



9 Albert Street and 31 O'Connell
Street, North Parramatta

Site Specific Planning Proposal Noise Impact Assessment

Peterose Pty Ltd

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1 INTRODUCTION

Pulse White Noise Acoustics Pty Ltd (PWNA) has been engaged by Peterose Pty Ltd to undertake an acoustic assessment for the proposed mixed use development located at 31 O'Connell Street and 9 Albert Street, North Parramatta.

This assessment will address the following:

- Potential surrounding environmental noise intrusion impacts on the development (i.e., traffic and other noise external noise sources).
- Noise emissions on nearby receivers from operation of the base building services (i.e., electrical, hydraulic and mechanical plant).
- Noise impact from the proposed commercial tenancies located within the ground floors of the project, including the proposed childcare centre.
- Noise emission on nearby receivers from the movement of vehicles in and out of the site.

This report will discuss the relevant acoustic criteria which have been adopted as well as the outcome of the assessment.

A list of acoustic terminology used in this report is included in Appendix A of this report.

1.1 Relevant Guidelines

Noise intrusion into the development will be controlled by the requirements of the NSW Legislation *State Environmental Planning Policy (Infrastructure) 2007*, NSW Department of Planning *Development Near Rail Corridors and Busy Roads – Interim Guideline 2008 (DNRCBR)* and the objectives of Australian New Zealand Standard *AS/NZS 2107:2016 Acoustics–Recommended design sound levels and reverberation times for building interiors* has been adopted.

Furthermore, the noise emission impacts from the proposed development on the adjacent receivers are regulated by the NSW EPA *Noise Policy for Industry (NPI) 2017*, NSW EPA *Road Noise Policy (RNP) 2011* and the typically imposed NSW Liquor and Gaming acoustic requirements.

1.2 Proposed Development

The proposed development includes the following:

- Three levels of basement areas which will accommodate residential parking, retail parking, back of house areas and building plant area.
- Lower Ground floor and Upper Ground Floors which include commercial and retail tenancies as well as a childcare centre and site loading.
- Levels one through level twenty-one are residential apartments.
- Level 6 will accommodate a rooftop common area.

Architectural drawings for the proposed development, which have been used in our assessment, are include the DKO Architects drawings dated November 2023.

1.3 Site Description

The project site is located on the site at 31 O'Connell Street and 9 Albert Street, North Parramatta which includes an area which is defined as a suburban area which includes exiting though traffic on the surrounding roadways.

The site is located adjacent to O'Connell Street which carries high volume of daily traffic including heavy vehicles.

The south and west of the site includes existing hostel, aged care and residential receivers. All these receivers are assessed as residential receivers in this assessment. Additionally there are existing residential receivers which are opposite the site on Albert Street to the north and O'Connell Street to the east.

The nearest sensitive receivers to the site have been identified below.

- | | |
|--------------------|--|
| Receiver 1: | Residential receivers located to the north of the site opposite on Albert Street including 10-16 Albert Street. |
| Receiver 2: | Residential receivers located to the east of the site opposite on O'Connell Street including 56-76 O'Connell Street. |
| Receiver 3: | Southern Cross Care nursing home located to the west of the site, including a residential receiver. |
| Receiver 4: | Hope Hostel located to the west of the site, including a residential receiver. |
| Receiver 5: | Lilian Wells Nursing Home located to the south of the site and including a residential receiver. |

A map showing the site location and all measurement locations as well as nearest receivers is provided in Figure 1 below.

Figure 1 Site Map, Measurement Locations and Surrounding Receivers



2 ACOUSTIC NOISE AND VIBRATION SURVEY

This section of the report details the acoustic survey which has been undertaken at the site.

2.1 Onsite Noise Measurements

Measured noise levels from both the unattended and attended noise surveys are outlined below.

2.1.1 Unattended Noise Monitoring

An unattended noise survey was conducted between 11th and 18th March 2022 along the north-eastern corner of the existing building as shown in Figure 1 above. All data in the graphs presented in Appendix B have not been corrected (i.e., raw data presented).

Instrumentation for the survey comprised one Rion NL-42 sound level meter (serial number 00998079). Calibration of the logger was checked prior to and following the measurements. Drift in calibration did not exceed ± 0.5 dB. 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. The charts present each 24-hour period and show the LA10, LAeq and LA90 noise levels for the corresponding 15-minute periods. This data has been filtered to remove periods affected by adverse weather conditions based on weather information.

Based on the unattended noise measurements, the results of the survey have been presented below.

2.1.1.1 Results in accordance with the NSW EPA Noise Policy for Industry (NPI) 2017 (RBL's)

In order to assess the acoustical implications of the development at nearby noise sensitive receivers, the measured background noise data of the logger was processed in accordance with the NSW EPA's *Noise Policy for Industry* (NPI, 2017). The Rating Background Noise Level (RBL) is the background noise level used for assessment purposes at the nearest potentially affected receiver. It is the 90th percentile of the daily background noise levels during each assessment period, being day, evening and night. RBL LA90 (15minute) and LAeq noise levels are presented in Table 1

Data affected by adverse meteorological conditions and by spurious and uncharacteristic events have been excluded from the results, and also excluded from the data used to determine the noise emission criteria. Meteorological information has been obtained from the Sydney Olympic Park AWS (Archery Centre) weather station (ID 066212).

Table 1 Measured Ambient Noise Levels corresponding to the NPI's Assessment Time Periods

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	
	LA90 ² (dBA)	LAeq ³ (dBA)	LA90 ² (dBA)	LAeq ³ (dBA)	LA90 ² (dBA)	LAeq ³ (dBA)
Albert Street, North Parramatta – See Figure 1.	47	55	42	53	39	48
<p><i>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</i></p> <p><i>Note 2: The LA90 noise level is representative of the "average minimum background sound level" (in the absence of the source under consideration), or simply the background level.</i></p> <p><i>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.</i></p>						

Note: Rating background noise levels will be adopted for the project based on the attended noise survey.

2.1.1.2 Results in accordance with the NSW Department of Planning “Development near Rail Corridors and Busy Roads – Interim Guideline”

In determining the required façade construction for the proposed building in accordance with the internal noise level requirements of NSW Department of Planning “Development near Rail Corridors and Busy Roads – Interim Guideline” measured noise levels are shown based on the time periods defined by the SEPP below.

Data affected by adverse meteorological conditions and by spurious and uncharacteristic events have been excluded from the results, and also excluded from the data used to determine the noise emission criteria.

Table 2 Measured Ambient Noise Levels corresponding to the “Development near Rail Corridors and Busy Roads – Interim Guideline” Assessment Time Periods

Measurement Location	Daytime ¹ 7:00 am to 10:00 pm	Night-time ¹ 10:00 pm to 7:00 am
	L _{Aeq} (whole period) ² (dBA)	L _{Aeq} (whole period) ² (dBA)
O’Connell Street	67	66
<i>Note 1: For Monday to Sunday, Daytime 7:00 am – 10:00 pm; Night-time 10:00 pm – 7:00 am.</i> <i>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.</i>		

2.1.2 Attended Noise Measurements

In addition to the unattended noise survey, an attended noise survey was carried out to establish levels at key locations within and surrounding the site. These are summarised below.

The attended noise measurements were conducted using a Brüel & Kjær Type 2250 sound level meter (serial number 2709757). Calibration of the sound level meter was checked prior to and following the measurements using a Brüel & Kjær Type 4231 sound calibrator (serial number 3009148). The calibrator emitted a calibration tone of 94 dB at 1 KHz. The drift in calibration did not exceed ± 0.5 dB. All equipment carries appropriate and current NATA (or manufacturer) calibration certificates.

Attended noise measurements were undertaken on 12th March 2022 and 18th March 2022. Results of the attended noise measurements are outlined in Table 3 below.

Table 3 Measured Results of the Attended Noise Survey

Measurement Location	Date and Time	Measured Noise Level (dBA)		Comments
		LA90 (15-min) ¹	LAeq (15-min) ²	
Location 1: South-east corner of site (see Figure 1)	12 th March 2022 between 9:30am to 10:30am	68	63	Noise dominated from traffic movements on surrounding Roadways
Location 2: North wester corner of the site (see Figure 1)		70	66	Noise dominated from traffic movements on surrounding Roadways
Location 3: Corner or O’Connell and Albert Streets		70	67	
Location 1: South-east corner of site (see Figure 1)	Wednesday 21 st March 2022 between 8:30pm to 9:30pm	67	63	Noise dominated from traffic movements on surrounding Roadways
Location 2: North wester corner of the site (see Figure 1)		69	66	Noise dominated from traffic movements on surrounding Roadways
Location 3: Corner or O’Connell and Albert Streets		67	66	
<i>Note 1: The LA90 noise level is representative of the "average minimum background sound level" (in the absence of the source under consideration), or simply the background level.</i>				
<i>Note 2: 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.</i>				

2.1.3 Calculated L_{Aeq} Noise Levels at Future Facades (Noise Intrusion)

In determining the required construction for the future building envelope, contributing L_{Aeq} noise levels from surrounding roads to each future façade need to be determined. Utilising the 15-minute interval difference between the attended measurement and the unattended monitor as well as the difference between 15-minute interval and overall period result the calculated noise levels at each façade are determined below. Where applicable, angle of view and distance corrections have also been provided.

Table 4 Predicted Noise Level at Future Facades

Prediction Location	Predicted Façade Noise Level L_{Aeq} (Period) ² (dBA)	
	Day time (7:00am-10:00pm)	Night time (10:00pm-7:00am)
	L_{Aeq} (Whole Period)	L_{Aeq} (Whole Period)
Northern Façade (Albert Street)	67	65
Eastern Façade (O'Connell Street)	68	66
Southern Façade	62	61
Western Façade	64	53
<i>Note 1: For Monday to Sunday, Daytime 7:00 am – 10:00 pm; Night-time 10:00 pm – 7:00 am.</i> <i>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.</i>		

3 ACOUSTIC CRITERIA

The acoustic criteria which have been adopted for this assessment are outlined below. All criteria have been separated into the relevant assessment type, these are *Noise Intrusion Criteria* (Assessment of building envelope), *Noise Emission Criteria* (Assessment of noise to surrounding receivers) and *Acoustic Separation Criteria* (Assessment of acoustic privacy within the building).

3.1 Noise Intrusion Criteria

External noise intrusion into the building will generally be via the building envelope (External wall, glazing or external roof). The design of the building envelope should be such that the requirements listed below are achieved.

3.1.1 NSW Legislation "*State Environmental Planning Policy (SEPP) (Infrastructure) 2007*"

Clause 102 from the SEPP (Infrastructure) states the following:

102 Impact of road noise or vibration on nonroad development

1. *This clause applies to development for any of the following purposes that is on land in or adjacent to the road corridor for a freeway, a tollway or a transitway or any other road with an annual average daily traffic volume of more than 20,000 vehicles (based on the traffic volume data published on the website of TfNSW) and that the consent authority considers is likely to be adversely affected by road noise or vibration-*
2. *Before determining a development application for development to which this clause applies, the consent authority must take into consideration any guidelines that are issued by the secretary for the purposes of this clause and published in the Gazette.*
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 LAeq level are not exceeded-*
 - a. *In any bedroom in the residential accommodation – 35dba at any time between 10pm and 7am.*
 - b. *Anywhere else in the residential accommodation (other than a garage, kitchen, bathroom or hallway) – 40dba at any time.*
4. *In this clause, freeway, tollway and transitway have same meanings as they have in the Roads Act 1993.*

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

NSW Department of Planning's document DNRCBR adopts the same internal noise criteria outlined in the SEPP infrastructure above; see below (note: clause 87 (i.e., rail) is not applicable to this site).

For clauses 87 (rail) and 102 (road):

If the development is for the purpose of a building for residential use, the consent authority must be satisfied that appropriate measures will be taken to ensure that the following LAeq levels are not exceeded:

- *in any bedroom in the building: 35dB(A) at any time 10pm–7am*
- *anywhere else in the building (other than a garage, kitchen, bathroom, or hallway): 40dB(A) at any time.*

3.1.3 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 5 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 5 Recommended Design Sound Levels and Reverberation Times

Type of Occupancy/Activity	Design sound level range dBA (LAeq,t)	Project Design Noise Level ¹
Residential Buildings		
Houses and apartments in inner city areas or entertainment districts or near major roads-		
Apartment common areas (e.g foyer, lift lobby)	45 to 50	50 dB(A) LAeq (24 hours)
Living areas	35 to 45	40 dB(A) LAeq (24 hours)
Sleeping areas (night time)	35 to 40	35 dB(A) LAeq (9 hours 10pm to 7am)
Work areas	35 to 40	40 dB(A) LAeq (24 hours)
<i>Note 1: Overall recommended level for mechanical services noise and intrusive noise, combined.</i>		

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.

3.2 Noise Emission Criteria (Operational Criteria)

Noise emissions from the operation of the site impacting on the adjacent land users are outlined below. Noise emissions expected from the use of the site include, basement carpark and associated driveway, mechanical services and communal areas.

3.2.1 NSW EPA Noise Policy for Industry (NPI) 2017

In NSW, the control of noise emissions is the responsibility of Local Governments and the NSW Environment Protection Authority (NSW EPA).

The NSW EPA has recently released a document titled *Noise Policy for Industry* (NSW NPI) which provides a framework and process for determining external noise criteria for the assessment of noise emission from industrial developments. The NSW NPI criteria for industrial noise sources have two components:

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

3.2.1.1 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.

3.2.1.2 Protecting Noise Amenity (All Receivers)

To limit continuing increase 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.

Project amenity noise level for industrial developments is specified as the recommended amenity noise level (Table 2.2 of the NPI) minus 5 dB(A). To standardise the time periods for the intrusiveness and amenity noise levels, this policy assumes that the $L_{Aeq,15min}$ will be taken to be equal to the $L_{Aeq,period} + 3$ decibels (dB).

Where the resultant project amenity noise level is 10 dB or more lower than the existing traffic noise level, the project amenity noise levels can be set at 15 dB below existing traffic noise levels (i.e. $LA_{eq,period}(traffic) \text{ minus } 15 \text{ dBA}$).

3.2.1.2.1 Area Classification

The NSW NPI characterises the “Residential Suburban” noise environment as an area that has the following characteristics:

- An acoustical environment that:
 - has through-traffic with characteristically heavy and continuous flows during peak periods
 - has any combination of the above.

For residential and non-residential receivers in an residential suburban area, the recommended amenity criteria are shown in Table 6 below.

Table 6 NSW NPI – Recommended LA_{eq} Noise Levels from Noise Sources

Type of Receiver	Indicative Noise Amenity Area	Time of Day ¹	Recommended Amenity Noise Level ($LA_{eq, period}$) ² (dBA)
Residence	Suburban	Day	55
		Evening	45
		Night	40
Commercial		When in use	65
<p><i>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.</i></p> <p><i>Note 2: The LA_{eq} 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.</i></p>			

3.2.1.3 Project Trigger Noise Levels

The intrusive and amenity criteria for industrial noise emissions, derived from the measured data, are presented in Table 7. These criteria are nominated for the purpose of determining the operational noise limits for mechanical plant associated with the development which can potentially affect noise sensitive receivers.

For each assessment period, the lower (i.e., the more stringent) of the amenity or intrusive criteria are adopted, which are shown in bold text in Table 7.

Table 7 External noise level criteria in accordance with the NSW NPI

Location	Time of Day ¹	Project Amenity Noise Level, LAeq, period ² (dBA)	Measured LA90, 15 min (RBL) ³ (dBA)	Measured LAeq, period Noise Level (dBA)	Intrusive LAeq, 15 min Criterion for New Sources (dBA)	Amenity LAeq, 15 min Criterion for New Sources (dBA)
Residences	Day	50	47	55	52	53
	Evening	40	42	53	47	43
	Night	35	39	48	44	38
Commercial	When in use	60	-	-	-	63
<p><i>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 – 1:00 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 – 1:00 am.</i></p> <p><i>Note 2: Project Amenity Noise Levels corresponding to "Suburban" areas, equivalent to the Recommended Amenity Noise Levels minus 5 dBA.</i></p> <p><i>Note 3: LA90 Background Noise or Rating Background Level.</i></p> <p><i>Note 4: Project Noise Trigger Levels are shown in bold.</i></p> <p><i>Note 5: Where the resultant project amenity noise level is 10 dB or more lower than the existing traffic noise level or traffic levels are the dominant source, the project amenity noise levels can be set at 15 dB below existing industrial noise levels.</i></p> <p><i>Note 6: According to Section 2.2 of the NSW NPI, the LAeq, 15 minutes is equal to the LAeq, period + 3 dB.</i></p>						



3.3 Acoustic Separation Criteria

3.3.1 National Construction Code (NCC) / Building Code of Australia (BCA) 2019

The Building Code of Australia (BCA) is a uniform set of technical provisions for the design and construction of buildings and other structures throughout Australia. The BCA is produced and maintained by the Australian Building Codes Board (ABCB) and given legal effect through the Building Act 1975. The National Construction Code (NCC) comprises the Building Code of Australia and the Plumbing Code of Australia (the Plumbing Code of Australia is given legal effect through the Plumbing and Drainage Act 2002 (Qld)) and is published in three volumes. Volumes one and two relate to the BCA.

Part F7 of the 2022 BCA / NCC provides the Sound Transmission and Insulation requirements for Class 2 or 3 buildings. A summary of the acoustic requirements of the NCC 2022 for Class 2 or 3 buildings is given in Table 8 below.

Table 8 NCC 2019 Sound Insulation Requirements

Construction	2019 NCC	
	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.	
<i>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 20mm cavity between two separate leaves with no mechanical linkage except at the periphery.</i>		
<i>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.</i>		
<i>Note 3: Masonry walls must be laid with all joints filled solid, including those between the masonry and any adjoining construction</i>		

4 ACOUSTIC ASSESSMENT

In addressing all of the criteria which are shown above, each component of the development is assessed and presented below.

4.1 Summary of Measured/Predicted Noise Level and Building Envelope Acoustic Criteria

The results of the monitoring that provides the façade noise levels of the proposed building are presented in Table 4. The relevant noise intrusion criterion for land-based noise intrusion sources are summarised in Table 9 below together with the monitored external noise levels and the predicted noise levels on the northern, eastern, southern and western building facades.

Table 9 Summary of Façade Noise Levels and Relevant Assessment Criteria

Facade Location	Document/ Guideline/ Standard	Day Time ^{1 2} (dBA)	Night Time ^{1 2} (dBA)
		L _{Aeq} (Whole Period)	L _{Aeq} (Whole Period)
Measured/Predicted Noise Levels			
Northern Facade (Albert Street)		67	65
Eastern Facade (O’Connell Street)		68	66
Southern Façade		62	61
Western Façade		64	53
Note 1: For Monday to Sunday, Daytime 7:00 am – 10:00 pm; Night-time 10:00 pm – 7:00 am.			
Note 2: For internal noise level criteria which are presented as a range, compliance is determined based on the highest level in the range.			

4.2 Building Envelope Assessment

4.2.1 Glazing Recommendations

The recommended sound transmission loss requirement required to satisfy the specified internal noise level criteria outlined above are summarised in Table 10.

Table 10 External Façade Elements Recommendations

Location	Levels	Spaces	Minimum Glazing System Rating Requirements ¹	Indicative Construction ¹
Northern Façade (Facing Albert Street)	All levels	Bedroom	Rw (C;Ctr): 35 (0;-3)	10.38mm Laminated
		Living Area	Rw (C;Ctr): 35 (0;-3)	10.38mm Laminated
		Commercial	Rw (C;Ctr): 35 (0;-3)	10.38mm Laminated
		Wet areas	Rw (C;Ctr): 30 (0;-3)	6.38mm Laminated
Eastern Façade (Facing O'Connell Street)		Bedroom	Rw (C;Ctr): 37 (0;-3)	12.38mm Laminated
		Living Area	Rw (C;Ctr): 37 (0;-3)	12.38mm Laminated
		Commercial	Rw (C;Ctr): 35 (0;-3)	10.38mm Laminated
		Wet areas	Rw (C;Ctr): 30 (0;-3)	6.38mm Laminated
Southern Façade		Bedroom	Rw (C;Ctr): 35 (0;-3)	10.38mm Laminated
		Living Area	Rw (C;Ctr): 35 (0;-3)	10.38mm Laminated
		Commercial	Rw (C;Ctr): 30 (0;-3)	6.38mm Laminated
		Wet areas	Rw (C;Ctr): 30 (0;-3)	6.38mm Laminated
Western Façade	Bedroom	Rw (C;Ctr): 35 (0;-3)	6.38mm Laminated	
	Living Area	Rw (C;Ctr): 35 (0;-3)	6.38mm Laminated	
	Commercial	Rw (C;Ctr): 30 (0;-3)	6.38mm Laminated	
	Wet areas	Rw (C;Ctr): 30 (0;-3)	6.38mm Laminated	
Note 1: These are preliminary selections will be confirmed in the detailed design stage once the layouts and façade orientations are approved.				
Note 2: All other currently documented glazed façade area are recommended to either be				
Note 3: Recommended constructions are also provided for the control of noise emissions from communal areas to adjacent receivers.				

Please note for windows, this performance is not only subject to the glazing selection but also to the construction of the window frame and the frame seal selection. Therefore, it is recommended that the window manufacturer should confirm that the required sound insulation can be achieved. It is anticipated that the window system should comprise Q-Lon (or equivalent) or fin seals with deep C channels as part of the window track (i.e., Performance levels outlined above need to be achieved with glazed panels + frame + seals).

4.2.2 External Wall Construction

External wall constructions will be constructed either from masonry/concrete or a lightweight cladding system. For the external walls which are constructed from a masonry/concrete construction, no further acoustic upgrading is required.

However, for the external walls constructed from a lightweight cladding system, the following construction is recommended.

Table 11 Recommended Light Weight External Wall Construction

Façade	Occupancy Area ¹	External Lining	Studwork System	Internal Lining
Northern Façade (facing Albert Street)	All Areas	Architectural Cladding + 1 x 9mm Fibre Cement Sheeting	Minimum 92mm Steel Studwork + 75mm thick 14kg/m³ glasswool insulation	13mm Standard Plasterboard OR 1 x 9mm Fibre Cement Sheeting
Southern Façade				
Western Façade				
Eastern Façade (Facing O’Connell Street)		Architectural Cladding + 1 x 9mm Fibre Cement Sheeting	Minimum 92mm Steel Studwork + 75mm thick 14kg/m³ glasswool insulation	2x 13mm Standard Plasterboard OR 1 x 9mm Fibre Cement and 1x13mm pasteboard Sheeting
Note 1: Recommended constructions are identical for each level. Note 2: These are preliminary selections will be confirmed in the detailed design stage once the layouts and façade orientations are approved.				

All façade elements constructed from masonry or concrete construction will not require additional acoustic treatments to ensure internal noise levels are achieved.

Any penetrations through any external skin which are required must ensure all gaps remaining in the penetration are filled with an acoustic grade sealant which provides an equal or better performance to the system being penetrated.

4.2.3 External Roof Construction

External roofs will be constructed from a concrete construction. In the event the external roof is constructed from a concrete construction, no further acoustic upgrading is required. If penetrations through any external skin are required, all gaps remaining in the penetration are to be filled with an acoustic grade sealant which provides an equal or better performance to the system being penetrated.

4.3 Noise from Engineering Services

At this stage of the project, the exact locations of key plant items have not been selected, and/or the selection of items to be installed. As such, a detailed assessment of noise associated with engineering services cannot be undertaken.

However, to ensure that future selections of plant items meet external noise levels at neighbouring properties a proof-of-concept approach has been considered.

In our experience, for this type of development the following mechanical systems would be installed, and their associated sound power levels are outlined below.

- Basement Exhaust fans – 85dBA (Lw)
- Air conditioning condensers – 70dBA (Lw)
- Apartment toilet or kitchen ventilation fans – 55dBA (Lw)

It is anticipated that basement ventilation fans will discharge on roof level utilising an inline fan. It is recommended that internally lined ductwork or inline attenuators are used on both the intake and discharge side of the fan. On this assumption, compliance would be achieved.

Air conditioning condensers are proposed to be installed on the roof level. Based on a typical sound power level of a condenser unit, the following acoustic treatments are recommended to be installed.

- Condenser plant are to be isolated from the base building structure with a rubber pad.
- Night operation mode must be in operation between 9:00pm and 7:00am and provide a minimum of 4-5dBA.
- Screening to roof top plant and equipment may be required, details to be provided once detailed selections are undertaken as part of the design stage of the project.

For apartment ventilation fans exhausting air from kitchen rangehoods or bathrooms/ensuites/laundries these will be individually discharging on apartment balconies. To ensure compliance the following is recommended:

- Ventilation plant are to be isolated from the base building structure with a vibration isolation include rubber or neoprene pads.

4.4 Noise Impacts on Surrounding Roadways

Noise impacts from the increase in vehicle movements on surrounding roadways including O'Connell Street to the east and Albert Street to the north are to be assessed in accordance with the NSW EPA Road Noise Policy (RNP) 2011.

A peak hour increase proposed for the number vehicles associated with the development will not exceed a 2dBA increase at a residential receiver as summarised in the NSW EPA RNP to be barely perceptible to the average person and therefore considered acoustically acceptable.

4.5 Childcare Centre – Activity Noise Assessment

This section of the report details the assessment of activity noise levels generated from the proposed child care centre which is to be located on ground floor level of the proposed development, including the use of the internal and external areas for play.

The proposed childcare centre is to be located on the ground floor of the development, and includes the area as detailed in the figure below.

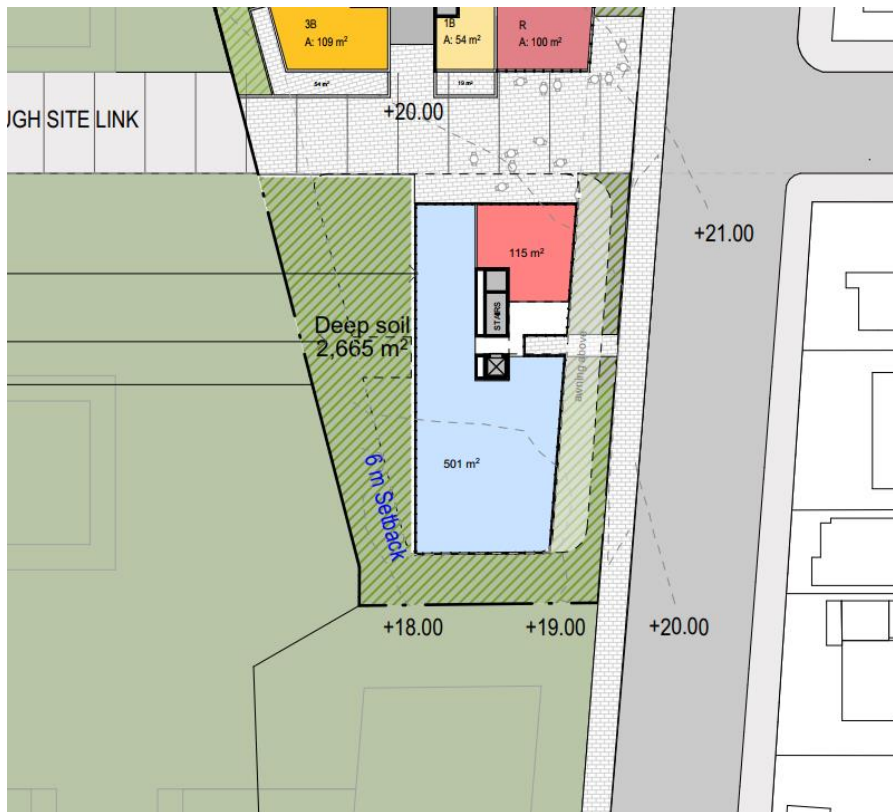


Figure 2 Location of the Proposed Childcare Centre

The proposed childcare centre is located with the outdoor play area which will be adjacent to neighbouring areas which include outdoor common areas to the east and a pedestrian link to the north.

This assessment includes the potential for noise emissions from the use of the childcare centre to the following locations:

1. Residential receivers neighbouring the site, including those to the west of the site and detail in Figure 1 of this report above.
2. Future residential receivers located within the building and located on the levels above.

The AAAC *Guideline for Child Care Centre Acoustic Assessment Version 3* includes recommendations for the assessment of noise levels from the use of play areas impacting on neighbouring residential receivers. The AAAC includes the following:

Background Greater Than 40 dB(A) – The contributed $L_{eq,15min}$ noise level emitted from an outdoor play and internal activity areas shall not exceed the background noise level by more than 5 or 10 dB at the assessment location, depending on the usage of the outdoor play area. AAAC members regard that a total time limit of approximately 2 hours outdoor play per morning and afternoon period should allow an emergence above the background of 10 dB (ie background +10 dB if outdoor play is limited to 2 hours in the morning and 2 hours in the afternoon).

Up to 4 hours (total) per day – If outdoor play is limited to no more than 2 hours in the morning and 2 hours in the afternoon, the contributed $L_{eq,15 minute}$ noise level emitted from the outdoor play shall not exceed the background noise level by more than 10 dB at the assessment location.

More than 4 hours (total) per day – If outdoor play is not limited to no more than 2 hours in the morning and 2 hours in the afternoon, the contributed $L_{eq,15 minute}$ noise level emitted from the outdoor play area shall not exceed the background noise level by more than 5 dB at the assessment location.

As the proposed childcare centre will use external areas of the centre for more than 2 hours per day the suitable noise level emission criteria is background noise + 5 dB(A). The relevant noise level criteria for the use of the childcare centre is detailed in the table below.

Table 12 Noise Emission Criteria for Activity Noise on the site

Location	Time of Day	Measured LA90, 15 min (dBA) Representative Background Noise Level	Intrusive LAeq, 15 min Criterion for New Sources (dBA)
Residential Receivers	Day time periods	47	50

This section of the report details the activity noise assessment which has been undertaken for the proposed childcare centre. The assessment has been undertaken based on the following:

1. The centre is operational to maximum capacity based on the proposed operation of the internal and external areas of the centre.
2. All areas of the centre including the internal and external areas are in use simultaneously.
3. All recommended acoustic treatments and controls detailed in this report are included in the construction and operation of the site.
4. Noise level generated are based on the source noise levels of the AAAC for external play areas and internal noise levels are based on experience of similar operational facilities operating at maximum capacity. Details of the source noise levels used in this assessment are detailed in the following table.

Table 13 Activity Source Noise Levels

Location	Play Type	Age Group	Source Noise Level
Internal play areas	Normal levels	maximum All Ages	Up to 70 dB(A) Sound Pressure Level
External Play Areas	Active Play ¹ For groups of 10 children	0-2	78 dB(A) Sound Power Level
		2-3	85 dB(A) Sound Power Level
		3-6	87 dB(A) Sound Power Level
	Passive Play ² For groups of 10 children	0-2	77 dB(A) Sound Power Level
		2-3	83 dB(A) Sound Power Level
		3-6	84 dB(A) Sound Power Level

Notes: 1 – Active play include areas where children can actively play and generate noise levels such as running, playing with movable items (scooters and the like). Active play noise levels are based on the medium noise level presented in the AAAC guideline.

2 – Passive play includes areas where play will include less active play such as a sand pit, use of tables and the like where play includes activities do not include moving around and hence a lower noise level results. Passive play noise levels are based on the lower range detailed within the AAAC guideline.

The AAAC Guideline for Child Care Centre Acoustic Assessment Version 3 includes the effective sound power levels of children which have been used in this report (as detailed above), including the following:

Table 1 provides recommended sound power levels for lots of 10 children, within the different age groupings, along with a recommended source height.

Table 1 – Effective Sound Power Levels ($L_{Aeq, 15min}$) for Groups of 10 Children Playing

Number and Age of Children	Sound Power Levels [dB] at Octave Band Centre Frequencies [Hz]								
	dB(A)	63	125	250	500	1k	2k	4k	8k
10 Children - 0 to 2 years	78	54	60	66	72	74	71	67	64
10 Children - 2 to 3 years	85	61	67	73	79	81	78	74	70
10 Children - 3 to 5 years	87	64	70	75	81	83	80	76	72

Notes:

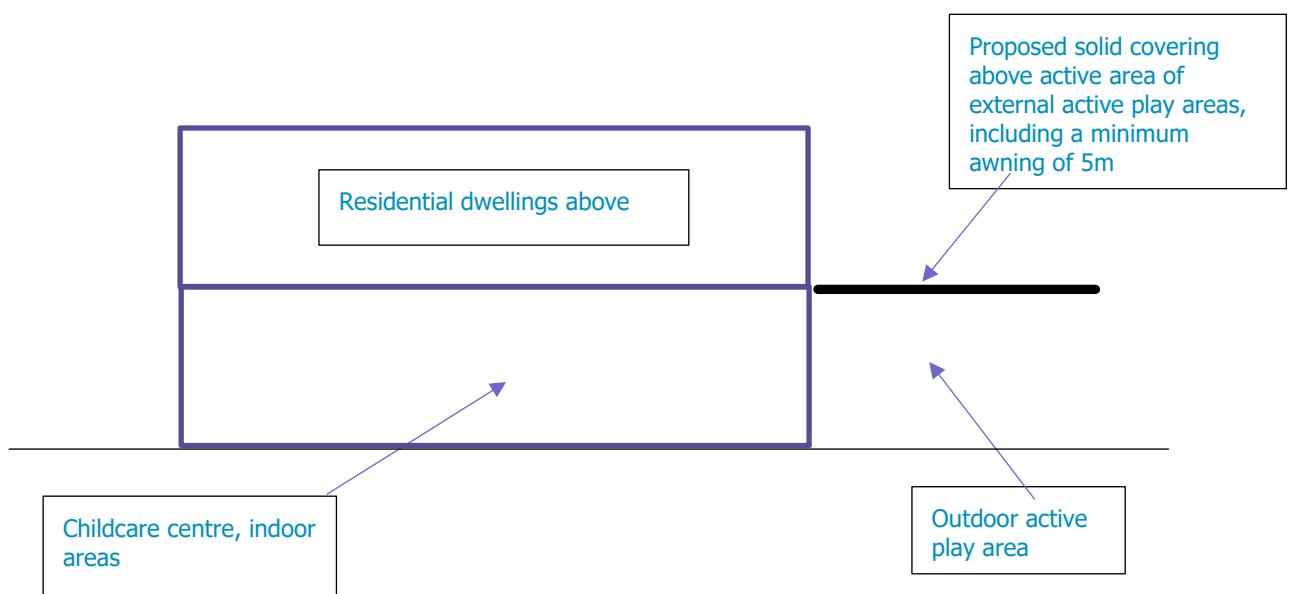
- 1 If applicable, an adjustment to the above sound power levels of -6 dB could be applied in each age group for children involved in passive play.
- 2 For simplicity, based upon a review of World Health Organization (WHO) data, a single recommended source height of 1metre is suggested as the source heights.

4.5.1.1 Recommended Acoustic Treatments and Controls

This section of the report details the required acoustic treatments and controls required for the proposed childcare centre to ensure noise emissions comply with the noise level criteria detailed in this report at the neighbouring property boundaries and the future residential receivers located on the levels above within the proposed development.

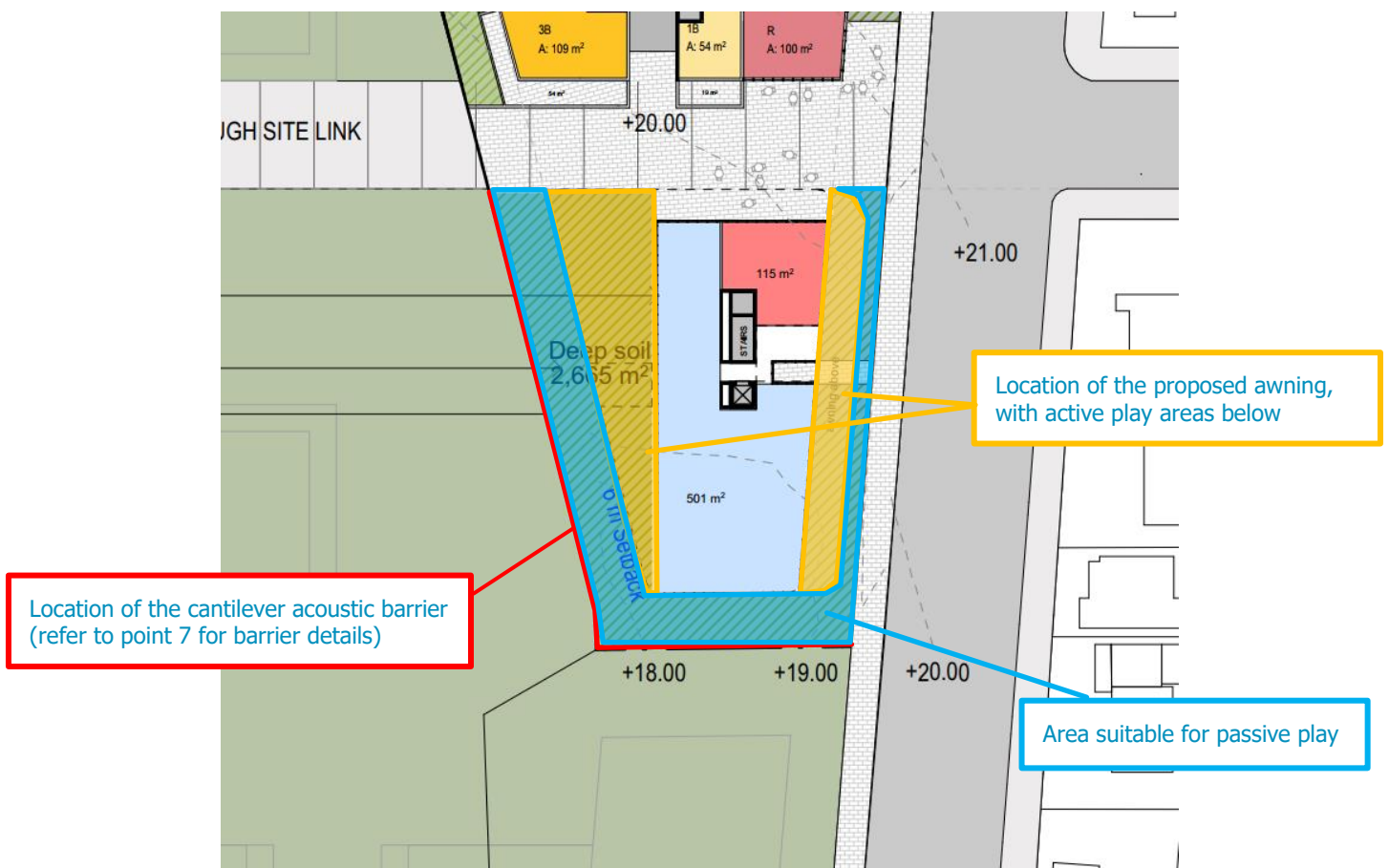
The required acoustic treatments and controls include the following:

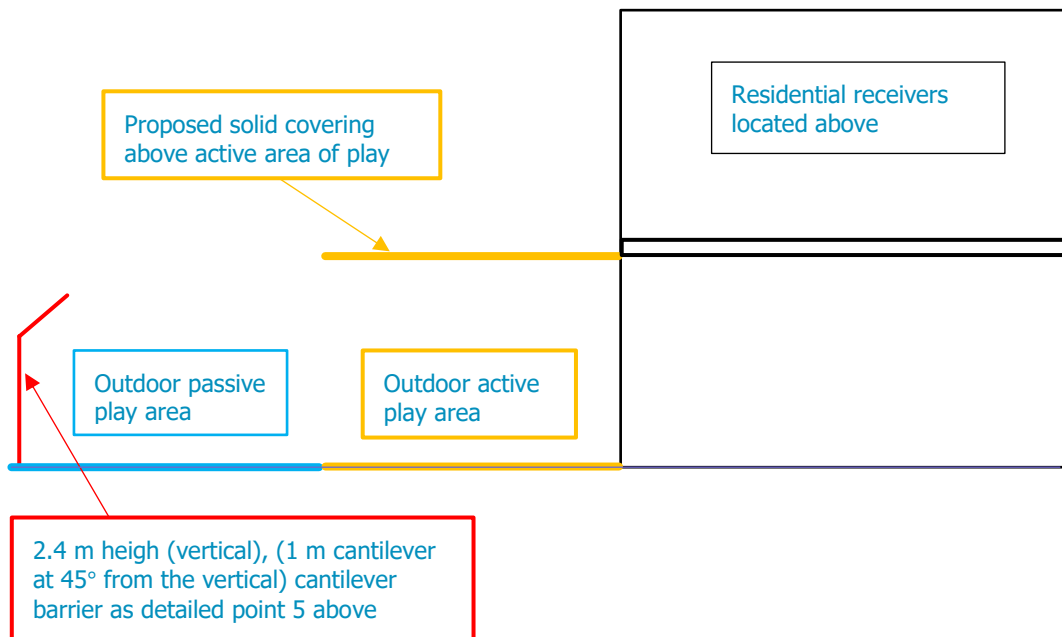
1. All plant and equipment to be used on the site is required to be assessed as part of the CC/design stage of the project. Suitable acoustic treatments are to be specified to ensure noise emission criteria detailed in this report are achieved. Treatments may include lined ductwork, acoustic silencers, time control switches, variable speed drives, acoustic screens or the like.
2. The management of active and passive play is to be undertaken to include the following:
 - a. Active play to be located to the eastern portion of the external play area and below the required acoustic cover detailed in the point below.
 - b. Passive play areas including areas located to the west of the external play area and not located under the building overhang.
3. A solid acoustic cover is required to be installed to the areas where active play is proposed to the courtyard play space. The cover is required to be constructed from a solid material such as 9mm FC sheet, metal deck, 1.38mm laminated glass or other solid building construction with a minimum R_w of 30. It is recommended that the external cover should include a mix of glass / transparent and solid construction including approximately 50% of each.
4. The external cover should include a mix of glass and solid construction including approximately 50% of each.
5. An acoustically absorptive material is to be installed to the underside of the solid external cover (detailed in the points above). The material is to include a minimum acoustic performance of NRC no less than 0.60 and can include surface finishes or spray on materials.
6. A summary of the recommended treatment above is included in the figures below.



7. A cantilever acoustic barrier is required along the perimeter of the deep soil passive play area (see Figure 3 below). The cantilever barrier should have a vertical height of at least 2.4 m, with an additional cantilever extension of ~ 1 m, at an angle of $\sim 45^\circ$ to the vertical. The cantilever acoustic barrier should be constructed from a solid material and can include masonry, 9 mm FC sheet, Hebel, sheet metal, 10.38 mm glass or 10 mm Perspex, or the like.
8. A summary of the recommended treatment above is included in the figures below.

Figure 3 Active / Passive Play Areas





9. All glass openings within the façade of the internal elements of the childcare centre are to include a minimum 10.38 mm laminated glass with a minimum acoustic performance of R_w 35.
10. All openable glazing is to be closed during periods of play or high noise generating activities.
11. All external play areas are to include supervision when used by children by a childcare operator.
12. No outdoor play to occur on the site after 7pm.
13. Details of a suitable site contact should be included a street frontage of the centre where complaints regarding the operation of the centre can be directed.

Providing the recommended treatments included above are the design and operation of the proposed childcare centre the resulting noise emissions will comply with the relevant noise emissions criteria and result in a suitable acoustic amenity to the exiting residential receivers as well as future residential receivers surrounding the centre.

5 CONCLUSION

Pulse White Noise Acoustics Pty Ltd (PWNA) has been engaged by Peterose Pty Ltd to undertake an acoustic assessment for the planning proposal for the residential development located at 31 O'Connell Street and 9 Albert Street, North Parramatta.

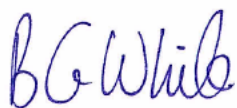
As part of this assessment, we have undertaken a review of the building envelope and noise emissions from the use of the site. From this assessment we note the following:

- Minimum acoustic performances and associated indicative constructions for the building envelope have been provided in section 4.2 of this report. The recommended treatments have been provided to ensure compliance with the objectives presented in 3.1.
- To control noise impacts at external receivers, recommended indicative treatments for major engineering services have been provided in section 4.3. From our review we have formulated the following opinion:
 - At this stage of the project the exact selections/locations of plant items are not known. A preliminary assessment, however, has been carried out using our experience with similar types of developments and the typical plant items installed in each type of plant room.
 - From this review we recommend the selection of high-performance acoustic treatment to ensure that the operation of the plant items comply with the project criteria. Therefore, it is recommended that prior to the issue of a Construction Certificate (CC) a detailed acoustic assessment is undertaken to ensure all cumulative noise from engineering services (including the roof plant room) comply with the requirements as listed in section 3.2.
- An assessment of noise resulting from the operation of the proposed childcare centre has been undertaken and details include to mitigate noise impacts from the centre to the existing residential receivers as well as the future dwellings within the project.
- An assessment of the impacts associated with number of vehicles on surrounding public roads around the site and the impact is less than 2dBA and therefore is compliant with the NSW EPA RNP.

Based on the acoustic assessment of the proposed development to the proposed residential provided will be acoustically acceptable.

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

Regards



Ben White
Director
PULSE WHITE NOISE ACOUSTICS PTY LTD



APPENDIX A: ACOUSTIC GLOSSARY

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

Ambient Sound	The totally encompassing sound in a given situation at a given time, usually composed of sound from all sources near and far.																				
Audible Range	The limits of frequency which are audible or heard as sound. The normal ear in young adults detects sound having frequencies in the region 20 Hz to 20 kHz, although it is possible for some people to detect frequencies outside these limits.																				
Character, acoustic	The total of the qualities making up the individuality of the noise. The pitch or shape of a sound's frequency content (spectrum) dictate a sound's character.																				
Decibel [dB]	The level of noise is measured objectively using a Sound Level Meter. The following are examples of the decibel readings of every day sounds; <table> <tr><td>0dB</td><td>the faintest sound we can hear</td></tr> <tr><td>30dB</td><td>a quiet library or in a quiet location in the country</td></tr> <tr><td>45dB</td><td>typical office space. Ambience in the city at night</td></tr> <tr><td>60dB</td><td>Martin Place at lunch time</td></tr> <tr><td>70dB</td><td>the sound of a car passing on the street</td></tr> <tr><td>80dB</td><td>loud music played at home</td></tr> <tr><td>90dB</td><td>the sound of a truck passing on the street</td></tr> <tr><td>100dB</td><td>the sound of a rock band</td></tr> <tr><td>115dB</td><td>limit of sound permitted in industry</td></tr> <tr><td>120dB</td><td>deafening</td></tr> </table>	0dB	the faintest sound we can hear	30dB	a quiet library or in a quiet location in the country	45dB	typical office space. Ambience in the city at night	60dB	Martin Place at lunch time	70dB	the sound of a car passing on the street	80dB	loud music played at home	90dB	the sound of a truck passing on the street	100dB	the sound of a rock band	115dB	limit of sound permitted in industry	120dB	deafening
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100dB	the sound of a rock band																				
115dB	limit of sound permitted in industry																				
120dB	deafening																				
dB(A)	<i>A-weighted decibels</i> The ear is not as effective in hearing low frequency sounds as it is hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter. The sound pressure level in dB(A) gives a close indication of the subjective loudness of the noise.																				
Frequency	Frequency is synonymous to <i>pitch</i> . Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.																				
Loudness	A rise of 10 dB in sound level corresponds approximately to a doubling of subjective loudness. That is, a sound of 85 dB is twice as loud as a sound of 75 dB which is twice as loud as a sound of 65 dB and so on																				
LMax	The maximum sound pressure level measured over a given period.																				
LMin	The minimum sound pressure level measured over a given period.																				
L1	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.																				
L10	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.																				
L90	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L ₉₀ noise level expressed in units of dB(A).																				
Leq	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.																				
dB (A)	'A' Weighted overall sound pressure level																				
Sound Pressure Level, LP dB	A measurement obtained directly 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 rms sound pressure to the reference sound pressure of 20 micro Pascals.																				
Sound Power Level, Lw dB	Sound power level is a measure of the sound energy emitted by a source, does not change with distance, and cannot be directly measured. Sound power level of a machine may vary depending on the actual operating load and is calculated from sound pressure level measurements with appropriate corrections for distance and/or environmental conditions. Sound power levels is equal to 10 times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power of 1 picoWatt																				

APPENDIX B: UNATTENDED NOISE MONITORING RESULTS

Weather Station: Sydney Olympic Park AWS (Archery Centre)

Weather Station ID: 066212

Co-ordinates: Lat: 33.8338°S, Lon: 151.0718°E, Height: 4m AMSL

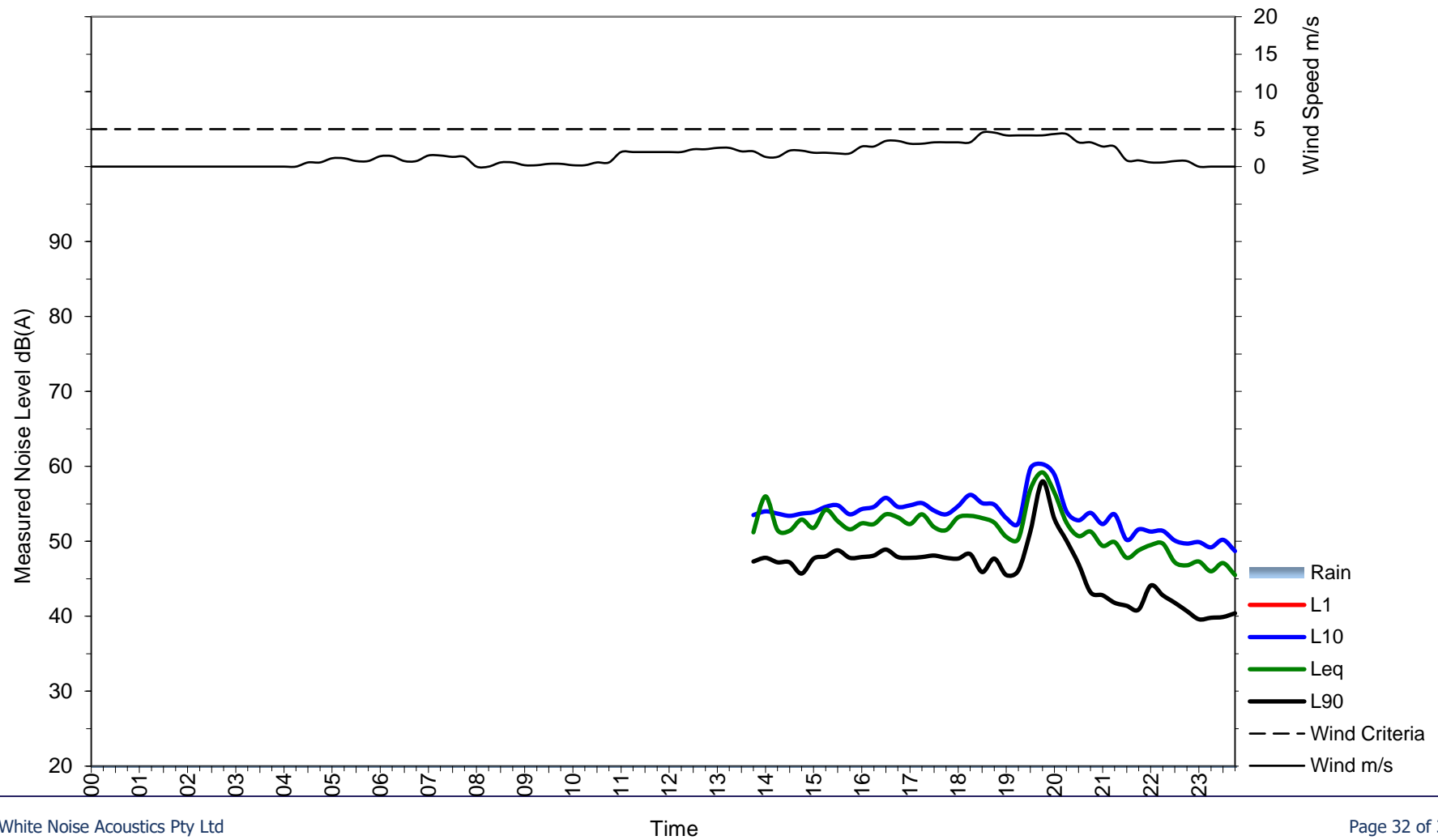
Figure B-1 Photo of Unattended Noise Monitor Location





31O'Connell and 9 Albert Street, North Parramatta

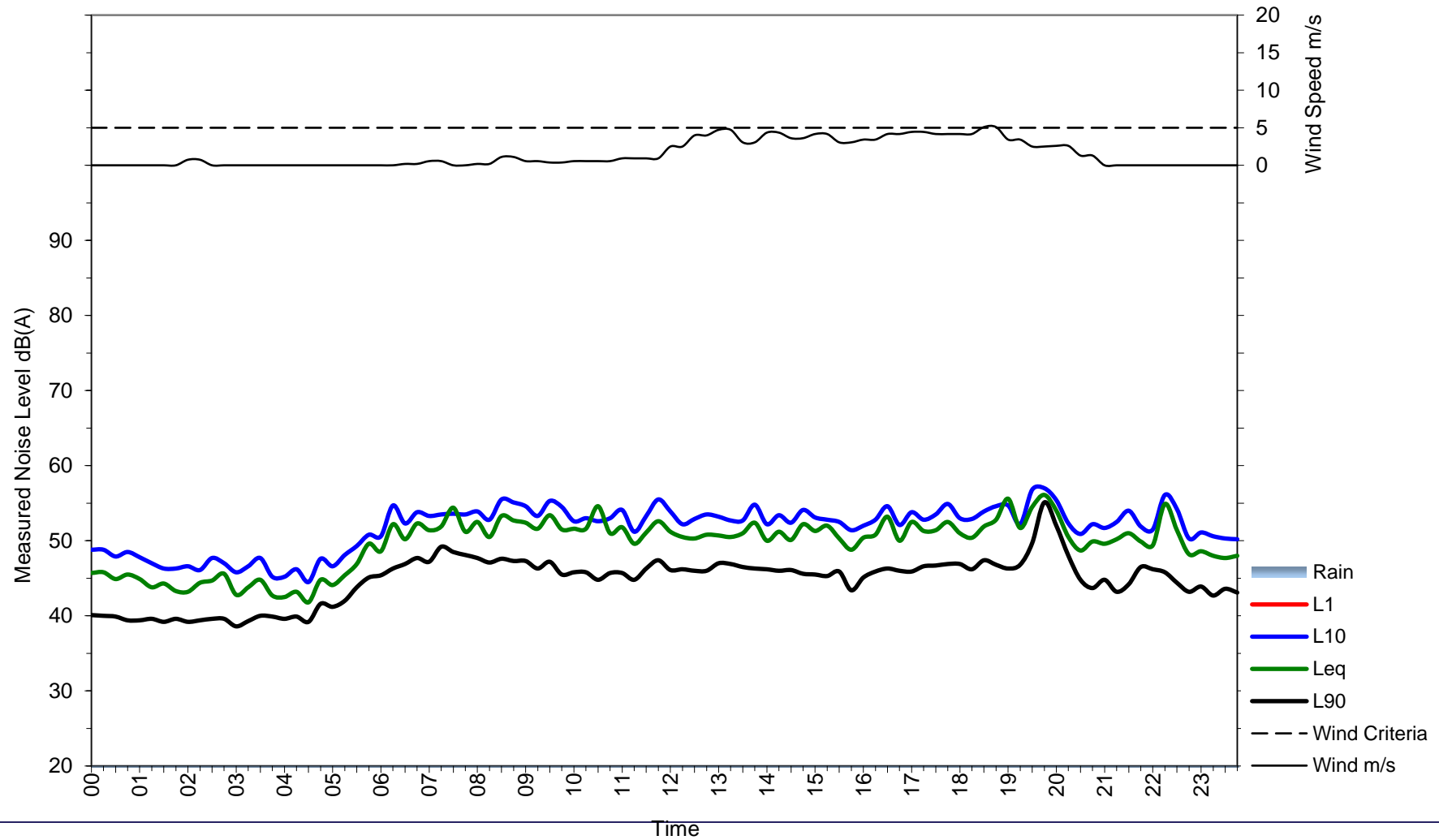
Friday 11 March 2022





31O'Connell and 9 Albert Street, North Parramatta

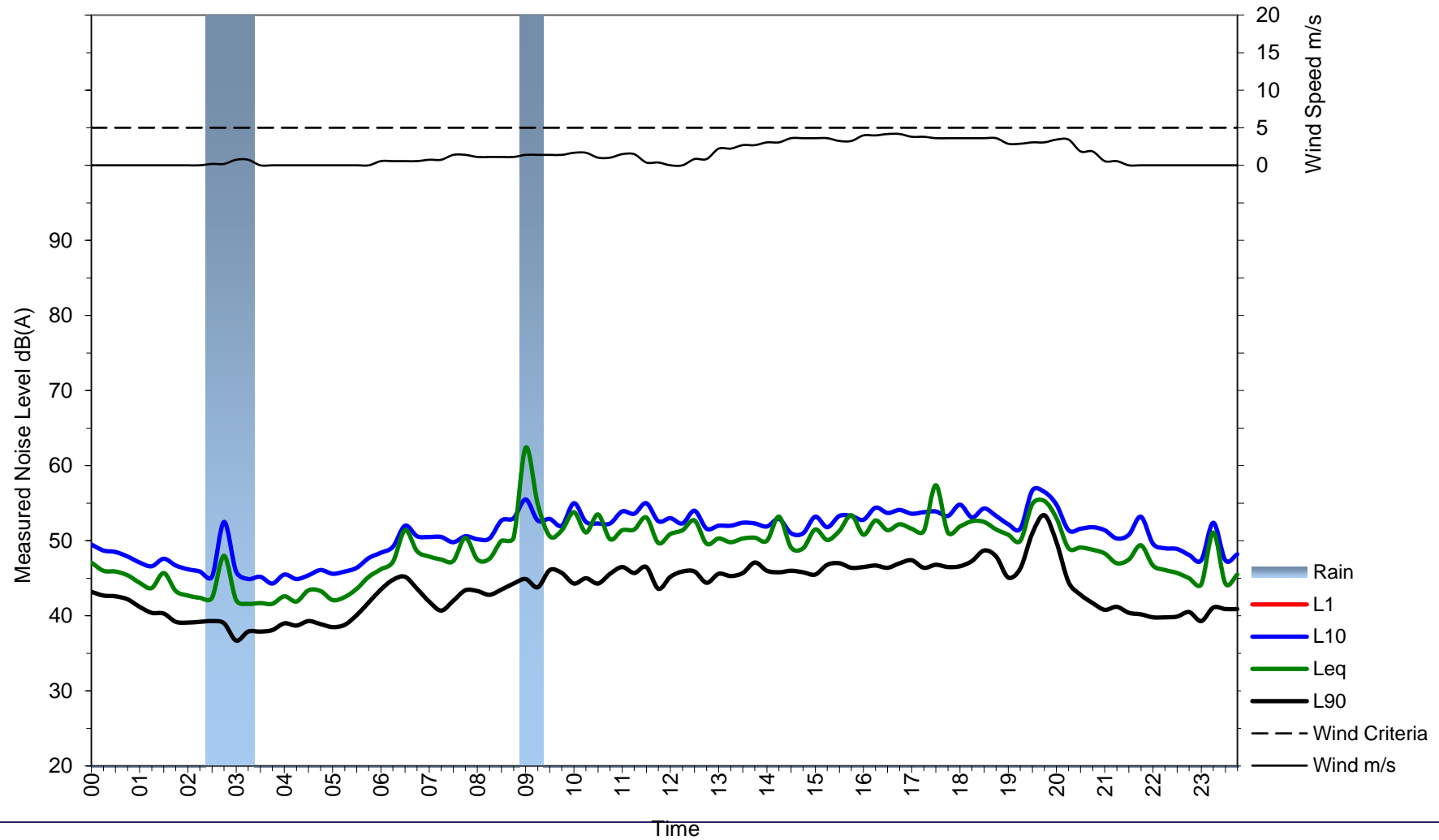
Saturday 12 March 2022





31O'Connell and 9 Albert Street, North Parramatta

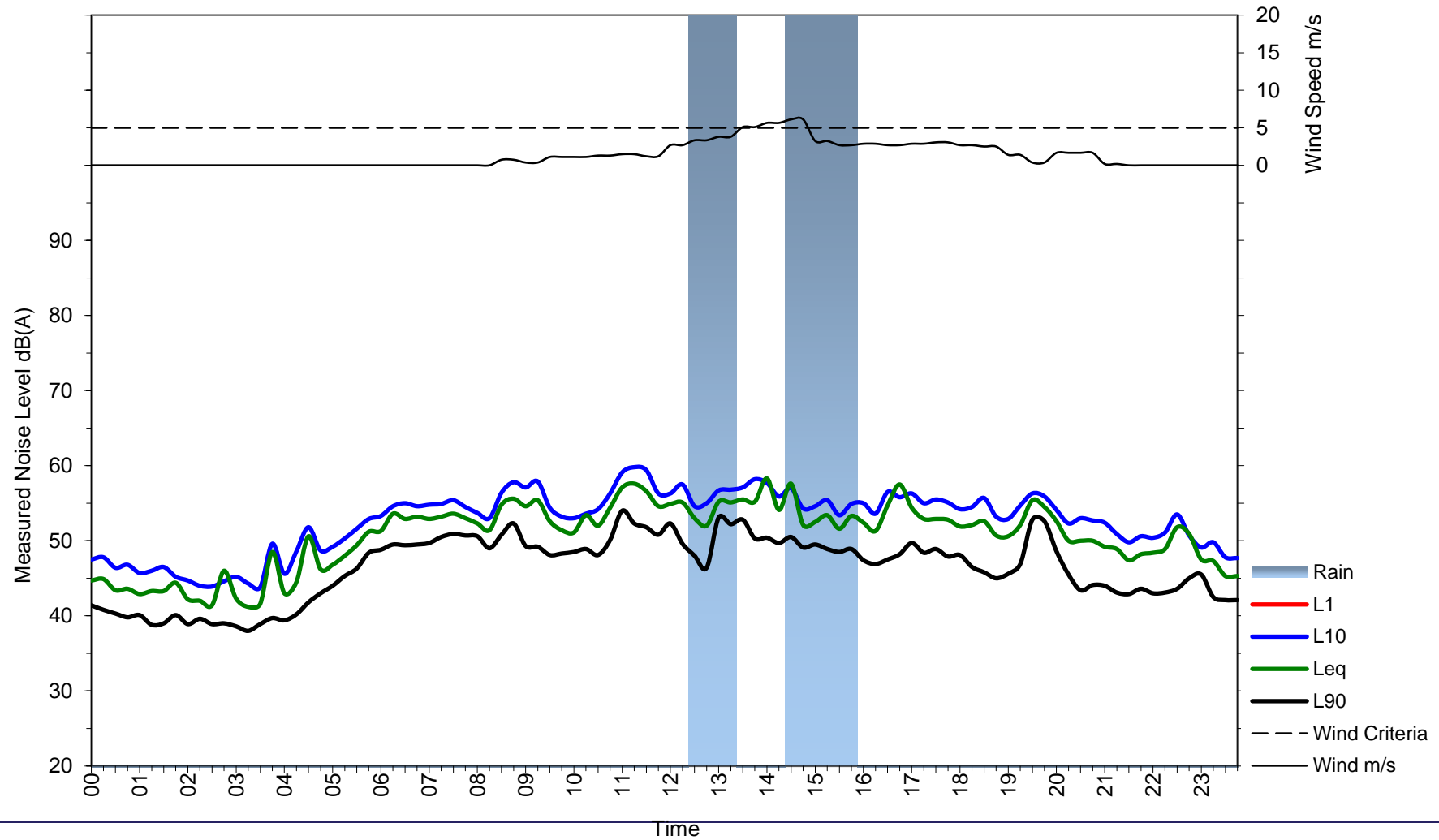
Sunday 13 March 2022





31O'Connell and 9 Albert Street, North Parramatta

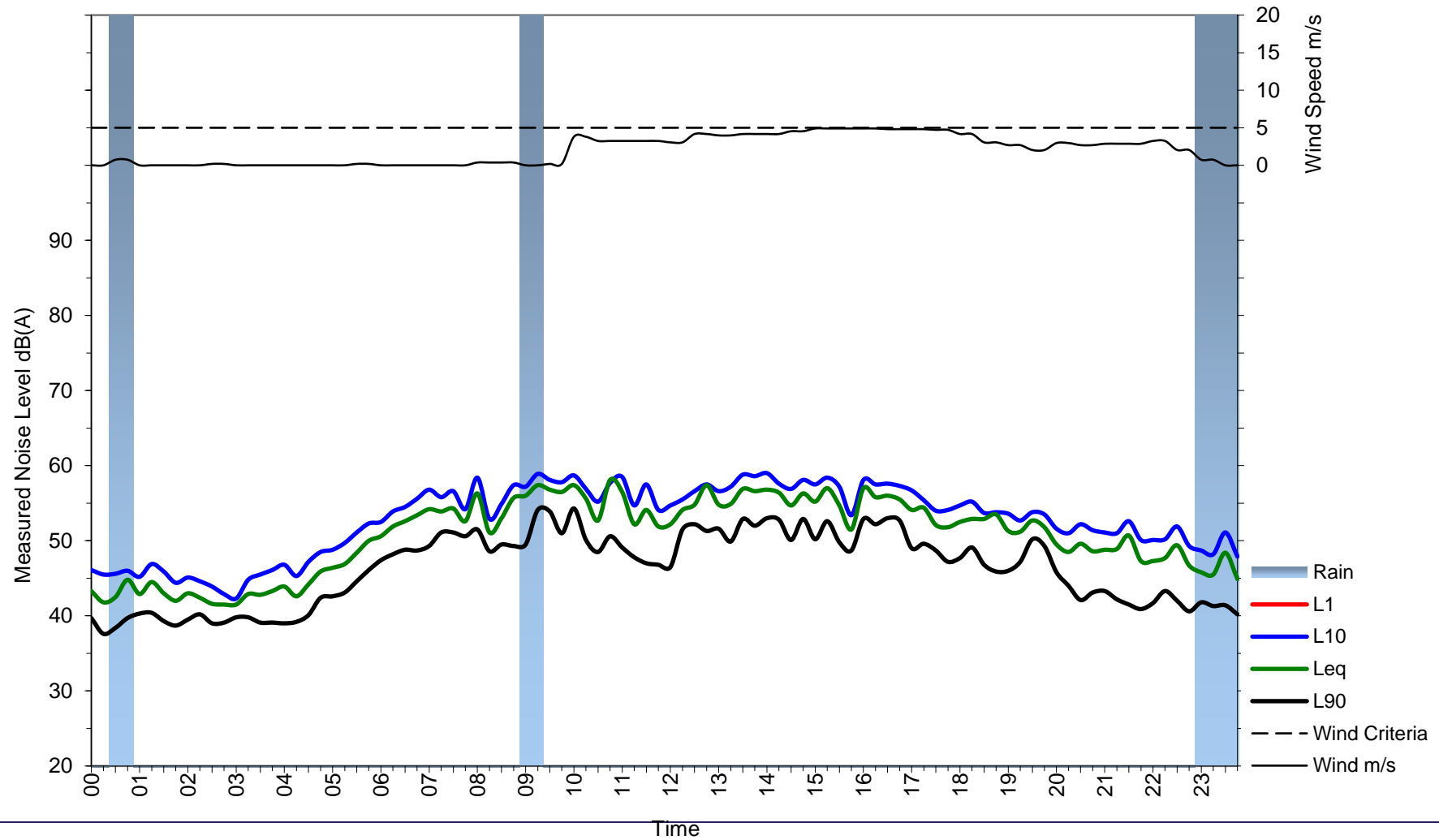
Monday 14 March 2022





31O'Connell and 9 Albert Street, North Parramatta

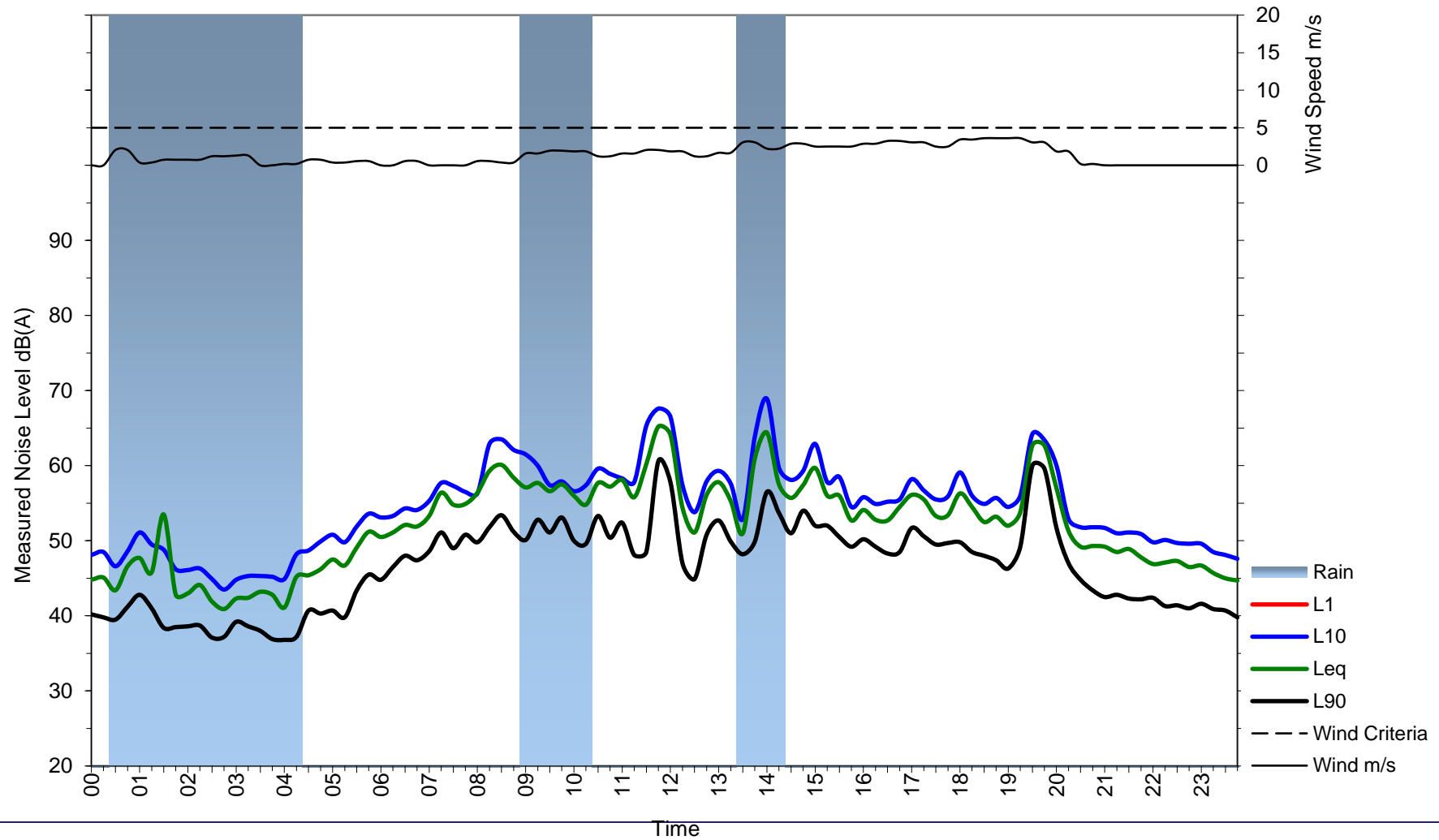
Tuesday 15 March 2022





31O'Connell and 9 Albert Street, North Parramatta

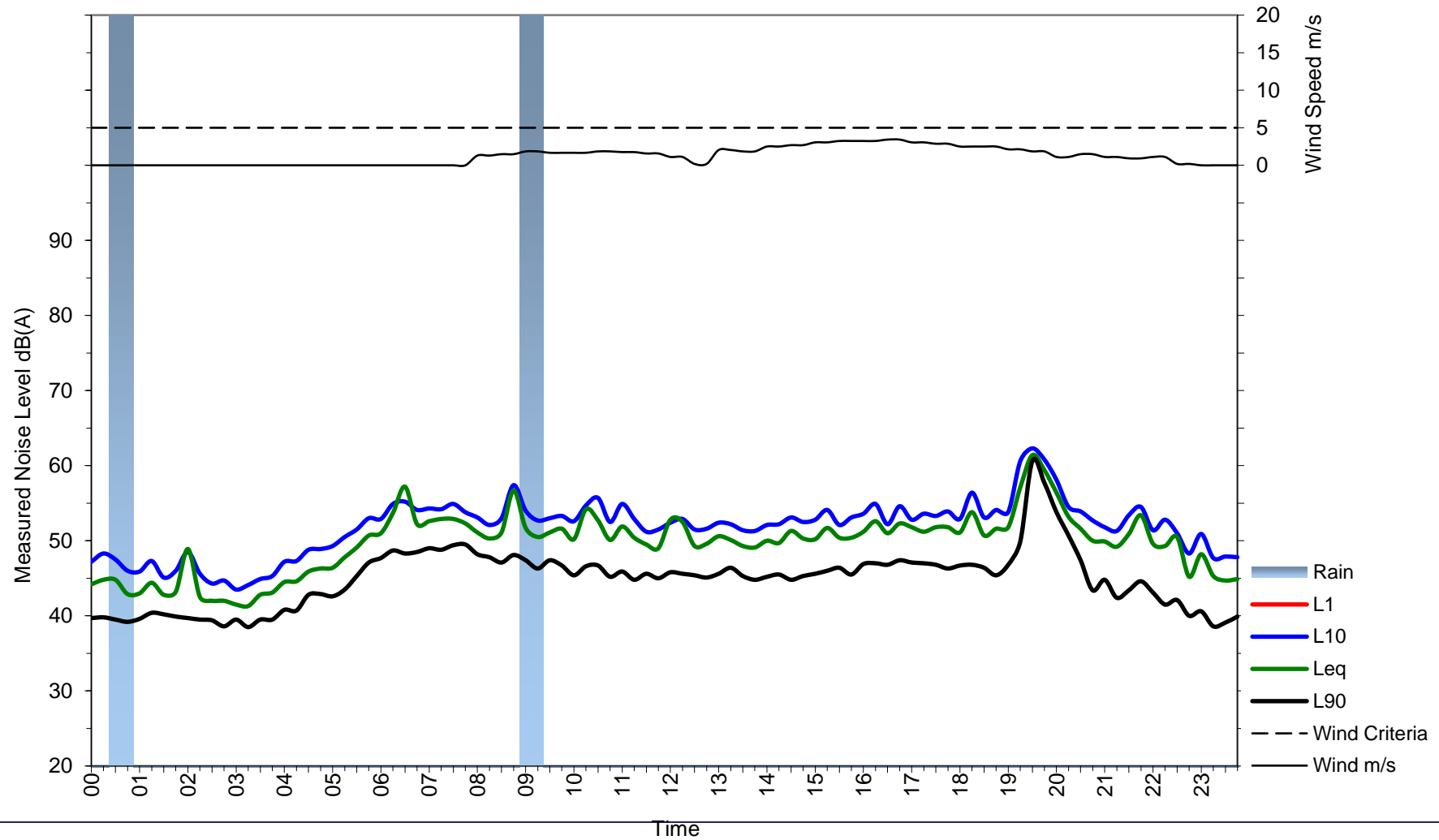
Wednesday 16 March 2022





31O'Connell and 9 Albert Street, North Parramatta

Thursday 17 March 2022





31O'Connell and 9 Albert Street, North Parramatta

Friday 18 March 2022

