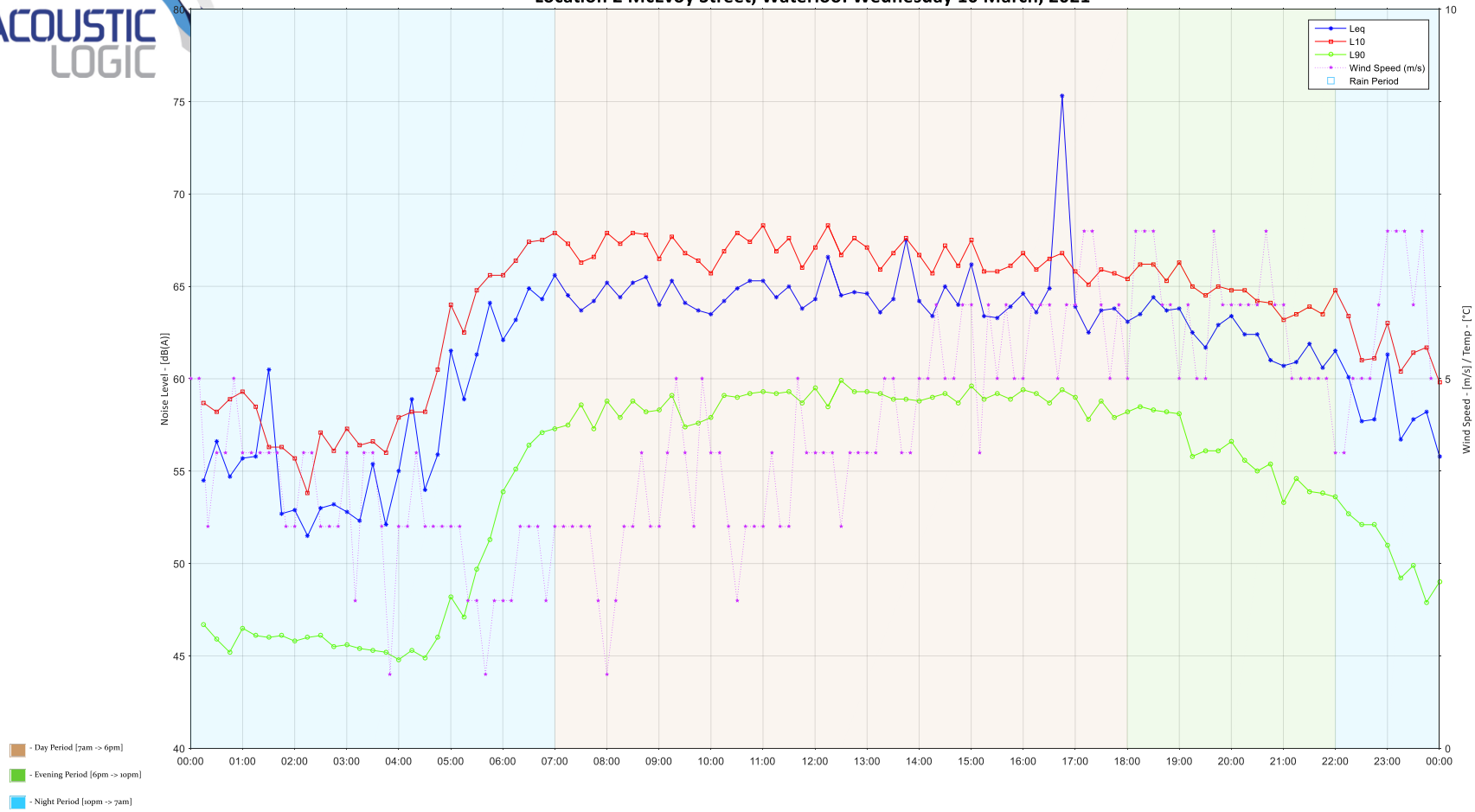
Location 2 McEvoy Street, Waterloo: Monday 08 March, 2021



Location 2 McEvoy Street, Waterloo: Tuesday 09 March, 2021



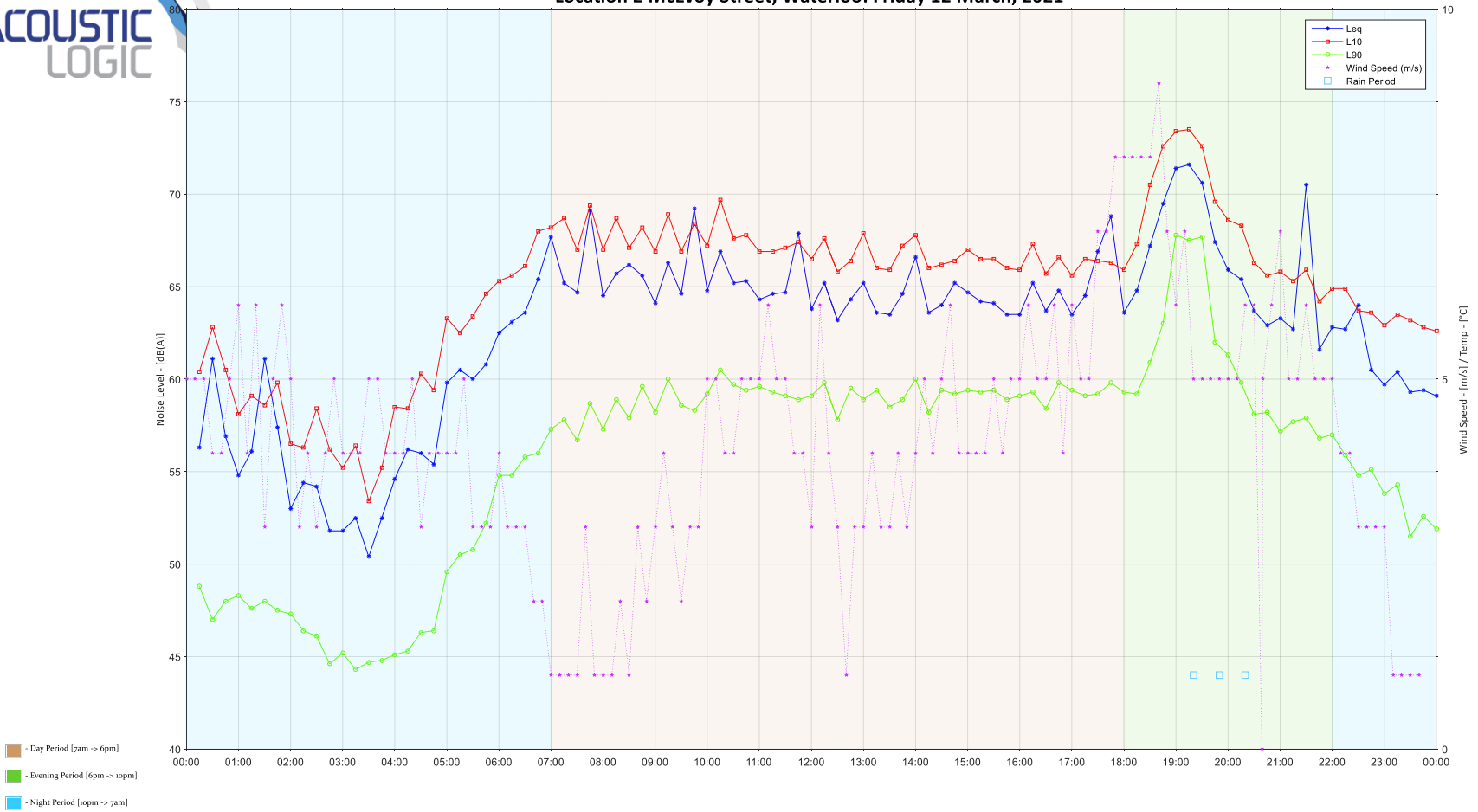
Location 2 McEvoy Street, Waterloo: Wednesday 10 March, 2021



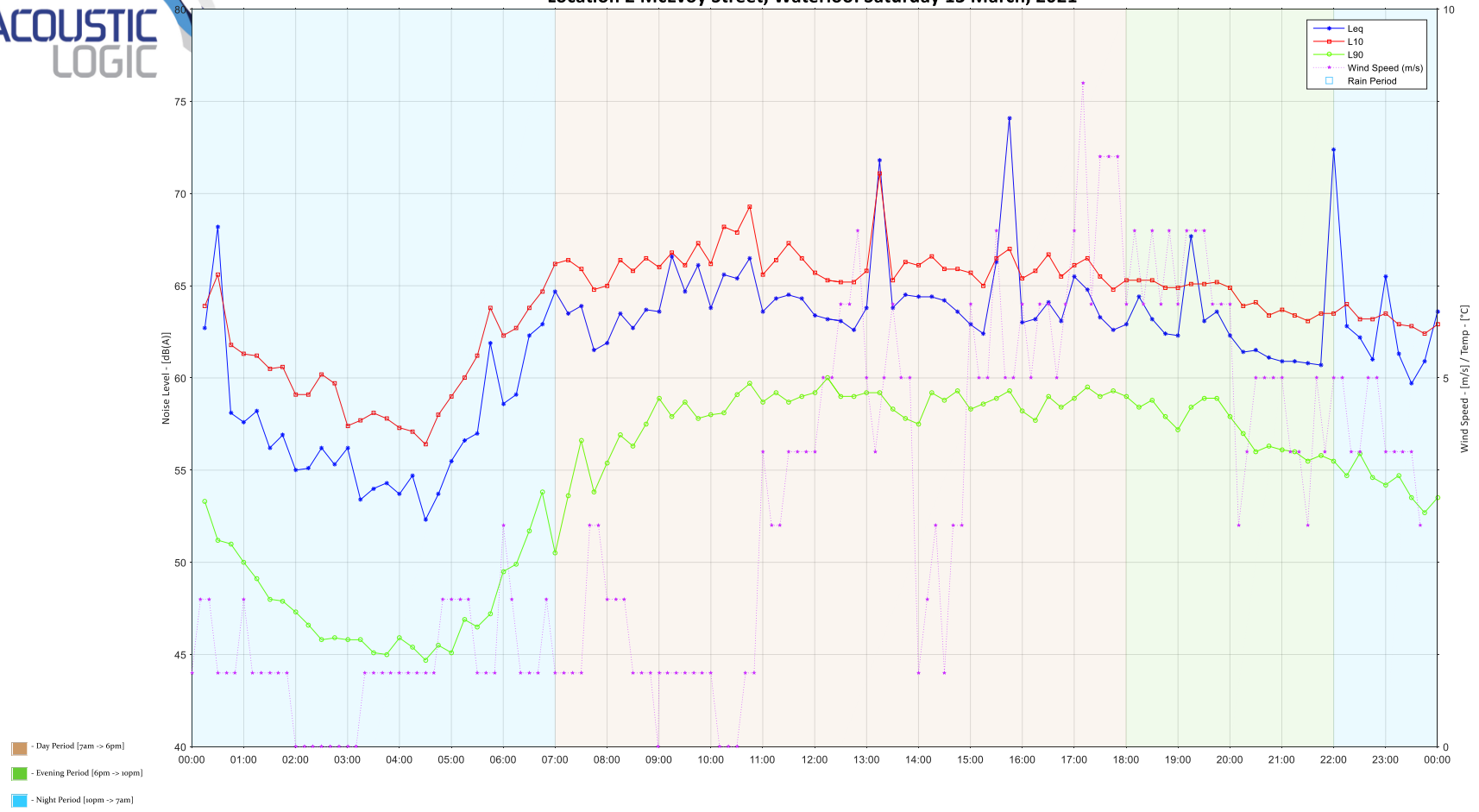
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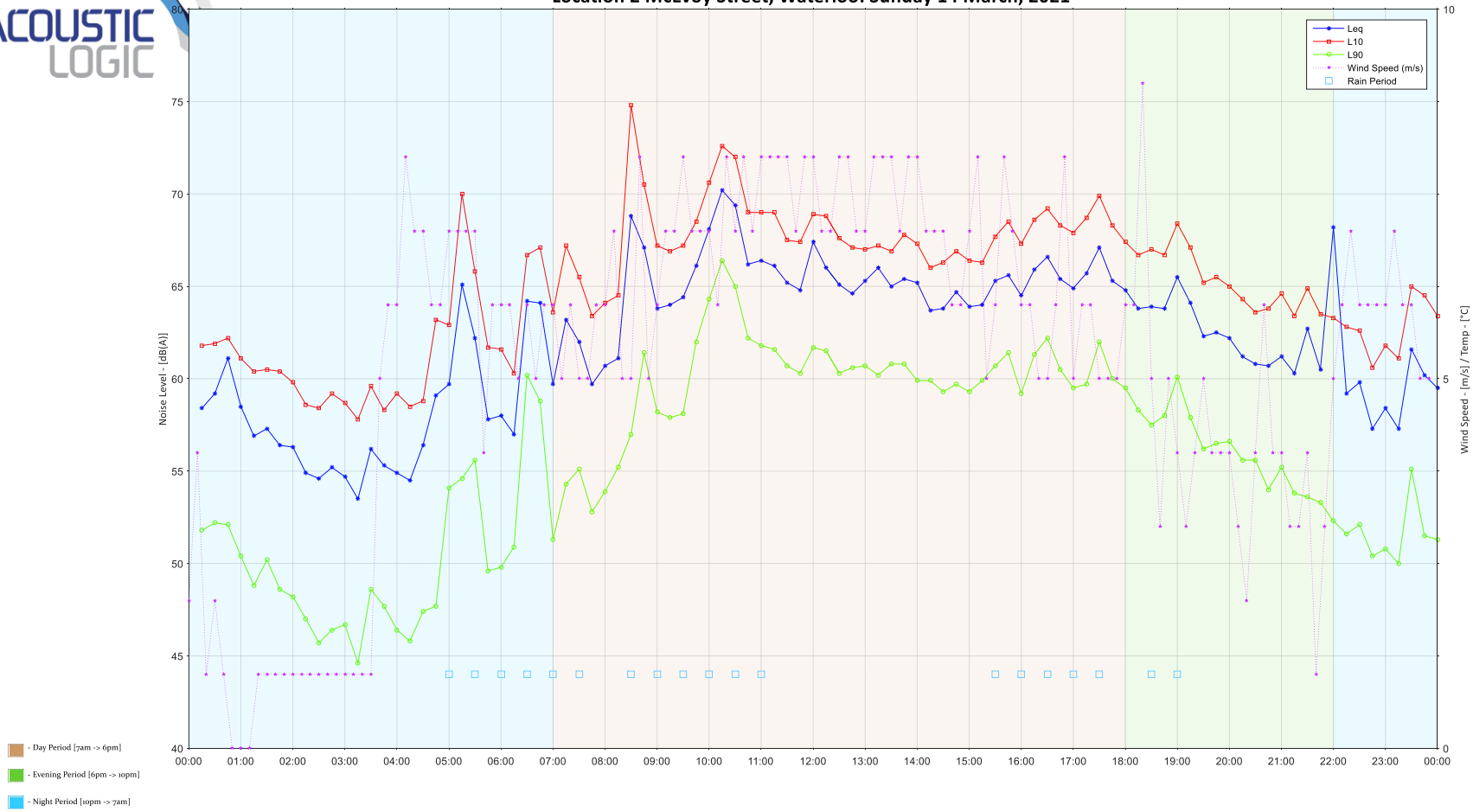
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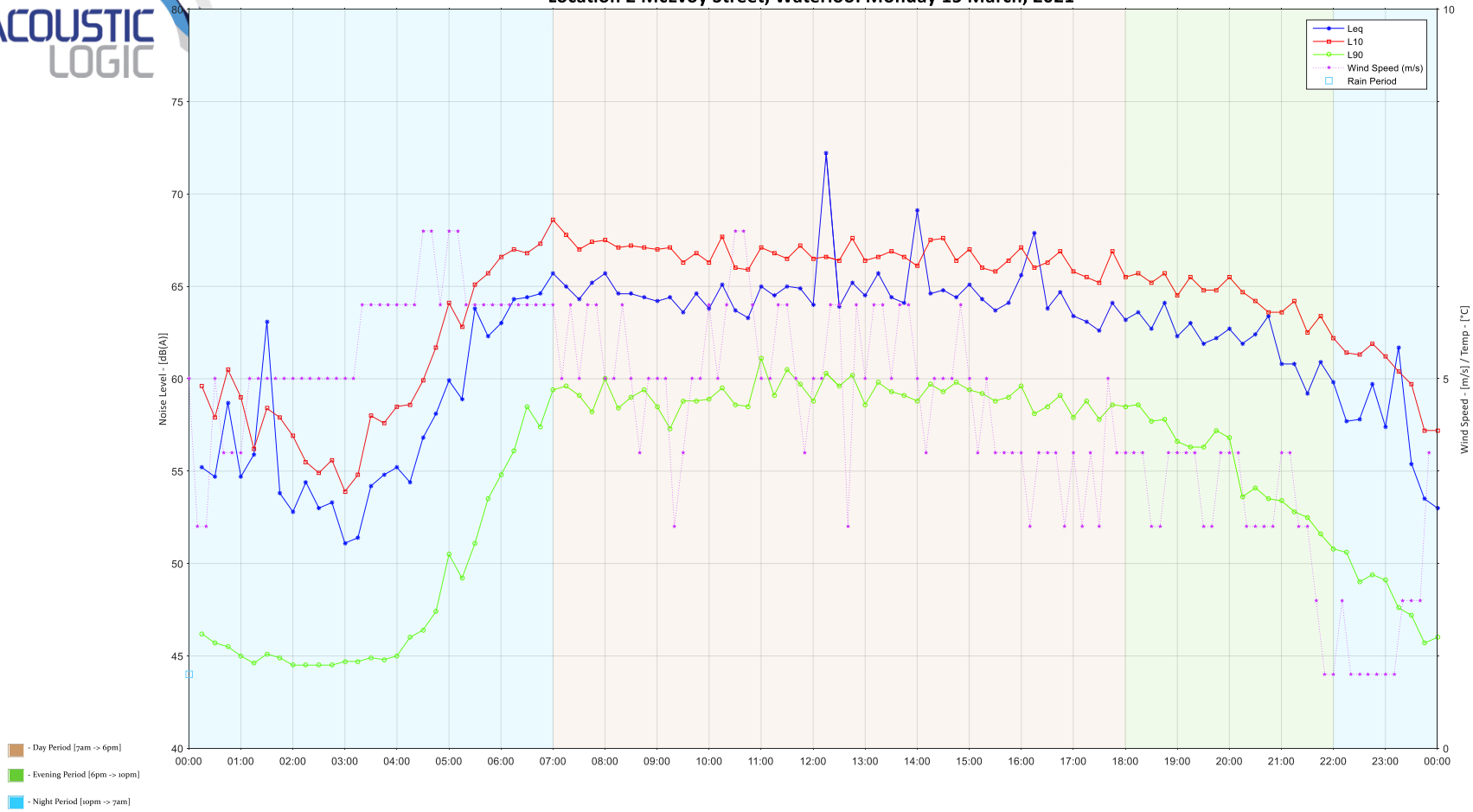
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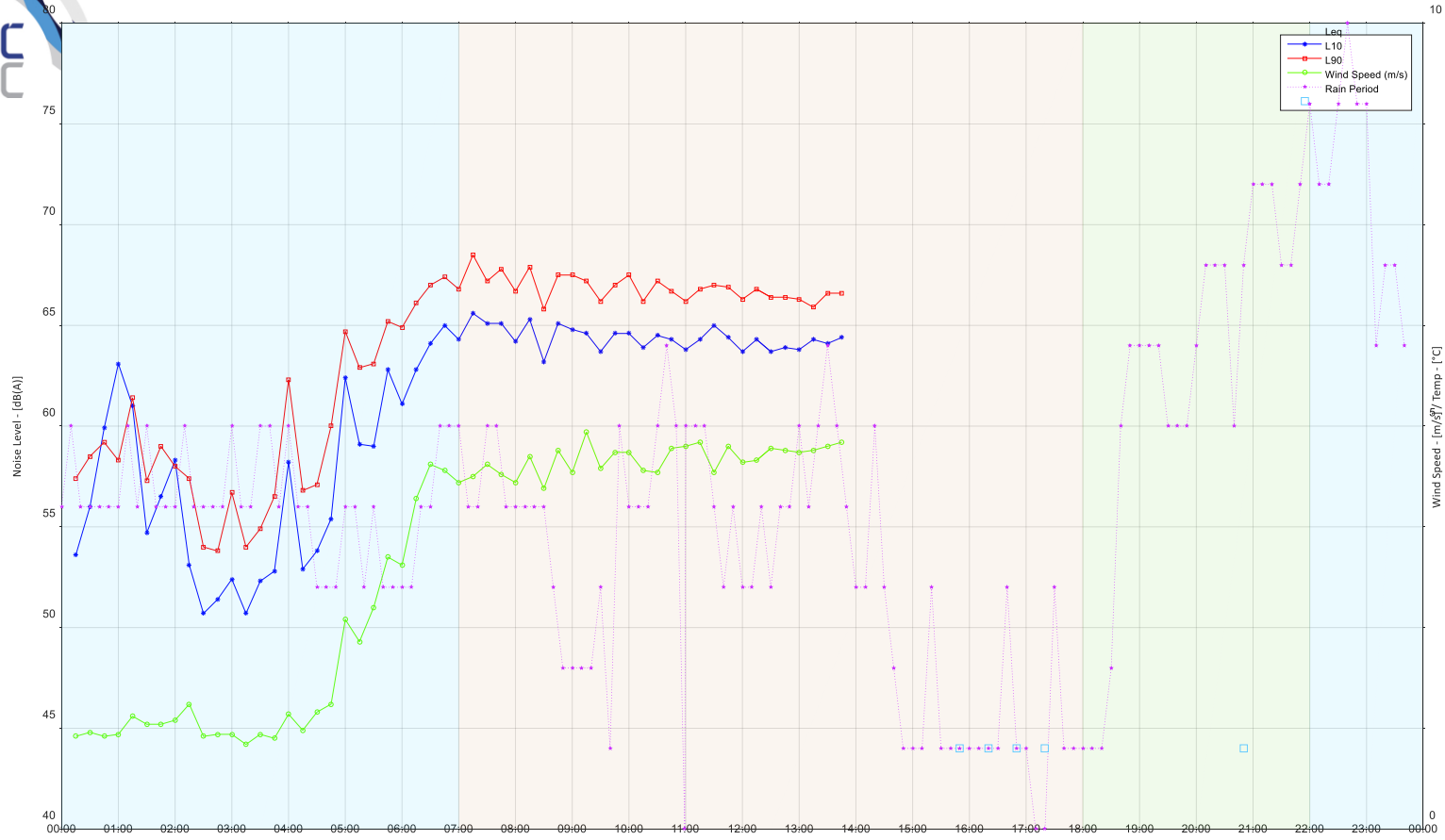
Location 2 McEvoy Street, Waterloo: Sunday 14 March, 2021



Location 2 McEvoy Street, Waterloo: Monday 15 March, 2021

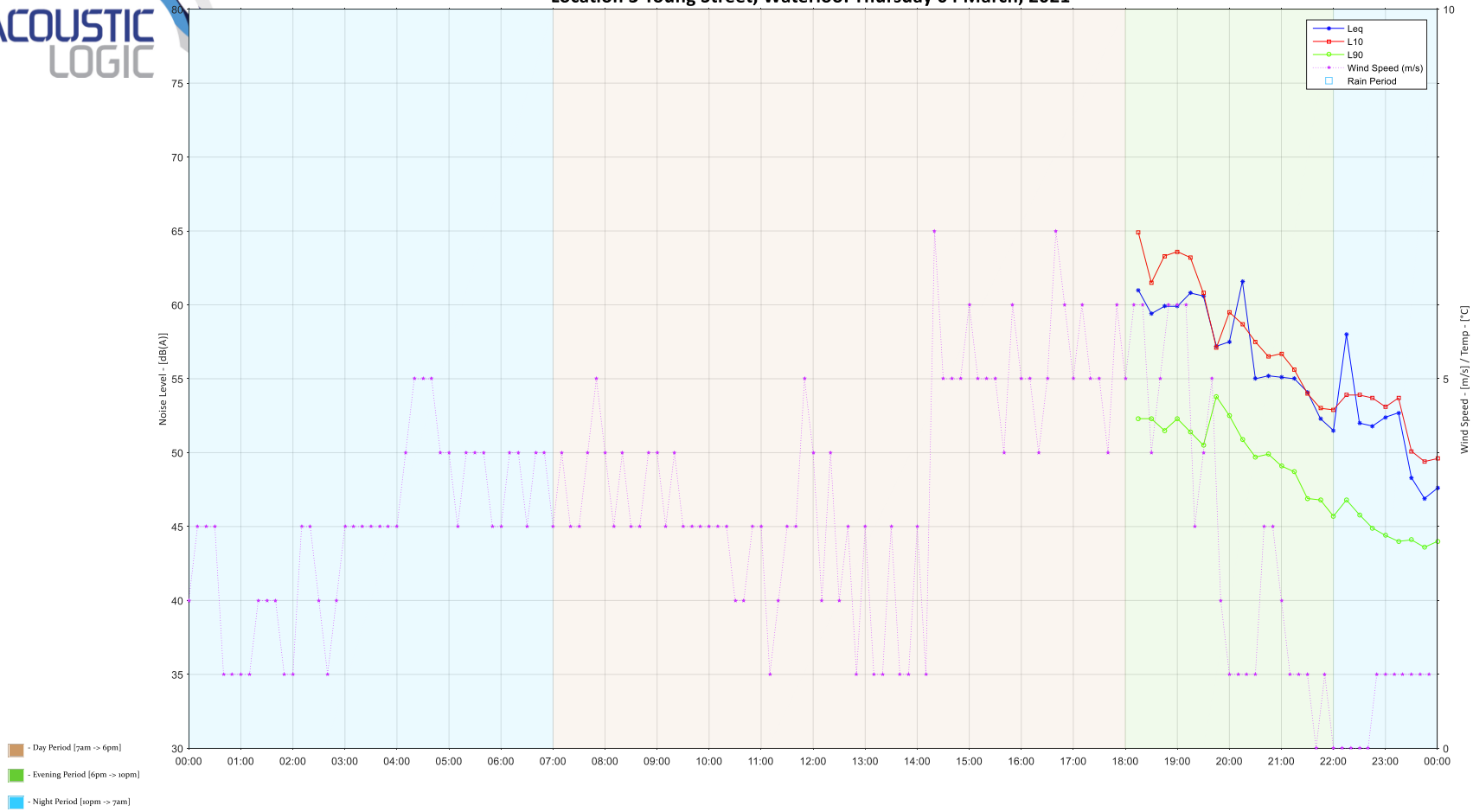


Location 2 McEvoy Street, Waterloo: Tuesday 16 March, 2021





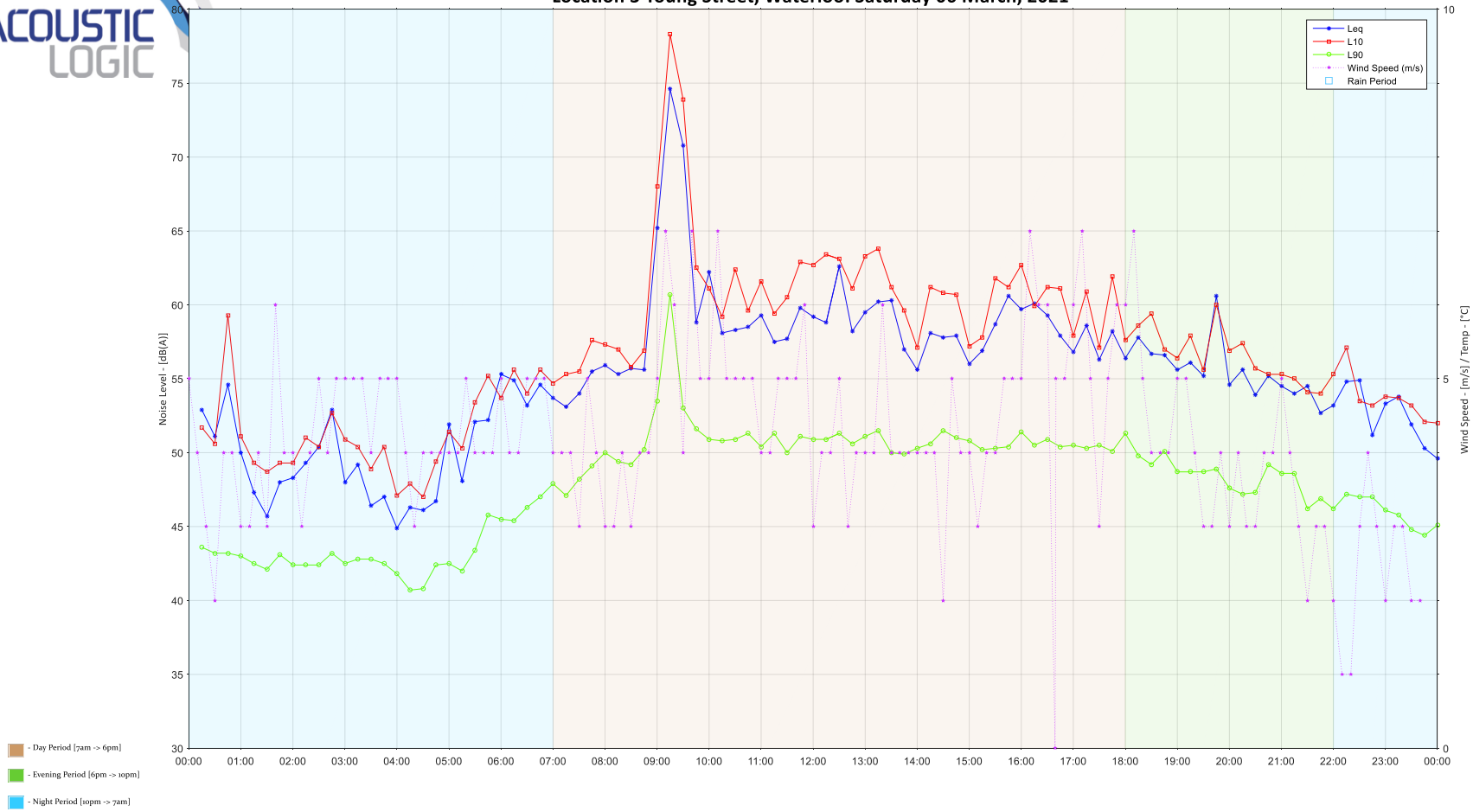
Location 3 Young Street, Waterloo: Thursday 04 March, 2021



Location 3 Young Street, Waterloo: Friday 05 March, 2021



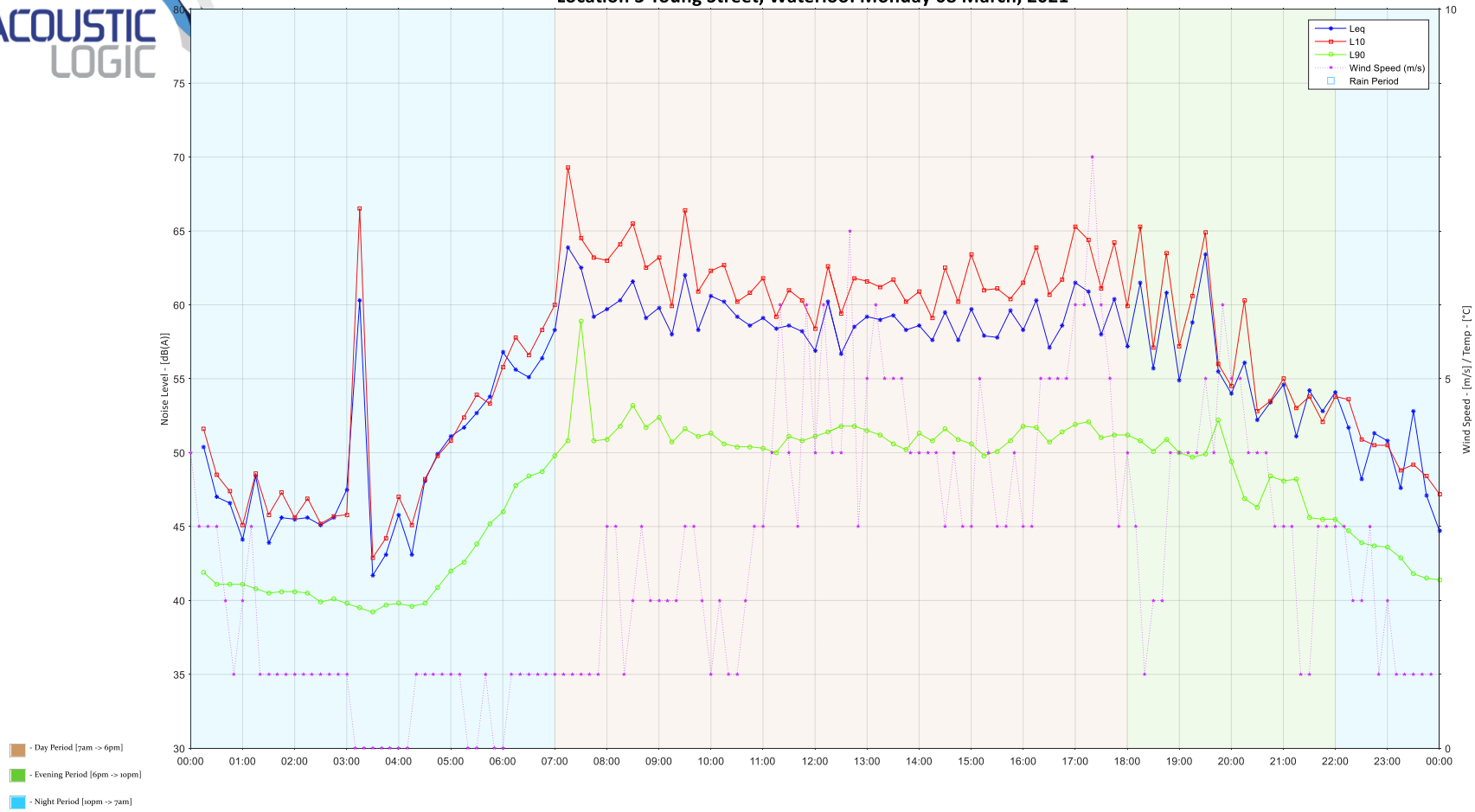
Location 3 Young Street, Waterloo: Saturday 06 March, 2021



Location 3 Young Street, Waterloo: Sunday 07 March, 2021



Location 3 Young Street, Waterloo: Monday 08 March, 2021

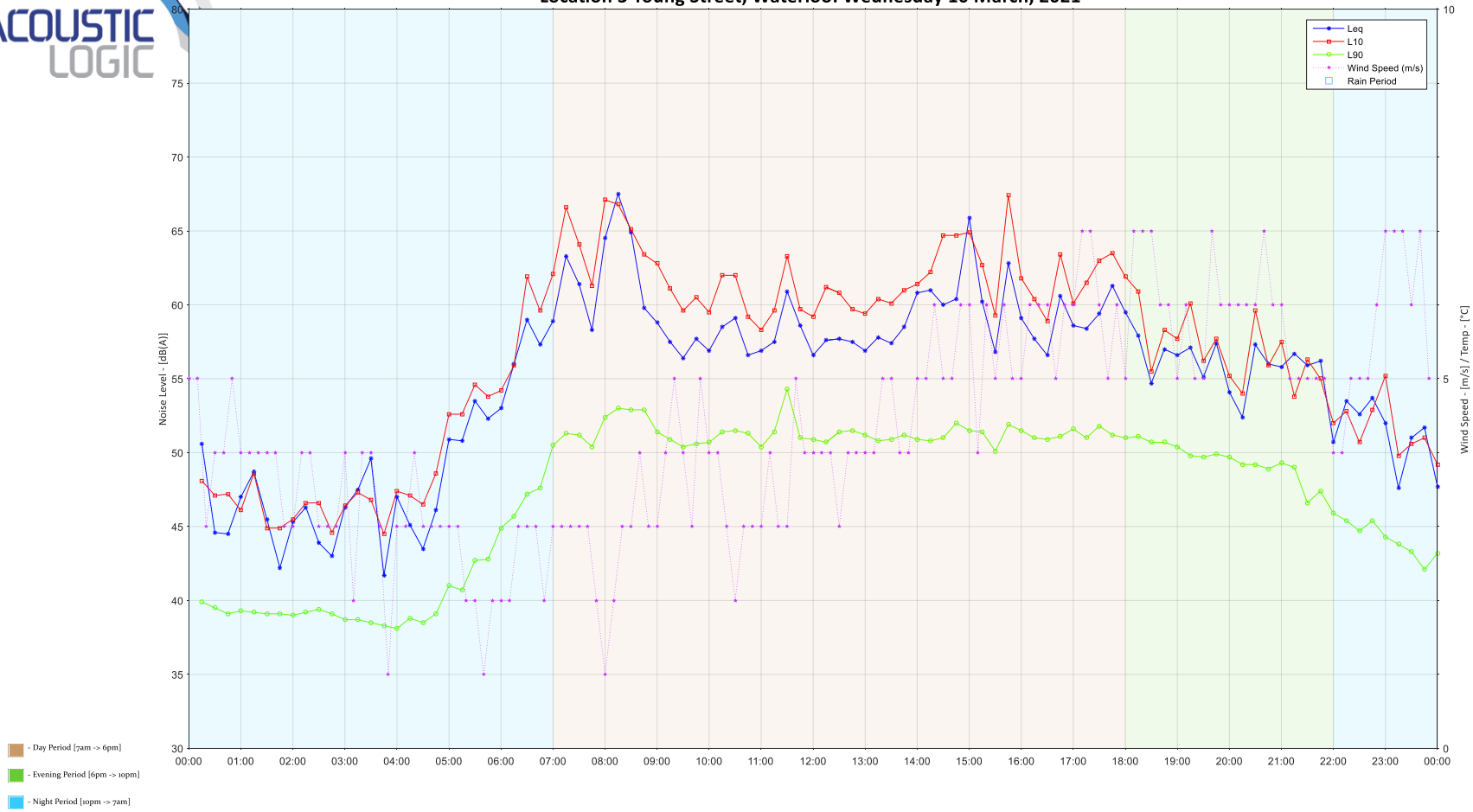


Location 3 Young Street, Waterloo: Tuesday 09 March, 2021

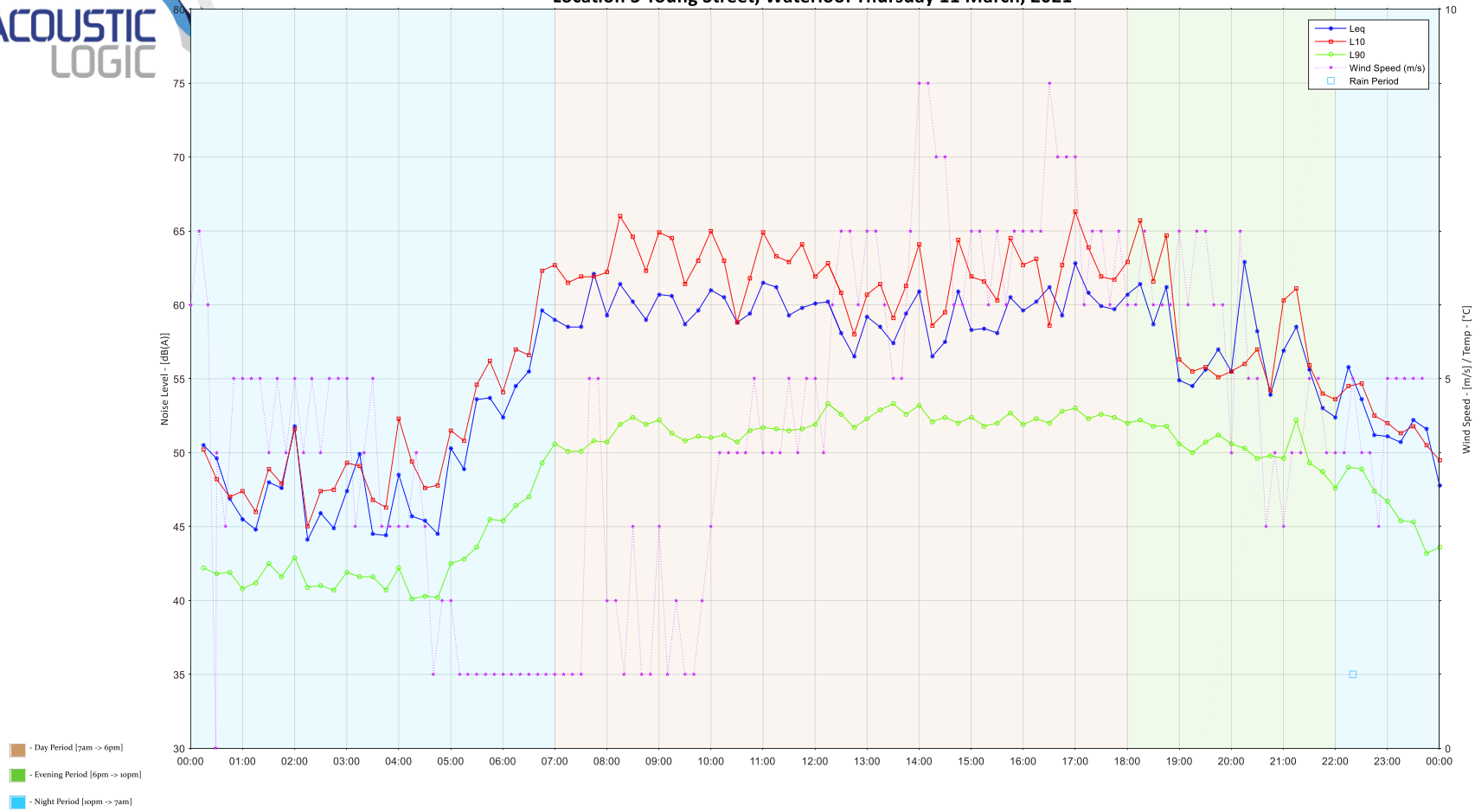




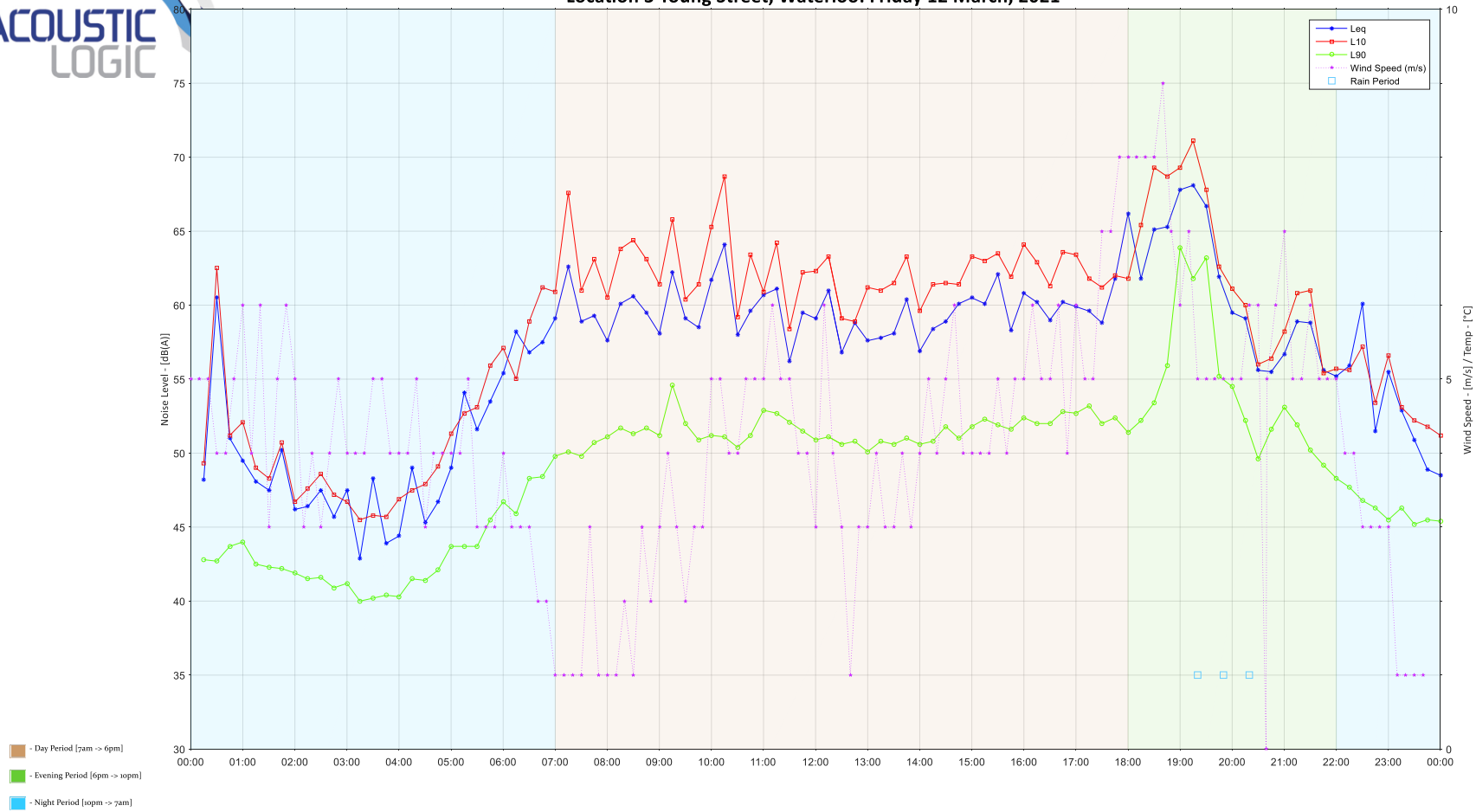
Location 3 Young Street, Waterloo: Wednesday 10 March, 2021



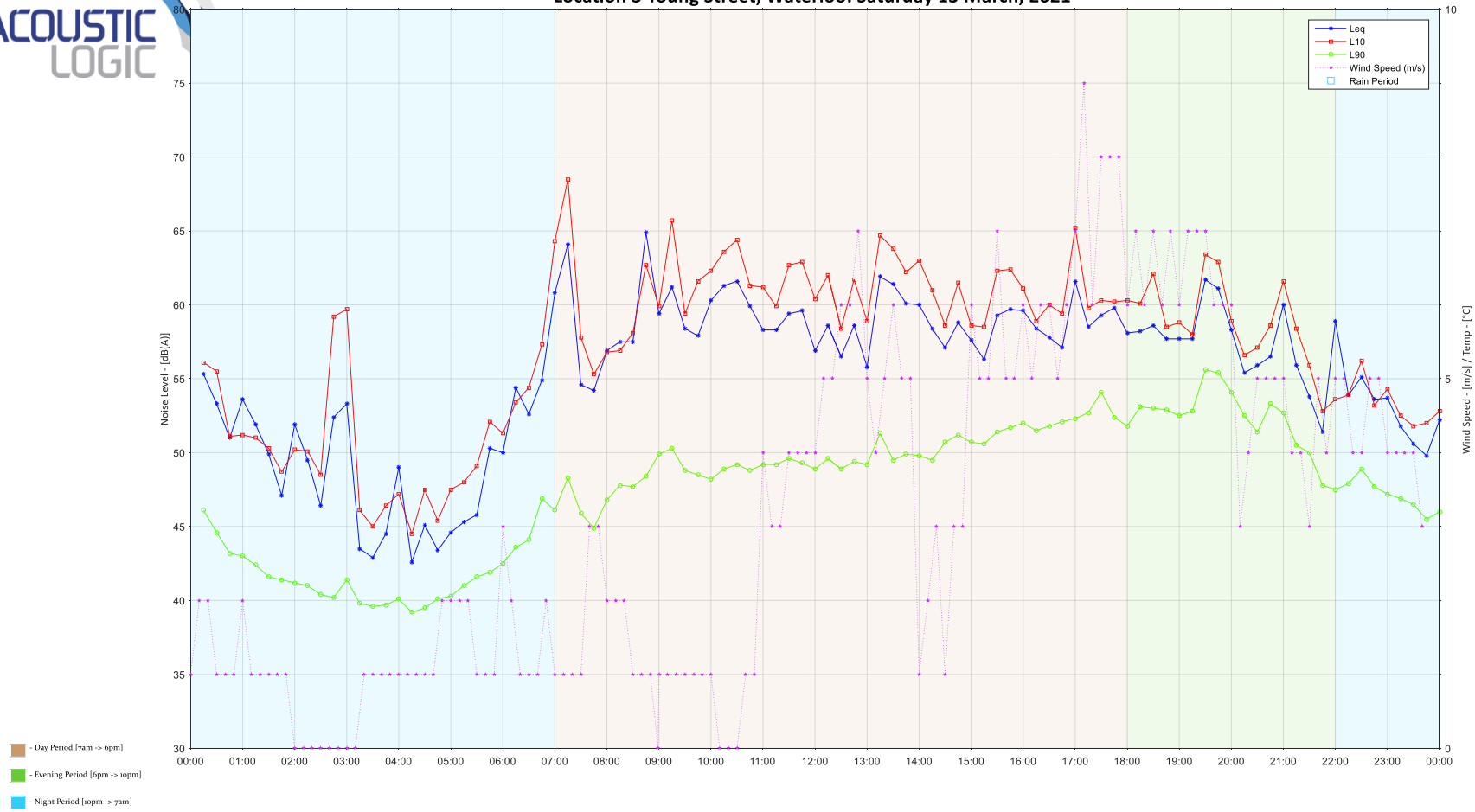
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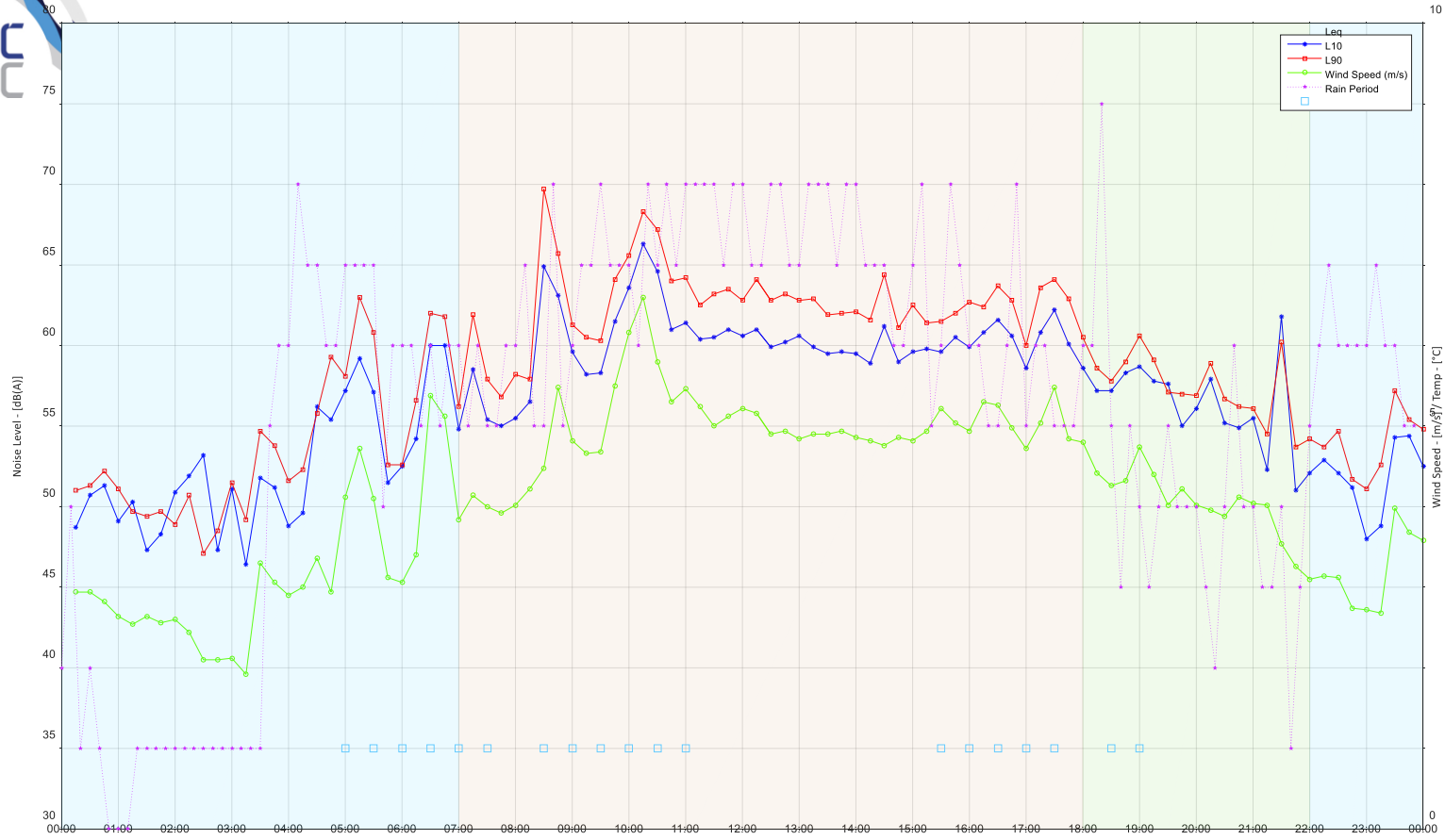
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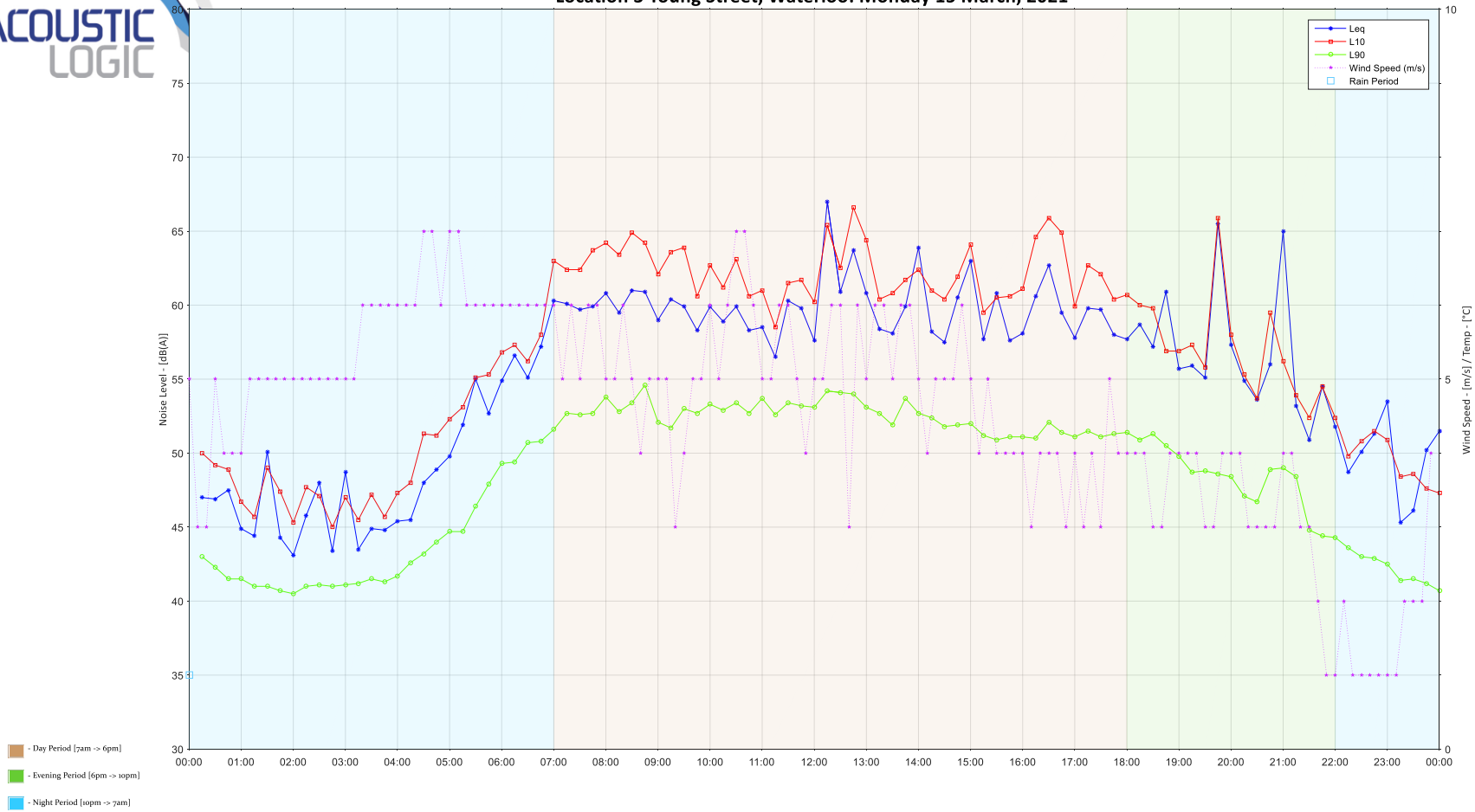
Location 3 Young Street, Waterloo: Saturday 13 March, 2021



Location 3 Young Street, Waterloo: Sunday 14 March, 2021



Location 3 Young Street, Waterloo: Monday 15 March, 2021



Location 3 Young Street, Waterloo: Tuesday 16 March, 2021

