Metro Theatre Hotel, 28-30 Orwell Street

Noise Impact Assessment

CE Minerva Pty Ltd

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TABLE OF CONTENTS

TABLES

FIGURES

1 INTRODUCTION

Pulse White Noise Acoustics Consultancy Pty Ltd (Pulse White Noise Acoustics) has been engaged to undertake an acoustic assessment for the proposed alterations and additions to be undertaken to the Metro Theatre Hotel located at 28-30 Orwell Street, Potts Point.

The proposed project includes the re-development of the existing Metro Theatre located on the site. The principal features of the development include the following:

1. A hotel with short stay accommodation.
2. Three basement levels including valet carparking using a car staking.
3. 2 venues on the basement levels to include licenced premises such as restaurants.
4. Ground floor is to include a stage, dining and hotel bar. The space will include use for cabaret or live performances.
5. A central area including the existing Metro Theatre space to include hotel bars and lounges including seating for performances.
6. A Seven level development including the hotel rooms.

This assessment includes the acoustic investigation into the potential for noise impacts from the operation of the completed project, including entertainment operations, as well as potential noise impacts from existing noise sources within the vicinity of the site which predominantly includes traffic noise from surrounding noise sources.

The development will be assessed against relevant statutory regulations and guidelines including the *Sydney Development Control Plan (DCP) 2012,* Australian / New Zealand Standard *AS/NZS 2107:2016 Acoustics - Recommended design sound levels and reverberation times for building interiors*, the acoustic requirements of the Environment Protection Authority's (EPA) *Noise Policy for Industry (NPI)* and Liquor & Gaming NSW's noise criteria which is relevant for the assessment of licensed premises.

The acoustic criteria required by the Building Code of Australia (BCA) section of the National Construction Code (NCC) for internal construction within the development will also be identified.

1.1 Relevant Guidelines

The guidelines applicable to this assessment include:

- *Sydney Development Control Plan (DCP) 2012 - Part 4 - Section 4.2.3.11 – Acoustic Privacy;*
- *Australian / New Zealand Standard AS/NZS 2107:2016 Acoustics - Recommended design sound levels and reverberation times for building interiors;*
- *NSW Noise Policy for Industry* 2017 (NPI);
- Liquor and Gaming NSW typically imposed noise conditions; and
- Section F5 of the Building Code of Australia (BCA) component of the National Construction Code (NCC) 2019.

1.2 Noise Descriptors and Terminology

Environmental noise constantly varies in level with time. It is therefore necessary to measure environmental noise in terms of quantifiable time periods and statistical descriptors. Typically, environmental noise is measured over 15 minute periods and relevant statistical descriptors of the fluctuating noise are determined to quantify the measured level.

Noise (or sound) consists of minute fluctuations in atmospheric pressure capable of detection by human hearing. Noise levels are expressed in terms of decibels, abbreviated as dB or dB(A), the A indicating that the noise levels have been frequency weighted to approximate the characteristics of normal human hearing. Because noise is measured using a logarithmic scale, 'normal' arithmetic does not apply, e.g. adding two sources of sound of an equal value results in an increase of 3dB (i.e. 60 dBA + 60 dBA = 63 dBA). A change of 1 dB or 2 dB in the level of a sound is difficult for most people to detect, whilst a 3 dB – 5 dB change corresponds to a small but noticeable change in loudness. A 10 dB change roughly corresponds to a doubling or halving in loudness.

The most relevant environmental noise descriptors are the L_{Aeq}, L_{A1}, L_{A10} and L_{A90} noise levels. The L_{Aeq} noise level represents the "equivalent energy average noise level". This parameter is derived by integrating the noise level measured over the measurement period and is equivalent to a level that would have been experienced had the fluctuating noise level remained constant during the measured time period.

The L_{A1}, L_{A10} and L_{A90} levels are the levels exceeded for 1%, 10% and 90% of the sample period. These levels are sometimes thought of as the typical maximum noise level, the average repeatable maximum and average repeatable minimum noise levels, respectively.

Specific acoustic terminology is used in this assessment report. An explanation of common acoustic terms is included as Appendix A.

2 PROJECT DETAILS

The proposed development includes the alterations and additions to the existing Metro Theatre Hotel which is located at 28-30 Orwell Street, Potts Points.

The proposed alterations and additions to the site include the following:

1. A hotel with short stay accommodation.
2. Four basement levels including valet carparking using a car staking.
3. 2 venues on the basement levels to include licenced premises such as restaurants.
4. Ground floor is to include a stage, dining and hotel bar. The space will include use for cabaret or live performances.
5. A central area including the existing Metro Theatre space to include hotel bars and lounges including seating for performances.
6. A Seven level development including the hotel rooms.

The site is located within a typical suburban area of Potts Points within the City of Sydney Council local government area.

2.1 Site Location

The site is located at 28-30 Orwell Street, Potts Point. The surrounding receivers to the site include a number of existing residential and commercial receivers including the following:

1. 34 Orwell Street - Commercial receiver to the east of the site.
2. 101-103 Macleay Street – Residential receiver to the east of the site.
3. 97-99 Macleay Street – Residential receiver to the east of the site.
4. 37 Hughes Street – Mixed use commercial and residential receiver to the north of the site.
5. 29 Hughes Street – Accommodation and commercial receiver (Wayside Chapel) to the north of the site.
6. 25 Hughes Street - Residential receiver to the north of the site.
7. 23 Hughes Street - Residential receiver to the north of the site.
8. 26 Orwell Street - Residential receiver to the west of the site.
9. 37 Orwell Street – Residential receiver to the south east of the site.
10. 29 Orwell Street – Mixed use commercial and residential receiver to the south of the site.
11. 27 Orwell Street – Residential receiver (Jolly Swagman Backpackers) to the south east of the site.
12. 17-25 Orwell Street – Residential receiver to the south of the site.
13. 15 Orwell Street – Residential receiver to the south west of the site.

The principal source of external environmental noise impacting on the future development site includes vehicle movements on surrounding roadways.

The site location is detailed in Figure 1 below.

Figure 1 Site location and Noise Measurement Locations

Legend

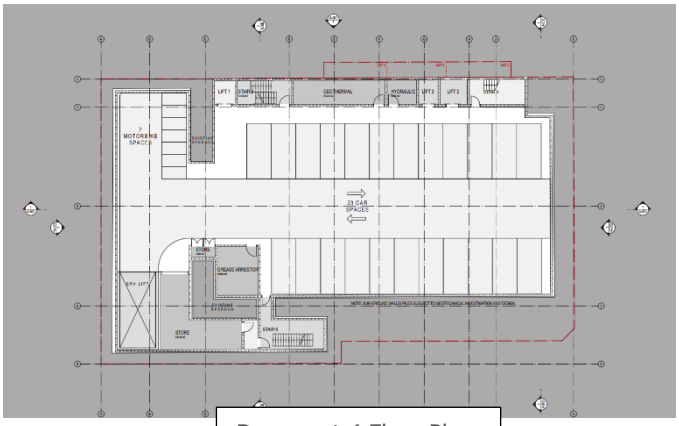
- Project Site (Metro Hotel, Potts Point)
- Residential Receivers
- Commercial Receiver
- Accommodation Buildings
- Unattended Noise Monitor Locations (NML"X")

2.2 Project Description

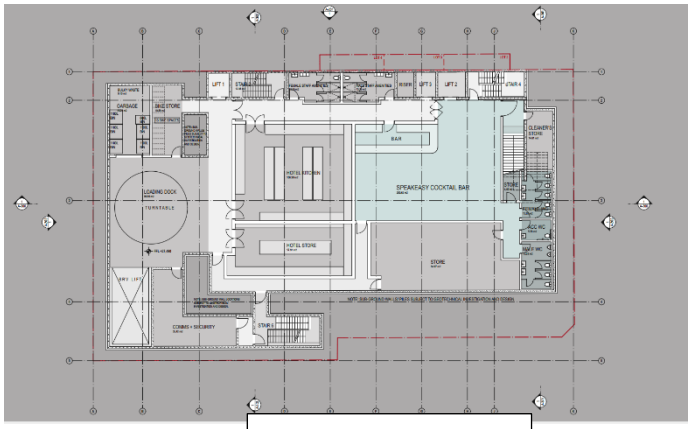
The proposed development includes the alterations and additions to the existing Metro Hotel on the 28-30 Orwell Street, Potts Point site.

Details of the proposed development are included in the figures below.

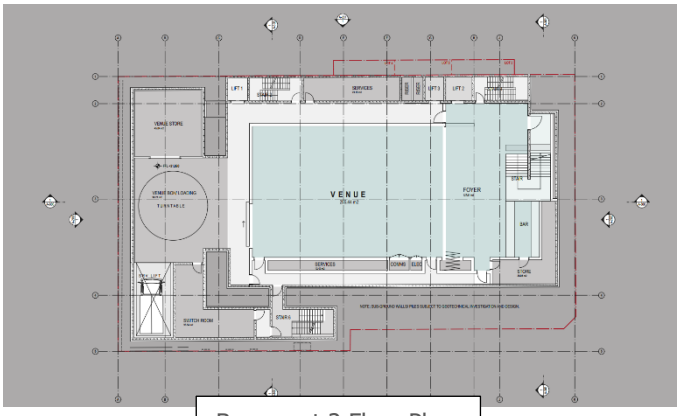
Figure 2 Project Details



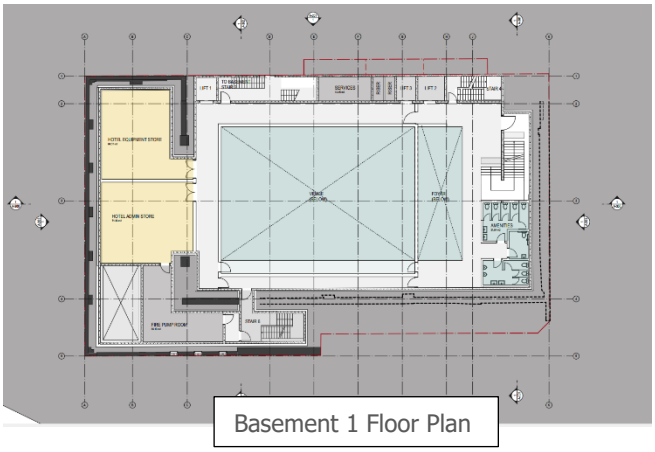
Basement 4 Floor Plan



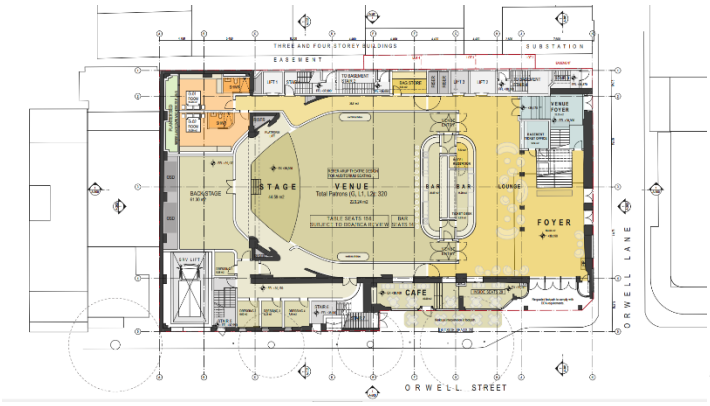
Basement 3 Floor Plan



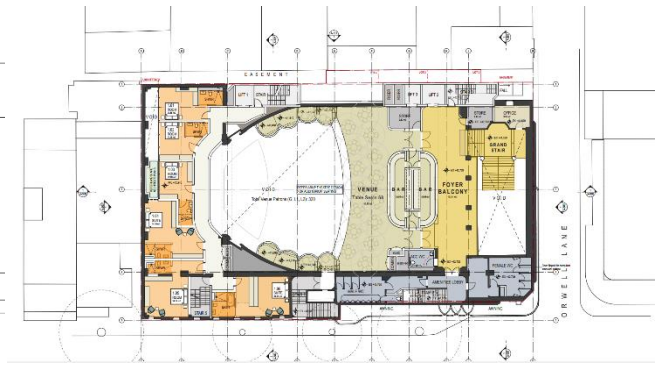
Basement 2 Floor Plan



Basement 1 Floor Plan

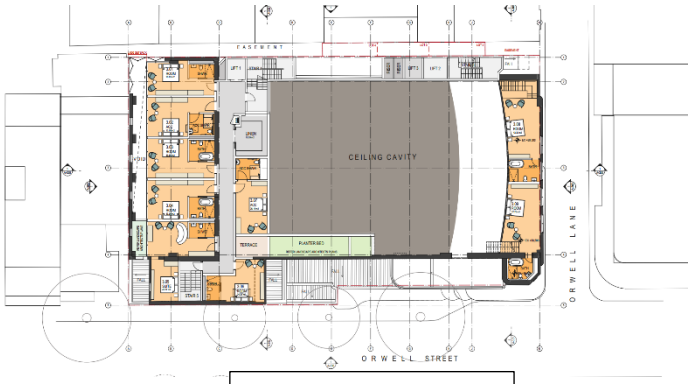


Ground Floor Plan

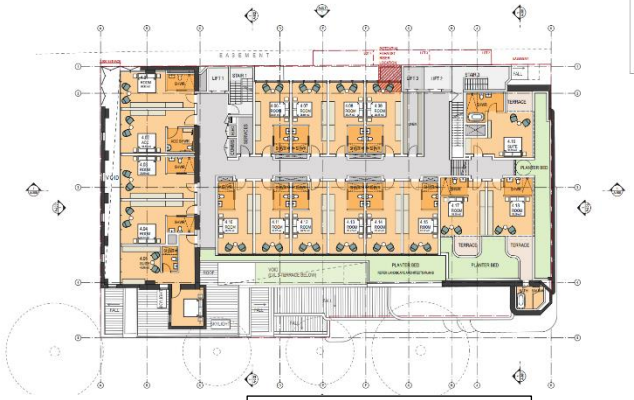


Level 1 Floor Plan

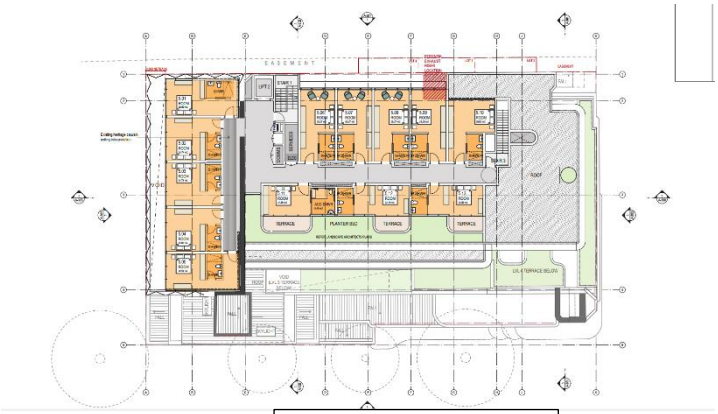
Level 2 Floor Plan



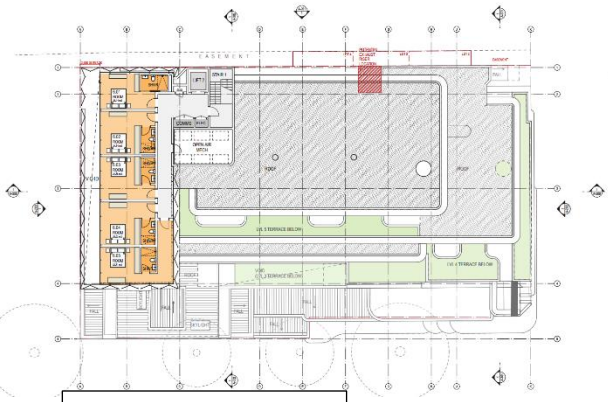
Level 3 Floor Plan



Level 4 Floor Plan



Level 5 Floor Plan



Level 6 Floor Plan

3 EXISTING ACOUSTIC ENVIRONMENT

The proposed site is located within an area of Potts points which is classified as a Suburban residential area as defined by the NSW EPA *Noise Policy for Industry*. The exiting noise levels at the site are predominantly as a result from traffic noise within the vicinity of the site on surrounding roadways. Existing receivers within the vicinity of the site include residential and commercial receivers as detailed in Figure 1 above.

3.1 Noise Survey Results

As part of this assessment an acoustic survey has been undertaken at the site which include long term unattended noise monitoring at two locations at the site.

The unattended noise monitoring was carried out over a number of days during the period of 1st March to the 8th March 2021. The locations of the unattended noise logging surveys are shown in Figure 1 above. During the ambient monitoring, some data was affected by rain periods. These affected time periods have been excluded from the calculated overall statistical noise level results. The measured background noise data of the logger was processed in accordance with the recommendations contained in the NSW Environment Protection Authority's (EPA) *Noise Policy for Industry* (NPI).

The measurement results have been filtered to remove data affected by adverse weather conditions, such as excessively windy or rainy time periods, as recorded by the Bureau of Meteorology weather station at Observatory Hill (ID:066062). Noise measurement data during the time periods when the background noise levels were significantly affected by mechanical services equipment, were also removed from the calculated overall statistical levels.

Instrumentation used for the noise survey comprised two Rion NL-42 sound level meter / analysers (serial numbers 00998081 and 00396931) fitted with microphone windshields. Calibration of the loggers was checked prior to and following the measurements. Drift in calibration did not exceed ±0.5 dBA. All equipment carried appropriate and current NATA (or manufacturer) calibration certificates.

Charts presenting summaries of the measured daily noise data are attached in Appendix B and Appendix C. These charts, representing each 24 hour period, show the L_{A1}, L_{A10}, L_{Aeq} and L_{A90} noise levels measured over 15 minute time periods.

Details of the location of the noise monitors include the following:

1. Location 1 – On the existing external terrace of the building to the south of the building on Level 2. The logger was located with a clear view over Orwell Street, without façade reflections. The location of the noise logger is included in the Figure below.

Figure 3 Noise Logger Location 1

2. Location 2 – On the roof of the existing building to the north south of the building on Level 6. The logger was located with a clear view to the north of the site, without façade reflections. The location of the noise logger is included in the Figure below.

Figure 4 Noise Logger Location 2

3.1.1 Environmental Noise Monitoring Results

In order to assess the acoustical impacts of the development at nearby noise sensitive receivers, the measured background noise data of both monitors was processed in accordance with the recommendations contained in the NSW Environment Protection Authority's (EPA) *Noise Policy for Industry* (NPI).

The Rating Background Noise Level (RBL) is the background noise level used for assessment purposes at the nearest potentially affected receivers. It is the 90th percentile of the daily background noise levels during each assessment period, being day, evening and night. The RBL $L_{A90(15minute)}$ and L_{Aeq} noise levels are presented in Table 1 below.

Data affected by adverse meteorological conditions and by operational mechanical services, have been excluded from the results.

Table 1 Measured ambient noise levels in accordance with the NSW NPI

Measurement Location	Daytime[1] 7:00 am to 6:00 pm		Evening[1] 6:00 pm to 10:00 pm		Night-time[1] 10:00 pm to 7:00 am	
	L_{A90}[2]	LAeq[3]	L_{A90}[2]	LAeq[3]	L_{A90}[2]	LAeq[3]
Logger Location 1 – To the south of the site	51	61	52	58	44	54
Logger Location 2 – To the north of the site	47	55	48	52	42	50

Note 1: For Monday to Saturday, Daytime 7:00 am – 6:00 pm; Evening 6:00 pm – 10:00 pm; Night-time 10:00 pm – 7:00 am. On Sundays and Public Holidays, Daytime 8:00 am – 6:00 pm; Evening 6:00 pm – 10:00 pm; Night-time 10:00 pm – 8:00 am

Note 2: The L_{A90} noise level is representative of the "average minimum background sound level" (in the absence of the source under consideration), or simply the background level.

Note 3: The LAeq is the energy average sound level. It is defined as the steady sound level that contains the same amount of acoustical energy as a given time-varying sound.

In addition to the overall broadband noise levels (i.e. single number ambient noise level measurement results) provided above, the accompanying single (1/1) octave band spectrum noise levels for each 15-minute period throughout the identified monitoring periods were also recorded. Octave band noise level criteria are sometimes imposed by Liquor and Gaming NSW as a condition on the hotel's Liquor License. The background L_{A90} noise levels in octave obtained during the monitoring periods are shown below.

Table 2 1/1 Spectra Background Noise Monitoring

Time Period	Parameter [1]	Octave Band Centre Frequency, Hz									Overall dB(A)
		31.5	63	125	250	500	1k	2k	4k	8k	
Day Time	Measured L_{A90}	32	30	36	41	44	44	40	36	26	**47**
Evening	Measured L_{A90}	33	30	38	42	45	45	41	36	23	**48**
Night-time	Measured L_{A90}	26	24	34	39	40	38	33	29	18	**42**

Note 1: Measured L_{A90} spectrum has been collected by the unattended noise monitor, not through attended measurements.

Note 2: For Monday to Saturday, Daytime 7:00 am – 6:00 pm; Evening 6:00 pm – 10:00 pm; Night-time 10:00 pm – 12:00 am. On Sundays and Public Holidays, Daytime 8:00 am – 6:00 pm; Evening 6:00 pm – 10:00 pm; Night-time 10:00 pm – 12:00 am.

4 INTERNAL NOISE LEVEL ASSESSMENT

Internal noise levels within the future residential occupancies have been based on the relevant noise levels as detailed within the Australian Standard AS2107:2000 *Acoustics - Recommended design sound levels and reverberation times for building interiors* and the *Sydney Development Control Plan (DCP) 2012-Part 4- Section 4.2.3.11-Acosutic Privacy* which are detailed below.

4.1 Sydney Development Control Plan (DCP) 2012 - Part 4 - Section 4.2.3.11 – Acoustic Privacy

Section 4.2.3.11 of the City of Sydney DCP provides the following internal design objectives for residential buildings and serviced apartments:

*7) The repeatable maximum **LAeq(1 hour)** for residential buildings and serviced apartments must not exceed the following levels:*

- *a. for closed windows and doors:*
  - *i. 35dB for bedrooms (10pm-7am); and*
  - *ii. 45dB for main living areas (24 hours).*
- *b. for open windows and doors:*
  - *i. 45dB for bedrooms (10pm-7am); and*
  - *ii. 55dB for main living areas (24 hours).*

8) Where natural ventilation of a room cannot be achieved, the repeatable maximum $L_{Aeq(1hour)}$ level in a dwelling when doors and windows are shut and air conditioning is operating must not exceed:

- *a. 38dB for bedrooms (10pm-7am); and*
- *b. 48dB for main living areas (24 hours).*

9) *These levels are to include the combined measured level of noise from both external sources and the ventilation system operating normally.*

Note: The requirements listed above are not strictly applicable to this project as the development is not classified as a *residential building* or *serviced apartments* as defined by the Sydney City LEP, rather *tourism and visitor accommodation* or *short term accommodation.* However, to ensure the future internal acoustic amenity of the occupants, the requirement from item 8a will be adopted. The development also proposes to provide air conditioning to all short term accommodation areas.

4.2 Australian / New Zealand Standard AS/NZS 2107:2016 Acoustics - Recommended design sound levels and reverberation times for building interiors - (AS/NZS 2107:2016)

Recommended ambient noise levels and reverberation times for internal spaces are given in a number of publications including Table 1 of Australian / New Zealand Standard 2107:2016 "*Acoustics - Recommended design sound levels and reverberation times for building interiors*". Unlike the previous version of this Standard, this latest edition recommends a range with lower and upper levels (rather than "satisfactory" and "maximum" internal noise levels) for building interiors based on room designation and location of the development relative to external noise sources. This change has occurred due to the fact that sound levels below 'satisfactory' could be interpreted as desirable, but the opposite may in fact be the case. Levels below those which were listed as 'satisfactory' can lead to inadequate acoustic masking resulting in loss of acoustic isolation and speech privacy.

Internal noise levels due to the combined contributions of external noise intrusion and mechanical ventilation plant should not exceed the maximum levels recommended in this Standard. The levels for areas relevant to this development are given in Table 3 below. The mid to maximum points of the internal noise level ranges are generally adopted as the internal design noise criteria for the combined effect of mechanical services and external noise intrusion. In this report we will confine our recommendations to dBA levels, however, where the background noise appears to be unbalanced, AS/NZS 2107:2016 provides direction in terms of suitable diagnostic tools that can be used to assess the spectrum distribution of the background noise.

Table 3 Recommended Design Sound Levels and Reverberation Times

Type of Occupancy/Activity	Design sound level range dBA ($L_{Aeq,t}$)	Project Design Noise Level [1] dBA ($L_{Aeq,t}$)
Hotel and motels—		
Hotels and motels in inner city areas or entertainment districts or near major roads—		
Sleeping areas (night time)	35 to 40	40
Washrooms and toilets	45 to 55	50
Foyers and recreation areas	45 to 50	50
Bars and lounges	<50	<50
Venue foyer	30-40	40

Note 1: Overall recommended level for mechanical services noise and intrusive noise, combined.

Section 6.18 of AS/NZ 2107:2016 notes that the presence of discrete frequencies or narrow band signals may cause the sound level to vary spatially within a particular area and be a source of distraction for occupants. Where this occurs, the sound level shall be determined as the highest level measured in the occupied location(s).

If tonal components are significant characteristics of the sound within a measurement time interval, an adjustment shall be applied for that time interval to the measured A-weighted sound pressure level to allow for the additional annoyance. If the background sounds include spectral imbalance, then the RC (Mark II) levels indicated in the Standard should be referenced (see also Appendix D of AS/NZ 2107:2016 for additional guidance).

Generally, where the final noise levels are within +/- 2 dB of the specified level given above, the design criteria will be considered met. Both the upper and lower limits will need to be satisfied especially where privacy is important or where noise intrusion to be avoided.

4.3 Environmental Noise Intrusion Assessment

This section of the report details the assessment of environmental noise intrusion into the proposed development and the recommended acoustic treatments to ensure the recommended internal noise levels detailed in the Sections above (including traffic noise intrusion) are achieved.

Internal noise levels within the future areas of the development will result from the noise intrusion into the building through the external façade including glass, masonry and other façade elements. Typically, the acoustic performance of building elements including the relatively light weight elements of the building façade, including glass and/or plasterboard constructions, will be the determining factors in the resulting internal noise levels.

Calculations of internal noise levels have been undertaken based on the measured traffic and calculated environmental noise levels at the site and the characteristics of the building, including window openings, buildings constructions and the like.

4.3.1 External Glass Elements

The recommended acoustic constructions to the buildings external façade glass elements are detailed in the table below to ensure the recommended internal noise levels detailed above are achieved, with the façade building openings closed.

Table 4 External Glass Acoustic Requirements

Façade Orientation	Room Type	Recommended Glass Construction	Minimum Façade Acoustic Performance[1]
All Façade Orientations	Hotel Accommodation Rooms	6.38mm Laminated	Rw 30
	Foyer and Entry Areas	10.38mm Laminated	Rw 35
	Restaurant and Function Rooms	10.38mm Laminated	Rw 35
	Wet areas	6mm Float/Toughened	Rw 28

Note 1: The acoustic performance of the external façade includes the installed glazing and frame including (but not limited to) the façade systems seals and frame. All external glazing systems are required to be installed using acoustic bulb seals.

The recommended glass constructions detailed in the table above include those required to ensure the acoustic requirements of the project are achieved. Thicker glazing may be required to achieve other project requirements such as structural, thermal, safety or other requirements and is to be advised by others.

4.4 External Building Elements

The proposed external building elements including masonry or concrete external walls and roof are acoustically acceptable without additional acoustic treatment.

Any lightweight external pasteboard walls should be constructed from a construction with a minimum acoustic performance of Rw 50.

4.5 External Roof

The required external roof and ceiling constructions for the project are required to include the following:

- Concrete external roof construction – no additional acoustic treatments required.
- Metal deck roof construction – no additional acoustic treatments required.

4.6 External Opening and Penetrations

All openings and penetrations are required to be acoustically treated such that the performance of the building construction is not compromised. This may require lining of duck work behind mechanical service openings/grills, treatments to ventilation opening and the like.

5 EXTERNAL NOISE EMISSION ASSESSMENT

This section of the report details the relevant noise level criteria for noise emissions generated on the site once completed.

The relevant authority which provides the required noise level criteria for noise levels generated on the site includes the NSW Environmental Protection Authority's (EPA) Noise Policy for Industry (NPfI).

This section contains noise criteria on the operational criteria, construction criteria and vibration criteria.

The following criteria are relevant for the assessment of noise and vibration emissions from the proposed training centre:

- For the assessment of the predicted operational noise emissions by the training facility: The criteria have been derived in accordance with the *Noise Policy for Industry* (EPA, 2017), details are included in the following sections of this report.

5.1 NSW EPA Noise Policy for Industry

In NSW, the control of noise emissions is the responsibility of Local Government and the NSW Environment Protection Authority (NSW EPA). In October 2017, the NSW EPA released the *Noise Policy for Industry* (NSW NPI). The purpose of the policy is to ensure that noise impacts associated with particular industrial developments are evaluated and managed in a consistent and transparent manner. The policy aims to ensure that noise is kept to acceptable levels in balance with the social and economic value of industry in NSW.

The NSW NPI criteria for industrial noise sources have two components:

- Controlling the intrusive noise impacts for residential receivers in the short-term; and
- Maintaining noise level amenity of particular land uses for residents and sensitive receivers in other land uses.

The project noise trigger level is derived from the more stringent value out of the project intrusiveness noise level and the project amenity noise level.

5.1.1 Intrusive Noise Impacts (Residential Receivers)

The NSW NPI states that the noise from any single source should not intrude greatly above the prevailing background noise level. Industrial noises are generally considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (L_{Aeq}), measured over a 15 minute period, does not exceed the background noise level measured in the absence of the source by more than 5 dB(A). This is often termed the Intrusiveness Criterion.

The 'Rating Background Level' (RBL) is the background noise level to be used for assessment purposes and is determined by the methods given in the NSW NPI. Using the rating background noise level approach results in the intrusiveness criterion being met for 90% of the time. Adjustments are to be applied to the level of noise produced by the source that is received at the assessment point where the noise source contains annoying characteristics such as tonality or impulsiveness.

5.1.2 Protecting Noise Amenity (All Receivers)

To limit continuing increases in noise levels, the maximum ambient noise level within an area from industrial noise sources should not normally exceed the acceptable noise levels specified in Table 2.2 of the NSW NPI. That is, the ambient L_{Aeq} noise level should not exceed the level appropriate for the particular locality and land use. This is often termed the 'Background Creep' or Amenity Criterion.

The amenity assessment is based on noise criteria specified for a particular land use and corresponding sensitivity to noise. The cumulative effect of noise from industrial sources needs to be considered in assessing the impact. These criteria relate only to other continuous industrial-type noise and do not include road, rail or community noise. If the existing (measured) industrial-type noise level approaches the criterion value, then the NSW NPI sets maximum noise emission levels from new sources with the objective of ensuring that the cumulative levels do not significantly exceed the criterion.

5.1.3 Area Classification

The NSW NPI characterises the "Suburban Residential" as an area that has local traffic with characteristically intermittent traffic flows or with some limited commerce or industry. This area often has the following characteristic: evening ambient noise levels defined by the natural environment and human activity.

For the considered receptors in the rural area, the recommended amenity noise level is shown in Table 5 below. When the existing noise level from industrial noise sources is close to the recommended "Amenity Noise Level" (ANL) given above, noise from the new source must be controlled to preserve the amenity of the area in line with the requirements of the NSW NPI.

Table 5 NSW NPI – Recommended L_{Aeq} Noise Levels from Industrial Noise Sources

Type of Receiver	Indicative Noise Amenity Area	Time of Day[1]	Recommended Amenity Noise Level ($L_{Aeq, period}$)[2]
Residence	Suburban	Day	55
		Evening	45
		Night	40
Commercial	All	When in use	65

Note 1: For Monday to Saturday, Daytime 7:00 am – 6:00 pm; Evening 6:00 pm – 10:00 pm; Night-time 10:00 pm – 7:00 am. On Sundays and Public Holidays, Daytime 8:00 am – 6:00 pm; Evening 6:00 pm – 10:00 pm; Night-time 10:00 pm – 8:00 am

Note 2: The L_{Aeq} is the energy average sound level. It is defined as the steady sound level that contains the same amount of acoustical energy as a given time-varying sound.

5.1.4 Project Trigger Noise Levels

The intrusive and amenity criteria for industrial noise emissions derived from the measured data are presented in Table 6. The amenity and intrusive criterion are nominated for the purpose of determining the operational noise limits for noise sources associated with the development which can potentially affect noise sensitive receivers.

For each assessment period, the project trigger noise levels are the lower (i.e. the more stringent) of the amenity or intrusive criteria. The project trigger noise levels are shown in bold text in Table 6.

Table 6 External noise level criteria in accordance with the NSW NPI

Location Type	Time of Day	Project Amenity Noise Level, $L_{Aeq, period}$ [1] (dBA)	Representative Background Noise level $L_{A90, 15\ min}$ (RBL) [2] (dBA)	Measured $L_{Aeq, period}$ Noise Level (dBA)	Intrusive $L_{Aeq, 15\ min}$ Criterion for New Sources (dBA) [3]	Amenity $L_{Aeq, 15\ min}$ Criterion for New Sources (dBA) [3, 4]
Residence to the south of the site	Day	50	51	61	**56**	53
	Evening	40	52	58	**57**	43
	Night	35	44	54	**49**	38
Residence to the north of the site	Day	50	47	55	**52**	53
	Evening	40	48	52	**53**	43
	Night	35	42	50	**47**	38
Commercial	When in use	60				**63**

Note 1: Project Amenity Noise Levels corresponding to "suburban" areas, equivalent to the Recommended Amenity Noise Levels minus 5 dBA

Note 2: L_{A90} Background Noise or Rating Background Level, including L_{A90} Background Noise or Rating Background Level based on the recoded noise levels at the site.

Note 3: Project Noise Trigger Levels are shown in bold

Note 4: According to Section 2.2 of the NSW NPI, the LAeq, 15 minutes is equal to the LAeq, period + 3 dB

5.1.5 Liquor & Gaming NSW

Section 79 of the Liquor Act 2007 provides mechanisms for complaints to be made when the amenity of local areas is disturbed by the use of licensed premises and registered clubs (including disturbances caused by patrons). These complaints are addressed by the Director of Liquor and Gaming, and in this process they may impose temporary or permanent noise conditions on the licensed venue. Typical noise conditions that are imposed upon licensed premises are as follows:

> *The L_{A10}* noise level emitted from the licensed premises shall not exceed the background noise level in any Octave Band Centre Frequency (31.5 Hz – 8k Hz inclusive) by more than 5 dB between 07:00 am and 12:00 midnight at the boundary of any affected residence.*
>
> *The L_{A10}* noise level emitted from the licensed premises shall not exceed the background noise level in any Octave Band Centre Frequency (31.5 Hz – 8k Hz inclusive) between 12:00 midnight and 07:00 am at the boundary of any affected residence.*
>
> *Notwithstanding compliance with the above, the noise from the licensed premises shall not be audible within any habitable room in any residential premises between the hours of 12:00 midnight and 07:00 am.*
>
> ** For the purposes of this condition, the L_{A10} can be taken as the average maximum deflection of the noise emission from the licensed premises.*
>
> *This is a minimum standard. In some instances the Director may specify a time earlier than midnight in respect of the above condition.*
>
> *Interior noise levels which still exceed safe hearing levels are in no way supported or condoned by the Director.*

These criteria are applicable to noise emissions from the licensed venue component of the development, excluding noise from mechanical services. For external noise emissions, octave band spectral criteria for each assessment period have been summarised in the table below.

These are based on the measured noise spectra shown in In addition to the overall broadband noise levels (i.e. single number ambient noise level measurement results) provided above, the accompanying single (1/1) octave band spectrum noise levels for each 15-minute period throughout the identified monitoring periods were also recorded. Octave band noise level criteria are sometimes imposed by Liquor and Gaming NSW as a condition on the hotel's Liquor License. The background L_{A90} noise levels in octave obtained during the monitoring periods are shown below.

Table 7 Liquor & Gaming NSW – L_{10} Criteria (external)

Time Period	Parameter [1]	Octave Band Centre Frequency, Hz									Overall dBA
		31.5	63	125	250	500	1k	2k	4k	8k	
7:00am – 12:00am (day, evening and early night period) [2]	**Day Period**										
	Measured L_{A90}	32	30	36	41	44	44	40	36	26	**47**
	Criteria L_{A10}	37	35	41	46	49	49	45	41	31	**52**
	Evening Period										
	Measured L_{A90}	33	30	38	42	45	45	41	36	23	**48**
	Criteria L_{A10}	38	35	43	47	50	50	46	41	28	**53**
	Early Night Period										
	Measured L_{A90}	26	24	34	39	40	38	33	29	18	**42**
	Criteria L_{A10}	31	29	39	44	45	43	38	34	23	**47**
	After Midnight										
	Measured L_{A90}	26	24	34	39	40	38	33	29	18	**42**
	Criteria L_{A10}	26	24	34	39	40	38	33	29	18	**42**

Note 1: Measured L_{A90} spectrum has been adjusted to match overall RBL for corresponding periods.

Note 2: For Monday to Saturday, Daytime 7:00 am – 6:00 pm; Evening 6:00 pm – 10:00 pm; Night-time 10:00 pm – 7:00 am. On Sundays and Public Holidays, Daytime 8:00 am – 6:00 pm; Evening 6:00 pm – 10:00 pm; Night-time 10:00 pm – 8:00 am.

Note 3: Noise levels after midnight are to be inaudible within any habitable room in any residential premises including existing and future dwellings.

5.1.6 City of Sydney Council – Typically Imposed Conditions

Conditions of consent typically imposed by the City of Sydney Council in relation to acoustics from the operation of entertainment and licensed premises are outlined below:

NOISE - ENTERTAINMENT

(a) The $L_{A10,\ 15\ minute}$ noise level emitted from the use must not exceed the background noise level ($L_{A90,\ 15minute}$) in any Octave Band Centre Frequency (31.5 Hz to 8 kHz inclusive) by more than 5dB between the hours of 7.00am and 12.00 midnight when assessed at the boundary of any affected residence.

(b) The $L_{A10,\ 15\ minute}$ noise level emitted from the use must not exceed the background noise level ($L_{A90,\ 15\ minute}$) in any Octave Band Centre Frequency (31.5 Hz to 8 kHz inclusive) between the hours of 12.00 midnight and 7.00am when assessed at the boundary of any affected residence.

(c) Notwithstanding compliance with (a) and (b) above, noise from the use when assessed as an $L_{A10,\ 15\ minute}$ enters any residential use through an internal to internal transmission path is not to exceed the existing internal $L_{A90,\ 15\ minute}$ (from external sources excluding the use) in any Octave Band Centre Frequency (31.5 Hz to 8 kHz inclusive) when assessed within a habitable room at any affected residential use between the hours of 7am and 12midnight. Where the $L_{A10,\ 15\ minute}$ noise level is below the threshold of hearing, Tf at any Octave Band Centre Frequency as defined in Table 1 of International Standard ISO 226 : 2003- Normal Equal-Loudness-Level Contours then the value of Tf corresponding to that Octave Band Centre Frequency shall be used instead.

(d) Notwithstanding compliance with (a), (b) and (c) above, the noise from the use must not be audible within any habitable room in any residential use between the hours of 12.00 midnight and 7.00am.

(e) The $L_{A10,\ 15\ minute}$ noise level emitted from the use must not exceed the background noise level ($L_{A90,\ 15\ minute}$) in any Octave Band Centre Frequency (31.5 Hz to 8 kHz inclusive) by more than 3dB when assessed indoors at any affected commercial premises.

Note: The $L_{A10,\ 15\ minute}$ noise level emitted from the use is as per the definition in the Australian Standard AS1055-1997 Acoustics – Description and measurement of environmental noise. The background noise level $L_{A90,\ 15\ minute}$ is to be determined in the absence of noise emitted by the use and be representative of the noise sensitive receiver. Background noise monitoring must be carried out in accordance with the long-term methodology in Fact Sheet B of the NPfI unless otherwise agreed by the City's Area Planning Manager.

NOISE – COMMERCIAL PLANT / INDUSTRIAL DEVELOPMENT

(a) Noise from commercial plant and industrial development must not exceed a project amenity/intrusiveness noise level or maximum noise level in accordance with relevant requirements of the NSW EPA Noise Policy for Industry 2017 (NPfI) unless agreed to by the City's Area Planning Manager. Further:

(i) Background noise monitoring must be carried out in accordance with the long-term methodology in Fact Sheet B of the NPfI unless otherwise agreed by the City's Area Planning Manager.

(ii) Commercial plant is limited to heating, ventilation, air conditioning, refrigeration and energy generation equipment.

(b) An $L_{Aeq,15\ minute}$ (noise level) emitted from the development must not exceed the $L_{A90,\ 15\ minute}$ (background noise level) by more than 3dB when assessed inside any habitable room of any affected residence or noise sensitive commercial premises at any time. Further:

(i) The noise level and the background noise level shall both be measured with all external doors and windows of the affected residence closed.

(ii) Background noise measurements must not include noise from the development but may include noise from necessary ventilation at the affected premise.

(c) Corrections in Fact Sheet C of the NPfI are applicable to relevant noise from the development measured in accordance with this condition, however duration corrections are excluded from commercial noise.

Note: Requirements shown in the *Noise – Entertainment* condition outlined above are identical to those outlined in the Liquor & Gaming NSW requirements shown above (Section 5.1.5). Requirements shown in the *Noise – Commercial Plant / Industrial Development* condition are identical to those outlined in NSW EPA Noise Policy for Industry (NPI) (section 5.1.4).

6 INTERNAL SOUND INSULATION CRITERIA

The National Construction Code (NCC) & Building Code of Australia (BCA) provided internal sound isolation requirements for Class 2 or 3 building in Part F5.

A Class 3 building is a residential building, other than a Class 1 or 2 building, which is a common place of long term or transient living for a number of unrelated persons. Example: boarding-house, hostel, backpackers accommodation or residential part of a hotel, motel, school or detention centre.

The short term accommodation located above ground fall under a Class 3 category.

6.1 Common Floors

Section FP5.1 of the BCA states that for Class 2 or 3 buildings:

> *Floors separating -*
>
> *a) sole-occupancy units; or*
>
> *b) sole-occupancy unit from a plant room, lift shaft, stairway, public corridor, public lobby, or the like, or a part of a different classification,*
>
> *must provide insulation against the transmission of airborne and impact generated sound sufficient to prevent illness or loss of amenity to the occupants.*

F5.4 provides the sound insulation performance rating of floors as follows:

> *a) A floor in a Class 2 or 3 building must have an R_w+C_{tr} (airborne) not less than 50 and an $L_{n,w}$ (impact) not more than 62 if it separates—*
>
> *(i) sole-occupancy units; or*
>
> *(ii) a sole-occupancy unit from a plant room, lift shaft, stairway, public corridor, public lobby or the like, or parts of a different classification.*
>
> *b) A floor in a Class 9c building separating sole-occupancy units must have an R_w not less than 45.*

FV5.1 states that compliance with FP5.1 is verified when it is measured in-situ that the separating floor has -

> *a) airborne: a weighted standardised level difference with spectrum adaptation term ($D_{nT,w} + C_{tr}$) not less than 45 when determined under AS/NZS 1276.1 or ISO 717.1; and*
>
> *b) impact: a weighted standardised impact sound pressure level with ($L_{nT,w}$) not more than 62 when determined under AS ISO 717.2.*

6.2 Common Walls

Section FP5.2 of the BCA requires:

> *Walls separating sole-occupancy units or a sole-occupancy unit from a plant room, lift shaft, stairway, public corridor, public lobby, or the like, or parts of a different classification, must provide insulation against the transmission of -*
>
> *a) airborne sound; and*
>
> *b) impact generated sound, if the wall is separating a bathroom, sanitary compartment, laundry or kitchen in one sole-occupancy unit from a habitable room (other than a kitchen) in an adjoining unit,*
>
> *sufficient to prevent illness or loss of amenity to the occupants.*

F5.5 of the BCA provides the sound insulation performance rating of walls as follows:

a) *A wall in a Class 2 or 3 building must -*

(i) have an Rw + Ctr (airborne) not less than 50, if it separates sole-occupancy units; and

(ii) have an Rw (airborne) not less than 50, if it separates a sole-occupancy unit from a plant room, lift shaft, stairway, public corridor, public lobby or the like, or parts of a different classification; and

(iii) comply with F5.3(b) if it separates—

(A) a bathroom, sanitary compartment, laundry or kitchen in one sole-occupancy unit from a habitable room (other than a kitchen) in an adjoining unit; or

(B) a sole-occupancy unit from a plant room or lift shaft.

b) A door may be incorporated in a wall in a Class 2 or 3 building that separates a sole-occupancy unit from a stairway, public corridor, public lobby or the like, provided the door assembly has an Rw not less than 30.

c) A wall in a Class 9c building must have an Rw not less than 45 if it separates—

(i) sole-occupancy units; or

(ii) a sole-occupancy unit from a kitchen, bathroom, sanitary compartment (not being an associated ensuite), laundry, plant room or utilities room.

d) In addition to (c), a wall separating a sole-occupancy unit in a Class 9c building from a kitchen or laundry must comply with F5.3 (b).

e) *Where a wall* required to have sound insulation has a floor above, the wall must continue to -

(i) the underside of the floor above; or

(ii) a ceiling that provides the sound insulation required for the wall.

f) Where a wall required to have sound insulation has a roof above, the wall must continue to -

(i) the underside of the roof above; or

(ii) a ceiling that provides the sound insulation required for the wall.

FV5.2 states that compliance with FP5.2(a) to avoid the transmission of airborne sound through walls is verified when it is measured in-situ that –

a) a wall separating sole-occupancy units has a weighted standardised level difference with spectrum adaptation term (DnT,w + Ctr) not less than 45 when determined under AS/NZS 1276.1 or ISO 717.1; or

b) a wall separating a sole-occupancy unit from a plant room, lift shaft, stairway, public corridor, public lobby, or the like, or parts of a different classification, has a weighted standardised level difference (DnT,w) not less than 45 when determined under AS/NZS 1276.1 or ISO 717.1;

c) any door assembly located in a wall that separates a sole-occupancy unit from a stairway, public corridor, public lobby, or the like, has a weighted standardised level difference (DnT,w) not less than 25 when determined under AS/NZS 1276.1 or ISO 717.1.

6.3 Summary of BCA Acoustic Requirements

A summary of the acoustic requirements of the BCA 2019 for Class 2 or 3 buildings is given in the table below.

Table 8 BCA 2019 Sound Insulation Requirements

Construction	2019 BCA	
	Laboratory performance requirements	**Verification method**
Walls between sole occupancy units	$R_w + C_{tr}$ not < 50	$D_{nT,w} + C_{tr}$ not < 45
Walls between a bathroom, sanitary compartment, laundry or kitchen in one sole occupancy unit and a habitable room (other than a kitchen) in an adjoining unit	$R_w + C_{tr}$ not < 50 and Must have a minimum 20 mm cavity between two separate leaves	$D_{nT,w} + C_{tr}$ not < 45 "Expert Judgment" Comparison to the "Deemed to satisfy" Provisions
Walls between sole occupancy units and a plant room or lift shaft	R_w not < 50 and Must have a minimum 20 mm cavity between two separate leaves[1]	$D_{nT,w}$ not < 45
Walls between sole occupancy units and a stairway, public corridor, public lobby or the like, or parts of a different classification	R_w not < 50	$D_{nT,w}$ not < 45
Door assemblies located in a wall between a sole-occupancy unit and a stairway, public corridor, public lobby or the like	R_w not < 30 [2]	$D_{nT,w}$ not < 25
Floors between sole-occupancy units or between a sole-occupancy unit and a plant room, lift shaft, stairway, public corridor, public lobby or the like, or parts of a different classification	$R_w + C_{tr}$ not < 50 $L_{n,w}$ not > 62	$D_{nT,w} + C_{tr}$ not < 45 $L'_{nT,w}$ not > 62
Soil, waste, water supply and stormwater pipes and ductwork to habitable rooms	$R_w + C_{tr}$ not < 40	n/a
Soil, waste, water supply and stormwater pipes and ductwork to kitchens and other rooms	$R_w + C_{tr}$ not < 25	n/a
Intra-tenancy Walls	There is no statutory requirement for airborne isolation via intra-tenancy walls.	

Note 1: A wall must be of "discontinuous construction" if it separates a sole occupancy unit from a plant room or lift shaft. Clause F5.3(c) defines "discontinuous construction" as a wall having a minimum 20 mm cavity between two separate leaves with no mechanical linkage except at the periphery.

Note 2: Clause FP5.3(b) in the 2016 BCA states that the required insulation of a floor or wall must not be compromised by a door assembly.

Note 3: Masonry walls must be laid with all joints filled solid, including those between the masonry and any adjoining construction

All project internal acoustic elements will be designed to comply with the requirements of the BCA as detailed in the table above.

7 OPERATIONAL ACOUSTIC ASSESSMENT

This section of the report details the assessment of potential noise generated as part of the proposed development.

The assessment of potential noise impacts from various sources of noise on the site are detailed in the following sections.

7.1 Mechanical Services Equipment

Detailed selections of the proposed mechanical plant and equipment to be used on the site are not available at this time. All future plant and equipment are to be acoustically treated to ensure the noise levels at all surrounding receivers comply with noise emission criteria detailed within this report. Experience with similar projects indicated that it is both possible and practical to treat all mechanical equipment such that the relevant noise levels are achieved. Examples of the possible acoustic treatments to mechanical equipment includes the following:

- Basement Supply and Exhaust Fans – location of fans within the building and treated using internally lined ductwork or acoustic silencers.
- General supply and exhaust fans – general exhaust and supply fans such as toilet, kitchen, lobby and other small mechanical fans can be acoustically treated using acoustic flex ducting or internal lined ducting.

Details of the required mechanical services equipment and acoustic treatments to ensure the relevant noise level criteria is achieved will be provided as part of the CC submission of the project.

Experience with similar projects indicates that the acoustic treatment of the proposed mechanical equipment to be installed on the project is both possible and practical.

7.2 Operational Noise Impacts – Future Basement Venues

This section of the report details the noise impact assessment of the proposed licensed venues to be located on basements 1 and 2 of the development.

The proposed venues will include use as a licensed restaurant or the like with each of the venues having an expected internal noise level from patrons and background noise levels of up to 85 dB(A) L_{eq} SPL and equivalent to a active restaurant without live or amplified levels of entertainment music.

7.2.1 Assessment of Noise Impacts

To ensure the acoustic impact from the operation of the proposed basement venues will be acceptable an assessment of noise impact to external receivers as well future internal areas of the development has been undertaken.

In assessing the potential noise impacts, two forms of noise transmission have been identified; airborne transmission (i.e. noise breaking out and re-entering the building façades) and structure borne transmission (vibration transmission through the mutual structures). Each is discussed in detail below.

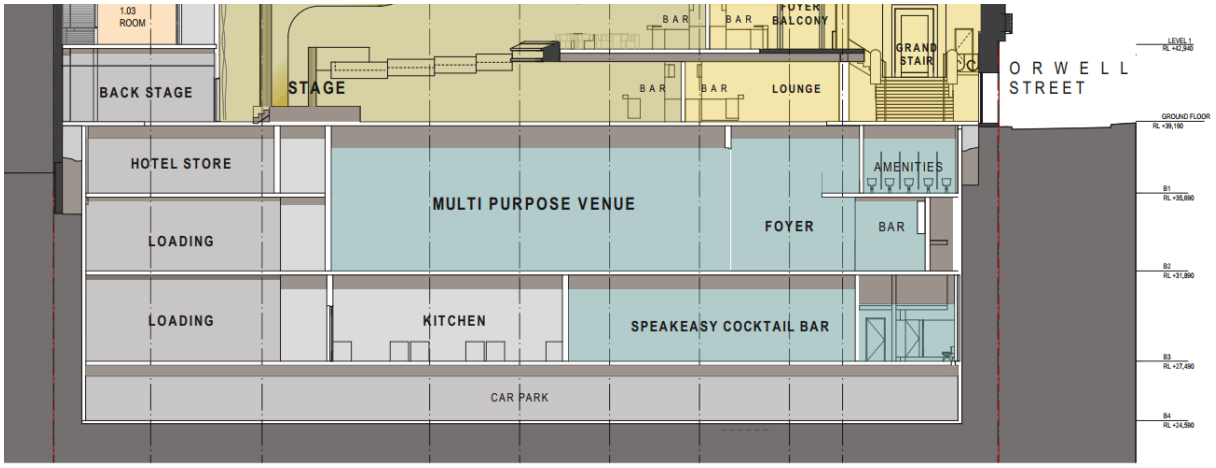
In addressing the transmission paths below, some assumptions have been made. These assumptions are all outlined in detail and justification for each assumption has been provided.

1. Airborne Transmission (i.e. through the façade and common floor structure)

   As the proposed venues are located within the basement of the proposed development air born noise breakout via the building's façade will be acoustically acceptable without additional acoustic treatments.

   The proposed venues on basement 1 include separation to the internal venue area on the ground floor above, see figure below.

Figure 5 Section of the Basement Venues below Ground Floor



There is a potential for airborne noise transfer via the common floor structure which separates the basement 1 venues and the ground floor area above. The proposed construction of the building separating these spaces includes a concrete slab of approximately 250mm. Based on the *Transmission Loss* perforamnce of the proposed building construction compliance with the internal noise criteria as outlined in this report will be achieved including 40 dB(A) L_{eq} and will not negatively impact on the area above.

To ensure the suitable separation between the basement venue and the Ground floor area the design and construction of the floor between the spaces is required to be constructed from a minimum acoustic performance of Rw 55.

2. Structure borne Noise Impacts

Structure borne noise impacts are only expected to occur from the amplification of music within the venues. As outlined above, the ground floor area will only be amplifying music to a background level. With the correct isolation of any speakers installed. Structure borne noise at the level proposed above for this area (i.e. 85dB(A)) will not result in an induced structure borne noise within the building structure impacts.

To ensure no adverse structure born vibration is generated within the proposed basement venues the following acoustic treatments are to be included in the design and construction of the venues:

- All speakers and noise generating equipment must be installed using isolated mounts. On the assumption these systems are correctly specified and installed, structure borne noise direct from the speaker system will be attenuated.

As part of the approvals for the future use of the basement venues a detailed noise impact assessment will be required to be conducted as part of the normal process. The detailed assessments would be undertaken once the details of operational capacities and activities are known and will include any additional acoustic mitigations required to ensure noise emissions comply with the noise level criteria detailed in this report.

7.3 Operational Noise Impacts – Future Ground Floor Venue

As part of the proposed development the use of the existing Metro Theatre including the stage and venue atrium is proposed. The proposed use of the space will include the following:

1. Performances such as live cabaret or acoustic bands (similar to 4-piece bands). The noise within the venue area resulting from the proposed performances will not include that of a concert or amplified event. The predicted noise level within the event area and void is a maximum of 95 dB(A) Leq SWL.
2. Patrons including up 250 people located on the Ground floor seating, first floor bar area and second floor bar area.
3. The proposed performances will include a period up until 11pm on any given day of the week.

As part of the assessment of the potential for noise impact from the proposed performances in the venue area of the development has been assessed using a 3-dimensional noise model.

Predictive noise modelling was carried out using the ISO 9613 algorithm within iNoise 2021. The iNoise software package allows a 3D computational model of the site and surrounding area to be created. Inputs into the noise model included terrain, ground absorption, surrounding buildings, fences, receiver locations and noise sources.

The following modelling assumptions are utilised in this noise impact assessment:

- The noise generating scenario is modelled for a worst case 15 minute period;
- Off site terrain has been sourced from the NSW Land and Property Information database Sixmaps;
- On site terrain has been taken from the architectural drawings;
- Ground Absorption has been included in the model with the site and surrounding grass areas having an absorption factor of 0.5;
- Off-site structures such as buildings and fences have been included in the model where relevant;
- Noise sources have been modelled as emitting façades or an emitting roof on the exterior of the hall building as detailed in the architectural drawings.
- The noise sources and sound power levels have been modelled with respect to the information presented in above;
- Internal spaces of the venue are assumed to be operational from 7am to 1am.

The following noise control measures are recommended for the use of performances within the main atrium are of the development.

- The ground floor perforamnce areas is recommended to be utilised until 11pm on any day of the week.
- No playing of music of announcements are to be undertaken externally to the building.
- All building openings are to be closed during periods when perforamnce are being undertaken. Access during periods when performances are being conducted should be undertaken via an air lock to the venue.
- The playing of amplified music or speech is to be limited within the venue atrium to be no greater than 90 dB(A) SWL within the space.
- The construction of the external elements of the building are to include the following minimum requirements:
    - Walls – Masonry or light weight construction with a minimum acoustic perforamnce of Rw 55.
    - External roof – The external roof construction of the building will include a concrete construction with a minimum performance of Rw 55.
- During performances there should be permanent security guides which monitor the entry and exit of patrons from the site. The security guards should ensure patrons enter and exit the site in a manner which mitigates noise impact to neighbours.
- Permanent notices should be installed and the entry/exit points to the premises reminding patrons to reduce noise to neighbours.

7.3.1 Airborne Transmission to Hotel Rooms

As the proposed venues are located with hotel rooms on floor and on the level above. To mitigate noise impacts from the use of the internal atrium for cabaret and acoustic performances the following treatments are recommended:

1. Floors separating the venue atrium and the hotel rooms above are to include a minimum acoustic performance of Rw 60, with a minimum 1/1 octave performance detailed in the table below. Floors can be constructed from a concrete floor with a air gap and insulation.
2. Wall between hotel rooms and the venue atrium are to include a construction of no less than Rw 60 a minimum 1/1 octave performance detailed in the table below.
3. Any speakers or noise generating equipment are to be vibration isolated from the building structure.
4. Access to the entry of hotel rooms are to include construction with an air lock arrangement between the venue atrium and hotel rooms.

Table 9 Structure Minimum Acoustic Perforamnce

Building Element		Frequency (Hz)							
		31	63	125	250	500	1k	2k	4k
Floors and walls separating hotel rooms to venue atrium	Insertion loss	28	32	37	50	60	65	70	70

7.4 Results of Noise Modelling

The results of the of the iNoise modelling are included in Appendix D and summarised in this section of the report.

The noise modelling was undertaken to include the operation of the site, including the assumptions detailed in the section above. The modelling was undertaken based on the operation of the sources being conducted simultaneously at any time.

Noise modelling included noise contour mapping, which is included in Appendix D, as well as noise predictions at selection receiver locations which included the following and is detailed in the figure below:

1. Receiver 1 – 26 Orwell Street, Level 2 front window facing Orwell Street.
2. Receiver 2 - 23 Hughes Street, rear of the residential receiver to the north of the site.
3. Receiver 3 – 27 Hughes Street, Windows to the rear of the residential dwellings facing the site.
4. Receiver 4 – 97 Macleay Street, residential receiver to the east of the sit.
5. Location 5 – 101 Macleay Street, residential receiver to the east of the site.
6. Location 6 – 32 Orwell Street, Commercial building located to the east of the site.
7. Location 7 – 113 Macleay Street, northern windows of the residential building located to the south east of the site.
8. Location 8 – 29 Orwell Street, northern windows of the residential dwellings in the building to the south of the site.
9. Location 9 – 27 Orwell Street, Residential receiver (Jolly Swagman Backpackers) to the south east of the site.
10. Location 10 – 12a Springfield Avenue, northern windows of the residential building to the south of the site.
11. Location 11 – 12 Springfield Avenue, northern windows of the residential building to the south of the site.
12. Location 12 – 15 Orwell Street, The north eastern edge of the building facing to site to the south west of the development.

Figure 7 Noise Modeling Receiver Locations

The summary of the noise modelling results are detailed in the table below.

Table 10 Summary of Noise Modelling Results

Receiver Location	Height of Receiver (m)	Calculated Overall L_{A10} Noise Level dB(A)	Frequency (Hz)								
			31	63	125	250	500	1k	2k	4k	8k
1	1.5	27	0.7	10	15.4	19.6	24.5	17.5	11.2	-3	-16.6
2	6.9	32	4.7	15.2	22.7	26.9	28.7	21.3	15.3	0.2	-12.7
3	6.9	42	12	22.7	30.4	35.3	39	35.5	31.3	16	5.1
4	17.7	39	5.6	16.8	25	31.1	36	33.4	29.3	13.7	1.9
5	9.6	40	4.7	14.9	22.2	30	36.5	35	31.1	15.5	4.5
6	4.2	38	3.2	12.1	18.1	27.8	34.6	33.2	29.2	13.5	2.3
7	17.7	40	8.2	19.2	27.2	32.9	37.5	34.5	30.3	14.8	3.4
8	9.6	37	7	18	26.8	31.6	34.4	28.3	22.9	8.9	-2.7
9	9.6	36	7	17.9	25.8	30.5	33.3	26.8	21.1	7.3	-4.3
10	9.6	35	5.9	16.7	24.7	29.4	32	25.2	19.2	5.6	-6.3
11	9.6	34	4.7	15.5	23.4	28.1	30.7	23.8	17.7	4	-8.2
12	31.2	29	0.2	10.6	18.2	22.9	26.1	21.4	16.6	1.1	-12.9

Based on the results of this assessment, including the iNoise noise modelling the noise emissions from the operation of the proposed noise sources within the 28-30 Orwell Street development will comply with the relevant noise emissions criteria detailed in this report, providing the recommended acoustic treatments in this report are included to the existing area.

8 CONCLUSION

Pulse White Noise Acoustics Consultancy Pty Ltd (Pulse White Noise Acoustics) has been engaged to undertake the Noise Impact Assessment of the proposed development of the Metro Theatre located at 28-30 Orwell Street, Potts Point.

This report details the required acoustic constructions of the building's façade, including external windows, to ensure that the future internal noise levels comply with the relevant noise levels of the Australian Standard AS2107:2016. Providing the recommended constructions detailed in this report are included in the construction of the project the required internal noise levels will be achieved.

External noise emissions from the site have been assessed and detailed in accordance with the NSW Environmental Protection Authorities *Noise Policy for Industry*. The future design and treatment of all building services associated with the project can be acoustically treated to ensure all noise emissions from the site comply with the EPA NPfI criteria including the following:

1. Operation of mechanical services on the site.
2. Operation of the proposed basement venues.
3. Us of the venue for cabaret or acoustic performances within the event atrium.

Providing the proposed acoustic treatments and controls detailed in this report are included in the design, construction and operation of the proposed development compliance with the relevant noise emissions criteria will be achieved.

For any additional information please do not hesitate to contact the person below.

Regards

Ben White
Director

Pulse White Noise Acoustics

9 APPENDIX A: ACOUSTIC TERMINOLOGY

The following is a brief description of the acoustic terminology used in this report.

Sound power level	The total sound emitted by a source
Sound pressure level	The amount of sound at a specified point
Decibel [dB]	The measurement unit of sound
A Weighted decibels [dB(A])	The A weighting is a frequency filter applied to measured noise levels to represent how humans hear sounds. The A-weighting filter emphasises frequencies in the speech range (between 1kHz and 4 kHz) which the human ear is most sensitive to, and places less emphasis on low frequencies at which the human ear is not so sensitive. When an overall sound level is A-weighted it is expressed in units of dB(A).
Decibel scale	The decibel scale is logarithmic in order to produce a better representation of the response of the human ear. A 3 dB increase in the sound pressure level corresponds to a doubling in the sound energy. A 10 dB increase in the sound pressure level corresponds to a perceived doubling in volume. Examples of decibel levels of common sounds are as follows:

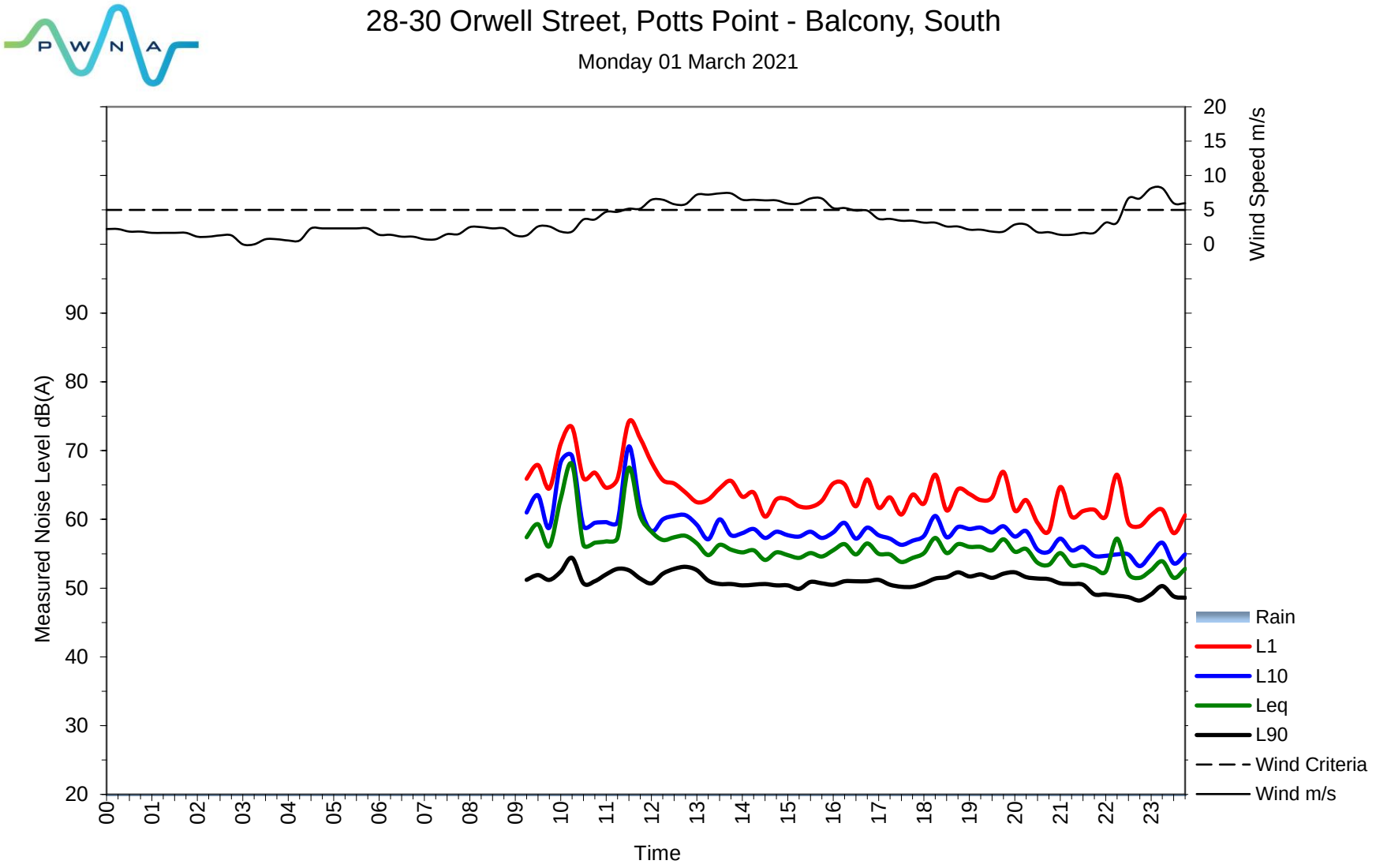
0dB(A)	Threshold of human hearing
30dB(A)	A quiet country park
40dB(A)	Whisper in a library
50dB(A)	Open office space
70dB(A)	Inside a car on a freeway
80dB(A)	Outboard motor
90dB(A)	Heavy truck pass-by
100dB(A)	Jackhammer/Subway train
110 dB(A)	Rock Concert
115dB(A)	Limit of sound permitted in industry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

Frequency [f]	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.
Ambient sound	The all-encompassing sound at a point composed of sound from all sources near and far.
Equivalent continuous sound level [L_{eq}]	The constant sound level which, when occurring over the same period of time, would result in the receiver experiencing the same amount of sound energy.
Reverberation	The persistence of sound in a space after the source of that sound has been stopped (the reverberation time is the time taken for a reverberant sound field to decrease by 60 dB)
Air-borne sound	The sound emitted directly from a source into the surrounding air, such as speech, television or music
Impact sound	The sound emitted from force of one object hitting another such as footfalls and slamming cupboards.
Air-borne sound isolation	The reduction of airborne sound between two rooms.
Sound Reduction Index [R] (Sound Transmission Loss)	The ratio the sound incident on a partition to the sound transmitted by the partition.
Weighted sound reduction index [R_w]	A single figure representation of the air-borne sound insulation of a partition based upon the R values for each frequency measured in a laboratory environment.
Level difference [D]	The difference in sound pressure level between two rooms.

Normalised level difference [D_n]	The difference in sound pressure level between two rooms normalised for the absorption area of the receiving room.
Standardised level difference [D_{nT}]	The difference in sound pressure level between two rooms normalised for the reverberation time of the receiving room.
Weighted standardised level difference [$D_{nT,w}$]	A single figure representation of the air-borne sound insulation of a partition based upon the level difference. Generally used to present the performance of a partition when measured in situ on site.
C_{tr}	A value added to an R_w or $D_{nT,w}$ value to account for variations in the spectrum.
Impact sound isolation	The resistance of a floor or wall to transmit impact sound.
Impact sound pressure level [L_i]	The sound pressure level in the receiving room produced by impacts subjected to the adjacent floor or wall by a tapping machine.
Normalised impact sound pressure level [L_n]	The impact sound pressure level normalised for the absorption area of the receiving room.
Weighted normalised impact sound pressure level [$L_{n,w}$]	A single figure representation of the impact sound insulation of a floor or wall based upon the impact sound pressure level measured in a laboratory.
Weighted standardised impact sound pressure level [$L'_{nT,w}$]	A single figure representation of the impact sound insulation of a floor or wall based upon the impact sound pressure level measured in situ on site.
C_I	A value added to an L_{nW} or $L'_{nT,w}$ value to account for variations in the spectrum.
Energy Equivalent Sound Pressure Level [$L_{A,eq,T}$]	'A' weighted, energy averaged sound pressure level over the measurement period T.
Percentile Sound Pressure Level [$L_{Ax,T}$]	'A' weighted, sound pressure that is exceeded for percentile x of the measurement period T.

*Definitions of a number of terms have been adapted from Australian Standard AS1633:1985 *"Acoustics – Glossary of terms and related symbols"*

10 APPENDIX B: UNATTENDED NOISE LOGGING – LOCATION 1


28-30 Orwell Street, Potts Point - Balcony, South
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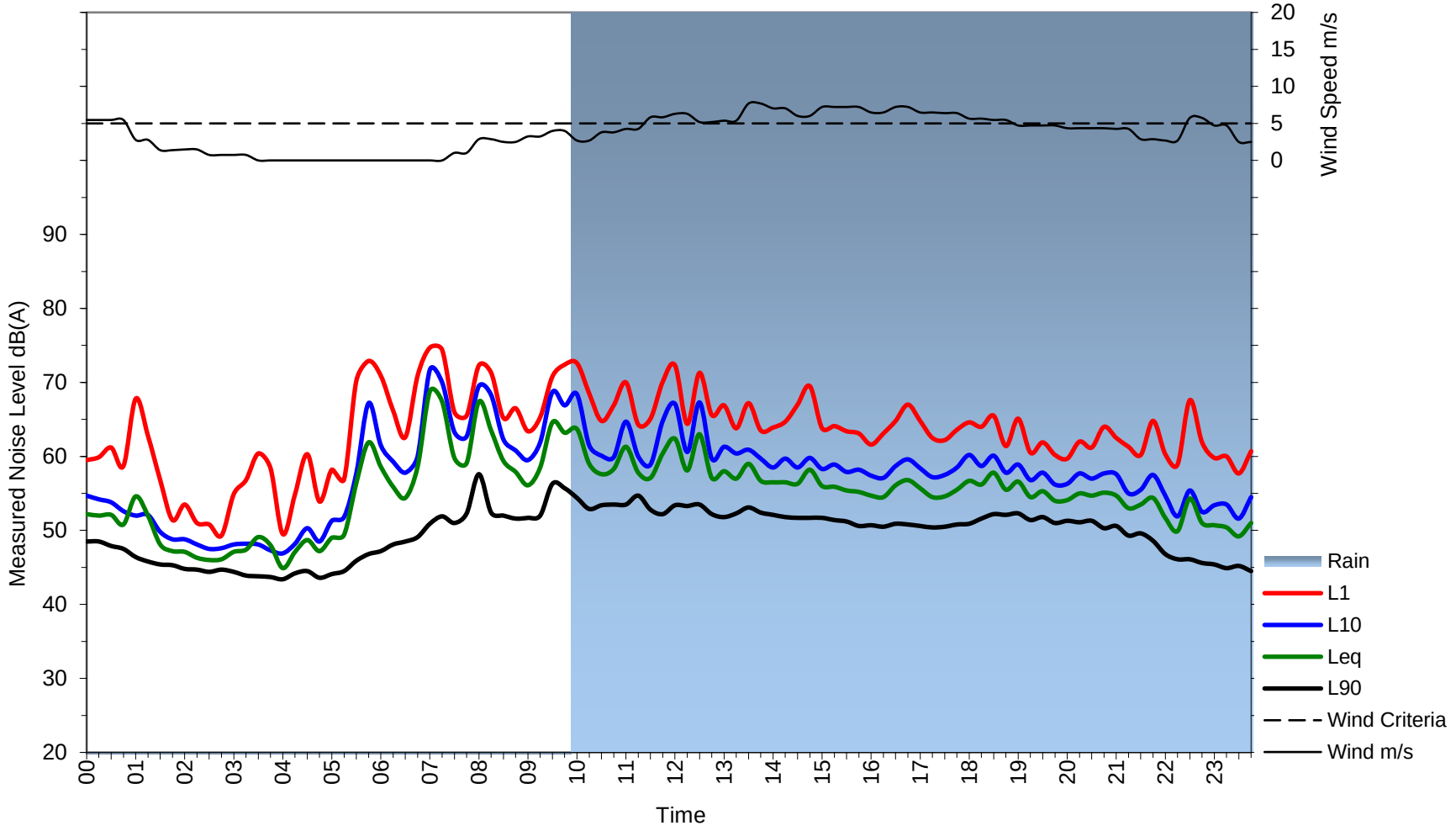
Measured Noise Level dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s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Tuesday 02 March 2021
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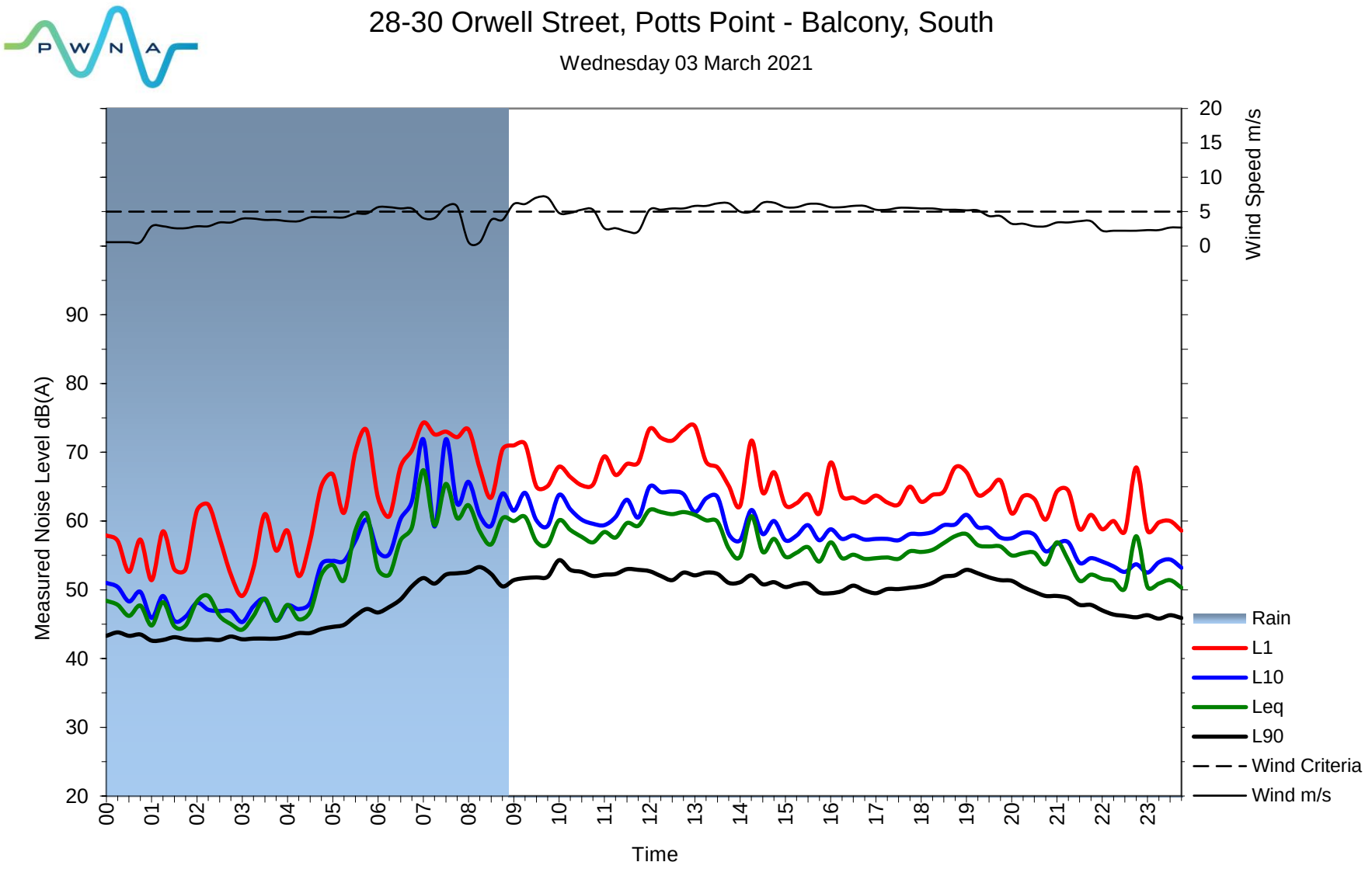
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s


28-30 Orwell Street, Potts Point - Balcony, South
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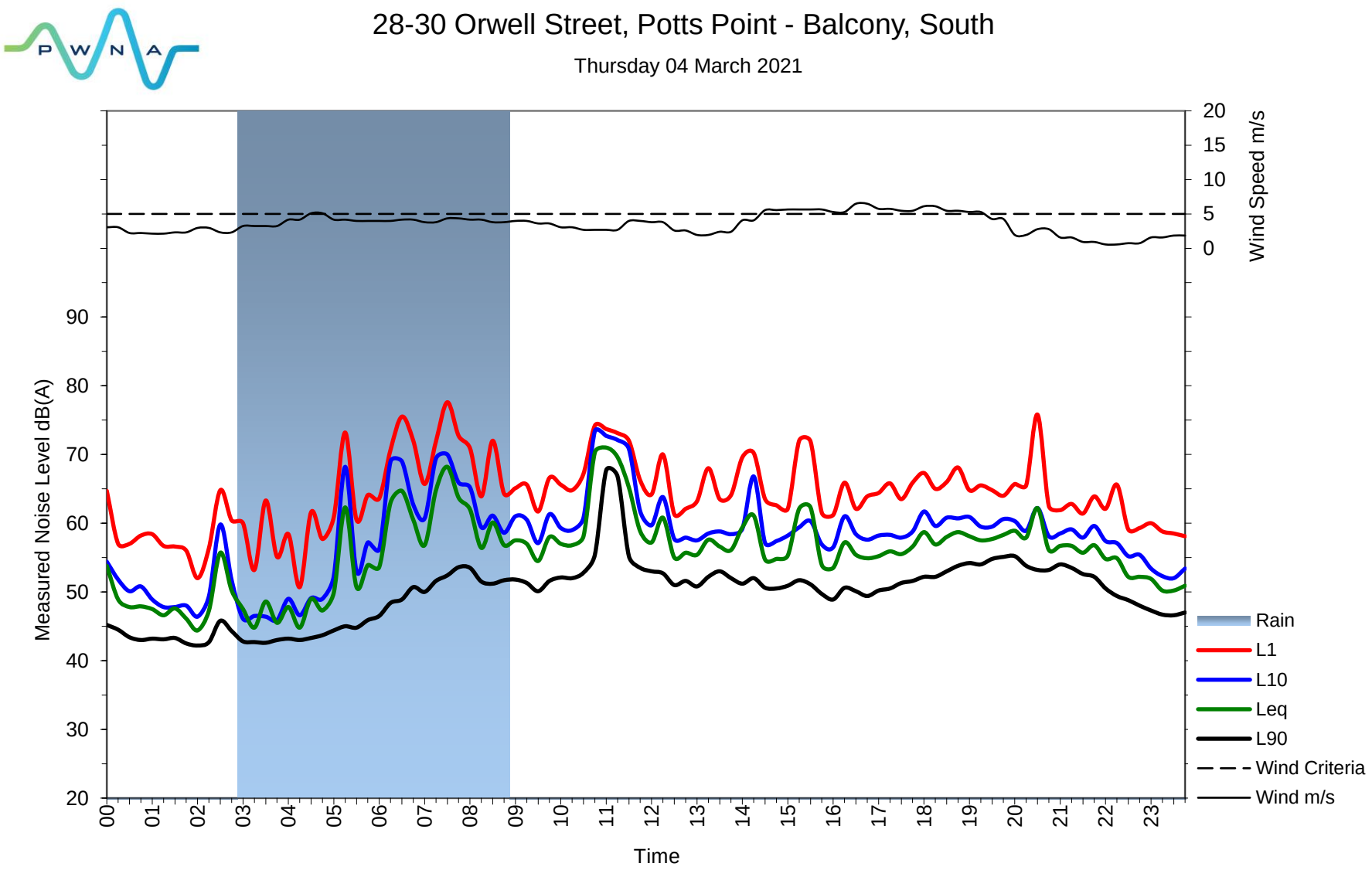
Measured Noise Level dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s


28-30 Orwell Street, Potts Point - Balcony, South
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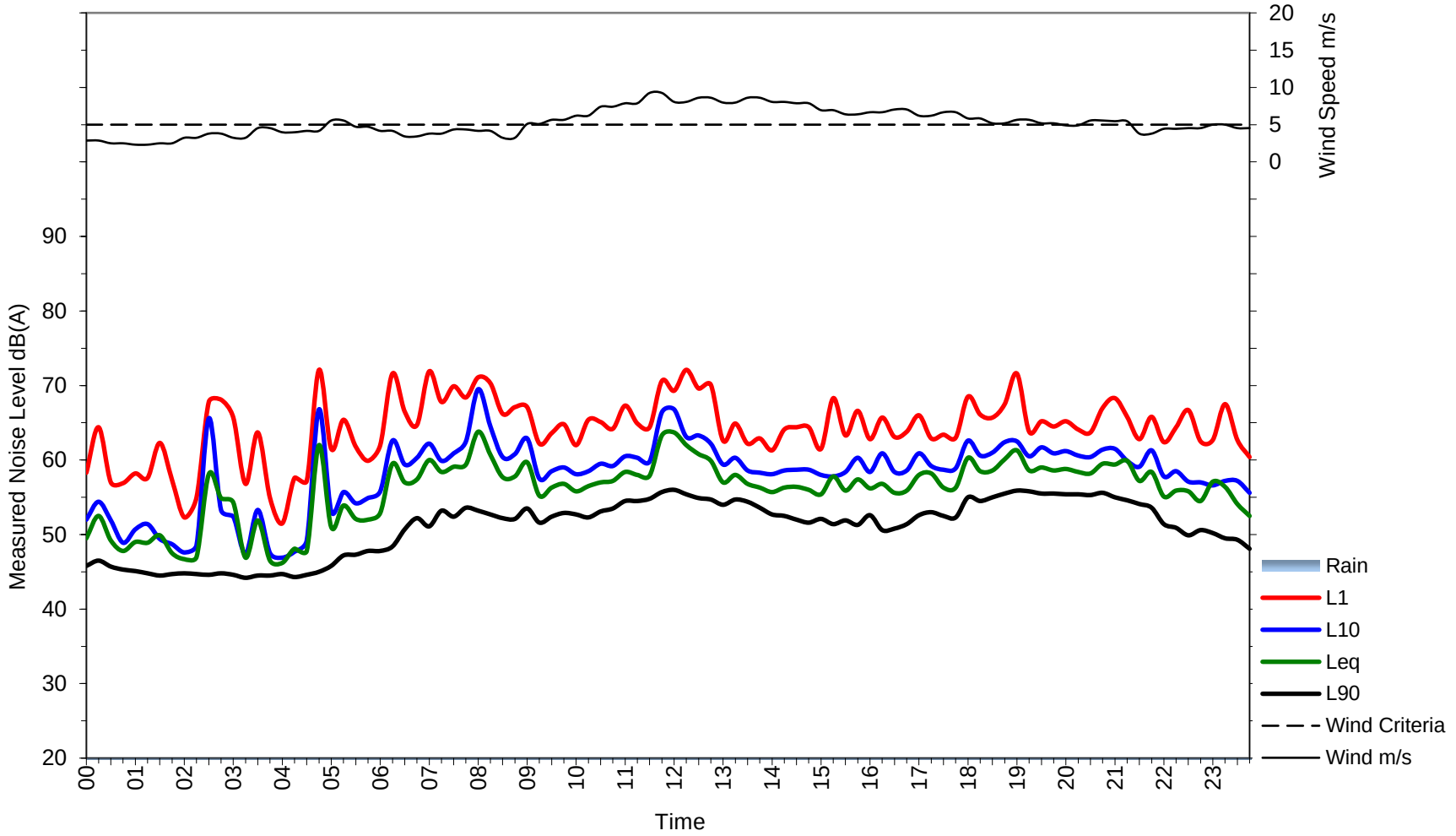
Measured Noise Level dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s


28-30 Orwell Street, Potts Point - Balcony, South
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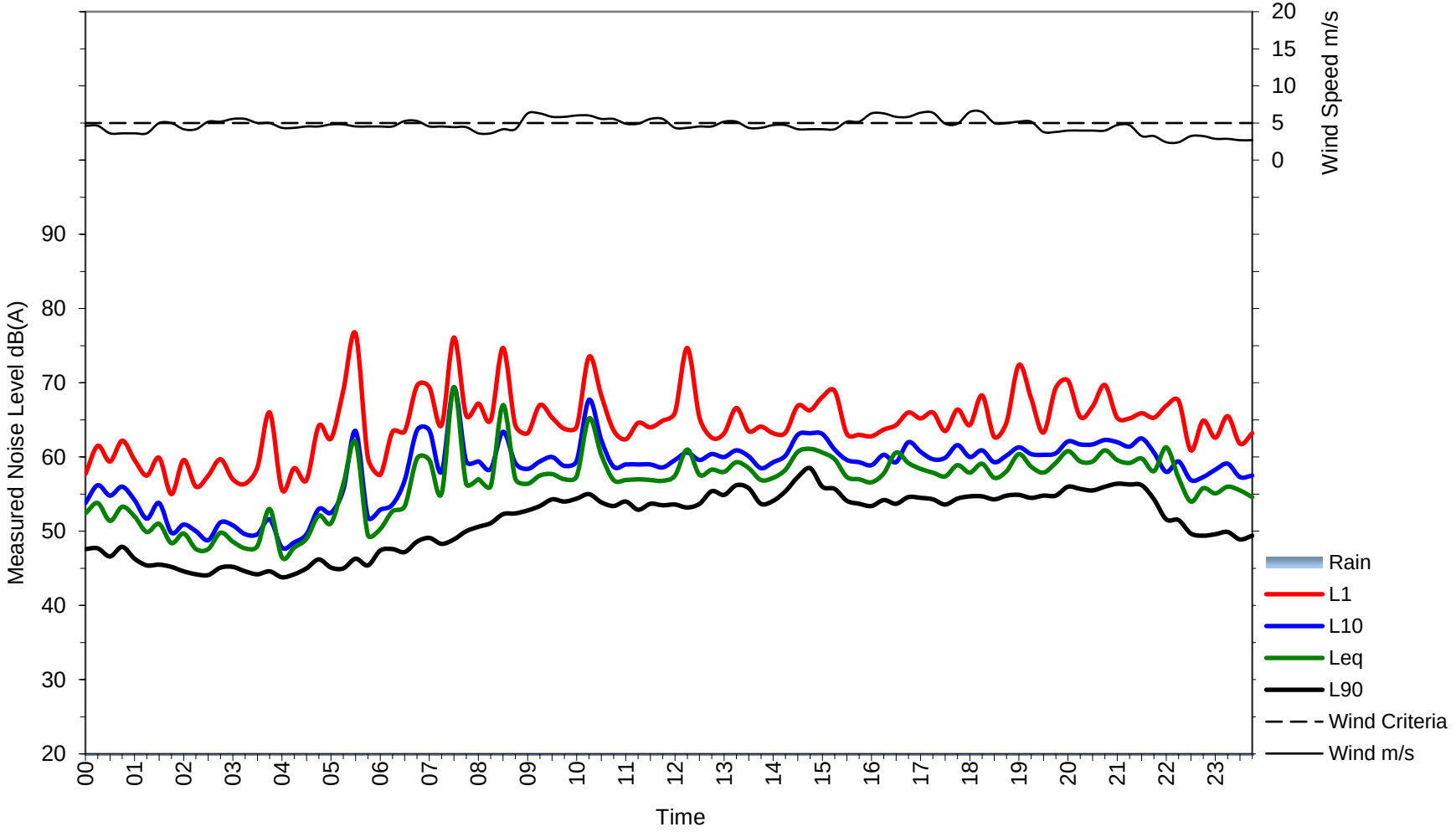
Measured Noise Level dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s


28-30 Orwell Street, Potts Point - Balcony, South
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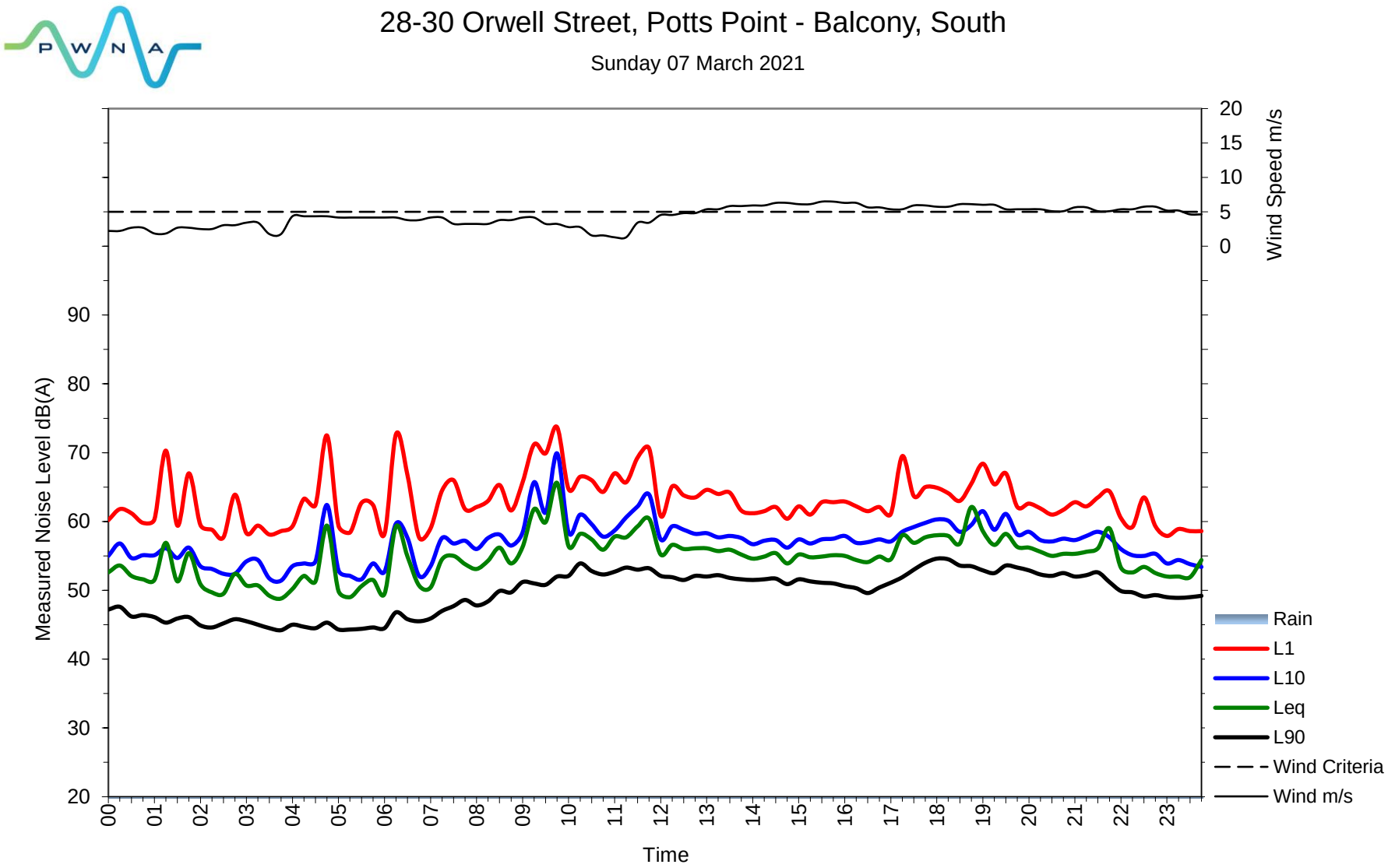
Measured Noise Level dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s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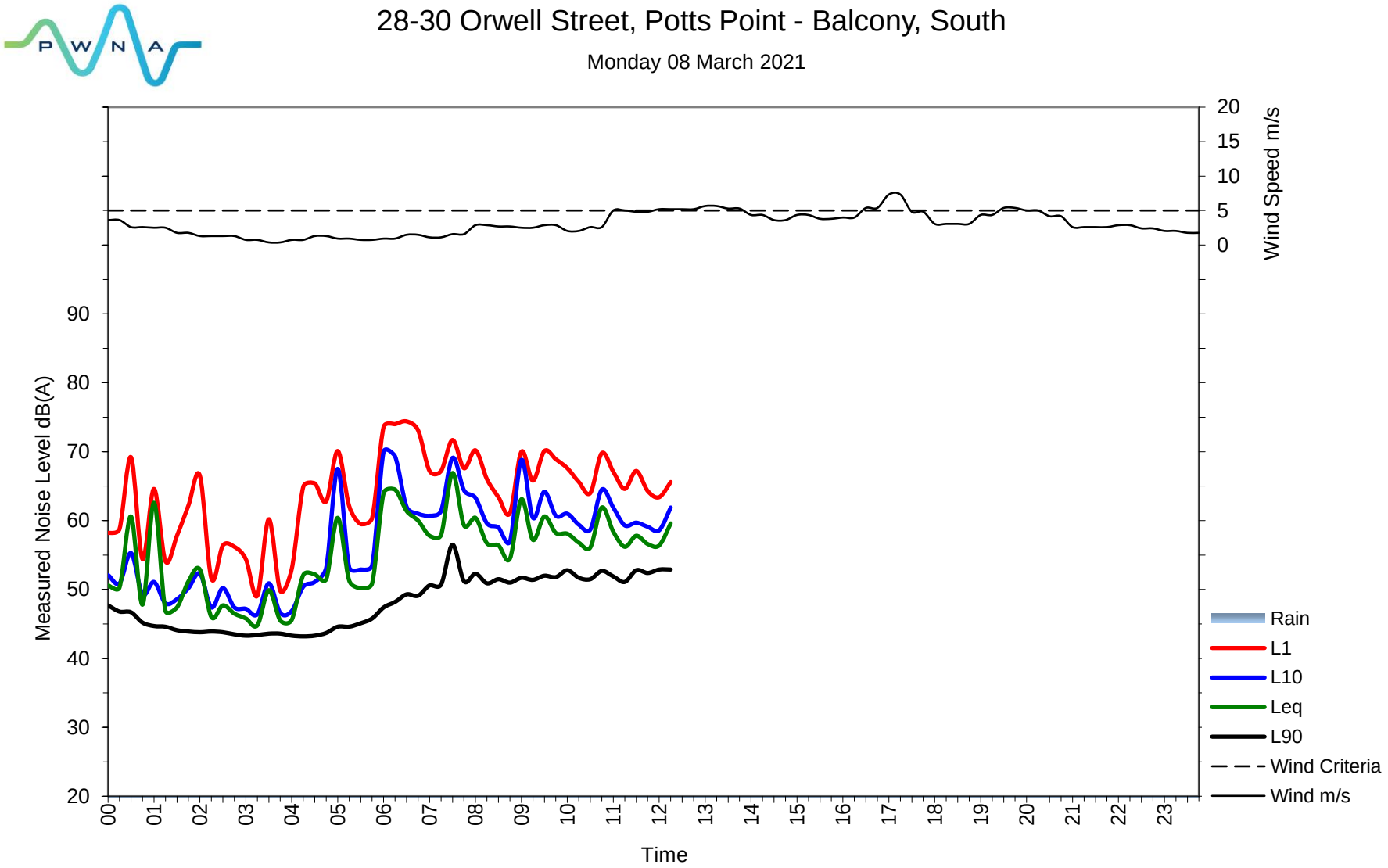
Measured Noise Level dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s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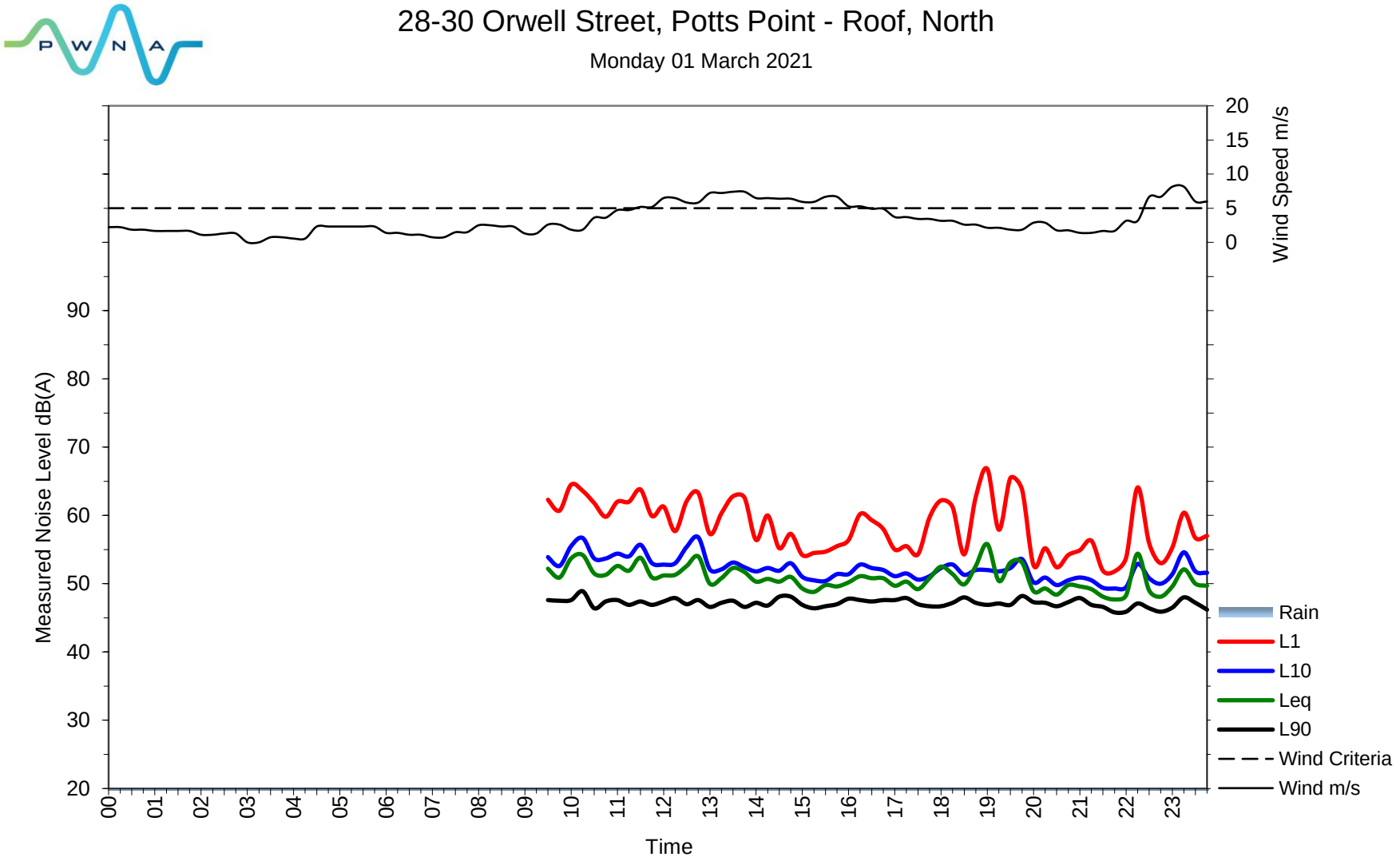
Monday 08 March 2021
Measured Noise Level dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

11 APPENDIX C: UNATTENDED NOISE LOGGING – LOCATION 2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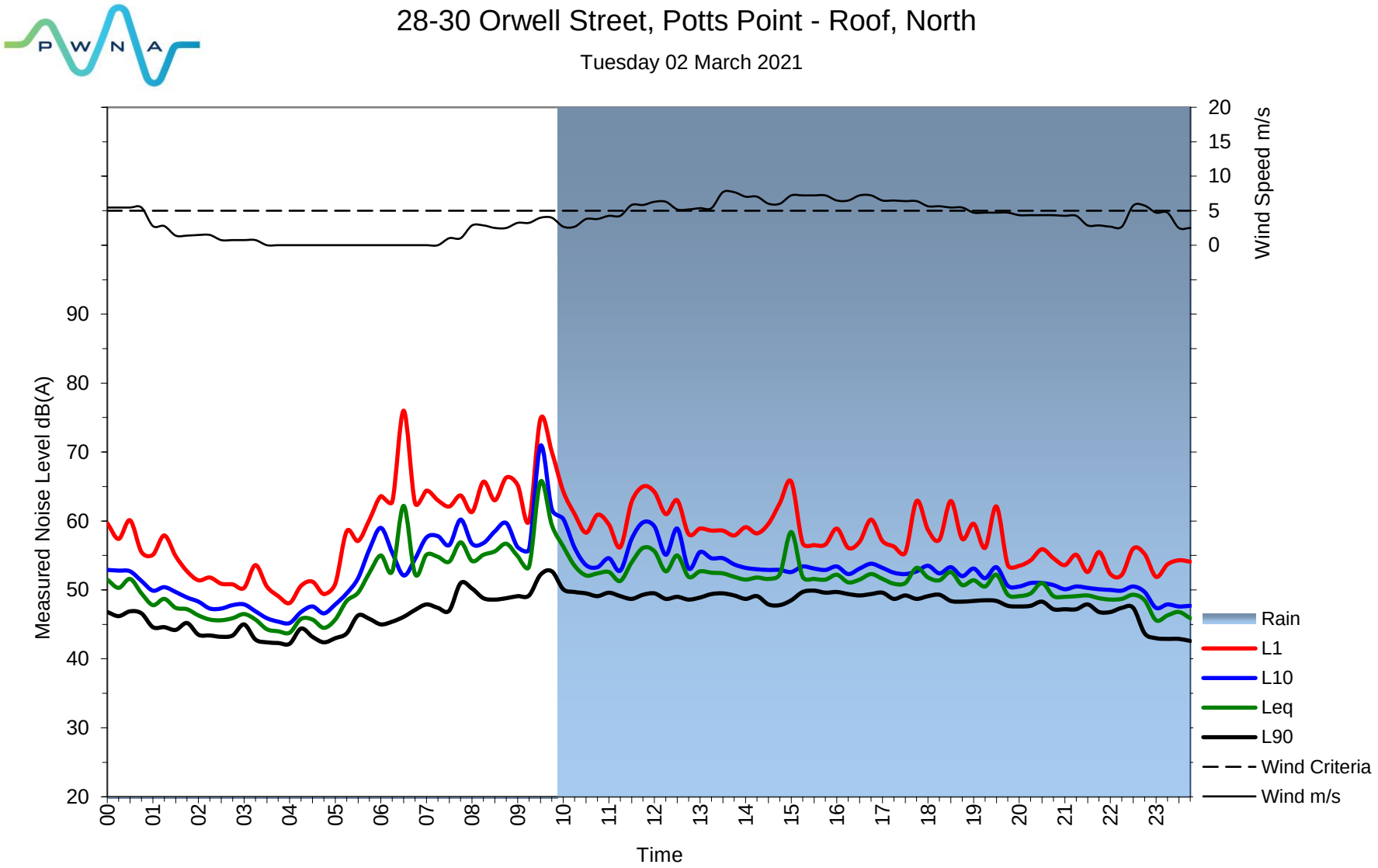
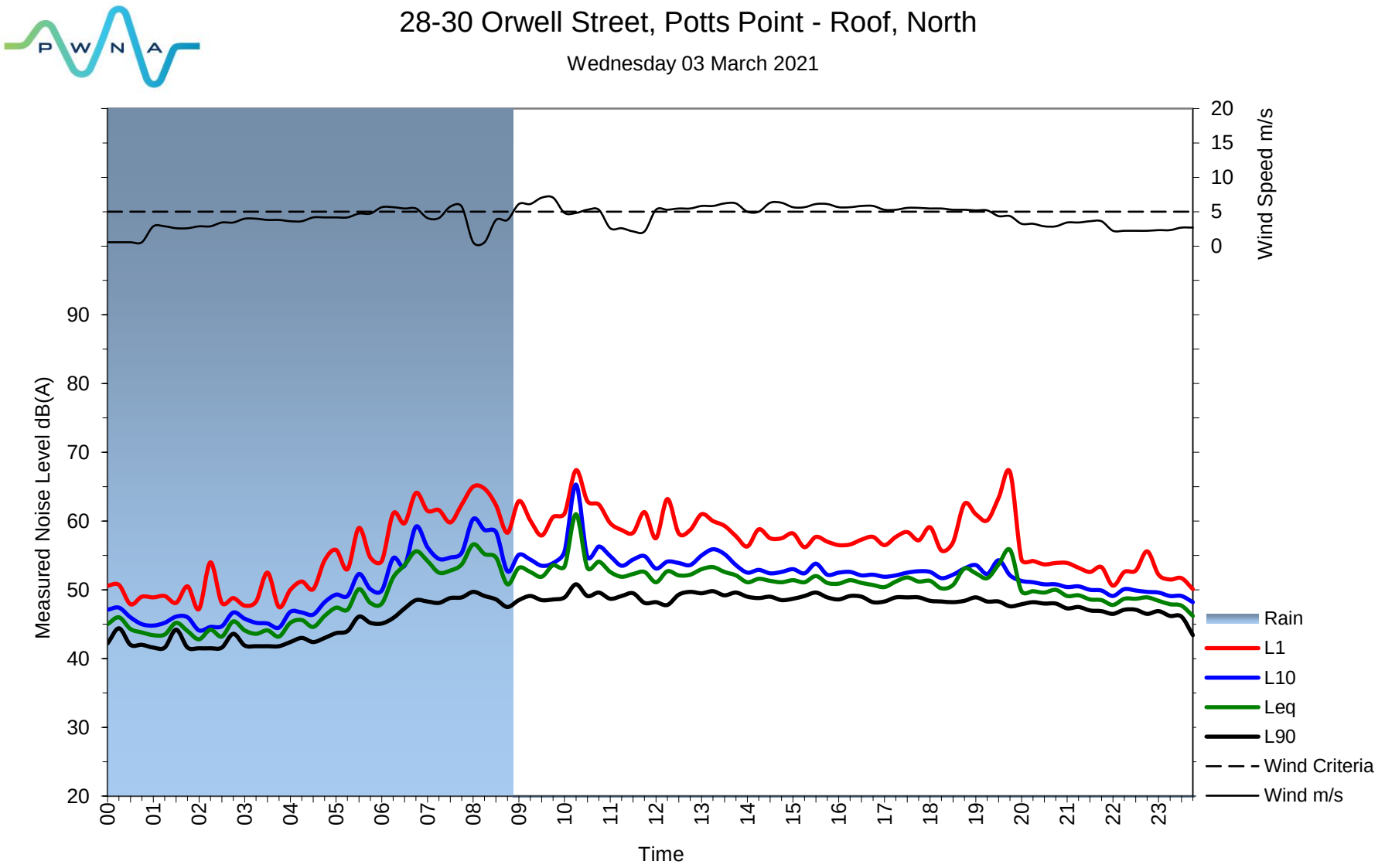
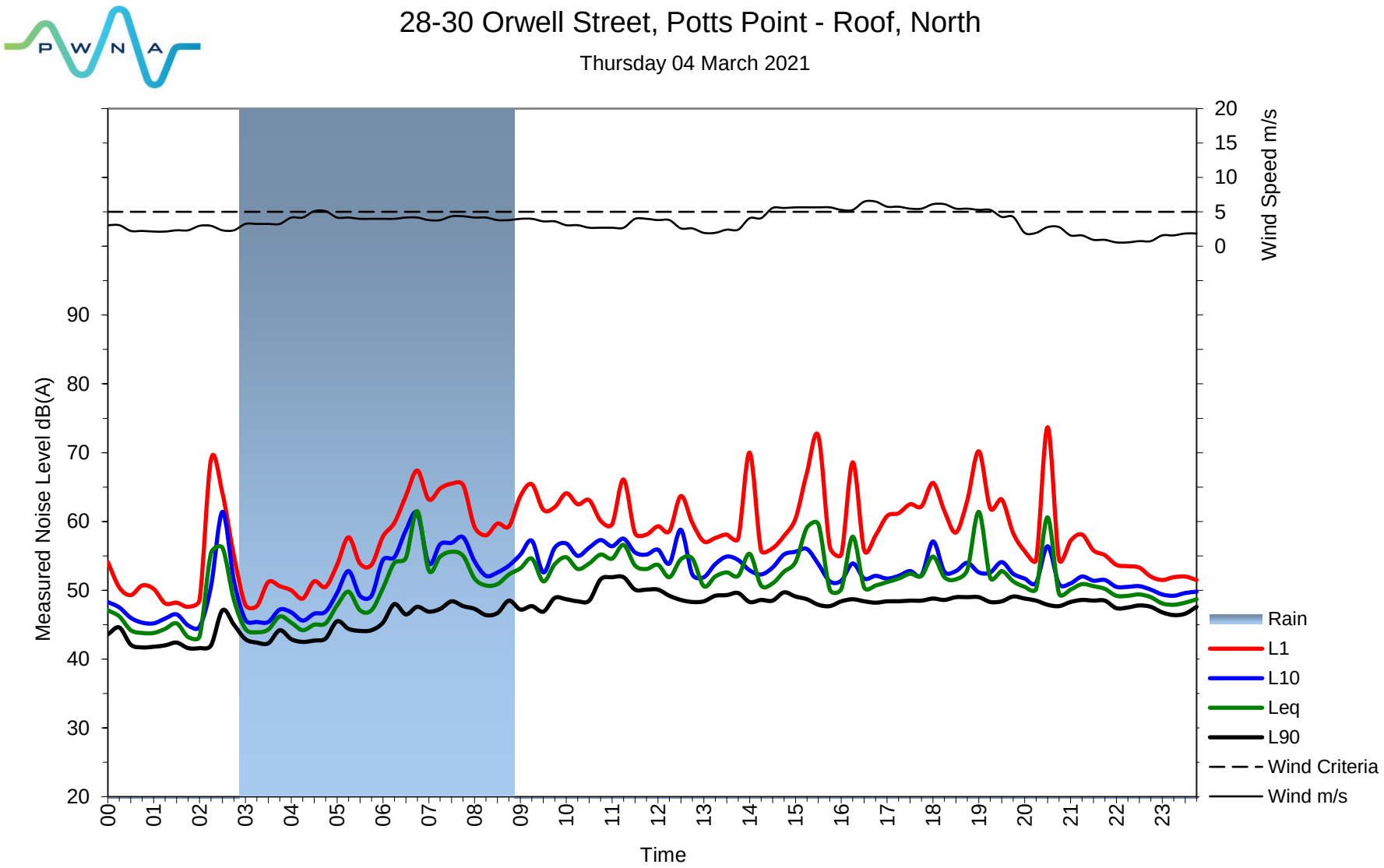
Measured Noise Level dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s


28-30 Orwell Street, Potts Point - Roof, North
Tuesday 02 March 2021
Measured Noise Level dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s


28-30 Orwell Street, Potts Point - Roof, North
Wednesday 03 March 2021
Measured Noise Level dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s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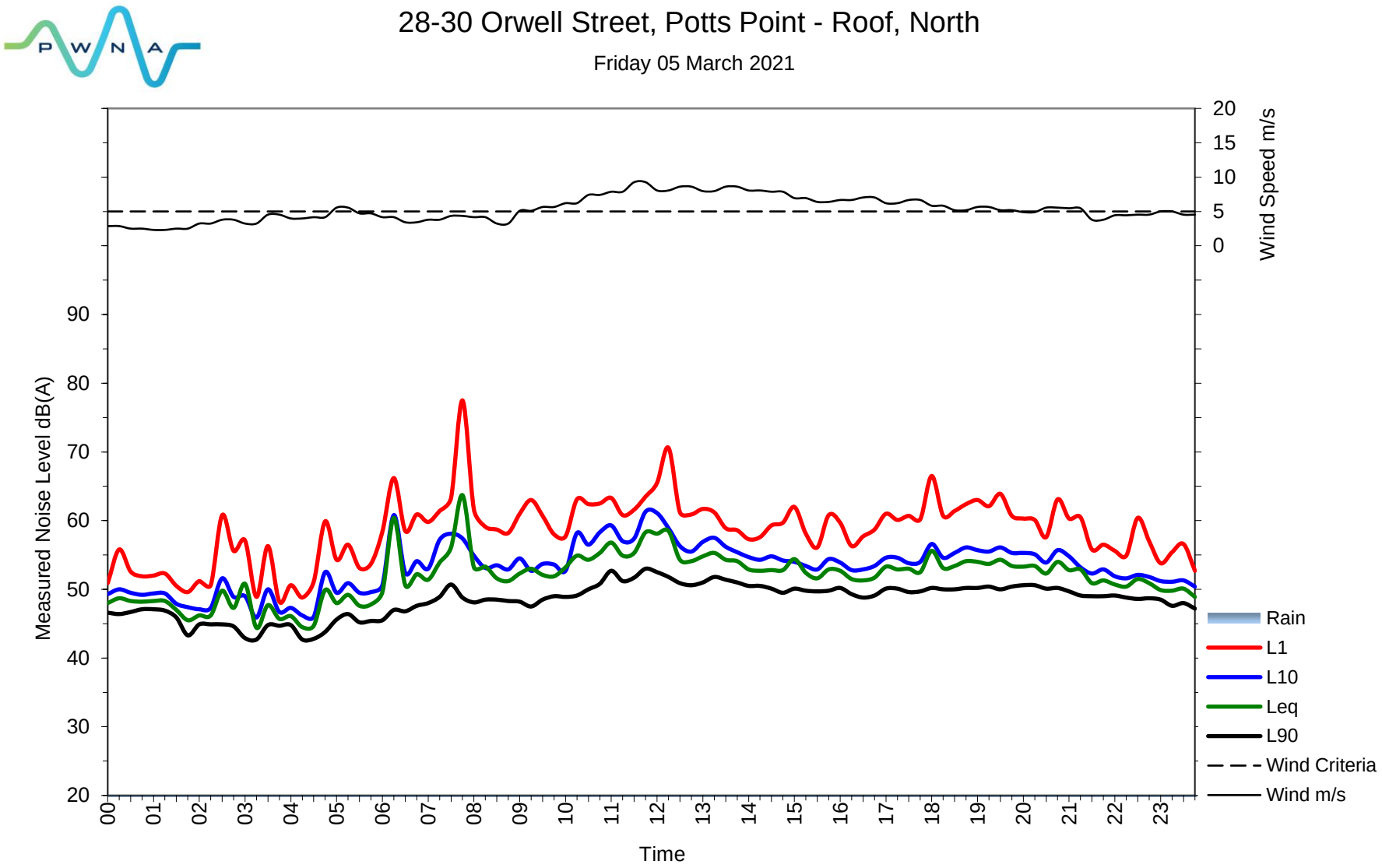
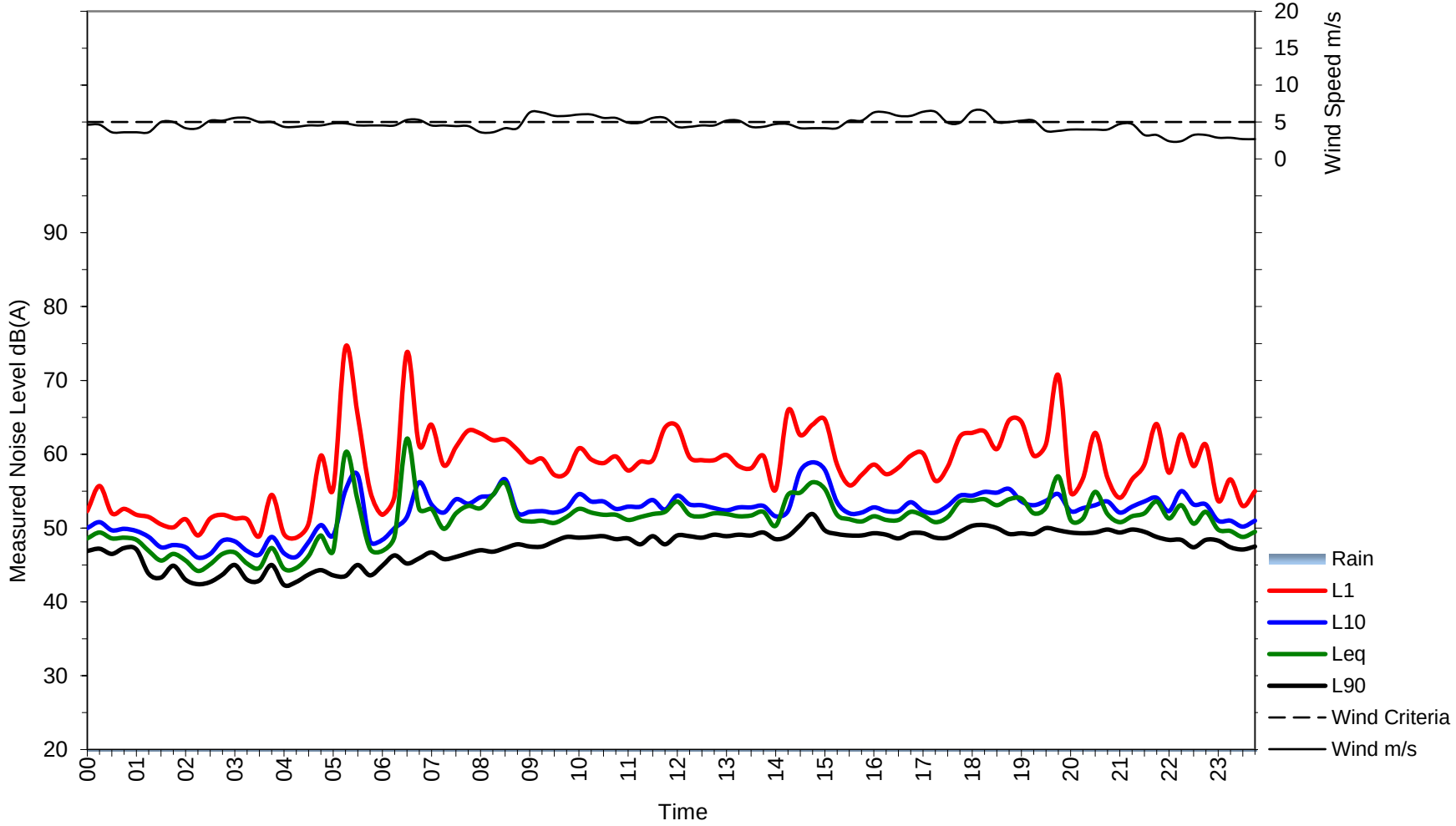
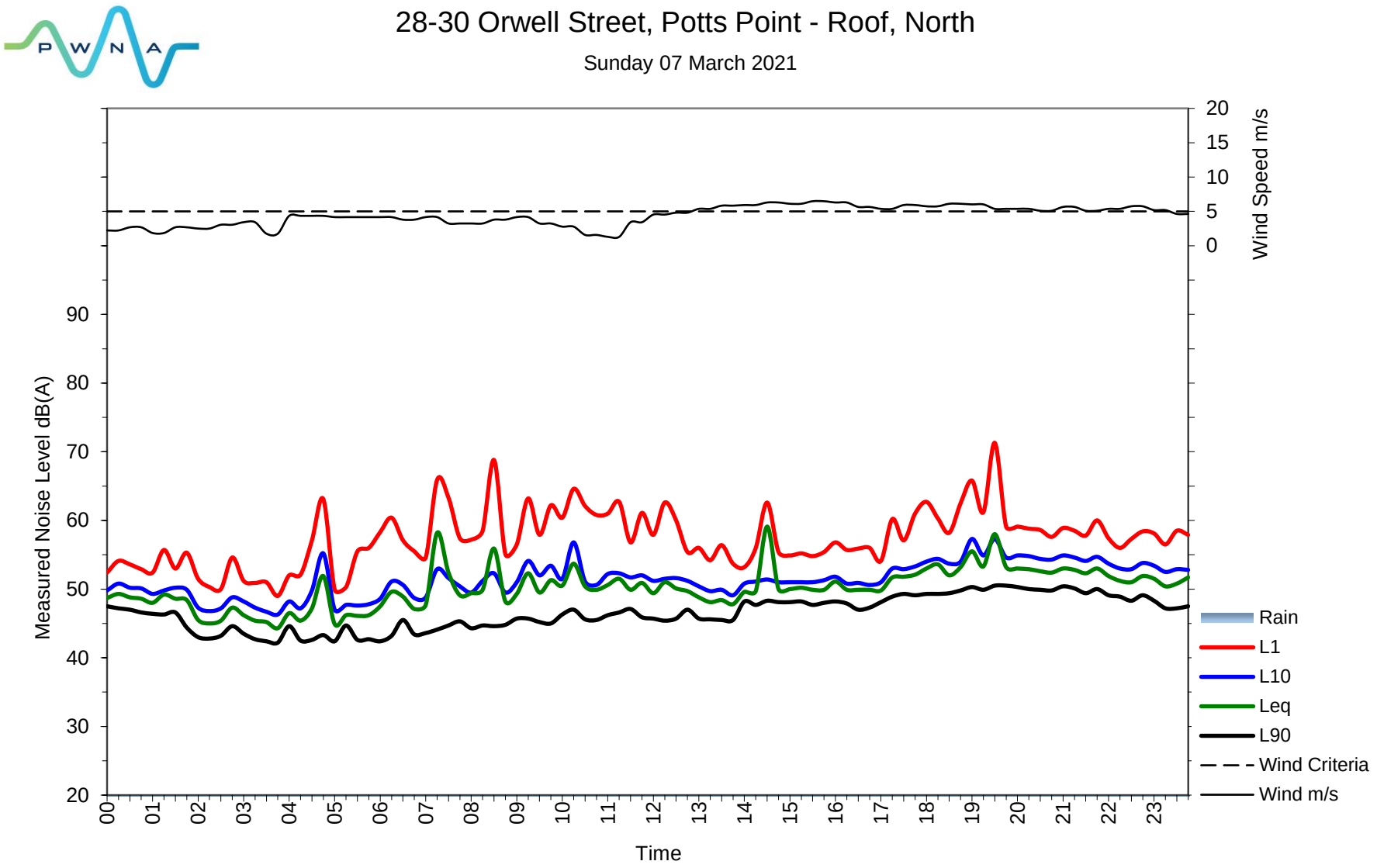
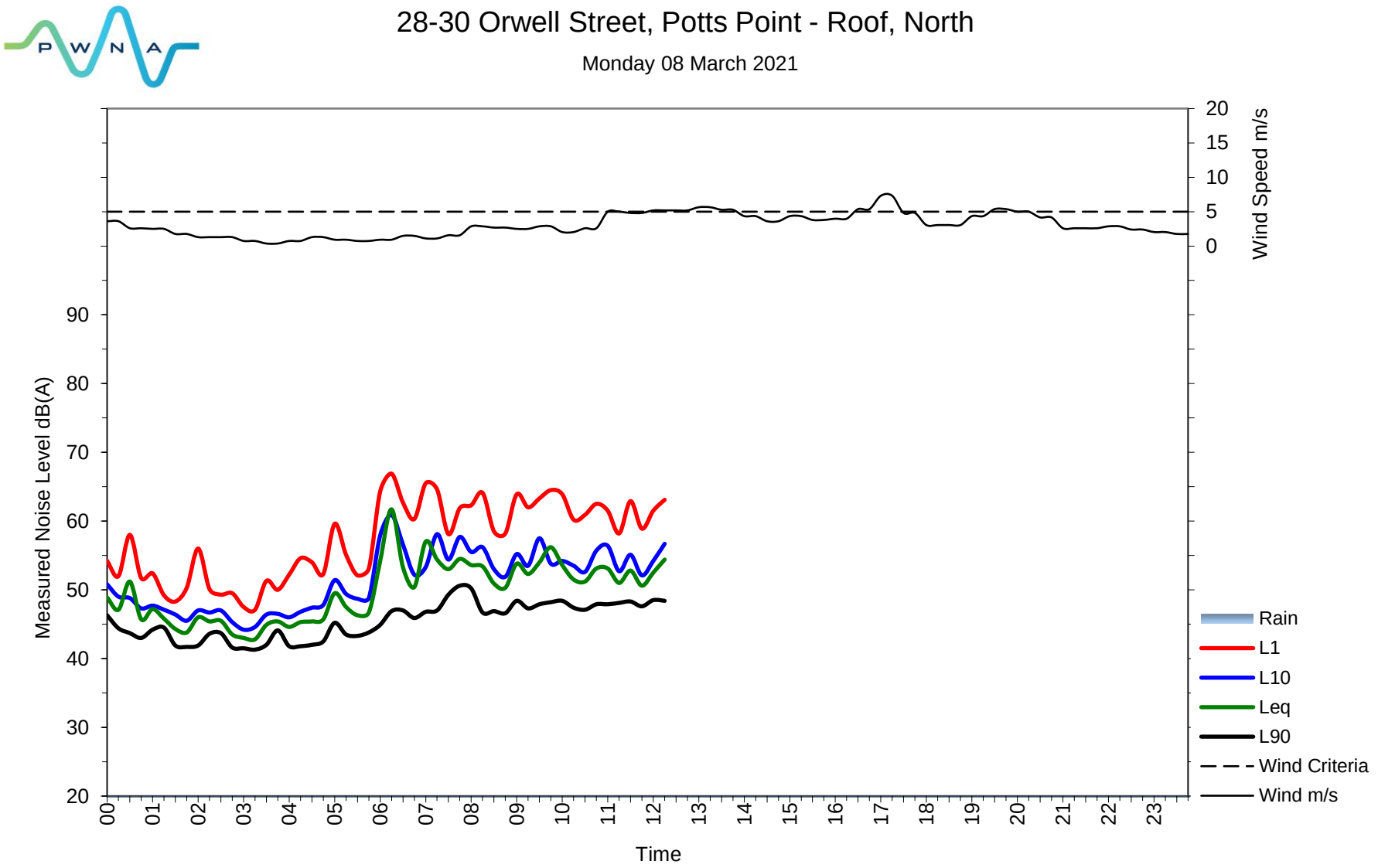
Thursday 04 March 2021
Measured Noise Level dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

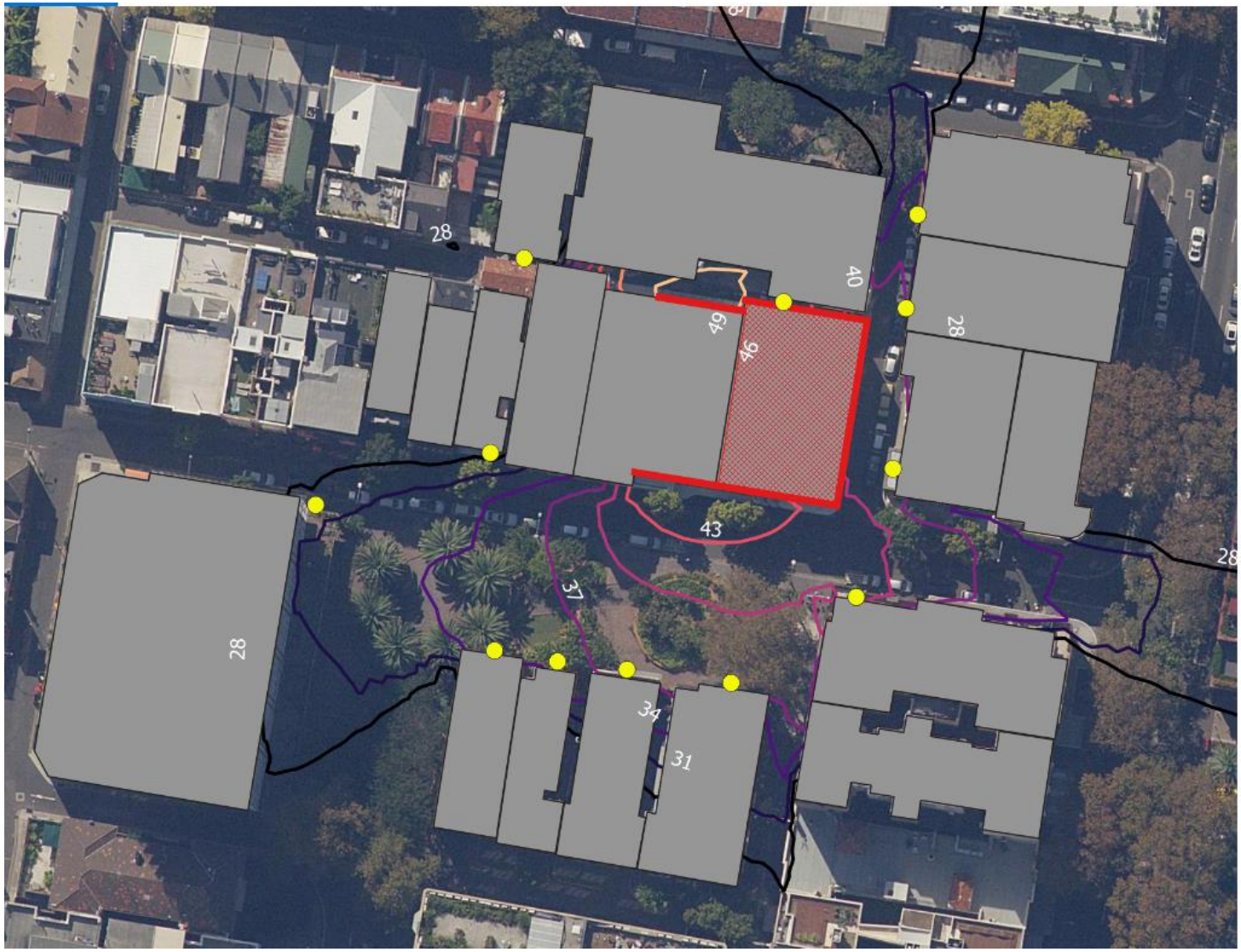

28-30 Orwell Street, Potts Point - Roof, North
Friday 05 March 2021
Measured Noise Level dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s


28-30 Orwell Street, Potts Point - Roof, North
Saturday 06 March 2021
Measured Noise Level dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

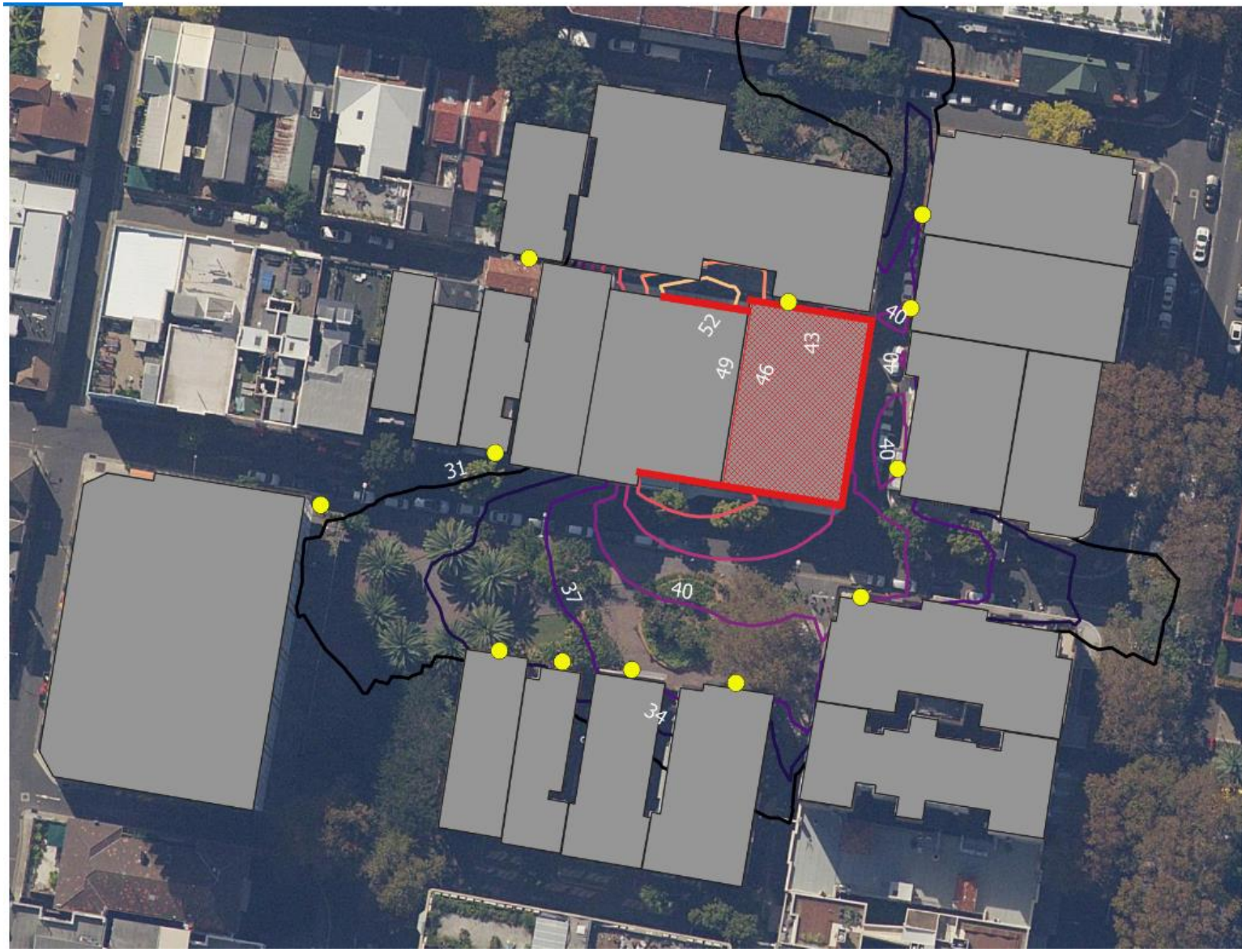

28-30 Orwell Street, Potts Point - Roof, North
Sunday 07 March 2021
Measured Noise Level dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s


28-30 Orwell Street, Potts Point - Roof, North
Monday 08 March 2021
Measured Noise Level dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

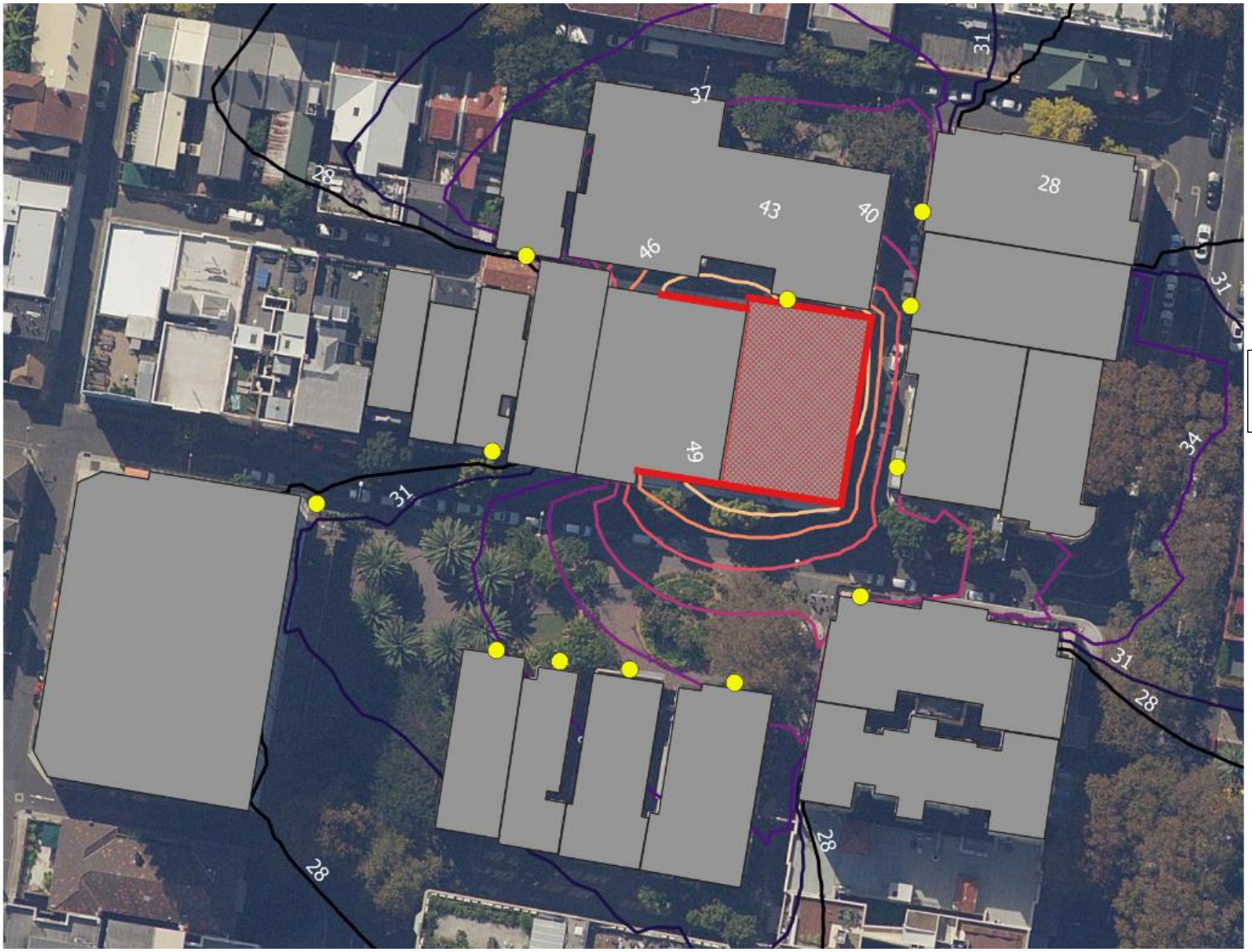
12 APPENDIX D – RESULTING OF CONTOUR NOISE MODELLING



Noise Contour Modelling at 1.5m above ground level



Noise Contour Modelling at 4.2m above ground level



Noise Contour Modelling at 15m above ground level