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Residential Development with In-fill Affordable Housing (SSD-93020230)

Noise and Vibration Impact Assessment

40-48 Redan Street, Mosman

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1 EXECUTIVE SUMMARY

This *Noise and Vibration Impact Assessment* has been prepared by Acoustic Logic to accompany a detailed State Significant Development Application (SSD-93020230) for a residential development (including in-fill affordable housing) at 40-48 Redan Street, Mosman within the Mosman Local Government Area (LGA).

This report has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) issued for the project (SSD-93020230) on 5 September 2025.

This report concludes that the proposed residential development is suitable and warrants approval subject to the implementation of the following mitigation measures.

- Façade complying construction presented in Section 9.2 is to be adopted during the design stage.
- During construction stage, acoustic barriers (e.g., plywood hoarding) with minimum height of 1.8m to be installed to the full perimeter of the site to provide noise attenuation.
- Long term noise monitoring is recommended during demolition and excavation stage as detailed in Section 14.1.

Following the implementation of the above mitigation measures, the remaining impacts are considered appropriate.

2 INTRODUCTION

This report has been prepared to support a State Significant Development Application (SSDA) SSD-93020230 for the site at 40-48 Redan Street, Mosman.

The Minister for Planning and Public Spaces, or their delegate, is the consent authority for the SSDA and this application is lodged with the NSW Department of Planning, Housing and Infrastructure (DPHI) for assessment.

The SSDA seeks consent for a multi-storey residential development that utilises the Low and Mid-Rise Housing (LMR) and In-fill Affordable Housing (IAH) policies recently introduced under the State Environmental Planning Policy (Housing) 2021 (Housing SEPP). The design is outlined in the Architectural Plan set prepared by FJC Studio and provided within the SSDA.

This report has been prepared in response to the requirements contained within the Secretary's Environmental Assessment Requirements (SEARs) dated 5 September 2025 (SSD- 93020230). Specifically, this report has been prepared to respond to the following SEARs:

Table 1 – SEARs Requirement

Description of SEARs Requirement	Section of Report Where Response is Provided
10. Noise and Vibration Provide a noise and vibration assessment prepared in accordance with the relevant NSW Environment Protection Authority (EPA) guidelines. The assessment must detail construction and operational noise and vibration impacts on nearby sensitive receivers and structures and outline the proposed management and mitigation measures that would be implemented.	Assessment in accordance with relevant EPA guidelines: Section 10.1.1.
	Construction noise and vibration assessment: Section 13
	Outline of proposed management and mitigation measures: Section 13.4, Section 14 & 15

3 PROJECT DESCRIPTION

The application seeks development consent for the redevelopment of the site for a multi-storey in-fill affordable housing residential development for 53 dwellings.

Specifically, this application seeks approval for the following:

- Demolition of the existing structures on site, including 5 dwellings and vehicle crossovers.
- Site preparation works including:
  - Tree removal.
  - Excavation across the site.
- Construction of a multi-storey residential flat building comprising:
  - Two levels of basement for 133 car parking spaces, services and storage.
  - 53 residential dwellings in 2-, 3- and 4-bedroom configurations.
  - Communal open space at ground level, level 1 and level 5.
- Ancillary vehicular entry and public domain works from Redan Street.
- Provision of 15% affordable housing to be managed by a community housing provider for a period of 15 years from date of the Occupation Certificate.
- Extension and augmentation of physical infrastructure and utilities as required.

Refer to Architectural Plans prepared by FJC Studio appended to the Environmental Impact Statement.

4 THE SITE

The site is located at 40-48 Redan Street, Mosman and comprises the following landholdings:

- Lot 1 on Deposited Plan 33257
- Lot 2 on Deposited Plan 33257
- Lot 1 on Deposited Plan 921113
- Lot 13 on Deposited Plan 920285
- Lot 1 on Deposited Plan 455982
- Lot 9 on Deposited Plan 1350
- Lot 10 on Deposited Plan 1350
- Lot 11 on Deposited Plan 1350

The site is regular in shape and has an area of approximately 3,233 square metres. The site currently accommodates four 2-storey residential dwellings, and one 2-storey attached dwelling in a landscaped setting. The site has a primary frontage to Redan Street to the east and a rear frontage to Redan Lane to the west.

The site is in Mosman, a suburban local government area (LGA) in Sydney's north shore. The site has excellent access to public amenities including supermarkets, cafes and destination shops along Military Road and at Spit Junction, and access to recreational areas including Balmoral Beach to the east and Georges Heights headland to the south. Spit Junction is a recognised town centre under the low and mid-rise (LMR) policy. The site is also close to regular bus services in the immediate vicinity.

The site is not a listed heritage item or located within a heritage conservation area, however Redan Street reserve is listed as a local heritage item in the Mosman Local Environmental Plan 2012 (LEP). The site to the immediate south at 36-38 Redan Street containing a pair of semi-detached houses and to the east at 29 Redan Street containing a house are also a listed local heritage item.

The location of the site is illustrated in Figure 1.

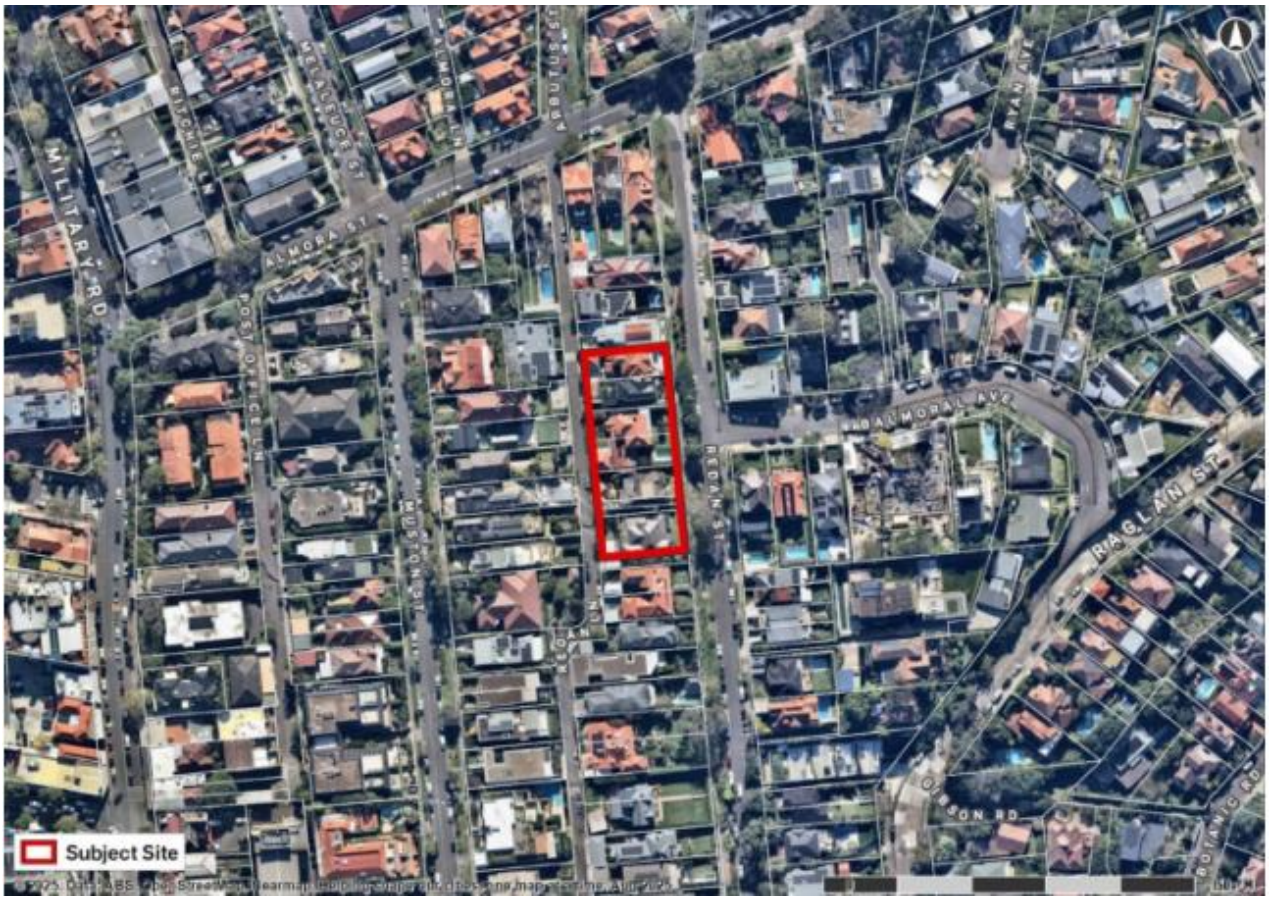


Figure 1 – Site Location (Source: Nearmap 2025)

5 REFERENCED DOCUMENTS

This document addresses noise impacts associated with the following:

- Noise intrusion to the project site from traffic at surrounding streets.
- Noise emissions from mechanical plant to service the project site (in principle).
- Noise and vibration emissions from construction activities from the site.

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

- Australian Standard 2107:2016 *Acoustics – Recommended design sound levels and reverberation times for building interiors* (**AS2107:2016**).
- NSW Environmental Protection Authority (**EPA**) *Noise Policy for Industry* (**NPI**) 2017.
- NSW DECC *Interim Construction Noise Guideline* (**ICNG**) 2009.
- German Standard DIN 4150-3 *Structural Vibration: Effects of Vibration on Structures*.
- NSW Department of Environment and Conservation (**DECC**) *Assessing Vibration: A Technical Guideline* (Feb 2006).

This assessment has been conducted based on the architectural drawings provided to us, prepared by FJC studio, dated 27/02/2026.

6 NOISE SOURCES

6.1 NOISE SOURCES IDENTIFIED

The main significant noise source with potential to impact the site is traffic noise from Redan Street and Redan Lane. Reference to the Transport for NSW website indicates that both streets carry daily traffic volumes less than 20,000 vehicles per day. The development should comply with the requirements of the **AS2107:2016**.

6.2 NOISE RECEIVERS IDENTIFIED

The nearest noise receivers around the site include:

- **R1**: Residential Receiver 1 – Residential houses to the west of the site across Redan Lane at 65-77 Muston Street.
- **R2**: Residential Receiver 2 – Residential houses to the south of the site at 36-38 Redan Street.
- **R3**: Residential Receiver 3 – Residential houses to the southeast of the site at 25-29 Redan Street, 14-16 Balmoral Avenue.
- **R4**: Residential Receiver 4 – Residential houses to the northeast of the site at 33-39 Redan Street.
- **R5**: Residential Receiver 5 – Residential houses to the north of the site at 50-56 Redan Street.

A site map, measurement locations and surrounding receivers are presented in Figure 2.

Figure 2 – Site Plan Showing Local Context and Noise Monitoring Locations (Source: NSW SDT Explorer)

7 ABBREVIATIONS AND DEFINITIONS

The following Abbreviations and definitions are used in this noise impact assessment.

dB	Decibels - unit for the measurement of sound
dB(A)	A-weighted decibels. Unit of measurement for broadband sound with the A-frequency weighting applied to approximate human loudness perception to sounds of different pitch.
L_{eq}	Energy, time averaged sound level
L_{max}	Maximum sound pressure level, fast response
L_{90}	Sound level exceeded for 90% of the measurement period
R_w	Frequency weighted sound reduction index.
NRC	Average absorption co-efficient for the octave bands with centre frequencies of 250Hz to 2 kHz inclusive.
Day*	For noise emissions assessment - the period from 7 am to 6 pm (Monday to Saturday) and 8 am to 6 pm (Sundays and public holidays). For transportation noise - the period from 7 am to 10 pm
Evening*	Refers to the period from 6 pm to 10 pm.
Night*	The period from 10 pm to 7 am (Monday to Saturday), and 10 pm to 8 am (Sundays and public holidays). For transportation noise - the period from 10 pm to 7am
Project Trigger Level	Target receiver noise levels for a particular noise-generating facility.
Assessment Background Level (ABL)	A-weighted background noise level representative of a single period. (Calculated in accordance with NPI unless noted otherwise)
Rating Background Level (RBL)	The overall, single-figure A-weighted background level representing each assessment period (day/evening/night) over the whole monitoring period. (Calculated in accordance with NPI unless noted otherwise)

* Unless nominated otherwise.

8 NOISE INTRUSION GUIDELINES AND ASSESSMENT CRITERIA

The noise intrusion to the project site shall comply with the requirements of the Australian Standard 2107:2016 *Acoustics Recommended Design Sound Levels*.

8.1 AUSTRALIAN STANDARD 2107:2016

AS2107:2016 specifies allowable internal noise levels for internal spaces within residential and commercial buildings. Table 1 in Section 5 of AS2107:2016, gives the following maximum internal noise levels for commercial buildings and residential buildings near major roads.

Table 2 – Recommended Design Sound Levels

Space /Activity Type	Recommended Design Sound Levels
Sleeping Areas	35-40 dB(A) $L_{eq\ (10pm\text{-}7am)}$
Living Areas	35-45 dB(A) $L_{eq\ (anytime)}$

8.2 ADOPTED PROJECT SPECIFIC CRITERIA

The following table provides the criteria adopted for this assessment based on the applicable instruments and guidelines.

Table 3 – Noise Assessment Criteria

Room	Noise Level dB(A) L_{eq}
Sleeping Areas	35 dB(A) $L_{eq\ (10pm\ –\ 7am)}$
Living Areas	40 dB(A) $L_{eq\ (anytime)}$

9 NOISE INTRUSION ASSESSMENT

A noise intrusion assessment has been undertaken using the following methodology:

- The measured noise levels have been used as a basis for predicting façade-incident noise levels around the development.
- Internal noise levels are then calculated to the centre of the room using the predicted octave band façade incident external noise levels and, for each façade element, correcting for the exposed area, octave band sound transmission loss and room sound power to pressure correction. The room noise level was calculated by accumulating all significant noise paths.

Envelope performance requirements to comply with the noise criteria stipulated in Section 8.2 have been assessed and are provided in Section 9.1.

9.1 TRAFFIC NOISE INTRUSION ASSESSMENT

9.1.1 Measured Existing External Noise Levels

Existing noise levels from the transportation sources have been measured using the methodology outlined in Appendix B3 of the RNP as a basis, and representative noise levels determined from analysis of the data. APPENDIX A summarises the measurements and data obtained, and the calculated noise descriptors. These are summarised in the following table.

Table 4 – Ambient Noise Level-Unattended Noise monitor

Location	Time of Day	Ambient Noise Level (dB(A) $L_{eq,period}$)
Eastern logger (Facing Redan Street)	Day (7am to 10pm)	54
	Night (10pm to 7am)	54
Western Logger (in the backyard)	Day (7am to 10pm)	55
	Night (10pm to 7am)	43

Table 5 – Ambient Noise Levels – Attended Noise Measurement

Location	Ambient Noise Level (dB(A) $L_{eq,15min}$) Day
2m from kerb of Redan Street	54
2m from kerb of Redan Lane	42

9.1.2 Predicted Future Facade Noise Levels

The measured noise levels have been used as a basis for predicting façade-incident noise levels around the development by:

- Accounting for any likely changes in traffic volumes in the long term. Traffic data provided by JMT Consulting (project no. 2578, dated 06/06/2026) indicates that traffic generation arsing from the proposal is considered to be negligible and would not be expected to result in any adverse impacts on the surrounding road network.
- Correcting for different distances between the noise source compared to the monitoring location.
- Barrier effects, where applicable.
- Reflections off adjacent structures, where significant.

The CoRTN traffic noise prediction model has been used to calculate the above adjustments indicated above.

Table 6 – Predicted Traffic Noise Levels at Future Building Façade

Location	Time of Day	Ambient Noise Level (dB(A) $L_{eq,period}$)
Eastern facade	Day (7am to 10pm)	54
	Night (10pm to 7am)	54
Western facade	Day (7am to 10pm)	55
	Night (10pm to 7am)	43

9.2 COMPLYING MITIGATION

Assessment of façade requirements to achieve required indoor noise levels has been undertaken. Dimensions of rooms, setbacks from roadways, window openings and floor areas have been used.

The following treatment is indicated for the proposed development to comply with the nominated assessment criteria.

9.2.1 Glazed Windows and Doors

Acoustically rated external windows and doors are required. 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 (or equal) acoustic seals. (**Mohair Seals are unacceptable**). The suitability of alternative seal types should be determined to an appropriately qualified acoustic expert.

The complying constructions are listed below.

Table 7 – Complying Glazing Constructions

Facade	Space	Glazing Construction	Acoustic Seals
All facades	Bedrooms	6.38mm Laminated	**Yes**
	Living rooms		

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.

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 8 below. 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 8 – Minimum R_w of Glazing (with Acoustic Seals)

Glazing Assembly	Minimum R_w of Installed Window
6.38mm Laminated	31

9.2.2 External Roof and Ceiling Construction

External roof will be constructed from concrete hence no acoustic upgrade is required.

In the event that any penetrations are required through the external skin, an acoustic sealant should be used to minimise all gaps.

9.2.3 External Walls

External walls constructed from concrete/masonry elements will not require any acoustic upgrading to achieve the acoustic requirements.

In the event that any penetrations are required through the external skin, an acoustic grade sealant should be used to minimise all gaps.

10 NOISE EMISSION CRITERIA

The following significant noise sources have been identified as requiring assessment: services plant noise emissions.

10.1 NOISE EMISSION GUIDELINE

The noise emission guideline applied to the project site is NSW Environmental Protection Authority *Noise Policy for Industry* (**NPI**) 2017.

10.1.1 Mechanical Plant and Loading Dock Noise Assessment Criteria - NSW EPA NPI 2017

Criteria to assess noise emissions from the operation of the proposed development have been developed using the NPI. This policy was primarily developed to assess noise impacts from industrial development, but can also be adapted to assess other types of development such as commercial buildings and air conditioning plant.

For each receiver type:

- Receivers have been grouped into "catchments". These are receivers that have been assessed as having similar characteristics (receiver type and ambient noise level). These are shown in Figure 2.
- For each catchment, representative noise assessment trigger levels have been determined based on NPI guidelines. The trigger levels have been adopted in this assessment as criteria. These will be used to indicate whether additional mitigation is needed to manage noise emissions.
- For each catchment, noise emissions have been assessed to the most impacted receiver. This means that impacts at all other receivers within that catchment will be less. Compliance at the most impacted receiver will therefore also result in compliance at all other receivers within the catchment.

For residential receivers, three criteria are assessed:

- Intrusive assessment– that is, how audible is the emitted noise compared to ambient, background noise). Criteria are determined relative to the measured rating background noise level.
- Amenity assessment – that is, how loud is the absolute level of industrial noise, including cumulative noise from other industrial sources. The NPI nominates appropriate amenity noise levels depending on the receiver type and prevailing noise environment/zoning.
- Maximum Noise assessment – will high-level, short-term noise events cause adversely impact sleep at night? Trigger levels are determined relative to the measured night rating background, and assessed outside rooms where sleep is likely to occur.

For residential receivers, noise emissions are assessed against the trigger levels to determine the likely extent of impacts. The lower of the relevant intrusiveness and amenity trigger levels are adopted. Noise emissions lower than the trigger levels indicate there is no adverse impact. A maximum noise level assessment is separately undertaken if night time emissions occur.

For other receiver types, only an "amenity" assessment is required.

APPENDIX A summarises the results of ambient noise monitoring. APPENDIX B provides the derivation of NPI trigger levels for each of the receivers. These are summarised in the following table.

10.2 SUMMARISED NOISE EMISSION CRITERIA

Table 9 – Project Specific Trigger Levels

Location/Receiver Type	Time	RBL dB(A) L_{90}	Trigger Noise Level (dB(A) $L_{eq,15min}$)		
			Intrusiveness	Amenity	Max Event
R1	Day	34	**39**	53	N/A
	Evening	32	**37**	43	N/A
	Night	30	**35**	38	**40 L_{eq}** **52 L_{max}**
R2-R5	Day	40	45	53	N/A
	Evening	38	43	**43**	N/A
	Night	32	**37**	38	**40 L_{eq}** **52 L_{max}**

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

11 NOISE EMISSION ASSESSMENT

11.1 MECHANICAL PLANT NOISE

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, childcare and commercial receivers should comply with the requirements of Section 10.2.

11.1.1 Preliminary Mechanical Treatment Advice

An assessment of initial design of primary plant items is presented below.

- Major fans (typically with a sound power over 80dB(A) – such as kitchen exhaust, major toilet exhaust and major relief air fans) may require acoustic treatment if located externally near sensitive receivers. It is recommended that axial (as opposed to roof mounted fans) are to be used as this will enable acoustic treatment to be incorporated within ductwork running to atmosphere and with attenuators if necessary. In addition to the location of the equipment, acoustic treatments to the major plant items may include silencers, treatment to ducting, time control, operational limitations, and vibration isolation.

- Supply and exhaust fans may be located within plant rooms or in rooftop plant areas. These units typically emit high noise levels and require acoustic treatment such as silencers and internal lined ductwork. Silencer requirements would be determined once fan selections have been completed.

- Other minor plant items, such as bathroom or kitchen exhaust fans, may also be required. These items typically emit relatively low noise levels and may require minimal acoustic treatment of a standard nature, such as internally lining of ductwork.

- Residential condensers: The project will include external residential condenser units on condenser farms on level 3, 7 and 9. An indicative assessment has been conducted based on the Daikin RSUYQ8AYM with sound power level of 75dB(A).

  Noise prediction results show that proposed condenser farms will meet the relevant noise emission criteria, except for level 3 condenser farm. Additional acoustic treatments are recommended for level 3 condenser farm:

  - An acoustic barrier is to be installed facing the western boundary from the level 3 condenser farm. Indicative location marked in red below.

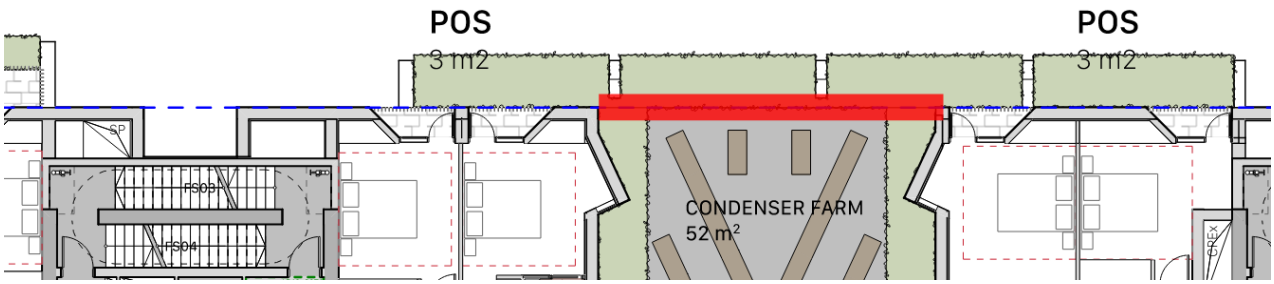


Figure 3 – Condenser Farm Acoustic Barrier Location

  - This can also be constructed by standard louvres that are blanked off, or an acoustic louvre with the following minimum insertion loss:

63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
2	4	5	11	14	17	18	16

    - The barrier is to be constructed to be minimum 500mm above the height of the condenser units.

  - Condenser units are to all installed with a night mode card with minimum 6 dB(A) reduction. This night mode is to be operational during the period of 10pm-7am (or any longer period which contains these hours).

Cumulative assessment of both plant noise with other noise sources is recommended when conducting acoustic design of plant items. Compliance with EPA acoustic criteria (as set out in Section 10.2) will be achievable, provided that detailed acoustic review of plant items is undertaken once plant is selected, and acoustic treatments similar to those outlined above are adopted.

The above recommendations are indicative. Detailed acoustic review should be undertaken at CC stage to determine acoustic treatments to control noise emissions to satisfactory levels.

12 VEHICLE MOVEMENTS ON LOCAL ROADS

Traffic generation from the proposed development would occur as a result of staff and patron vehicles.

The *Traffic Impact Assessment*, prepared by JMT Consulting (project no. 2578, dated 06/02/2026),provides information regarding existing and future expected vehicle movements on the surrounding road network. The peak periods for traffic generation have been defined in AM peak and PM peak.

The impact of additional traffic generated by the proposed development has been assessed using the EPA RNP 2011, which states the following:

- Section 2.3 of the RNP provides noise assessment criteria at residential (Table 3) and non-residential receivers (Table 4), and for different road classifications.
- Where existing traffic noise is already close to or exceeds the criteria in Tables 3 or 4, the RNP indicates the increase in noise should be assessed instead of the absolute level. For sensitive land uses affected by additional traffic on existing roads, any increase in the total traffic noise level should be limited to 2dB(A) above that of the corresponding "no build option". The RNP indicates that an increase of up to 2dB(A) represents a minor impact that is considered barely perceptible to the average person.
- Where night time traffic movements are proposed, for residential receivers, the impact on sleep from maximum noise events generated by these movements should also be considered.

The following table summarises the peak hour noise impact resulting from traffic generated by the proposed development on public roads based on traffic data obtained from the *Traffic Impact Assessment*.

Table 10 – Noise Impact Assessment – Daytime Road to R2-R5 Receiver Façades

Road	No Build Traffic Volume [1,2]	Additional Traffic with Proposed Development	Noise Increase dB(A)
Redan Street AM Peak	90	6	< 1
Redan Street PM Peak	90	5	< 1

1 For roads classified as local roads, the assessment is based on the peak hour traffic volume. For other road classifications, it is based on the traffic volume for the whole period.

2 Vehicle speed – signposted speeds (or 60 km/h on non-local roads 50 km/hr on local roads) outside of school hours and 40km/hr in school zones.

The analysis indicates that the increase in noise from traffic on any of the surrounding roads to local sensitive receivers do not exceed 2 dB(A) in the daytime traffic period. The increase in road traffic noise as a result of the proposal would not be noticeable and is compliant with the objectives of the RNP.

13 CONSTRUCTION NOISE AND VIBRATION ASSESSMENT

13.1 CONSTRUCTION NOISE MANAGEMENT LEVELS

Noise associated of construction activities on the site will be assessed in accordance with the NSW *DECC Interim Construction Noise Guideline* (**ICNG**) 2009.

The "quantitative" assessment procedure, as outlined in the ICNG will be used. The quantitative assessment method requires: Determination of noise generation goals (based on ambient noise monitoring); Prediction of operational noise levels at nearby development; and if necessary, recommendation of noise controls strategies in the event that compliance with noise emission goals is not possible.

DECC guidelines adopt differing strategies for noise control depending on the predicted noise level at the nearest residences:

- ***"Noise affected" level*** where construction noise is predicted to exceed the "noise affected" level at a nearby residence, the proponent should take reasonable/feasible work practices to ensure compliance with the "noise affected level". For residential properties, the "noise affected" level occurs when construction noise exceeds ambient levels by more than 10dB(A)$L_{eq(15min)}$.

- ***"Highly noise affected level"*** where noise emissions are such that nearby properties are "highly noise affected", noise controls such as respite periods should be considered. For residential properties, the "highly noise affected" level occurs when construction noise exceeds 75dB(A)$L_{eq(15min)}$ at nearby residences.

A summary of the above recommended noise levels from the ICNG is presented below.

Table 11 – Noise Management Levels at Residential Receiver

Receiver	"Noise Affected" Level dB(A)$L_{eq(15min)}$	"Highly Noise Affected" Level dB(A)$L_{eq(15min)}$
R1	44 (BG+10) externally at façade	75
R2-R5	50 (BG+10) externally at façade	75

Where noise from the construction works is above the "noise affected" level, the proponent should apply any feasible and reasonable work practices to minimise noise. The "noise affected level is representative of a level where there may be some community reaction to noise.

If noise emissions are likely to exceed 75 dB(A)$L_{eq(15min)\ "highly\ noise\ affected"}$ at the boundary of surrounding affected residential receivers, the receiver is deemed to be "highly noise affected". The "highly noise affected" level is representative of a level where strong community reaction to noise is expected. Introduction of management controls such as scheduling of noisy periods, or respite periods is then recommended.

13.2 CONSTRUCTION VIBRATION OBJECTIVES

Vibration associated with demolition and excavation activities on the site will be assessed in conjunction with the following guidelines:

- **For human exposure to vibration –** Department of Environment and Conservation *NSW Assessing Vibration: A Technical Guideline* (Feb 2006) is based on the guidelines contained in BS 6472:1992 *Guide to Evaluate Human Exposure to Vibration in Buildings (1Hz to 80Hz)* for low probability of adverse comment.

- **For structural damage vibration –** German Standard DIN 4150-3 *Structural Vibration: Effects of Vibration on Structures.*

13.2.1 Assessing Amenity (Human Comfort Guidelines)

The NSW EPA's *Assessing Vibration – a technical guideline* is based on the guidelines contained in British Standard BS 6472-1992 '*Guide to Evaluate Human Exposure to Vibration Buildings (1Hz to 80Hz)*'. This guideline provides procedures for assessing tactile vibration and regenerated noise within potentially affected buildings.

The recommendations of this guideline should be adopted to assess and manage vibration from the site during construction. Where vibration exceeds, or is likely to exceed, the recommended levels then an assessment of reasonable and feasible methods for the management of vibration should be undertaken.

Table 12 – BS 6472 Vibration Criteria

		RMS acceleration (m/s^2)		RMS velocity (mm/s)		Peak velocity (mm/s)	
Place	**Time**	**Preferred**	**Maximum**	**Preferred**	**Maximum**	**Preferred**	**Maximum**
Continuous Vibration							
Residences	Daytime	0.01	0.02	0.2	0.4	0.28	0.56
Offices	Day or night-time	0.02	0.04	0.4	0.8	0.56	1.1
Workshops		0.04	0.08	0.8	1.6	1.1	2.2
Impulsive Vibration							
Residences	Daytime	0.3	0.6	6.0	12.0	8.6	17.0
Offices	Day or night-time	0.64	1.28	13	26	18	36
Workshops		0.64	1.23	13	26	18	36

Note 1: Continuous vibration relates to vibration that continues uninterrupted for a defined period (usually throughout the daytime or night-time), e.g. continuous construction or maintenance activity. (DECC, 2009).

Note 2: Impulsive vibration relate to vibration that builds up rapidly to a peak followed by a damped decay and that may or may not involve several cycles of vibration (depending on frequency and damping), with up to three occurrences in an assessment period, e.g. occasional loading and unloading, or dropping of heavy equipment. (DECC, 2009).

13.2.2 Structure Borne Vibration (Damage Criteria)

German Standard DIN 4150-3 (2016) provides a guideline for acceptable levels of vibration velocity in building foundations, to assess the effects of vibration on structures. The table give guidance on the maximum accepted values of velocity at the foundation and in the plane of the highest floor of various types of buildings, to prevent any structural damage.

The table following lists the peak particle velocity, which is the maximum absolute value of the velocity signals for the three orthogonal components. This is measured as a maximum value of any of the three orthogonal component particle velocities when measured at the foundation, and the maximum levels measured in the x- and y-horizontal directions in the plane of the floor of the uppermost storey.

It is noted that if measured vibration levels do not exceed the guidelines listed in the following table, damage that will reduce the serviceability of the building will not occur, and if damage to the building does occur, it is assumed that the damage is related to other causes. Furthermore, the DIN4150-3 guideline states the following regarding the limits presented in Table 1 of the standard:

"Exceeding the guideline values does not necessarily lead to damage. Should they be exceeded, however, further investigations may be necessary, such as determining and evaluating the stresses as detailed in 4.3 and 4.4.".

Table 13 – Table 1 – DIN 4150-3 (2016)) – Guideline Values for Vibration Velocity, $v_{i,max}$, for Evaluating the Effects of Short-Term Vibration on Structures

	TYPE OF STRUCTURE	Guideline values for $v_{i,max}$ in mm/s				
		Foundation, all directions, i = x, y, z, at a frequency of			Topmost floor, horizontal direction, i = x, y	Floor slabs, vertical direction, i = z
		1Hz to 10Hz	10Hz to 50Hz	50Hz to 100Hz [a]	All Frequencies	All Frequencies
L/C	1	2	3	4	5	6
1	Buildings used for commercial purposes, industrial buildings, and buildings of similar design	20	20 to 40	40 to 50	40	20
2	Residential buildings and buildings of similar design and/or occupancy	5	5 to 15	15 to 20	15	20
3	Structures that, because of their particular sensitivity to vibration, cannot be classified under lines 1 and 2 **and** are of great intrinsic value (e.g. listed buildings) buildings that are under a preservation order)	3	3 to 8	8 to 10	8	20[b]

NOTE: Even if guideline values as in line 1, columns 2 to 5, are complied with, minor damage cannot be excluded.

a. At frequencies above 100 Hz, the guideline values for 100 Hz can be applied as minimum values.

b. b It may be necessary to lower the guideline value markedly to prevent minor damage

13.3 CONSTRUCTION NOISE EMISSION ASSESSMENT

The proposal is to demolish the existing residential blocks and build a new residential building. An indicative construction scope is summarised as following:

- **Demolition Stage**: Demolish existing residential buildings on site.
- **Excavation Stage**: Excavate and piling for basement levels.
- **Construction Stage**: Construct new residential building.

It is envisaged that construction scope and staging would be further refined in subsequent stages of the development approval and documented (along with additional impacts or considerations) within a *Construction Environmental Management Plan*.

13.3.1 Source Noise Data

In this section, typical equipment/processes anticipated to be used during the construction of the project site are outlined in the table below with A-weighted sound power levels. The equipment list is prepared based on our experience with similar projects. Typically, the most significant sources of noise or vibration generated during a construction project will be demolition and excavation.

Table 14 – Sound Power Levels of Equipment

Equipment /Process	Typical Sound Power Level dB(A)	Duty
Excavator with 10T hydraulic hammer	118	75%
Jackhammer	113	75%
Concrete Saw	118	75%
10t Vibratory roller	109	100%
1t skidsteer loader	110	75%
Piling Rig	112	100%
Mobile Crane	113	25%
Concrete pump	109	100%
Concrete Pump Truck	109	100%
20T Medium Rigid Trucks	103	10%
Powered Hand Tools (Electric)	102	50%

The noise levels presented in the above table are derived from the following sources, namely:

- On-site measurements.
- Table A1 of Australian Standard 2436-2010.
- Data held by this office from other similar studies.

Noise levels take into account correction factors (for tonality, intermittency where necessary).

13.3.2 Methodology

Noise from the loudest typical construction activities for all stages of works have been predicted to the nearest most affected sensitive receivers.

Predictions take into account:

- The distance between the noise source and the receiver.
- The screening effect provided by any building structure or building shell, if applicable. In particular, noise from works proposed during the fit-out stages when the building shell will screen these activities from the surrounding sensitive receivers.

Recommended standard hours for construction work presented in Section 2.2 of the NSW DECC ICNG 2009 has been adopted for this project.

13.3.3 Recommended Hours of Work

The following construction hours are proposed under the standard hours noise management levels of the ICNG:

- Monday to Friday – 7:00am to 6:00pm.
- Saturdays – 8:00am to 1:00pm.
- Sundays and Public Holidays – No works.

13.3.4 Predicted Noise Levels

Maximum noise impacts from the construction equipment listed above have been predicted to the nearest noise receivers and presented below. Given the size of the site predicted noise levels will change significantly depending on where the noise source is located. As such, a noise level range has been presented, giving expected noise levels for activities 'farthest from' to 'nearest to' the receiver.

Table 15 – Predicted Construction Noise Levels – R1

Activity	Predicted Noise Level	Criteria	Comment
Excavator with 10T hydraulic hammer	60-74	NML 44dB(A) HNML 75dB(A)	Predicted noise levels exceed the NML 44dB(A) But below HNML 75dB(A) all the time
Jackhammer	55-74		
Concrete Saw	60-74		
10t Vibratory roller	52-71		
1t Skid-steer loader	52-71		
Piling Rig	55-74		
Mobile Crane	50-68		
Concrete pump	52-71		
Concrete Pump Truck	52-71		
20T Medium Rigid Trucks	36-55		Predicted noise levels exceed the NML 44dB(A) when work close to boundary But below HNML 75dB(A) all the time
Powered Hand Tools (Electric)	42-61		

Table 16 – Predicted Construction Noise Levels – R2 & R5

Activity	Predicted Noise Level	Criteria	Comment
Excavator with 10T hydraulic hammer	61-90	NML 50dB(A) HNML 75dB(A)	Predicted noise levels exceed the HNML 75dB(A) when work close to boundary
Jackhammer	56-85		
Concrete Saw	61-90		
10t Vibratory roller	53-75		Predicted noise levels exceed the NML 50dB(A) But below HNML 75dB(A) all the time
1t Skid-steer loader	53-75		
Piling Rig	56-79		Predicted noise levels exceed the HNML 75dB(A) when work close to boundary
Mobile Crane	51-64		Predicted noise levels exceed the NML 50dB(A) But below HNML 75dB(A) all the time
Concrete pump	53-70		
Concrete Pump Truck	53-70		
20T Medium Rigid Trucks	37-54		Predicted noise levels exceed the NML 50dB(A) when work close to boundary
Powered Hand Tools (Electric)	43-66		

Table 17 – Predicted Construction Noise Levels – R3 & R4

Activity	Predicted Noise Level	Criteria	Comment
Excavator with 10T hydraulic hammer	59-74	NML 50dB(A) HNML 75dB(A)	Predicted noise levels exceed the NML 50dB(A) when work close to boundary But below HNML 75dB(A) all the time
Jackhammer	54-69		
Concrete Saw	59-74		
10t Vibratory roller	51-66		
1t Skid-steer loader	51-66		
Piling Rig	54-69		
Mobile Crane	49-64		
Concrete pump	51-66		
Concrete Pump Truck	51-66		
20T Medium Rigid Trucks	35-50		Predicted Noise Levels below the NML 50dB(A) all the time
Powered Hand Tools (Electric)	41-56		Predicted noise levels exceed the NML 50dB(A) when work close to boundary

13.4 GENERAL DISCUSSION

Noise

Noise impacts on nearby development will be dependent on the activity and where on the site the activity is undertaken. Demolition works (e.g., use of hydraulic hammer, jack hammer and concrete saw) tend to be the loudest typical activity. Work close to the site boundaries will have the greatest impact on nearby receivers.

Initial analysis indicates:

- For **Residential Receivers R1, R3 and R4**, construction noise levels are predicted below the HNML the whole time. Predictions show that higher noise levels may occur when excavator with hydraulic hammer, jack hammer, concrete saw and piling rigs are used.
- For **Residential Receivers R2 and R5**, construction noise levels are generally higher due to closer to the project site. Noise levels are predicted to exceed the HNML when excavator with hydraulic hammer, jack hammer, concrete saw and piling rigs are used. Once the excavation stage is completed, construction noise levels are expect to be lower.

To assess whether mitigation of these exceedances is feasible or reasonable, the ICNG indicates the following should be considered:

- The levels of impact including noise levels and the number of people affected.
- The benefits of noise mitigation and the number of people protected.
- Cost effectiveness of mitigation.
- Community views.

For **R2** and **R5**, the number of impacted receivers is small, and the exceedances will only occur at the north façade of R2 and southern façade of R5 when plant is operating close to the receiver. Any significant mitigation for these receivers is not indicated beyond "good practice" management of the works. Additional controls are recommended in Section 14. Should the application of feasible and reasonable mitigation not reduce noise levels below a satisfactory level then the application of respite periods is recommended.

For all other receivers closer to the project site, this assessment indicates that feasible and reasonable noise mitigation would need to be investigated to by the contractor to minimise noise impacts, based on the procedures and methods in Section 14 and the ICNG.

The most effective mitigation investigation strategy is likely to be:

- Select the quietest plant/activity available (or retrofit acoustic treatment to the plant such as residential class mufflers) to minimise any NML exceedances.
- If any residual exceedances, investigate the use of additional barriers to screen the affected receivers. It is noted that solid hoardings are proposed along the whole perimeter of the site.
- If any remaining residual significant exceedances, investigate time restrictions (e.g. avoiding loud early morning works at the residences) and notification of affected receivers when works likely to exceed the NML's is likely to occur.

Detailed construction noise planning is typically undertaken after engagement of a builder and a construction program is prepared (i.e., after DA stage) and therefore, detailed planning is not possible at this stage.

In light of the above, we recommend:

- During preparation of the construction program (CC stage), acoustic review of proposed construction activities and plant/methods should be undertaken to identify work items likely to exceed Noise Management Levels.
- For those activities likely to generate high noise levels, the analysis should identify where on the site are the areas likely to result in high noise levels. This will then assist in determining the likely time period for which high noise levels will occur.
- Identify feasible acoustic controls or management techniques (use of screens, scheduling of noisy works, notification of adjoining land users, respite periods) when excessive levels may occur.
- For activities where acoustic controls and management techniques still cannot guarantee compliant noise levels, implement a notification process whereby nearby development is made aware of the time and duration of noise intensive construction processes.

Through adoption of the above, noise impacts on nearby development can be suitably managed to prevent excessive impact.

Vibration

The highest levels of vibration are likely to be produced when excavation activities are undertaken with the use of piling rig. This activity would only produce a moderate level of vibration close to the work site. Given the distance attenuation between existing residential receivers and the project site, the impact at the surrounding properties is moderate considering amenity and structure damage.

Where required, vibration monitors may be installed at critical locations to determine any impact. Ongoing review and assessment of vibration impact will be conducted throughout the construction process to determine appropriate vibration levels. The specific location and quantity of vibration monitors to monitor residential houses are to be determined in consultation with the builder and structural engineer.

14 NOISE AND VIBRATION MANAGEMENT AND CONTROLS

Noise and vibration emissions should be minimised as part of best practice endeavours, and contingency measures should be put into place to respond to complaints or if it is found the processes needed to complete the tasks vary from those envisaged in this assessment.

The recommended measures are provided below.

14.1 UNATTENDED NOISE MONITORING

Noise monitors will be installed on surface level, at the following two locations during demolition & excavation periods:

- Location 1- Northern boundary of the project site at a location close to receiver R5.
- Location 2- Eastern boundary of the project site at a location facing R3 & R4.

Exact locations will be determined based on investigation on site before commencement of demolition work.

Figure 4 – Proposed On-going Monitoring Locations

14.1.1 ATTENDED NOISE SURVEYS

Attended noise surveys (and reporting) should be carried out at locations not covered by the unattended monitoring or in response to complaints, or to assess noise emissions from major noise producing plant items at the commencement of operation on site.

Attended noise surveys should be carried out at 2 week intervals, or in response to complaints or major changes in work methodology.

Noise monitoring within receivers will depend on access being made available.

14.1.2 REPORTING

At 2 week intervals provide a report summarising:

- The period covered.
- The locations monitored (attended and unattended).
- Equipment used.
- Graphical presentation of monitored L_{90}, L_{10} and L_{max} noise descriptors for 15minute samples.
- A discussion of the measurement results and site observations.
- Any items required for action.

14.2 VIBRATION MONITORING, REPORTING AND RESPONSE PROCEDURES

Given the relatively low level of impact predicted, monitoring would only be required in response to complaints, if the processes needed to complete the tasks vary from those envisaged in this assessment, or if works outside of standard hours are proposed.

Vibration monitoring may either consist of manned and/or unmanned measurements. Active monitoring may be undertaken during the construction work phase of the project if required in the event complaints are received from neighbours.

In the event that complaints are received from neighbours the following process should be considered:

1. Assessing impacts and determining the offending plant/equipment/process.

2. Locating the plant/equipment/process further away from the affected receiver(s) if possible.

3. Implementing additional acoustic treatment in the form of localised barriers, silencers etc.

4. Selecting alternative equipment/processes.

Where monitoring is required and indicates exceedances of the predicted impacts immediate action should be taken to identify any further controls as required to reduce noise emissions so that the limits are complied with. Monitoring of the activities following the implementation of these additional controls will be undertaken to confirm compliance.

14.2.1 Reporting Requirements

The following is an example of reporting which may be kept on site:

1. A register of complaints received/communication with the local community shall be maintained and kept on site with information as detailed below.

2. Where vibration complaints require vibration monitoring, results from monitoring shall be retained on site at all times.

3. Any exceedances occurring including, the actions taken and results of follow up monitoring.

4. A report detailing complaints received and actions taken shall be presented.

5. All monitoring and reporting shall be conducted in conjunction with the conditions of consent.

14.2.2 Response Procedures

Complaints associated with noise and vibration generated by site activities shall be recorded on a Noise Complaint Form. The person(s) responsible for complaint handling and contact details for receiving of complaints shall be established on site prior to construction works commencing. A sign shall be displayed at the site indicating the site manager and the general public and their contact telephone number.

If a noise complaint is received the complaint should be recorded on a Noise Complaint Form. The complaint form may list:

- The name and address of the complainant (if provided).
- The time and date the complaint was received.
- The nature of the complaint and the time and date the noise was heard.
- The name of the employee who received the complaint.
- Actions taken to investigate the complaint, and a summary of the results of the investigation.
- Indicate what operations were occurring on site at the time of the complaint.
- Required remedial action, if required
- Validation of the remedial action.
- Summary of feedback to the complainant.

The flow chart that follows illustrate the process followed to assess construction activities prior to the start of work on site and well as the ongoing investigation into noise during the construction period.

14.3 GENERAL NOISE CONTROL METHODS

The determination of appropriate additional noise control measures will be dependent on the particular activities and the construction equipment and plant identified as requiring future acoustic treatments to those already identified in this report. This section provides an outline of available methods which have previously been used on similar construction sites and may be possible on this site.

14.3.1 Selection of Alternate Appliance or Process

Where a particular activity or plant and equipment is found to generate noise levels that exceed the management levels, it may be possible to select an alternative approach or plant and equipment. For example, the use of excavator mounted hydraulic hammers of the site may potentially generate high levels of noise. By carrying this activity by using concrete saws or smaller plant here practical, construction noise levels and/or length of exposure to construction noise levels may be reduced.

14.3.2 Acoustic Barriers

The placement of barriers at the source is generally only effective for static plant. Placing barriers at the source cannot effectively attenuate equipment which is on the move or working in rough or undulating terrain.

The degree of noise reduction provided by barriers is dependent on the amount by which the line of sight can be blocked by the barrier. If the receiver is totally shielded from the noise source reductions of up to 15 dB(A) can be affected. Where only partial obstruction of line of sight occurs, noise reductions of 5 to 8 dB(A) may be achieved. Where the barrier does not obstruct line of sight, generally no noise reduction will occur.

Barriers are used to provide shielding and do not act as an enclosure. The material they are constructed from should have a noise reduction performance which is approximately 10dB(A) greater than the maximum reduction provided by the barrier screening. In this case, the use of a material such as 15mm plywood (or equivalent material) would be acceptable for the barriers.

14.3.3 Silencing Devices

Where construction methodologies or plant and equipment permit, investigate the use of silencing devices. These may take the form of engine shrouding, or special industrial silencers fitted to exhausts, for example.

14.3.4 Treatment of Specific Equipment

In certain cases, it may be possible to specially treat a piece of equipment to dramatically reduce the sound levels emitted.

14.3.5 Establishment of Site Practices

This involves the formulation of work practices to reduce noise generation. This includes investigating the possibility of locating fixed plant items as far as possible from residents as well as rotating plant and activities to provide respite to receivers.

14.3.6 Notification

Notification of affected receivers of the progress of works, particularly when short-term activities likely to create higher noise levels occur, can in many cases minimise community reaction.

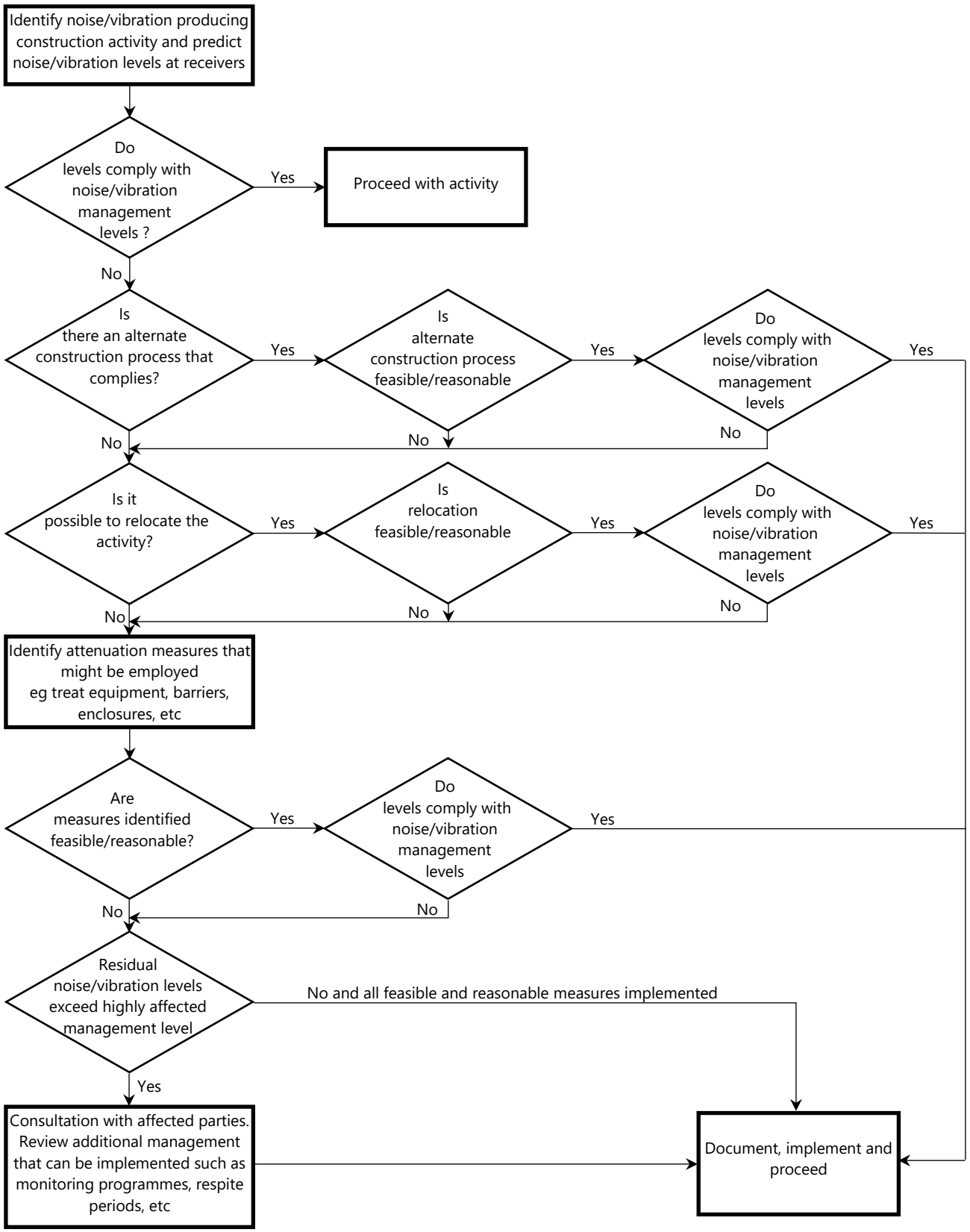
14.4 SITE SPECIFIC RECOMMENDATIONS

In light of the above, we recommend:

- **Barrier**: acoustic barriers (e.g., plywood hoarding) with minimum height of 1.8m to be installed to the full perimeter of the site to provide noise attenuation.
- **Community consultation/notification:** Notification (leaflet or similar) of nearby residents is recommended, detailing the duration of demolition and piling works.
- Quiet Work Methods/Technologies:
    - The primary noise generating activity at the site will be the demolition and excavation period. As much as practicable, use of quieter demolition methods is to be adopted.
    - Excavation is conducted initially using excavator with bucket (quietest excavation method), then use of rock saws or rippers if required. Use of the loudest excavation equipment is used only when other options are not available.
    - It is recommended to use rock saws near all boundaries to reduce vibration and noise levels if required.
    - Materials handling/vehicles:
        - Trucks and bobcats to use a non-tonal reversing beacon (subject to OH&S requirements) to minimise potential disturbance of neighbours.
        - Avoid careless dropping of construction materials into empty trucks.
        - Trucks, trailers and concrete trucks (if feasible) should turn off their engines during idling to reduce noise impacts (unless truck ignition needs to remain on during concrete pumping).
- Complaints handling:
    - A contact number is displayed outside of the building site, so that in the event that surrounding development believes that a noise breach is occurring, they may contact the site.
    - In the event of complaint, the procedures outlined in Section 15 are adopted. Additional methods of control of construction noise and additional noise control measures which may be adopted by the site are detailed in Section 14.
- **Noise monitoring:** long term noise monitoring is recommended during demolition and excavation stage as detailed in Section 14.1.
- **Vibration monitoring:** in case of complaints received from neighbouring residents, long term vibration monitoring shall be conducted at closest receivers.

15 CONTROL OF CONSTRUCTION NOISE AND VIBRATION – PROCEDURAL STEPS

The flow chart presented below illustrates the process that will be followed in assessing construction activities.



16 CONCLUSION

This report presents an assessment of noise and vibration impacts associated with the proposed Residential Development with In-fill Affordable Housing (SSD-93020230).

Based on the information provided above we conclude the following:

Provided complying constructions presented in Section 9.2 of this report are adopted, internal noise levels for the development will comply with the acoustic requirements of the Australian Standard 2107:2016 *Acoustics Recommended Design Sound Levels*.

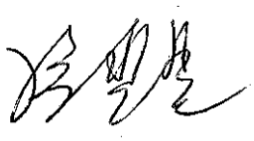
Noise emission criteria from the operational of the development has been set up using the following document NSW Environmental Protection Authority *Noise Policy for Industry* (**NPI**) 2017.

Once detailed location and selections of all proposed mechanical plant are known, an acoustic review should be undertaken to ensure compliance with the above. This should be undertaken during CC stage.

Construction noise and vibration management levels have been established and preliminary assessed in this report. With treatments provided in the Section 14.4 being adopted, construction noise impacts will be adequately managed. A full construction noise and vibration management plan can be prepared in CC stage ensuring compliance with the following:

- NSW DECC Interim Construction Noise Guideline 2009.
- German Standard DIN 4150-3 *Structural Vibration: Effects of Vibration on Structures*.
- NSW Department of Environment and Conservation *Assessing Vibration: A Technical Guideline* (Feb 2006).

Yours faithfully,



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APPENDIX A AMBIENT NOISE MONITORING

This appendix summarises the ambient noise data measured near the subject site, and the calculated noise level descriptors adopted to characterise the existing noise environment.

Monitoring has been undertaken to provide the following ambient data:

- Traffic noise levels from local roads, and
- Background noise levels for the project site.

A.1 UNATTENDED LONG TERM NOISE MONITORING

A.1.1 Ambient 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:

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

L_{90} – This is commonly used as a measure of the background noise level as it represents the noise level heard in the quieter periods during the measurement interval. The L_{90} parameter is used to set noise emission criteria for potentially intrusive noise sources since the disturbance caused by a noise source will depend on how audible it is above the pre-existing noise environment, particularly during quiet periods, as represented by the L_{90} level.

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

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

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

A.1.2 Equipment Used

Unattended noise monitoring was conducted using the following equipment:

- Rion NL-42 (Type 2).
- Rion Sound Level calibrator Type NC 74.

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

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

A.1.3 Locations Monitored

Detailed locations of the noise monitoring are presented in Figure 2.

A.1.4 Weather Affected and Extraneous/Outlying Data

Periods affected by adverse weather conditions are indicated on the following data graphs. Weather data was obtained from records provided by the Bureau of Meteorology for the Fort Denison and Observatory Hills weather station.

A.2 CALCULATION OF REPRESENTATIVE AMBIENT NOISE LEVELS

The ambient, assessment and rating background levels have been determined from the unattended, long-term noise monitoring data based on the methodology in the Noise Policy for Industry Fact Sheet B.

A.2.1 Rating Background Noise Levels

The following tables summarise the assessment background noise levels (ABL) for each location. Note that where no ABL is indicated, this is because that period was significantly affected by adverse weather or other extraneous noise.

In accordance with the NPI, if the calculated:

- evening rating background noise level is higher than the day level, the day rating background noise level has been adopted for the evening period.
- night rating background noise level is higher than the evening level, the evening rating background noise level has been adopted for the evening period.
- day rating background noise level was less than 35 dB(A), a "default" background of 35 dB(A) has been adopted.
- evening or night rating background noise level was less than 30 dB(A), a "default" background of 30 dB(A) has been adopted.

Where monitoring was conducted within 3m of a significant sound reflecting surface, 2.5 dB(A) has been subtracted from the calculated rating background to account for an increase in noise from reflections.

Table 18 – RBL – Logger Facing Redan Street

Date	Noise Level dB(A) $L_{90,\ period}$		
	Day	Evening	Night
Friday 7/11/2025	-	40.4	34
Saturday 8/11/2025	39.8	36.3	32.8
Sunday 9/11/2025	38.1	35.5	30.1
Monday 10/11/2025	41.9	39.2	31.5
Tuesday 11/11/2025	39	39.6	30.4
Wednesday 12/11/2025	41	36.6	33.4
Thursday 13/11/2025	42	37.2	31.1
Friday 14/11/2025	41.1	36.8	34.9
Saturday 15/11/2025	37.9	40.6	31.5
Sunday 16/11/2025	34.8	38.5	31.3
Calculated RBL	40	38	32

Table 19 – RBL – Rear Logger

Date	Noise Level dB(A) $L_{90,\ period}$		
	Day	Evening	Night
Friday 7/11/2025	-	35.4	29.2
Saturday 8/11/2025	33.5	33.8	30.5
Sunday 9/11/2025	35.4	29.1	26.7
Monday 10/11/2025	32.9	32.2	28.6
Tuesday 11/11/2025	34.2	36.6	27.9
Wednesday 12/11/2025	32.5	30.6	28.9
Thursday 13/11/2025	34	31.4	28
Friday 14/11/2025	35.1	29.3	29.1
Saturday 15/11/2025	31.1	35.9	29.6
Sunday 16/11/2025	31.2	31.7	27.7
Calculated RBL	34	32	30

A.2.2 Ambient Noise Levels – Noise Intrusion Assessment

The $L_{eq,15hr}$ (day period, 7am to 10pm) and $L_{eq,9hr}$ (night period, 10pm to 7am) ambient noise level descriptors have been calculated from the data, and are summarised in the following table.

Table 20 – Ambient Noise Levels – Unattended Noise Monitor

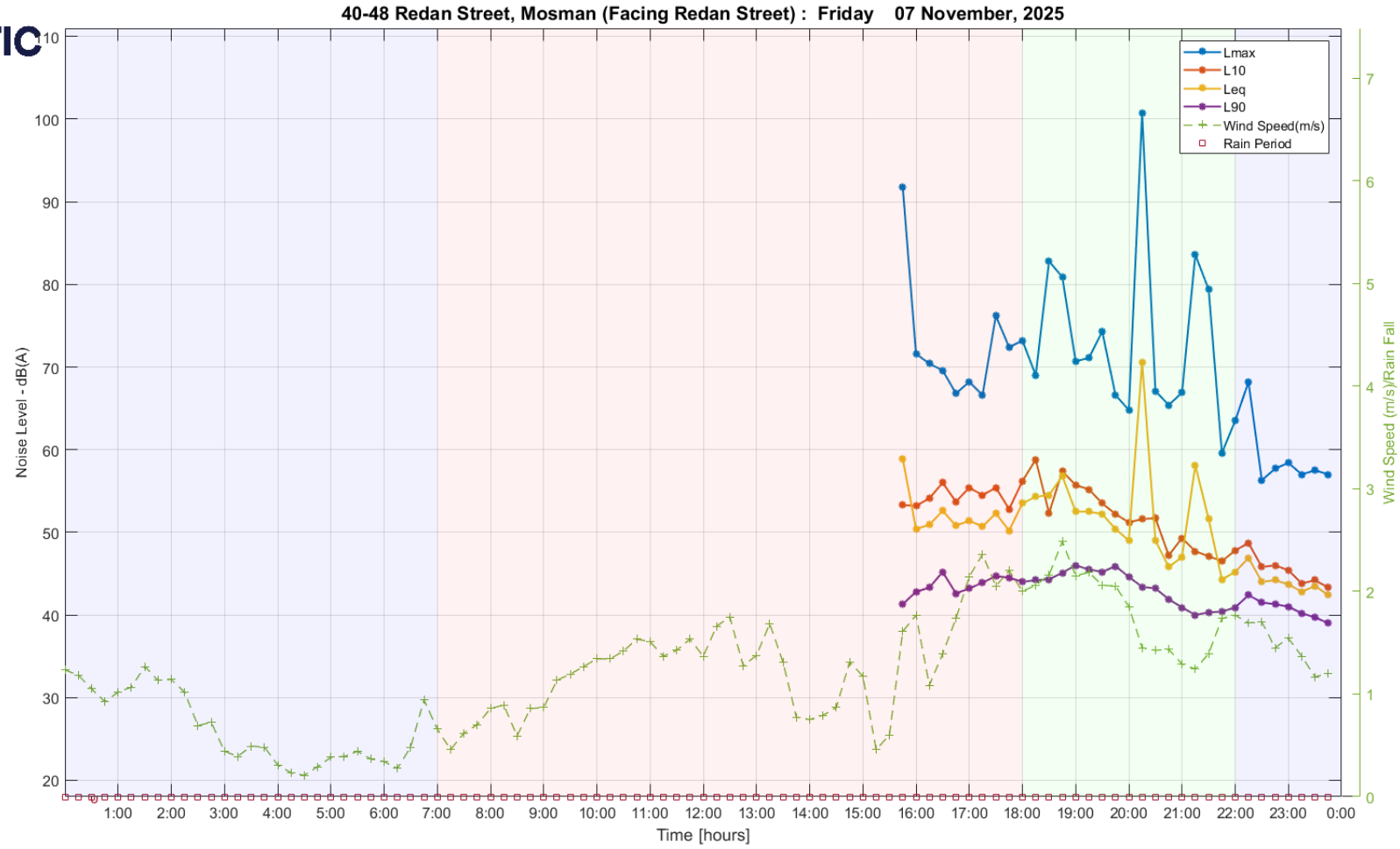
Location	Ambient Noise Level (dB(A) $L_{eq,period}$)	
	Day (7am to 10pm)	Night (10pm to 7am)
Front Facing Redan Street	54	54
Rear Logger	55	43

A.3 ATTENDED NOISE MEASUREMENT

Table 21 – Ambient Noise Levels – Attended Noise Measurement

Location	Ambient Noise Level (dB(A) $L_{eq,15min}$) Day
2m from kerb of Redan Street	54
2m from kerb of Redan Lane	42

A.4 UNATTENDED MONITORING DATA GRAPHS


40-48 Redan Street, Mosman (Facing Redan Street) : Friday 07 November, 2025
Lmax
L10
Leq
L90
Wind Speed(m/s)
Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
Time [hours]
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
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23:00
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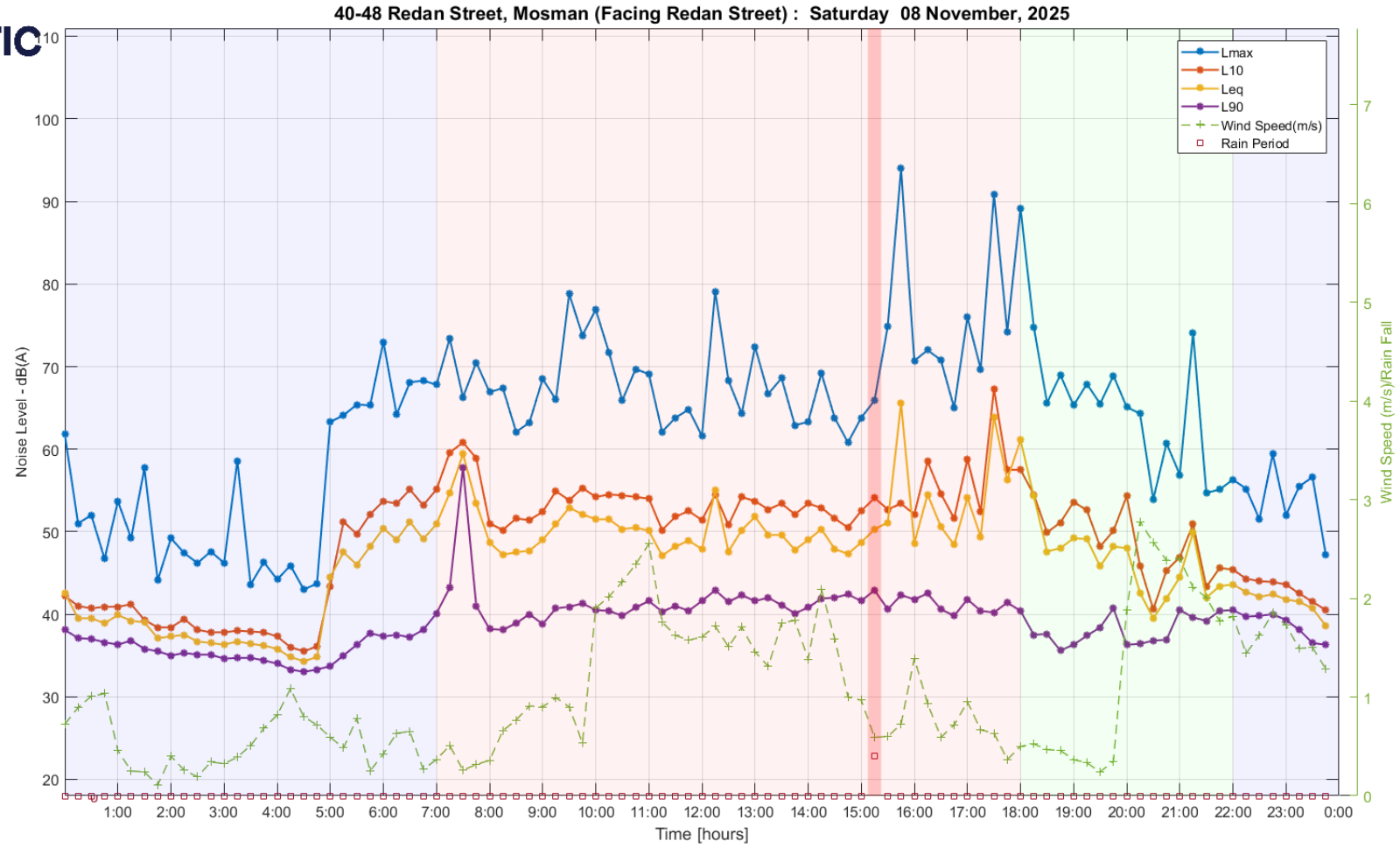
40-48 Redan Street, Mosman (Facing Redan Street) : Saturday 08 November, 2025
Lmax
L10
Leq
L90
Wind Speed(m/s)
Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
Time [hours]
110
100
90
80
70
60
50
40
30
20
7
6
5
4
3
2
1
0
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
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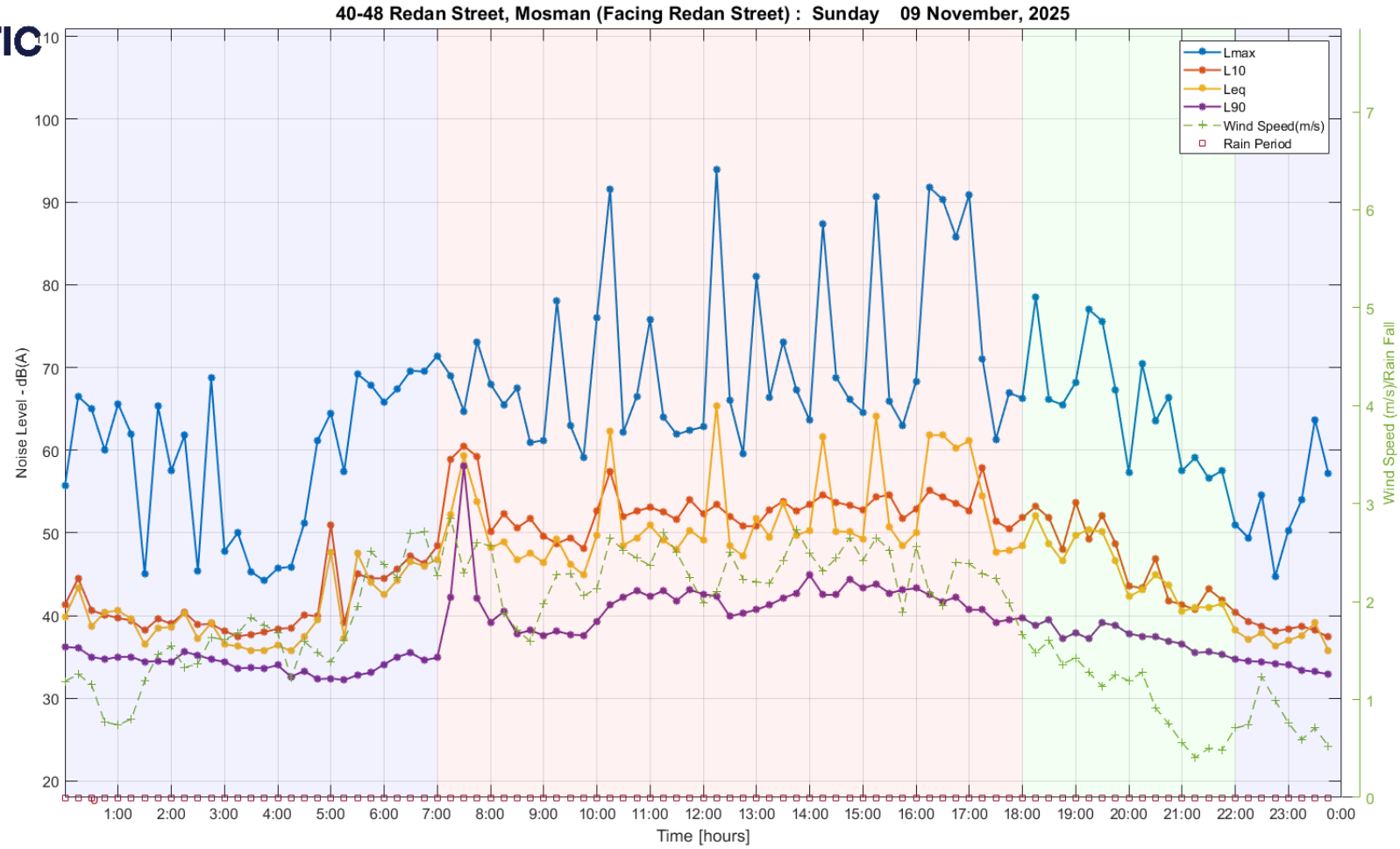
19:00
20:00
21:00
22:00
23:00
0:00


40-48 Redan Street, Mosman (Facing Redan Street) : Sunday 09 November, 2025
Lmax
L10
Leq
L90
Wind Speed(m/s)
Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
Time [hours]
110
100
90
80
70
60
50
40
30
20
7
6
5
4
3
2
1
0
1:00
2:00
3:00
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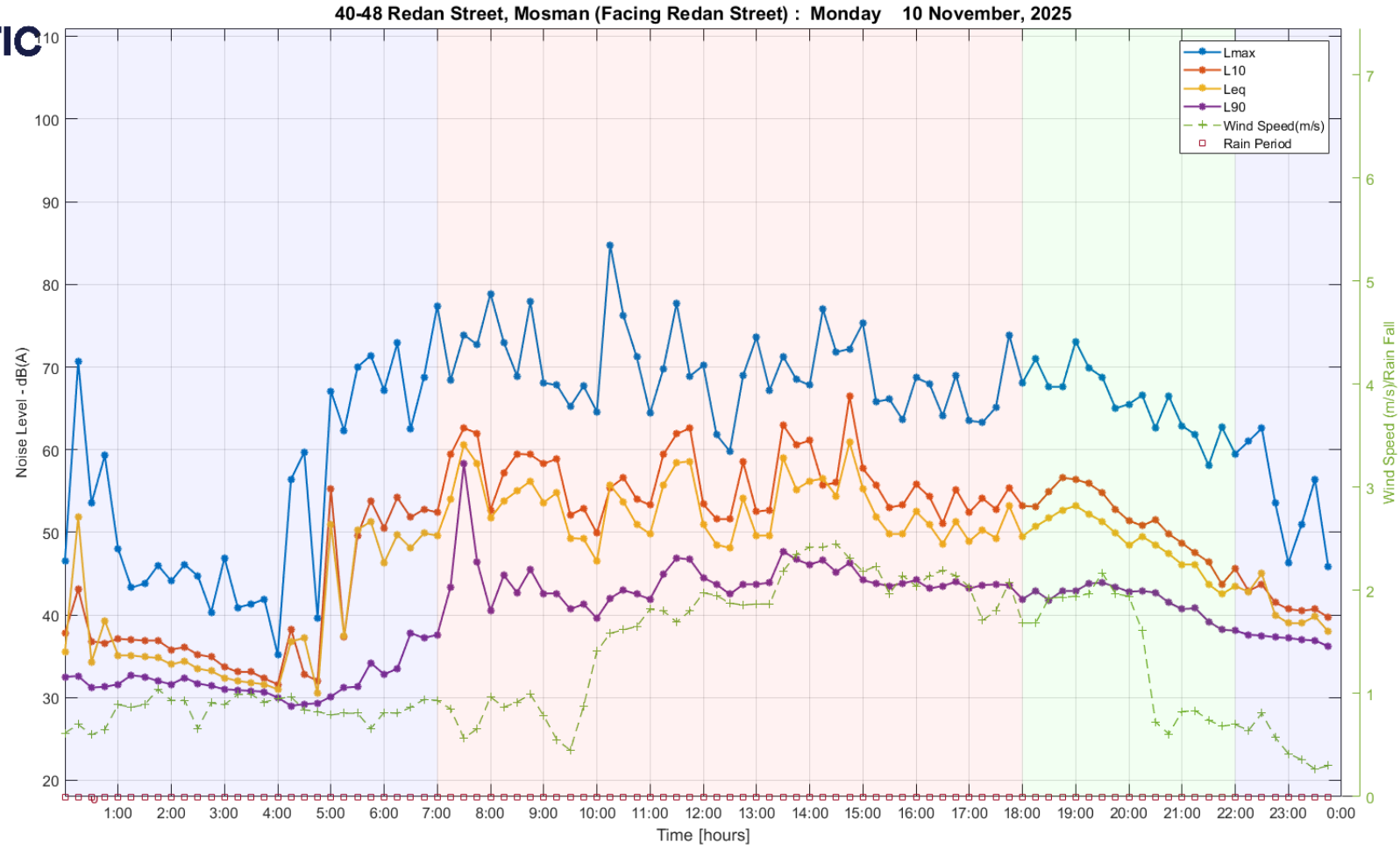
40-48 Redan Street, Mosman (Facing Redan Street) : Monday 10 November, 2025
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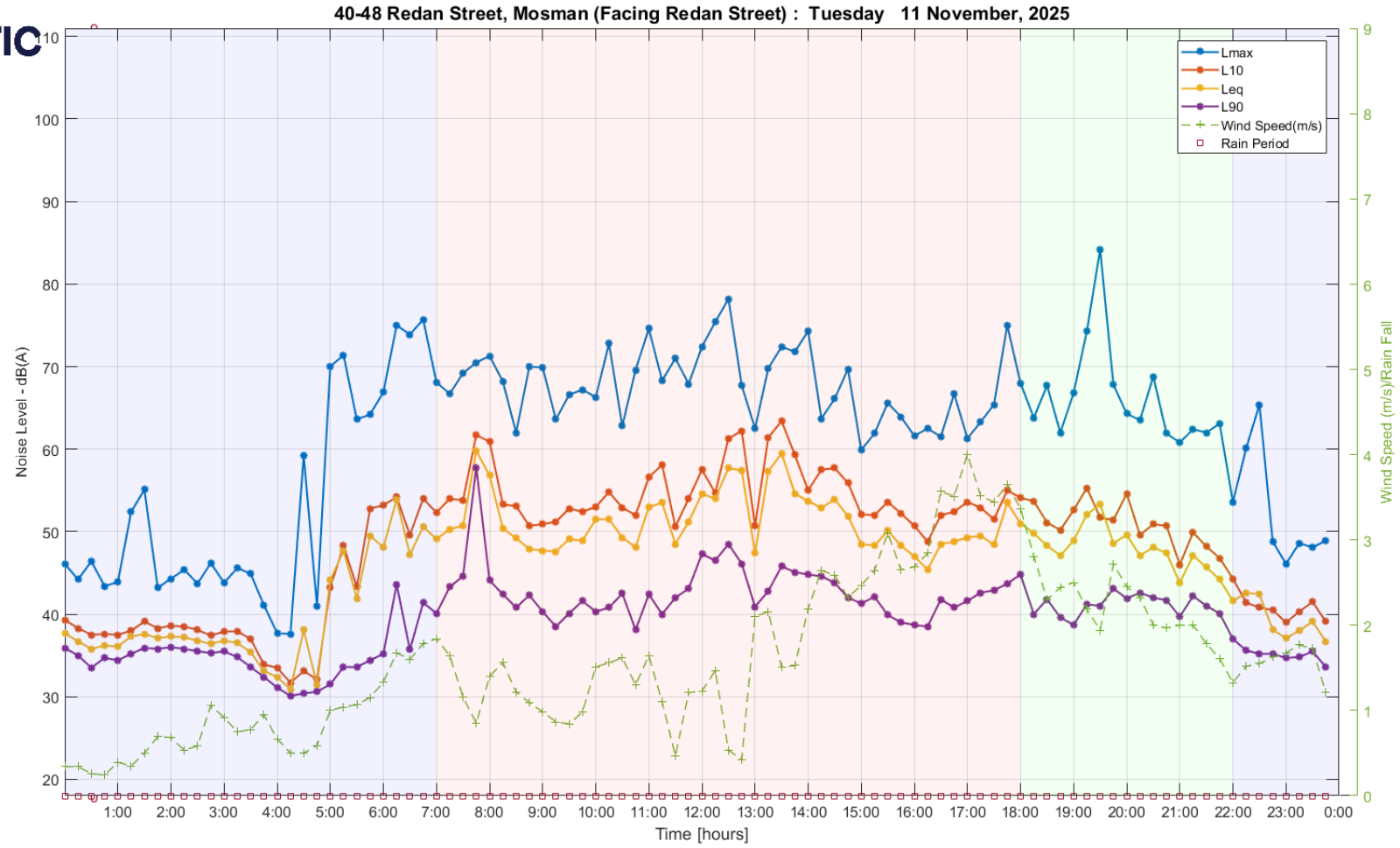
40-48 Redan Street, Mosman (Facing Redan Street) : Tuesday 11 November, 2025
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Wind Speed(m/s)
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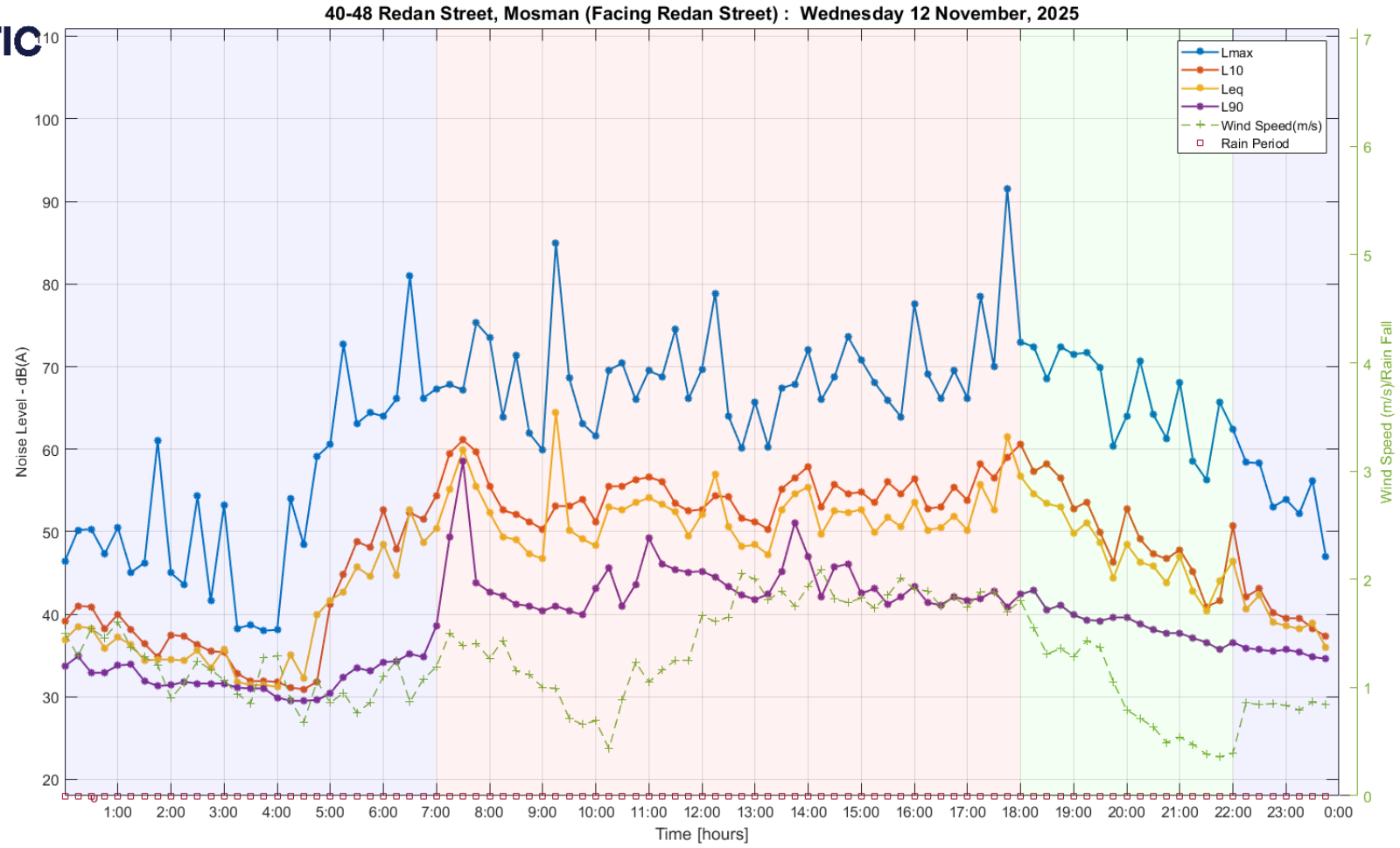
40-48 Redan Street, Mosman (Facing Redan Street) : Wednesday 12 November, 2025
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
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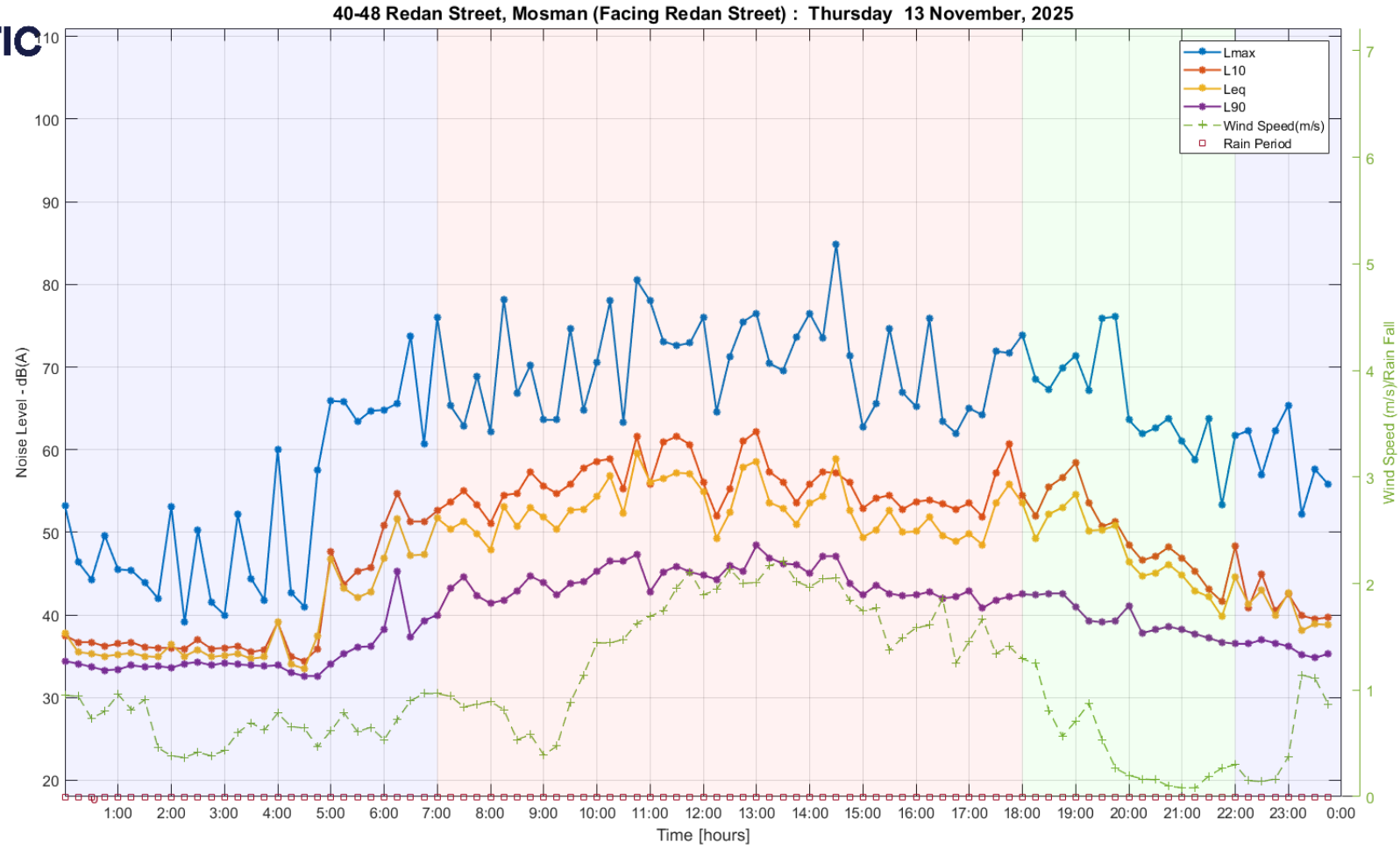
40-48 Redan Street, Mosman (Facing Redan Street) : Thursday 13 November, 2025
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Wind Speed(m/s)
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Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
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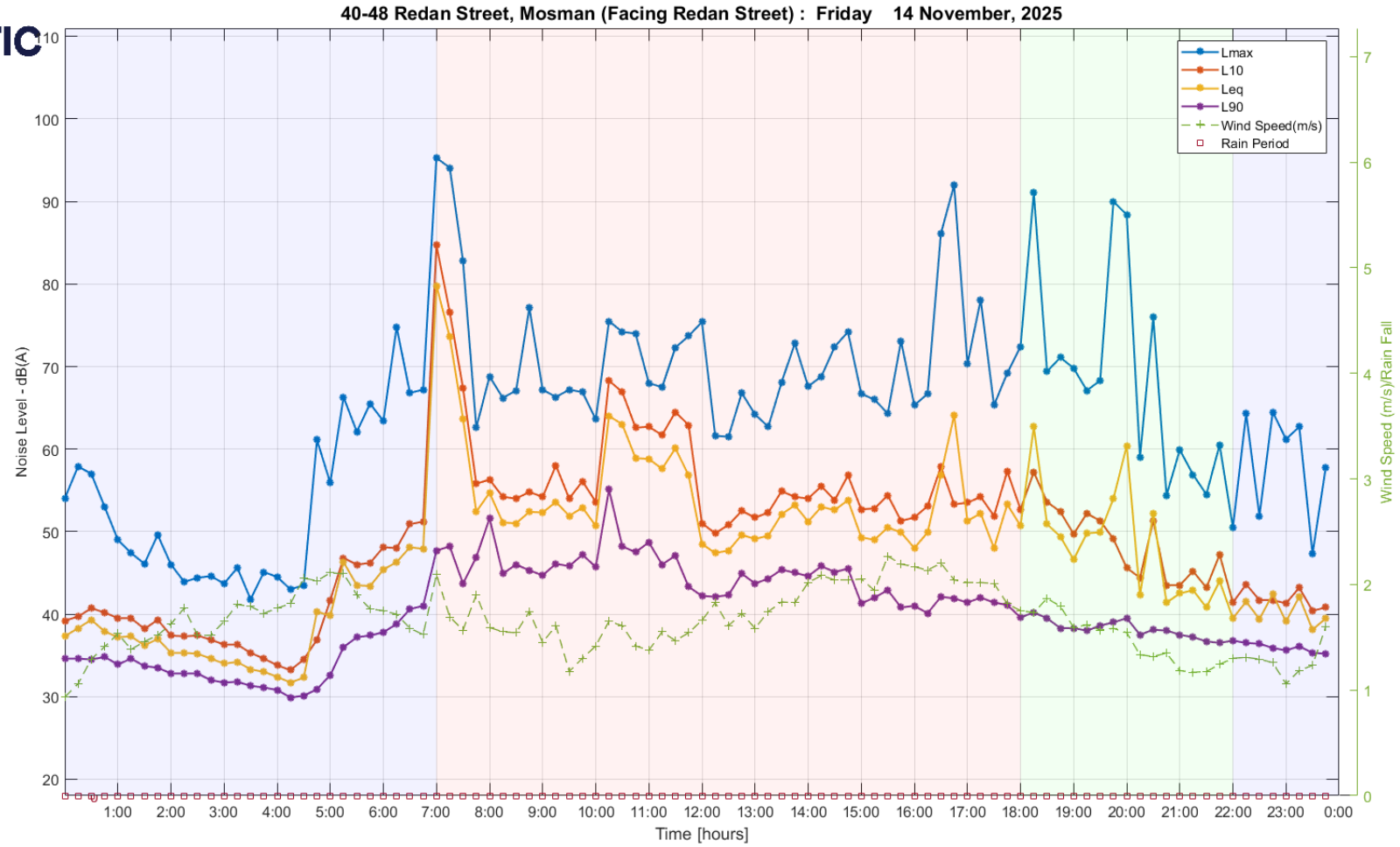
40-48 Redan Street, Mosman (Facing Redan Street) : Friday 14 November, 2025
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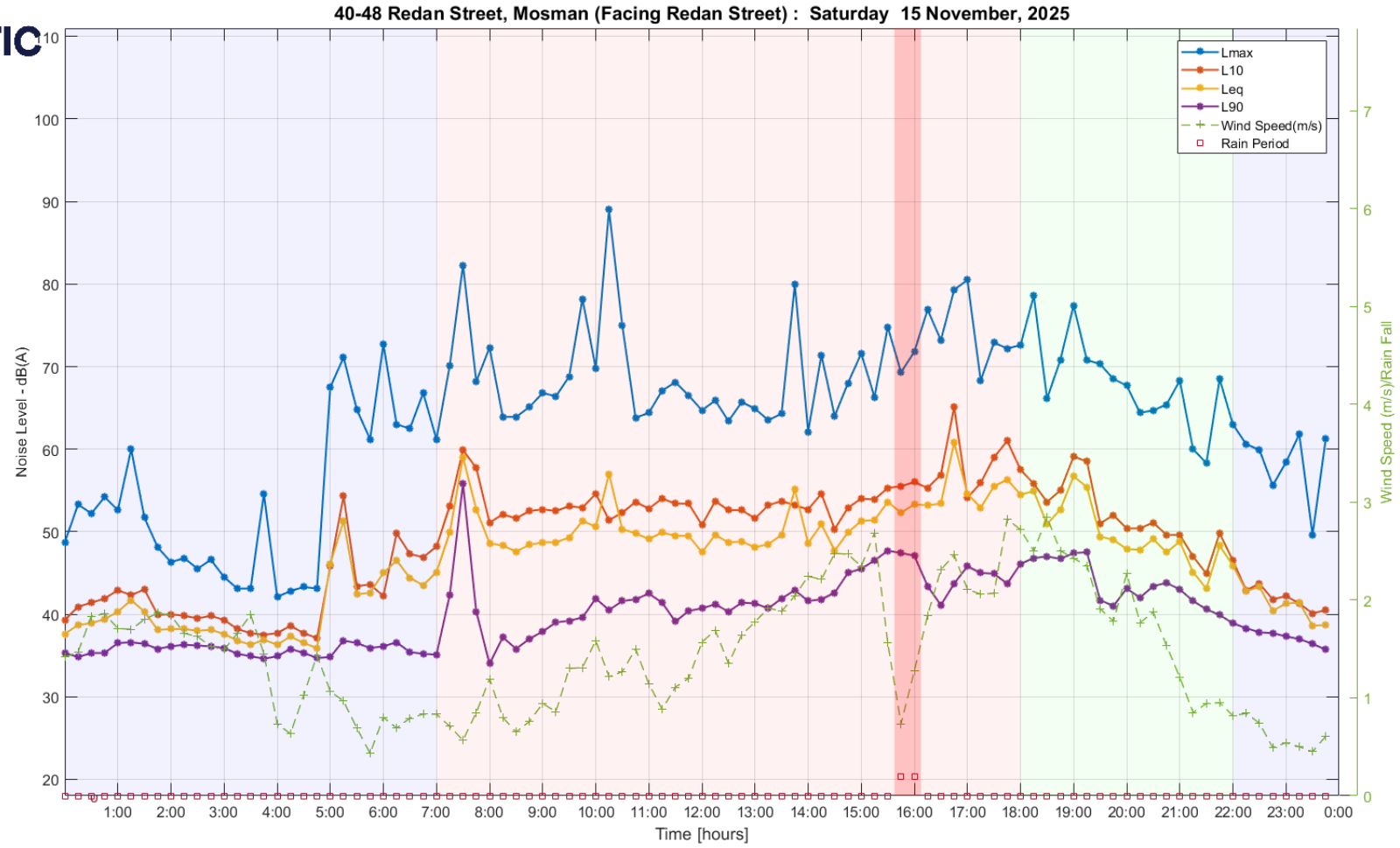
40-48 Redan Street, Mosman (Facing Redan Street) : Saturday 15 November, 2025
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Wind Speed(m/s)
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Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
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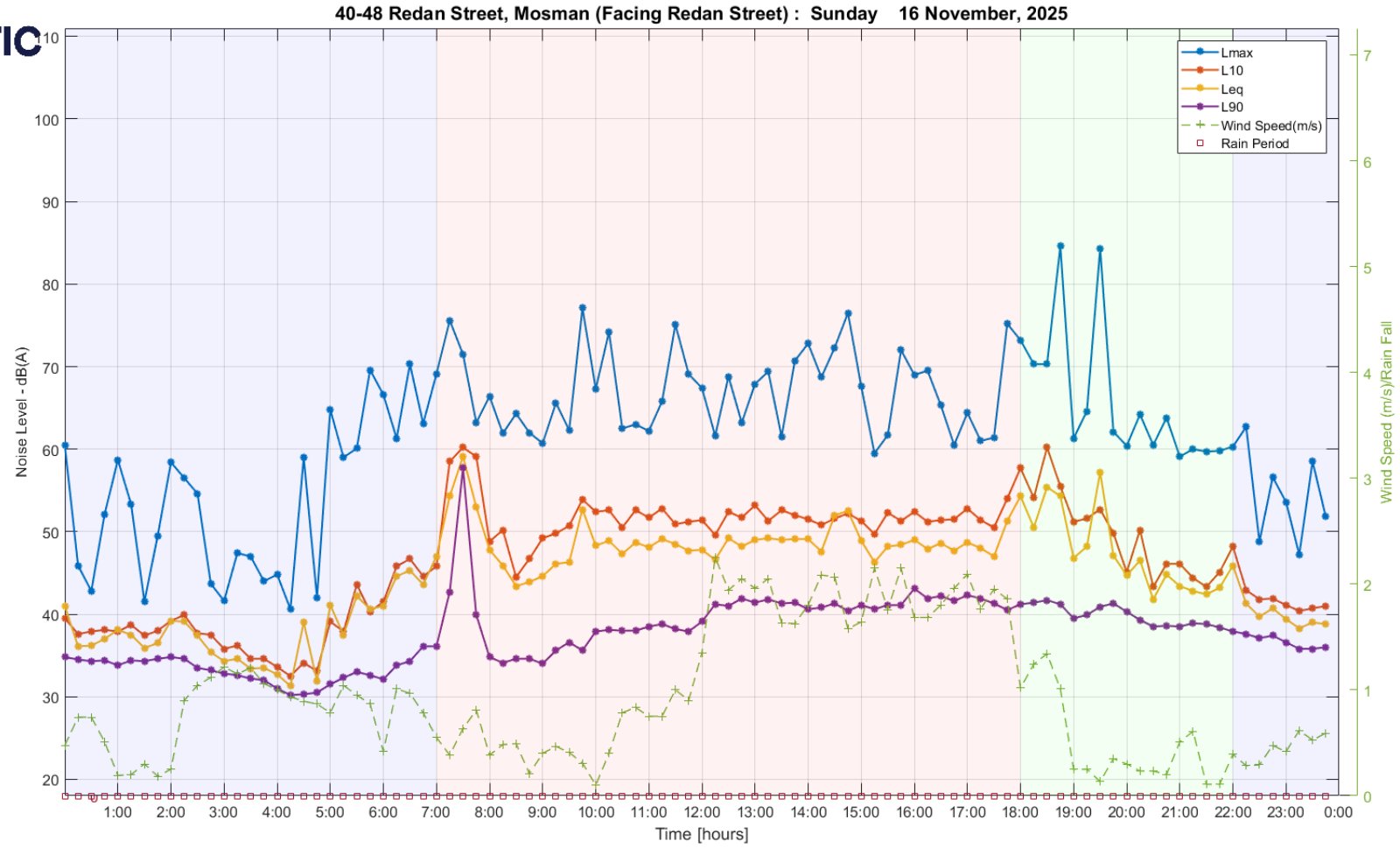
40-48 Redan Street, Mosman (Facing Redan Street) : Sunday 16 November, 2025
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Wind Speed(m/s)
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Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
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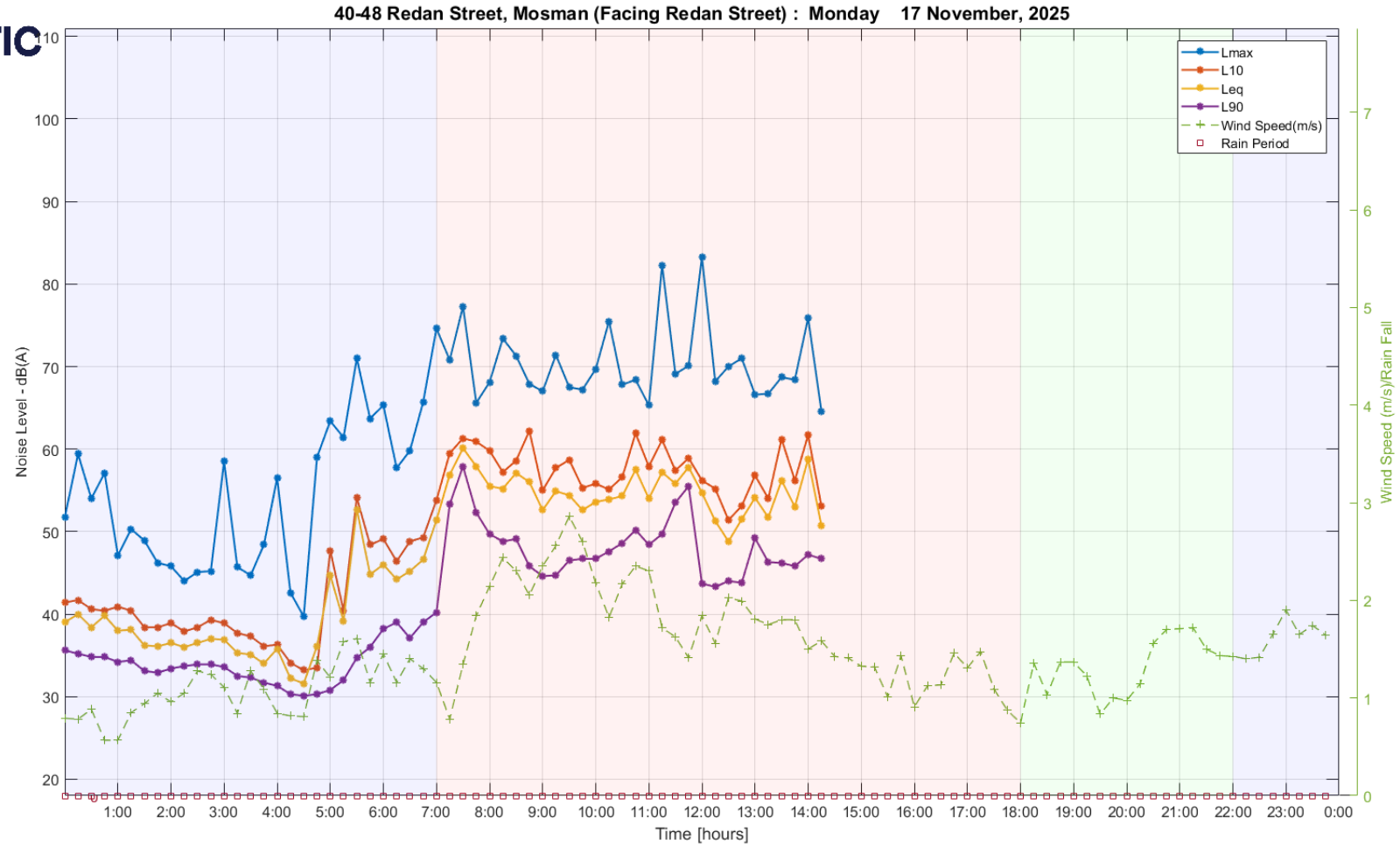
40-48 Redan Street, Mosman (Facing Redan Street) : Monday 17 November, 2025
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Wind Speed(m/s)
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Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
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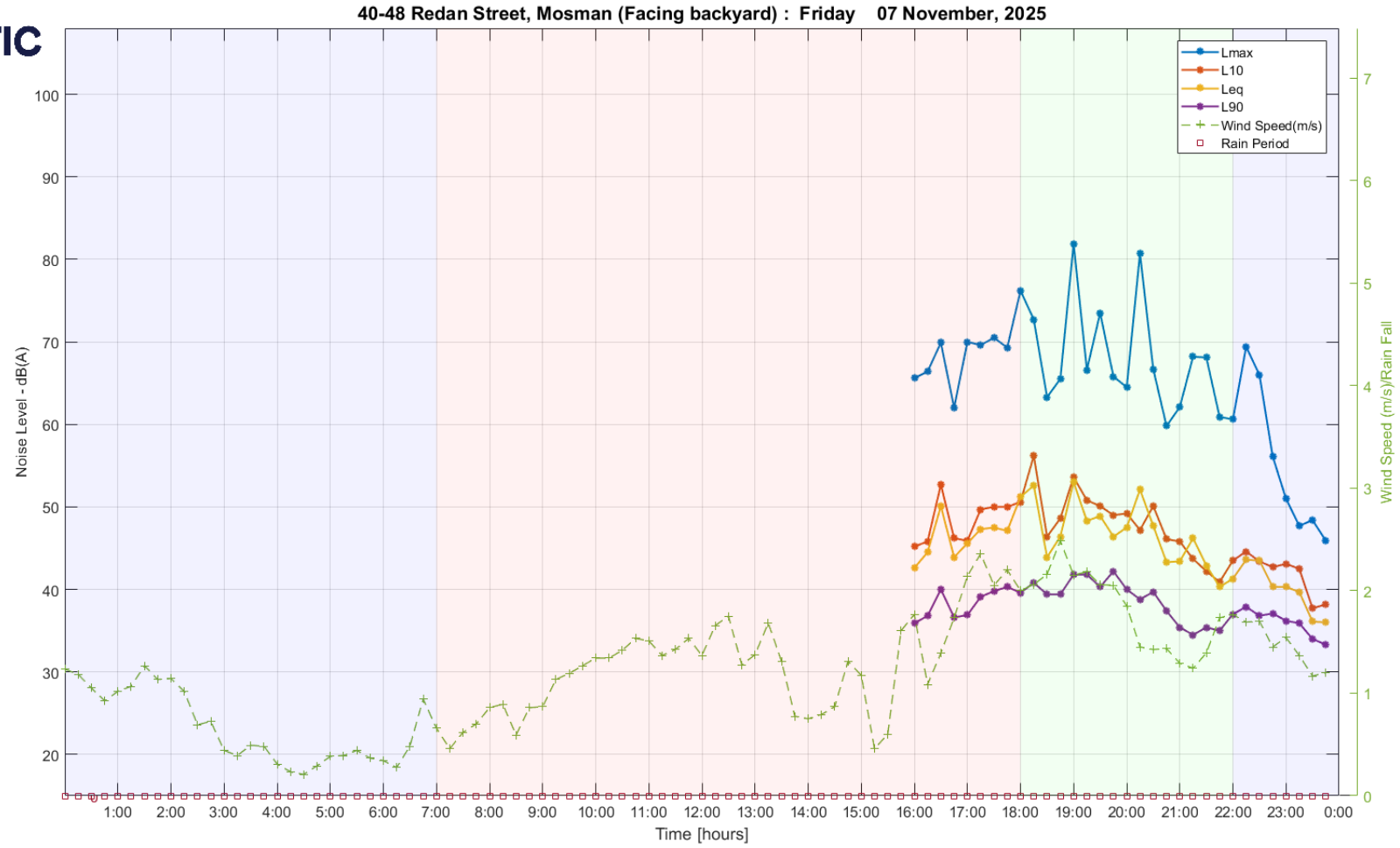
40-48 Redan Street, Mosman (Facing backyard) : Friday 07 November, 2025
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Wind Speed(m/s)
Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
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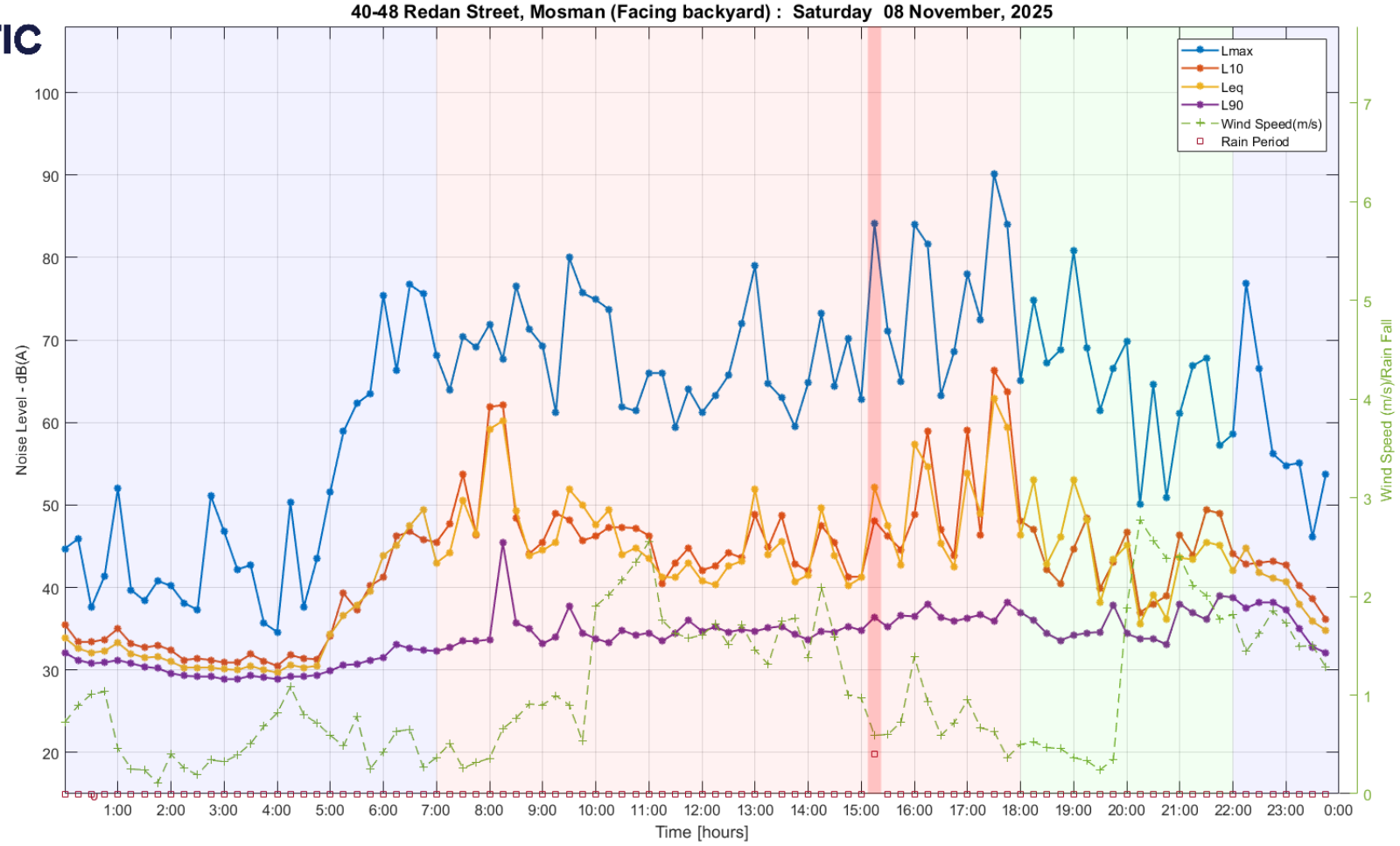
40-48 Redan Street, Mosman (Facing backyard) : Saturday 08 November, 2025
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Wind Speed(m/s)
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Noise Level - dB(A)
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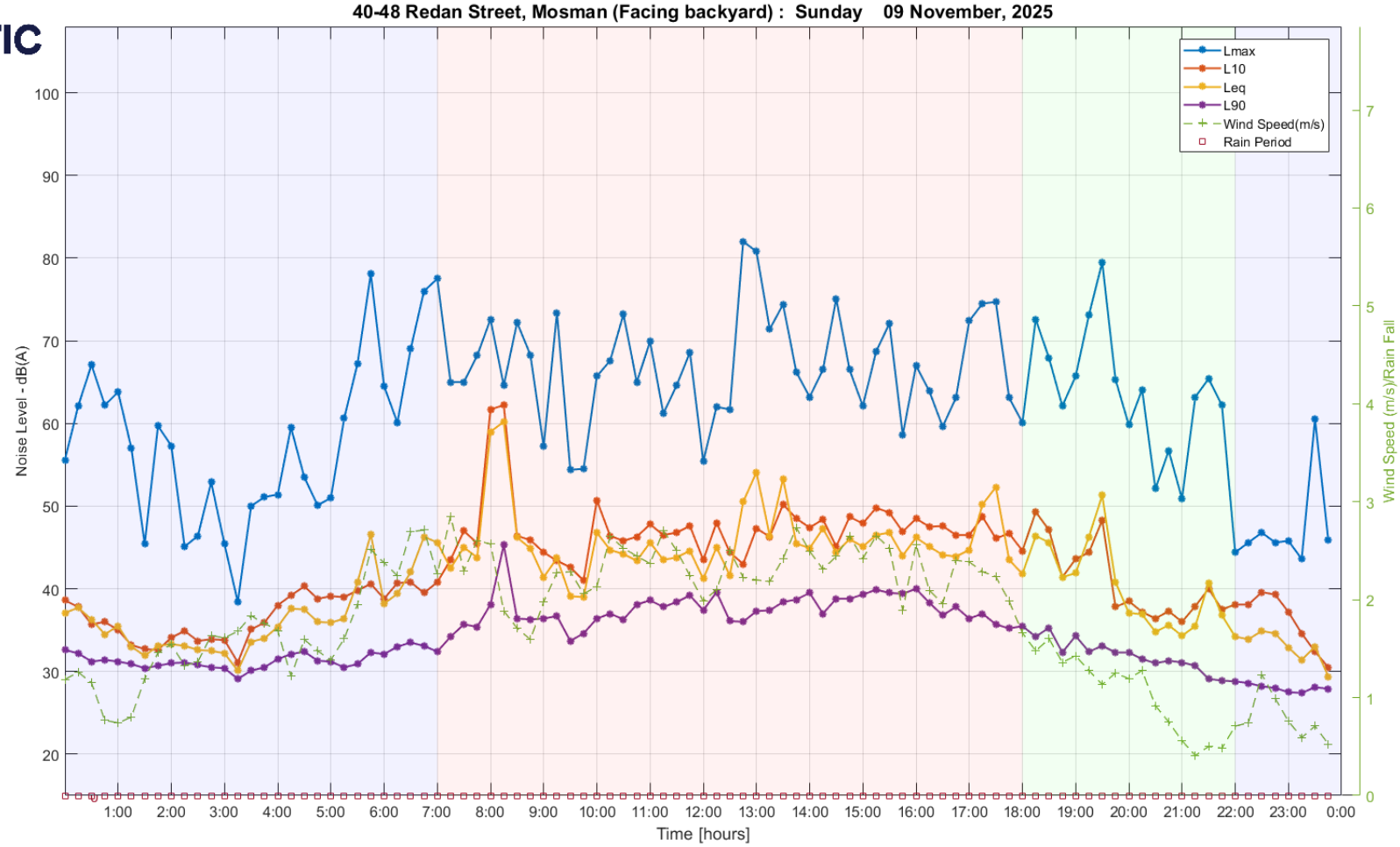
40-48 Redan Street, Mosman (Facing backyard) : Sunday 09 November, 2025
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Wind Speed(m/s)
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Noise Level - dB(A)
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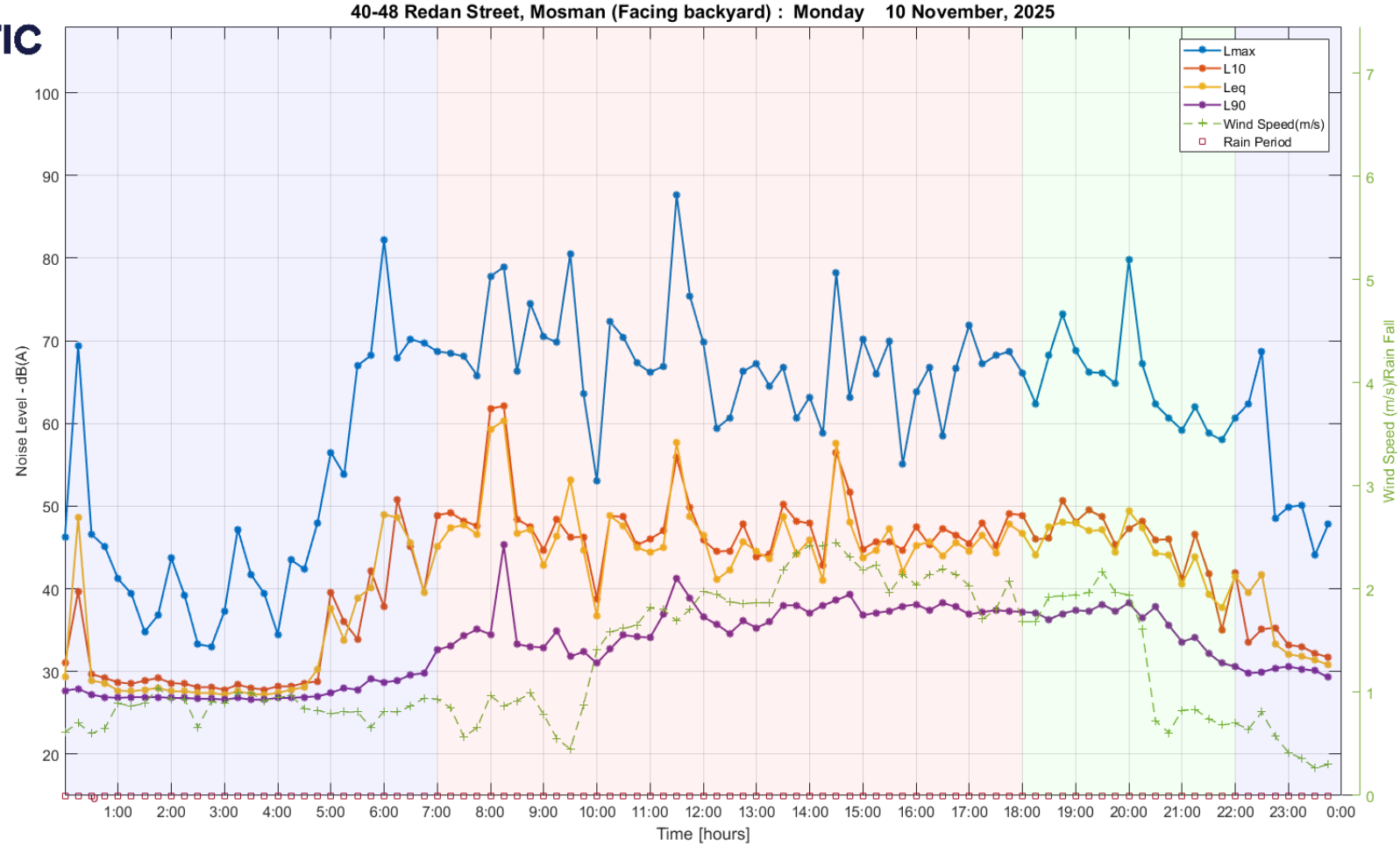
40-48 Redan Street, Mosman (Facing backyard) : Monday 10 November, 2025
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Noise Level - dB(A)
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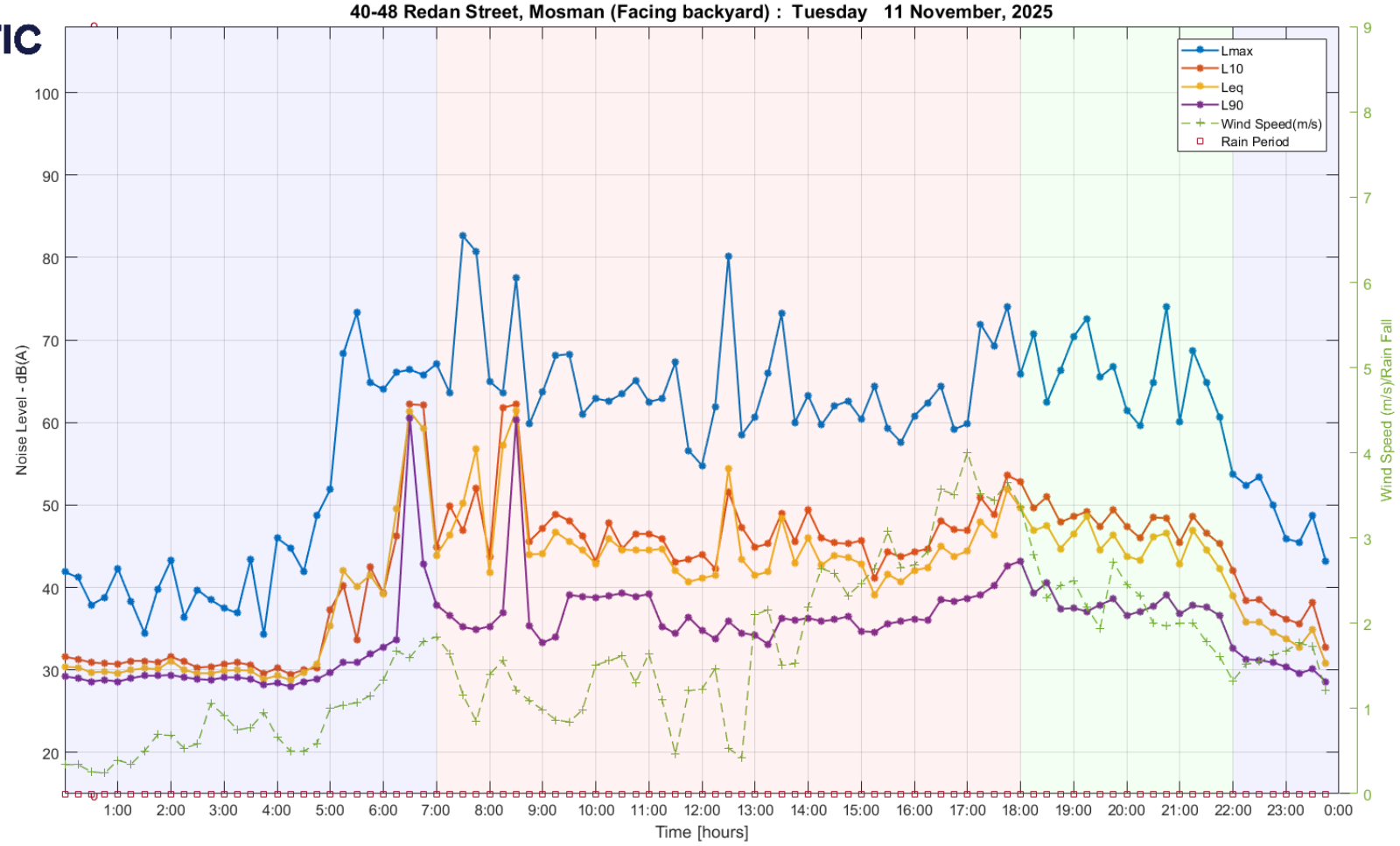
40-48 Redan Street, Mosman (Facing backyard) : Tuesday 11 November, 2025
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Wind Speed(m/s)
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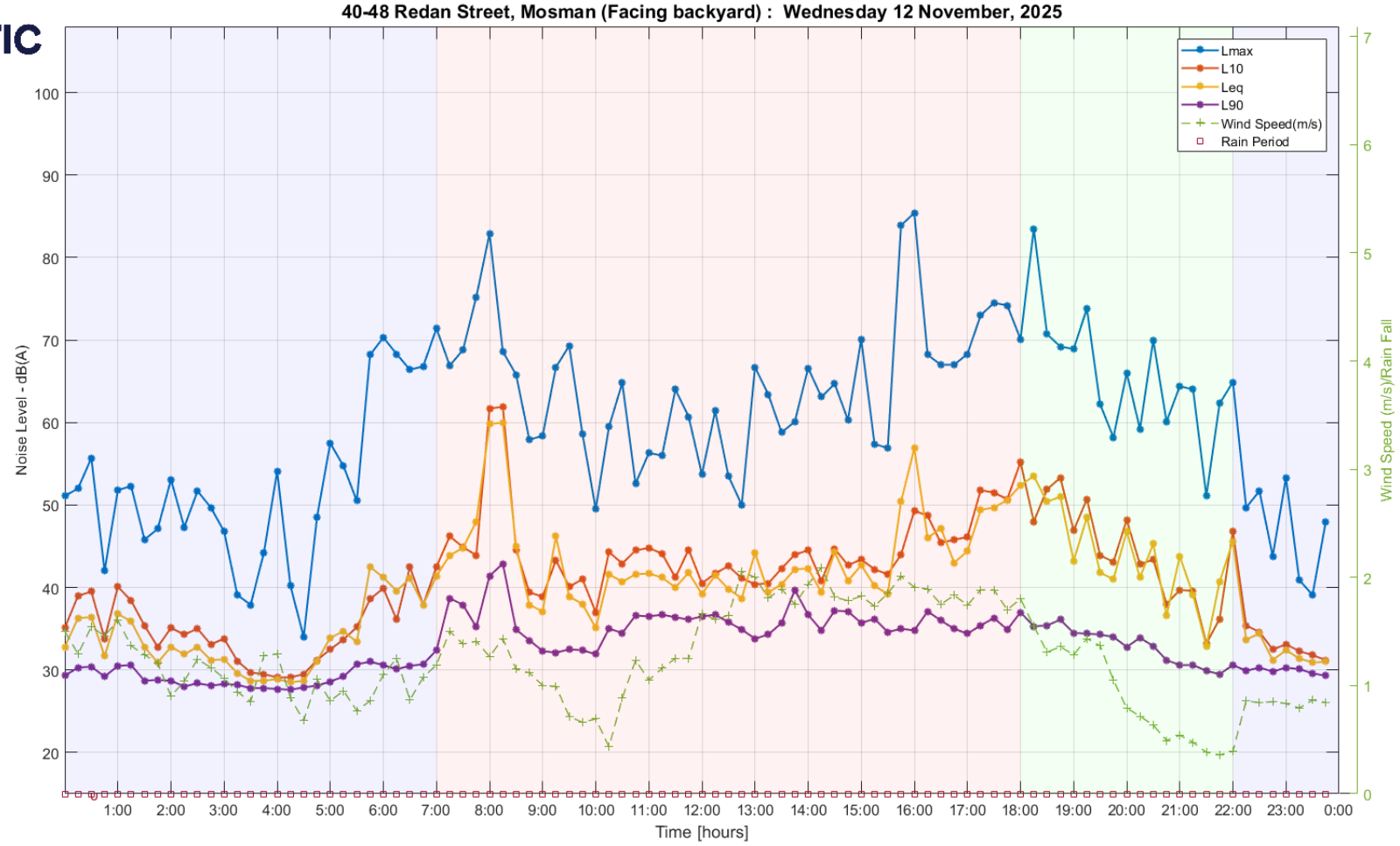
40-48 Redan Street, Mosman (Facing backyard) : Wednesday 12 November, 2025
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Wind Speed(m/s)
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Wind Speed (m/s)/Rain Fall
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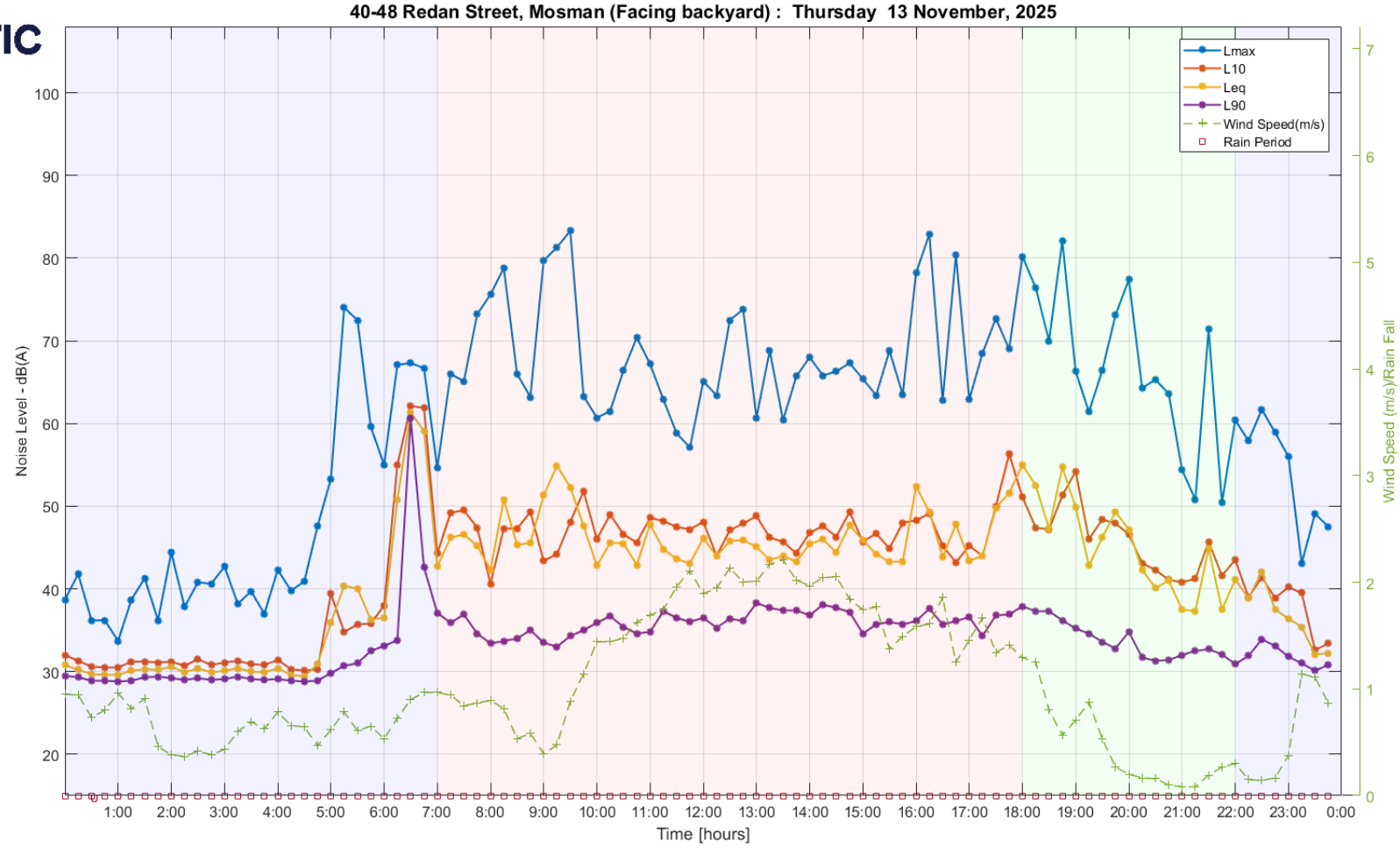
40-48 Redan Street, Mosman (Facing backyard) : Thursday 13 November, 2025
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Wind Speed(m/s)
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Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
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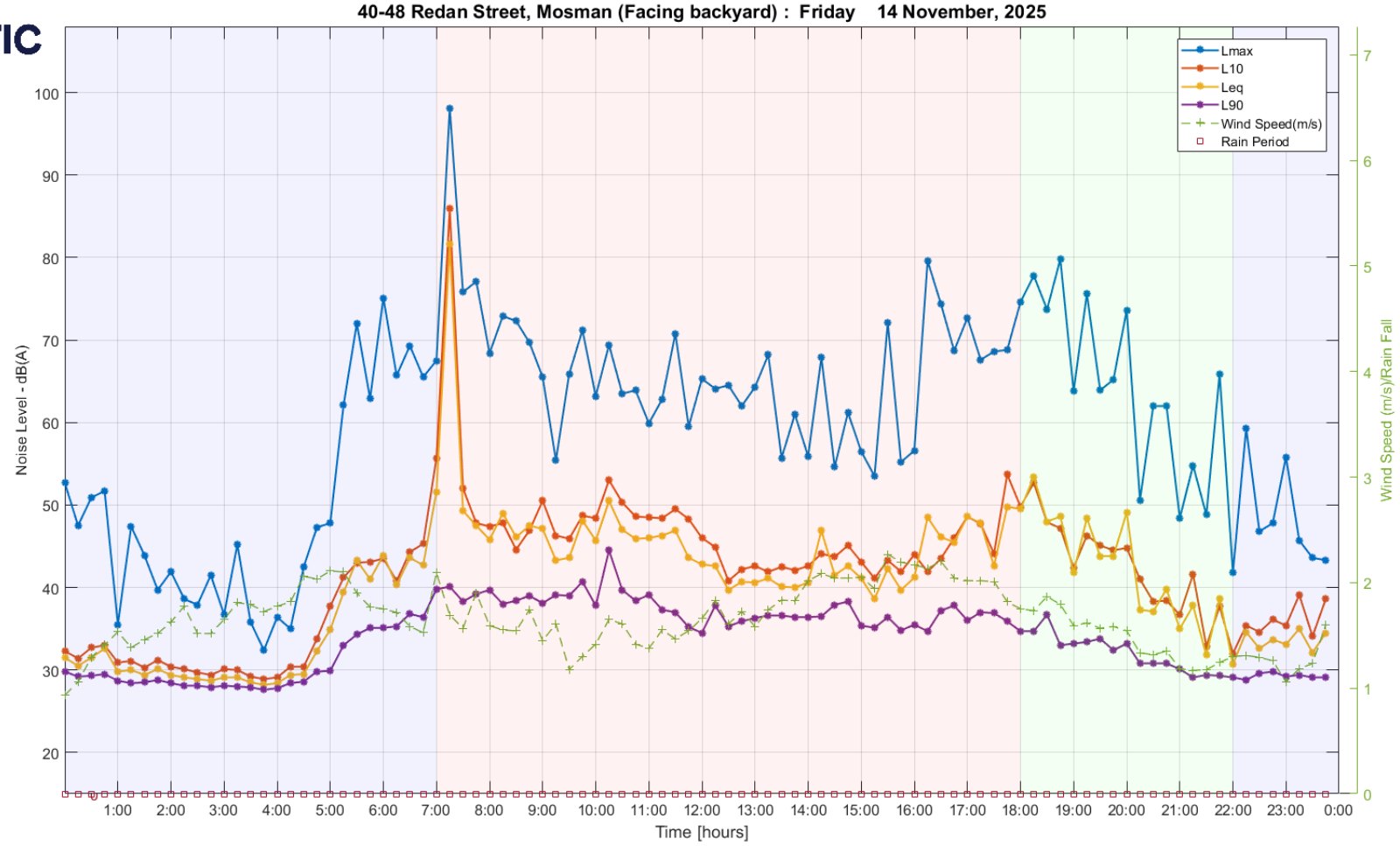
40-48 Redan Street, Mosman (Facing backyard) : Friday 14 November, 2025
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Wind Speed(m/s)
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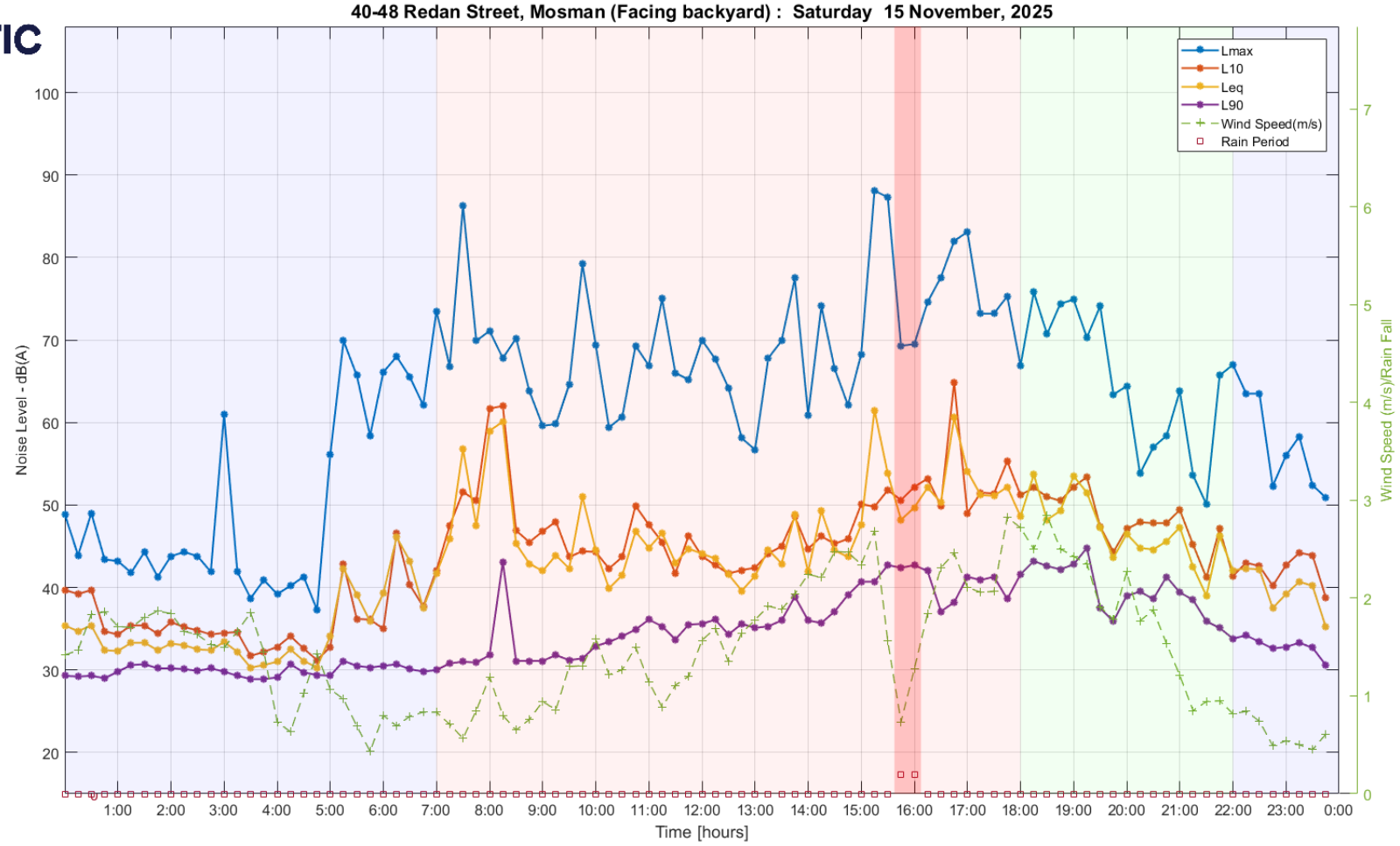
40-48 Redan Street, Mosman (Facing backyard) : Saturday 15 November, 2025
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Wind Speed(m/s)
Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
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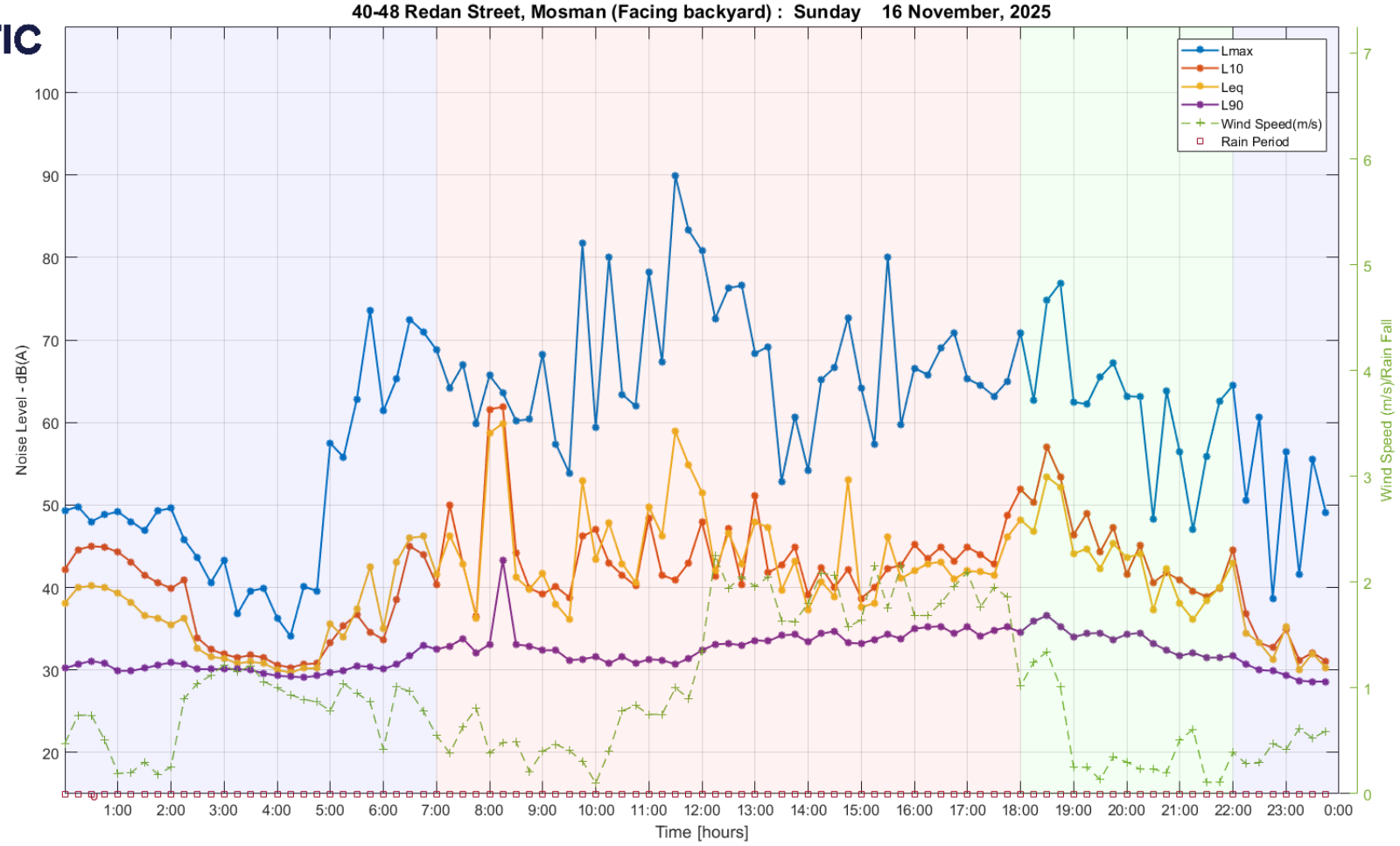
40-48 Redan Street, Mosman (Facing backyard) : Sunday 16 November, 2025
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Wind Speed(m/s)
Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
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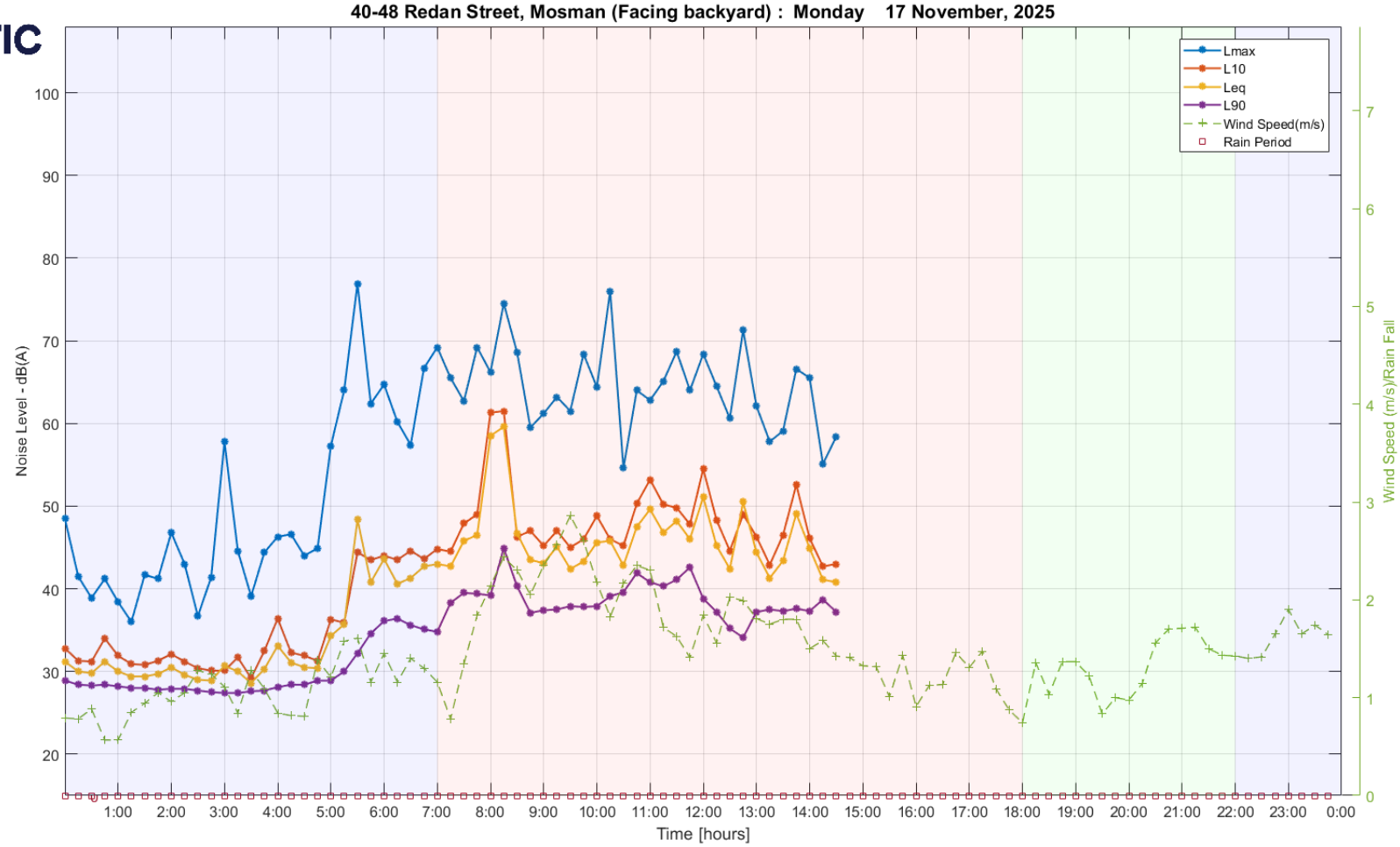
40-48 Redan Street, Mosman (Facing backyard) : Monday 17 November, 2025
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Wind Speed(m/s)
Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
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APPENDIX B EPA NOISE POLICY FOR INDUSTRY TRIGGER LEVELS

Project specific assessment trigger levels have been determined for each noise source applying at the identified potentially most impacted receivers.

B.1 NPI TRIGGER LEVELS

The NPI requires noise impacts at residential receivers to be assessed in 3 ways:

- Whether the emitted noise is unreasonably loud relative to ambient background noise. (which the EPA calls the "intrusiveness" trigger level).
- Whether the noise emitted is unreasonably loud in an absolute sense, and consistent with surrounding land use and environment. ("amenity" trigger level)
- For night noise emissions, whether discrete noise events are likely to adversely impact sleep ("maximum noise level" trigger levels).

For other receiver types only the amenity trigger level is relevant.

B.1.1 Intrusiveness

The $L_{eq,15min}$ descriptor is used for the intrusiveness trigger level, and is set at a level that is 5dB(A) above the rating background noise level for the relevant period.

B.1.2 Amenity

Table 2.2 of the NPI (repeated below) sets out acceptable noise levels for various receiver types.

There are 3 categories of residential receivers - rural, suburban, urban. The nearest residential receivers to the subject site are categorised as "suburban" receivers. Categories for non-residential uses are also indicated in the table.

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

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

NPI *Table 2.2: Amenity* Noise Levels			
Receiver	***Noise Amenity Area***	***Time of Day***	***Recommended* Amenity Noise Level L_{Aeq}**
Residential	*Rural*	*Day*	*50*
		Evening	*45*
		Night	*40*
	Suburban	*Day*	*55*
		Evening	*45*
		Night	*40*
	Urban	*Day*	*60*
		Evening	*50*
		Night	45
Hotels motels caretakers' quarters holiday accommodation permanent resident caravan parks	*See column 4*	*See column 4*	*5 dB(A) above the recommended amenity noise level for a residence for the relevant noise amenity area and time of day*
School classroom – internal	*All*	*Noisiest 1-hour period when in use*	*35 (see notes for table)*
Hospital ward internal external	*All* *All*	*Noisiest 1-hour* *Noisiest 1-hour*	*35* *50*
Place of worship – internal	*All*	*When in use*	*40*
Area specifically reserved for passive recreation (e.g. national park)	*All*	*When in use*	*50*
Active recreation area (e.g. school playground golf course)	*All*	*When in use*	55
Commercial premises	*All*	*When in use*	*65*
Industrial premises	*All*	*When in use*	*70*
Industrial interface (applicable only to residential noise amenity areas)	*All*	*All*	*Add 5 dB(A) to recommended noise amenity area*

Notes: The recommended amenity noise levels refer only to noise from industrial sources. However, they refer to noise from all such sources at the receiver location, and not only noise due to a specific project under consideration. The levels represent outdoor levels except where otherwise stated.

Types of receivers are defined as follows:

• rural residential – see Table 2.3

• suburban residential – see Table 2.3

• urban residential – see Table 2.3

• industrial interface – an area that is in close proximity to existing industrial premises and that extends out to a point where the existing industrial noise from the source has fallen by 5 dB or an area defined in a planning instrument. Beyond this region the amenity noise level for the applicable category applies. This category may be used only for existing situations (further explanation on how this category applies is outlined in Section 2.7)

• commercial – commercial activities being undertaken in a planning zone that allows commercial land uses

• industrial – an area defined as an industrial zone on a local environment plan; for isolated residences within an industrial zone the industrial amenity level would usually apply.

Time of day is defined as follows:

• day – the period from 7 am to 6 pm Monday to Saturday or 8 am to 6 pm on Sundays and public holidays

• evening – the period from 6 pm to 10 pm

• night – the remaining periods.

(These periods may be varied where appropriate, for example, see A3 in Fact Sheet A.)

In the case where existing schools are affected by noise from existing industrial noise sources, the acceptable L_{Aeq} noise level may be increased to 40 dB $L_{Aeq(1hr)}$.

B.1.3 Maximum Noise Level Assessment

The purpose of this assessment is to identify whether discrete, night time noise events have the potential to produce adverse sleep impacts.

Section 2.5 of NPI recommends the following procedure to assess the potential for adverse sleep 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 (L_{90}) plus 5 dB, whichever is the greater, and/or
- L_{max} 52 dB(A) or the prevailing RBL (L_{90}) plus 15 dB, whichever is the greater,

a detailed maximum noise level event assessment should be undertaken.

The detailed assessment should cover the maximum noise level, the extent to which the maximum noise level exceeds the rating background noise level, and the number of times this happens during the night-time period. Some guidance on possible impact is contained in the review of research results in the NSW Road Noise Policy.

Other factors that may be important in assessing the extent of impacts on sleep include:

- *how often high noise events will occur*
- *the distribution of likely events across the night-time period and the existing ambient maximum events in the absence of the subject development*
- *whether there are times of day when there is a clear change in the noise environment (such as during early-morning shoulder periods)*
- *current scientific literature available at the time of the assessment regarding the impact of maximum noise level events at night.*

Maximum noise level event assessments should be based on the L_{AFmax} descriptor on an event basis under 'fast' time response. The detailed assessment should consider all feasible and reasonable noise mitigation measures with a goal of achieving the above trigger levels.

B.2 PROJECT SPECIFIC TRIGGER LEVELS

The following table summarises the trigger levels applying at each of the identified "most impacted" receivers. These have been determined based on the NPI methodology described above and the measured rating background noise levels.

The trigger levels in bold indicate the most stringent trigger level at each location.

Table 22 – Project Specific Trigger Levels

Location/Receiver Type	Time	RBL dB(A) L_{90}	Trigger Noise Level (dB(A) $L_{eq,15min}$)		
			Intrusiveness	Amenity	Max Event
R1	Day	34	**39**	53	N/A
	Evening	32	**37**	43	N/A
	Night	30	**35**	38	**40 L_{eq}** **52 L_{max}**
R2-R5	Day	40	45	53	N/A
	Evening	38	43	**43**	N/A
	Night	32	**37**	38	**40 L_{eq}** **52 L_{max}**

Project trigger levels are highlighted in bold.