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372-374 MANN STREET AND 35-37 DWYER STREET, NORTH GOSFORD

SSDA Noise and Vibration Impact Assessment

16 April 2025

Stockbridge Properties Pty Ltd

TN922-01F02 SDDA Acoustic Report (r3)

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1 Introduction

This SSDA Noise and Vibration Impact Assessment accompanies an Environmental Impact Statement (EIS) pursuant to Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), in respect of a State Significant Development Application (SSDA) for a proposed mixed-use development at 35-37 Dwyer Street and 372-374 Mann Street, North Gosford. This report addresses the relevant Secretary's Environmental Assessment Requirements (SEARs) as detailed in Table 1-1.

Table 1-1: Summary of Relevant SEARs

SEAR	Requirement	Response	Report Section
12	Provide a noise and vibration assessment prepared in accordance with the relevant NSW Environment Protection Authority (EPA) guidelines. The assessment must detail construction and operational noise and vibration impacts on nearby sensitive receivers and structures and outline the proposed management and mitigation measures that would be implemented.	This report presents a summary of the noise impacts onto the site and from the site with governing criteria and mitigation advice for the various aspects.	Whole of report

Project Site

The project site is known as 35-37 Dwyer Street and 372-374 Mann Street, North Gosford and is legally known as Lot 4-5 in DP 15954, Lot 2A in DP 407164 and Lot 31 in DP 553523.

The site is irregularly shaped and has an area of 7,038.5m^2. The site has a frontage of 86m to Dwyer Street to the north and 34.2m to Mann Street to the east.

An aerial photograph of the site is provided in **Figure 1.**

Figure 1 Aerial Photograph

Project Description

The project is a mixed-use development which includes site preparation works, the construction of three buildings ranging in height from seven storeys to 22 storeys containing residential apartments, commercial/retail floor area and basement car parking, and the construction of a private road, landscaping and public domain improvements.

The site is bound to the East by Mann Street (Pacific Highway), to the North by Dwyer Street with residential receivers opposite, and commercial / industrial lots to the West and South.

This is a noise impact assessment which assesses the noise emissions from the site to the neighbours, the noise impact from the environment onto the development, and sets up the framework for the internal acoustic separation and the management of construction noise and vibration. Indicative measures are proposed for the mitigation of noise emissions, noise intrusion and internal acoustic separation, but these will be further developed during detailed design.

Noise surveys were conducted on site by Renzo Tonin & Associates from Tuesday the 14th of May 2024 to Thursday the 23rd May 2024, inclusive, to determine the existing traffic, rail and ambient noise levels at the development site. These levels were used to set the project noise emission goals.

As a result of our assessment, the following potential acoustic items were identified:

1. Noise emission targets from proposed mechanical plant impacting on existing residences;
2. Noise emissions from use of the site including use of the on site loading dock;
3. External noise from road traffic on Mann Street (Pacific Highway) impacting the receivers on site;
4. External noise from rail movements on the nearby corridor to the West; and
5. Noise from traffic generated by the development impacting existing residential receivers.

A noise and vibration assessment is requested in accordance with the relevant NSW Environment Protection Authority (EPA) guidelines. This report presents an assessment of the above acoustic components in terms of the NSW State Environmental Planning Policy (Transport & Infrastructure) 2021, NSW Environmental Protection Authority (EPA) Noise Policy for Industry (NPfI) (2017), Australian Standard AS2107:2016 and NSW EPA Interim Construction Noise Guideline (ICNG) (2009).

In regard to acoustic privacy, this is generally satisfied through the requirements set by the National Construction Codes - Building Code of Australia with which all new residential developments would need to comply. Further detailed discussion of the identified acoustic factors is set out within this report.

The work documented in this report was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard / NZS ISO 9001. Appendix A contains a glossary of acoustic terms used in this report.

2 Site and Surrounds

The mixed use development is to be located at 372-374 Mann Street and 35-37 Dwyer Street, North Gosford.

The East boundary adjoins Mann Street / Pacific Highway (Regional Road 7757). The north boundary adjoins Dwyer Street (a Local Road), with residential receivers opposite. The remaining boundaries adjoin existing commercial/light industrial land uses, which it is anticipated will be redeveloped in the short to medium term. For the purpose of this assessment, the adjacent lots are assumed to include residential receivers.

Long term noise monitoring has been undertaken at the site to determine the existing acoustic environment – both in areas affected by road traffic noise rail noise. Logger Location L1 (near Mann Street / Pacific Hwy) is representative of the background noise levels at R1, R7, R5 and R6, whilst Logger Location L2 is representative of receivers R2, R3, R4 and the west of R5 and R6 which are partially shielded from road traffic noise, but also exposed to rail noise.

Figure 2 - Site plan and monitoring locations

3 Measured and Predicted Noise Levels

3.1 Long-Term Noise Survey

Two RTA Technology Environmental Noise Loggers was set up for the ambient noise survey from Tuesday the 14th of May 2024 to Thursday the 23rd May 2024, inclusive. Refer to Figure 2 for monitoring locations.

- One logger was installed near the east boundary of the site to capture the existing traffic noise on Mann Street / Pacific Hwy as well as the background noise at traffic-affected receivers.
- The second logger was placed at the rear of the site, to capture the background noise environment away from the road, and capture train noise.

The noise logger records noise levels on a continuous basis and stores data every fifteen minutes. The noise logger was calibrated before and after measurements and no significant deviation in calibration was noted. The noise monitoring equipment used here complies with Australian Standard 1259.2-1990 "Acoustics - Sound Level Meters" and is designated as Type 2 instruments suitable for field use. The dates of measurement and the results obtained from the logger survey are shown in Appendix B.

Results from the unattended noise survey were used to calculate noise emission goals.

3.2 Results of long-term noise monitoring

The results of the long-term noise monitoring have been summarised in accordance with the Noise Policy for Industry requirements published by NSW Environmental Protection Authority (EPA) and are presented in Table 3-1 below.

Table 3-1: Measured Site Background (L_{A90}) and Ambient (L_{Aeq}) Noise Levels dB(A)

Noise Monitoring		Descriptor	Day[1]	Evening[2]	Night[3]
Location	Duration				
L1 – East Boundary, appx 12m to moving traffic	14/05/24-23/05/24	L_{A90}	56	44	31
		L_{Aeq}	65	63	59
L2 – rear of site	14/05/24-23/05/24	L_{A90}	49	44	35
		L_{Aeq}	57	52	50

Notes: Day, Evening & Night assessment periods are defined in accordance NSW EPA's Industrial Noise Policy as follows.

1. Day is defined as 7:00am to 6:00pm, Monday to Saturday; 8:00am to 6:00pm Sundays & Public Holidays. As results were affected by construction noise weekend day and Saturday morning, Sunday results have been presented for the Day time period
2. Evening is defined as 6:00pm to 10:00pm, Monday to Sunday & Public Holidays
3. Night is defined as 10:00pm to 7:00am, Monday to Saturday; 10:00pm to 8:00am Sundays & Public Holidays

Logger Location L1 (near Mann Street / Pacific Hwy) is representative of the background noise levels at R1, R7, R5 and R6, whilst Logger Location L2 is representative of receivers R2, R3, R4 and the west of R5 and R6 which are partially shielded from road traffic noise, but also exposed to rail noise.

The representative background noise levels (L_{A90}) are used in defining external noise emission from the development such as mechanical ventilation and air-conditioning systems in accordance with the EPA Noise Policy for Industry (NPfI) (2017).

Table 3-2 - Measured Road Traffic Noise Levels at North-West Boundary – including façade reflection

Noise Monitoring		Day[1]	Night[3]
Location	**Duration**		
L1 – East side of site – on the patio of the existing dwelling	14/05/24-23/05/24	67	61
L2 – West portion (partially screened), appx 84m from rail	14/05/24-23/05/24	59	52

Notes: Day is 7am to 10pm; Night is 10pm to 7am; Quoted values include 2.5dB façade correction

3.3 Assessment traffic noise levels

For the East boundary, the existing dwelling is set back a little further than the proposed façade location, so the measured levels have been corrected to the distance of the proposed façade. For the Western side of the site, the unattended noise monitor was slightly screened from rail noise by the intermediate buildings. The measured levels were corrected for the barrier. The resultant period average traffic noise levels are shown in the following table:

Table 3-3 - Assessment Road Traffic Noise Levels near North-West Boundary – including façade reflection

Noise Monitoring		Day[1]	Night[3]
Location	**Duration**		
East Boundary (9m from edge of moving traffic	14/05/24-23/05/24	68	63
West boundary – appx 50m from rail line (level 4)	14/05/24-23/05/24	67	61
Road traffic noise – predicted to 36 Dwyer Street – south façade (1m from façade)	14/05/24-23/05/24	57	51

Notes: Day is 7am to 10pm; Night is 10pm to 7am; Quoted values include 2.5dB façade correction

4 Noise Intrusion Assessment

This section presents the assessment of environmental noise impacts onto the site from its surroundings and the mitigation measures that are proposed to achieve appropriate internal noise levels in accordance with the necessary standards / statutory requirements.

4.1 Noise Intrusion Criteria

4.1.1 State Environmental Planning Policy (Transport & Infrastructure) 2021

The NSW State Environmental Planning Policy (Infrastructure) 2007 (known as 'ISEPP') came into force in NSW on 1 January 2008 to facilitate the effective delivery of infrastructure across the State. This has since been superseded by the State Environment Planning Policy (Transport & Infrastructure) 2021, effective 1 March 2022 (T&ISEPP). The aim of the policy includes identifying the environmental assessment category into which different types of infrastructure and services development fall and identifying matters to be considered in the assessment of development adjacent to particular types of infrastructure.

The subject site faces the Pacific Highway and is affected by a rail corridor (within 100m), thus triggering the T&ISEPP.

Clause 2.120 applies to the subject site as it relates to noise impacts from a busy road on residential accommodation.

> *2.120 Impact of road noise or vibration on non-road development*
>
> *(1) This section 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—*
>
> *(a) residential accommodation,*
>
> *(b) a place of public worship,*
>
> *(c) a hospital,*
>
> *(d) an educational establishment or centre-based child care facility.*
>
> *(2) Before determining a development application for development to which this section applies, the consent authority must take into consideration any guidelines that are issued by the Planning Secretary for the purposes of this section 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 levels are not exceeded—

(a) in any bedroom in the residential accommodation—35 dB(A) at any time between 10 pm and 7 am,

(b) anywhere else in the residential accommodation (other than a garage, kitchen, bathroom or hallway)—40 dB(A) at any time.

(3A) Subsection (3) does not apply to a building to which State Environmental Planning Policy (Housing) 2021, Chapter 3, Part 7 applies.

(4) In this section, freeway, tollway and transitway have the same meanings as they have in the Roads Act 1993.

Note: In respect of Item 3A) above, SEPP (Housing) 2021, Chapter 3, Part 7 relates to serviced apartments and so the exclusion is not relevant to this project. The development shall be designed for compliance with Item 3 internal noise levels.

In respect of Item 2 above, under the previous SEPP (Infrastructure) 2007, the Department of Planning published the Developments Near Rail Corridors and Busy Roads – Interim Guideline (2008) (ISEPP Guideline), which was published in the Gazette on 22/12/08. The Guideline has not been re-gazetted under the T&ISEPP. However, Planning Circular PS 21-018 was issued 02 December 2021 which requires a consent authority to "take into consideration this interim guideline to minimise the impacts of busy roads and railway corridors on residential and other sensitive developments". On that basis, the recommendations and clarifications contained within the ISEPP Guideline are still valid except where directly contradicted by the T&ISEPP (e.g. under the T&ISEPP it is mandatory to assess road traffic noise for roads carrying >20000 vehicles per day, whereas ISEPP and ISEPP Guideline refer to mandatory assessment for >40000 vehicles per day and only recommend assessment for >20000 vehicles per day).

Clause 2.100 applies to the subject site as it relates to noise impacts from the rail corridor on residential accommodation.

2.100 Impact of rail noise or vibration on non-rail development

(1) This section applies to development for any of the following purposes that is on land in or adjacent to a rail corridor and that the consent authority considers is likely to be adversely affected by rail noise or vibration—

(a) residential accommodation,

(b) a place of public worship,

(c) a hospital,

(d) an educational establishment or centre-based child care facility.

(2) Before determining a development application for development to which this section applies, the consent authority must take into consideration any guidelines that are issued by the Planning Secretary for the purposes of this section 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 levels are not exceeded—

(a) in any bedroom in the residential accommodation—35 dB(A) at any time between 10.00 pm and 7.00 am,

(b) anywhere else in the residential accommodation (other than a garage, kitchen, bathroom or hallway)—40 dB(A) at any time.

Given there are other buildings and sites between the subject lot and the rail corridor, this site is not adjacent to the rail corridor and so would not technically trigger Clause 2.100. However, the intention of the clause is to prevent unreasonable impacts on residential receivers due to rail operations. On that basis, we have used the SEPP (T&I) and associated ISEPP Guideline to consider impacts from the railway on the future mixed use development.

Further, given that the building nearest the rail tracks is offset by approximately 47m, vibration impacts on the future residents is not of concern.

4.1.2 Development near rail corridors and busy roads – interim guideline 2008

The ISEPP Guideline clarifies the time period of measurement and assessment. Section 3.4 '*What Noise and Vibration Concepts are Relevant*' and Table 3.1 of Section 3.6.1 confirms that noise assessment is based over the following time periods:

- Daytime 7:00am - 10:00pm $L_{Aeq(15hr)}$
- Night-time 10:00pm - 7:00am $L_{Aeq(9hr)}$

The noise criteria nominated in the T&ISEPP apply to internal noise levels with windows and doors closed. However as the preliminary noise assessment is based on measurements/predictions at external locations, equivalent external noise criteria has been established. The equivalent external noise criterion is used to determine which areas of the development may require acoustic treatment in order to meet the internal noise requirements of the T&ISEPP. The equivalent external goals have been determined on the following basis:

- The Department of Planning publication 'Development near rail corridors and busy roads – Interim guideline' states: *"If internal noise levels with windows or doors open exceed the criteria by more than 10dBA, the design of the ventilation for these rooms should be such that occupants can leave windows closed, if they so desire, and also to meet the ventilation*

requirements of the Building Code of Australia." The internal criteria with windows open is therefore 10dB(A) above the criteria explicitly outlined in the T&ISEPP.

- The generally accepted noise reduction through an open window from a free-field external position is 10dB(A). Windows/doors are assumed to be open no more than 5% of room floor area, in accordance with the National Construction Code, Building Code of Australia (BCA) ventilation requirements.

Table 4-1 presents the T&ISEPP internal noise criteria along with the equivalent external noise criteria for residential premises.

Table 4-1: T&ISEPP noise criteria for new residential development

Room	Location	$L_{Aeq,\ 15hr}$ Day 7am – 10pm	$L_{Aeq\ 9hr}$ Night 10pm – 7am
Living rooms[1]	Internal, windows closed	40	40
	Internal, windows open	50	50
	External free-field (allowing windows to remain open)[2]	60	60
Bedrooms[1]	Internal, windows closed	40[3]	35
	Internal, windows open	50[3]	45
	External free-field (allowing windows to remain open) [2]	-	55

Notes: 1. Requisite for 20,000AADT Roads only under T&ISEPP 2021.

2.Department of Planning's Guideline states that where internal noise criteria are exceeded by more than 10dB(A) with windows open mechanical ventilation is required. External goals have been calculated on the basis of nominal 10dB(A) reduction through an open window to a free-field position. Windows open to 5% of floor area in accordance with the NCC/BCA requirements.

3. T&ISEPP does not define internal goals in Bedrooms during the daytime (only at night). In view of project quality, we have elected to apply the Living Room goals to Bedrooms during the daytime.

4.1.3 Australian Standard AS/NZS 2107-2016

For the residential portion, compliance with the T&ISEPP internal goals will also achieve compliance with AS2107:2016. The commercial/retail spaces are not governed by the T&ISEPP and so guidance is sought from Australian Standard AS2107:2016. The applicable criteria shall be based on AS/NZS 2107-2016 are presented below in Table 4-2. These goals are applicable to both road traffic noise and mechanical services noise. Mechanical noise impacts on bedrooms and private living spaces from central building equipment (which the resident has no control over) shall be designed to less than 30dB(A) Leq.

Table 4-2: Recommended design sound levels for different areas of occupancy in buildings

Type of occupancy/ activity	Design sound level (LAeq,t) range[8]
7 RESIDENTIAL BUILDING	
Houses and apartments near major roads-	
Living Areas	35 to 45
Sleeping Areas (night time)	35 to 40
Work Areas	35 to 45

Type of occupancy/ activity	Design sound level (LAeq,t) range[8]
8 SHOP BUILDINGS	
Small retail store	50
Enclosed Carpark	65

In accordance with the NSW EPA Noise Policy for Industry (2017) (NPfI), the target noise level for courtyards within the development shall be 50dB(A) Leq(period) when in use.

4.2 Noise intrusion assessment

The main noise impact onto the site is from road traffic noise on Mann Street/ Pacific Highway and noise from the railway line.

Noise calculations were performed using glazing design software developed in this office which take into account external noise levels, facade transmission loss and room sound absorption characteristics. The forms of constructions presented below are recommended to comply with the nominated acoustic criteria for the development.

The Eastern portion of the site is most affected by noise from the Pacific Highway / Mann Street, whilst the western portion is more impacted by the railway noise. The following section presents the indicative treatments for compliance with the project internal noise goals as defined in section 4.1.

To capture the impact of changes during detailed design, a review of environmental noise intrusion is to be undertaken during detailed design prior to construction documentation.

4.2.1 Glazing

To achieve the criteria outlined in Table 4-1 with windows closed, the following table presents the recommended glazing acoustic performances for the proposed development. There is no restriction on ability to open windows/doors. For the noise affected facades, they need to be closed to comply.

Table 4-3: Recommended acoustic performance of indicative glazing assembly

Zone	Room Description	Required Acoustic Rating of Glazing Assembly, R_w
Building 1 - East façade	Bedrooms facing Mann Street	R_w 35
	Lounge/Activity/Dining	R_w 35
	Commercial	R_w 32
Building 1 – North, South and West facades	Bedrooms facing North/South	R_w 32
	Lounge/Activity/Dining	R_w 32
	Commercial	R_w 32
	Bedrooms facing West (toward railway)	R_w 35

Building 2/3 – West facade	Lounge/Activity/Dining	R_w 35
	Common property	R_w 28
Building 2/3 – North, South and East facades	Bedrooms facing North / South / East	R_w 32
	Lounge/Activity/Dining	R_w 32

Notes:

The client is advised not to commence detailing or otherwise commit to partition construction systems which have not been tested in an approved laboratory or for which an opinion only is available. Testing of partition construction systems is a component of the quality control of the design process and should be viewed as a priority because there is no guarantee the forecast results will be achieved thereby necessitating the use of an alternative which may affect the cost and timing of the project. No responsibility is taken for use of or reliance upon untested partition construction systems, estimates or opinions. The advice provided here is in respect of acoustics only.

The information in this table is provided for the purpose of Council approvals process and cost planning and shall not be used for construction unless otherwise approved in writing by the acoustic consultant.

The design in this table is preliminary and a comprehensive assessment shall be conducted prior to Construction Certification.

Before committing to any form of construction or committing to any builder, advice should be sought from an acoustic consultant to ensure that adequate provisions are made for any variations which may occur as a result of changes to the form of construction where only an "estimate" is available for the sound insulation properties of recommended materials.

The glazing supplier shall ensure that installation techniques will not diminish the Rw performance of the glazing when installed on site.

All openable glass windows and doors shall incorporate full perimeter acoustic seals equivalent to Q-Lon, which enable the Rw rating performance of the glazing to not be reduced.

The above glazing thicknesses should be considered the minimum thicknesses to achieve acoustical ratings. Greater glazing thicknesses may be required for structural loading, wind loading etc.

4.2.1.1 Typical Glazing Constructions to Achieve Acoustic Ratings

The following table presents typical glazing constructions to achieve the minimum acoustic ratings presented in Table 4-3 above.

Table 4-4: Typical Glazing Constructions to Achieve Acoustic Ratings

R_w Rating	Typical Glazing System
R_w 28	Minimum 6mm float or toughened glass in an aluminium sliding window frame. Q-on seals full perimeter seals shall be installed, or acoustic equivalent to be determined in Detailed Design.
R_w 32	Minimum 6.38mm laminated glass in an aluminium sliding window frame. Q-lon seals full perimeter seals shall be installed, or acoustic equivalent to be determined in Detailed Design.
R_w 35	Minimum 10.38mm laminated glass in an aluminium sliding window frame. Q-lon seals full perimeter seals shall be installed, or acoustic equivalent to be determined in Detailed Design.

The table presented above is intended as a guide only and should not be used for construction. It is the responsibility of the sub-contractor to provide laboratory test reports for the glazed systems proposed for installation at the development site to show compliance with the acoustic ratings presented in Table 4-3.

4.2.2 Roof

To achieve the criteria outlined in Section 4.1 with windows closed, the following table presents the recommended roof acoustic performances for the proposed development. There is no restriction on ability to open windows/doors. For the noise affected facades, they need to be closed to comply.

In the development, it is anticipated that roofs will be concrete, nominally R_w 50+.

4.2.2.1 Typical Roofing Constructions to Achieve Acoustic Ratings

The following table presents typical roofing constructions to achieve the minimum acoustic ratings presented above.

Table 4-5: Typical Roof Constructions to Achieve Acoustic Ratings

R_w Rating	Typical Roofing System
R_w 50	Concrete roof, min 150mm thick, or acoustic equivalent to be determined in Detailed Design.

The table presented above is intended as a guide only and should not be used for construction. It is the responsibility of the sub-contractor to provide laboratory test reports for the roof/ceiling systems proposed for installation at the development site to show compliance with the acoustic ratings presented above.

4.2.3 External walls

To achieve the criteria outlined in Section 4.1 with windows closed, the following table presents the recommended external wall acoustic performances for the proposed development. There is no restriction on ability to open windows/doors. For the noise affected facades, they need to be closed to comply.

Table 4-6: Recommended acoustic performance of indicative external wall construction

Building	Room Description	Required Acoustic Rating of Wall Assembly, R_w
All	Building 1, East facade	R_w 50
	Building 1, north / south / west façade; Building 2/3, North, South and West	R_w 47
	Rooms with glass Rw28 or less	R_w 43

Notes:

The client is advised not to commence detailing or otherwise commit to partition construction systems which have not been tested in an approved laboratory or for which an opinion only is available. Testing of partition construction systems is a component of the quality control of the design process and should be viewed as a priority because there is no guarantee the forecast results will be achieved thereby necessitating the use of an alternative which may affect the cost and timing of the project. No responsibility is taken for use of or reliance upon untested partition construction systems, estimates or opinions. The advice provided here is in respect of acoustics only.

The information in this table is provided for the purpose of Council approvals process and cost planning and shall not be used for construction unless otherwise approved in writing by the acoustic consultant.

The design in this table is preliminary and a comprehensive assessment shall be conducted prior to Construction Certification.

Before committing to any form of construction or committing to any builder, advice should be sought from an acoustic consultant to ensure that adequate provisions are made for any variations which may occur as a result of changes to the form of construction where only an "estimate" is available for the sound insulation properties of recommended materials.

The supplier shall ensure that installation techniques will not diminish the Rw performance of the system when installed on site.

Table 4-7: Typical Wall Constructions to Achieve Acoustic Ratings

R_w Rating	Typical Roofing System
R_w 43	Masonry (i.e. brick veneer, or concrete); or Minimum 9mm compressed fibre cement cladding or 20mm sandstone cladding, on minimum 92mm studwork with 13mm plasterboard internally and 75mm thick 11kg/m3 glass or mineral wool insulation, or acoustic equivalent determined during detailed design.

R_w Rating	Typical Roofing System
R_w 47	Masonry (i.e. brick veneer, or concrete); or Minimum 16mm compressed fibre cement cladding or minimum 20mm sandstone cladding, on minimum 92mm studwork with 13mm plasterboard internally and 75mm thick 11kg/m3 glass or mineral wool insulation, or acoustic equivalent determined during detailed design.
R_w 50	Masonry (i.e. brick veneer, or concrete); or Minimum 16mm compressed fibre cement cladding or minimum 20mm stone cladding on steel studwork with furring channels/tophats (minimum air cavity 92mm), with 75mm thick 11kg/m3 glass or mineral wool insulation and 2x16mm fire rated plasterboard; or Acoustic equivalent determined during detailed design.

The table presented above is intended as a guide only and should not be used for construction.

It is the responsibility of the sub-contractor to provide laboratory test reports for the roof/ceiling systems proposed for installation at the development site to show compliance with the acoustic ratings presented above.

4.2.4 Ventilation

Building 1 facing the Highway, including the corner units on the Dwyer and the southern façade are mechanically ventilated.

Each room of apartments facing the Pacific Highway (including corner units), along with the West, North and South facades of Buildings 2 and 3 need to be provided with alternative ventilation, as internal noise levels with windows open for natural ventilation exceed the SEPP (T&I) internal noise goals.

Remaining areas may be naturally ventilated from a noise intrusion perspective.

5 Noise Emission Assessment

Under the NSW Planning Secretary's Environmental Assessment Requirements, a noise and vibration assessment is required in accordance with the relevant NSW Environment Protection Authority (EPA) guidelines. This section outlines the noise emission assessment.

5.1 Noise Emission Requirements

Noise emissions from vehicles being driven on the site and from mechanical plant and equipment, shall be managed in accordance with the NSW EPA Noise Policy for Industry 2017 (NPfI).

Noise from additional traffic on the public road will be assessed in accordance with the NSW EPA Road Noise Policy 2011 (RNP).

5.1.1 NSW EPA Noise Policy for Industry

The NSW EPA Noise Policy for Industry (2017) assessment has three main components:

- Controlling *intrusive* noise impacts in the short-term for residences;
- Maintaining noise level amenity for particular land uses for residences and other land uses (*amenity*); and
- Assessing night-time noise impacts on residential receivers for the potential for sleep disturbance.

In the event that particular assessment is undertaken, and trigger levels are found to be exceeded even after application of feasible and reasonable treatments, additional analysis would be required to determine the impact of the residual.

5.1.1.1 Intrusive noise trigger level

The intrusiveness trigger level is applicable to residential premises only. According to the NPfI, the intrusiveness of a noise source may generally be considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (represented by the L_{Aeq} descriptor) does not exceed the background noise level measured in the absence of the source by more than 5dB(A).

The intrusiveness criterion is summarised as follows:

- $L_{Aeq,15minute} \leq$ Rating Background Level (RBL) plus 5dB

Table 5-1: Measured Site Background (L_{A90}) and associated NPfI Intrusive trigger

Receiver Location	Descriptor	Day[1]	Evening[2]	Night[3]
R1, R2, R8	Background L_{A90}	56	44	31
	Intrusive Trigger, Background + 5dB(A) $L_{Aeq(15min)}$	61	49	36
R3, R4, R5, R6, R7	Background L_{A90}	49	44	35
	Intrusive Trigger, Background + 5dB(A) $L_{Aeq(15min)}$	54	49	40

Notes: Day, Evening & Night assessment periods are defined in accordance NSW EPA's Industrial Noise Policy as follows.

1. Day is defined as 7:00am to 6:00pm, Monday to Saturday; 8:00am to 6:00pm Sundays & Public Holidays. As results were affected by construction noise weekend day and Saturday morning, Sunday results have been presented for the Day time period
2. Evening is defined as 6:00pm to 10:00pm, Monday to Sunday & Public Holidays
3. Night is defined as 10:00pm to 7:00am, Monday to Saturday; 10:00pm to 8:00am Sundays & Public Holidays

5.1.1.2 Amenity noise trigger levels

The NPfI amenity trigger levels are designed to maintain noise level amenity for particular land uses, including residential and other land uses. The NPfI recommends base acceptable noise levels for various receivers, including residential, commercial, industrial receivers and other sensitive receivers in Table 2.2 of the NPfI. For this project, the neighbouring receivers are classified as Suburban residential receivers (existing receivers) and Urban receivers (adjacent sites, for development). Despite the heavy traffic noise, application of the Urban category is appropriate.

Table 5-2: NPfI Amenity Criteria - Recommended L_{Aeq} noise levels from industrial noise sources [NSW NPfI Table 2.2]

Type of receiver	Indicative Noise Amenity Area	Time of day	Recommended amenity noise level $L_{Aeq(Period)}$
Residence	Suburban	Day	55
		Evening	45
		Night	40
	Urban	Day	60
		Evening	50
		Night	45
Passive Recreation	-	When in use	50

Type of receiver	Indicative Noise Amenity Area	Time of day	Recommended amenity noise level $L_{Aeq(Period)}$

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

Types of receivers are defined as follows:

• suburban residential – see Table 2.3

• urban residential – see Table 2.3

Time of day is defined as follows:

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

• evening – the period from 6 pm to 10 pm

• night – the remaining periods.

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

To ensure that industrial noise levels (existing plus new) remain within the recommended amenity noise levels for an area a project amenity noise level applies for each new source of industrial noise as follows:

- Project amenity noise level for industrial developments = recommended amenity noise level (NPfI Table 2.2) minus 5 dB(A)
- Project amenity trigger noise level $L_{Aeq(15min)}$ = Project amenity noise level for industrial developments $L_{Aeq(period)}$ plus 3dB(A). (Note: this is a screening test and the policy still permits period average assessment by review of particular operations)

The NPfI, Section 2.4.1 notes that the level of road traffic noise may provide acoustic masking to operational noise impacting receivers. It is only applicable where traffic noise is identified as the dominant noise source at the site; the existing traffic noise level is 10dB or more above the recommended amenity noise level for the area; and it is highly unlikely traffic noise levels will decrease in the future.

Based on the on-site monitoring, this would be applicable to the residential receivers fronting to Mann St specifically receivers R1, R5, R6 and R7, where the traffic noise levels are 65 dB(A)L_{eq} (day), 63dB(A) L_{eq} (evening, and 59dB(A) L_{eq} (night). High traffic criteria would apply to the evening and night periods, when the traffic noise is 10dB greater than the recommended amenity noise level.

Taking into account the additional distance between the logging location and the nearest receiver at 36 Dwyer Street (receiver R2) using CoRTN calculation method, the traffic noise level at that receiver is predicted to be 58dB(A)$L_{eq(Day)}$ and 52 dB(A)$L_{eq(Night)}$.

36 Dwyer Street is selected as it is furthest from Mann Street and so least impacted by road traffic noise, presenting the critical scenario.

On that basis, the Project Amenity Noise Levels are as shown in the following table.

Table 5-3 - Determination of Project Amenity Noise Levels and Project Amenity Trigger Levels

Receiver Reference	Description	Time of day		
		Day	Evening	Night
R1, R5, R6, R7	Recommended amenity noise level $L_{Aeq(Period)}$	60	50	45
	Project amenity trigger level $L_{Aeq(15min)}$	60-5=55 +3 = 58	**63-15=48 +3 = 51**	**59-15=44+3 = 47**
R2, R3 and rear of R5, R6	Recommended amenity noise level $L_{Aeq(Period)}$	55	45	40
	Project amenity trigger level $L_{Aeq(15min)}$	55-5+3 =53	45-5+3=43	40-5+3=38

Notes: **Bold** indicates use of the High Traffic correction to the project amenity noise level.

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

Time of day is defined as follows (These periods may be varied where appropriate, for example, see A3 in Fact Sheet A.):

1. Day is defined as 7:00am to 6:00pm, Monday to Saturday; 8:00am to 6:00pm Sundays & Public Holidays. As results were affected by construction noise weekend day and Saturday morning, Sunday results have been presented for the Day time period
2. Evening is defined as 6:00pm to 10:00pm, Monday to Sunday & Public Holidays
3. Night is defined as 10:00pm to 7:00am, Monday to Saturday; 10:00pm to 8:00am Sundays & Public Holidays

Table 5-4 - Determination of Project Noise Trigger Levels (more stringent of intrusive and amenity)

Receiver Location	Descriptor	Day[1]	Evening[2]	Night[3]
R1, R5, R6, R7	Intrusive Trigger, Background + 5dB(A) $L_{Aeq(15min)}$	61	49	36
	Project Amenity trigger level $L_{Aeq(15min)}$	58	51	47
	Project Noise Trigger Level $L_{Aeq(15min)}$	58	49	36
R2, R3 and rear of R5, R6	Intrusive Trigger, Background + 5dB(A) $L_{Aeq(15min)}$	49	44	40
	Project Amenity trigger level $L_{Aeq(15min)}$	53	43	38
	Project Noise Trigger Level $L_{Aeq(15min)}$	49	44	38

Notes: Day, Evening & Night assessment periods are defined in accordance NSW EPA's Industrial Noise Policy as follows.

1. Day is defined as 7:00am to 6:00pm, Monday to Saturday; 8:00am to 6:00pm Sundays & Public Holidays.
2. Evening is defined as 6:00pm to 10:00pm, Monday to Sunday & Public Holidays
3. Night is defined as 10:00pm to 7:00am, Monday to Saturday; 10:00pm to 8:00am Sundays & Public Holidays

5.1.1.3 Maximum noise level event assessment

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

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

a detailed maximum noise level event assessment should be undertaken.

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

Where there are noise events found to exceed the initial screening level, further analysis is made to identify:

- the likely number of events that might occur during the night assessment period
- Whether events exceed an 'awakening reaction' level of $L_{A1(1min))}$ 65 dB(A).

The only use of the site that is anticipated could result in noise events with the potential for sleep disturbance are from use of the driveway and loading dock for trucks. It would be unusual for trucks to visit a development such as this at night time (between 10pm and 7am).

The sleep disturbance criteria for the project are presented in Table 5-5.

Table 5-5: Sleep disturbance criteria

Loc ID	Address	Sleep disturbance screening tests, 10pm - 7am,	
		$L_{A1,1min}$ (or L_{Amax}) = $L_{A90(15min)}$ + 15 dB(A) or 52dB(A) whichever is greater	**$L_{Aeq,\ 15min}$ = $L_{A90(15min)}$ + 5 dB(A) or 40dB(A) whichever is greater**
R1, R5, R6, R7	Facing Mann Street	52 (31+15 = 46)	40 (31+5=36)
R2, R3 and rear of R5 R6	Rear of 372 Mann Street	52 (35+15=50)	40 (35+5=40)

5.1.2 NSW Road Noise Policy

This section presents the criteria for assessment of noise from traffic generated by the development.

Table 5-6 sets out the assessment criteria for residences to be applied to particular types of project, road category and land use. These criteria are for assessment against façade corrected noise levels when measured in front of a building façade. In Table 5-6, freeways, arterial roads and sub-arterial roads are grouped together and attract the same criteria.

Table 5-6: Road traffic noise assessment criteria for residential land uses

Road category	Type of project/land use	Assessment criteria – dB(A)	
		Day 7:00am-10:00pm	Night 10:00pm-7:00am
Freeway/ arterial/ sub-arterial roads	1. Existing residences affected by noise from new freeway/arterial/sub-arterial road corridors	$L_{Aeq,(15\ hour)}$ 55 (external)	$L_{Aeq,(9\ hour)}$ 50 (external)
	2. Existing residences affected by noise from redevelopment of existing freeway / arterial / sub-arterial roads	$L_{Aeq,(15\ hour)}$ 60 (external)	$L_{Aeq,(9\ hour)}$ 55 (external)
	3. Existing residences affected by additional traffic on existing freeways / arterial / sub-arterial roads generated by land use developments	$L_{Aeq,(15\ hour)}$ 60 (external)	$L_{Aeq,(9\ hour)}$ 55 (external)
Local roads	4. Existing residences affected by noise from new local road corridors	$L_{Aeq,(1\ hour)}$ 55 (external)	$L_{Aeq,(1\ hour)}$ 50 (external)
	5. Existing residences affected by noise from redevelopment of existing local roads		
	6. Existing residences affected by additional traffic on existing local roads generated by land use developments		

Note: Land use developers must meet internal noise goals in the Infrastructure SEPP (Department of Planning NSW 2007) for sensitive developments near busy roads (see Appendix C10).

Where existing traffic noise levels are above the noise assessment criteria (as is the case for this project), the primary objective is to reduce these through feasible and reasonable measures to meet the assessment criteria. The façade noise level at 36 Dwyer Street was calculated from the unattended noise monitoring results on Mann Street. These have been predicted to the façade of 36 Dwyer Street. A secondary objective is to protect against excessive decreases in amenity as the result of a project by applying the relative increase criteria. In assessing feasible and reasonable mitigation measures, an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person.

For existing residences and other sensitive land uses affected by *additional traffic on existing roads generated by land use developments*, any increase in the total traffic noise level (where the assessment criteria cannot be achieved) should be limited to 2 dB above that of the corresponding 'no build option'.

In this instance, vehicles entering and exiting the site will do so from Dwyer Street and based on the monitoring conducted on site, the existing residential receivers on Dwyer Street already experience noise levels in excess of the RNP targets (58dB(A) $L_{eq\ (1hour,\ day)}$ and 52dB(A) $L_{eq\ (1hour,\ night)}$ at 1m from the façade, including façade reflection) and the development should not result in an increase in those noise levels of more than 2dB.

The traffic flows predicted to be generated by the proposed development (based on the Ason Group Traffic Assessment, reference P2437r01, dated 01.06.2024) will not result in any noticeable increase in noise from the public road to the nearest residential receivers. Daytime peak development only is 57dB(A) Leq (worst 1hr) and combined with the existing traffic the estimated combined traffic noise level is 60dB(A), which is approximately 2 dB louder than the existing, a noise level difference which is not usually perceptible.

5.2 NPfI Noise Emission Assessment

This section presents the outcomes of the assessment of noise emissions from vehicles being driven on the site and noise from mechanical plant and equipment, which shall be managed in accordance with the NPfI.

In the event that particular assessment is undertaken and trigger levels are found to be exceeded after application of feasible and reasonable treatments, additional analysis would be required to determine the impact of the residual. The Noise Trigger Levels are named so that they trigger an appropriate response but are not to be viewed as hard and fast targets.

Where necessary, noise amelioration treatment has been incorporated in the design to ensure that noise levels comply with the recommended EPA's INP noise emission criteria noted above. Indicative assessment of the mechanical plant noise emissions shall be included, once the project moves into the next design phase.

5.2.1 Mechanical plant

Mechanical plant noise emission can be controllable by appropriate mechanical system design and implementation of common engineering methods that may include any of the following:

- Procurement of 'quiet' plant;
- Strategic positioning of plant away from sensitive neighbouring premises, maximising the intervening shielding between the plant and sensitive neighbouring premises;
    - Provision should be made for rooftop plant decks for air-conditioning services in the centre of the site with provision for acoustic perimeter screening to the decks;
    - Carpark exhaust fan located in a dedicated plant room, with ductwork to roof exhaust, and supply to intake plenum;
    - Placement of loading dock in the basement, away from residential receivers and utilising electric equipment;
- Commercially available silencers or acoustic attenuators for air discharge and air intakes of plant;
- Acoustically lined and lagged ductwork;
- Acoustic screens and barriers between plant and sensitive neighbouring premises;

All mechanical plant shall have the cumulative noise emissions reviewed prior to CC to ensure ongoing compliance.

Identified mechanical equipment shall be mounted on vibration isolators and balanced in accordance with Australian Standard 2625 "Rotating and Reciprocating Machinery – Mechanical Vibration".

We recommend a full and detailed assessment with fully documented acoustic treatments be undertaken at the detailed design phase of the development, followed by construction/installation supervision of mechanical plant and equipment acoustic treatment. Compliance testing following the installation of the plant should also be undertaken.

We do not anticipate any significant vibration from the use of the site impacting surrounding receivers. Vibration isolation will be nominated as required for the comfort of the occupants of the site (typically for mechanical plant and equipment).

All mechanical plant shall comply with the criteria set hereby in this report and in accordance with SEARs.

5.2.2 In principle mechanical noise assessment.

An in-principle assessment of noise emissions from key mechanical plant and equipment has been undertaken, based on preliminary design and selections by Waterman (project Mechanical Engineers). The following treatments are indicative only and subject to refinement, changes in mechanical plant selections, and further coordination in Detailed Design.

This section outlines the key mechanical plant systems provided by Waterman, and the treatments and management controls applicable to their use.

Equipment usage on mixed use buildings tends to vary over the day, evening and night time periods. For example, air conditioning tends to have its peak usage during the day, but ramps down at night. Similarly, carpark exhaust fans usually ramp down at night when there are fewer vehicle movements and so a lesser requirement for exhausting vehicle gasses. Where these operational considerations have been included in the acoustic calculations, they are noted.

Building 1 Carpark Exhaust fan

Proposed selection is AP1254CA6/28, outlet 80dB(A) @3m – mounted in riser at roof level of Building 1.

Discharge treatment is a rectangular silencer equal to N3T17R-475-125from Fantech.

Intake treatment is a C2P-200 to the intake side of the fan and 3m of 50mm thick internal duct lining.

To be fitted with a VSD and run at no more than 50% between 10pm and 7am.

Within the adjacent unit, the 200mm concrete wall is to be upgraded with a separate stud with no connection to the wall and minimum 100mm airgap, insulated 75mm thick 11kg/m^3 glasswool with 2x16mm fire rated plasterboard lining.

Building 1 Stair Pressurisation Fans 3 and 4

Proposed selection is AP0904CP9/31, outlet 72dB(A) at 3m, inlet 73dB(A) at 3m – mounted on the roof of Building 1.

Targeting 80dB(A) L_{eq} in the fire isolated corridor and 65dB(A) L_{eq} in occupied space, given it is emergency plant, to be tested during the day, or operated only in the event of an emergency.

Intake side treatment – C2-090 open type circular attenuator and one 50mm thick internally lined bend between the fans and the intake.

Supply side treatment: C1-090 open type circular attenuator and one 50mm thick internally lined bend between the fans and the stair.

Fan casing and flexible connections to be wrapped with 8kg/m^2 mass loaded vinyl or installed in an enclosure of 9mm fibre cement with 50mm thick 11kg/m^3 glasswool insulation.

Building 1 Rooftop mounted Kitchen Exhaust Fan

Proposed selection is AP0634AA10/17 exhaust outlet 68dB(A) at 3m. To be installed on the roof of Building 1.

Fan assumed to run until 10pm only, or be fitted with a VSD to reduce the fan speed to 50% from 10pm, for operation to midnight.

Exhaust side: Minimum of C2-063QS circular open type silencer with Q-seal facing, with minimum of 2m of 50mm thick internally lined ductwork plus one lined bend.

Fan casing and flexible connections to be installed in an enclosure of 9mm compressed fibre cement with 50mm thick 11kg/m^3 glasswool insulation in the cavity.

Intake side: Minimum of C2-063QS circular open type silencer with Q-seal facing

Building 1 Stair Pressurisation Fans 1 and 2

Proposed selection AP1254CA6/21, 80dB(A) @3m, to be installed in Basement 1.

Targeting 80dB(A) L_{eq} in the fire isolated corridor and 65dB(A) L_{eq} in occupied space, and 80dB(A) L_{eq} in the carpark during fire mode, given it is emergency plant, to be tested during the day, or operated only in the event of an emergency.

Intake side: C2P-125 circular podded silencer and 1m straight plus one bend all lined 50mm thick.

Supply side: C2-125 circular open style silencer and 1m straight plus one bend all lined 50mm thick.

Case: Fan casing and flexible connections to be installed in an enclosure of 2x9mm compressed fibre cement with 50mm thick 11kg/m^3 glasswool insulation in the cavity.

Building 1 Carpark Supply Air Fan

Proposed selection is AP1004CP6/33, 77dB(A) @3m

Fan is to run 24 hours a day, but between 10pm and 7am, is to run on a VSD at no more than 50% fanspeed.

Intake: N3T15F-225-165 rectangular silencer and a minimum of 1m of 50mm thick internally lined ductwork and one 50mm thick lined bend.

Supply: N2T07C-220-195 rectangular silencer and a minimum of 1m of 50mm thick internally lined ductwork and one 50mm thick lined bend.

Fan casing and flexible connections to be installed in an enclosure of 2x9mm compressed fibre cement with 50mm thick 11kg/m^3 glasswool insulation in the cavity.

Building 1 Loading Dock Exhaust Fan

Proposed selection is AP0564BP14/37, 63dB(A) @3m, fan on level B1 lower ground

Intake: line minimum of 3m straight duct and 2 bends, with 50mm thick internal lining

Exhaust: line minimum of 3m straight duct and 2 bends, with 50mm thick internal lining

Case: No additional treatment, located in store room.

Building 2 Stair Pressurisation Fan 1 and 2

Proposed SWSI centrifugal fan 68dB(A)@3m and 64dB(A)@3m, located on LG level

Intake: line minimum of 3m straight duct and one bend, with 50mm thick internal lining

Supply: line the first 3m straight duct 50mm thick internal lining

Case: Install a resiliently suspended ceiling in the plant room with minimum 150mm ceiling void and 2x13mm fire rated plasterboard.

Building 2 Stair Pressurisation Fan 3 and 4

Proposed SWSI centrifugal fan 68dB(A)@3m and 64dB(A)@3m, located on LG level

Intake: line minimum of 3m straight duct and one bend, with 50mm thick internal lining

Supply: line the first 3m straight duct 50mm thick internal lining

Case: Install a resiliently suspended ceiling in the plant room with minimum 150mm ceiling void and 2x13mm fire rated plasterboard.

Building 2 Car Park Supply Fan

Proposed SWSI centrifugal fan 68dB(A)@3m, located on LG level

Fan to run on a VSD reduced to 50% fan speed between 10pm and 7am.

Intake: N3T10E-200-150 rectangular silencer and one 50mm thick internally lined bend between the fan and the intake.

Supply: Line 50mm thick a minimum of 4m straight and 2 lined bends before the first grille (lining to be located as close to the fan as possible).

Case: Install a resiliently suspended ceiling in the plant room with minimum 150mm ceiling void and 2x13mm fire rated plasterboard.

Building 2 CPEF

Proposed SWSI centrifugal fan 68dB(A)@3m, located on LG

Fan to run on a VSD reduced to 50% fan speed between 10pm and 7am.

Exhaust side: internally insulate minimum 50mm thick the first 4m straight and 2 bends.

Intake: internally insulate minimum 50mm thick the first 2m straight and 2 bends.

Riser to be nom 200mm concrete.

Building 2 LDEF

Proposed AP0714GP6/15, 70dB(A)@3m, located on B1

Fan to run on a VSD reduced to 50% fan speed between 10pm and 7am.

Intake: line a minimum of the first 3m and one bend 50mm thick.

Exhaust: Line the first 5m and one bend 50mm thick internally.

Case: Wrap the fan casing with 8kg/m^3 loaded vinyl lagging.

Building 3 Stair Pressurisation Fan 1 2 3 4

Proposed SWSI centrifugal fans 2x 68dB(A)@3m and 2x 64dB(A)@3m, located on Basement 1 level

Targeting 80dB(A) L_{eq} in the fire isolated corridor and 65dB(A) L_{eq} in occupied space, given it is emergency plant, to be tested during the day, or operated only in the event of an emergency.

Intake: line minimum of 4m straight duct and one bend, with 50mm thick internal lining

Supply: line the first 3m straight duct 50mm thick internal lining

Case: Install a resiliently suspended ceiling in the plant room with minimum 150mm ceiling void and 2x13mm fire rated plasterboard.

Building 3 CPEF

Proposed SWSI centrifugal fan 68dB(A)@3m, located on LG

Fan to run on a VSD reduced to 50% fan speed between 10pm and 7am.

Exhaust side: internally insulate minimum 50mm thick the first 4m straight and 2 bends.

Intake: internally insulate minimum 50mm thick the first 2m straight and 2 bends.

Riser to be nom 200mm concrete.

Building 3 Car Park Supply Fan

Proposed SWSI centrifugal fan 68dB(A)@3m, located on LG level

Fan to run on a VSD reduced to 50% fan speed between 10pm and 7am.

Intake: N3T10E-200-150 rectangular silencer and one 50mm thick internally lined bend between the fan and the intake.

Supply: Line 50mm thick a minimum of 4m straight and 2 lined bends before the first grille (lining to be located as close to the fan as possible).

Case: Install a resiliently suspended ceiling in the plant room with minimum 150mm ceiling void and 2x13mm fire rated plasterboard.

Air conditioning condensers are proposed to be located on the balconies. The indicative selection has a sound pressure level of 56dB(A) at 1m. On that basis, noise emissions to existing residential receivers external to the site are predicted to be in the order of 36dB(A) (assuming it sits behind a solid balustrade). No additional acoustic treatment would be required to achieve compliance with the NPfI goals. Additional management controls may be required to ensure compliance with the Protection of the Environment Operations Regulation, if the residential condensers are audible in another dwelling.

5.3 RNP -Noise from traffic generated by the development

The measured road traffic noise on Mann Street already exceeds the daytime and night time RNP objectives. On that basis, the development should not cause an increase of traffic noise in excess of 2dB. Noise from traffic generated by the site (being 80 vehicles movements per peak hour as advised by traffic engineers Ason Group) is predicted to result in an overall increase in traffic on Dwyer Street of approximately 2dB which is acoustically acceptable. The increase on Mann Street would be less, as it carries a greater number of vehicles already (making the difference between pre and post development less).

6 Internal Acoustic Separation

As a minimum requirement, walls and floors and separation of services around sole occupancy units shall comply with the National Construction Code (NCC) / Building Code of Australia (BCA) 2022 or later, as relevant to the date of submission of the Construction Certificate.

Internal partitioning for separation of retail spaces etc are not governed by the NCC and will be determined/refined in consultation with the client during the detailed design phase.

6.1 NCC 2022 Requirements

The National Construction Code 2022 (NCC 2022) - Volume One sets out the following acoustic provisions for Class 2 and 3 buildings:

F7D3 Determination of airborne sound insulation ratings

A form of construction required to have an airborne sound insulation rating must –

> *(a) have the required value for weighted sound reduction index (Rw) or weighted sound reduction index with spectrum adaptation term (Rw + Ctr) determined in accordance with AS/NZS ISO 717.1 using results from laboratory measurements; or*
>
> *(b) comply with Specification 28.*

F7D4 Determination of impact sound insulation ratings

(1) A floor in a building required to have an impact sound insulation rating must –

> *(a) have the required value for weighted normalised impact sound pressure level (Ln,w) determined in accordance with AS ISO 717.2 using results from laboratory measurements; or*
>
> *(b) comply with Specification 28*

(2) A wall in a building required to have an impact sound insulation rating must –

> *(a) for a Class 2 or 3 building be of discontinuous construction and*
>
> *(b) (Class 9c)*

(3) For the purposes of this Part, discontinuous construction means a wall having a minimum 20 mm cavity between 2 separate leaves, and

> *(a) for masonry, where wall ties are required to connect leaves, the ties are of the resilient type; and*

(b) for other than masonry, there is no mechanical linkage between leaves except at the periphery.

F7D5 Sound insulation rating of floors

(1) A floor in a Class 2 or 3 building must have an Rw + Ctr (airborne) not less than 50 and an Ln,w (impact) not more than 62 if it separates –

(a) sole-occupancy units; or

(b) a sole-occupancy unit from a plant room, lift shaft, stairway, public corridor, public lobby or the like, or parts of a different classification.

(2) (Class 9c)

F7D6 Sound insulation rating of walls

(1) A wall in a Class 2 or 3 building must –

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

(b) 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

(c) comply with F7D4(2) if it separates:

(i) 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

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

(2) 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.

(3) (Class 9c)

(4) (Class 9c)

(5) Where a wall required to have sound insulation has a floor above, the wall must continue to –

(a) the underside of the floor above; or

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

(6) Where a wall required to have sound insulation has a roof above, the wall must continue to –

(a) the underside of the roof above; or

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

F7D7 Sound insulation rating of internal services

(1) If a duct or soil, waste or water supply pipe, including a duct or pipe that is located in a wall or floor cavity, serves or passes through more than one sole-occupancy unit, the duct or pipe must be separated from the rooms of any sole-occupancy unit by construction with an Rw+Ctr (airborne) not less than –

(a) 40 if the adjacent room is a habitable room (other than a kitchen); or

(b) 25 if the adjacent room is a kitchen or non-habitable room.

(2) If a stormwater pipe passes through a sole-occupancy unit, it must be separated in accordance with (1)(a) and (b).

F7D8 Sound isolation of pumps

A flexible coupling must be used at the point of connection between the service pipes in a building and any circulating or other pump.

NCC 2022, Specification outlines a number of different "Acceptable forms of constructions for walls and floors". Use of Acceptable forms of constructions is not mandatory. The design team will determine the particular constructions during the detailed design stage (to be finalised prior to Construction Certificate), however based on previous projects it is anticipated that internal partitions around sole occupancy units will likely be steel stud with plasterboard (or equivalent) linings and insulation in the cavity.

7 Construction noise

A detailed Excavation and Construction Management Plan should be prepared for the site prior to the issue of Construction Certificate detailing the site specific plant and equipment to be used, expected periods of construction, and noise and vibration management treatments and procedures to be implemented.

7.1 Environmental Protection Authority's Construction Noise Guidelines

The Environmental Protection Authority (EPA) released its Interim Construction Noise Guideline (ICNG) in 2009. This document is being referred to as EPA's standard policy for assessing construction noise on new projects.

The key components of the ICNG that can be incorporated into this assessment include:

1. Use of LAeq as the descriptor for measuring and assessing construction noise.

In recent years NSW noise policies including EPA's NSW Industrial Noise Policy (INP) and the NSW Environmental Criteria for Road Traffic Noise (ECRTN) have moved to the primary use of LAeq over any other descriptor. As an energy average, LAeq provides ease of use when measuring or calculating noise levels since a full statistical analysis is not required as when using, for example, the LA10 descriptor.

Consistent with the latest guideline (ICNG) the use of LAeq as the key descriptor for measuring and assessing construction noise may follow a 'best practice' approach.

2. Application of feasible and reasonable noise mitigation measures

As stated in the ICNG, a noise mitigation measure is feasible if it is capable of being put into practice, and is practical to build given the project constraints.

Selecting reasonable mitigation measures from those that are feasible involves making a judgement to determine whether the overall noise benefit outweighs the overall social, economic and environmental effects, including the cost of the measure.

3. Quantitative and qualitative assessment

The ICNG provides two methods for assessment of construction noise, being either a quantitative or a qualitative assessment.

A quantitative assessment is recommended for major construction projects of significant duration, and involves the measurement and prediction of noise levels, and assessment against set criteria.

A qualitative assessment is recommended for small projects with a short-term duration where works are not likely to affect an individual or sensitive land use for more than three weeks in total. It focuses on

minimising noise disturbance through the implementation of feasible and reasonable work practices, and community notification.

Given the significant scale of the construction works proposed for this Project, a quantitative assessment is carried out herein, consistent with the ICNG's requirements.

4. Management Levels

Residences

Table 7-1 below (reproduced from Table 2 of the ICNG) sets out the noise management levels and how they are to be applied. The guideline intends to provide respite for residents exposed to excessive construction noise outside the recommended standard hours whilst allowing construction during the recommended standard hours without undue constraints.

The rating background level (RBL) is used when determining the management level. The RBL is the overall single-figure background noise level measured in each relevant assessment period (during or outside the recommended standard hours).

Table 7-1: Noise at residences using quantitative assessment

Time of Day	Management Level $L_{Aeq\ (15\ min)}$*	How to Apply
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected RBL + 10dB(A)	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured LAeq (15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5dB(A)	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5dB(A) above the noise affected level, the proponent should negotiate with the community. For guidance on negotiating agreements see section 7.2.2.

* Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence. Noise levels may be higher at upper floors of the noise affected residence.

Table 7-2: Noise Affected Noise Management Levels - Standard Construction Hours

Receiver	RBL, L_{A90} Day (7am - 6pm)	Noise Management Level, $L_{Aeq(15min)}$
R1, R5, R6, R7	56	56+10=66
R2, R3, R4,	59	59 + 10 = 69

Sensitive Land Use

Table 7-3 below (reproduced from Table 2 of the ICNG) sets out the noise management levels for various sensitive land use developments.

Table 7-3: Noise at other sensitive land uses using quantitative assessment

Land use	Management level, LAeq (15 min) – applies when land use is being utilised
Industrial premises	75
Commercial (offices, retail)	70

7.2 Construction source noise levels

A detailed assessment of construction noise will need to be undertaken at the conclusion of the detailed design phase when there is more certainty on the equipment and methodologies that will be used to construct the building. However, this section presents a preliminary assessment of noise emissions from the construction stage.

Table 7-4 Typical construction equipment & sound power levels, dB(A) re 1pW

Plant item	Plant description	Sound power levels
Demolition, Excavation and Piling		
1.	Concrete saw	120*
2.	Excavator with hammer	120*
3.	Excavator with bucket	108
4.	Piling drilling rig	111
5.	Truck – cement mixer	108
6.	Concrete pump	102
7.	Concrete vibrator	100
8.	Bobcat	102
9.	Dump Truck	108
Construction		
10.	Powered hand tools	110*
11.	Delivery trucks	106

Plant item	Plant description	Sound power levels
12.	Truck – cement mixer	108
13.	Cherry picker	102
14.	Concrete pump	105
15.	Concrete vibrator	100
16.	Tower Crane (Diesel)	105
17.	Air compressor - silenced	95

*Inclusive of 5dB(A) penalty for tonality/impulsiveness.

7.3 Predicted Noise Levels

Noise levels at any receiver location resulting from construction works would depend on the location of the receiver with respect to the area of construction, shielding from intervening topography and structures, and the type and duration of construction being undertaken. Furthermore, noise levels at receivers would vary significantly over the total construction program due to the transient nature and large range of plant and equipment that could be used.

Detailed calculations shall be undertaken after appointment of the contractor when the methodologies are well resolved.

7.4 General noise management measures

The following general noise management measures are recommended for all receiver locations:

- Use less noisy plant and equipment, where feasible and reasonable.
- Plant and equipment must be properly maintained.
- Strategically position plant on site to reduce the emission of noise to the surrounding neighbourhood and to site personnel where feasible and reasonable.
- Avoid any unnecessary noise when carrying out manual operations and when operating plant.
- Any equipment not in use for extended periods during construction work must be switched off.
- Simultaneous operation of noisy plant within discernible range of a sensitive receiver is to be limited/avoided where possible.
- The offset distance between noisy plant and adjacent sensitive receivers is to be maximised where practicable.
- Plant used intermittently to be throttled down or shut down when not in use where practicable.

- Noise-emitting plant to be directed away from sensitive receivers where possible.
- Staging of construction works so as to erect solid external walls first and utilising them to provide noise shielding to the noise sensitive receivers. However, the structural integrity of the external walls should be investigated prior to implementing this measure and should be prioritised over the noise benefits.
- In addition to the noise mitigation measures outlined above, a management procedure will need to be put in place to deal with noise complaints that may arise from construction activities. Each complaint will need to be investigated and appropriate noise amelioration measures put in place to mitigate future occurrences, where the noise in question is in excess of allowable limits.
- Good relations with people living and working in the vicinity of a construction site should be established at the beginning of a project and be maintained throughout the project, as this is of paramount importance. Keeping people informed of progress and taking complaints seriously and dealing with them expeditiously is critical. The person selected to liaise with the community must be adequately trained and experienced in such matters.

8 Construction Vibration Objectives

Construction vibration is associated with three main types of impact:

- disturbance to building occupants;
- potential damage to buildings; and
- potential damage to sensitive equipment in a building.

Generally, if disturbance to building occupants is controlled, there is limited potential for structural damage to buildings.

Vibration amplitude may be measured as displacement, velocity, or acceleration.

- Displacement (x) measurement is the distance or amplitude displaced from a resting position. The International System of Units (SI unit) for distance is the metre (m), although common industrial standards include mm.
- Velocity ($v=\Delta x/\Delta t$) is the rate of change of displacement with respect to change in time. The SI unit for velocity is metres per second (m/s), although common industrial standards include mm/s. The Peak Particle Velocity (PPV) is the greatest instantaneous particle velocity during a given time interval. If measurements are made in 3-axis (x, y, and z) then the resultant PPV is the vector sum (i.e. the square root of the summed squares of the maximum velocities) regardless of when in the time history those occur.
- Acceleration ($a=\Delta v/\Delta t$) is the rate of change of velocity with respect to change in time. The SI unit for acceleration is metres per second squared (m/s2). Construction vibration goals are summarised below.

Construction vibration goals are summarised below.

A detailed construction vibration management plan shall be prepared toward the conclusion of the detailed design phase with input from the building contractor, so that it can take into account the proposed construction methodologies and equipment.

8.1 Disturbance to Buildings Occupants

Assessment of potential disturbance from vibration on human occupants of buildings is made in accordance with the DECC '*Assessing Vibration; a technical guideline*' (DECC, 2006). The guideline provides criteria which are based on the British Standard BS 6472-1992 '*Evaluation of human exposure to vibration in buildings (1-80Hz)*'. Sources of vibration are defined as either 'Continuous', 'Impulsive' or 'Intermittent'. Table 8-1 provides definitions and examples of each type of vibration.

Table 8-1: Types of vibration

Type of vibration	Definition	Examples
Continuous vibration	Continues uninterrupted for a defined period (usually throughout the day-time and/or night-time)	Machinery, steady road traffic, continuous construction activity (such as tunnel boring machinery).
Impulsive vibration	A rapid build-up to a peak followed by a damped decay that may or may not involve several cycles of vibration (depending on frequency and damping). It can also consist of a sudden application of several cycles at approximately the same amplitude, providing that the duration is short, typically less than 2 seconds	Infrequent: Activities that create up to 3 distinct vibration events in an assessment period, e.g. occasional dropping of heavy equipment, occasional loading and unloading.
Intermittent vibration	Can be defined as interrupted periods of continuous or repeated periods of impulsive vibration that varies significantly in magnitude	Trains, nearby intermittent construction activity, passing heavy vehicles, forging machines, impact pile driving, jack hammers. Where the number of vibration events in an assessment period is three or fewer, this would be assessed against impulsive vibration criteria.

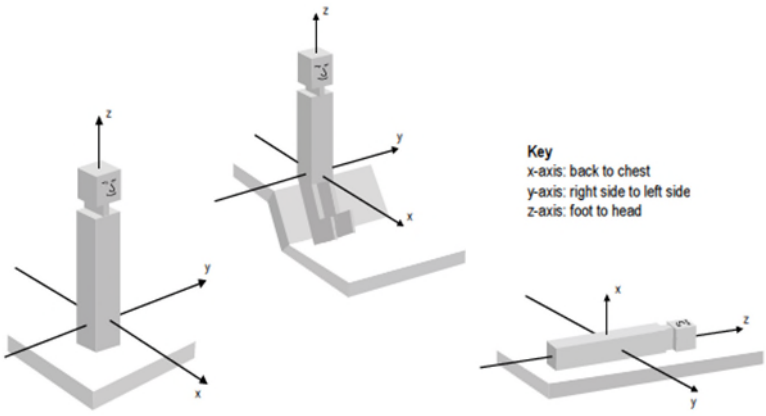
Source: Assessing Vibration; a technical guideline, Department of Environment & Climate Change, 2006

The vibration criteria are defined as a single weighted root mean square (rms) acceleration source level in each orthogonal axis. Section 2.3 of the guideline states:

> *'Evidence from research suggests that there are summation effects for vibrations at different frequencies. Therefore, for evaluation of vibration in relation to annoyance and comfort, overall weighted rms acceleration values of the vibration in each orthogonal axis are preferred (BS 6472).'*

When applying the criteria, it is important to note that the three directional axes are referenced to the human body, i.e. x-axis (back to chest), y-axis (right side to left side) or z-axis (foot to head). Vibration may enter the body along different orthogonal axes and affect it in different ways. Therefore, application of the criteria requires consideration of the position of the people being assessed, as illustrated in Figure 3. For example, vibration measured in the horizontal plane is compared with x- and y-axis criteria if the concern is for people in an upright position, or with the y- and z- axis criteria if the concern is for people in the lateral position.

Figure 3: Orthogonal axes for human exposure to vibration



The preferred and maximum values for continuous and impulsive vibration are defined in Table 2.2 of the guideline and are reproduced in Table 8-2.

Table 8-2: Preferred and maximum levels for human comfort

Location	Assessment period[1]	Preferred values		Maximum values	
		z-axis	x- and y-axis	z-axis	x- and y-axis
Continuous vibration (weighted RMS acceleration, m/s^2, 1-80Hz)					
Critical areas[2]	Day- or night-time	0.005	0.0036	0.010	0.0072
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night-time	0.007	0.005	0.014	0.010
Offices, schools, educational institutions and places of worship	Day- or night-time	0.020	0.014	0.040	0.028
Workshops	Day- or night-time	0.04	0.029	0.080	0.058
Impulsive vibration (weighted RMS acceleration, m/s^2, 1-80Hz)					
Critical areas[2]	Day- or night-time	0.005	0.0036	0.010	0.0072
Residences	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.10	0.071	0.20	0.14
Offices, schools, educational institutions and places of worship	Day- or night-time	0.64	0.46	1.28	0.92
Workshops	Day- or night-time	0.64	0.46	1.28	0.92

Notes:
1. Daytime is 7:00am to 10:00pm and night-time is 10:00pm to 7:00am
2. Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. There may be cases where sensitive equipment or delicate tasks require more stringent criteria than the human comfort criteria specify above. Stipulation of such criteria is outside the scope of their policy and other guidance documents (e.g. relevant standards) should be referred to. Source: BS 6472-1992

The acceptable vibration dose values (VDV) for intermittent vibration are defined in Table 2.4 of the guideline and are reproduced in Table 8-3

Table 8-3: Acceptable vibration dose values for intermittent vibration ($m/s^{1.75}$)

Location	Daytime[1]		Night-time[1]	
	Preferred value	Maximum value	Preferred value	Maximum value
Critical areas[2]	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

Notes:
1. Daytime is 7:00am to 10:00pm and night-time is 10:00pm to 7:00am
2. Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. These criteria are only indicative, and there may be a need to assess intermittent values against the continuous of impulsive criteria for critical areas.
Source: BS 6472-1992

8.2 Building Structural Damage

Potential structural damage of buildings as a result of vibration is typically managed by ensuring vibration induced into the structure does not exceed certain limits and standards, such as British Standard 7385 Part 2 and German Standard DIN4150-3, with the preference being BS7385. Currently there is no existing Australian Standard for assessment of structural building damage caused by vibration energy.

It is noted that vibration levels required to cause minor cosmetic damage are typically 10 x higher than levels that will cause disturbance to building occupants. Many building occupants assume that building damage is occurring when they feel vibration or observe rattling of loose objects, however the level of vibration at which people perceive vibration or at which loose objects may rattle is far lower than vibration levels that can cause damage to structures.

Within British Standard 7385 Part 1: 1990, different levels of structural damage are defined:

- *Cosmetic - The formation of hairline cracks on drywall surfaces, or the growth of existing cracks in plaster or drywall surfaces; in addition the formation of hairline cracks in mortar joints of brick/concrete block construction.*
- *Minor - The formation of large cracks or loosening of plaster or drywall surfaces, or cracks through bricks/concrete blocks.*
- *Major - Damage to structural elements of the building, cracks in supporting columns, loosening of joints, splaying of masonry cracks, etc.*

The vibration limits in Table 1 of British Standard 7385 Part 2 (1993) are for the protection against cosmetic damage, however guidance on limits for minor and major damage is provided in Section 7.4.2 of the Standard:

> *7.4.2 Guide values for transient vibration relating to cosmetic damage*
>
> *Limits for transient vibration, above which cosmetic damage could occur are given numerically in Table 1 and graphically in Figure 1. In the lower frequency region where strains associated with a given vibration velocity magnitude are higher, the guide values for the building types corresponding to line 2 are reduced. Below a frequency of 4 Hz, where a high displacement is associated with a relatively low peak component particle velocity value a maximum displacement of 0.6 mm (zero to peak) should be used.*
>
> *Minor damage is possible at vibration magnitudes which are greater than twice those given in Table 1, and major damage to a building structure may occur at values greater than four times the tabulated values.*

Within DIN4150-3, damage is defined as "*any permanent consequence of an action that reduces the serviceability of a structure or one of its components*" (p.4). The Standard also outlines:

"For buildings as in lines 2 and 3 of Tables 1, 4 or B.1, the serviceability is considered to have been reduced if, for example

- *cracks form in plastered or rendered surfaces of walls;*
- *existing cracks in a structure are enlarged;*
- *partitions become detached from load-bearing walls or floor slabs.*

These effects are deemed 'minor damage. " (DIN4150.3:2016, p.6)

While the DIN Standard defines the above damage as 'minor', based on the definitions provided in BS7385, the DIN standard is considered to deal with cosmetic issues rather than major structural failures.

8.2.1.1 British Standard

British Standard 7385: Part 2 '*Evaluation and measurement of vibration in buildings*', can be used as a guide to assess the likelihood of building damage from ground vibration. BS7385 suggests levels at which 'cosmetic', 'minor' and 'major' categories of damage might occur.

The cosmetic damage levels set by BS 7385 are considered 'safe limits' up to which no damage due to vibration effects has been observed for certain particular building types. Damage comprises minor non-structural effects such as hairline cracks on drywall surfaces, hairline cracks in mortar joints and cement render, enlargement of existing cracks and separation of partitions or intermediate walls from load bearing walls. 'Minor' damage is considered possible at vibration magnitudes which are twice those given and 'major' damage to a building structure may occur at levels greater than four times those values.

BS7385 is based on peak particle velocity and specifies damage criteria for frequencies within the range 4Hz to 250Hz, being the range usually encountered in buildings. At frequencies below 4Hz, a maximum displacement value is recommended. The values set in the Standard relate to transient vibrations and to low-rise buildings. Continuous vibration can give rise to dynamic magnifications due to resonances and may need to be reduced by up to 50%. Table 8-4 sets out the BS7385 criteria for cosmetic, minor and major damage.

Regarding heritage buildings, British Standard 7385 Part 2 (1993) notes that "*a building of historical value should not (unless it is structurally unsound) be assumed to be more sensitive*" (p.5).

Table 8-4: BS 7385 structural damage criteria

Group	Type of structure	Damage level	Peak component particle velocity, mm/s		
			4Hz to 15Hz	15Hz to 40Hz	40Hz and above
1	Reinforced or framed structures Industrial and heavy commercial buildings	Cosmetic	50		
		Minor*	100		
		Major*	200		
2	Un-reinforced or light framed structures Residential or light commercial type buildings	Cosmetic	15 to 20	20 to 50	50
		Minor*	30 to 40	40 to 100	100
		Major*	60 to 80	80 to 200	200

Notes: Peak Component Particle Velocity is the maximum Peak particle velocity in any one direction (x, y, z) as measured by a tri-axial vibration transducer.

* Minor and major damage criteria established based on British Standard 7385 Part 2 (1993) Section 7.4.2

8.2.1.2 German Standard

German Standard DIN 4150 - Part 3 (2016) '*Vibration in buildings - Effects on Structures*' (DIN 4150-3:2016), also provides recommended maximum levels of vibration that reduce the likelihood of building damage caused by vibration and are generally recognised to be conservative.

DIN 4150-3:2016 presents the recommended maximum limits over a range of frequencies (Hz), measured at the foundations, in the plane of the uppermost floor of a building or structure or vertically on floor slabs. The vibration limits at the foundations increase as the frequency content of the vibration increases. The criteria are presented in Table 8-5.

Table 8-5: DIN 4150-3:2016 structural damage criteria

Group	Type of structure	Vibration velocity, mm/s				
		At foundation in all directions at frequency of			Plane of floor uppermost storey in horizontal direction	Floor slabs, vertical direction
		1Hz to 10Hz	10Hz to 50Hz	50Hz to 100Hz	All frequencies	All frequencies
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40	20
2	Residential buildings and buildings of similar design and/or occupancy	5	5 to 15	15 to 20	15	20
3	Structures that because of their particular sensitivity to vibration, cannot be classified under Groups 1 and 2 and are of great intrinsic value (eg listed buildings)	3	3 to 8	8 to 10	8	20

8.2.2 Damage to vibration sensitive equipment

Some high technology manufacturing facilities, hospitals and laboratories utilise equipment that is highly sensitive and susceptible to vibration, for example scanning electron microscopes and micro-electronic manufacturing facilities. In addition, buildings housing sensitive computer or telecommunications equipment may require assessment against stricter criteria than those nominated for building damage.

The adjacent premises include light industrial and commercial buildings in addition to residential dwellings. None of the business types in the surrounding buildings appear likely to contain vibration sensitive equipment.

8.2.3 Damage to buried services

Section 5.3 of DIN 4150-3:2016 also sets out guideline values for vibration velocity to be used when evaluating the effects of vibration on buried pipework. These values, which apply at the wall of the pipe, are reproduced and presented in Table 8-6 below.

Table 8-6: DIN 4150-3:2016 Guideline values for vibration velocity to be used when evaluating the effects of short-term vibration on buried pipework

Line	Pipe Material	Guideline values for vibration velocity measured at the pipe, mm/s
1	Steel, welded	100
2	Vitrified clay, concrete, reinforced concrete, prestressed concrete, metal (with or without flange)	80
3	Masonry, plastics	50

Note: For gas and water supply pipes within 2 m of buildings, the levels given in Table 8-5 should be applied. Consideration must also be given to pipe junctions with the building structure as potential significant changes in mechanical loads on the pipe must be considered.

For long-term vibration the guideline levels presented in Table 8-6 should be halved.

Recommended vibration goals for electrical cables and telecommunication services such as fibre optic cables range from between 50 mm/s and 100 mm/s. It is noted however that although the cables may sustain these vibration levels, the services they are connected to, such as transformers and switch blocks, may not. It is recommended that should such equipment be encountered during the construction process an individual vibration assessment should be carried out. This may include a specific CNVIS addressing impact on the utility and consultation with the utility provider to confirm specific vibration requirements.

8.3 Construction vibration assessment

The vibration generated from construction works will vary depending on the level and type of activity carried out at each site during each activity.

Potential vibration generated at receivers for this project will be dependent on separation distances, the intervening soil and rock strata, dominant frequencies of vibration and the receiver building's construction and structure. The recommended minimum working distances for vibration intensive plant are presented in Table 8-7, however these should be verified with site measurements

Table 8-7 Recommended minimum working distances for vibration intensive equipment

Plant item	Minimum working distance, m			
	Cosmetic damage			Human disturbance
	Commercial and industrial buildings[1]	Dwellings and similar structures[1]	Sensitive structures (e.g. heritage) [1]	Residences Day[2]
Pneumatic Hammer	5-10	10	20	10
Bored Piling	5	5	10	10

Notes: 1. Criteria referenced from DIN 4150 Structural Damage - Safe Limits for Short-term Building Vibration.
2. Daytime is 7 am to 10 pm;

Site specific buffer distances for vibration significant plant items must be measured on site where plant and equipment is likely to operate close to or within the minimum working distances for cosmetic damage.

Unlike noise, vibration from construction activities is difficult to predict due to many variables from site to site, for example soil type and conditions; sub surface rock; building types and foundations; and actual plant on site. The data relied upon in this assessment (tabulated above) is taken from a database of vibration levels measured at various sites or obtained from other sources (eg. BS5228-2:2009). They are not specific to this project as final vibration levels are dependent on many factors including the actual plant used, its operation and the intervening geology between the activity and the receiver.

As work will be required within the safe working distances, a detailed construction vibration management plan shall be prepared toward the conclusion of the detailed design phase with input from the building contractor, so that it can take into account the proposed construction methodologies and equipment.

9 Conclusion

Renzo Tonin & Associates have completed an assessment of the potential noise impacts to and from the proposed mixed use development at 372-372 Mann Street and 35-37 Dwyer Street, North Gosford in accordance with the SEARs.

In order to control traffic noise intrusion and comply with the nominated criteria, glazing and external building shell recommendations have been made in Section 4 above. A follow up assessment of noise intrusion will be required prior to construction certificate.

Recommendations to comply with noise emission criteria for the site, including mechanical plant (including vibration isolation for reciprocating plant), noise from traffic generated by the development and noise from use of café, pavilion and wellness centre have been presented in Section 5 of this report. A review of noise emission and refinement of particular treatments will be required prior to construction certificate.

Ratings are nominated for the internal acoustic separation within the building in Section 6 and the particular constructions for compliance will be refined during detailed design.

Sections 8 and 9 present the proposed strategies for the management of construction noise and vibration. As with most construction projects, noise levels above the Noise Management Levels are anticipated to occur at times, but the builder shall determine mitigation measures to reduce noise emissions as feasible and reasonable.

In conclusion, the proposed site is capable of complying with all relevant acoustic criteria through means of some standard and other specialised acoustic treatment and management.

APPENDIX A Glossary of terminology

The following is a brief description of the technical terms used to describe noise to assist in understanding the technical issues presented.

Adverse weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).
Ambient noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.
Assessment period	The period in a day over which assessments are made.
Assessment point	A point at which noise measurements are taken or estimated. A point at which noise measurements are taken or estimated.
Background noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L90 noise level (see below).
Decibel [dB]	The units that sound is measured in. The following are examples of the decibel readings of every day sounds: 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 CBD mall 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
dB(A)	A-weighted decibels. The A- weighting noise filter simulates the response of the human ear at relatively low levels, where the ear is not as effective in hearing low frequency sounds as it is in 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.
dB(C)	C-weighted decibels. The C-weighting noise filter simulates the response of the human ear at relatively high levels, where the human ear is nearly equally effective at hearing from mid-low frequency (63Hz) to mid-high frequency (4kHz), but is less effective outside these frequencies.
Frequency	Frequency is synonymous to pitch. 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.
Impulsive noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
Intermittent noise	The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.
L_{Max}	The maximum sound pressure level measured over a given period.
L_{Min}	The minimum sound pressure level measured over a given period.

L_1	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L_{10}	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L_{90}	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
L_{eq}	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.
Reflection	Sound wave changed in direction of propagation due to a solid object obscuring its path.
SEL	Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain Leq sound levels over any period of time and can be used for predicting noise at various locations.
Sound	A fluctuation of air pressure which is propagated as a wave through air.
Sound absorption	The ability of a material to absorb sound energy through its conversion into thermal energy.
Sound level meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound pressure level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone.
Sound power level	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.
Tonal noise	Containing a prominent frequency and characterised by a definite pitch.

APPENDIX B Results of unattended noise monitoring

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Vibration
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Background & Ambient Noise Monitoring Results - NSW 'Noise Policy for Industry', 2017

Periods with insufficient results excluded	L_{A90} Background Noise Levels[4]			L_{Aeq} Ambient Noise Levels		
Date	**Day[1]**	**Evening[2]**	**Night[3]**	**Day[1]**	**Evening[2]**	**Night[3]**
Tuesday-14-May-2024	-	44	-	-	62	-
Wednesday-15-May-2024	55	52	31	65	65	60
Thursday-16-May-2024	56	43	31	65	62	58
Friday-17-May-2024	57	44	38	65	62	57
Saturday-18-May-2024	-	50	36	-	63	59
Sunday-19-May-2024	52	42	31	64	61	58
Monday-20-May-2024	56	42	33	64	63	58
Tuesday-21-May-2024	57	45	31	65	62	58
Wednesday-22-May-2024	56	44	31	65	62	59
Thursday-23-May-2024	-	-	-	-	-	-
Representative Weekday[5]	**56**	**44**	**31**	**65**	**63**	**58**
Representative Weekend[5]	**52**	**46**	**34**	**64**	**62**	**59**
Representative Week[5]	**56**	**44**	**31**	**65**	**63**	**59**

Notes:

1. Day is 7:00am to 6:00pm on all days except Sundays and Public Holidays when it is 8:00am to 6:00pm 2. Evening is 6:00pm to 10:00pm

3. Night is the remaining periods 4. Assessment Background Level (ABL) for individual days 5. Rating Background Level (RBL) for L_{A90} and logarithmic average for L_{Aeq} 6. Leq is calculated in the free field. 2.5dB is subtracted from results if logger is placed at façade 7. Number in brackets represents th measured (actual) RBL value, which is below the minimum policy value of 30 dB(A) during the evening or night period or 35 dB(A) during the day period

374 Mann St, North Gosford

Road / Rail Noise Monitoring Results (at one metre from façade)

Periods with insufficient results excluded	L_{Aeq} Noise Levels		$L_{Aeq\ 1hr}$ Noise Levels			
Date	**Day[1]**	**Night[2]**	**Day - Up[4]**	**Day - Low[3]**	**Night - Up[4]**	**Night - Low[3]**
Tuesday-14-May-2024	-	62	-	-	66	55
Wednesday-15-May-2024	67	62	69	66	67	55
Thursday-16-May-2024	67	61	68	65	64	56
Friday-17-May-2024	67	60	67	64	61	57
Saturday-18-May-2024	67	61	68	65	64	57
Sunday-19-May-2024	66	61	67	63	64	55
Monday-20-May-2024	67	61	68	63	65	54
Tuesday-21-May-2024	67	61	68	64	64	55
Wednesday-22-May-2024	66	61	68	64	65	55
Thursday-23-May-2024	-	-	-	-	-	-
Representative Weekday[6]	**67**	**61**	**68**	**64**	**65**	**55**
Representative Weekend[6]	**66**	**61**	**68**	**64**	**64**	**56**
Representative Week[6]	**67**	**61**	**68**	**64**	**64**	**55**

Notes:

1. Day is 7:00am to 10:00pm 2. Night is 10:00pm to 7:00am 3. Lower 10th percentile $L_{Aeq\ 1hr}$

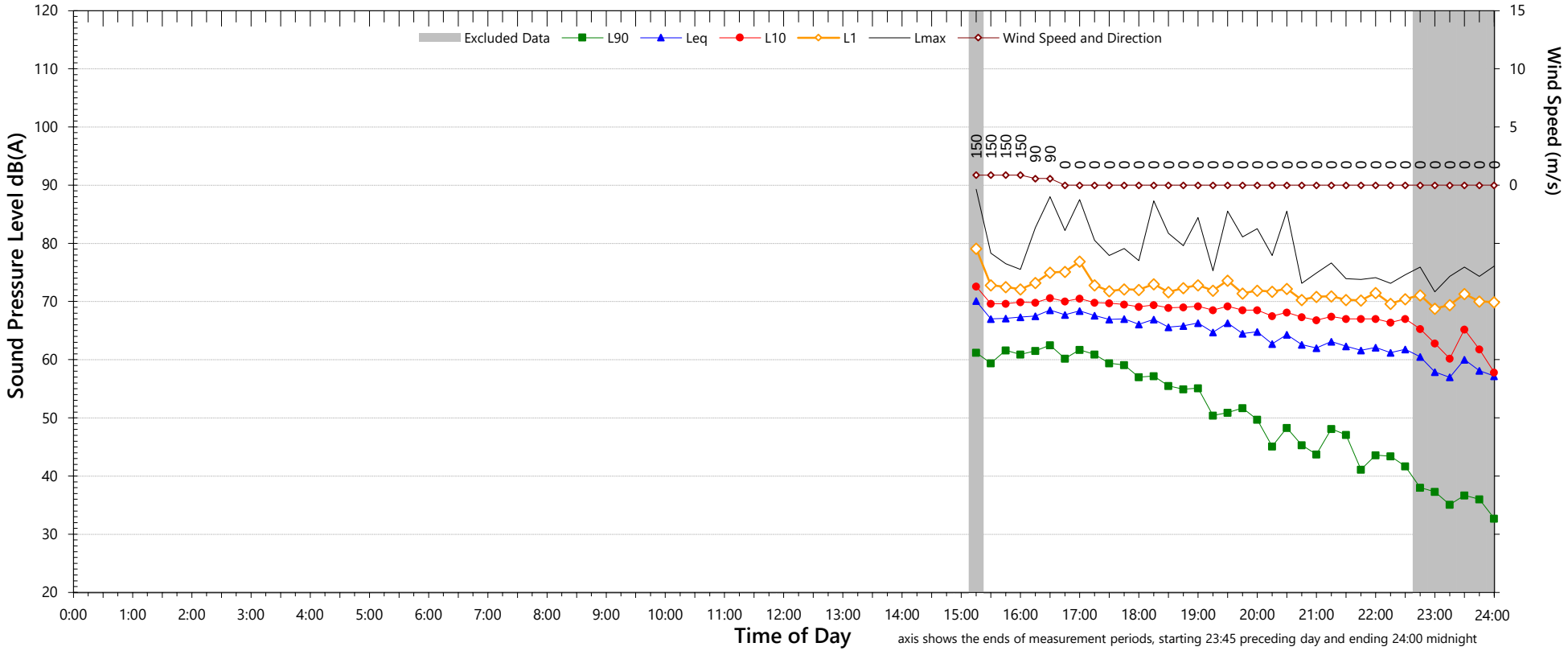
4. Upper 10th percentile $L_{Aeq\ 1hr}$ 5. Values are calculated at the facade. 2.5dB is added to results if logger is placed in the free field

6. Logarithmic average for L_{Aeq}, Median of daily L_{Aeq} for $L_{Aeq\ 1hr}$

Unattended Noise Monitoring Results

374 Mann St, North Gosford - L01 - Front yard of 374 Mann St

Tuesday, 14 May 2024



NSW Noise Policy for Industry (Free Field)				
Descriptor		**Day**[2]	**Evening**[3]	**Night**[4 5]
L_{A90} ABL		-	44	-
L_{Aeq}	(see note 6)	-	62	-

Night Time Maximum Noise Levels			**(see note 7)**
L_{AFMax} (Range)	74	to	96
L_{AFMax} - L_{Aeq} (Range)	16	to	30

NSW Road Noise Policy (1m from facade)		
Descriptor	**Day**	**Night**[5]
	7am-10pm	**10pm-7am**
$L_{Aeq\ 15\ hr}$ and $L_{Aeq\ 9\ hr}$	-	62
$L_{Aeq\ 1hr}$ upper 10 percentile	-	66
$L_{Aeq\ 1hr}$ lower 10 percentile	-	55

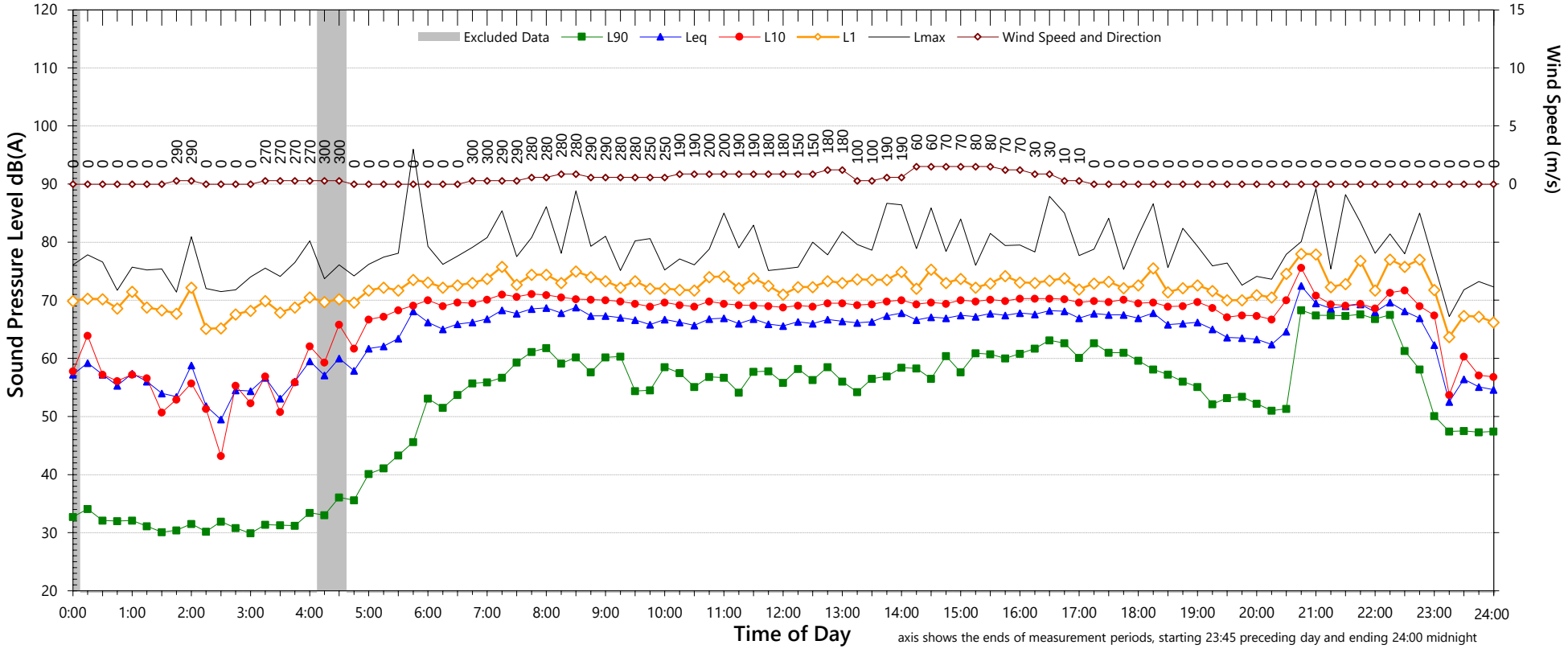
Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured 1m from facade; tabulated results free-field corrected
7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} >65dB(A) and where L_{AFMax}- L_{Aeq} ≥15dB(A)

Unattended Noise Monitoring Results

374 Mann St, North Gosford - L01 - Front yard of 374 Mann St

Wednesday, 15 May 2024



axis shows the ends of measurement periods, starting 23:45 preceding day and ending 24:00 midnight

NSW Noise Policy for Industry (Free Field)				
Descriptor		**Day[2]**	**Evening[3]**	**Night[4 5]**
L_{A90} ABL		55	52	31
L_{Aeq}	(see note 6)	65	65	60

Night Time Maximum Noise Levels			(see note 7)
L_{AFMax} (Range)	73	to	85
L_{AFMax} - L_{Aeq} (Range)	18	to	25

NSW Road Noise Policy (1m from facade)		
Descriptor	**Day**	**Night[5]**
	7am-10pm	**10pm-7am**
$L_{Aeq\ 15\ hr}$ and $L_{Aeq\ 9\ hr}$	67	62
$L_{Aeq\ 1hr}$ upper 10 percentile	69	67
$L_{Aeq\ 1hr}$ lower 10 percentile	66	55

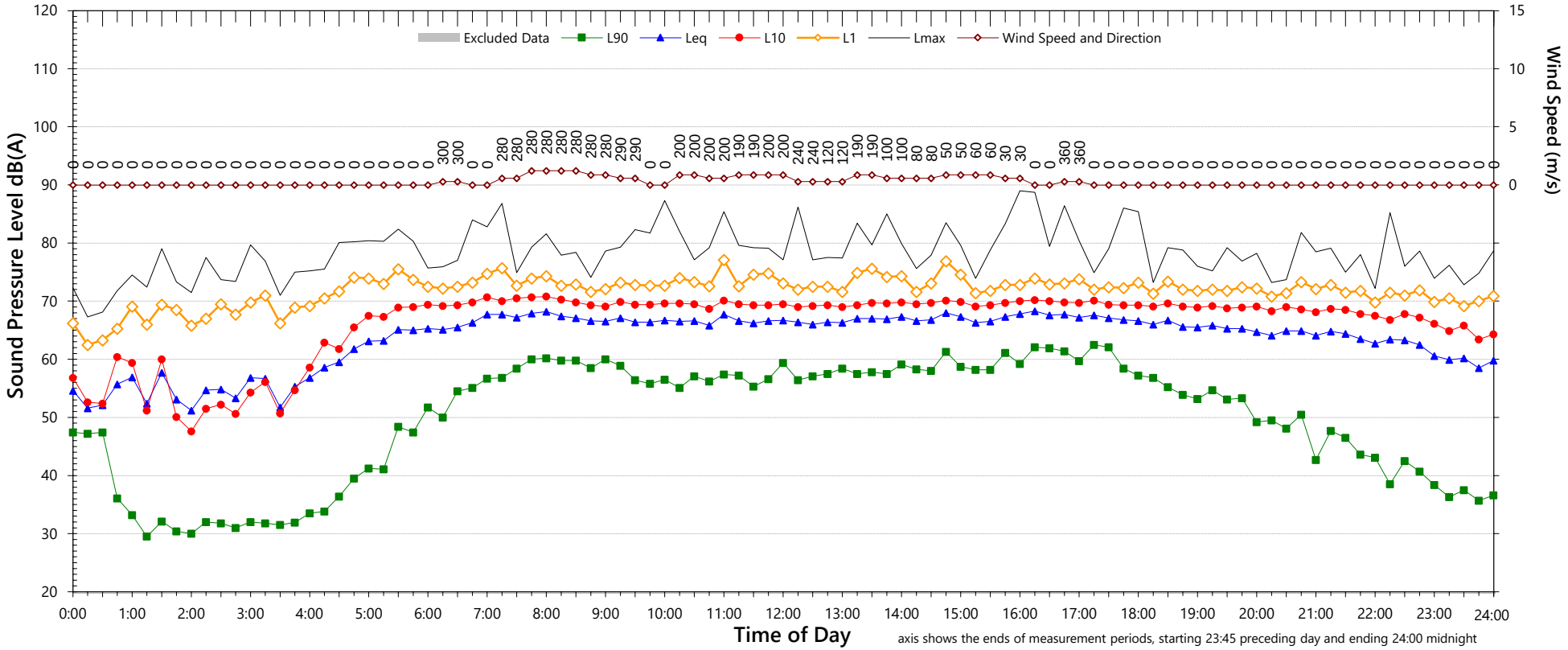
Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured 1m from facade; tabulated results free-field corrected
7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} >65dB(A) and where L_{AFMax}- L_{Aeq} ≥15dB(A)

Unattended Noise Monitoring Results

374 Mann St, North Gosford - L01 - Front yard of 374 Mann St

Thursday, 16 May 2024



axis shows the ends of measurement periods, starting 23:45 preceding day and ending 24:00 midnight

NSW Noise Policy for Industry (Free Field)				
Descriptor		**Day[2]**	**Evening[3]**	**Night[4 5]**
L_{A90} ABL		56	43	31
L_{Aeq}	(see note 6)	65	62	58

Night Time Maximum Noise Levels			(see note 7)
L_{AFMax} (Range)	75	to	85
L_{AFMax} - L_{Aeq} (Range)	17	to	25

NSW Road Noise Policy (1m from facade)		
Descriptor	**Day**	**Night[5]**
	7am-10pm	**10pm-7am**
$L_{Aeq\ 15\ hr}$ and $L_{Aeq\ 9\ hr}$	67	61
$L_{Aeq\ 1hr}$ upper 10 percentile	68	64
$L_{Aeq\ 1hr}$ lower 10 percentile	65	56

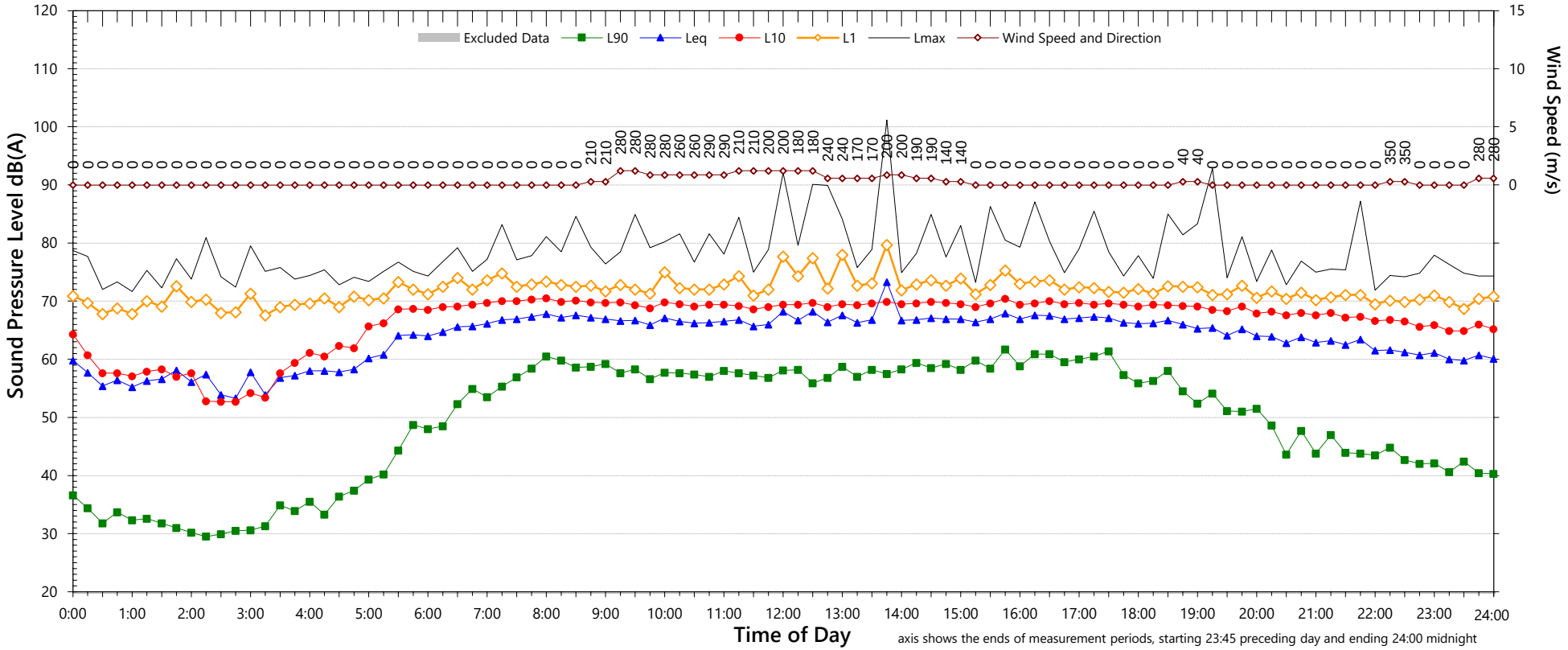
Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured 1m from facade; tabulated results free-field corrected
7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} >65dB(A) and where L_{AFMax}- L_{Aeq} ≥15dB(A)

Unattended Noise Monitoring Results

374 Mann St, North Gosford - L01 - Front yard of 374 Mann St

Friday, 17 May 2024



axis shows the ends of measurement periods, starting 23:45 preceding day and ending 24:00 midnight

NSW Noise Policy for Industry (Free Field)				
Descriptor		**Day[2]**	**Evening[3]**	**Night[4 5]**
L_{A90} ABL		57	44	38
L_{Aeq}	(see note 6)	65	62	57

Night Time Maximum Noise Levels			(see note 7)
L_{AFMax} (Range)	76	to	84
L_{AFMax} - L_{Aeq} (Range)	16	to	23

NSW Road Noise Policy (1m from facade)		
Descriptor	**Day**	**Night[5]**
	7am-10pm	**10pm-7am**
$L_{Aeq\ 15\ hr}$ and $L_{Aeq\ 9\ hr}$	67	60
$L_{Aeq\ 1hr}$ upper 10 percentile	67	61
$L_{Aeq\ 1hr}$ lower 10 percentile	64	57

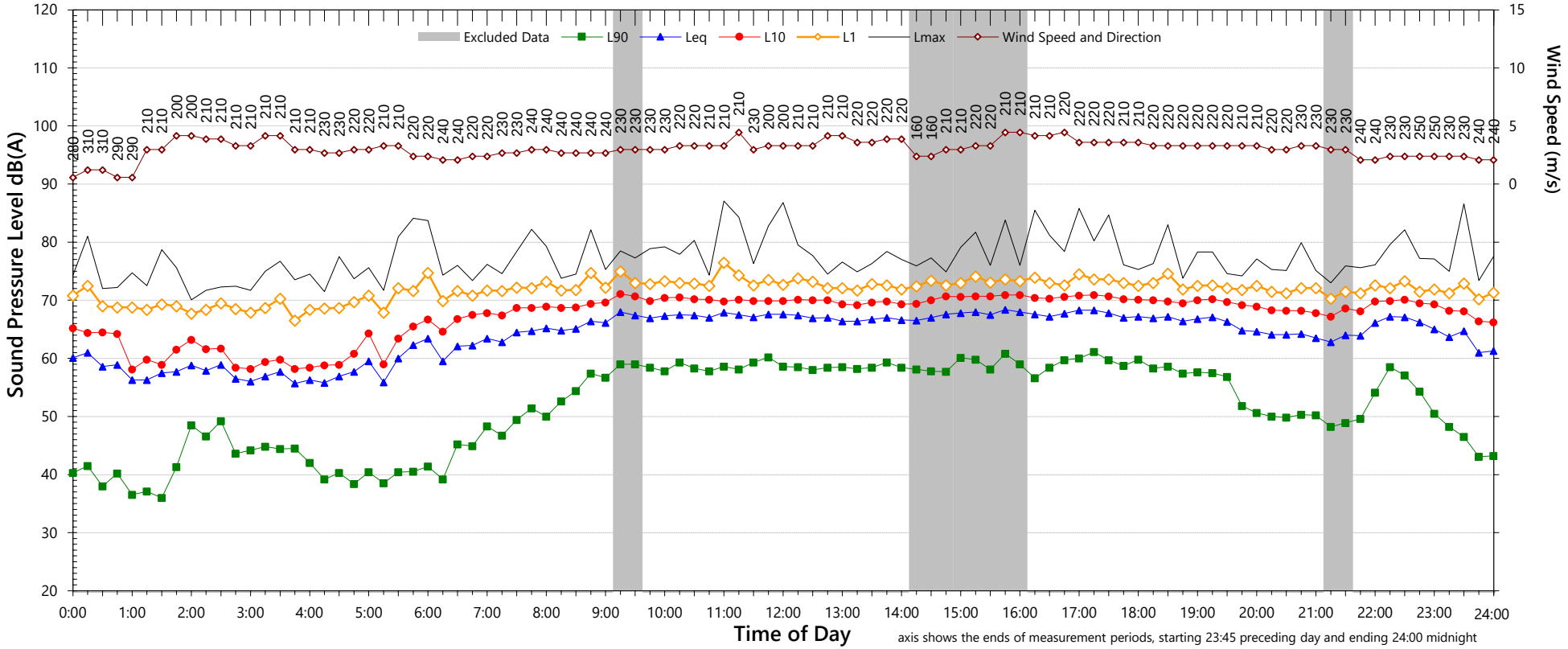
Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured 1m from facade; tabulated results free-field corrected
7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} >65dB(A) and where L_{AFMax}- L_{Aeq} ≥15dB(A)

Unattended Noise Monitoring Results

374 Mann St, North Gosford - L01 - Front yard of 374 Mann St

Saturday, 18 May 2024



axis shows the ends of measurement periods, starting 23:45 preceding day and ending 24:00 midnight

NSW Noise Policy for Industry (Free Field)				
Descriptor		**Day**[2]	**Evening**[3]	**Night**[4 5]
L_{A90} ABL		-	50	36
L_{Aeq}	(see note 6)	-	63	59

Night Time Maximum Noise Levels			(see note 7)
L_{AFMax} (Range)	76	to	88
L_{AFMax} - L_{Aeq} (Range)	16	to	27

NSW Road Noise Policy (1m from facade)		
Descriptor	**Day**	**Night**[5]
	7am-10pm	**10pm-7am**
$L_{Aeq\ 15\ hr}$ and $L_{Aeq\ 9\ hr}$	67	61
$L_{Aeq\ 1hr}$ upper 10 percentile	68	64
$L_{Aeq\ 1hr}$ lower 10 percentile	65	57

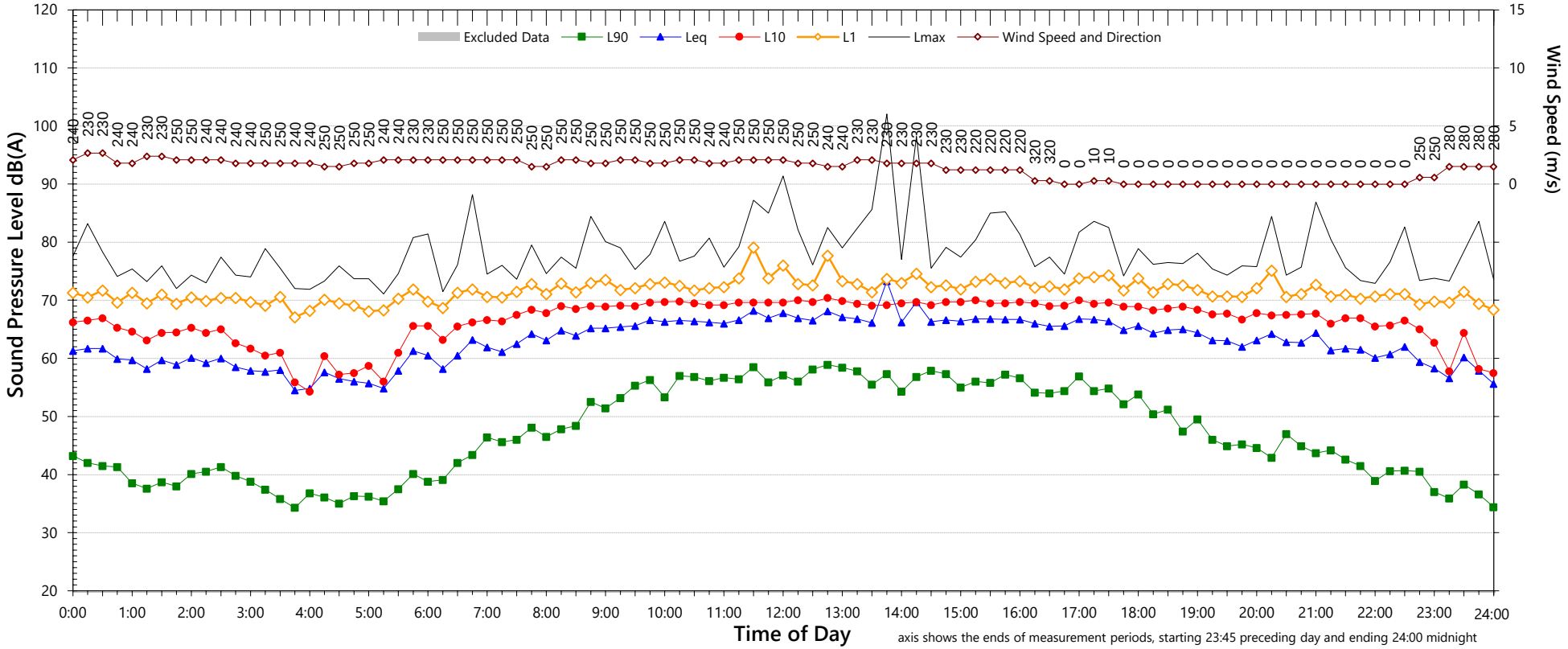
Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured 1m from facade; tabulated results free-field corrected
7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} >65dB(A) and where L_{AFMax}- L_{Aeq} ≥15dB(A)

Unattended Noise Monitoring Results

374 Mann St, North Gosford - L01 - Front yard of 374 Mann St

Sunday, 19 May 2024



axis shows the ends of measurement periods, starting 23:45 preceding day and ending 24:00 midnight

NSW Noise Policy for Industry (Free Field)				
Descriptor		**Day[2]**	**Evening[3]**	**Night[4 5]**
L_{A90} ABL		52	42	31
L_{Aeq}	(see note 6)	64	61	58

Night Time Maximum Noise Levels			(see note 7)
L_{AFMax} (Range)	77	to	86
L_{AFMax} - L_{Aeq} (Range)	18	to	26

NSW Road Noise Policy (1m from facade)		
Descriptor	**Day**	**Night[5]**
	7am-10pm	**10pm-7am**
$L_{Aeq\ 15\ hr}$ and $L_{Aeq\ 9\ hr}$	66	61
$L_{Aeq\ 1hr}$ upper 10 percentile	67	64
$L_{Aeq\ 1hr}$ lower 10 percentile	63	55

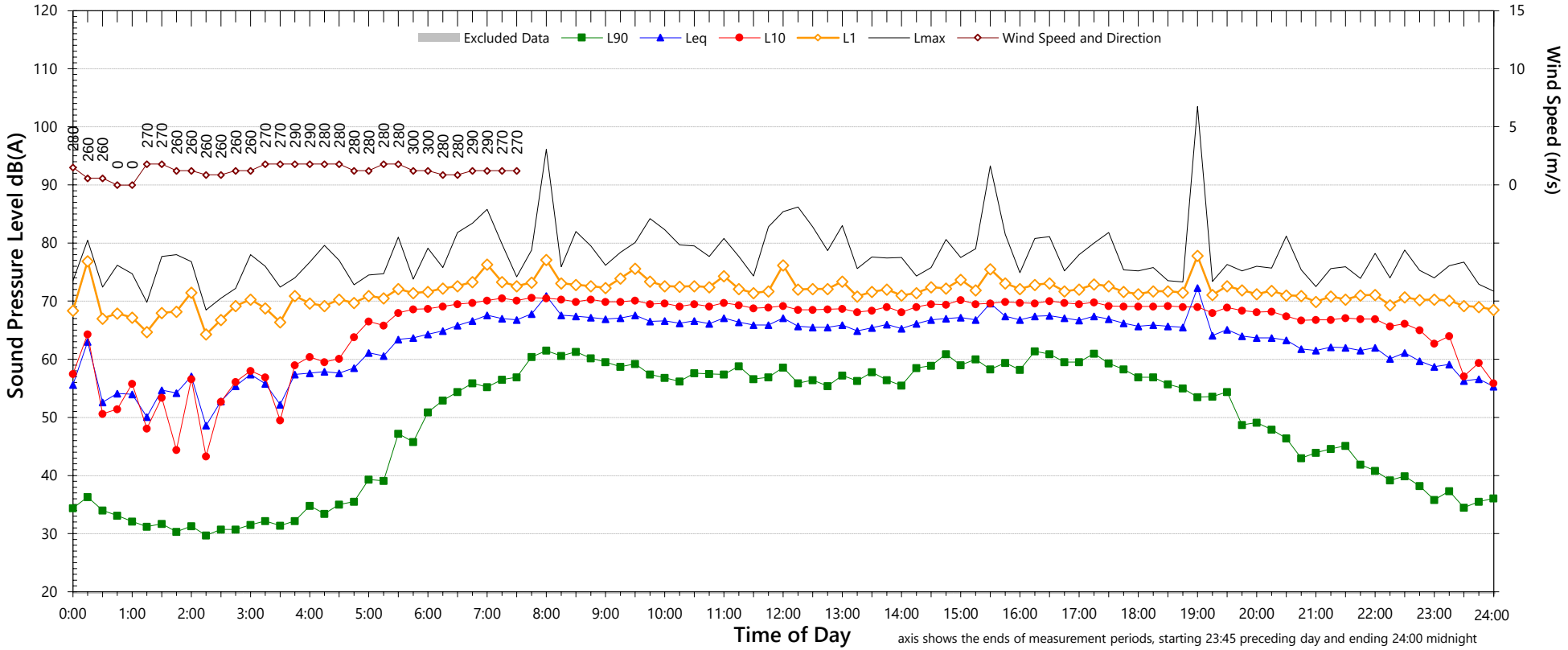
Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured 1m from facade; tabulated results free-field corrected
7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} >65dB(A) and where L_{AFMax}- L_{Aeq} ≥15dB(A)

Unattended Noise Monitoring Results

374 Mann St, North Gosford - L01 - Front yard of 374 Mann St

Monday, 20 May 2024



NSW Noise Policy for Industry (Free Field)				
Descriptor		Day[2]	Evening[3]	Night[4 5]
L_{A90} ABL		56	42	33
L_{Aeq}	(see note 6)	64	63	58

Night Time Maximum Noise Levels			(see note 7)
L_{AFMax} (Range)	75	to	85
L_{AFMax} - L_{Aeq} (Range)	15	to	25

NSW Road Noise Policy (1m from facade)		
Descriptor	Day	Night[5]
	7am-10pm	10pm-7am
$L_{Aeq\ 15\ hr}$ and $L_{Aeq\ 9\ hr}$	67	61
$L_{Aeq\ 1hr}$ upper 10 percentile	68	65
$L_{Aeq\ 1hr}$ lower 10 percentile	63	54

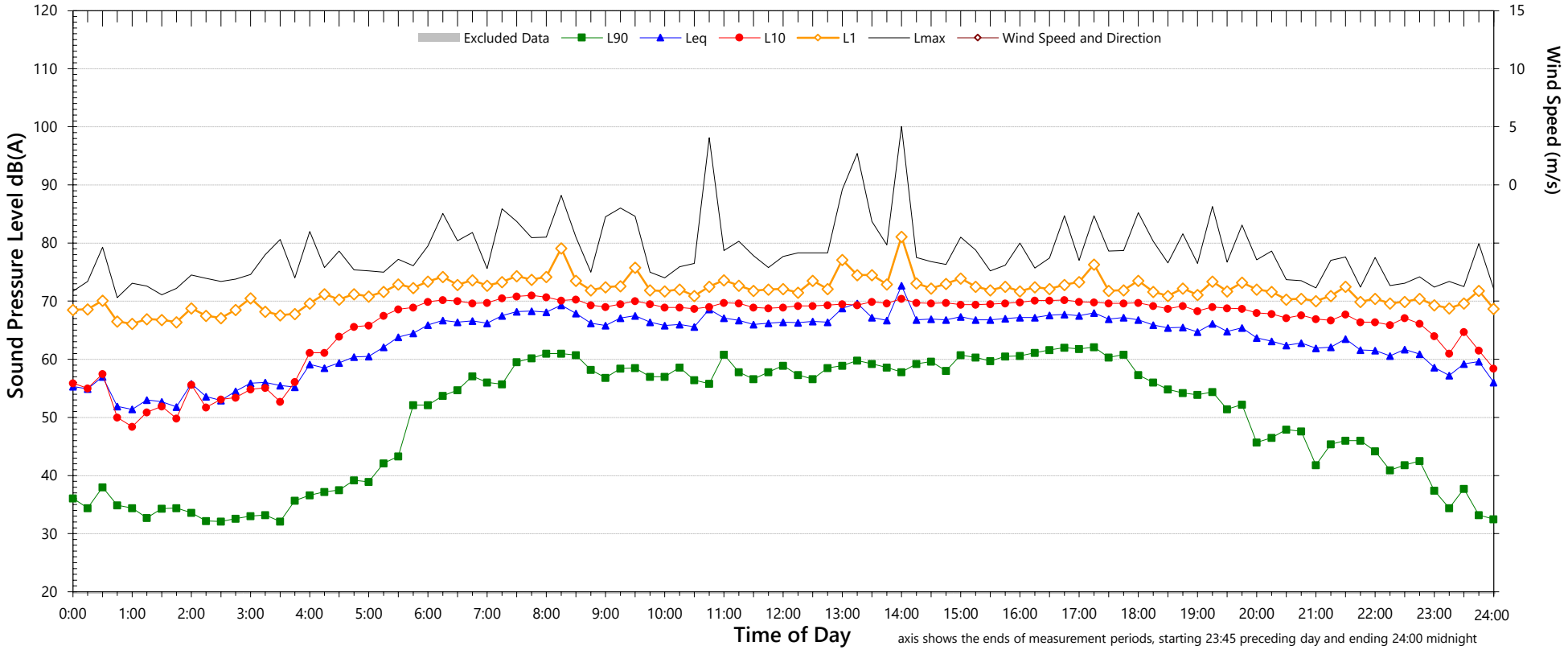
Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured 1m from facade; tabulated results free-field corrected
7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} >65dB(A) and where L_{AFMax}- L_{Aeq} ≥15dB(A)

Unattended Noise Monitoring Results

374 Mann St, North Gosford - L01 - Front yard of 374 Mann St

Tuesday, 21 May 2024



axis shows the ends of measurement periods, starting 23:45 preceding day and ending 24:00 midnight

NSW Noise Policy for Industry (Free Field)				
Descriptor		Day[2]	Evening[3]	Night[4 5]
L_{A90} ABL		57	45	31
L_{Aeq}	(see note 6)	65	62	58

Night Time Maximum Noise Levels			(see note 7)
L_{AFMax} (Range)	74	to	84
L_{AFMax} - L_{Aeq} (Range)	16	to	27

NSW Road Noise Policy (1m from facade)		
Descriptor	Day	Night[5]
	7am-10pm	10pm-7am
$L_{Aeq\ 15\ hr}$ and $L_{Aeq\ 9\ hr}$	67	61
$L_{Aeq\ 1hr}$ upper 10 percentile	68	64
$L_{Aeq\ 1hr}$ lower 10 percentile	64	55

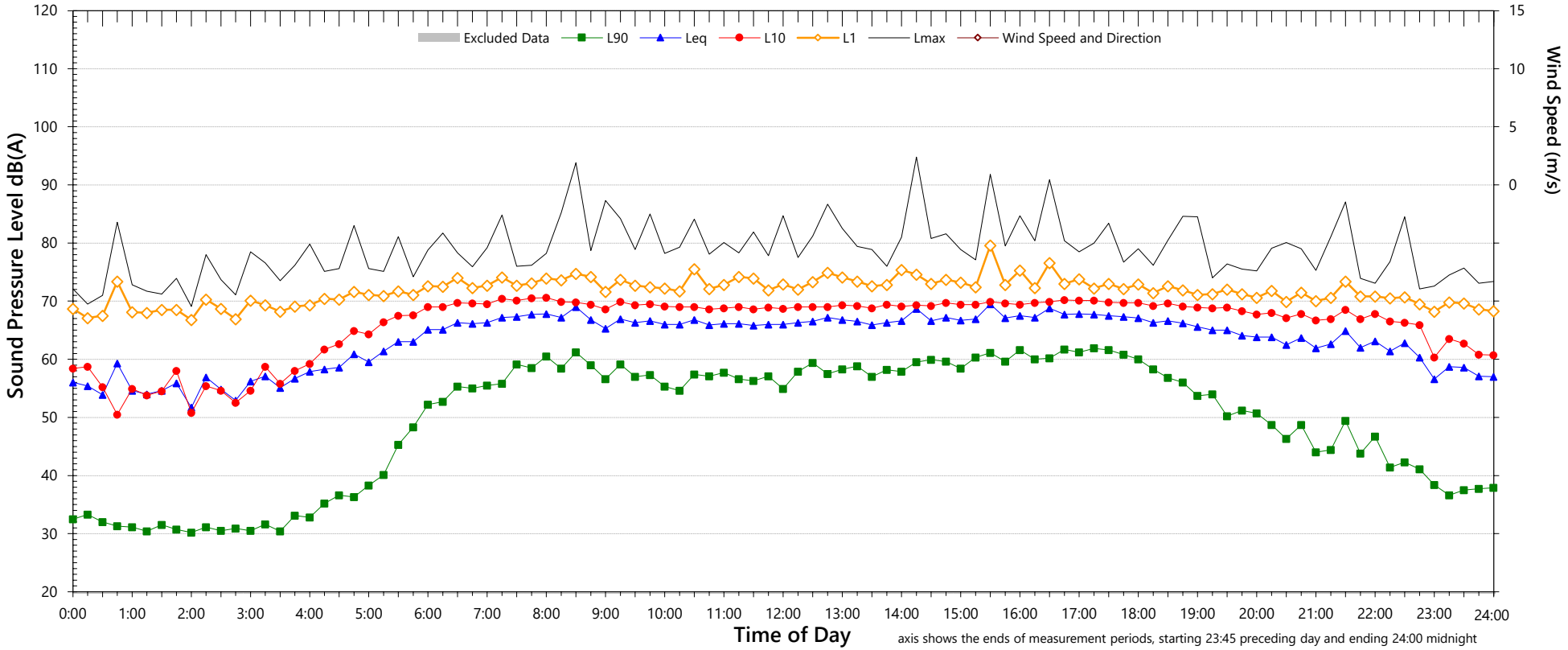
Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured 1m from facade; tabulated results free-field corrected
7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} >65dB(A) and where L_{AFMax}- L_{Aeq} ≥15dB(A)

Unattended Noise Monitoring Results

374 Mann St, North Gosford - L01 - Front yard of 374 Mann St

Wednesday, 22 May 2024



axis shows the ends of measurement periods, starting 23:45 preceding day and ending 24:00 midnight

NSW Noise Policy for Industry (Free Field)				
Descriptor		**Day**[2]	**Evening**[3]	**Night**[4 5]
L_{A90} ABL		56	44	31
L_{Aeq}	(see note 6)	65	62	59

Night Time Maximum Noise Levels			(see note 7)
L_{AFMax} (Range)	76	to	86
L_{AFMax} - L_{Aeq} (Range)	18	to	25

NSW Road Noise Policy (1m from facade)		
Descriptor	**Day**	**Night**[5]
	7am-10pm	**10pm-7am**
$L_{Aeq\ 15\ hr}$ and $L_{Aeq\ 9\ hr}$	66	61
$L_{Aeq\ 1hr}$ upper 10 percentile	68	65
$L_{Aeq\ 1hr}$ lower 10 percentile	64	55

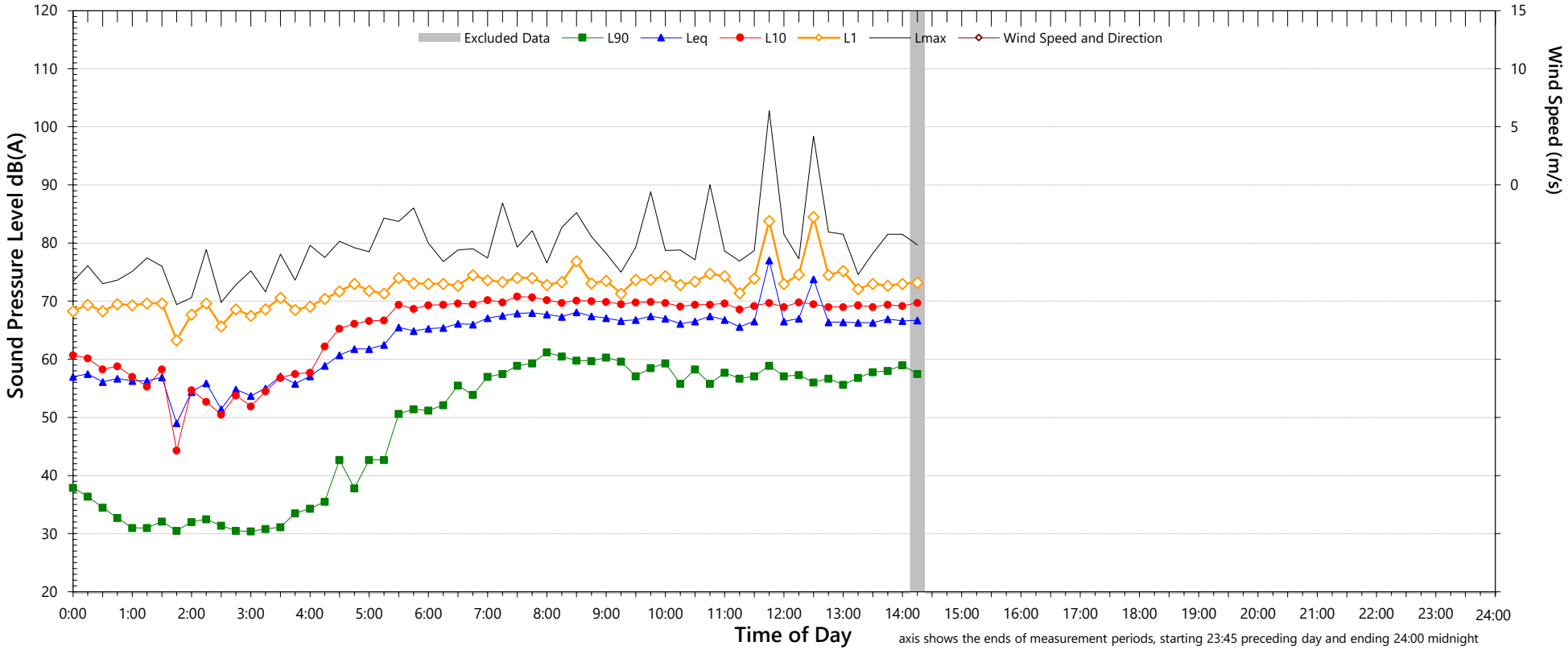
Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured 1m from facade; tabulated results free-field corrected
7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} >65dB(A) and where L_{AFMax}- L_{Aeq} ≥15dB(A)

Unattended Noise Monitoring Results

374 Mann St, North Gosford - L01 - Front yard of 374 Mann St

Thursday, 23 May 2024



NSW Noise Policy for Industry (Free Field)				
Descriptor		Day[2]	Evening[3]	Night[4 5]
L_{A90} ABL		-	-	-
L_{Aeq}	(see note 6)	-	-	-

Night Time Maximum Noise Levels			(see note 7)
L_{AFMax} (Range)	-	to	-
L_{AFMax} - L_{Aeq} (Range)	-	to	-

NSW Road Noise Policy (1m from facade)		
Descriptor	Day	Night[5]
	7am-10pm	10pm-7am
$L_{Aeq\ 15\ hr}$ and $L_{Aeq\ 9\ hr}$	-	-
$L_{Aeq\ 1hr}$ upper 10 percentile	-	-
$L_{Aeq\ 1hr}$ lower 10 percentile	-	-

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured 1m from facade; tabulated results free-field corrected
7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} >65dB(A) and where L_{AFMax}- L_{Aeq} ≥15dB(A)

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372 Mann St, North Gosford

Background & Ambient Noise Monitoring Results - NSW 'Noise Policy for Industry', 2017

Periods with insufficient results excluded	L_{A90} Background Noise Levels[4]			L_{Aeq} Ambient Noise Levels		
Date	**Day[1]**	**Evening[2]**	**Night[3]**	**Day[1]**	**Evening[2]**	**Night[3]**
Tuesday-14-May-2024	-	44	-	-	51	-
Wednesday-15-May-2024	48	45	35	54	52	49
Thursday-16-May-2024	49	43	34	54	51	50
Friday-17-May-2024	49	44	40	54	51	51
Saturday-18-May-2024	-	47	37	-	53	50
Sunday-19-May-2024	48	43	34	53	50	51
Monday-20-May-2024	51	43	36	63	53	49
Tuesday-21-May-2024	50	44	34	55	52	49
Wednesday-22-May-2024	49	45	35	54	52	50
Thursday-23-May-2024	-	-	-	-	-	-
Representative Weekday[5]	**49**	**44**	**35**	**58**	**52**	**50**
Representative Weekend[5]	**48**	**45**	**36**	**53**	**52**	**51**
Representative Week[5]	**49**	**44**	**35**	**57**	**52**	**50**

Notes:

1. Day is 7:00am to 6:00pm on all days except Sundays and Public Holidays when it is 8:00am to 6:00pm 2. Evening is 6:00pm to 10:00pm 3. Night is the remaining periods 4. Assessment Background Level (ABL) for individual days 5. Rating Background Level (RBL) for L_{A90} and logarithmic average for L_{Aeq} 6. Leq is calculated in the free field. 2.5dB is subtracted from results if logger is placed at façade 7. Number in brackets represents th measured (actual) RBL value, which is below the minimum policy value of 30 dB(A) during the evening or night period or 35 dB(A) during the day period

372 Mann St, North Gosford

Road / Rail Noise Monitoring Results (at one metre from façade)

Periods with insufficient results excluded	L_{Aeq} Noise Levels		$L_{Aeq\ 1hr}$ Noise Levels			
Date	**Day[1]**	**Night[2]**	**Day - Up[4]**	**Day - Low[3]**	**Night - Up[4]**	**Night - Low[3]**
Tuesday-14-May-2024	-	53	-	-	56	46
Wednesday-15-May-2024	56	52	57	54	56	45
Thursday-16-May-2024	56	52	58	53	55	48
Friday-17-May-2024	56	54	58	53	56	50
Saturday-18-May-2024	57	52	59	55	55	46
Sunday-19-May-2024	55	54	56	53	58	46
Monday-20-May-2024	65	51	58	54	54	47
Tuesday-21-May-2024	57	51	57	54	54	45
Wednesday-22-May-2024	56	53	57	54	56	46
Thursday-23-May-2024	-	-	-	-	-	-
Representative Weekday[6]	**59**	**52**	**58**	**54**	**56**	**46**
Representative Weekend[6]	**56**	**53**	**58**	**54**	**56**	**46**
Representative Week[6]	**58.6**	**52.4**	**58**	**54**	**56**	**46**

Notes:

1. Day is 7:00am to 10:00pm 2. Night is 10:00pm to 7:00am 3. Lower 10th percentile $L_{Aeq\ 1hr}$

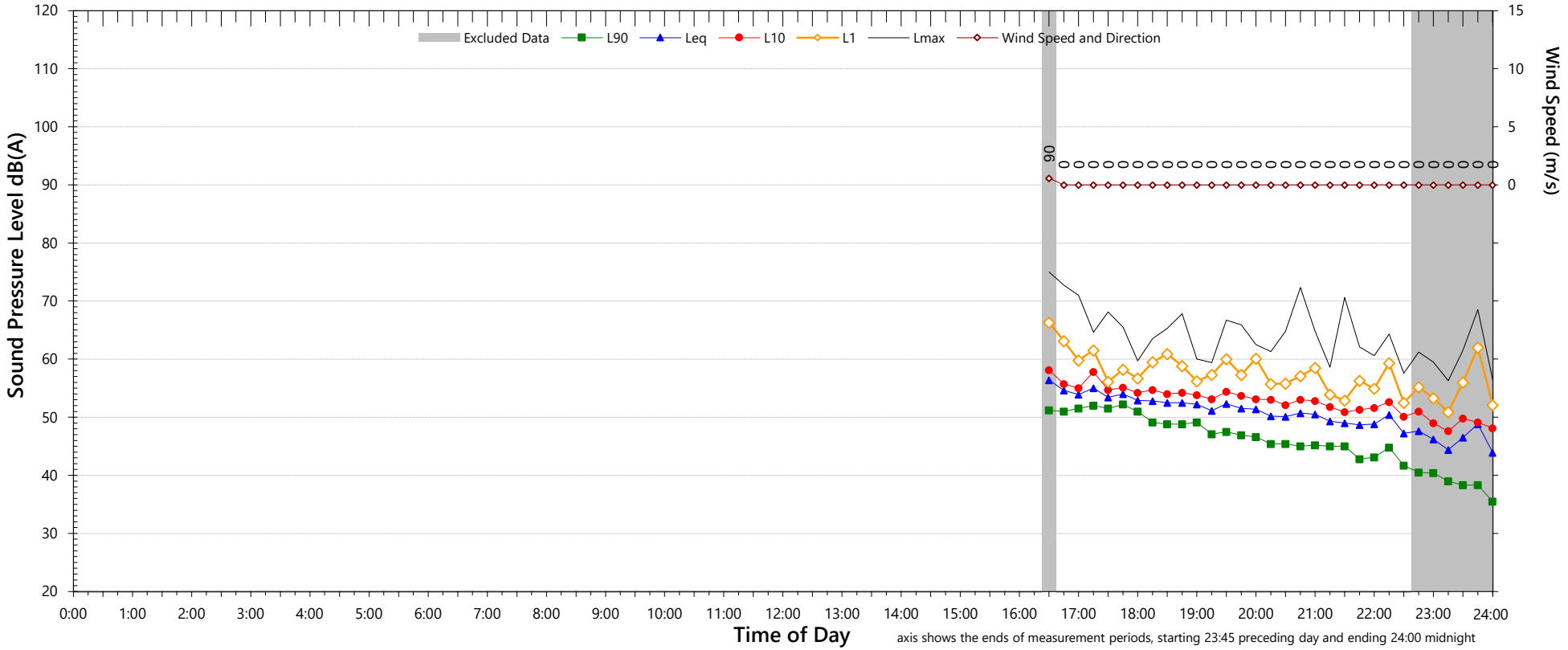
4. Upper 10th percentile $L_{Aeq\ 1hr}$ 5. Values are calculated at the facade. 2.5dB is added to results if logger is placed in the free field

6. Logarithmic average for L_{Aeq}, Median of daily L_{Aeq} for $L_{Aeq\ 1hr}$

Unattended Noise Monitoring Results

372 Mann St, North Gosford - L01 - Back of property fronting rail l

Tuesday, 14 May 2024



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day[2]	Evening[3]	Night[4 5]
L_{A90} ABL	-	44	-
L_{Aeq}	-	51	-

Night Time Maximum Noise Levels			(see note 7)
L_{AFMax} (Range)	66	to	80
L_{AFMax} - L_{Aeq} (Range)	15	to	26

NSW Road Noise Policy (1m from facade)		(see note 6)
Descriptor	Day	Night[5]
	7am-10pm	10pm-7am
$L_{Aeq\ 15\ hr}$ and $L_{Aeq\ 9\ hr}$	-	53
$L_{Aeq\ 1hr}$ upper 10 percentile	-	56
$L_{Aeq\ 1hr}$ lower 10 percentile	-	46

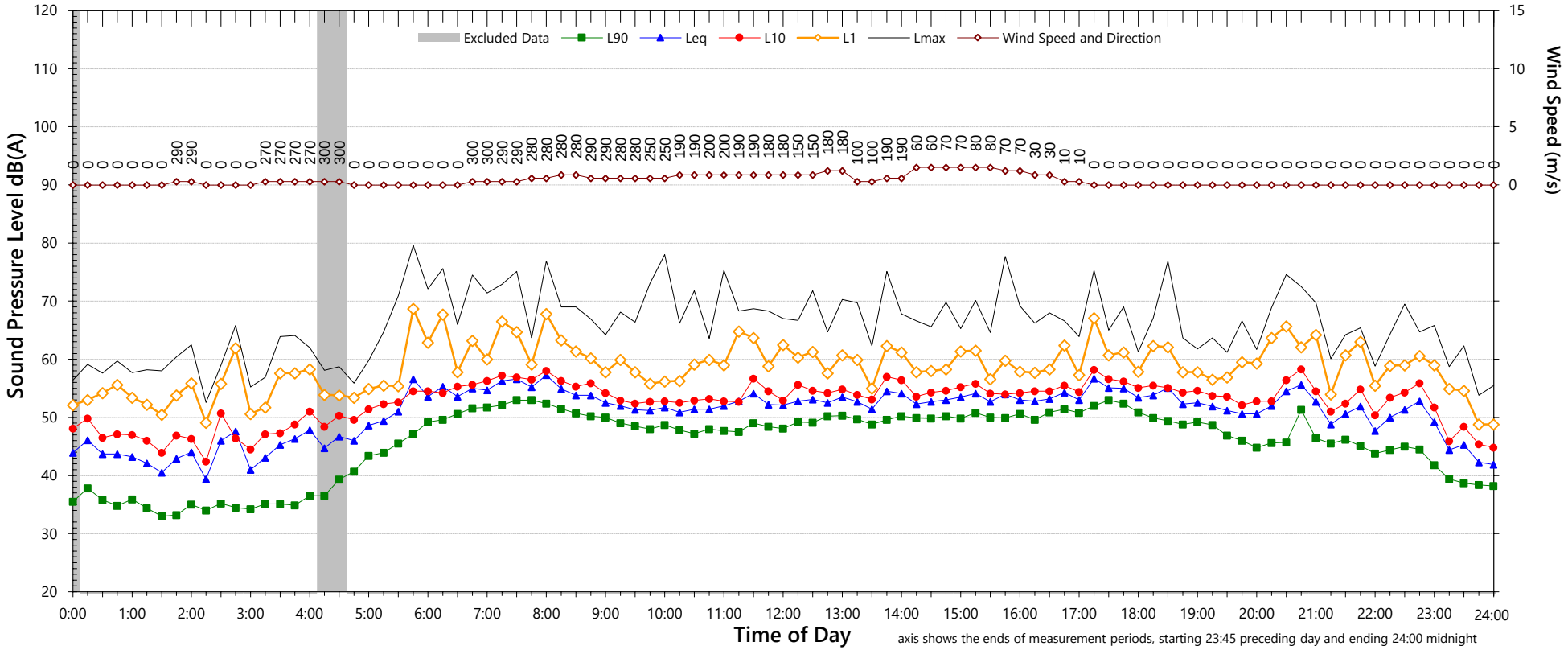
Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured in free-field; tabulated results facade corrected
7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} >65dB(A) and where L_{AFMax}- L_{Aeq} ≥15dB(A)

Unattended Noise Monitoring Results

372 Mann St, North Gosford - L01 - Back of property fronting rail l

Wednesday, 15 May 2024



axis shows the ends of measurement periods, starting 23:45 preceding day and ending 24:00 midnight

NSW Noise Policy for Industry (Free Field)			
Descriptor	Day[2]	Evening[3]	Night[4 5]
L_{A90} ABL	48	45	35
L_{Aeq}	54	52	49

NSW Road Noise Policy (1m from facade)		(see note 6)
Descriptor	Day	Night[5]
	7am-10pm	10pm-7am
$L_{Aeq\ 15\ hr}$ and $L_{Aeq\ 9\ hr}$	56	52
$L_{Aeq\ 1hr}$ upper 10 percentile	57	56
$L_{Aeq\ 1hr}$ lower 10 percentile	54	45

Night Time Maximum Noise Levels			(see note 7)
L_{AFMax} (Range)	68	to	73
L_{AFMax} - L_{Aeq} (Range)	16	to	21

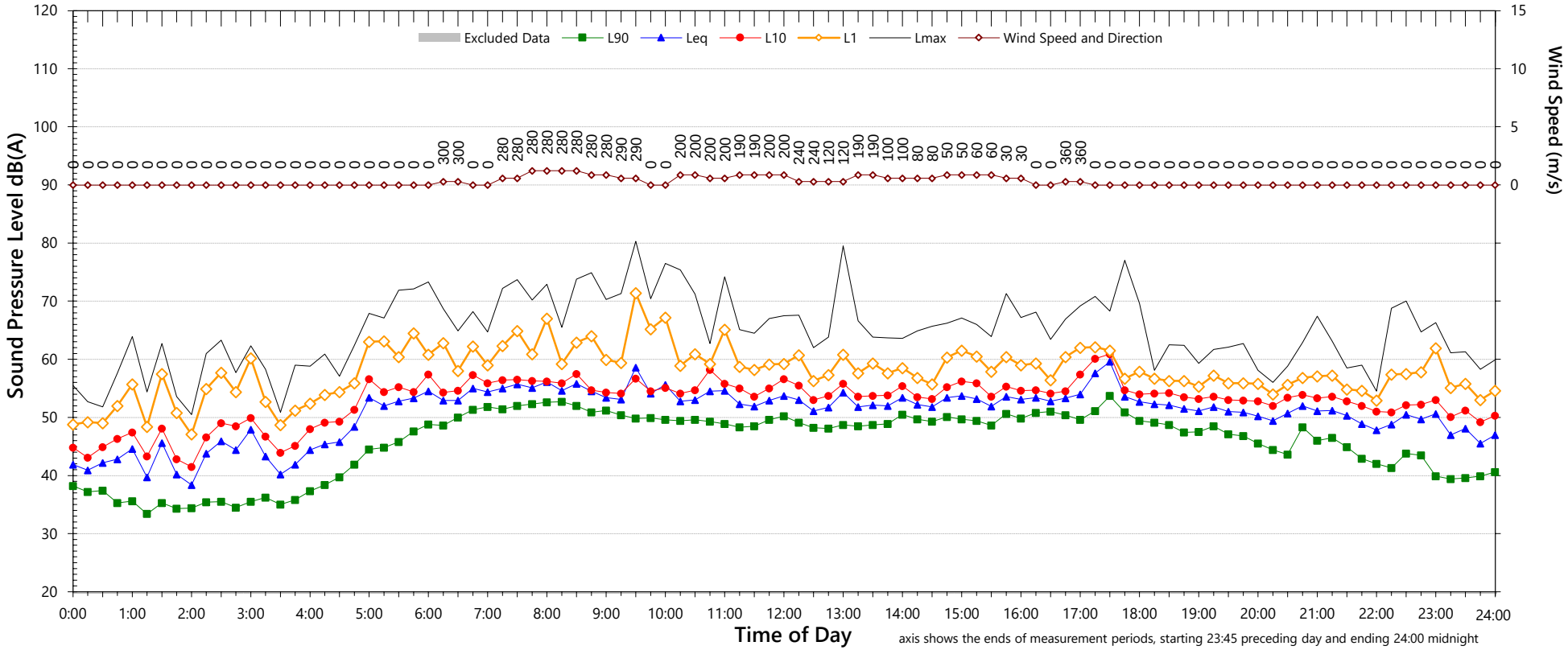
Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured in free-field; tabulated results facade corrected
7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} >65dB(A) and where L_{AFMax}- L_{Aeq} ≥15dB(A)

Unattended Noise Monitoring Results

372 Mann St, North Gosford - L01 - Back of property fronting rail l

Thursday, 16 May 2024



axis shows the ends of measurement periods, starting 23:45 preceding day and ending 24:00 midnight

NSW Noise Policy for Industry (Free Field)			
Descriptor	Day[2]	Evening[3]	Night[4 5]
L_{A90} ABL	49	43	34
L_{Aeq}	54	51	50

NSW Road Noise Policy (1m from facade)		(see note 6)
Descriptor	Day	Night[5]
	7am-10pm	10pm-7am
$L_{Aeq\ 15\ hr}$ and $L_{Aeq\ 9\ hr}$	56	52
$L_{Aeq\ 1hr}$ upper 10 percentile	58	55
$L_{Aeq\ 1hr}$ lower 10 percentile	53	48

Night Time Maximum Noise Levels			(see note 7)
L_{AFMax} (Range)	70	to	78
L_{AFMax} - L_{Aeq} (Range)	15	to	26

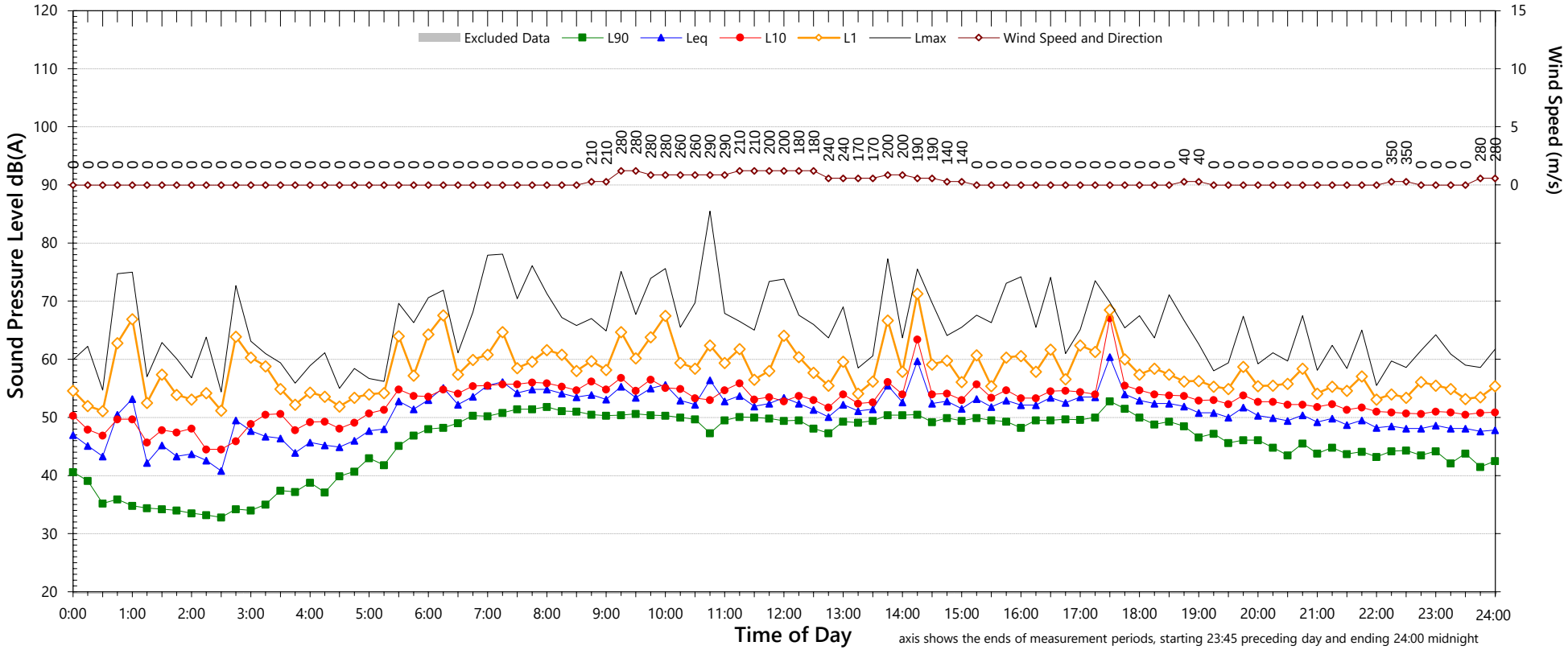
Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured in free-field; tabulated results facade corrected
7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} >65dB(A) and where L_{AFMax}- L_{Aeq} ≥15dB(A)

Unattended Noise Monitoring Results

372 Mann St, North Gosford - L01 - Back of property fronting rail l

Friday, 17 May 2024



axis shows the ends of measurement periods, starting 23:45 preceding day and ending 24:00 midnight

NSW Noise Policy for Industry (Free Field)			
Descriptor	Day[2]	Evening[3]	Night[4 5]
L_{A90} ABL	49	44	40
L_{Aeq}	54	51	51

Night Time Maximum Noise Levels			(see note 7)
L_{AFMax} (Range)	65	to	75
L_{AFMax} - L_{Aeq} (Range)	16	to	22

NSW Road Noise Policy (1m from facade)		(see note 6)
Descriptor	Day	Night[5]
	7am-10pm	10pm-7am
$L_{Aeq\ 15\ hr}$ and $L_{Aeq\ 9\ hr}$	56	54
$L_{Aeq\ 1hr}$ upper 10 percentile	58	56
$L_{Aeq\ 1hr}$ lower 10 percentile	53	50

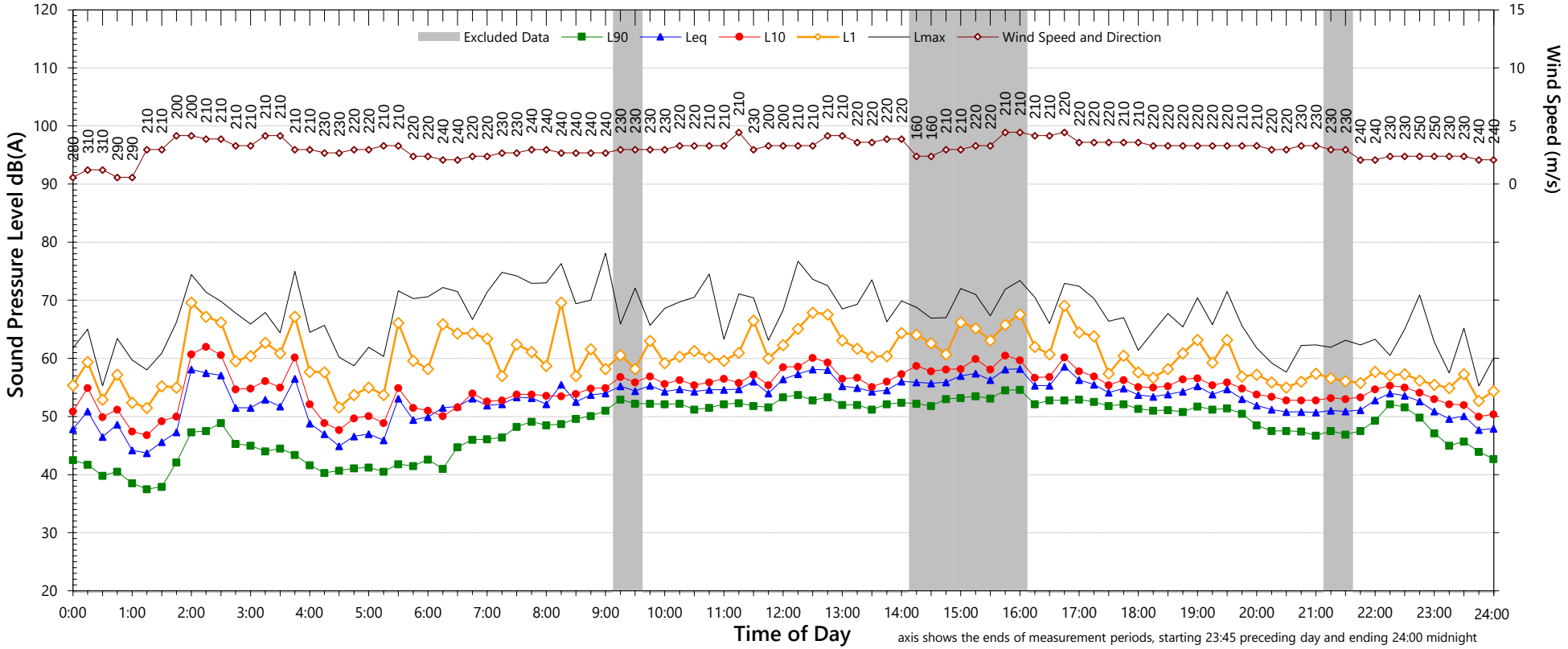
Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured in free-field; tabulated results facade corrected
7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} >65dB(A) and where L_{AFMax}- L_{Aeq} ≥15dB(A)

Unattended Noise Monitoring Results

372 Mann St, North Gosford - L01 - Back of property fronting rail l

Saturday, 18 May 2024



axis shows the ends of measurement periods, starting 23:45 preceding day and ending 24:00 midnight

NSW Noise Policy for Industry (Free Field)			
Descriptor	Day[2]	Evening[3]	Night[4 5]
L_{A90} ABL	-	47	37
L_{Aeq}	-	53	50

NSW Road Noise Policy (1m from facade)		(see note 6)
Descriptor	Day	Night[5]
	7am-10pm	10pm-7am
$L_{Aeq\ 15\ hr}$ and $L_{Aeq\ 9\ hr}$	57	52
$L_{Aeq\ 1hr}$ upper 10 percentile	59	55
$L_{Aeq\ 1hr}$ lower 10 percentile	55	46

Night Time Maximum Noise Levels			(see note 7)
L_{AFMax} (Range)	65	to	77
L_{AFMax} - L_{Aeq} (Range)	16	to	25

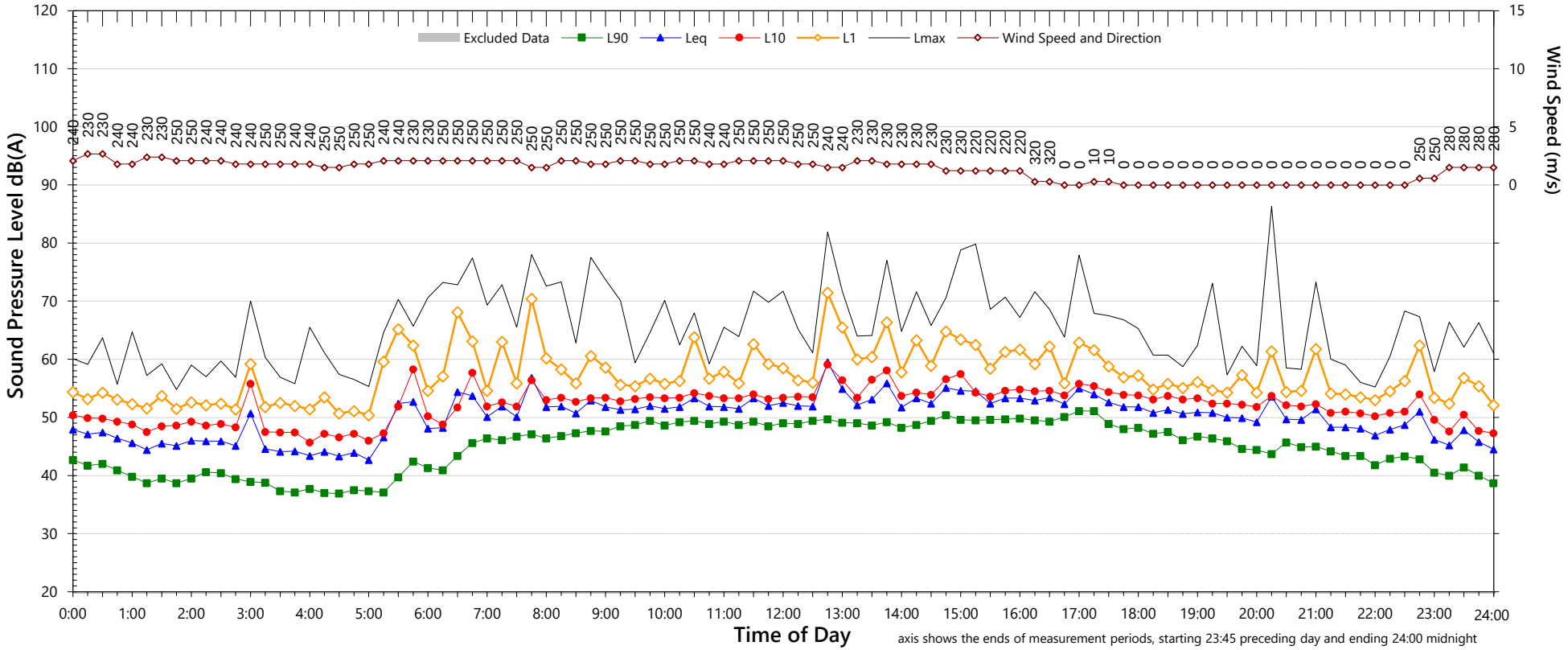
Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured in free-field; tabulated results facade corrected
7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} >65dB(A) and where L_{AFMax}- L_{Aeq} ≥15dB(A)

Unattended Noise Monitoring Results

372 Mann St, North Gosford - L01 - Back of property fronting rail l

Sunday, 19 May 2024



axis shows the ends of measurement periods, starting 23:45 preceding day and ending 24:00 midnight

NSW Noise Policy for Industry (Free Field)			
Descriptor	Day[2]	Evening[3]	Night[4 5]
L_{A90} ABL	48	43	34
L_{Aeq}	53	50	51

Night Time Maximum Noise Levels			(see note 7)
L_{AFMax} (Range)	65	to	78
L_{AFMax} - L_{Aeq} (Range)	18	to	29

NSW Road Noise Policy (1m from facade)		(see note 6)
Descriptor	Day	Night[5]
	7am-10pm	10pm-7am
$L_{Aeq\ 15\ hr}$ and $L_{Aeq\ 9\ hr}$	55	54
$L_{Aeq\ 1hr}$ upper 10 percentile	56	58
$L_{Aeq\ 1hr}$ lower 10 percentile	53	46

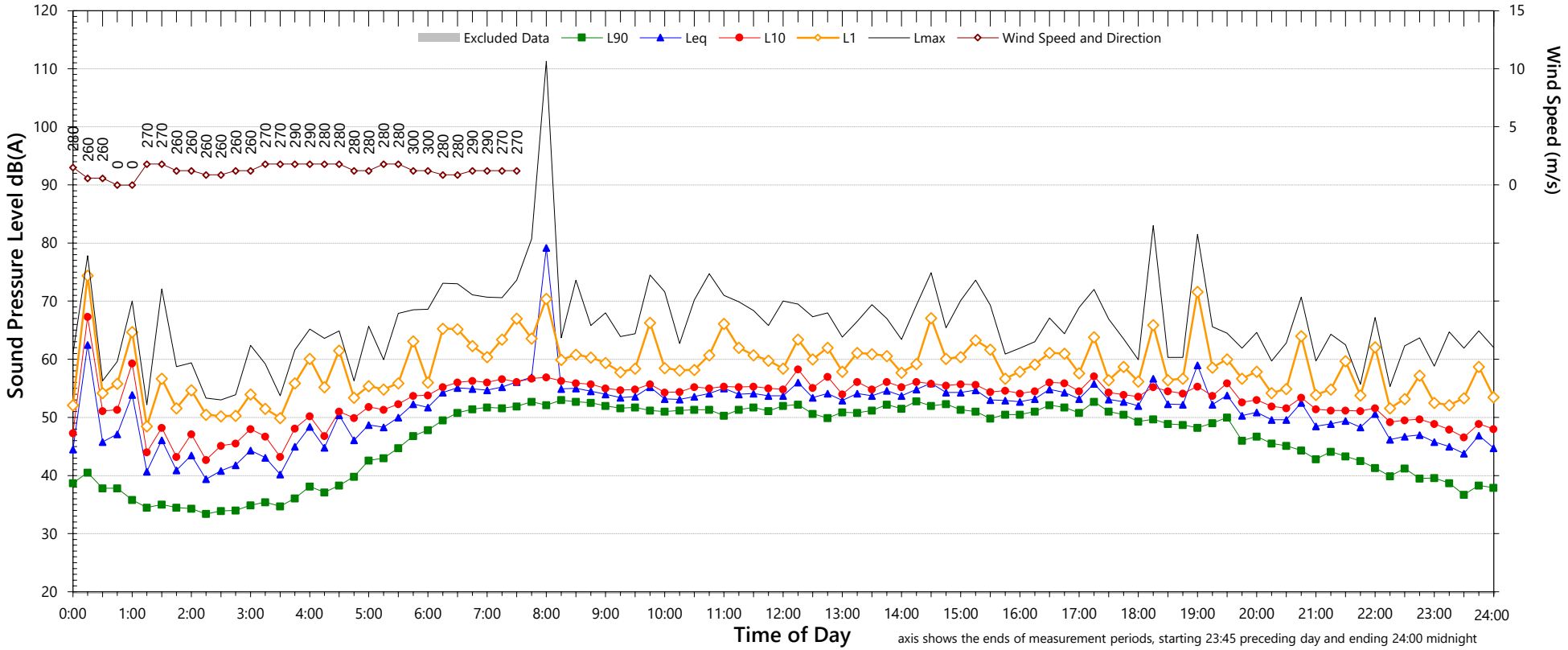
Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured in free-field; tabulated results facade corrected
7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} >65dB(A) and where L_{AFMax}- L_{Aeq} ≥15dB(A)

Unattended Noise Monitoring Results

372 Mann St, North Gosford - L01 - Back of property fronting rail l

Monday, 20 May 2024



axis shows the ends of measurement periods, starting 23:45 preceding day and ending 24:00 midnight

NSW Noise Policy for Industry (Free Field)			
Descriptor	Day[2]	Evening[3]	Night[4 5]
L_{A90} ABL	51	43	36
L_{Aeq}	63	53	49

NSW Road Noise Policy (1m from facade)		(see note 6)
Descriptor	Day	Night[5]
	7am-10pm	10pm-7am
$L_{Aeq\ 15\ hr}$ and $L_{Aeq\ 9\ hr}$	65	51
$L_{Aeq\ 1hr}$ upper 10 percentile	58	54
$L_{Aeq\ 1hr}$ lower 10 percentile	54	47

Night Time Maximum Noise Levels			(see note 7)
L_{AFMax} (Range)	65	to	74
L_{AFMax} - L_{Aeq} (Range)	16	to	26

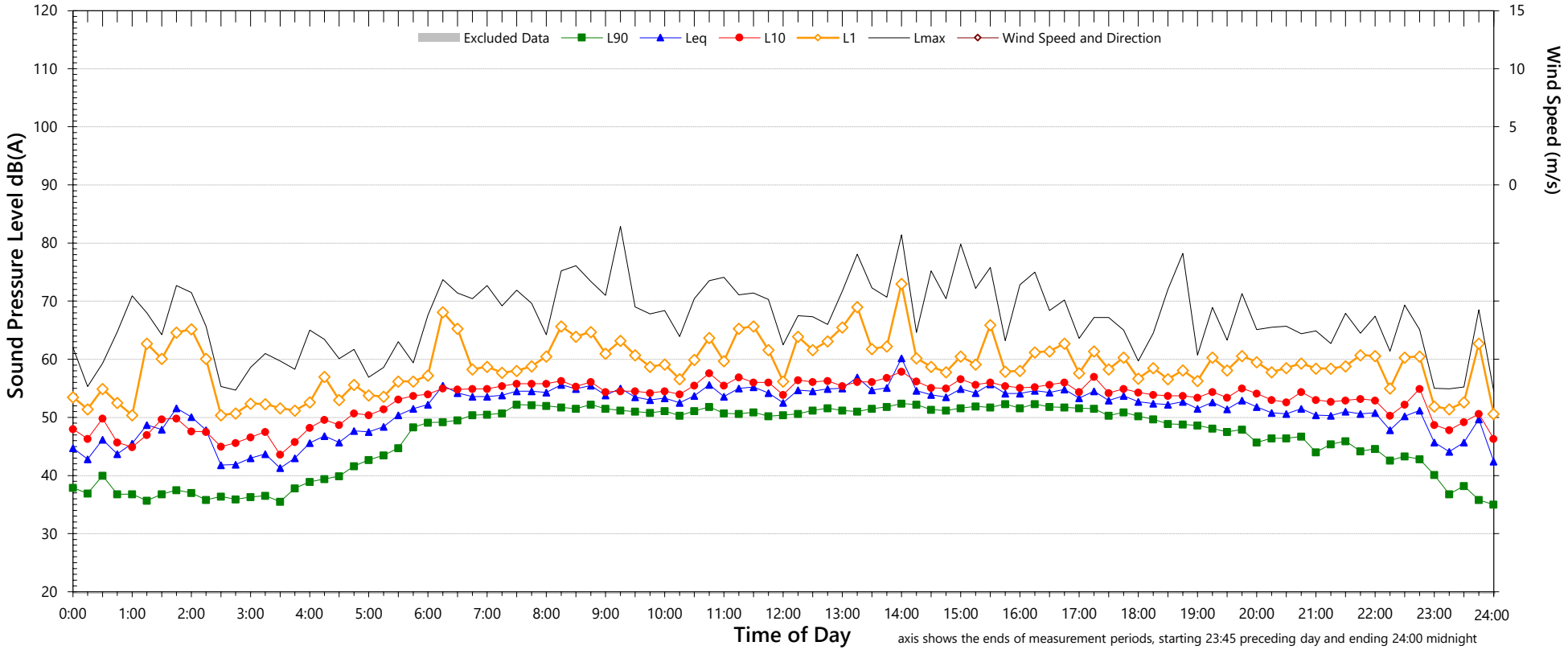
Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured in free-field; tabulated results facade corrected
7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} >65dB(A) and where L_{AFMax}- L_{Aeq} ≥15dB(A)

Unattended Noise Monitoring Results

372 Mann St, North Gosford - L01 - Back of property fronting rail l

Tuesday, 21 May 2024



axis shows the ends of measurement periods, starting 23:45 preceding day and ending 24:00 midnight

NSW Noise Policy for Industry (Free Field)			
Descriptor	Day[2]	Evening[3]	Night[4 5]
L_{A90} ABL	50	44	34
L_{Aeq}	55	52	49

NSW Road Noise Policy (1m from facade)		(see note 6)
Descriptor	Day	Night[5]
	7am-10pm	10pm-7am
$L_{Aeq\ 15\ hr}$ and $L_{Aeq\ 9\ hr}$	57	51
$L_{Aeq\ 1hr}$ upper 10 percentile	57	54
$L_{Aeq\ 1hr}$ lower 10 percentile	54	45

Night Time Maximum Noise Levels			(see note 7)
L_{AFMax} (Range)	66	to	73
L_{AFMax} - L_{Aeq} (Range)	15	to	24

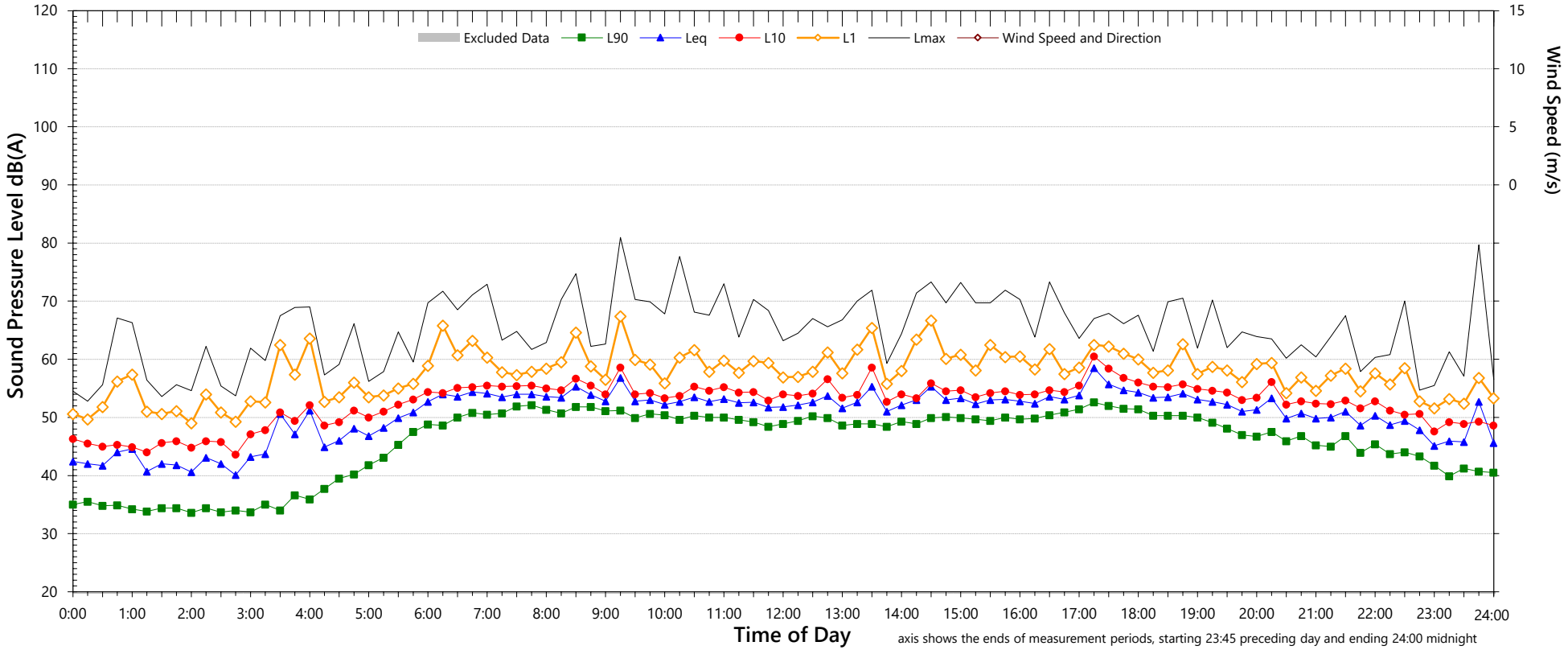
Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured in free-field; tabulated results facade corrected
7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} >65dB(A) and where L_{AFMax}- L_{Aeq} ≥15dB(A)

Unattended Noise Monitoring Results

372 Mann St, North Gosford - L01 - Back of property fronting rail l

Wednesday, 22 May 2024



axis shows the ends of measurement periods, starting 23:45 preceding day and ending 24:00 midnight

NSW Noise Policy for Industry (Free Field)			
Descriptor	Day[2]	Evening[3]	Night[4 5]
L_{A90} ABL	49	45	35
L_{Aeq}	54	52	50

NSW Road Noise Policy (1m from facade)		(see note 6)
Descriptor	Day	Night[5]
	7am-10pm	10pm-7am
$L_{Aeq\ 15\ hr}$ and $L_{Aeq\ 9\ hr}$	56	53
$L_{Aeq\ 1hr}$ upper 10 percentile	57	56
$L_{Aeq\ 1hr}$ lower 10 percentile	54	46

Night Time Maximum Noise Levels			(see note 7)
L_{AFMax} (Range)	66	to	81
L_{AFMax} - L_{Aeq} (Range)	17	to	31

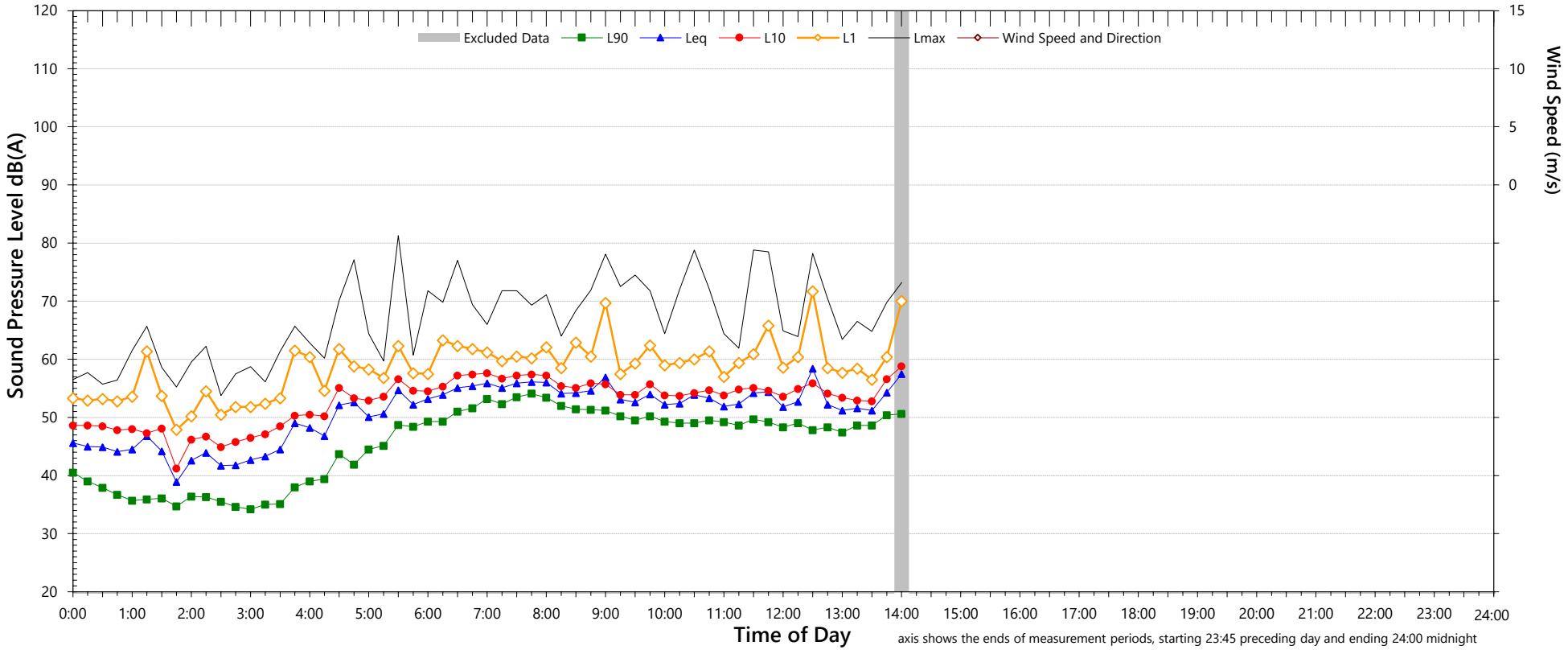
Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured in free-field; tabulated results facade corrected
7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} >65dB(A) and where L_{AFMax}- L_{Aeq} ≥15dB(A)

Unattended Noise Monitoring Results

372 Mann St, North Gosford - L01 - Back of property fronting rail l

Thursday, 23 May 2024



axis shows the ends of measurement periods, starting 23:45 preceding day and ending 24:00 midnight

NSW Noise Policy for Industry (Free Field)			
Descriptor	Day[2]	Evening[3]	Night[4 5]
L_{A90} ABL	-	-	-
L_{Aeq}	-	-	-

Night Time Maximum Noise Levels			(see note 7)
L_{AFMax} (Range)	-	to	-
L_{AFMax} - L_{Aeq} (Range)	-	to	-

NSW Road Noise Policy (1m from facade)		(see note 6)
Descriptor	Day	Night[5]
	7am-10pm	10pm-7am
$L_{Aeq\ 15\ hr}$ and $L_{Aeq\ 9\ hr}$	-	-
$L_{Aeq\ 1hr}$ upper 10 percentile	-	-
$L_{Aeq\ 1hr}$ lower 10 percentile	-	-

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured in free-field; tabulated results facade corrected
7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} >65dB(A) and where L_{AFMax}- L_{Aeq} ≥15dB(A)