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154-158 Pacific Parade, Dee Why

Noise Impact Assessment

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1 INTRODUCTION

This report has been prepared to assess noise impacts associated with the proposed mixed-use development located at 154-158 Pacific Parade, Dee Why.

Impacts assessed include:

- Impacts on occupant amenity from identified nearby environmental noise sources:
    - Traffic noise
    - Commercial noise (fuel station, mechanic)
- Construction noise and vibration emissions
- Operational noise emissions
- Noise impacts from additional traffic on nearby public roads generated by the development.

The subject site and local context are indicated in Figure 1.

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

2 REFERENCED DOCUMENTS

2.1.1 Background Information Used

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

- Architectural drawings prepared by Platform Architects (Revision P2, dated 17/10/24)
- Transport Assessment Report prepared by PDC Consultants (ref: 0818r01v01)

2.1.2 Guidelines

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

- Northern Beaches Council (Warringah) Development Control Plan ("**DCP**") 2011
- NSW Department of Planning - Development Near Rail Corridors and Busy Roads - Interim Guideline ("**DNRCBR**") 2008
- NSW EPA – 'Noise Policy for Industry' ("**NPfI**") October 2017
- Liquor and Gaming NSW ("**L&GNSW**") Standard Requirements
- NSW EPA – 'Interim Construction Noise Guideline' ("**IGNG**") July 2009
- NSW EPA – 'Road Noise Policy" ("**RNP**") March 2011

3 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 NPfI 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 NPfI unless noted otherwise)

* Unless nominated otherwise.

4 SITE DESCRIPTION AND THE PROPOSAL

The project site is located within a local centre zone (E1) at 154-158 Pacific Parade, Dee Why and consists of:

- 2 basement levels and associated car lift for parking
- Ground floor restaurant and retail space.
- 3 storeys of residential apartments above.

The predominant external noise sources impacting the site are summarised below:

- Local roads - Noise from traffic movements along Pacific Parade and Griffin Road which carries moderate levels of traffic, and The Strand which serves as an access lane to the adjacent United Petrol Station and Mechanic.
- The site is adjacent to commercial development including a petrol station and mechanic to the west.

The proposed hours of operation for the retail/restaurant components of the development are assumed to be from 7am-10pm.

4.1 SENSITIVE RECEIVERS

The following table lists the nearest/potentially most impacted sensitive receivers surrounding the site. An aerial photo of the site indicating nearby noise sensitive receivers and measurement locations is presented in Figure 1 below.

Table 1 – Surrounding Sensitive Receivers

Receiver (Refer Figure 1)	Receiver Type	Comment
R1	Residential	Existing multi-storey residential apartments to the north-west
R1	Residential	Existing multi-storey residential apartments to the east
R1	Residential	Existing two-storey residential dwellings south-east
R1	Residential	Existing multi-storey residential apartments to the south
C1	Commercial	Existing United Petrol Station and Shore Dee Why Automotive Repair mechanic to the west

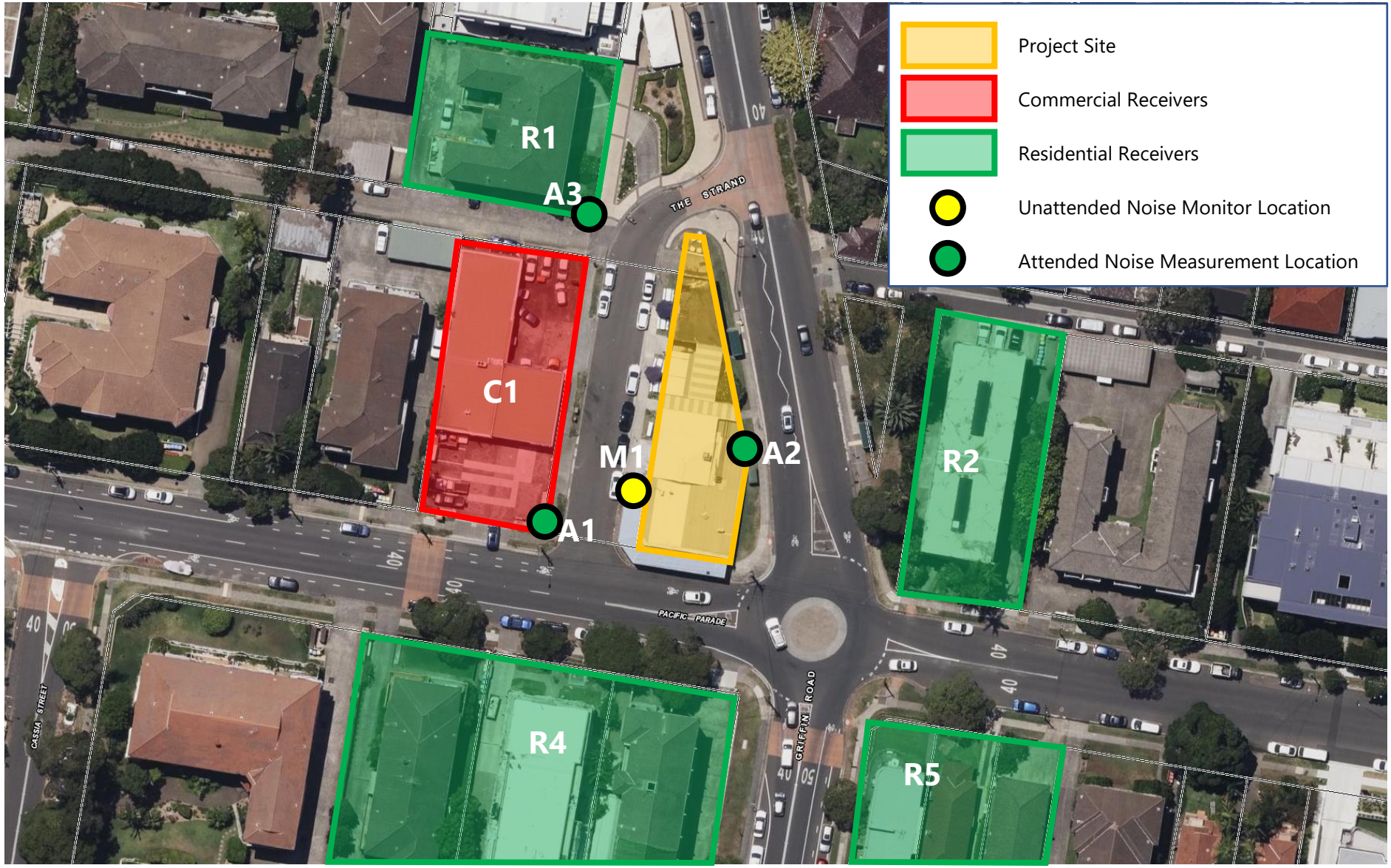


Figure 1 – Site Map, Monitoring Locations and Surrounding Receivers (source: NSW SIX Maps)

5 AMBIENT NOISE SURVEY SUMMARY

Long term unattended noise monitoring was conducted to quantify the existing acoustic environment at the project site in September 2024.

Unattended measurements have been undertaken as per the procedures outlines in Fact Sheet A & B of the NSW EPA Noise Policy for Industry. Detailed graphs of the measured noise levels from unattended noise monitoring are presented in the appendices of this report.

Rating background noise levels and traffic noise levels have been summarised in the tables below. Appendix A provides detailed information on the selected monitoring locations, duration and calculation procedures required for the assessment, as well as detailed graphs of the measured noise levels from each monitor.

Table 2 – Measured Rating Background Noise Levels

Monitor Location	Rating Background Noise Level - Time of Day		
	Daytime (7am-6pm)	**Evening (6pm-10pm)**	**Night (10pm-7am)**
M1	53 dB(A) $L_{90(period)}$	51 dB(A) $L_{90(period)}$	48 dB(A) $L_{90(period)}$

Table 3 – Measured Traffic Noise Levels

Monitor Location	Traffic Noise Level dB(A) $L_{eq,period}$	
	Daytime (7am-10pm)	**Night (10pm-7am)**
M1	62 dB(A) $L_{eq(1\text{-}hr)}$ 60 $L_{eq(15\text{-}hr)}$	58 dB(A) $L_{eq(1\text{-}hr)}$ 55 $L_{eq(9\text{-}hr)}$
A1 Pacific Parade	63 dB(A) $L_{eq(15\text{-}min)}$	-
A2 Griffin Road	64 dB(A) $L_{eq(15\text{-}min)}$	-

Table 4 – Measured Background Noise Level Spectrum

Monitoring Location	Frequency (Hz)									A-wt.
	31.5	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	
A3 (R1)	62	60	55	52	50	49	44	38	31	**53**

6 NOISE STANDARDS AND GUIDELINES

6.1 EXTERNAL NOISE INTRUSION STANDARDS AND GUIDELINES

Noise intrusion impacts from external noise sources will be assessed within the context of the site against relevant noise project noise criteria. The primary potential noise sources surrounding the site include traffic movements along surrounding roadways and the petrol station and automotive repair shop to the west.

The following guidelines have been referenced to as part of the assessment:

- Warringah Development Control Plan ("**DCP**") 2011
- NSW Department of Planning - Development Near Rail Corridors and Busy Roads - Interim Guideline ("**DNRCBR**") 2008

An outline of relevant acoustic criteria is presented below.

6.1.1 Warringah Development Control Plan 2011

The Warringah DCP provides the following guidance relating to external noise intrusion.

> *For new development, a Noise Impact Assessment prepared by a suitably qualified acoustic consultant is required. Noise attenuation measures shall demonstrate that residential uses can withstand an external noise level of 55 decibels.*
>
> *Consideration should be given to the impact of land uses which facilitate late night trading, entertainment and events in the public domain on residential amenity.*

6.1.2 NSW Department of Planning - Development Near Rail Corridors and Busy Roads - Interim Guideline ("DNRCBR") 2008

The DNRCBR provides the following guidance relating to external noise intrusion into the development:

> *If the development is for the purposes of a building for residential use, the consent authority must not grant consent to the development unless it is satisfied that appropriate measures will be taken to ensure that the following L_{Aeq} levels are not exceeded:*
>
> *(a) In any bedroom in the building – 35 dB(A) at any time between 10pm and 7am,*
> *(b) Anywhere else in the building (other than a garage, kitchen, bathroom or hallway) – 40 dB(A) at any time."*

6.2 SUMMARISED EXTERNAL NOISE INTRUSION REQUIREMENTS

Internal noise objectives adopted for areas within the development are summarised below.

Table 5 – Project Internal Noise Level Objectives

Space / Activity Type	Internal Noise Level Objective
Sleeping Areas (Night time: 10pm – 7am)	35 dB(A) $L_{eq\ (9\text{-}hr)}$
Habitable Areas (24 hrs)	40 dB(A) $L_{eq\ (15\text{-}hr)}$

Noise intrusion from external traffic movements shall be assessed against the requirements above with minimum complying constructions to be applied to the building shell (external walls, windows and roof).

Consideration shall also be made with regard to other external noise sources such as activities associated with the adjacent petrol station and mechanic to the west of the site.

6.3 SITE NOISE EMISSION STANDARDS AND GUIDELINES

Potential noise emissions from the site will be assessed within the context of the site against relevant noise project noise criteria. The primary potential noise sources from the use of the site will be from restaurant/retail uses, traffic movements associated with the use of the site as well as mechanical plant and equipment servicing the development.

The following guidelines have been referenced to as part of the assessment:

- Warringah Development Control Plan ("**DCP**") 2011
- NSW EPA Noise Policy for Industry ("**NPfI**") 2017
- NSW EPA Road Noise Policy ("**RNP**") 2011
- Liquor and Gaming NSW ("**L&GNSW**") Standard Requirements

6.3.1 Warringah Development Control Plan 2011

The Warringah DCP provides the following guidance relating to noise emissions from the development:

> *Noise from combined operation of all mechanical plant and equipment must not generate noise levels that exceed the ambient background noise by more than 5dB(A) when measured in accordance with the NSW Industrial Noise Policy at the receiving boundary of residential and other noise sensitive land uses.*

6.3.2 NSW EPA Noise Policy for Industry (NPfI) 2017

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

Noise levels are to be assessed at the property boundary or nearby dwelling, or at the balcony or façade of an apartment.

6.3.2.1 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 are adopted from the lowest rating background noise level from each noise monitor location as presented in Section 5. Noise emissions from the site should comply with the noise levels presented below when measured at nearby property boundary.

Table 6 – NPfI Intrusiveness Project Trigger Levels

Receiver	Time of Day	Rating Background Noise Level dB(A)$L_{90(15min)}$	Project Noise Trigger Level (Intrusiveness) dB(A)$L_{eq(15min)}$
Residential Receivers	Day (7am – 6pm)	53	58
	Evening (6pm-10pm)	51	56
	Night (10pm – 7am)	48	53

6.3.2.2 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 2, the Noise Policy for Industry suggests the adoption of the 'Urban' categorisation.

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

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

Table 7 – EPA Amenity Noise Levels

Type of Receiver	Time of Day*	Recommended Noise Level dB(A)$L_{eq(period)}$	Project Amenity Noise Level dB(A)$L_{eq(period)}$
Residential – Urban	Day	60	58
	Evening	50	48
	Night	45	43
Commercial	When in use	65	63

*The NSW EPA Noise Policy for Industry (NPfI) 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.

6.3.2.3 Sleep Arousal Criteria

In addition to the above, the NSW EPA NPfI provides an assessment procedure for assessing any potential sleep arousal impacts for when any noise is generated between 10:00pm and 7:00am (i.e. during the night period). Sleep arousal is a function of both the noise level and the duration of the noise.

As recommended in the NPfI, to assess the potential sleep arousal impacts a two-stage test is carried out:

- Step 1 – Section 2.5 *Maximum noise level event assessment* from the NPfI states the following:

  Where the subject development/premises night-time noise levels at a residential location exceed:

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

Table 8 - Sleep Arousal Criteria for Residential Receivers

Receiver	Rating Background Noise Level (Night)	Emergence Level
Residential Receivers	48 dB(A) L_{90}	53 dB(A)$L_{eq,\ 15min}$; 63 dB(A)L_{Fmax}

- Step 2 – If there are noise events that could exceed the average/maximum criteria detailed 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 test takes into account the noise level and number of occurrences of each event with the potential to create a noise disturbance. As is recommended in the explanatory notes of the EPA *NPfI*, 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 60-75dB(A) are not likely to affect health and wellbeing significantly.*

A review of the site and surrounding receivers indicates that there are no proposed activities which would exceed the sleep arousal emergence levels provided the other criteria are met. Therefore, a detailed analysis is not required.

6.3.3 NSW Road Noise Policy (RNP) 2011

Table 3 within Section 2.3 of the RNP provides relevant assessment criteria for residential land-use to be applied to particular types of projects, road category and land use. We note that the RNP states that the following assessment criteria are non-mandatory, and are to be used as a basis for establishing appropriate noise levels to be incorporated into conditions in planning approvals.

Roadways surrounding the site are classified as local roads with the following assessment criteria:

Table 9 – Road Traffic Noise Assessment Criteria for Residential Land Uses

Road Category	Type of Project / Land Use	Assessment Criteria – dB(A)	
		Day (7am – 10pm)	Night (10pm – 7am)
Local Roads	Existing residences affected by additional traffic on existing local roads generated by land use developments	55 dB(A) $L_{eq(1\text{-}hour)}$ (external)	50 dB(A) $L_{eq(1\text{-}hour)}$ (external)

Notwithstanding the above, it is noted that the existing $L_{Aeq(1\text{-}hour)}$ traffic noise levels are higher than the guideline levels.

Section 3.4 of the RNP provides the following guidance with respect to the assessment of traffic noise generation where existing traffic noise levels are above the noise assessment criteria.

> *Where existing traffic noise levels are above the noise assessment criteria, the primary objective is to reduce these through feasible and reasonable measures to meet the assessment criteria.*
>
> *In assessing feasible and reasonable mitigation measures, an increase of up to 2 dB represents a minor impact that is considered barely imperceptible to the average person.*

As such, resultant vehicle movements along surrounding roads will be assessed against a maximum 2 dB(A) increase above the corresponding existing traffic noise levels. This corresponds to a maximum noise level from additional traffic generation associated with the development plus existing traffic.

6.4 Liquor And Gaming NSW (L&GNSW) Standard Requirements

Noise emissions from any licensed premises are to comply with the acoustic requirements imposed by L&GNSW. These guidelines relate to noise generated by patrons and music. The typical requirements imposed in licensing conditions are set out below:

> ***Standard L_{A10} Noise Condition***
>
> *The L_{A10} noise level emitted from the licensed premises shall not exceed the background noise level in any Octave Band Centre Frequency (31.5Hz – 8kHz inclusive) by more than 5dB between 7.00am and 12:00 midnight at the boundary of any affected residence.*
>
> *The LA_{10} noise level emitted from the licensed premises shall not exceed the background noise level in any Octave Band Centre Frequency (31.5Hz – 8kHz inclusive) between 12:00 midnight and 7:00am at the boundary of any affected residence.*
>
> *Notwithstanding compliance with the above, the noise from licensed premises shall not be audible within any habitable room in any residential premises between the hours of 12:00 midnight and 7:00am.*

The most noise sensitive periods have been identified as between 7am and 10pm as these are the quietest period in which any proposed restaurants/licensed premises may operate. The assessment criteria for noise emissions during these periods are summarised in the following Section.

6.5 SUMMARISED EXTERNAL NOISE EMISSION CRITERIA

Summarised noise emission criteria applicable to the development site are bolded in the tables below.

Table 10 – EPA NPfI Noise Emission Project Trigger Levels

Receiver	Period	Assessment Background Noise Level dB(A)L_{90}	Project Amenity Noise Level dB(A) $L_{eq(15min)}$	Intrusiveness Noise Level $L_{eq(15min)}$	NPfI Sleep Disturbance Noise Level
Residential Receivers	Day	53	**58**	**58**	N/A
	Evening	51	**48**	56	N/A
	Night	48	**43**	53	53 dB(A)$L_{eq,\ 15min}$; **63** dB(A)L_{Fmax}
Commercial	When in use	N/A	**63**	N/A	N/A

Table 11 – Allowable Traffic Noise Level Increase on Local Roads

Street/Roadway	Allowable Traffic Noise Level dB(A)$L_{eq(1\text{-}hr)}$ (Existing + 2dB(A))
The Strand	64 (Day)
	60 (Night)
Pacific Parade	65 (Day)
	61 (Night)
Griffin Road	66 (Day)
	62 (Night)

Table 12 – Adopted Criteria for Licenced Premises Noise Emissions (At Residences)

Receiver	Time of Day	Frequency (Hz)									A-wt.
		31.5	63	125	250	500	1k	2k	4k	8k	
R1	7am – 6pm BG+5dB(A)	67	65	60	57	55	54	49	43	36	**58**
	6pm – 10pm BG+5dB(A)	65	63	58	55	53	52	47	41	34	**56**

7 EXTERNAL NOISE INTRUSION ASSESSMENT

Airborne noise levels have been measured at the site using a combination of long term unattended and attended measurements and have been used as a basis for predicting noise levels around the development by:

- Correcting for different distances between the noise source compared to the monitoring location.
- Barrier effects, where applicable.
- Reflections off adjacent structures, where significant

7.1 DISCUSSION

7.1.1 Windows Closed Noise Assessment

The modelling indicates that mitigation of noise impacts is needed to achieve compliance with the nominated assessment criteria.

Internal noise levels have been predicted using the predicted façade incident noise levels taking into account the external noise level, the area of exposed envelope element, transmission loss of the construction, and typical room absorption, and the cumulative noise level through all exposed building elements.

Complying mitigation is provided in Section 7.2 below.

7.1.2 Windows Open Noise Assessment

Where the predicted incident external noise levels exceed 60 dB(B) $L_{eq,15hr}$ for living rooms and the like and 55 dB(A) $L_{eq,9hr}$ for sleeping areas, those rooms relying on natural ventilation from windows in these façades will be required to have an alternative form of ventilation complying with the BCA, in addition to operable windows in that room, to allow the windows to be closed.

A discussion of ventilation requirements is provided in Section 7.3

7.2 COMPLYING CONSTRUCTIONS

Internal noise levels will primarily be a result of noise transfer through windows and doors, as these are expected to be relatively light building elements which offer less resistance to the transmission of sound.

Calculations were performed considering the orientation of windows, barrier effects (where applicable), the total area of glazing, façade transmission loss and the likely room sound absorption characteristics. In this way, the likely internal noise level can be predicted.

7.2.1 Glazed Windows and Doors

The following constructions are required to comply with the project noise objectives. Aluminium framed/sliding glass doors and windows will be satisfactory provided they meet the following criteria. All external windows and doors listed are required to be fitted with Q-Lon type acoustic seals. (**Mohair Seals are not considered acoustic seals**).

Thicker glazing may be required for structural, safety or other purposes. Where it is required to use thicker glazing than scheduled, this will also be acoustically acceptable. The recommended minimum constructions are detailed below:

Table 13– Minimum Complying Glazing Thickness

Façade	Space	Glazing Construction	Acoustic Seals
West (The Strand)	Living Rooms	6.38mm Laminate	Yes
	Bedrooms		
East (Griffin Road)	Living Rooms	6.38mm Laminate	
	Bedrooms		
South (Pacific Parade)	Living Rooms	6.38mm Laminate	
	Bedrooms		
All	Bathroom/Ensuite	4mm Float	

Aluminium framed/sliding glass doors and windows will be satisfactory provided they meet the following criteria listed below. It is recommended that only window systems having test results indicating compliance with the required ratings obtained in a certified laboratory be used where windows with acoustic seals have been recommended.

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

Table 14 -Minimum R_w of Glazing Assembly (with Acoustic Seals)

Glazing Assembly	Minimum R_w of Installed Window
4mm Float	27
6.38mm Laminate	31

Table Note: *the nominated Rw values are specific to the glazing assembly listed above only and should not be adopted between different assemblies (such as for DGU/IGU systems). Where an alternative glazing proposed is submitted during the CC stage of the project, these should be reviewed by the builder's acoustic consultant to ensure internal noise design goals will be met.*

7.2.2 External Wall Construction

External wall constructions from concrete/masonry elements are acoustically acceptable. In the event that lightweight external wall constructions are proposed they are to be reviewed as part of the detailed design of the project to ensure internal noise levels are achieved. Any penetrations required through the external skin are to be sealed with an acoustic grade sealant should be used to minimise all gaps.

7.2.3 External Roof/Ceiling Construction

Any roof constructed from masonry/concrete elements will not require upgrading to achieve acoustic requirements. In the event that a lightweight roof construction is proposed, it is to be reviewed as part of the detailed design of the project to ensure internal noise levels are achieved. Any penetrations required through the external skin are to be sealed with an acoustic grade sealant should be used to minimise all gaps.

Any supplementary ventilation system proposed to be installed should be acoustically designed to ensure that the acoustic performance of the envelope is not reduced, and the required indoor noise levels are achieved, and does not exceed Council criteria for noise emission to nearby properties.

7.2.4 Limitations of this Advice

This assessment is indicative only. Given building shell construction elements have not been finalised at this stage, treatments are to be reviewed by a qualified acoustic consultant at detailed design stage or construction certificate stage to ensure satisfactory internal noise levels are achieved in all areas within the development.

7.3 VENTILATION OF RESIDENTIAL AREAS

With respect to natural ventilation of residencies within the project development site, the DNRCBR dictates:

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

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

For all units within the development, satisfaction of the DNRCBR 'windows open' noise levels is generally achievable in living rooms and bedrooms without the need for supplementary ventilation.

Where supplementary ventilation systems are to be installed, these should be acoustically designed to ensure that the acoustic performance of the acoustic treatments outlined above is not reduced and does not exceed EPA criteria for noise emission to nearby properties.

7.4 EXTERNAL NOISE INTRUSION IMPACTS FROM PETROL STATION

Based on a review of unattended noise monitoring data undertaken opposite to the existing petrol station and mechanic service lane to the west of the site, the following observations and additional treatment recommendations shall be considered:

Existing operations occur during the night-time period between 5am – 7am (typical), where ambient/background noise levels are typically rising as a result of increased traffic movements. During the night time period, short term peak noise events are also observed (in addition to continuous or longer term noise levels) with respect to the potential for sleep disturbance.

In consideration of the above, the design of the façade should be such that windows can be closed during the night time period, to mitigate noise impacts.

8 NOISE EMISSIONS ASSESSMENT

A discussion of the potential noise impacts associated with the development have been presented for the following:

- Use of the carpark and car lift
- Preliminary assessment of noise from restaurant and retail tenancies
- Preliminary assessment of mechanical plant noise emissions (commercial and residential)
- Traffic noise generation on surrounding road network

8.1 CARPARK AND CAR LIFT

The following assumptions have been made for cars and trucks entering and exiting the associated carpark servicing the development, based on the findings of the referenced Traffic Impact Statement:

- Vehicle movements occur during the day and evening periods (between 7am – 10pm):
    - In a given peak-hour period, up to 20 vehicles trips will occur.
        - In a peak 15-minute period, 5 car movements will occur.
        - In a peak 15-minute period, 1 truck movement will occur.
- Cars are assumed to be travelling at 10km/h.
- Cars have been modelled to a sound power level of 84dB(A), typical of these vehicles in the experience of this office.
- Trucks have been modelled to a sound power level of 100dB(A) travelling forward and 105dB(A) reversing, typical of these vehicles in the experience of this office.
- Trucks are assumed to be travelling at 10km/h.
- No truck movements are assumed during the night-time period
- It is assumed that any peak noise events such as car door slamming and engine starts will be isolated within the basement levels of the development. As such, transient (L_{max}) noise levels have not been calculated as part of this assessment.

The average ($L_{eq(15min)}$) noise level generated by assumed maximum potential use of the loading dock and retail carpark areas have been predicted to the nearest residential receivers and assessed below. Where compliance is achieved at these receivers, it is expected that noise levels at remaining receivers will also be achieved given that they are located further away.

Table 15 – Predicted Average Noise Levels from Carpark Operation

Emission Scenario	Receiver	Predicted Noise Level dB(A) $L_{Aeq,15min}$	Project Noise Trigger Level	Compliance
Cars/Trucks Entering, Leaving & Manoeuvring in Carpark	R4 Residential	<43	Evening (6pm – 10pm) ≤ 48 dB(A) $L_{Aeq,15min}$	Yes
	C1 / C2 Commercial	<52	Commercial ≤ 63 dB(A) $L_{Aeq,15min}$	

Noise emissions associated with the use of the carpark servicing the development are expected to be compliant with the relevant noise criteria.

8.2 COMMERCIAL USE OF THE SITE

The specific use of each of the tenancy spaces is unknown at this stage. It is assumed that the spaces across ground floor will be within a retail, restaurant or café tenancy capacity.

The primary source of noise generated by the retail/restaurant /café tenancies are likely to be associated indoor background music (as well as plant noise associated with the use). In this regard, we note the following:

- It is expected that compliance with the relevant noise emission objectives is to be reviewed based on a separate planning approval as part of a fit out development application subject to the specific operations of each individual commercial tenancy once operators have been determined. Tenancies are capable of achieving noise emission objectives provided the appropriate acoustic treatments and management controls are implemented for each specific application.

- *If* tenancies were to become licensed for the service of alcohol, this use would be subject to a separate planning application which would be accompanied by a noise impact assessment of the proposed use typical for Liquor and Gaming NSW. Acoustic treatments and management controls could be applied to these tenancies use to achieve the relevant noise emission requirements from internal activities (such as upgraded glazing); however, the use of external areas (if any) would be likely management of patron numbers/hours of use to achieve compliance at all times.

8.3 NOISE FROM MECHANICAL PLANT

Mechanical plant servicing the development are not typically selected at this stage, though it is assumed that common plant is to be installed within the basement levels of the development as well as at roof level.

Typically, this is comprised of large axial and centrifugal supply/exhaust fans, AHUs, A/C and refrigeration condensers and the like. A preliminary review of noise generation from mechanical plant has been undertaken below.

8.3.1 Plant Generally

Experience with similar projects dictates that the following acoustic treatment methods may be implemented:

Major Supply / Exhaust Plant

Supply and exhaust fans are typically located within the basement plant rooms or in rooftop plant areas. These units typically emit high noise levels and require acoustic treatment such as silencers/attenuators and internally lined ductwork, and barriers, external lagging or enclosures for external plant. Silencer requirements would be determined once fan selections have been completed.

Minor Plant

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.

A detailed acoustic review should be undertaken prior to CC to determine acoustic treatments to control noise emissions to satisfactory levels.

Acoustic treatments to all plant are to be reviewed by the acoustic consultant prior to construction once final plant selections have been made to ensure relevant noise emission requirements are satisfied. Noise levels are to be satisfied cumulatively from all plant servicing the development.

8.3.2 Plant located at roof level

Commercial exhaust fans and condenser units (CUs) are most typically located in these areas and are likely to require additional treatment to comply with external noise emission goals, typically in the form of perimeter barriers, attenuators and/or enclosures. Given the detailed number, location and noise levels of rooftop plant is unknown, maximum permissible sound power levels from roof top plant have been determined based on the following assumptions:

- The building will have one rooftop plant compound
- The nearest rooftop plant is approximately 25-30m from the nearest residential receiver
- Units will operate at up to 100% capacity between 7am-10pm
- Residential CUs will operate at a reduced capacity after 10pm
- Condensing units have night quiet mode settings installed for off peak use

Based on assumptions above, to comply with Council and NSW EPA guidelines at the nearest sensitive residential receiver; the maximum permissible *sound power level* for the cumulative rooftop plant is:

- 94 dB(A) during the day
- 84 dB(A) during the evening.
- 79 dB(A) during the night.

Note: these levels are indicative only and are to be reviewed in more detail during the detailed design stage and is to be assessed cumulatively from all external plant in this area.

If the final plant selection exceeds the above cumulative noise levels, additional treatment will be required to either individual plant items or to each roof plant compound as a whole. This may be achieved with solid barriers/screens, acoustic louvres, alternative plant selections, attenuators and/or absorptive linings to wall surfaces.

The development is capable of achieving complying noise emission levels; a detailed acoustic review should be undertaken prior to CC to determine acoustic treatments to control noise emissions to satisfactory levels.

8.4 ADDITIONAL TRAFFIC GENERATION ASSESSMENT

The assessment is based on the findings of the referenced Traffic Impact Statement prepared by PDC Consultants.

Considering the development is predicted to generate up to three additional vehicle trips an hour during a peak period, the development will not produce more than the 2 dB increase in traffic noise that the Road Noise Policy considers to be a significant increase.

On this basis it is concluded that increased traffic movements on the surrounding road network generated by the proposed development will not result in any significant noise impact, and there would not be any perceptible noise impact at surrounding properties.

8.5 RECOMMENDATIONS

The following recommendations for the carpark and car-lift are provided:

- The car lift is to be appropriately vibration isolated from the structure such that the car lift will not adversely impact the amenity of internal residents within the development.
- Broom finish or similar is recommended to prevent tyre squeal along the car park slab.
- Any strip drain must be securely fixed to eliminate metal on metal contact where noise could be generated.
- Minimise noise from any carpark gate or roller door operation by minimising rattling, and ensuring smooth operation.
- Speed humps shall not be installed within the project site.

9 CONSTRUCTION NOISE AND VIBRATION IMPACTS

Construction noise and vibration impacts during the demolition/construction phases of the development have been assessed with reference to the following documents.

- Australian Standard AS2436:2010 – *"Guide to noise control on construction, maintenance and demolition sites*."
- NSW Department of Environment & Climate Change document "*Interim Construction Noise Guidelines* 2009 (ICNG)."
- German Standard DIN 4150-3 "*Structural Vibration: Effects of Vibration on Structures"*.
- Department of Environment and Conservation document – '*Assessing Vibration- A technical guideline.*'
- British Standard BS 7385 Part 2-"*1993 Evaluation and Measurement for Vibration in Buildings. Part 2. Guide to damage levels from ground borne vibration*."

9.1 CONSTRUCTION NOISE AND VIBRATION LIMITS

9.1.1 Australian Standard AS2436:2010 "*Guide to Noise Control on Construction, Maintenance and Demolition Sites*"

Australian Standard AS2436 states that where all reasonable and available measures have been taken to reduce construction noise, mitigation strategies may be put in place to reduce levels noise levels to within a reasonable and acceptable level.

For the control and regulation of noise from construction sites, AS2436 nominates the following:

a. That reasonable suitable noise criterion is established,

b. That all practicable measures be taken on the building site to regulate noise emissions, including the siting of noisy static processes to locations of the site where they can be shielded, selecting less noisy processes, and if required regulating construction hours, and

c. The undertaking of noise monitoring where non-compliance occurs to assist in the management and control of noise emission from the construction site.

The guideline reflects on feasible and reasonable mitigation strategies, management controls and public liaising in the effort to reach realistic comprises between construction sites and potential noise affected receivers.

Based on these criteria the following procedure will be used to assess noise emissions:

- Predict noise levels produced by typical construction activities at the sensitive receivers.
- Adopt management conditions as per AS2436 in the event of a non-compliance.

9.2 NSW EPA INTERIM CONSTRUCTION NOISE GUIDELINE – NOISE LIMITS

Given the scale of the proposed works, the "quantitative" assessment procedure, as outlined in the Interim Construction Noise Guideline (ICNG) will be used (as opposed to the simpler "qualitative" assessment method outlined in the guidelines). The quantitative assessment method requires:

- Determination of noise generation management levels (based on background noise levels on site).
- Prediction of operational noise levels at nearby development.
- If necessary, recommendation of noise controls strategies in the event that compliance with noise emission management levels is not possible.

9.2.1 At Residential Receivers

EPA guidelines adopt differing strategies for noise control depending on the predicted noise level at the nearest residences and the time of day:

Recommended Standard Hours - Monday to Friday (7am – 6pm) & Saturday (8am – 1pm)

- *"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.

Table 16 – Construction Noise Management Levels to Residential Receivers

Location/Receiver	Recommended Standard Hours "Noise Affected" Level - dB(A)$L_{eq(15min)}$	"Highly Noise Affected" Level - dB(A)$L_{eq(15min)}$
Residential Receivers	Monday – Friday 7am – 6pm and Saturday 8am-1pm BG 53 + 10 = 63	75

9.2.2 To Commercial Receivers

Section 4.1.3 *"Commercial and industrial premises"* of the ICNG outlines the following external management noise levels to the most-affected occupied point of the premises:

Table 17 – Noise Management Level for Commercial Premises (ICNG)

Receiver	Management Level dB(A)$L_{eq\ (15\ min)}$
Commercial	70

9.2.3 Summary of Relevant Construction Noise Management Levels

A summary is presented below of the most stringent construction noise limits.

Table 18 – Noise Management Levels

Receiver Type	Noise Management Level dB(A) $L_{eq(15min)}$
Residential	***Noise Affected Level*** 63 (Externally) ***Highly Noise Affected Level*** 75 (Externally)
Commercial	70 (Externally)

If noise levels exceed the management levels identified in the table above, reasonable and feasible noise management techniques will be reviewed.

9.3 VIBRATION IMPACTS

Vibrations caused by any proposed activities on site, at the façade or incident on the structure of any surrounding sensitive receivers, will be assessed against the following provisions:

- For structural damage vibration, German Standard DIN 4150-3 *Structural Vibration: Effects of Vibration on Structures*.
- For human exposure to vibration, the evaluation criteria presented in Department of Environment and Conservation document – '*Assessing Vibration- A technical guideline.*'
- British Standard BS 7385 Part 2-"*1993 Evaluation and Measurement for Vibration in Buildings. Part 2. Guide to damage levels from ground borne vibration*," and

The criteria and the application of these guidelines are discussed in separate sections below.

9.3.1 Vibration Impacts on Surrounding Buildings

9.3.1.1 Structure Borne Vibrations

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 provides 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 below 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 are below the guidelines listed below, 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 activities or sources. 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 19 -(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) i.e. Heritage	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 It may be necessary to lower the guideline value markedly to prevent minor damage

9.3.1.2 Assessing Amenity

The NSW Environment Protection Authority's (EPA) publication "Assessing Vibration: A Technical Guideline" outlines vibration criteria to assess the effects on human exposure to vibration from industry, transportation and machinery. This will ensure the amenity of tenants within surrounding residential properties is not adversely impacted.

This document classifies vibrations in buildings into continuous (with magnitudes varying or remaining constant with time), impulsive (such as shocks) or intermittent (with the magnitude of each event being either constant or varying with time). Criteria stipulated in this publication is based on the type of vibrations generated by the source.

Criteria relevant to the proposed excavation and construction activities on site are detailed below.

Table 20 – EPA Recommended Human Comfort 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		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		0.64	1.28	13.0	26.0	18.0	36.0
Workshops		0.64	1.28	13.0	26.0	18.0	36.0

9.3.2 Recommended Vibration Limits

The table below presents the recommended vibration limit at the nearest vibration sensitive receivers.

Table 21 – Recommended Vibration Limit

Vibration Receiver	Recommended Vibration Limits
Residential	≤5mm/s PPV*
Commercial	≤20mm/s PPV*
Existing Substation	≤3mm/s PPV

*Note: it is for building damage limit only

9.4 CONSTRUCTION NOISE AND VIBRATION MANAGEMENT PLAN

At this stage, detailed construction methodologies have not been determined. Based on the proximity of surrounding development, Acoustic Logic recommend that a Construction Noise and Vibration Management Plan be required for submission to council prior to gaining Construction Certificate to assess the impact of Construction on surrounding noise and vibration sensitive receivers.

The management plan should include the following:

- Identification of the noise and vibration standards and statutory requirements which will be applicable to this project, in line with those presented within this Section of the report.
- Identification of potentially impacted nearby sensitive noise receivers to the development, in line with those presented within this report.
- Identify likely sources of noise and vibration generation during construction and predicted noise levels at nearby development, including the determination of noise and vibration monitoring locations to be undertaken at the most affected adjacent development.
- Formulation of a strategy to comply with the standards identified and mitigation treatments in the event that compliance is not achievable.

10 CONCLUSION

Acoustic Logic (AL) has conducted an acoustic assessment of potential noise & vibration impacts associated with the proposed mixed used development located at 154-158 Pacific Parade, Dee Why.

The following noise impacts have been addressed:

- External noise intrusion impacts into project site from surrounding traffic sources.
- Noise emissions from commercial/residential use of the site.
- Noise emissions from mechanical plant servicing the development.
- Construction noise and vibration impacts.

Indicative complying constructions to meet the noise intrusion requirements of the above have been detailed in Section 7.2. A review of these treatments is to be undertaken during detailed design of the development.

Limits for the site have been established for the proposed uses of the development. It is recommended that individual commercial tenancies and any proposed mechanical plant be acoustically reviewed as part of future fit out development applications (at which stage the details of specific plant will be confirmed) to ensure that the noise emission criteria established are achieved. Additional recommendations for the construction of the carpark and car-lift have been provided in Section 8.5.

It is expected that separate fit-out planning applications will be submitted for future commercial development.

Provided the recommendations within the report are adopted, internal noise levels will be satisfied, noise emissions from the proposed development would not adversely impact any of the surrounding developments, and construction noise and vibration impacts will be minimised.

Please contact us should you have any further queries.

Yours faithfully,

Acoustic Logic Pty Ltd
Hyde Deng
MAAS

APPENDIX A AMBIENT NOISE MONITORING

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

Monitoring has been undertaken to determine existing background and traffic noise levels along at the site and operational noise associated with the adjacent petrol station, mechanic and service lane to the west of the 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 Monitoring Locations

Monitoring locations are as outlined in Section 3, Figure 1 and detailed as follows:

- M1 – Monitor located along the western boundary of the project site along the awning of the existing development. External noise levels at this location have been used to assess potential noise intrusion into the new proposed retail and residential areas, as well as inform rating background noise levels at the site.

A.1.3 Measurement Period and Equipment Used

Long term unattended noise monitoring was conducted between the 11th to 20th of September 2024.

Unattended noise monitoring was conducted using the following equipment:

- 1 x Rion NL-42 (Type 2) noise monitor
- 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.1.4 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 following station:

- Terrey Hills AWS

A.2 CALCULATION OF REPRESENTATIVE AMBIENT NOISE LEVELS

The noise data for the day, evening and night periods have been processed to determine the period ambient noise levels at the monitoring locations. Noise levels that are blank indicate that these periods were determined to have been significantly affected by non-representative noise sources (weather, mechanical plant, etc.) and these periods were excluded from subsequent calculations.

The following tables summarise the daily measurements and the representative rating background noise levels and traffic noise levels at the monitoring location.

Table 22 – NPfI Assessment Background Noise Levels – Location M1

Location	Date	ABL		
		Day	Evening	Night
Location M1	11/09/2024	-	52	48
	12/09/2024	53	-	46
	13/09/2024	53	53	45
	14/09/2024	53	52	48
	15/09/2024	52	48	49
	16/09/2024	53	49	45
	17/09/2024	53	51	48
	18/09/2024	53	52	49
	19/09/2024	53	51	48
	20/09/2024	-	-	-
	RBL	**53**	**51**	**48**

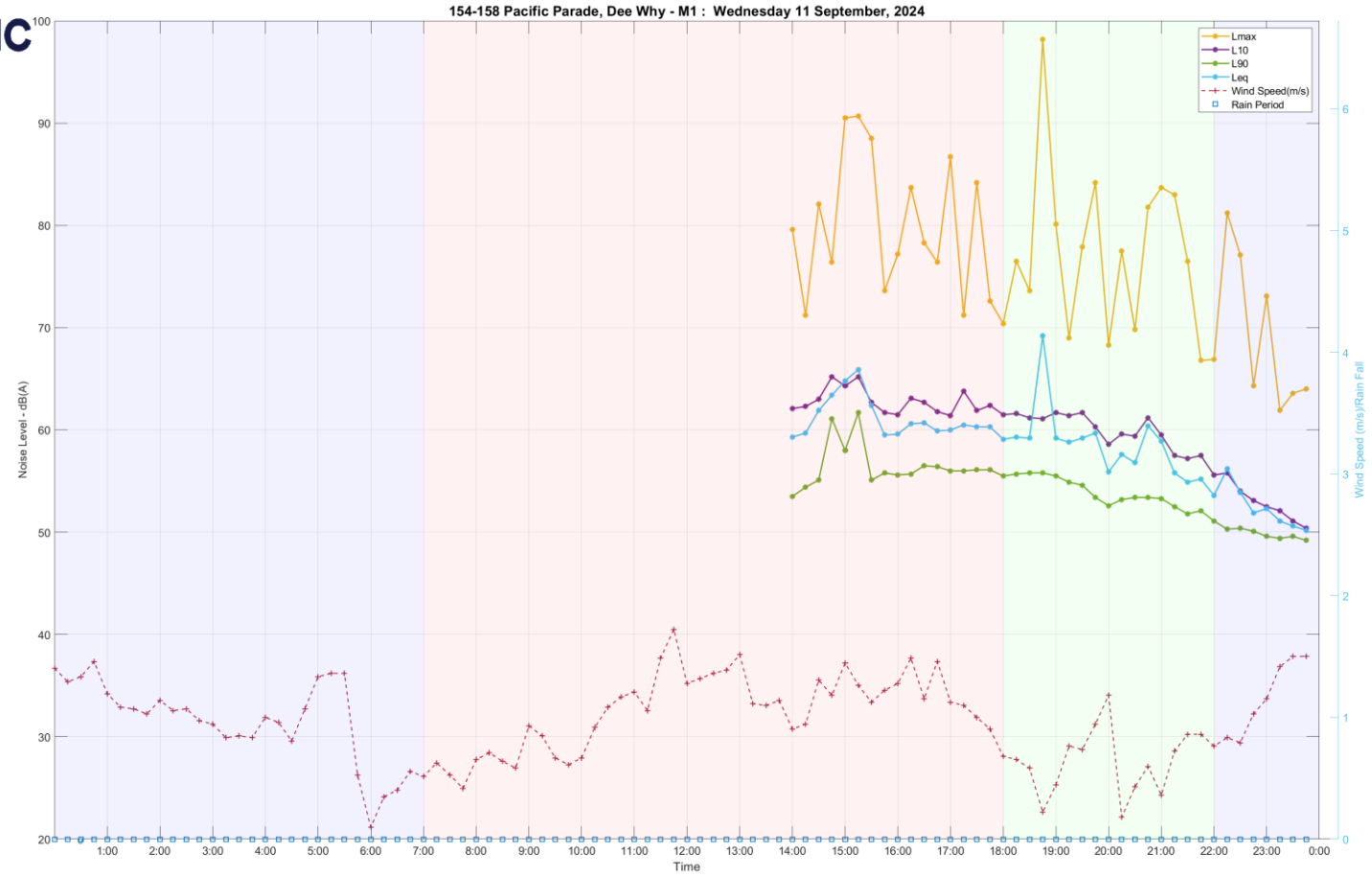
Table 23 – Measured Traffic Noise Levels – Location M1

Location	Date	Traffic Noise Level dB(A) $L_{eq,\ (period)}$			
		Day (1-hr)	Night (1-hr)	Day (15-hr)	Night (9-hr)
Location M1	11/09/2024	0	59	0	54
	12/09/2024	65	62	61	55
	13/09/2024	63	59	62	56
	14/09/2024	62	59	60	54
	15/09/2024	61	59	59	54
	16/09/2024	61	60	59	54
	17/09/2024	64	59	61	54
	18/09/2024	61	59	60	54
	19/09/2024	62	65	60	58
	20/09/2024	0	0	0	0

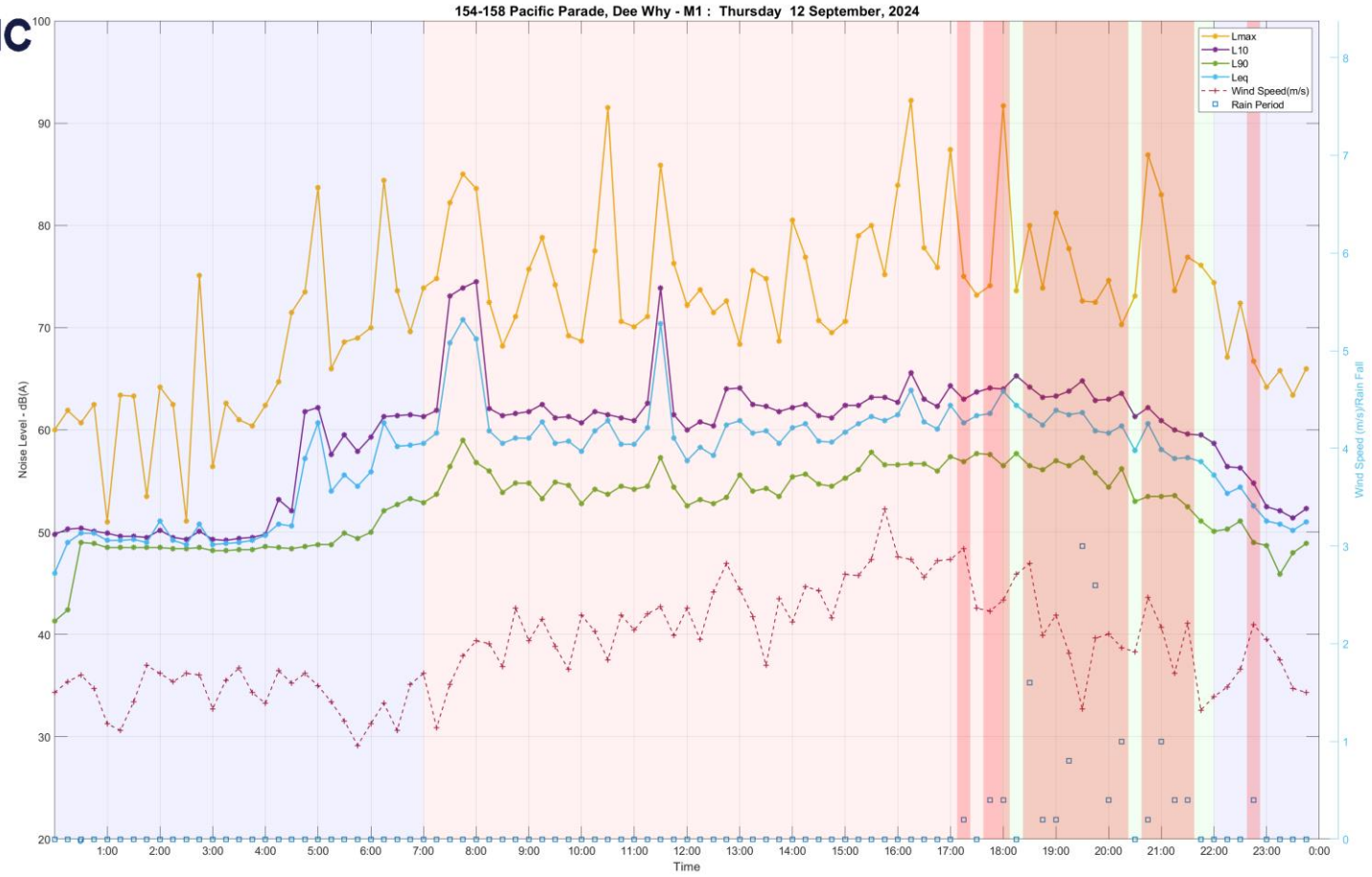
A.3 UNATTENDED NOISE MONITORING DATA

Unattended noise monitoring locations are outlined in Section 4. Photographs of the monitoring location are presented below, with respective monitoring graphs provided on the following pages.

ACOUSTIC LOGIC



ACOUSTIC LOGIC



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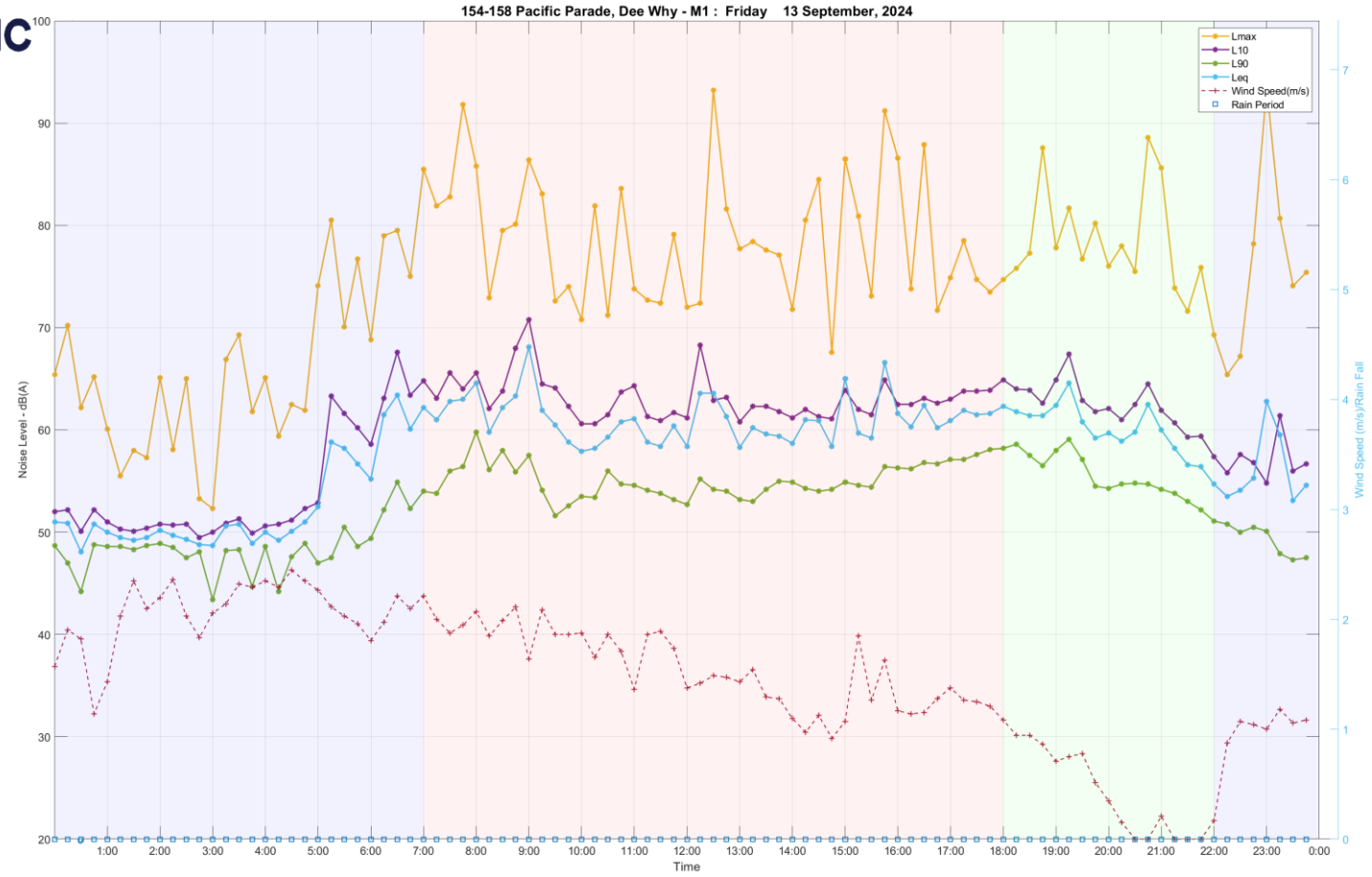

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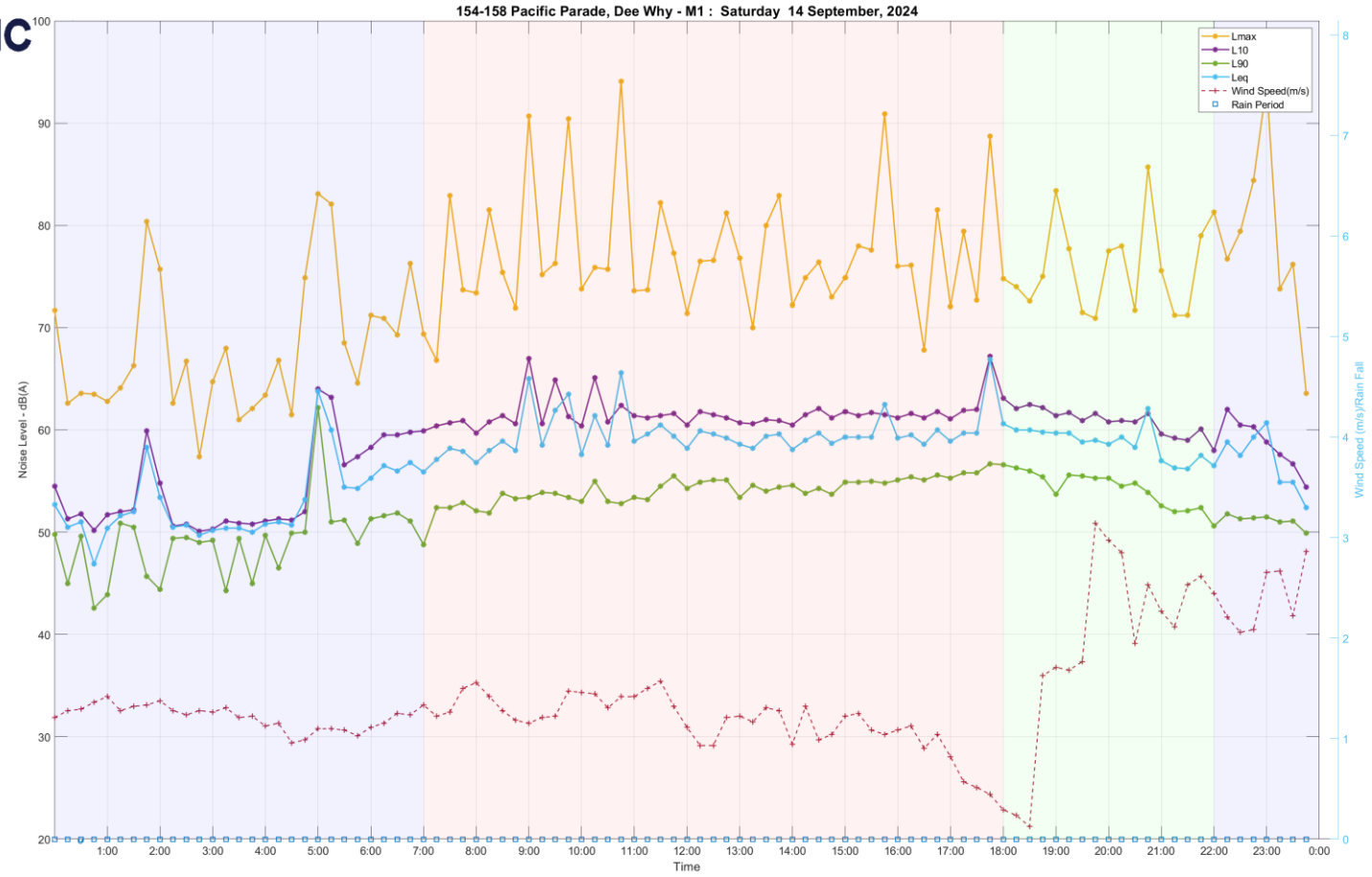

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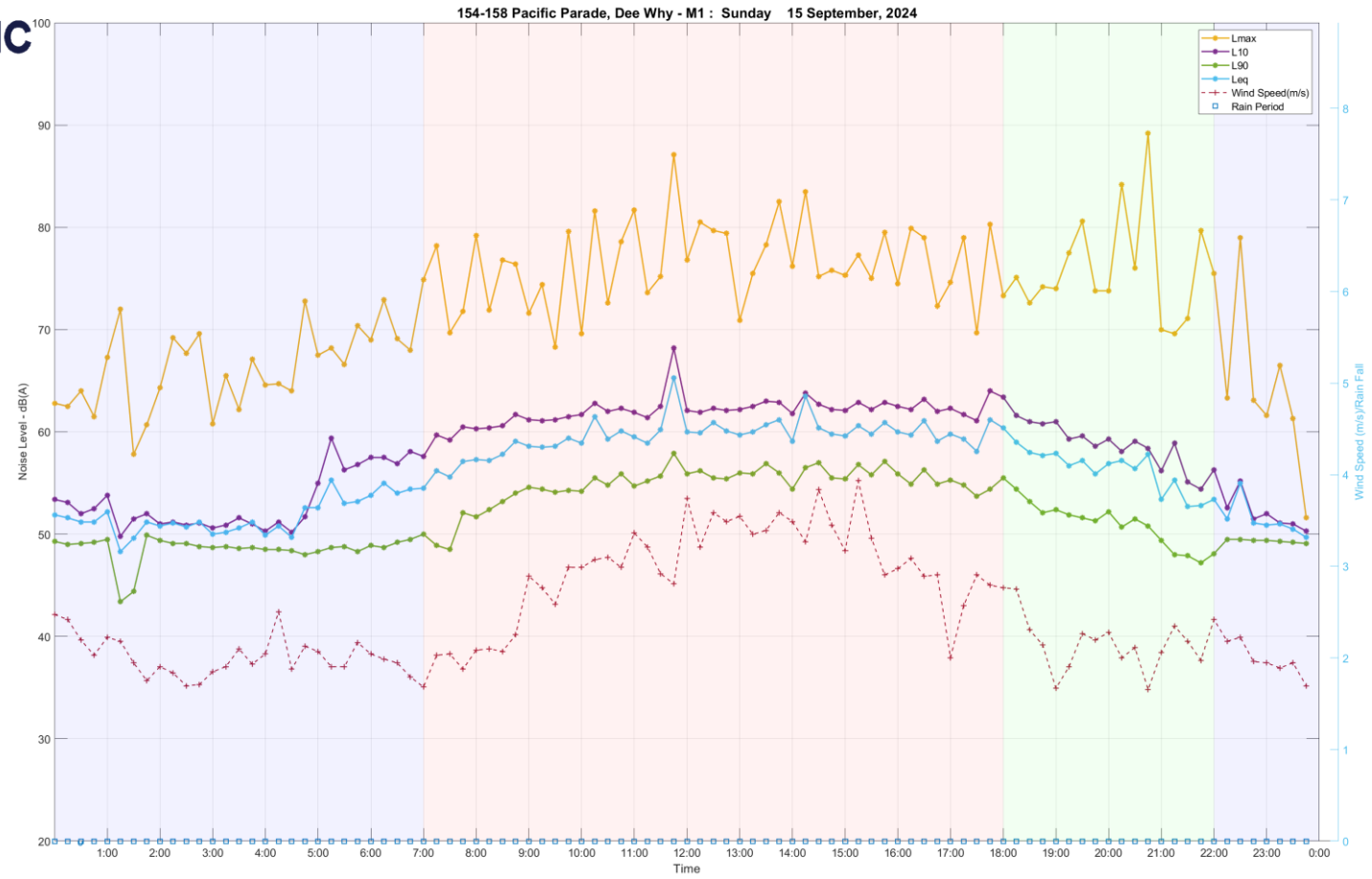

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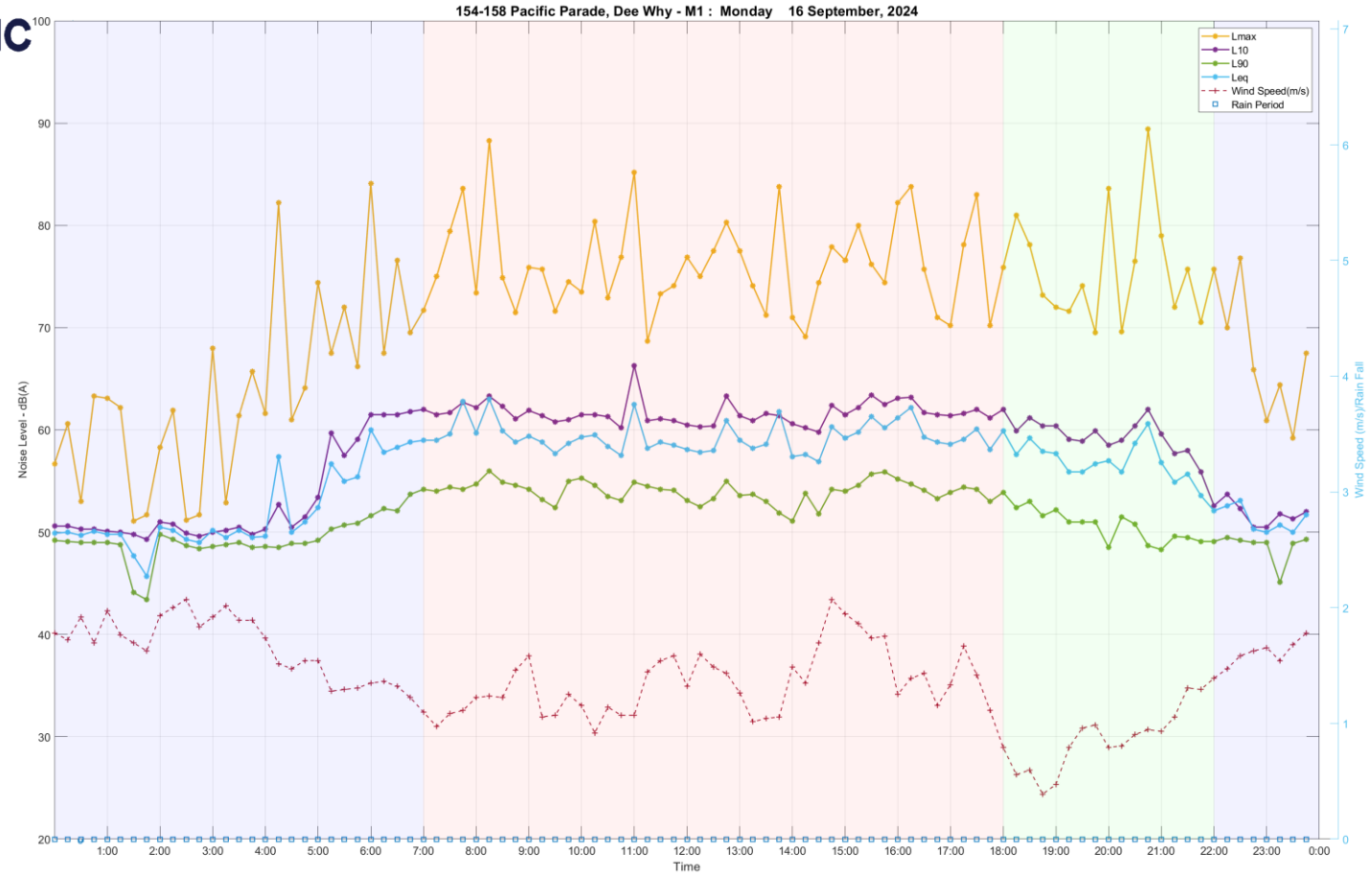

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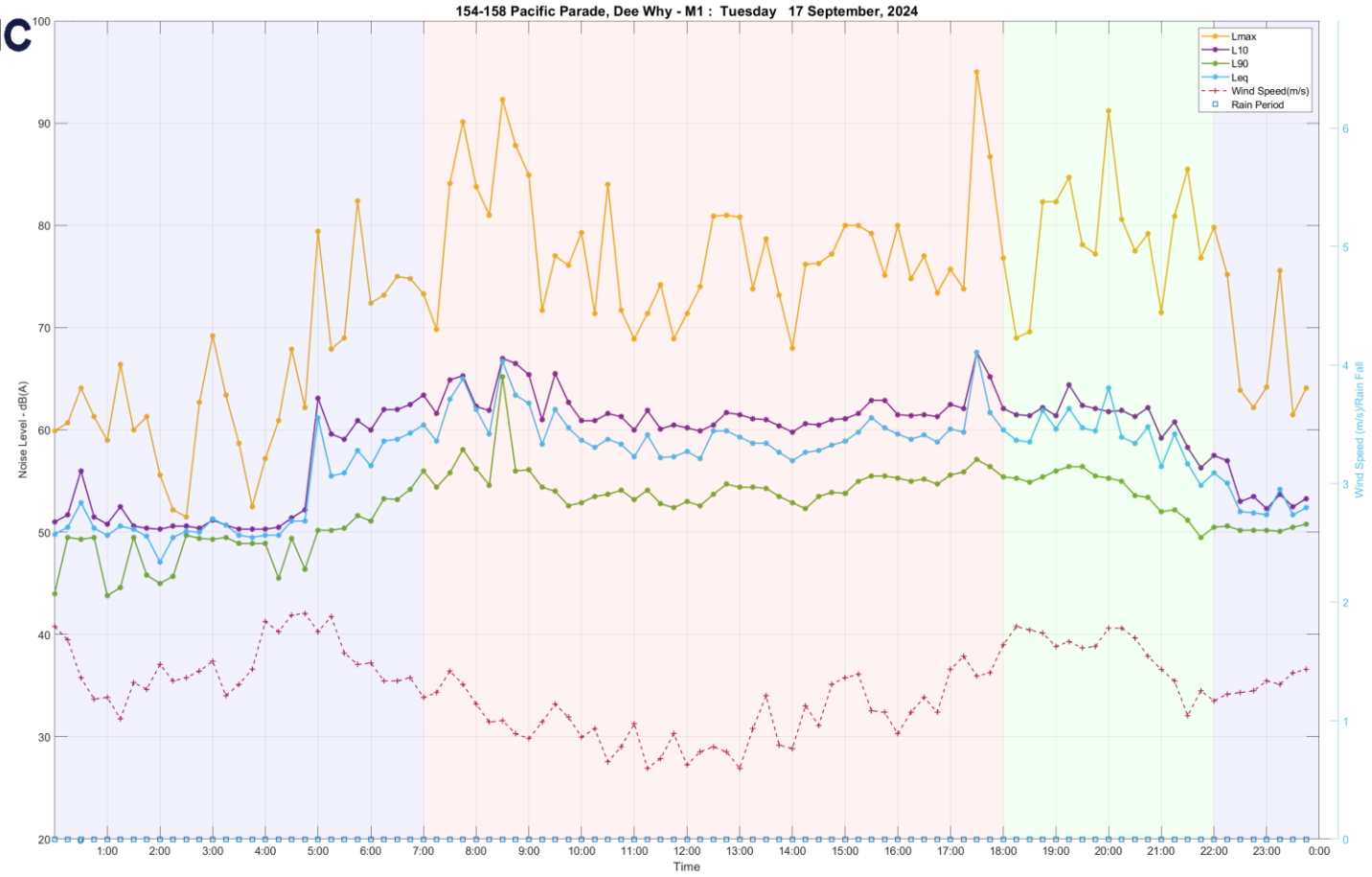

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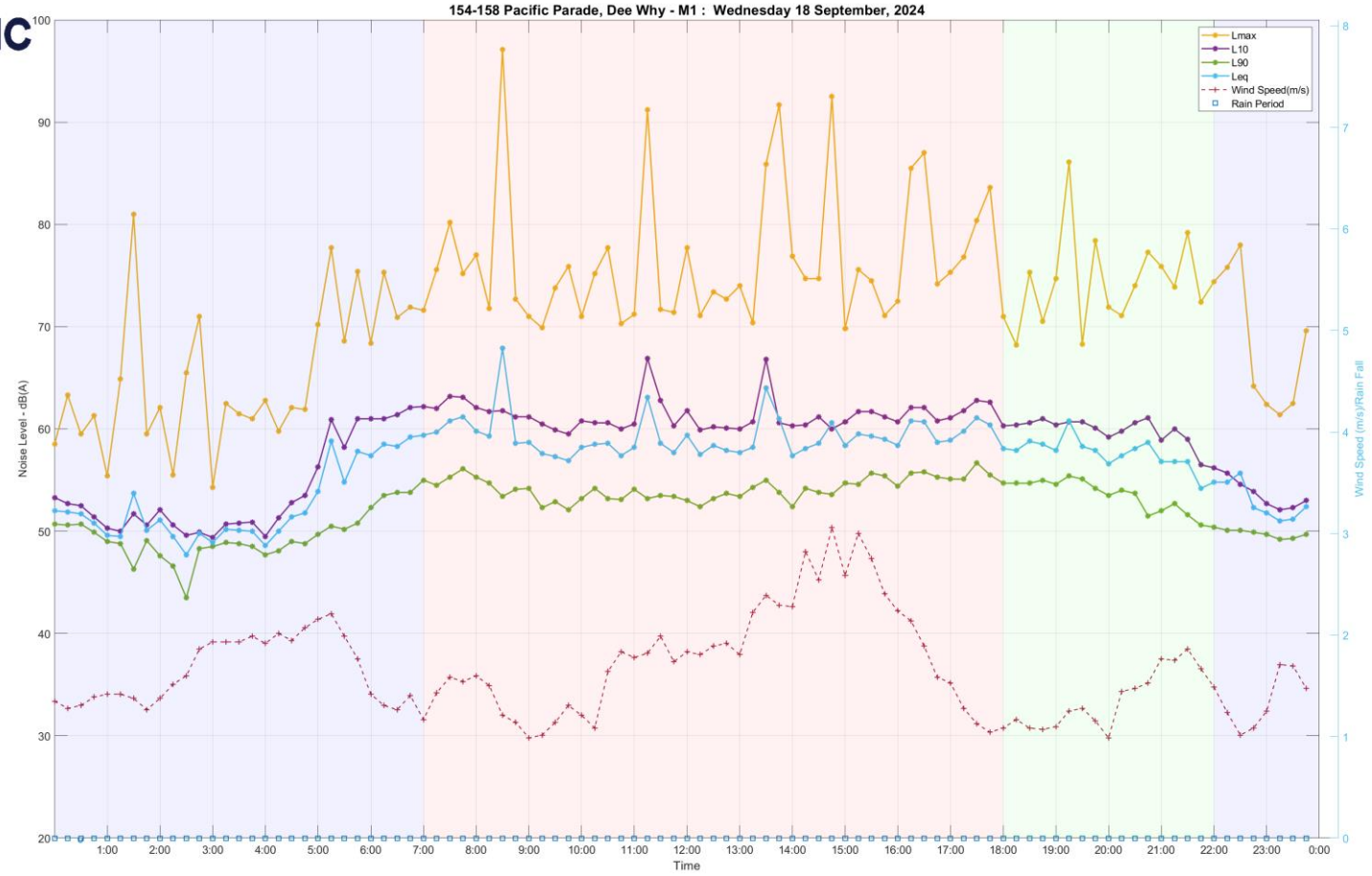

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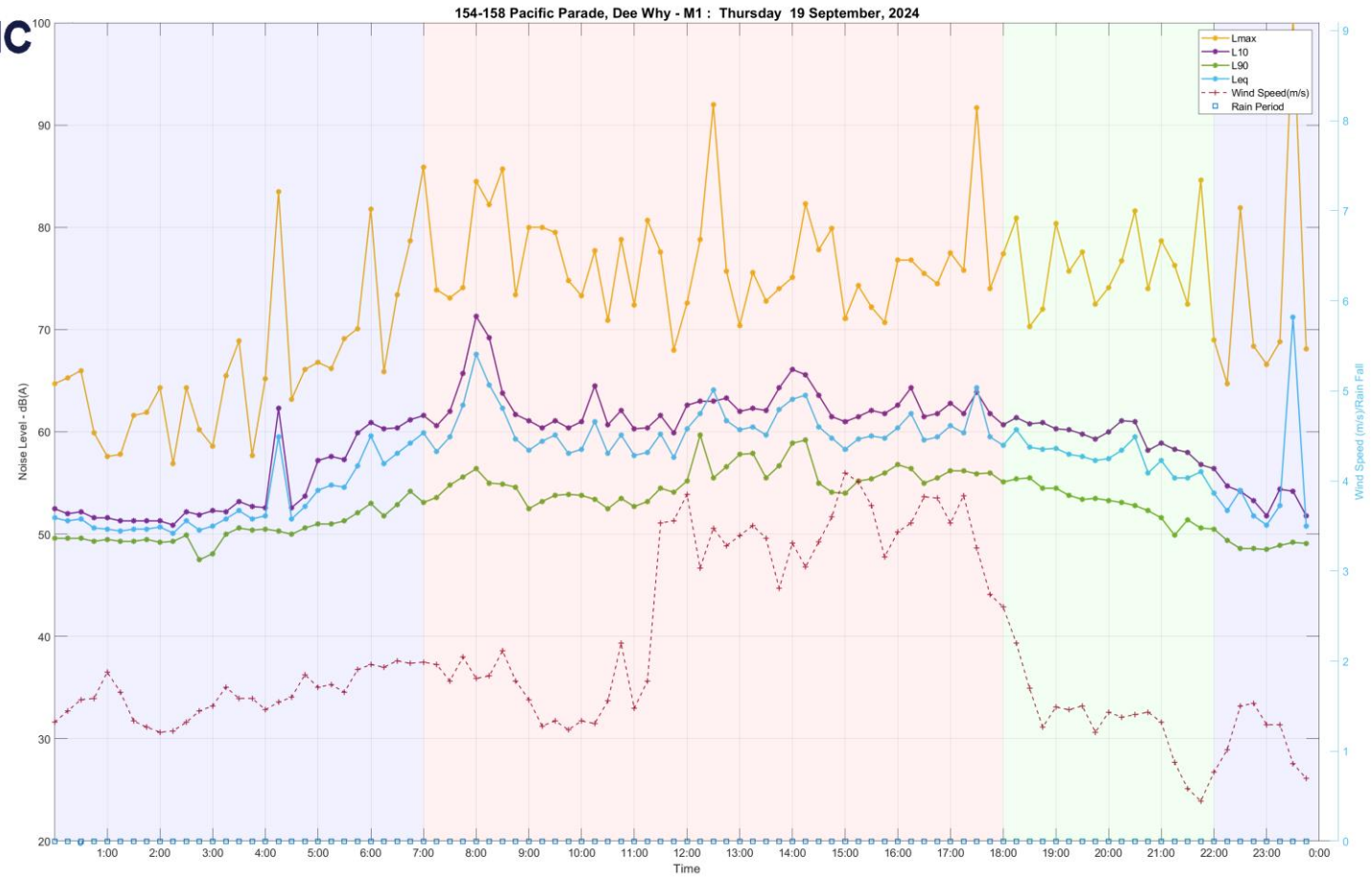

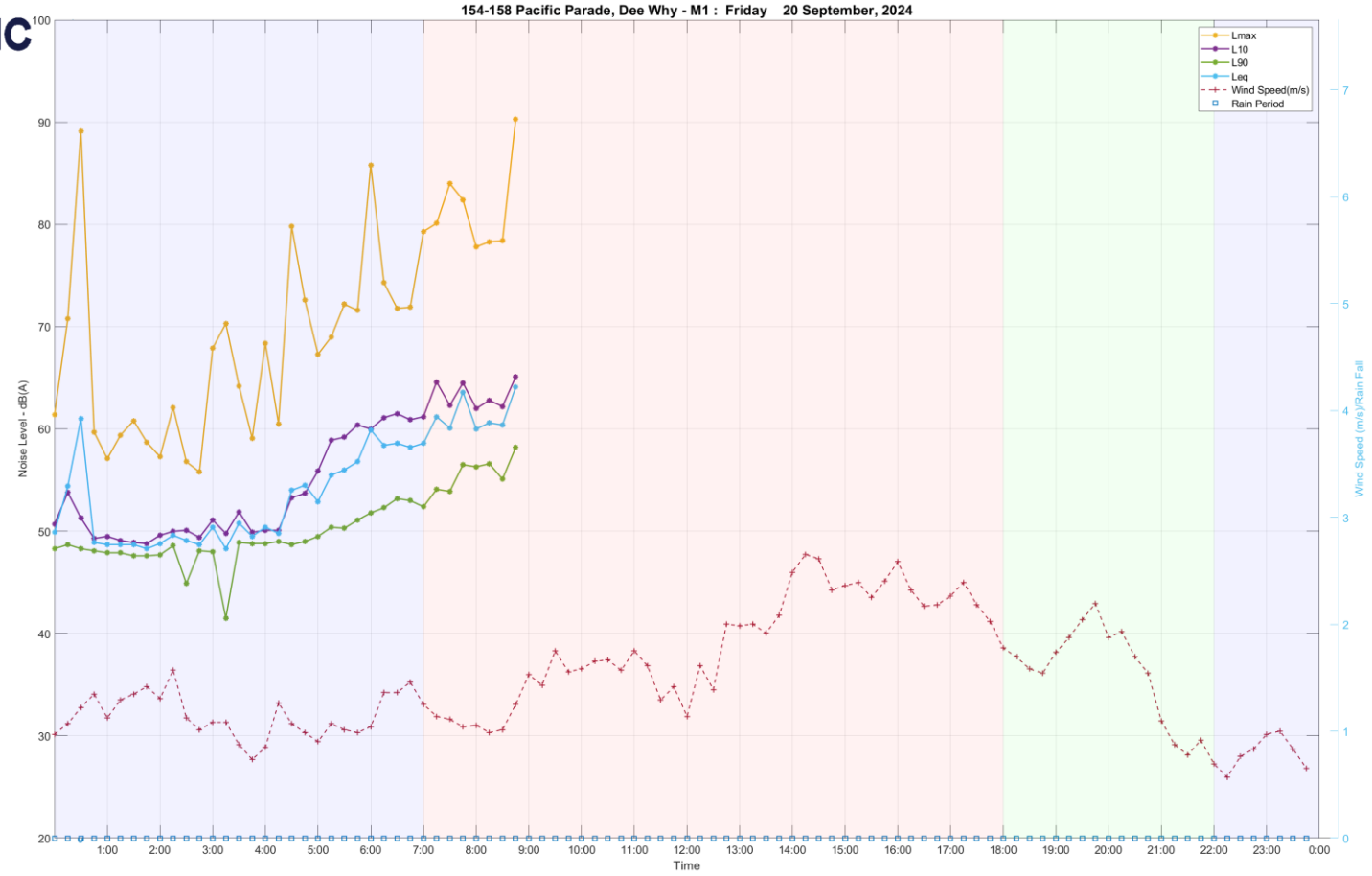

Wind Speed is corrected using factor 0.5000 based on logger location