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Vipac Engineers & Scientists

Walter Projects Pty Ltd

1-31 Walter Street & 452-462 Willoughby Road, Willoughby

Noise Impact Assessment

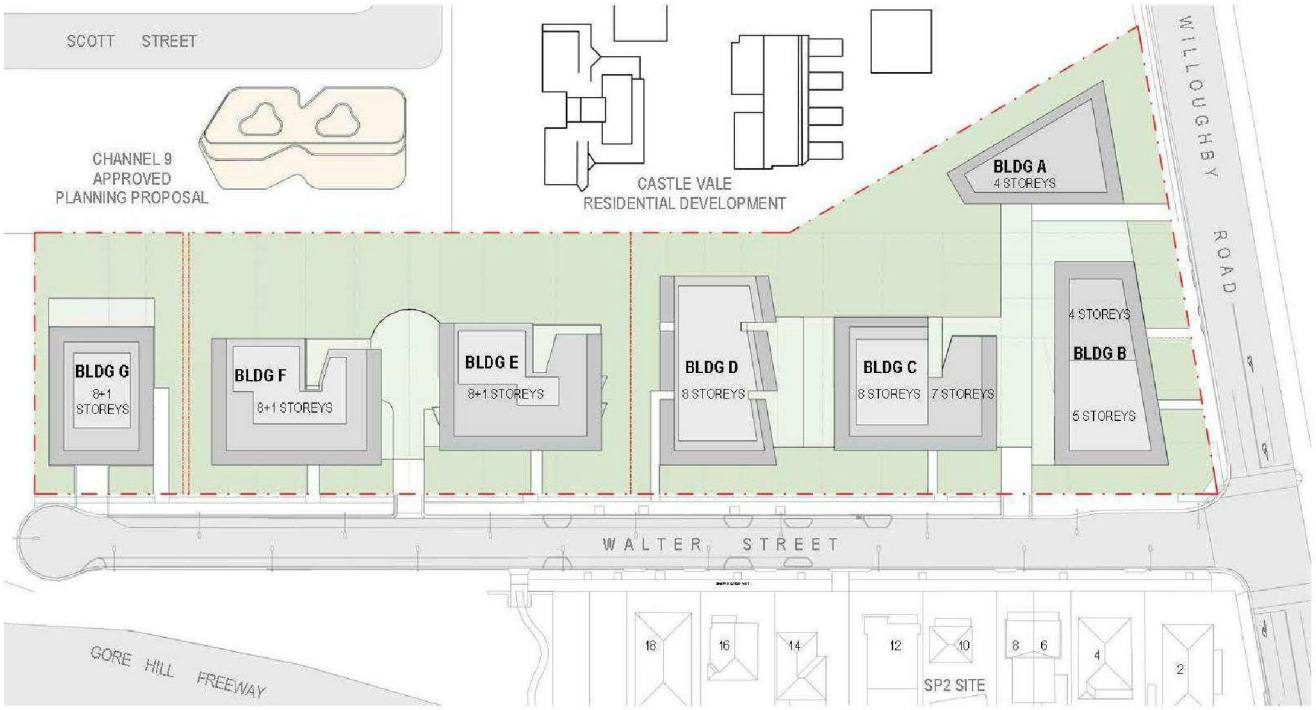

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TABLE OF CONTENTS

1 INTRODUCTION 4
1.1 Site Details 4
2 NOISE MONITORING PROGRAM 6
2.1 Noise Monitoring Methodology 6
2.2 Background Noise Measurement 6
2.3 Road Traffic Noise Levels 6
3 NOISE CRITERIA 7
3.1 Road Traffic Noise 7
3.2 Environmental Noise Impact Criteria 7
4 TRAFFIC NOISE LEVELS 8
5 TRAFFIC NOISE ASSESSMENT 10
6 CONCLUSION 12
Appendix A Glossary Of Terms 13

1 INTRODUCTION

Vipac Engineers & Scientists Ltd. (VIPAC) was commissioned by Walter Projects Pty Ltd to provide a noise impact assessment on the proposed site located at 1-31 Walter Street & 452-462 Willoughby Road, Willoughby. According to Willoughby Council Local Environment Plan (LEP), the site is found within R3'medium density' residential and it is proposed to change the zoning from R3 'medium density' residential to R4 'high density' residential.

The purpose of this acoustic assessment is to ensure that the proposal of changing the zoning category adheres to relevant acoustic requirements. This assessment will focus on:

- The establishment and recommendation of various acoustic criteria for the site. This includes maintaining satisfactory noise amenity for surrounding receivers and the future occupants of the development.
- Road Traffic Noise Assessment: To determine the road traffic noise impact on the proposed property and recommend exterior building components in order to satisfy indoor noise amenity. This includes investigating the likely traffic noise emitting from the site.

This assessment will consist of measuring the background noise of the site, establishing the relevant criteria, calculating various noise generating scenarios and providing recommendations to minimise the noise impact on the affected receivers, inside and surrounding the site.

1.1 SITE DETAILS

The existing site is located within Walter Street (south) with Willoughby Road extending along the east side of the proposed development. Gore Hill Freeway is located further south from the site, with the Hallstrom Park located further east and commercial buildings further north from the site.

A noise logger to record the background and traffic noise was installed on the front yard of 9 Walter Street, Willoughby. Figure 1-1 displays the location of the proposed development.

Figure 1-1: Aerial Site Map

Figure 1-2 provides the location of the nearby potentially noise sensitive receivers. Table 1-1 presents the known details of those receives. The addresses are approximate.

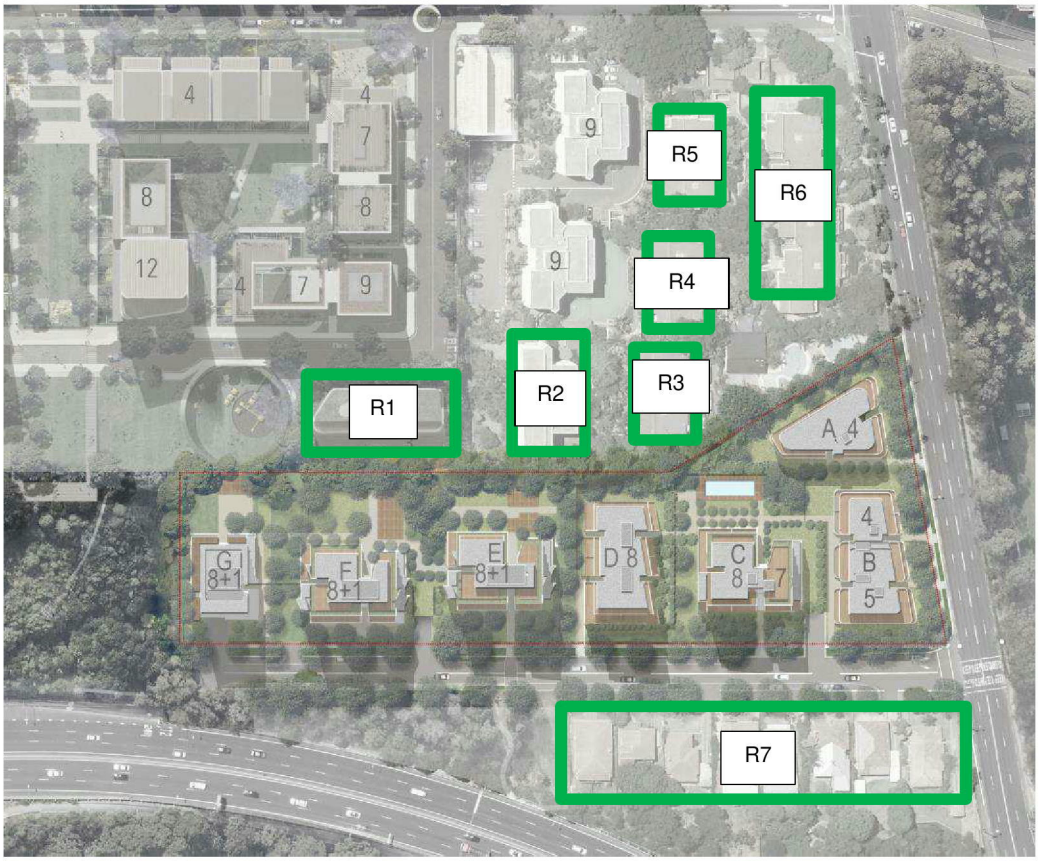

Figure 1-2: potential noise affected receivers

Table 1-1: potentially noise affected receivers

Receiver(s)	Address	Receiver Type	Building Type	Orientation to Subject Site
R1	2 Artarmon Road	Residential	Four single storey dwellings	West
R2	2 Artarmon Road	Residential	Double storey dwelling	West
R3	2 Artarmon Road	Residential	Two double storey buildings	North
R4	2 Artarmon Road	Residential	Double storey Office/Workshop	North
R5	2 Artarmon Road	Residential	Multistorey apartment building	North
R6	2 Artarmon Road	Residential	Existing commercial site Future: Potential multistorey residential building	North
R7	2-18 Walter street	Residential	Single storey dwellings	South

2 NOISE MONITORING PROGRAM

2.1 NOISE MONITORING METHODOLOGY

Vipac has previously conducted measurements at this site (Vipac report ref: 20E-16-0060-TRP-455798-3). The following presents noise results extracted from the above referenced report. The measurement of the background noise was conducted between the 17th and 23rd of May 2016 using the ARL 316 Noise Logger. The noise logger was installed on the front property of 9 Walter Street, Willoughby.

The noise logger was set to record the 'A' weighted statistical sound pressure level using a 'fast response'. The unit was calibrated prior to and after the noise measurement and no significant drift was found.

The L_{A90} has been used to determine the Rating Background Level (RBL) for the acoustic assessment. This statistical measurement is a sound pressure level that is exceeded for 90% of the measurement period. The L_{Aeq} was also collected during the monitoring period. The L_{Aeq} represents the equivalent continuous noise level — the level of noise equivalent to the energy average of noise levels occurring over a measurement period.

2.2 BACKGROUND NOISE MEASUREMENT

Table 2-1 presents a summary of the measured ambient and background noise of the site. The RBL will be used to establish the applicable noise criteria for the assessment of environmental noise emissions.

Table 2-1: Background & Ambient Noise Monitoring Results, dB(A)

Location	Time Period	Existing Noise Level	
		L_{Aeq}	RBL
9 Walter Street, Willoughby	Day	56	52
	Evening	56	52
	Night	52	44

2.3 ROAD TRAFFIC NOISE LEVELS

Road traffic noise values obtained from the noise monitoring are presented in the following Table 2-2.

Table 2-2: Summary of Road Traffic Noise measurement, dB(A)

Location	Day		Night	
	$L_{Aeq-15hr}$	$L_{Aeq-Noisiest\ 1Hr}$	$L_{Aeq-9hr}$	$L_{Aeq-Noisiest\ 1Hr}$
9 Walter Street, Willoughby	56	58	53	56

A short attended noise measurement was undertaken at the corner of Willoughby Road and Walter Street on 10th February 2017 to capture the traffic noise from Willoughby Road. The measurement was taken at approximately 9 meters from Willoughby Road. Table 2-3 presents the measured road traffic noise levels.

Table 2-3: Traffic Noise Results on Willoughby Road

Location	Sound Pressure Levels –dB(A)			
	L_{Aeq}	L_1	L_{10}	L_{90}
Corner of Walter Street and Willoughby Road 10/02/2017 13:51	68	74	71	62

3 NOISE CRITERIA

The following standards and guidelines are applicable to this project:

- Willoughby Development Control Plan (WDCP)
- NSW Government's Development near Rail Corridors and Busy Roads – Interim Guidelines
- AS3671 – 'Road traffic noise intrusion, Building siting and construction.'
- NSW Department of Environment, Office of Environment & Heritage (OEH) Noise Policy for Industry (NPI).

The requirements of each are summarised as follows:

3.1 ROAD TRAFFIC NOISE

Section C.14 of the WDCP, states the following requirements for new dwellings near busy roads:

Development located in the vicinity of a rail corridor or busy road needs to take into consideration the provisions of the State Environmental Planning Policy (Infrastructure) 2007 and the NSW Department of Planning's Development near Rail Corridors and Busy Roads –Interim Guideline.

The Infrastructure SEPP's publication 'Development near Rail Corridors and Busy Roads – Interim guidelines' has been used to assess the proposed development. Table 3-1 outlines the indoor noise criteria for residential dwellings and childcare centres near busy roads and rail lines.

Table 3-1 Indoor Noise Criteria

Type of occupancy	Noise Level dB(A)	Applicable time period
Sleeping areas (bedroom)	35	Night Time (10pm to 7am)
Other habitable rooms (excludes garages, bathrooms and hallways)	40	At any time
Childcare Centre	40	When in Use

The site is located approximately 30 metres from Gore Hill Freeway and 7.5 to 9 metres from Willoughby Road to the nearest proposed apartment. Therefore, the traffic noise impact from both roads on the proposed development will be considered to satisfy the indoor noise requirement, as outlined above.

3.2 ENVIRONMENTAL NOISE IMPACT CRITERIA

The OEH's publication 'NSW Industrial Noise Policy' was used to assess the noise emitted from the proposed site, including mechanical plant. This policy provides guidelines for these procedures and noise mitigation strategies if the level exceeds the noise threshold. The main aims for this policy are:

- To establish noise criteria that will protect the community from excessive intrusive noise and preserve amenity for specific land uses.
- To use the criteria as the basis for deriving project specific noise levels.
- To outline a range of mitigation measures that could be used to minimise noise impacts.

The Industrial Noise Policy states that an additional 5dB is to be added to the Rating Background Level to establish the intrusive noise criterion. The amenity noise criteria is specific to land use and associated activities.

Table 3-2: Industrial Noise Policy Criteria

Location	Time Period	Rating Background Level	Intrusive Noise Criteria	Amenity Noise Criteria	Project Noise Criteria
9 Walter Street, Willoughby	Day	52	57	60	57
	Evening	52	57	50	50
	Night	44	49	45	45

4 TRAFFIC NOISE LEVELS

The proposed development consists of five apartment blocks along Walter Street (fronting Gore Hill Freeway) and two apartment block facing Willoughby Road. Each building façade has different distances to the kerb of Gore Hill Freeway as the road curves away from the proposed development towards the Willoughby Road. Consequent to the varying distance and height of the proposed apartments to the Gore Hill Freeway, a traffic noise impact computer model was created to determine the traffic noise level at each level of each apartment block. The calculation was carried out in accordance with CoRTN guideline.

The traffic noise computer model was carried out with the following assumptions:

- A noise barrier along Gore Hill Freeway was also noted during site inspection. The height of the noise barrier is not known and Vipac estimated the barrier height to be approximately 4 meters;
- It is assumed the $L_{A10,18hours}$ traffic count is 94% of AADT;
- Traffic speed of 100km/hr;
- Ground terrain level for residential apartment blocks are the same as Gore Hill Freeway;

Figure 4-1 shows the location of each of the proposed buildings.

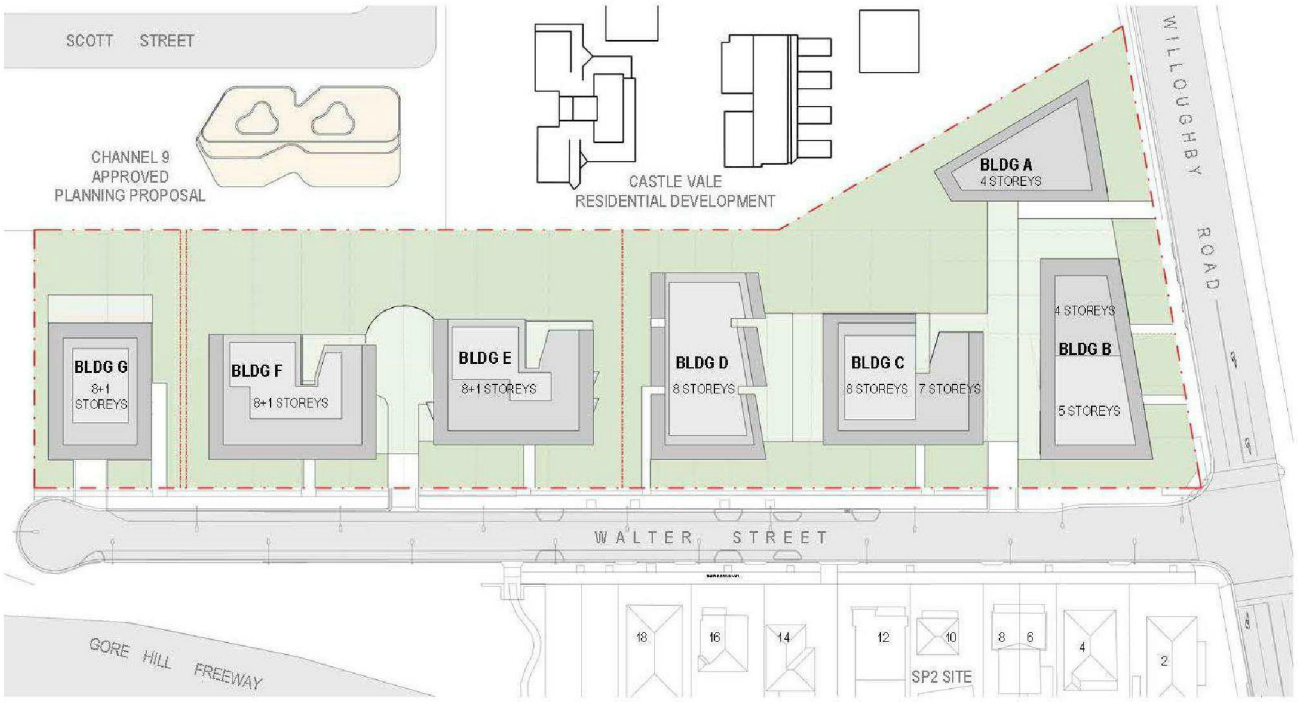

Figure 4-1: Proposed Building Location

The calculated traffic noise level at each floor and each block is shown in Table 4-1.

Table 4-1: Calculated Traffic Noise Levels

Description	Building A		Building B		Building C		Building D	
	Day	Night	Day	Day	Night	Night	Day	Night
Ground Floor	61	57	66	62	62	58	61	57
1st Floor	63	59	68	64	63	59	62	59
2nd Floor	64	60	68	65	64	60	63	60
3rd Floor	65	61	69	65	65	61	64	61
4th Floor	-	-	69	65	65	62	65	62
5th Floor	-	-	-	-	66	62	67	63
6th Floor	-	-	-	-	67	63	68	64
7th Floor	-	-	-	-	67	64	69	65
8th Floor	-	-	-	-	-	-	-	-

Description	Building E		Building F		Building G	
	Day	Night	Day	Night	Day	Night
Ground Floor	61	57	62	58	62	58
1st Floor	62	58	63	59	64	60
2nd Floor	63	60	65	61	66	62
3rd Floor	65	61	67	64	68	64

Description	Building E		Building F		Building G	
	Day	Night	Day	Night	Day	Night
4th Floor	66	62	70	66	71	67
5th Floor	68	64	71	67	73	69
6th Floor	69	66	73	69	74	70
7th Floor	71	67	74	70	75	71
8th Floor	72	68	74	70	75	71

5 TRAFFIC NOISE ASSESSMENT

This section provides acoustic recommendations to achieve the appropriate noise attenuation from the road traffic noise. The façade requirements were determined in accordance with the methodology set out in AS3671 – 'Road traffic noise intrusion, Building siting and construction.' The calculations for the recommended facade are based on various factors including, the measured traffic noise, indoor design sound level criteria, reverberation time, and the room dimensions.

In the absence of the layout plan at this early stage, the following assumptions are made to determine the sound reduction index (R_w) required.

- Bedroom
  - Reverberation time of 0.5 seconds;
  - Room Volume of 24m^3 - 3m(W) x 3m(L) x 2.7m (H)
  - Glazed area of 2m^2 - 1m (W) x 2 m (H)
- Living Room
  - Reverberation time of 0.7 seconds;
  - Room Volume of 68m^3 - 5m(W) x 5m(L) x 2.7m (H)
  - Glazed area of 6m^2 - 3m (W) x 2m (H)

Table 5-1 outlines the required glazing weighted sound reduction index (R_w) for each building to satisfy the appropriate indoor noise levels. It should be noted that only the bedroom and living room fronting Gore Hill Freeway and Willoughby Road are assessed in this instance as it is the worst affected area. The glazing requirements were calculated based on the recommendation that external walls will have a minimum Rw 45 acoustic rating.

Table 5-1: Require Glazing R_w

Description	Building A		Building B		Building C		Building D	
	Bedroom	Living	Bed	Living	Bed	Living	Bed	Living
Ground Floor	30	30	30	30	30	30	30	30
1st Floor	30	30	30	32	30	30	30	30
2nd Floor	30	30	32	32	30	30	30	30
3rd Floor	30	30	32	32	30	30	30	30
4th Floor	-	-	32	32	30	30	30	30
5th Floor	-	-	-	-	30	30	30	30
6th Floor	-	-	-	-	30	30	30	32
7th Floor	-	-	-	-	30	30	32	34
8th Floor	-	-	-	-	-	-	-	-

Description	Building E		Building F		Building G	
	Bed	Living	Bed	Living	Bed	Living
Ground Floor	30	30	30	30	30	30
1st Floor	30	30	30	30	30	30
2nd Floor	30	30	30	30	30	30
3rd Floor	30	30	30	30	30	32
4th Floor	30	30	32	33	34	36
5th Floor	30	32	34	36	37	37
6th Floor	32	32	37	37	39	39
7th Floor	34	36	39	39	41	41
8th Floor	35	36	39	39	41	41

Table Notes:

1. An example of suitable construction materials to achieve the minimum required Rw for glazed window and door are listed as follows. **This should only be used as a guide for window Rw values, as different glass manufacturers have different ratings and thicknesses for their systems.**
    - R_W 30 -3mm thick monolithic glass
    - R_w 32 - 6mm thick monolithic glass
    - R_w 33 – 6.38mm laminated glass
    - R_w 35 – 8.52mm laminated glass
    - R_w 36 – 10.38mm thick laminated glass
    - R_w 38 – 13.76mm thick laminated glass
    - R_w 42 – double glazing consisting of 6.38mm laminated glass to each side of 12mm air gap
    - R_w 44 - double glazing consisting of 6mm monolithic glass to 11.52mm laminated glass of 19 mm air gap
2. All windows/doors should be well sealed (air tight) when closed with good acoustic seals around the top and bottom sliders and also with other sliding doors and fixed section. Any air gap will significantly reduce the performance of the glazing in terms of the ability to attenuate noise. All of the above assumes that the glass will be properly sealed airtight. Note that standard (mohair) seals do not have noise reduction properties. Raven seals and Schlegel seals are example of acoustics seals.
3. Equivalent constructions that achieve the minimum required Rw are acceptable. The manufacturer information of the equivalent construction should be forwarded to Vipac for review and approval.

The internal noise levels at different spaces can be achieved, provided the weighted sound reduction index (Rw) detailed in Table 5-1 are installed. Pending on the design details, it is our expectation that, in the worst case, glazing requirement would not exceed the weighted sound reduction index (Rw) detailed in Table 5-1.

T**he external walls should be constructed with minimum R_w+C_{tr} of 45**. A typical wall construction that exceeds the established R_w+C_{tr} value may have the following construction:

- 75mm concrete (97.5 kg/m^2)
- 76mm steel stud with 50mm insulation 10kg/m^3
- 13mm standard plasterboard internally

An acoustically insulated building must be kept virtually airtight to exclude external noise. Therefore mechanical ventilation or air conditioning is needed to provide fresh air and to control odours.

6 CONCLUSION

An acoustic assessment of the proposed multi-residential development has been carried out in accordance with the relevant Willoughby Council Development Control Plan (WDCP), Australian Standards and other relevant noise guidelines, as detailed in Section 3.

The multi-residential development located at 1-31 Walter Street & 452-462 Willoughby Road, Willoughby is anticipated to comply with the internal noise levels criteria. **A detailed noise assessment should be carried out once the design drawings are finalised.**

Appendix A GLOSSARY OF TERMS

Decibel, dB:

Unit of acoustic measurement. Measurements of power, pressure and intensity. Expressed in dB relative to standard reference levels.

dB(A):

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

Sound Pressure Level, Lp (dB), of a sound:

20 times the logarithm to the base 10 of the ratio of the r.m.s. sound pressure to the reference sound pressure of 20 micro Pascals. Sound pressure level is measured using a microphone and a sound level meter, and varies with distance from the source and the environment.

Sound Power Level, LW (dB), of a source:

10 times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power of 1 Pico Watt. Sound power level cannot be directly measured using a microphone. Sound power level does not change with distance. The sound power level of a machine may vary depending on the actual operating load.

Ambient Sound:

Of an environment: the all-encompassing sound associated with that environment, being a composite of sounds from many sources, near and far.

Background noise:

The underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is removed.

Percentile Level - L_{90}, L_{10}, etc:

A statistical measurement giving the sound pressure level which is exceeded for the given percentile of an observation period, e.g. L90 is the level which is exceeded for 90% of a measurement period. L_{90} is commonly referred to as the "background" sound level.

$L_{AEQ,T}$:

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

Rating Background Level – RBL:

Method for determining the existing background noise level which involves calculating the tenth percentile from the LA90 measurements. This value gives the Assessment Background Noise Level (ABL). Rating Background Level is the median of the overall ABL.

Decibel, dB:

Unit of acoustic measurement. Measurements of power, pressure and intensity. Expressed in dB relative to standard reference levels.

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