



Homes NSW – 72 and 82-86 Menangle Road, Camden

Noise Impact Assessment for a State Significant
Development Application (SSDA)

Prepared for Homes NSW

Project No. SYD4168

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Revision 03

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Location 72 and 82-86 Menangle Road, Camden.
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Project Team	
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1 Executive Summary

This acoustic report has been prepared by ADP Consulting Pty Ltd as part of the Environmental Impact Statement (EIS) for a State Significant Development (SSD) application and concurrent rezoning for a social and affordable housing development at 72 and 82-86 Menangle Road, Camden.

The site is located at 72 and 82-86 Menangle Road, Camden, in the Camden Local Government Area (LGA) and has a combined site area of 7,184sqm.

The SSDA seeks approval for the construction of two residential flat buildings comprising a total of 95 social and affordable housing dwellings.

This report has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) issued for the project (SSD-116982991) on 11th May 2026 as detailed in the table below.

Table 1: Relevant SEARs considered

Issue	SEARs requirement	Section reference
10. Noise and Vibration	Provide a noise and vibration impact 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.	Section 8

This report concludes that the proposed development appropriately considers noise and vibration subject to the implementation of the following mitigation measures:

- Building envelope treatments as presented in Section 9.
- Mechanical noise treatment as presented in Section 10.1. A detailed mechanical noise assessment will be conducted during construction certificate stage.
- Construction noise and vibration management plan presented in Section 11.

2 Proposed development

The SSDA seeks consent for the following:

- Site preparation works including excavation.
- Construction of two residential flat buildings containing 95 dwellings for the purpose of social and affordable housing.
- Construction of one level of basement parking for each residential flat building.
- Associated landscaping and communal open space.
- Infrastructure servicing.

A detailed description of the project is included in the EIS.

2.1 Subject Site

The site is located at 72 and 82-86 Menangle Road, Camden in the Camden Local Government Area (LGA). The site comprises 9 lots and has a combined site area of 7,184sqm. The lots are legally described as Lot 73-77 in DP21405, Lot 86 in DP21405, and Lots 1-3 in DP24039.

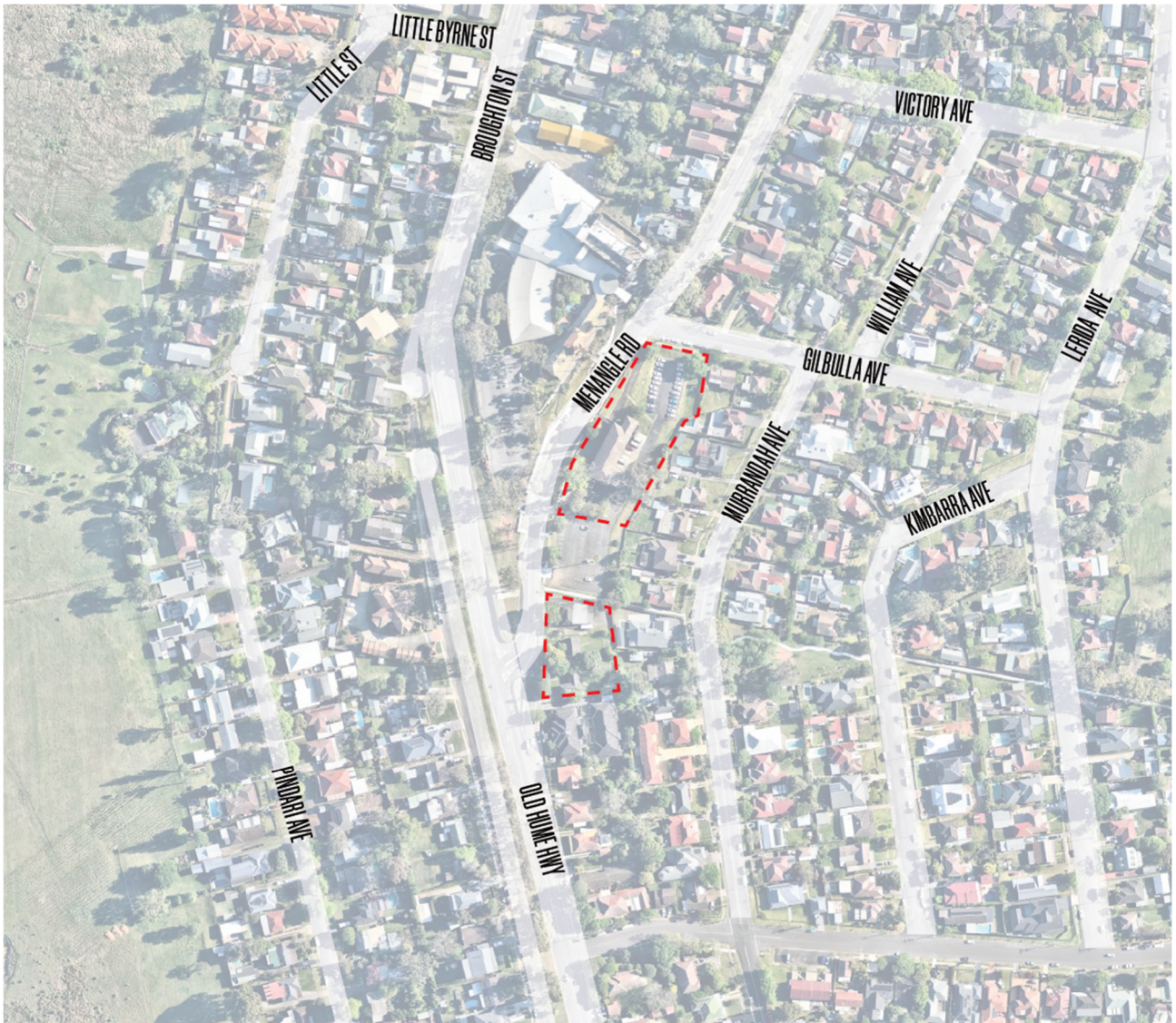
The site is currently occupied by three 1960s brick cottages, the former Camden Nurses' Quarters, and a former NSW Health car park.

The site has frontage to Menangle Road and Gilbulla Avenue. It is located opposite Camden Hospital and is approximately 600 metres from the Camden Town Centre, which provides a range of essential services, retail, and civic facilities.

A bus stop is located directly in front of the site on Menangle Road and Don Moon Memorial Reserve is located less than 250m from the site.

To the south and east, the site is surrounded by low density residential housing.

Figure 1 Subject site (Source DKO)



3 Introduction

ADP Consulting has been engaged by Homes NSW to provide a Noise Impact Assessment for the proposed residential development located at 72 and 82-86 Menangle Road, NSW, in support of a State Significant Development Application (SSDA).

The development will comprise:

- The construction of two residential flat buildings comprising a total of 95 social and affordable housing dwellings.
 - Building A1 & A2
 - Building B

This report presents an environmental noise impact assessment and addresses the following:

- Noise impacts to the proposed development
- Noise emissions from the operation of the proposed development affecting the surrounding noise sensitive receivers.

This report includes the following:

- Description of policies, guidelines and standards and apply to the project.
- Nominated design criteria for:
 - Environmental noise emission to nearby sensitive areas
 - Noise intrusion to the proposed development.
- Acoustic design strategy implemented to comply with the nominated criteria.

A glossary of acoustic terms is presented in Appendix A - Terminology.

3.1 Reference Documents

The following documentation has been used in preparing this report:

- Architectural Drawings prepared by DKO, Project Number 14127, Revision A and dated 26/06/2026.
- Camden Council DCP 2019 (Camden DCP 2019).
- Apartment Design Guide (ADG) acoustic provisions.
- Australian/ New Zealand Standard AS/NZS 2107:2016 Acoustics – Recommended design sound levels and reverberation times for building interiors.
- NSW Department of Planning '*Development Near Rail Corridors and Busy Roads*' – Interim Guideline 2008.
- EPA NSW Noise Policy for Industry (NPfI) 2017.
- State Environmental Planning Policy (Transport and Infrastructure) 2021.
- Protection of the Environment Operations Regulation 2017 (POEO 2017).

4 Site Context

The proposed development is located at 72 and 82-86 Menangle Road, within the Camden Local Government Area (LGA).

The nearest noise sensitive receivers include:

- R1 – R4: Medium-density residential dwellings directly to the east, and to the north, west and south.
- R5: Hospital noise sensitive receiver to the west, opposite Menangle Road (Camden Hospital).
- R6: Nearest passive recreational noise sensitive receiver approximately 70m to the southeast.

Potential noise sources that may impact the development include:

- Road traffic on Menangle Road directly to the west, Broughton Street approximately 65m to the west, Gilbulla Avenue directly to the north, and Murrandah Avenue to the east. None of these roads are classified as “busy roads” under the Transport for NSW Transport and Infrastructure SEPP.
- The carpark and emergency driveway of Camden Hospital to the west, opposite Menangle Road.
- The existing carpark to the south.
- Externally located services plant and equipment for buildings in all directions.

The project site and surrounding features, including noise-sensitive receivers, are presented in Figure 2.

Figure 2 Project site and context (Sourced from SIX Maps)



- Project site 72 and 82-86 Menangle Road, Camden
- R1 – R4: Nearest residential noise sensitive receivers
- R5: Nearest hospital receiver
- R6: Nearest passive recreation noise sensitive receiver
- L1: Unattended long-term noise monitoring locations
- CP: Existing Carpark

5 Noise Surveys

Unattended and attended noise surveys were conducted at the site to determine the noise emission criteria and noise intrusion requirements for the proposed development. This section presents a summary of the noise surveys conducted for this assessment. Refer to Figure 2 for noise monitor locations.

5.1 Noise Measurement Equipment

The following instrumentation was used for noise measurement and analysis:

- Bruel and Kjaer Sound calibrator Type 4231.
- 1 x Type 1 Noise Sentry NSRT MK3 Sound Level Meter Data Logger.

All instrument systems are laboratory calibrated using instrumentation traceable to Australian National Standards and certified within the last two years thus conforming to Australian Standards. The measurement system was also field calibrated prior to and after noise surveys. Calibration drift was found to be less than 0.2dB during measurements. No adjustments for instrument drift during the measurement period were warranted.

5.2 Unattended Noise Measurements

Unattended background noise monitoring was conducted in the period between Thursday, 5th March 2026 to Monday, 16th March 2026, at the eastern boundary of the proposed development site. The monitoring equipment was installed with the microphone positioned approximately 1.5 m above natural ground level, adjacent to the western façade of the nearest residential receiver R1 as shown in Figure 2.

The measured background noise levels have been corrected for meteorological conditions (excessive wind and/or rain), as required by Section 3.4 of the EPA Noise Policy for Industry. Exceedances of the 5m/s average wind speed limit of the EPA were noted and corrected for in determining the background noise levels.

Appendix B – Unattended Noise Logger Graphs provides the results of the unattended noise monitoring.

Measured background and equivalent continuous sound levels at location L1 (refer to Figure 2) are summarised in Table 2 below.

Table 2 Unattended Noise Logging Results

Location	Period	Ambient Noise Level (L _{Aeq})	Rating Background Noise Level – RBL (L _{A90})	Traffic Noise Level (L _{Aeq, Period})
L1 (at the boundary of nearest residential noise sensitive receiver R1 – refer to Figure 2).	Day	53	42	53
	Evening	52	44	
	Night	50	43	50
Notes:		1. Day periods are outlined below: Daytime: 7 am – 6 pm (Monday-Saturday) Daytime: 8 am – 6 pm (Sundays and Public Holidays) Evening: 6 pm – 10 pm Nighttime: 10 pm – 7 am (Mondays-Saturdays) Nighttime: 10 pm – 8 am (Sundays and Public Holidays) 2. 15-hour and 9-hour traffic levels outlined per NSW DoP guidelines. 15-hour: 7am - 10pm 9-hour: 10pm - 7am		

5.3 Attended Noise Measurements

Attended noise measurements were undertaken at the site on 16 March 2026 to characterise short-term environmental noise levels, with particular emphasis on road traffic noise conditions during peak periods. The measured results are intended to inform the façade noise intrusion assessment and provide representative peak 15-minute noise levels for design purposes.

Two representative 15-minute measurement periods were recorded in the late afternoon, capturing peak traffic activity along Menangle Road and surrounding local road networks.

Table 3 Summary of Attended Noise Measurements (15-minute samples)

Measurement Location	Start Time	LAeq,15min (dB(A))	LAmix (dB(A))
Murrandah Avenue @ 3m from the road kerb	16/03/2026 17:15 pm	57	75
Menangle Road @3m from the road kerb	16/03/2026 17:45 pm	62	78

6 Internal Noise Level Criteria

The following section outlines the environmental noise policies and noise goals applicable to the project.

6.1 Camden Development Control Plan (DCP) 2019

Section 4.2 of the Camden DCP provides general residential development controls. Controls for Visual and Acoustic Privacy are provided in Section 4.2.9 and are summarised below.

“Controls

1. *The internal layout of residential buildings, window openings, the location of outdoor living areas (i.e. courtyards and balconies) and building plant should be designed to minimise noise impact and transmission.*
2. *Direct overlooking of the main living areas and private open spaces of adjacent dwellings should be minimised through building layout, window and balcony location and design, and the use of screening devices, including landscaping. A privacy screen or fixed obscure glass must be provided for any part of a window (on the first floor) to a habitable room (excluding bedroom) that is less than 1.5m above the finished floor level of that room, if the room overlooks an adjacent dwelling window or the private open space of an adjacent dwelling.*
3. *Active recreation facilities (e.g. swimming pools) should be located away from the bedroom areas of adjoining dwellings.*
4. *First floor balconies or decks facing the side or rear boundaries are not permitted, unless it can be demonstrated that there will be no adverse privacy impacts to neighbouring properties. The depth of the first-floor balcony or deck is not to exceed 2 metres.”*

The DCP does not provide specific acoustic criteria for residential development. Thus, the most stringent residential noise criteria, SEPP 2021 and NSW DoP Interim Guidelines, will be considered.

6.2 State Environmental Planning Policy (Transport & Infrastructure) 2021

The Transport and Infrastructure State Environmental Planning Policy (T&I SEPP) apply to development in proximity to classified “busy roads” and rail corridors. Clause 2.100 specifies indoor noise level requirements for non-rail developments that are for residential use. The following are stated:

- (3) *If the development is for the purposes of residential accommodation, 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 residential accommodation—35 dB(A) at any time between 10 pm and 7 am,*
 - (b) *anywhere else in the residential accommodation (other than a garage, kitchen, bathroom or hallway)—40 dB(A) at any time.*

Based on the relevant mapping, Menangle Road is not identified as a “busy road” under the Transport and Infrastructure SEPP. Accordingly, the specific requirements of the T&I SEPP are not triggered for the proposed development.

Notwithstanding, to ensure a satisfactory level of acoustic amenity for future occupants and in accordance with the intent of the Apartment Design Guide, internal noise criteria consistent with industry practice have been adopted for the assessment.

6.3 NSW Department of Planning Interim Guidelines

Further to the above, Section 3.6.1 of the DoP interim guideline (now Department of Planning, Housing and Infrastructure) outlines that habitable rooms inside a residential building should comply with the following:

Table 4 NSW DoP Internal Noise Criteria – [dB(A)]

Type of Occupancy	Noise Level	Applicable Time Period
Sleeping area (bedroom)	35	Night [10 pm – 7 am]
Other habitable rooms	40	Any time

Further to this, the Interim Guidelines make allowances of 10 dBA above the SEPP internal noise criteria for rooms with windows and doors open. Outdoor noise levels in exceedance of 10 dBA above the internal noise level criteria will require the room to be ventilated by alternative methods. Therefore, the target internal noise levels for apartments that require open doors and windows may be presented as:

- In any bedroom in the building – 45 dB(A) at any time between 10.00pm and 7.00am,*
- Anywhere else in the building (other than a garage, kitchen, bathroom or hallway) – 50 dB(A) at any time.*

The internal noise criteria outlined in Section 3.6.1 of the DoP have been adopted as design targets to ensure appropriate acoustic amenity, consistent with the intent of the Apartment Design Guide.

6.4 AS/NZS 2107:2016

Indoor background noise levels in terms of Sound Pressure Level (SPL) and reverberation times (seconds) deemed acceptable to most occupants are published in AS/NZS 2107 and have been referred to in this assessment for non-habitable areas, where SEPPTI or the NSW Department of Planning, Housing and Infrastructure do not provide criteria. The table below summarises the recommended indoor noise levels for areas other than residential in the proposed development.

Table 5 Internal Design Sound Pressure Levels

Type of Occupancy	Design SPL, L_{Aeq} , dB(A)
Washrooms and toilets	45 to 50
Enclosed carparks	≤ 65

6.5 Summary of Internal Noise Level Criteria

The internal noise criteria for the proposed development have been derived from the State Environmental Planning Policy (Transport and Infrastructure) 2021 (SEPP), the NSW Department of Planning Interim Guidelines, and AS/NZS 2107:2016. For residential habitable spaces, SEPP and the Interim Guidelines provide the governing criteria, while AS/NZS 2107:2016 has been adopted for non-habitable areas where specific regulatory limits are not defined. These criteria collectively form the basis for façade design, glazing selection, and ventilation strategy to ensure acceptable internal amenity.

Table 6 Summary of Adopted Internal Noise Criteria

Room Type	Condition	Internal Noise Criteria dB(A) L_{Aeq}
Bedrooms (habitable rooms)	Night-time (10 pm – 7 am)	≤ 35
Other habitable rooms (living, dining, etc.)	All times	≤ 40
Bedrooms (windows open allowance)	Where natural ventilation is assumed	≤ 45
Other habitable rooms (windows open allowance)	Where natural ventilation is assumed	≤ 50
Washrooms and toilets	Non-habitable	45–50
Enclosed carparks	Non-habitable	≤ 65

7 External Noise Emission Criteria

This section outlines the noise emission criteria applicable to the subject development.

7.1 Camden Development Control Plan (DCP) 2019

The Camden Development Control Plan 2019 requires compliance with the *EPA Noise Policy for Industry 2017*, and states the following:

- "Residential plant and equipment must not generate a noise level greater than 5dBA above background noise level as measured at the boundary of a noise sensitive property during the hours of 7.00am to 10.00pm".
- "Noise from plant and equipment must not be audible in habitable rooms of adjoining noise sensitive properties during the hours of 10.00pm to 7.00am."

In this regard, the noise emission criterion per the Camden DCP can be seen in the intrusive criteria in Table 7 below. Refer to Section 5.2 for details on the long-term noise monitoring conducted at the site.

Table 7 Intrusive Noise Criterion - Camden DCP 2019

Period	Intrusive	
	RBL	RBL + 5 dB
Most Noise Affected Surrounding Residential Receivers		
Day (7am – 6pm)	42	47
Evening (6pm – 10pm)	44	49
Night (10pm – 7am)	43	48

7.2 Noise Policy for Industry, EPA NSW (NPfI)

The NPfI requires compliance with specific *project noise trigger levels*, which provide a benchmark or objective for assessing the acceptability of noise impacts associated with a proposed development. The project noise trigger level is not a mandatory requirement but rather indicates a potential noise impact on the community, and so 'triggers' a management response, for example, further investigation of mitigation measures.

The *project trigger levels* are determined from the lower (that is, the more stringent) value of the project *intrusiveness noise level* and *project amenity noise level*. The NPfI also includes the application of modifying factors for undesirable noise characteristics such as tonality or impulsiveness, up to a maximum of 10dB.

7.2.1 Noise Intrusiveness

The NPfI states that the intrusiveness of an industrial noise source may generally be considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (represented by the L_{Aeq} descriptor), measured over a 15-minute period, does not exceed the background noise level (L_{A90}) measured in the absence of the source by more than 5 dB.

7.2.2 Amenity Noise Levels

The NPfI describes a methodology to limit gradual increases in noise levels from the introduction of new noise sources in an area, sometimes referred to as 'background noise creep'.

The *recommended amenity noise levels* represent the objective for total noise at a receiver location, whereas the *project amenity noise level* represents the objective for noise from this project. The *project amenity noise level for developments* = *recommended amenity noise level* (Table 2.2) minus 5 dB(A). 3 dB is then added to convert from an L_{Aeq} , period to $L_{Aeq, 15min}$.

The *project amenity noise level* for developments in areas of high traffic (such as the subject site) = $L_{Aeq, \text{period (traffic)}} - 15 \text{ dB(A)}$. A site is a 'high traffic project' if traffic noise is identified as the dominant noise source, existing traffic noise levels are 10 dB or more above the recommended amenity noise levels and it is highly unlikely traffic noise levels will decrease in future.

NPfI Table 2.2 specifies amenity noise levels for different types of receivers.

7.2.3 Modifying Factors

Undesirable characteristics such as tonality, low frequency, impulsiveness and intermittency, adjustments (as per Fact Sheet C of the NPfI) shall be assessed. These modifying factors include a 5dB penalty for each undesirable characteristic. A maximum penalty of 10dB for 2 or more undesirable characteristics applies.

7.3 Protection of the Environment Operations (Noise Control) Regulation 2017

Clause 45 of the POEO 2017 Regulation states that all air-conditioning units installed on residential premises must not emit a noise that is audible inside a habitable room of an adjoining residential premise during the night-time period. The following has been extracted and reproduced from the regulation.

"A person is guilty of an offence if:

(a) the person causes or permits an air conditioner to be used on residential premises in such a manner that it emits noise that can be heard within any room in any other residential premises (that is not a garage, storage area, bathroom, laundry, toilet or pantry) whether or not any door or window to that room is open:

- (i) before 8 am or after 10 pm on any Saturday, Sunday or public holiday, or*
- (ii) before 7 am or after 10 pm on any other day"*

While Clause 45 of the POEO (Noise Control) Regulation 2017 specifies an audibility-based criterion rather than a numerical noise limit, a quantitative assessment has been undertaken to demonstrate compliance. For the purpose of establishing a numerical inaudibility criterion, a level 5–8 dB below the prevailing background noise level has been adopted. This criterion is considered conservative and is intended to ensure that noise from the air-conditioning units would not be audible within habitable rooms of neighbouring residences during the night-time period, provided the noise is not tonal or impulsive in nature.

- **R1 – R4: Most Noise Affected Residential Receivers:** $L_{Aeq, 15 \text{ minutes}}$ **35-38 dB**

7.4 Summary of Environmental Noise Criteria

A summary of noise emission criteria that apply at residential receivers from the use of the proposed development is presented in the following table.

The 'project trigger levels' are the most stringent noise criteria of the intrusive and amenity noise levels that apply in each instance.

Table 8 EPA NPfI Planning Levels – $L_{Aeq, 15\text{-minutes}}$ [dBA] for Most Stringent Criteria

Period	Intrusive		Amenity				Project Noise Trigger Level – L _{Aeq} , 15- minutes	Inaudibility Criteria
	RBL	RBL + 5 dB	Area Classification	Recommended Amenity Noise Level	High Traffic Area	Project Amenity Noise Level		
R1-R4: Most Noise Affected Surrounding Residential Receivers								
Day	42	47	Suburban	55	No	53	47	-
Evening	44	49	Suburban	45	No	43	43	-

Period	Intrusive		Amenity				Project Noise Trigger Level – L _{Aeq} , 15- minutes	Inaudibility Criteria
	RBL	RBL + 5 dB	Area Classification	Recommended Amenity Noise Level	High Traffic Area	Project Amenity Noise Level		
Night	43	48	Suburban	40	No	38	38	35-38 dB
Notes:	- Periods as defined by EPA are outlined below: Daytime: 7 am – 6 pm (Monday-Saturday), 8 am – 6 pm (Sundays and Public Holidays) Evening: 6 pm – 10 pm Nighttime: 10 pm – 7 am (Mondays-Saturdays), 10 pm – 8 am (Sundays and Public Holidays) - Noise emission criteria at the boundary of the residential receivers.							

8 Construction Noise and Vibration Criteria

8.1 Construction Noise Emission Criteria

The *Draft Construction Noise Guideline*, dated 2020, was produced by EPA to replace the Interim Guideline, dated 2009. It sets out a framework for the management of construction noise through feasible and reasonable mitigation measures. The key objective of the Guideline is to ensure that noise impacts from construction are adequately controlled.

The framework outlines the following steps:

- Identify sensitive land uses and construction hours.
- Select the assessment method between a qualitative assessment and a quantitative assessment. A qualitative assessment involves a simplified procedure appropriate for noise sources unlikely to cause significant noise impacts, while a quantitative assessment predicts noise from activities at noise-sensitive receivers and is required for projects where the expected construction duration will exceed 3 weeks.
- For a quantitative assessment, the procedures in Section 5 of the Guideline should be followed to predict construction noise levels; the predicted levels should be compared against the relevant noise management levels set out in Tables 3, 4 and 6 of the Guideline, to identify feasible and reasonable mitigation.

Section 5.3 of the Guideline presents Noise Management Levels (NMLs) for airborne noise at residences and provides supplementary mitigation measures. These are presented in the following Table.

- The 'noise affected' level represents the point above which there may be **some community reaction** to noise.
- The 'highly noise affected' level represents the point above which there may be **strong community reaction** to noise.

Table 9 Noise management levels to residences (Tables 3 and 4 of the EPA Draft Construction Noise Guideline)

Time of Day	Management level, L_{Aeq} (15 min)	How to apply
Recommended Standard Hours	Noise affected level	Where the predicted or measured $L_{Aeq, 15min}$ is greater than the noise-affected management level, the proponent shall apply all feasible and reasonable work practices to meet this level. As a matter of good practice, noise should be reduced as far as reasonably practicable. The proponent should notify all potentially impacted residents.
Monday to Friday: 7:00 am to 6:00 pm	RBL ¹ + 10 dB	
Saturday 8:00 am to 1:00 pm	Highly noise-affected level	Where noise is above the highly noise-affected management level, all feasible and reasonable mitigation shall be applied as well as engagement with the consent authority or regulator to identify other measures to manage noise impacts. Where appropriate, engagement with the community is encouraged to determine the preferred mitigation approach, such as:
No work on Sundays or Public Holidays	75 dB(A)	▪ negotiated agreements and/or respite periods to restrict work activity. ▪ identification of times when the community is less sensitive to noise, including options for longer periods of construction in exchange for restrictions on construction times.
Outside recommended standard hours:	Noise affected level: RBL + 5 dB	Strong justification is required for works outside the recommended standard hours. The proponent shall apply all feasible and reasonable work practices to meet the noise-affected management level. Where this cannot be met, residual impacts should be quantified, and potentially impacted residents notified. The supplementary mitigation

described in Table 5 of the Guideline must also be considered, subject to the application notes in Section 5.4.

Highly noise-affected level
65 dB(A)

The highly noise-affected management level represents the point above which the supplementary mitigation described in Table 5 must be considered, subject to the application notes in Section 5.4. The proponent must justify the selection of feasible and reasonable mitigation, including the supplementary mitigation, with emphasis on consultation with the community and the consent authority or regulator, and community views on work scheduling and respite periods, as described in Section 5.4.

Notes:

1. RBL as defined in *Noise Policy for Industry*

Section 5.5 of the Guideline also presents noise management levels for construction noise at non-residential noise-sensitive receivers.

8.2 Summary of Construction Noise Criteria

Using the methodology outlined above and the Rating Background Levels determined in Section 5.2, Noise Management Levels for all receivers are presented below.

Table 10 Noise Management Levels

Time of Day	Land Use	Noise Management Level L_{Aeq} (15 min) dB(A)	
		Noise affected	Highly noise-affected
Recommended standard hours: Monday to Friday: 7:00 am to 6:00 pm Saturday 8:00 am to 1:00 pm No work on Sundays or Public Holidays	Residential L1 (at the boundary of nearest residential noise sensitive receiver R1 – refer to Figure 2).	52	75
	Residential L1 (at the boundary of nearest residential noise sensitive receiver R1 – refer to Figure 2).	47	65

8.3 Construction Vibration Emission Criteria

EPA *Draft Construction Noise Guideline* does not include criteria for vibration generated from construction works. Vibration shall be measured and assessed in accordance with *Assessing Vibration: A Technical Guideline* (AVTG).

The criteria outlined in the AVTG is based on BS 6472-1992. Sources of vibration are defined as either 'Continuous', 'Impulsive' or 'Intermittent'.

Vibration is assessed in the following categories:

- Human comfort

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- Structural damage
- Ground-borne noise

8.3.1 Human Comfort

Human comfort due to exposure to vibrations is dependent on duration and magnitude. Vibration assessed for human comfort can be classified as continuous, impulsive, or intermittent and can enter the body along different orthogonal axes, i.e. x-axis (back to chest), y-axis (right side to left side), or z-axis (foot to head).

The AVTG refers to BS6472:1992 for human comfort criteria, which are outlined in the following sections.

8.3.2 Continuous and Impulsive Vibration

Allowable magnitudes for continuous and impulsive exposure to building vibration (summarised from Table 2.2 of AVTG) with respect to human response are presented in the following table.

Table 11 Continuous and impulsive vibration criteria, m/s^2

Location	Time of Construction	Preferred (rms)		Maximum (rms)	
		z-axis	x & y-axis	z-axis	x & y-axis
Continuous vibration					
Residences	Day (7 am – 10 pm)	0.010	0.0071	0.020	0.014
	Night (10 pm – 7 am)	0.007	0.005	0.014	0.010
Impulsive vibration					
Residences	Day (7 am – 10 pm)	0.30	0.21	0.60	0.42
	Night (10 pm – 7 am)	0.10	0.071	0.20	0.14

8.3.3 Intermittent Vibration

The VDV criteria recommended in AVTG are summarised in Table 12. To quantify the cumulative effects of several vibration events based on human exposure due to duration and magnitude, the Vibration Dose Value (VDV) descriptor is used.

Table 12 Intermittent vibration criteria, vibration dose values (VDV), $\text{m/s}^{1.75}$

Location	Time of Construction	Preferred (rms)	Maximum (rms)
Residences	Day (7 am – 10 pm)	0.20	0.40
	Night (10 pm – 7 am)	0.13	0.26

8.3.4 Structural Damage

BS 7385.2:1993 sets structural damage limits for during both the excavation and construction phases, and for both heritage and non-heritage buildings.

The vibration limits in buildings associated with cosmetic damage in BS7385.2:1993 for non-heritage buildings are summarised in the table below.

Table 13 Transient vibration guide values for cosmetic damage for non-heritage buildings

Type of Building	Peak component particle velocity in frequency range of predominant pulse	
	4Hz to 15Hz	15Hz and above
Reinforced or framed structures Industrial and heavy commercial buildings	50mm/s at 4Hz and above	
Unreinforced or light-framed structures Residential or light commercial-type buildings	15mm/s at 4Hz increasing to 20 mm/s at 15Hz	20mm/s at 15Hz increasing to 50mm/s at 40Hz and above
At frequencies below 4Hz, a maximum displacement of 0.6mm (zero to peak) should not be exceeded		

Vibration limits for buildings that are heritage may need to be revised due to their potentially sensitive nature. As BS 7385.2:1993 does not refer to buildings of a sensitive nature, the more appropriate DIN 4150.3:1999 is proposed. Table 14 summarises vibration limits for the adjacent heritage buildings that are sensitive to vibrations, as outlined in DIN 4150.3:1999.

Table 14 Guideline values for vibration velocity to be used when evaluating the effects of short-term

Type of Building	Peak component particle velocity in frequency range of predominant pulse mm/s			Vibration of horizontal plane of highest floor at all frequencies
	1Hz to 10Hz	10Hz to 50Hz	50Hz to 100Hz	
Structures that have sensitivity to vibration and are of great intrinsic value (e.g. listed buildings under preservation order)	3	3 to 8	8 to 10 (at frequencies above 100Hz, the values given in this column may be used as minimum values)	8

Monitoring equipment should be configured in such a way so that alarms are triggered at a level below 3mm/s (we recommend 2mm/s as a trigger level in heritage buildings).

8.3.5 Ground-Borne Noise

Ground-borne noise is generated by vibration through the ground affecting structures through activities such as rock breaking or excavations. The EPA *Draft Construction Noise Guideline* (ICNG) states that noise management actions should be implemented (which may include community consultation and respite) when the following levels are exceeded:

Evening (18:00-22:00) – Internal: $L_{Aeq\ 15min} - 40\text{ dB(A)}$

Night-time (22:00-07:00) – Internal: $L_{Aeq\ 15min} - 35\text{ dB(A)}$

There are no criteria presented in the ICNG for ground-borne noise during the daytime hours (7:00 am-6:00 pm), when it is expected that construction work will take place. Therefore, we recommend that ground-borne noise levels in the adjacent buildings do not exceed the levels presented in Table 15 during the daytime period. These recommendations are in accordance with the internal noise levels adopted from AS/NZS 2107:2016 for use under construction intrusion noise conditions for consistency.

Table 15 Daytime ground-borne noise criteria

Type of receiver	Type of room	Ground borne noise, $L_{Aeq, 15min}$ dB(A)
Residential	Any	45
Hospital	Any	40
Commercial, educational institutions and places of worship	General office areas/meeting rooms/classrooms	45

9 Noise Intrusion Assessment

The noise intrusion assessment is based on the following:

- The external incident noise level at the proposed building façade resulting from the acoustic survey conducted at the site;
- The sound insulation performance of the building envelope, including external walls, glazing and associated elements; and
- The internal acoustic characteristics of the building, specifically the reverberation control within the affected rooms.

The dominant noise sources affecting the proposed development are road traffic along Menangle Road and Gilbulla Avenue.

The external noise measurements described in Section 5 have been used to determine façade noise levels and to establish the minimum building envelope performance required to achieve compliance with the internal noise criteria outlined in Section 6.5.

9.1 External Walls

External walls are proposed to be constructed by masonry elements. Additional treatments for compliance with the acoustic criteria will not be required.

Wall construction details will be reviewed during the detail design phase, prior to the Construction Certificate stage.

9.2 Roofing

The roof is proposed to be made of concrete slab. Additional treatments for compliance with the acoustic criteria will not be required.

Roof construction details will be reviewed during the detail design phase, prior to the Construction Certificate stage.

9.3 Glazing

This section presents indicative glazing thickness and glazed element performance rating for the proposed development. These recommendations are subject to review and confirmation at the Construction Certificate stage, following further progression of the architectural design.

Table 16 Glazing Recommendations

Room	Glazing	Seals	Minimum R_w performance rating*
All	6.38 mm laminated glass	Q-Ion and fin	31

*Minimum required R_w rating for glazed element, inclusive of glass, frame and seals

The following should also be noted:

- The glazing outlined above is the minimum required to comply with the relevant noise intrusion standards.
- Other window configurations may be considered provided they are reviewed before selection.
- Glazing should be built into a solid frame with Q-Ion and fin seals.
- All windows that can be opened should be air-tight when closed.

9.4 Ventilation

Noise intrusion to bedrooms with façades exposed to Menangle Road is predicted to result in a minor exceedance (up to 2 dB LAeq) of the façade noise levels assumed for partially open windows. Given the small magnitude of exceedance, this is not expected to result in a perceptible impact on internal acoustic amenity when windows are open. Accordingly, the provision of alternative (mechanical) ventilation is not considered necessary. This is further supported by the fact that the site is not adjacent to a “busy road” under the Transport and Infrastructure SEPP, and therefore the associated ventilation requirements are not strictly triggered.

In addition, the proposed development includes condenser units, which will enable occupants to maintain thermal comfort with windows closed, should they prefer to do so.

10 Noise Emission Assessment

10.1 Building Services Plant and Equipment

Mechanical services drawings and equipment schedules have not been finalised at this stage and therefore, the following advice is intended as a guide and will be reviewed and confirmed during the detailed design phase as the design progresses. A detailed mechanical noise emission assessment will be undertaken during construction certificate stage, once mechanical plans and plant selections are progressed.

The following table outlines general mechanical plant recommendations that shall be allowed for.

Table 17 Mechanical Plant and Equipment Recommendations

Equipment	Potential Noise Attenuation Measures
Car park supply / exhaust fans	- Plant should be selected considering the noise output. - Speed controllers may be required if used, should be of good quality and compatible with the motor model. Poor quality controllers can result in a significant increase in motor noise. - Attenuators between the fan and outdoor environment may be required. - Internal duct lining between the fan and outdoor environment may also be required. Duct lining (<i>where required</i>) should have a density of at least 24 kg/m³. - Vibration isolators to reduce vibration to the building structure will be required. - Acoustic screens for external plant exhaust areas may be required. - Acoustic louvres may be required to control noise emissions.
Garbage exhaust fan	- Plant should be selected considering the noise output. - Attenuators between the fan and exhaust outlet may be required. - Internal duct lining between the fan and exhaust outlet may be required. Duct lining (<i>where required</i>) should have a density of at least 24 kg/m³. - Vibration isolators to reduce vibration to the building structure will be required. - Acoustic screens for external plant exhaust areas may be required. - Sound absorptive treatments in plant room spaces may be required. - Acoustic louvres may be required to control noise emissions.
Basement supply / exhaust fans	- Plant should be selected considering the noise output. - Internal duct lining between the fan and outdoor environment may be required. Duct lining (<i>where required</i>) should have a density of at least 24 kg/m³. - Vibration isolators to reduce vibration to the building structure will be required. - Acoustic louvres may be required to control noise emissions.
Air-conditioning condenser units	- Condenser units should be selected considering the noise output. - Selecting condenser units with night quiet mode availabilities to lower the noise level during nighttime hours. - Acoustic screens or enclosures may be required.
Kitchen exhaust fans	No acoustic treatment is likely due to intermittent use and inherently low noise levels.
Bathroom exhaust fans	No acoustic treatment is likely due to intermittent use and inherently low noise levels.

Services plant and equipment installed within the development must not emit noise levels that exceed the EPA's NPfI project noise trigger levels as presented in Section 7.4 at all nearest noise sensitive receivers.

11 Construction Noise and Vibration Management Plan

This section outlines the management framework, mitigation measures, and monitoring strategies to minimise construction noise and vibration impacts associated with proposed residential development at 72 and 82-86 Menangle Road, Camden. The recommendations are intended to guide the contractor in managing demolition, excavation, and construction activities in accordance with the relevant criteria presented in Section 7, and to reduce potential impacts on surrounding sensitive receivers.

11.1 Construction Methodology

At the time of preparing this assessment, detailed construction information, including the construction methodology, staging, and plant and equipment schedules, is not yet available. As a result, a detailed assessment of construction noise and vibration impacts of the construction methodology cannot be completed.

A detailed Construction Noise and Vibration Management Plan (CNVMP), incorporating the final construction methodology, staging, and plant selection, shall be prepared prior to the commencement of construction works.

11.2 Construction Noise Assessment

An indicative assessment of construction noise levels has been undertaken using noise data for typical construction activities. As detailed construction methodology, staging and equipment schedules are not currently available, the assessment is intended to provide an indication of potential construction noise impacts only.

This assessment of the construction noise levels has been undertaken with respect to the Noise Management Levels (NMLs). Noise emissions from the proposed construction works were calculated at the most affected noise-affected boundary location of all nearest noise-sensitive receivers. On-site residential Receivers 1 and 4 are considered to experience similar exposure conditions due to their comparable proximity and orientation to the construction zone and therefore have been assessed using the same methodology. Receivers 2 and 3, located off-site, has been assessed separately to reflect its distinct location relative to the site boundary.

Appendix C presents the indicative construction noise levels from expected typical construction activities. As the exact location of each construction activity is not yet determined and may change throughout the construction process, stationary sources with unknown positions have been conservatively assumed to operate from the centre of the construction site. Distances from the site boundary to the most affected receiver locations have been used, with 10 m applied as a minimum separation distance.

Indicative construction noise levels are presented in Appendix C of this report.

Outcomes include some 'Noise Affected' receivers and 'Highly Noise Affected' receivers, per the ICNG definitions:

- The 'noise affected' level represents the point above which there may be **some community reaction** to noise.
- The 'highly noise affected' level represents the point above which there may be a **strong community reaction** to noise.

The indicative assessment based on typical construction activities suggests that highly noise-affected levels may occur at nearby receivers during certain construction activities, particularly when works are undertaken in 10 metres of the receiver.

Where construction activities are predicted to exceed the relevant management levels, additional mitigation measures, consultation requirements and respite periods may be required in accordance with the Draft Construction Noise Guideline. Similarly, the community may be prepared to accept a longer period of construction in exchange for restrictions on construction times.

In general, construction works are temporary, therefore potential noise impact on the surrounding noise sensitive receivers (as shown Figure 2) and the surrounding environment will not be permanent or continuous. However, where the predicted noise level is greater than the noise management levels all feasible and reasonable work practices should be applied, it is unlikely mitigation measures would reduce the received noise levels below the noise management levels in all cases.

As this work is undertaken within standard construction hours, if after implementing all 'feasible and reasonable' controls noise levels the site still exceeds the noise affected level, the ICNG does not require any further action – since there is no further scope for noise mitigation. Where the risk of Noise Affected or Highly Noise Affected receivers is predicted, the contractor shall prepare a detailed Construction Noise and Vibration Management Plan (CNVMP) as outlined in Section 11.4. The layout and operation of equipment on site are subject to change; therefore, this assessment is provided as a guide to where acoustic mitigation or consideration is more likely to be required.

11.3 Construction Vibration Assessment

11.3.1 Vibration Buffer Distances

Buffer distances can be used to indicate safe distances of activities from adjacent buildings to meet vibration criteria. Indicative best-practice buffer distances are presented in Table 18. At this stage, the equipment for construction has not been finalised and the buffer distances are intended as a guide only for the contractor.

Table 18 Vibration buffer distances, day period

Criterion	Descriptor		Handheld jack-hammer	Rock-breaker			Rotary cutter
				Light (300kg)	Medium (900kg)	Heavy (1600kg)	
Tactile vibration – residential	VDV & rms	Continuous	10m	25m	35m	55m	5m
		Impulsive	< 1m	1m	5m	20m	< 1m
Tactile vibration – commercial	VDV & rms	Continuous	5m	10m	20m	40m	2m
		Impulsive	< 1m	< 1m	5m	15m	< 1m
Cosmetic damage	Peak particle velocity		< 1m	2m	7m	22m	< 1m

11.3.2 Vibration Assessment

The indicative vibration buffer distances presented in Table 18 demonstrate that some construction activities may have the potential to generate vibration impacts at nearby sensitive receivers. The requirement for vibration monitoring and additional mitigation measures should be reviewed once the detailed construction methodology and equipment selection are available.

During the development of the detailed Construction Noise and Vibration Management Plan, an investigation of vibration impact on existing buildings on the subject site and on nearby sensitive receivers should take place. Vibration monitoring may be required under the CNVMP.

11.4 Construction Noise and Vibration Recommendations

This section presents recommendations to mitigate the potential noise and vibration impacts from the proposed development construction works. The mitigation measures are intended to represent 'feasible and reasonable' mitigation measures suitable for implementation during construction of the project.

11.4.1 General Noise and Vibration Controls

The following general management controls should be implemented:

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- The scheduling of construction activities should be undertaken to reasonably minimise noise impacts to all surrounding land uses.
- In this regard, highly noise-intrusive works should not be conducted before 8 am where noise levels would significantly exceed the noise criteria at residential receivers. This would typically apply to hammering operations and use of excavators within 50 m of a residence.
- Additionally, a respite period is to be implemented where excavator-mounted hydraulic hammering works are required and will generate noise levels exceeding the highly noise-affected levels.
- The recommended hours for use of excavator-mounted hydraulic hammering are:
 - Monday to Friday: 9 am – 12 pm and 2 pm – 5 pm.
 - Saturday: 8 am – 1 pm.
- The above hours may be modified in consultation with the surrounding receivers (in particular, with residential receivers) to minimise impact while not reducing the overall allowable hours per day.
- Notification to receivers immediately bounding the site should be provided (via flyer or similar), informing occupiers of the expected duration of the noisy activities should be conducted.
- Where reasonable and feasible, pulverisers and other non-percussive methods should be used to demolish concrete structures (where proposed).
- Before the commencement of any activity likely to generate significant ground vibration (typically hammering and dropping of objects), attended vibration monitoring is to be undertaken to establish “safe” working distances from the structures around the site.
- Attended noise measurements shall be conducted at the surrounding properties, at the beginning of the demolition works, to quantify the level of noise typically emitted from the site and confirm the predictions/respite periods applied.

Materials handling/vehicles:

- Trucks and forklifts in general use on site are to use a non-tonal reversing beacon where possible (subject to OH&S requirements) to minimise potential disturbance of surrounding receivers.
- Trucks, trailers and delivery vehicles are to turn off engines when idling to reduce noise impacts (unless required for concrete pumping or similar).

Complaints handling:

- An after-hours 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.

The noise and vibration management plan should be reviewed and revised as appropriate by the contractor carrying out the work to ensure it is relevant to the work methods selected and the programme adopted.

11.4.1.1 Equipment Selection

Equipment mitigation measures (developed from AS 2436 *Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites* (AS2436)) shall be considered to reduce noise emission from construction equipment.

Where practicable, alternative quieter methodology should be employed to reduce the impacts of the construction, i.e. using saws instead of jackhammers near adjacent structures where vibration is easily transferable, such as in bedrock.

Table 19 Equipment mitigation measures from AS2436:2010

Equipment Plant	Possible Remedies
Handheld Pneumatic Jack Hammer	Tool muffler or silencer
Handheld Demolition Saws	Dampened bit
	Enclosure barrier
	Maintain saw sharpness

Equipment Plant	Possible Remedies
5-tonne excavator (with hammer attachment)	Engine exhaust silencer Portable acoustic enclosure Tool muffler or silencer Dampened bit
Concrete pump	Enclosure barrier where feasible and reasonable Letterbox drop (notification) for dates of pouring Acoustic silencer on engine

11.4.1.2 Plant Operation

Careful selection and maintenance of plant equipment will minimise noise impact on nearby sensitive receivers.

The following are some techniques for quiet and efficient plant operation:

- Where practical, undertake the noisiest work during less sensitive times.
- Turn off plant and equipment at times that it is not being used.
- Implement, where feasible and reasonable, alternative work practices that generate less air-borne and ground-borne noise – for example:
 - use electric equipment instead of diesel or petrol-powered equipment
 - use sawing methods that reduce ground-borne noise
- Use silenced equipment and noise shielding around stationary plant (such as generators) where possible.
- Ensure plant and equipment is regularly maintained, and repair or replace equipment that becomes noisy.
- Configure the work site to minimise the use of movement alarms on vehicles and mobile plant.
- Locate noisy plant away from noise-affected neighbours or behind barriers, such as sheds or walls.
- Ensure that the site foreman or representative is trained in taking noise measurements and logs noisy activities during construction at the closest affected receivers and on-site.

11.4.1.3 Barriers

A solid barrier could be installed around the perimeter of the construction site to control construction noise. A barrier along the site boundaries can reduce the noise emission levels by up to 15 dB to ground-level receivers during the excavation and construction of the first level of the proposed development. Acoustic barriers or hoardings may also be strategically placed around noisy equipment, such as hand-held pneumatic jackhammers and hand-held demolition saws.

11.4.1.4 Worker Conduct

Workers should also be involved in noise mitigation through the following methods:

- Regularly train workers and contractors (such as at toolbox talks) to use equipment in ways that minimise noise. Avoid dropping materials from a height.
- Avoid the use of radios and stereos outdoors.
- Avoid the overuse of public address systems.
- Avoid shouting and minimise talking loudly and slamming vehicle doors.
- Turn off all plant and equipment when not in use.

Community Consultation

Section C2 of the *Draft Construction Noise Guideline* states:

“The proponent should ensure those affected by the work are informed about the project, including:

- When the work will take place and its expected duration.*
- The likely noise impact of the work without understanding its effect.*
- Any work activities or equipment that will be particularly noisy or noticeable.*
- Mitigation measures to manage noise impacts, including complaints handling procedures.”*

“Any notification should be provided before and during construction through an appropriate method, within reasonable timeframes and commensurate to the risk of noise impact. Where appropriate, information should also be provided on a site information board displayed in a prominent location with the name and contact details of the organisation responsible for the site. Include:

- after-hours contact details, including a contact phone number and email address for enquiries and complaints.*
- basic information on the conditions of approval, such as the hours of work*
- contact details for the consent authority responsible for regulating environmental issues, such as the local council or the EPA Environment Line”.*

“A complaints procedure can be a helpful tool to manage community concerns and may be required as part of a project consent, approval or licence. Proponents should:

- Provide a prompt response to complaints.*
- Ensure complaint handling staff have a good knowledge of the project and its environmental and noise management procedures.*
- Provide feedback to the complainant on the actions taken to investigate and address noise problems.*
- Maintain a register of complaints to include the name of the person making the complaint.*
 - the date and time the complaint was made.*
 - a description of the complaint o action taken to respond to and address the complaint.*

Complaints Handling

The following recommendations should be put in place to respond to complaints:

- Site staff with the displayed complaints phone number will be informed of current and upcoming works and the relevant contacts for these works.
- Respond to complaints in a prompt and responsive manner
- Once a complaint is received, undertake and assess noise measurements accordingly.
- Where there are complaints about noise from an identified work activity, review and implement, where feasible and reasonable, actions additional to those described above to minimise noise output.

Specific Vibration Recommendations

It is the contractor's responsibility to ensure that the vibration levels do not exceed the criteria in Section 8.

11.4.1.5 Dilapidation Reports

We recommend that dilapidation reports be undertaken for adjacent and surrounding buildings prior to construction, where works are expected to generate perceptible vibration. This will help establish the existing condition of nearby structures and assist in assessing any potential impacts.

11.4.1.6 Vibration Monitoring

Vibration buffer distances scheduled in Table 18 indicate that the proposed construction activities associated with heavy equipment may exceed the Vibration Criteria in Section 8.3. In these instances, we recommend that vibration monitoring be undertaken to observe and identify when the vibration limits are at risk of exceedance (particularly during excavation and piling works).

Vibration monitors could be installed at the boundary of the nearest residential receivers. The vibration monitors should be set up to inform site staff of the risks of exceeding the limits. The monitors may be relocated

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to a different monitoring location depending on the proximity of the nearest vibration-intensive excavation activity. As further information is provided by the contractors, the above monitoring methodology may be revised accordingly. Monitoring equipment should be configured in such a way that alarms are triggered at a level below the values described in Section 8.3.

12 Summary

This report presents a Noise Impact Assessment for the residential development at 72 and 82-86 Menangle Road, Camden.

The assessment concludes that:

- Internal noise criteria can be achieved through the façade, glazing and ventilation recommendations outlined in Section 8.
- Building services plant can be designed to comply with the applicable EPA noise emission criteria, subject to detailed design.
- Compliance with NCC inter-tenancy acoustic requirements can be achieved using the constructions outlined in Section 10.
- Construction noise and vibration impacts should be managed in accordance with the recommendations provided in Section 11 and reviewed further once construction details are available.

Subject to the implementation of the recommendations contained within this report, the proposed development is considered acoustically feasible.

Appendices

13 Appendix A - Terminology

Airborne sound

The sound emitted directly from a source into the surrounding air, such as speech, television or music.

Ambient sound

Of an environment: the all-encompassing sound associated with that environment, being a composite of sounds from many sources, near and far. This is normally taken to be the LAeq value.

Background noise level

The average of the lowest levels of the noise levels measured in an affected area in the absence of noise from occupants and from unwanted external ambient noise sources. Usually, the LA90 value represents the background noise level.

Day

Referred to as the period between 7am and 6pm for Monday to Saturday and 8am to 6pm for Sundays and Public Holidays.

dB(A)

Unit of acoustic measurement weighted to approximate the sensitivity of human hearing to sound frequency.

Decibel scale

The decibel scale is logarithmic in order to produce a better representation of the response of the human ear. Therefore, a 3 dB increase in the sound pressure level corresponds to a doubling in the sound energy. It is generally accepted that a 10 dB increase in the sound pressure level corresponds to a perceived doubling in loudness.

Examples of decibel levels of common sounds are as follows:

- 0 dB(A) Threshold of human hearing
- 30 dB(A) A quiet country park
- 40 dB(A) Whisper in a library
- 50 dB(A) Open office space
- 70 dB(A) Inside a car on a freeway
- 80 dB(A) Outboard motor
- 90 dB(A) Heavy truck pass-by
- 100 dB(A) Jackhammer / Subway train
- 110 dB(A) Rock Concert
- 115 dB(A) Limit of sound permitted in industry
- 120 dB(A) 747 take off at 250 metres

Evening

Referred to as the period between 6pm and 10pm for Monday to Sunday and Public Holidays.

Frequency

The repetition rate of the cycle measured in Hertz (Hz). The frequency corresponds to the pitch of the sound. A high frequency corresponds to a high-pitched sound and a low frequency to a low-pitched sound.

Intrusive noise

(of NPfl) Refers to noise that intrudes above the background level by more than 5 decibels.

L₉₀, L₁₀, etc

A statistical measurement giving the sound pressure level which is exceeded for the given percentile of a measurement period (i.e. L90 is the level which is exceeded for 90 percent of a measurement period). L90 is commonly referred to as a basis for measuring the background sound level.

$L_{Aeq,T}$

The equivalent continuous A-weighted sound pressure level. The value of the A-weighted sound pressure level of a continuous steady sound that, within a measurement time interval T, has the same A-weighted sound energy as the actual time-varying sound.

L_{Amax}

The maximum sound pressure level measured over the measurement period.

L_{Amin}

The minimum sound pressure level measured over the measurement period.

Night

Referred to as the period between 10pm and 7am for Monday to Saturday and 10pm to 8am for Sundays and Public Holidays.

Reverberation

The persistence, after emission by the source has stopped, of a sound field in an enclosure.

R_w

Weighted Sound Reduction Index. Expressed in a single number (dB), it describes the airborne sound insulation performance of a building element.

Sound isolation

A reference to the degree of acoustical separation between two spaces. Sound isolation may refer to sound transmission loss of a partition or to noise reduction from any unwanted noise source. The term 'sound isolation' does not specify any grade or performance quality and requires the units to be specified for any contractual condition.

Sound pressure level, L_p , dB

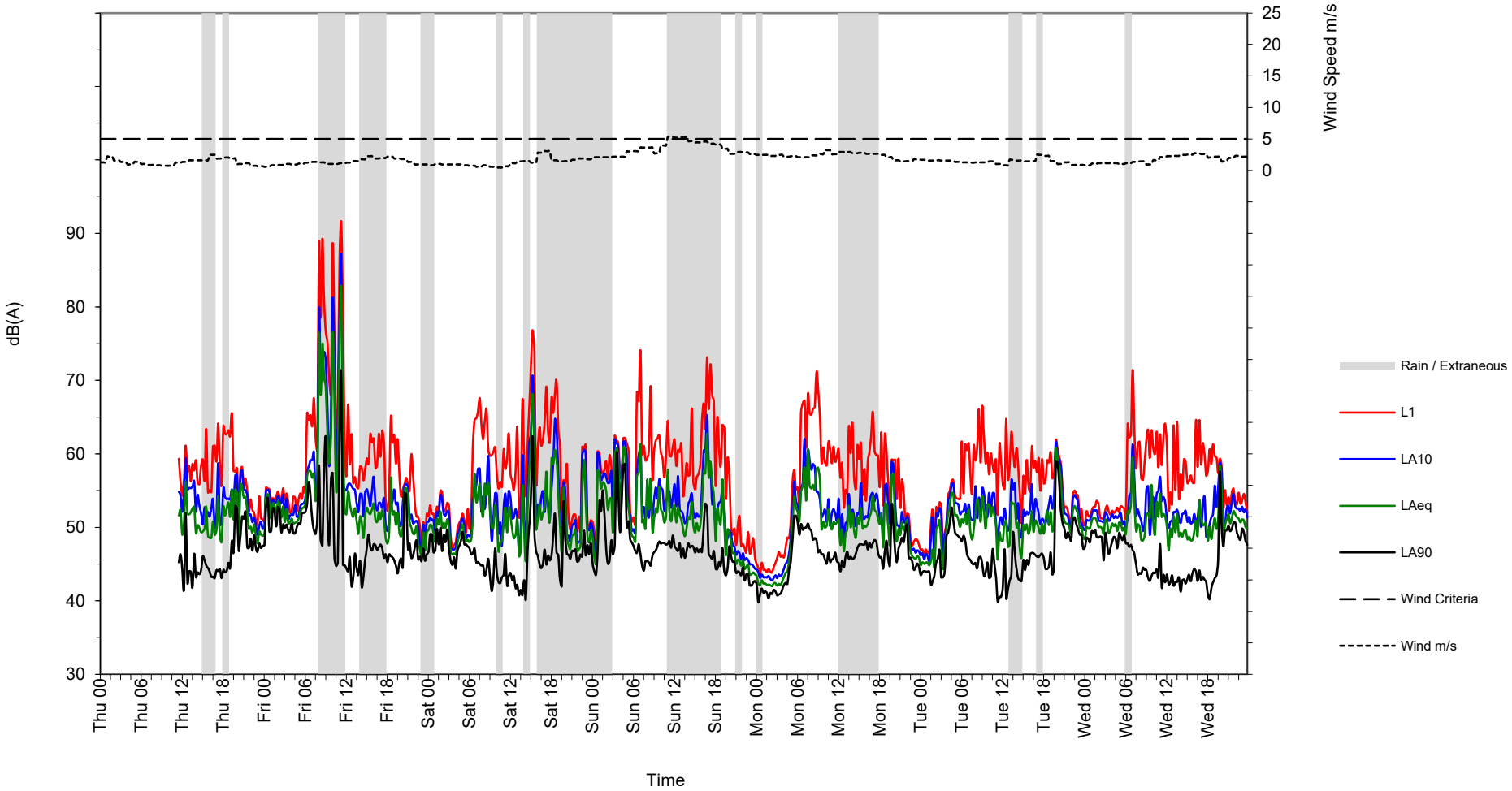
A measurement obtained directly obtained using a microphone and sound level meter. Sound pressure level varies with distance from a source and with changes to the measuring environment. Sound pressure level equals 20 times the logarithm to the base 10 of the ratio of the R.M.S. sound pressure to the reference sound pressure of 20 micro Pascals.

14 Appendix B – Unattended Noise Logger Graphs

HNSW Camden NSRT MK3 Noise Logger Data

72 Menangle Rd Camden

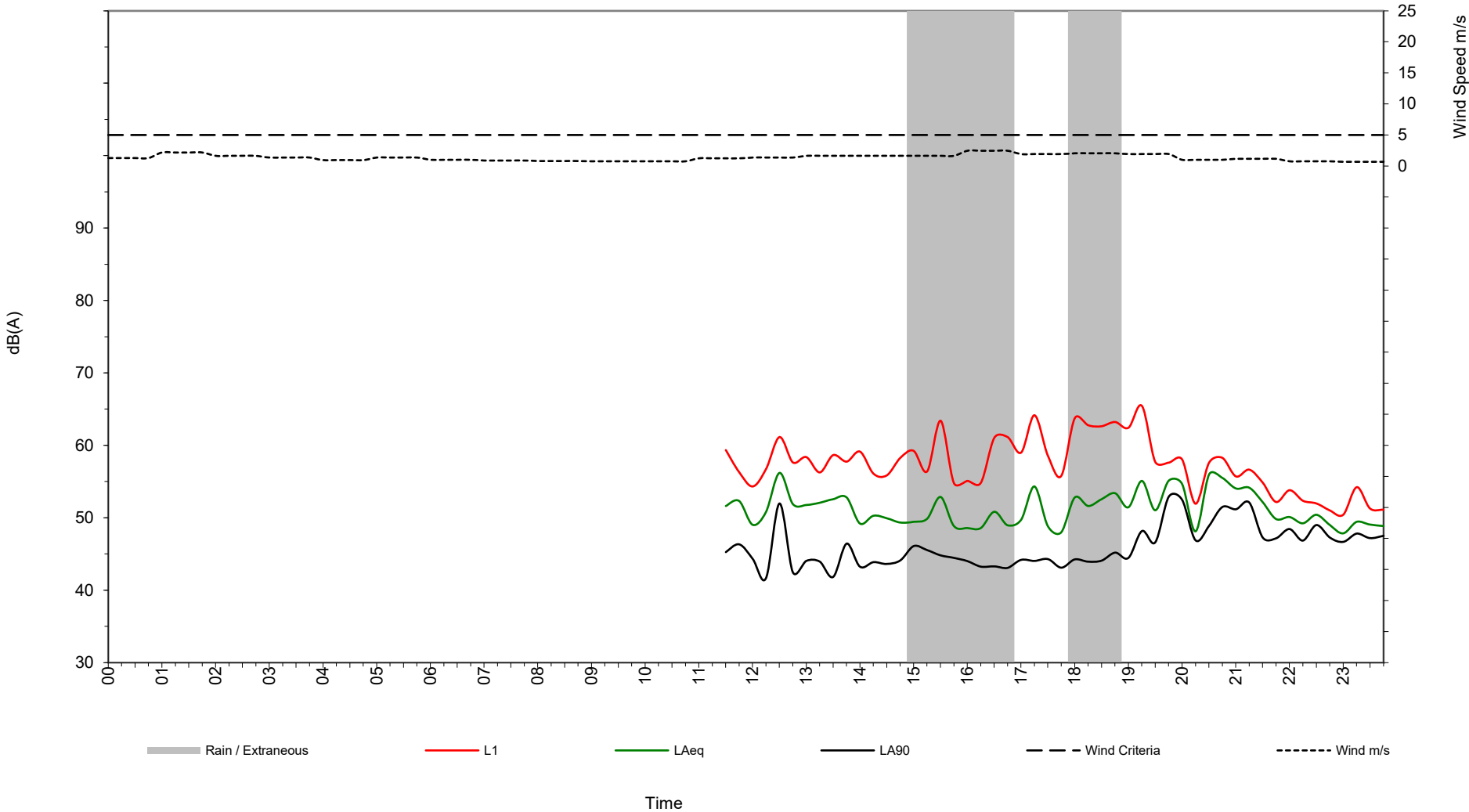
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to
Wednesday 11 March 2026



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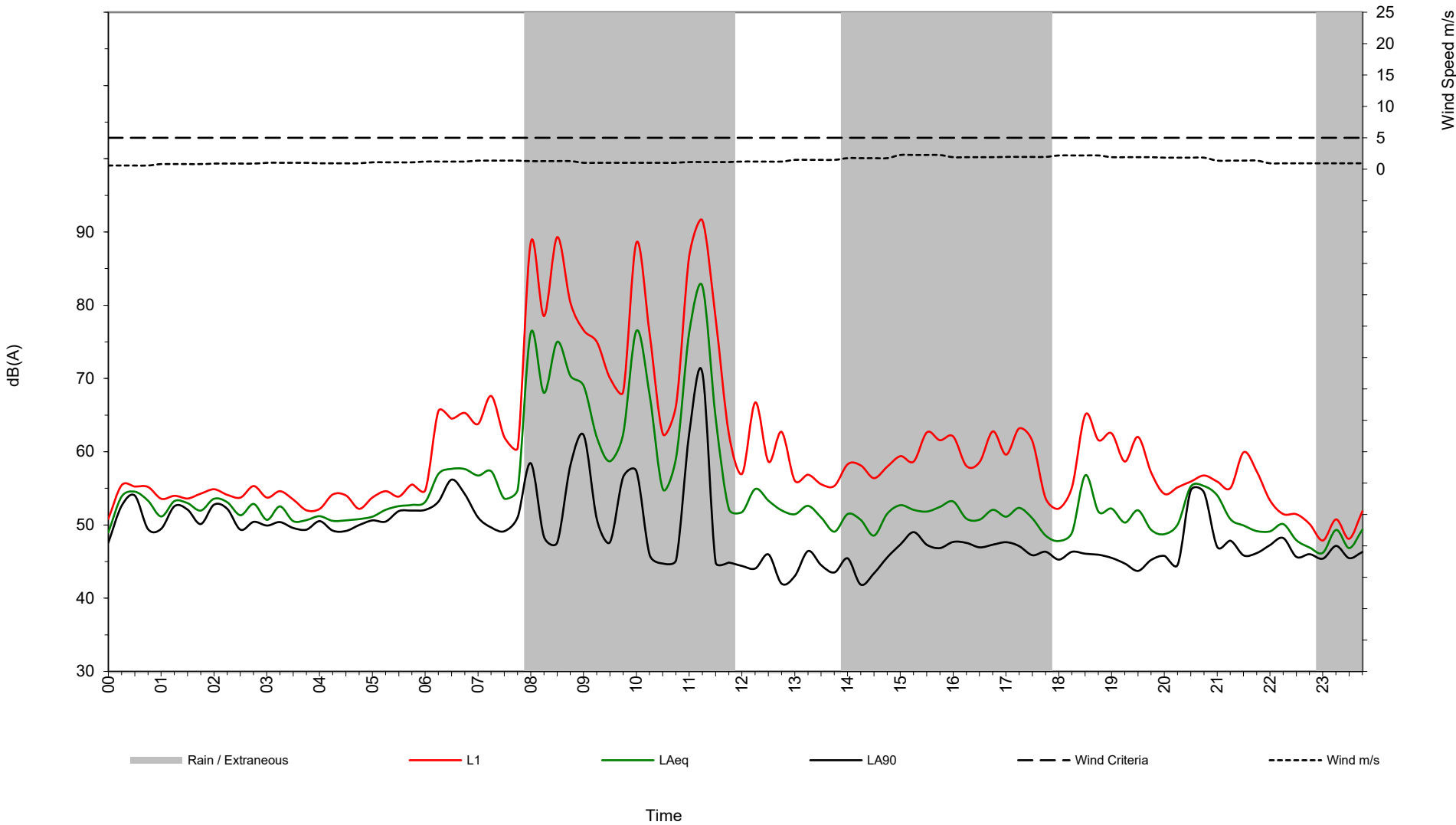
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72 Menangle Rd Camden

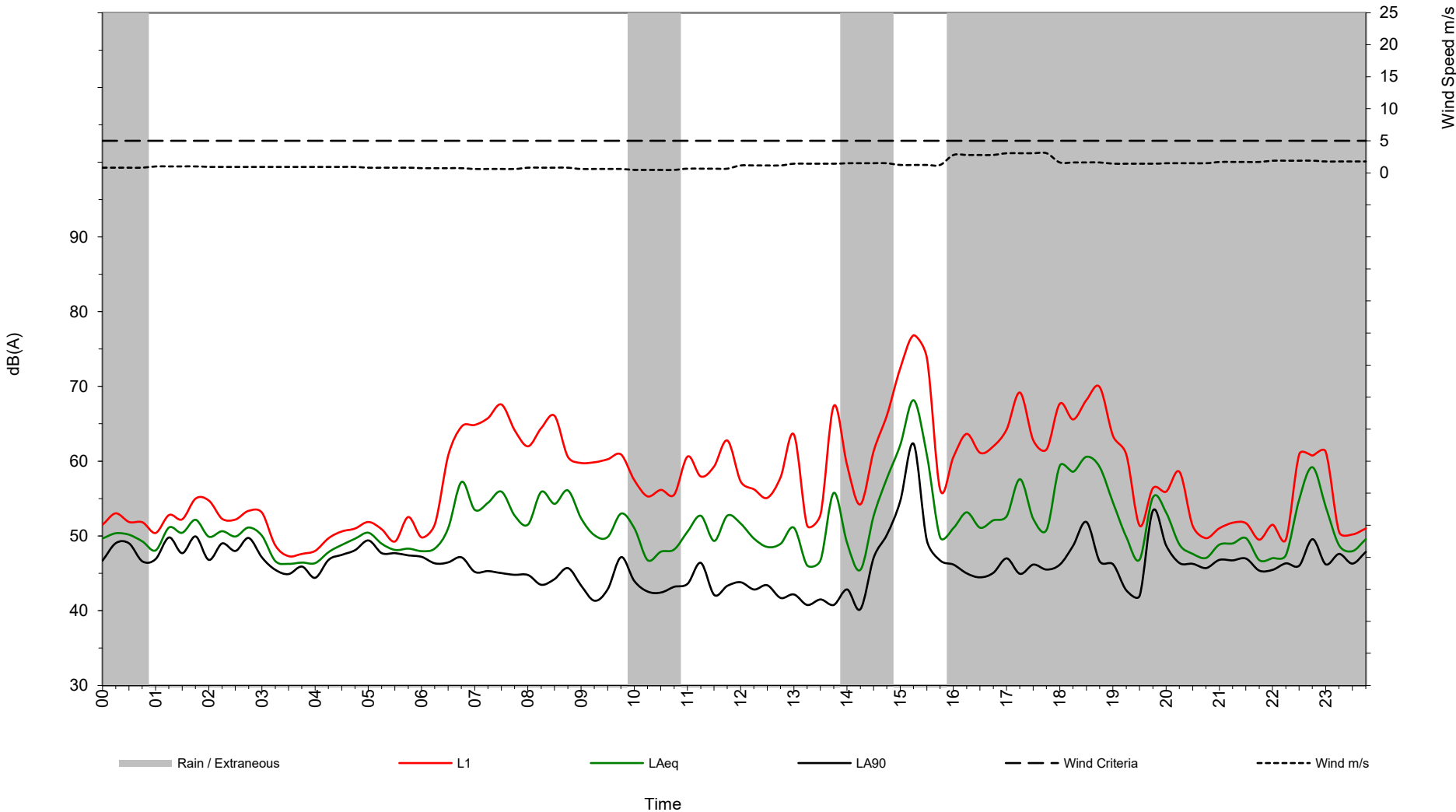
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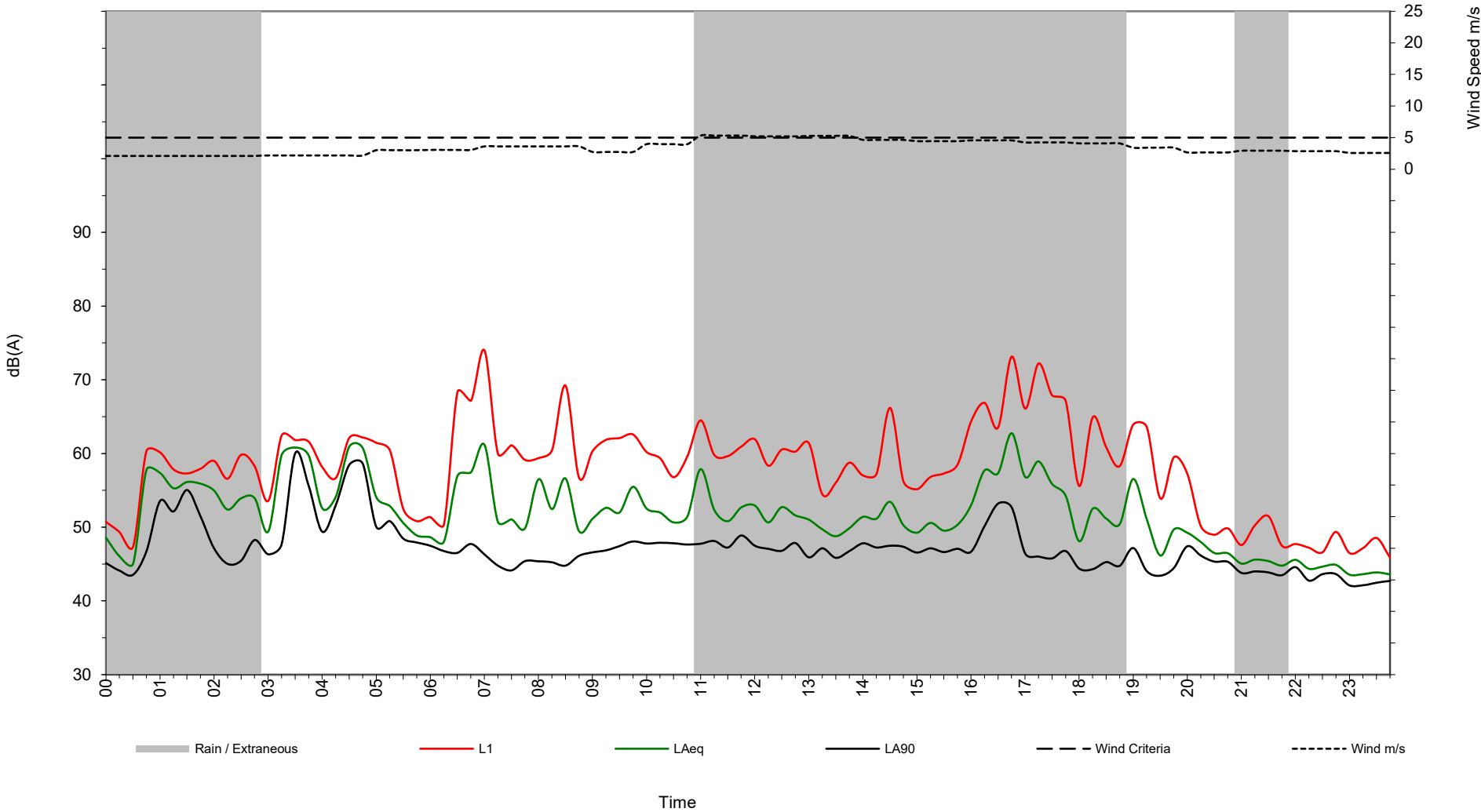
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Sunday 08 March 2026

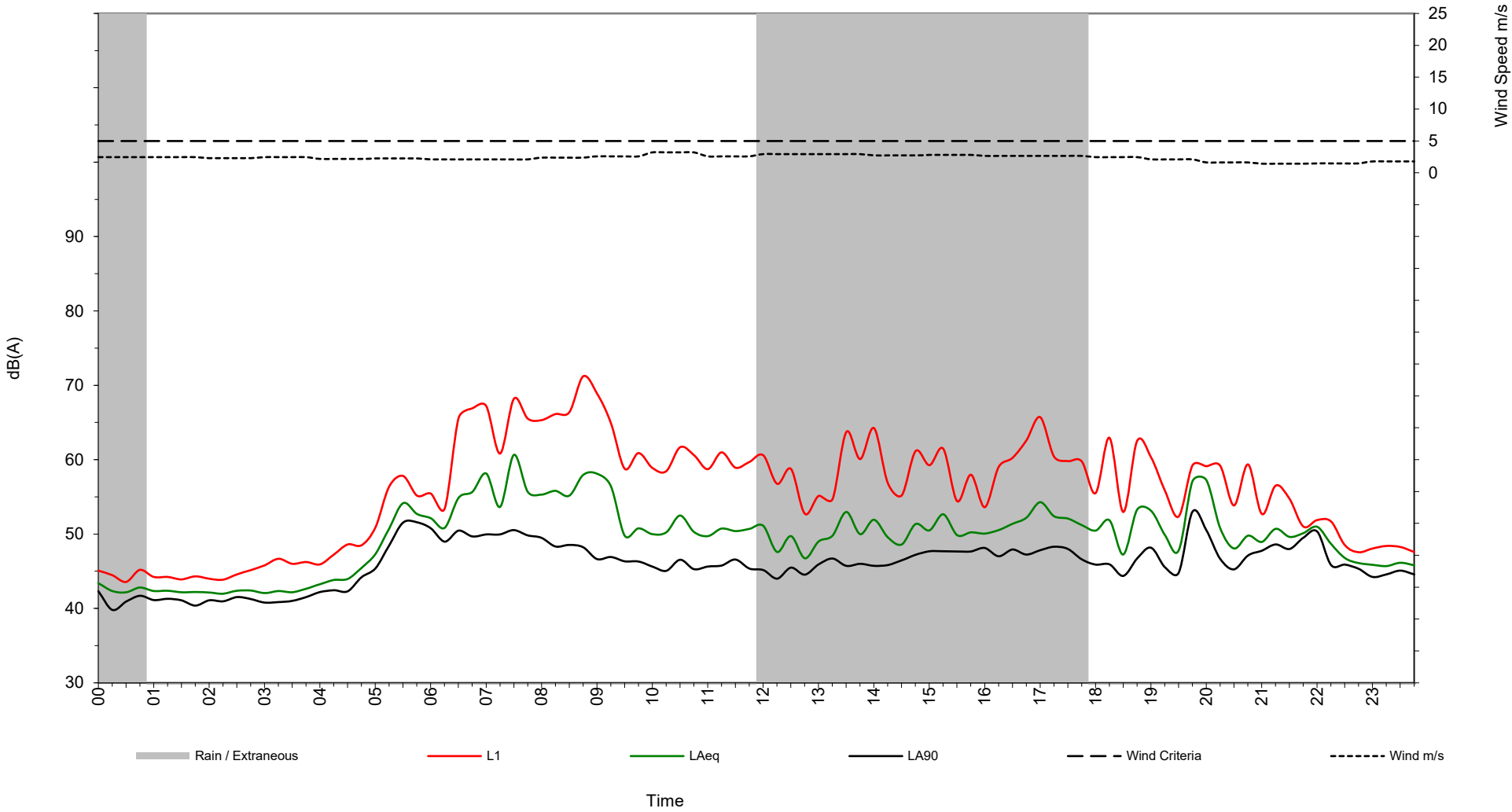
72 Menangle Rd Camden



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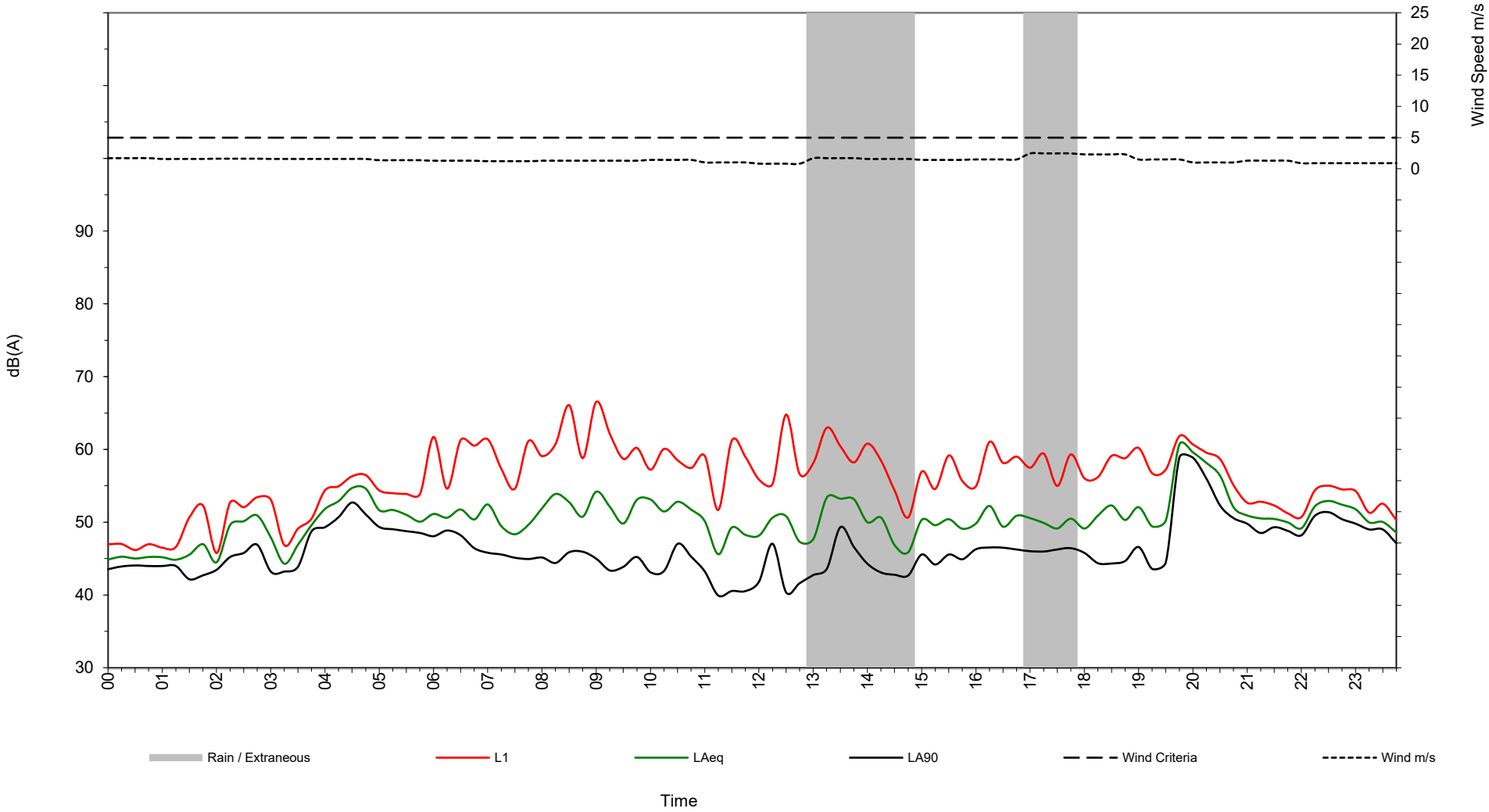
72 Menangle Rd Camden



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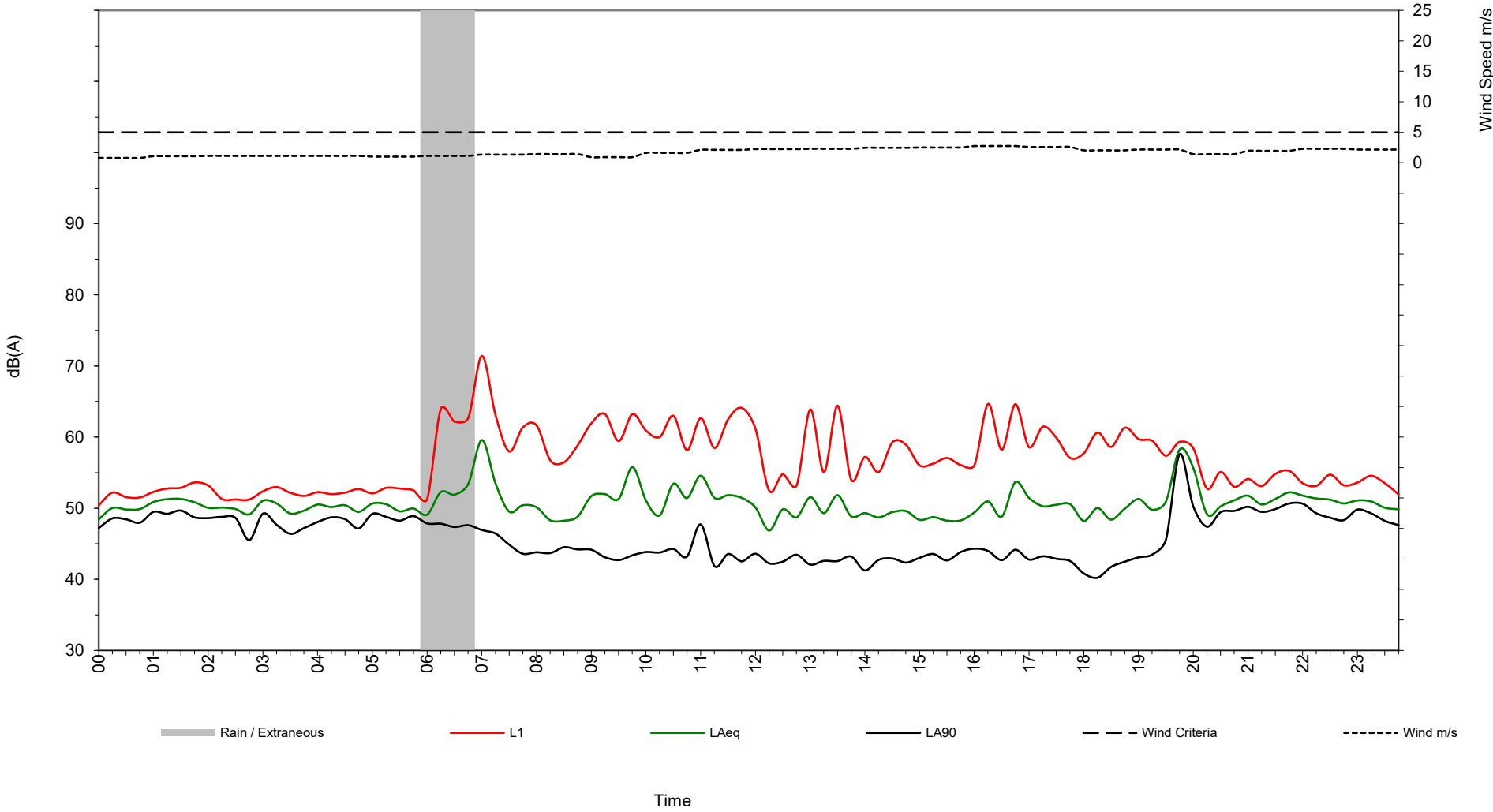
72 Menangle Rd Camden



HNSW Camden NSRT MK3 Noise Logger Data

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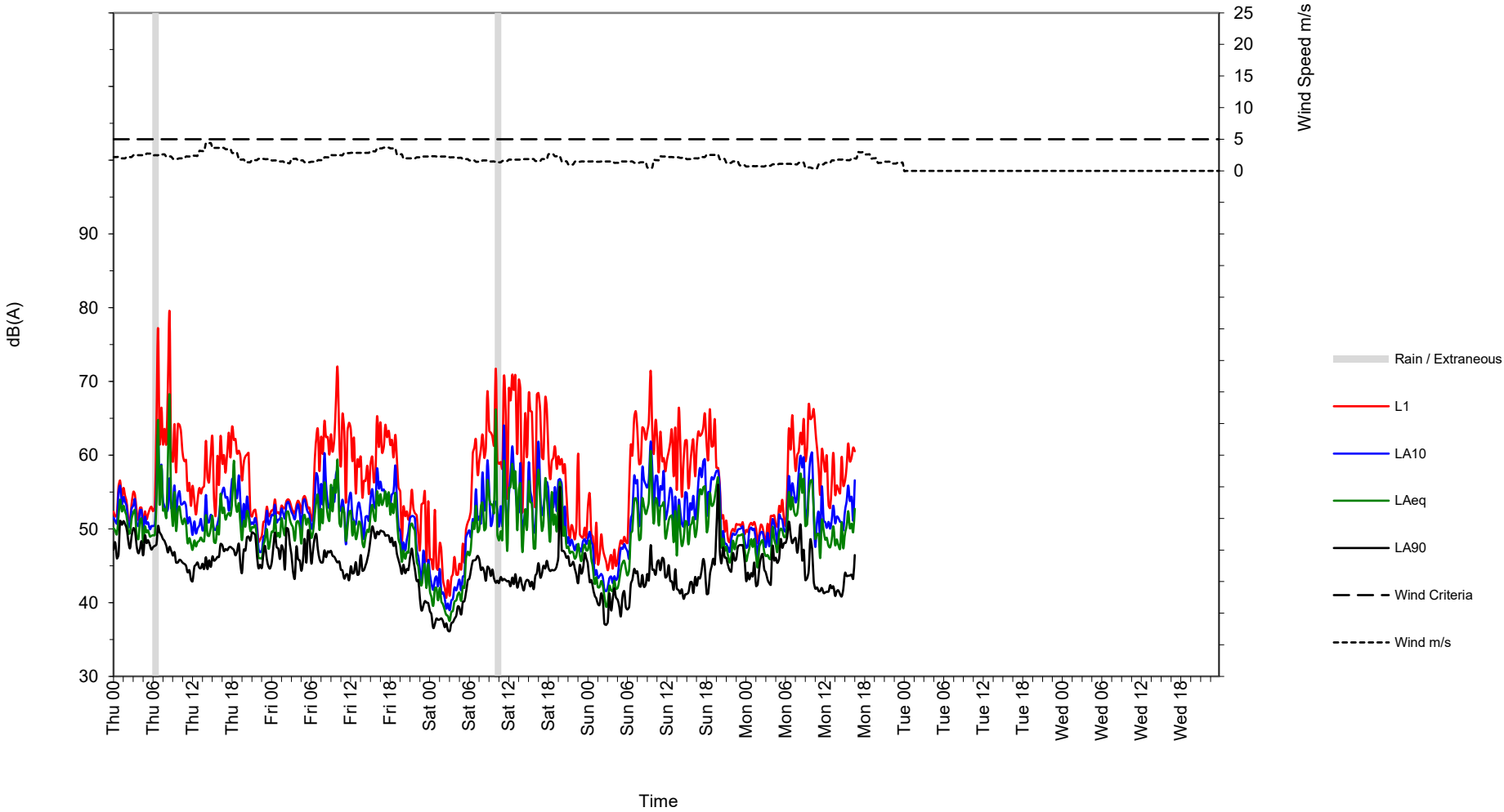
72 Menangle Rd Camden



HNSW Camden NSRT MK3 Noise Logger Data

72 Menangle Rd Camden

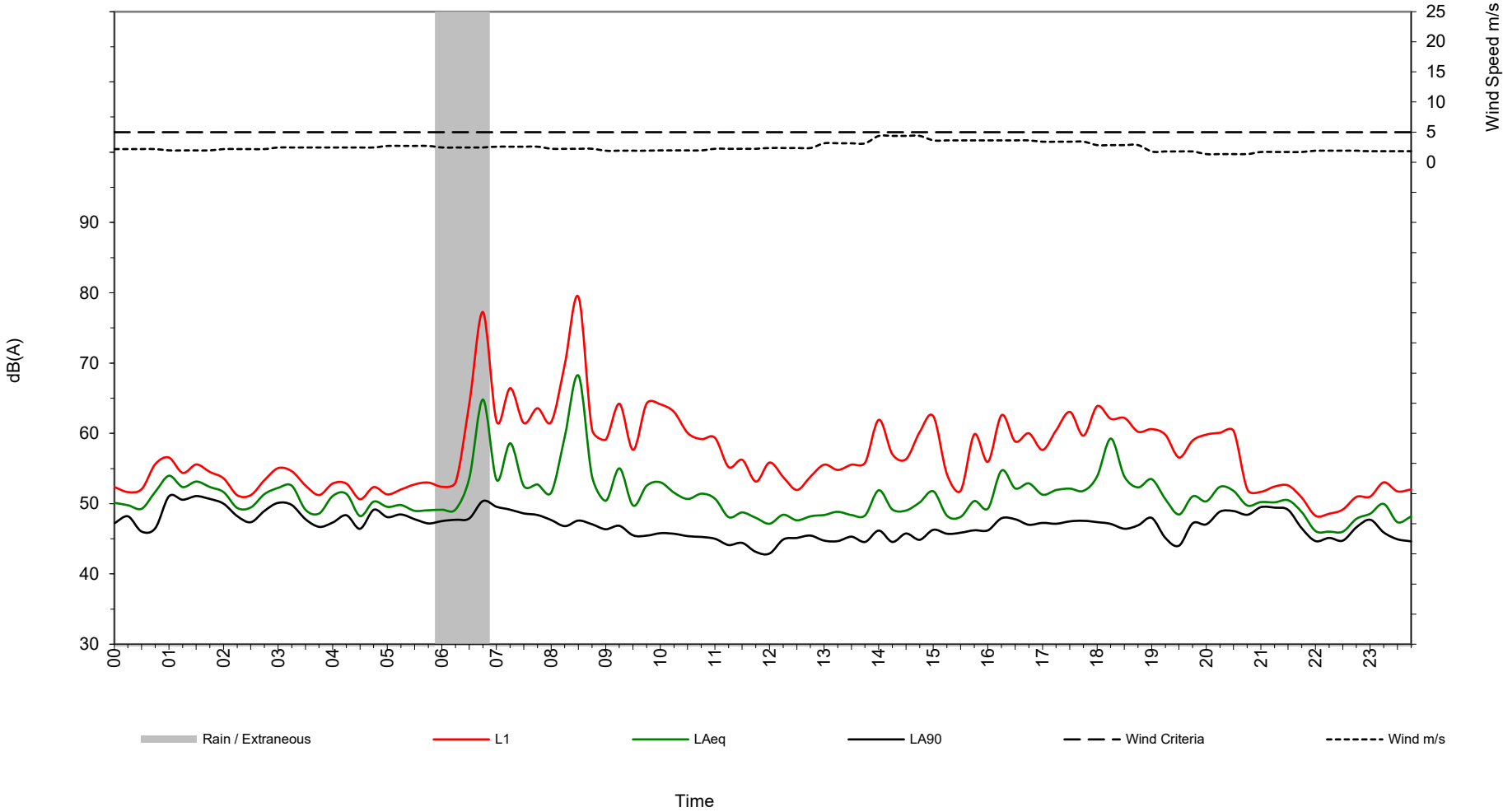
Thursday 12 March 2026
to
Wednesday 18 March 2026



HNSW Camden NSRT MK3 Noise Logger Data

Thursday 12 March 2026

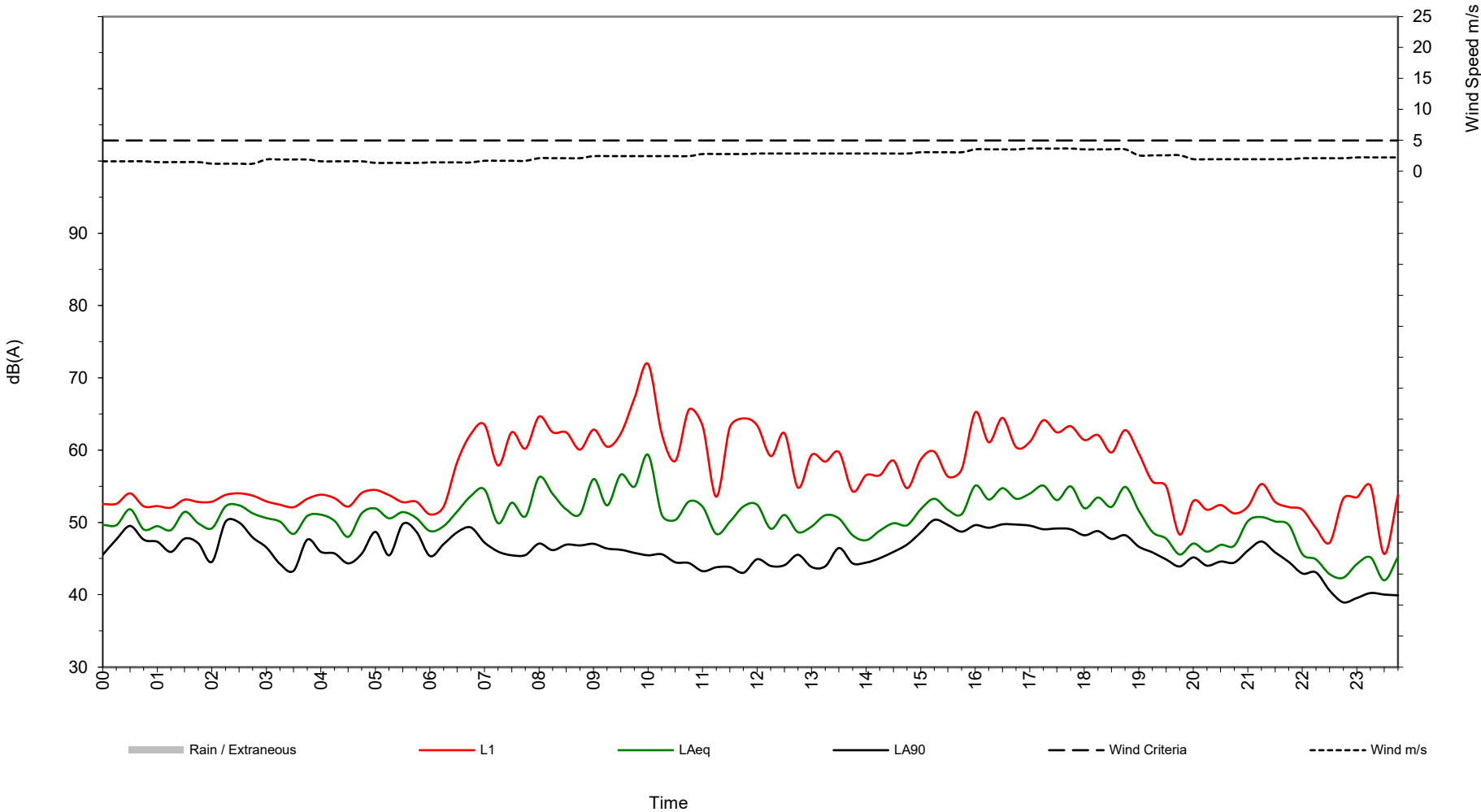
72 Menangle Rd Camden



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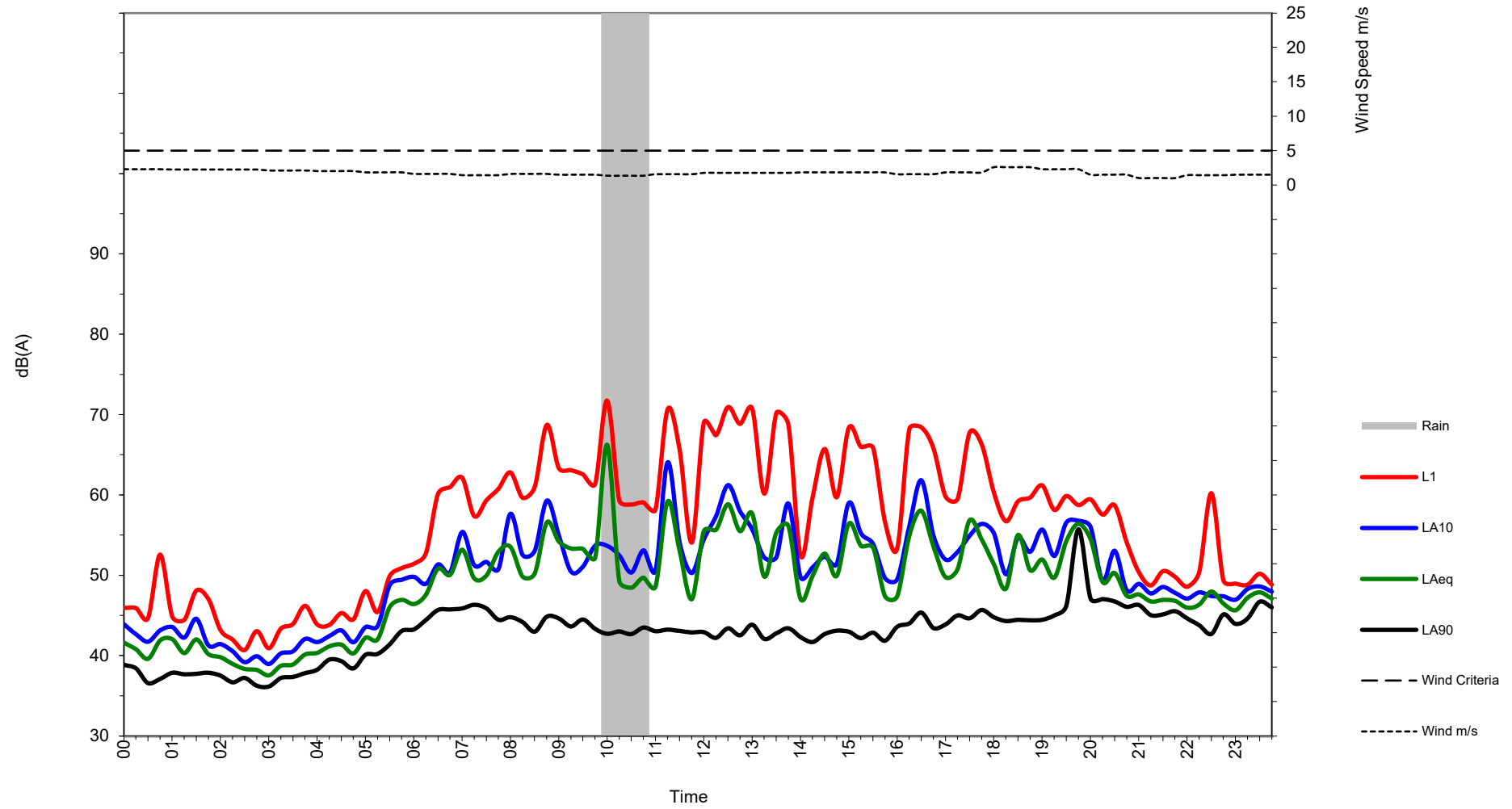
72 Menangle Rd Camden



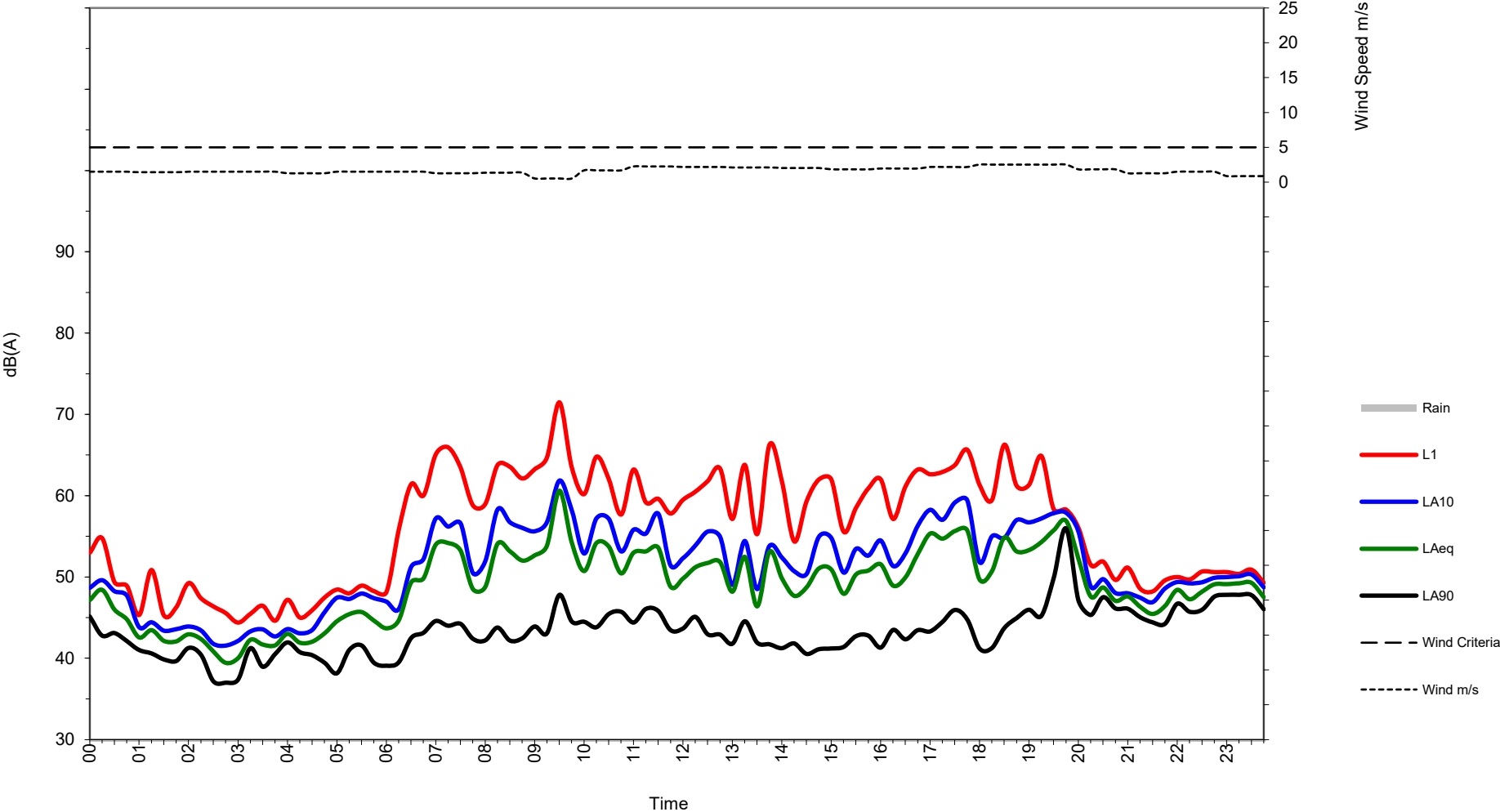
HNSW Camden NSRT MK3 Noise Logger Data

Saturday 14 March 2026

72 Menangle Rd Camden



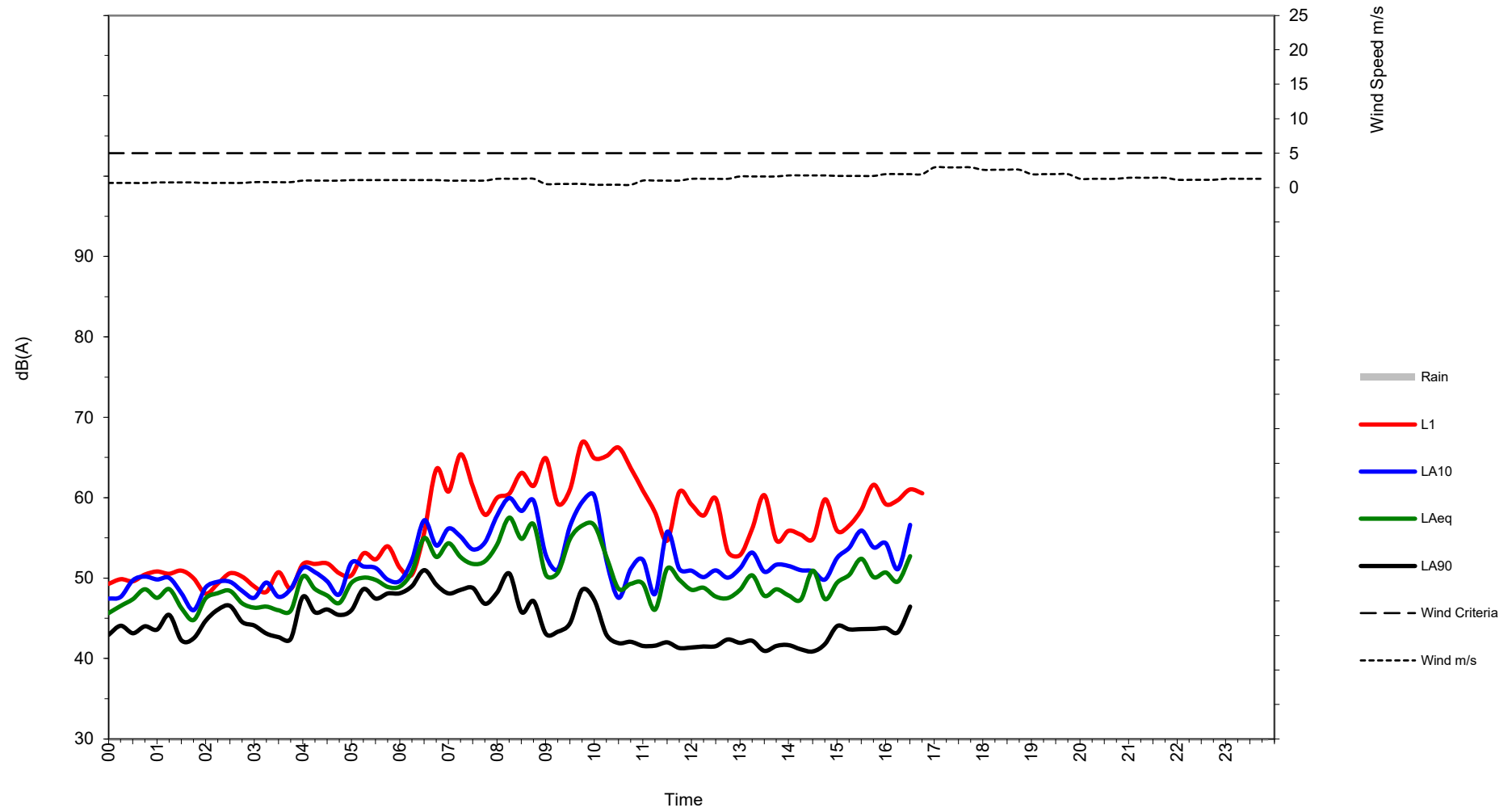
72 Menangle Rd Camden



HNSW Camden NSRT MK3 Noise Logger Data

Monday 16 March 2026

72 Menangle Rd Camden



15 Appendix C – Indicative Construction Noise Levels Based on Typical Construction Activities

Table 20 Indicative Construction Noise Levels at Surrounding Southern Receivers, $L_{Aeq, 15\text{-minute}}$ dB – Closest Façade of Receivers R1 & R4

Equipment	Predicted Noise Level	Criteria	Comments
Truck	59-83	Standard hours: ≤ 52 Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	Risk of being 'Highly noise-affected' See Section 11 for recommendations
22-tonne excavator	47-71	Standard hours: ≤ 52 Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	See Section 11 for recommendations
Excavator breaking rubble	58-82	Standard hours: ≤ 52 Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	Risk of being 'Highly noise-affected' See Section 11 for recommendations
Piling Rig (bored)	59-83	Standard hours: ≤ 52 Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	Risk of being 'Highly noise-affected' See Section 11 for recommendations
Rock breaker	66-90	Standard hours: ≤ 52 Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	Risk of being 'Highly noise-affected' See Section 11 for recommendations
Rock saw	63-87	Standard hours: ≤ 52 Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	Risk of being 'Highly noise-affected' See Section 11 for recommendations
Excavator (ground removal)	47-71	Standard hours: ≤ 52 Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	See Section 11 for recommendations
Tree Removal	56-80	Standard hours: ≤ 52 Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	Risk of being 'Highly noise-affected' See Section 11 for recommendations
Excavator loading a truck (brick rubble)	65-89	Standard hours: ≤ 52 Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	Risk of being 'Highly noise-affected' See Section 11 for recommendations
Concrete pump truck	60-84	Standard hours: ≤ 52 Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	Risk of being 'Highly noise-affected' See Section 11 for recommendations
Circular saw	60-84	Standard hours: ≤ 52 Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	Risk of being 'Highly noise-affected' See Section 11 for recommendations
Angle grinder	56-80	Standard hours: ≤ 52 Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	Risk of being 'Highly noise-affected' See Section 11 for recommendations
Hand tools (pneumatic)	64-88	Standard hours: ≤ 52	

Equipment	Predicted Noise Level	Criteria	Comments
		Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	Risk of being 'Highly noise-affected' See Section 11 for recommendations
Concrete pump	51-75	Standard hours: ≤ 52 Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	Risk of being 'Highly noise-affected' See Section 11 for recommendations
Concrete truck and pump	43-67	Standard hours: ≤ 52 Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	See Section 11 for recommendations
Handheld pneumatic jackhammer	64-88	Standard hours: ≤ 52 Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	Risk of being 'Highly noise-affected' See Section 11 for recommendations
Handheld demolition saws	68-92	Standard hours: ≤ 52 Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	Risk of being 'Highly noise-affected' See Section 11 for recommendations
Forklift	54-78	Standard hours: ≤ 52 Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	Risk of being 'Highly noise-affected' See Section 11 for recommendations
Tower crane	53-77	Standard hours: ≤ 52 Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	Risk of being 'Highly noise-affected' See Section 11 for recommendations
Single hoist (man and materials)	44-68	Standard hours: ≤ 52 Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	See Section 11 for recommendations
Handheld drill	36-60	Standard hours: ≤ 52 Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	See Section 11 for recommendations
Nail gun	49-73	Standard hours: ≤ 52 Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	See Section 11 for recommendations

Table 21 Indicative Construction Noise Levels at Surrounding Southern Receivers, L_{Aeq} , 15-minute dB – Closest Façade of Receivers R2 & R3

Equipment	Predicted Noise Level	Criteria	Comments
Truck	57-77	Standard hours: ≤ 52 Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	Risk of being 'Highly noise-affected' See Section 11 for recommendations
22-tonne excavator	45-65	Standard hours: ≤ 52 Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	See Section 11 for recommendations
Excavator breaking rubble	56-76	Standard hours: ≤ 52 Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	Risk of being 'Highly noise-affected' See Section 11 for recommendations
Piling Rig (bored)	57-77	Standard hours: ≤ 52 Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	Risk of being 'Highly noise-affected' See Section 11 for recommendations
Rock breaker	64-84	Standard hours: ≤ 52 Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	Risk of being 'Highly noise-affected' See Section 11 for recommendations
Rock saw	61-81	Standard hours: ≤ 52 Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	Risk of being 'Highly noise-affected' See Section 11 for recommendations
Excavator (ground removal)	45-65	Standard hours: ≤ 52 Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	See Section 11 for recommendations
Tree Removal	54-74	Standard hours: ≤ 52 Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	See Section 11 for recommendations
Excavator loading a truck (brick rubble)	63-83	Standard hours: ≤ 52 Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	Risk of being 'Highly noise-affected' See Section 11 for recommendations
Concrete pump truck	58-78	Standard hours: ≤ 52 Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	Risk of being 'Highly noise-affected' See Section 11 for recommendations
Circular saw	58-78	Standard hours: ≤ 52 Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	Risk of being 'Highly noise-affected' See Section 11 for recommendations
Angle grinder	54-74	Standard hours: ≤ 52 Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	See Section 11 for recommendations
Hand tools (pneumatic)	62-82	Standard hours: ≤ 52 Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	Risk of being 'Highly noise-affected' See Section 11 for recommendations
Concrete pump	49-69	Standard hours: ≤ 52	

Equipment	Predicted Noise Level	Criteria	Comments
		Non-standard hours: ≤ 47 41-61 Highly noise-affected level: ≥ 75	Risk of being 'Highly noise-affected' See Section 11 for recommendations
Concrete truck and pump	41-61	Standard hours: ≤ 52 Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	See Section 11 for recommendations
Handheld pneumatic jackhammer	62-82	Standard hours: ≤ 52 Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	Risk of being 'Highly noise-affected' See Section 11 for recommendations
Handheld demolition saws	66-86	Standard hours: ≤ 52 Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	Risk of being 'Highly noise-affected' See Section 11 for recommendations
Forklift	52-72	Standard hours: ≤ 52 Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	See Section 11 for recommendations
Tower crane	51-71	Standard hours: ≤ 52 Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	See Section 11 for recommendations
Single hoist (man and materials)	42-62	Standard hours: ≤ 52 Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	See Section 11 for recommendations
Handheld drill	34-54	Standard hours: ≤ 52 Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	See Section 11 for recommendations
Nail gun	47-67	Standard hours: ≤ 52 Non-standard hours: ≤ 47 Highly noise-affected level: ≥ 75	See Section 11 for recommendations



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