WYUNA

Glebe Island Berth 8
Compliance Noise Monitoring Report

Prepared for:

Port Authority of New South Wales
PO Box 25
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BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Port Authority of New South Wales (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

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SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
610.04309-R92-v1.1	17 March 2021	Nicholas Vandenberg	Aaron McKenzie	Aaron McKenzie
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CONTENTS

DOCUMENT REFERENCES

TABLES

FIGURES

APPENDICES

1 Introduction

SLR Consulting Australia Pty Ltd (SLR Consulting) has been commissioned by the Port Authority of New South Wales (Port Authority of NSW) to conduct monitoring of noise emissions during the unloading of the "Wyuna" (a bulk carrier vessel) at Glebe Island Berth 8 (GI-8), as required by the Glebe Island and White Bay Port Noise Policy, *Port Authority of NSW (2020)* which came into effect in January 2021.

Noise measurements have been conducted whilst the ship was berthed at GI-8 and unloading using the onboard blowers at two locations considered representative of the potentially most exposed residential receivers adjacent to Batty Street during the daytime period and night-time period as required by the Port Noise Policy.

The measurements were conducted during the daytime between 12:19 and 12:50 and during the night-time between 00:16 and 01:41 on Friday 5 March 2021.

2 Site description

The Glebe Island Port facility is located north of Anzac Bridge between Johnsons Bay and White Bay on Glebe Island. The facility occupies approximately 40 hectares of waterfront land and forms a crescent around Glebe Island, with a water frontage of about 1,400 m in length.

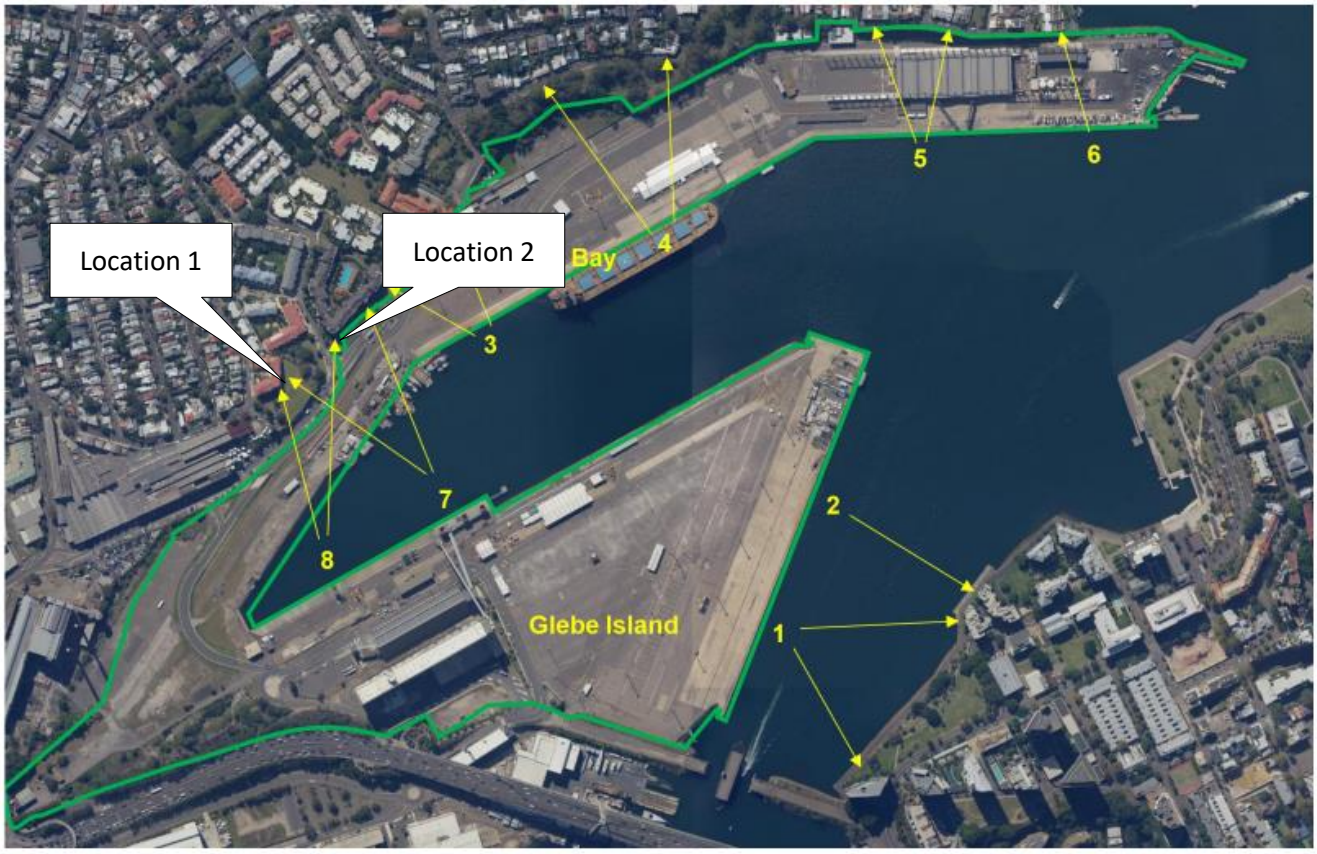
The facility layout comprises the following main elements:

- Two berths on the eastern side of Glebe Island designated GI-1 and GI-2, and two berths on the western side designated GI-7 and GI-8;
- Concrete/asphalt area previously used for vehicle storage; and
- Internal roads continuing from Sommerville Road providing truck access to the storage areas of Berths 1 to 2.
- The adjacent White Bay facility to the west of Glebe Island consists of 5 berths on the northern side of White Bay.

Berth 8 is located towards the western end Glebe Island, as shown in **Figure 1**.

Figure 1 also identifies the nearest receiver locations for each berth as identified in Appendix H – Noise Standard, which forms part of the Port Noise Policy and the measurement locations used.

Figure 1 Location of berths and nearest receivers to each berth



Note: Figure referenced from Appendix H of the Port Noise Policy

2.1 Noise Trigger Levels and Criteria

The noise trigger levels applicable at the worst affected sensitive receiver as outlined in the Port Noise Policy is reproduced in **Table 1**.

Table 1 Vessel Trigger Noise Level (external)

Environmental trigger applied to vessels at berth	Assessment Location	Day $L_{Aeq(15hour)}$[1] (7am to 10pm)	Night $L_{Aeq(1hour)}$ (10pm to 7am)	Night L_{Amax} (10pm to 7am)
Glebe Island 1 and 2	All sensitive receivers near the port	60 dBA	55 dBA	65 dBA
Glebe Island 7 and 8		60 dBA	55 dBA	65 dBA
White Bay 3		60 dBA	55 dBA	65 dBA
White Bay 4 (non-cruise)		60 dBA	55 dBA	65 dBA

Note 1: This includes a 5dBA allowance in the short term for vessels that cannot meet the night time vessel trigger noise level without restrictions to unloading speeds. The 24/7 goal is the median unloading noise level for vessels which is applied as the night time vessel trigger noise level

3 Measurement Methodology and Instrumentation

In accordance with the Port Noise Policy, compliance with the Noise Trigger Levels is required at all sensitive receivers to the port. The nearest receivers to each berth have been identified and measurements have been subsequently undertaken at the closest receiver to assess compliance as identified in the Port Noise Policy and shown in **Figure 1**. The noise measurements were undertaken during unloading operations.

Furthermore, the noise monitoring is required to be undertaken over a period of sufficient duration to ensure representative results from all activities and combinations of activities that would be expected to occur and to satisfy the $L_{Aeq(period)}$ trigger level. During attended noise monitoring ship noise emissions were observed to be consistent although heavily influenced by wind conditions during the daytime period, and as such only two 15minute measurements were undertaken. Four measurements undertaken during the night-time to confirm receiver noise levels with calm weather conditions.

All acoustic instrumentation employed throughout the monitoring programme has been designed to comply with the requirements of AS IEC 61672.1 – 2013 *Electroacoustics—Sound level meters - Specifications* and carries current National Association of Testing Authorities (NATA) or manufacturer calibration certificates. Instrument calibration was checked before and after each measurement survey, with the variation in calibrated levels not exceeding ±0.5 dBA.

Noise measurements and assessments in this report have been prepared in accordance with Australian Standard AS 1055-2018 "Acoustics - *Description and Measurement of Environmental Noise"* and with reference to the Noise Policy for Industry (NPfI).

During day time measurements, wind speeds were observed between 5-7m/s at the monitoring location. As per *AS1055:2018* measurement requirements, wind speeds above 5m/s may potentially impact microphone performance and should be used with caution. As such the day time measurement results should be considered indicative only and have not been assessed for compliance. The survey instrumentation used during the studies is set out in **Table 2**.

Table 2 Noise Survey Instrumentation

Type	Serial Number	Instrumentation Description
2270	3029485	Brüel & Kjær Modular Precision Sound Level Meter
4189	3260622	Brüel & Kjær 12.5 mm Pre-polarised Condenser Microphone
42AG	279662	GRAS Sound Level Calibrator

4 Results and Analysis

The results of the attended noise measurements are summarised in **Table 3**. The measured noise levels presented include noise from the ship unloading activity as well as ambient noise unrelated to GI-8.

Table 3 Summary of Measurement Results – 5 March 2021

Location	Period/ Weather	Start Time	LAeq	LCeq	LCeq - LAeq	LA10	LA90	GI-8 Related LAmax	Comments
Location 1	Daytime Temp: 28°C Wind: 4-5m/s Gusts up to 7m/s from South	12.19pm	60	73	13	62	58	64	*Note this measurement is not in accordance with AS1055 due to elevated wind speeds and should be considered indicative only.* *Site related noise events:* Tones at 1.6kHz and 2kHz – upto 68 dBA **Wyuna** **Estimated contribution** **LAeq(15hour) ~ 55-56 dBA** *Other noise events:* Traffic – 56 to 66 dBA Construction 61 to 70 dBA
		12.35 pm	60	73	14	62	57	68	
Location 1	Night Temp: 20°C Wind: 0m/s	00:16am	52	61	9	55	50	61	*Site related noise events:* Tones at 1.6kHz and 2kHz – upto 65 dBA General Ship noise – 51-52 dBA Air release **– 52 to** 60 dBA **Wyuna** **Estimated contribution** **LAeq(1hour) 53 dBA** **LAmax 64.9 dBA** *Other noise events:* Construction at times – 54 dBA Traffic – 52 dBA
		00:33am	53	62	10	55	50	62	
		00:51am	54	63	9	57	51	61	
		01:06am	54	63	10	56	51	65	
Location 2	Night Temp: 20°C Wind: 0m/s	1:26am	49	61	13	52	45	59	*Site related noise events:* Tones at 1.6kHz and 2kHz – upto 55 dBA Air Release – 46 to 59 dBA **Wyuna** **Estimated contribution** **LAeq(1hour) 49 dBA** **LAmax 59 dBA** *Other noise events:* Insects– upto 56 dBA

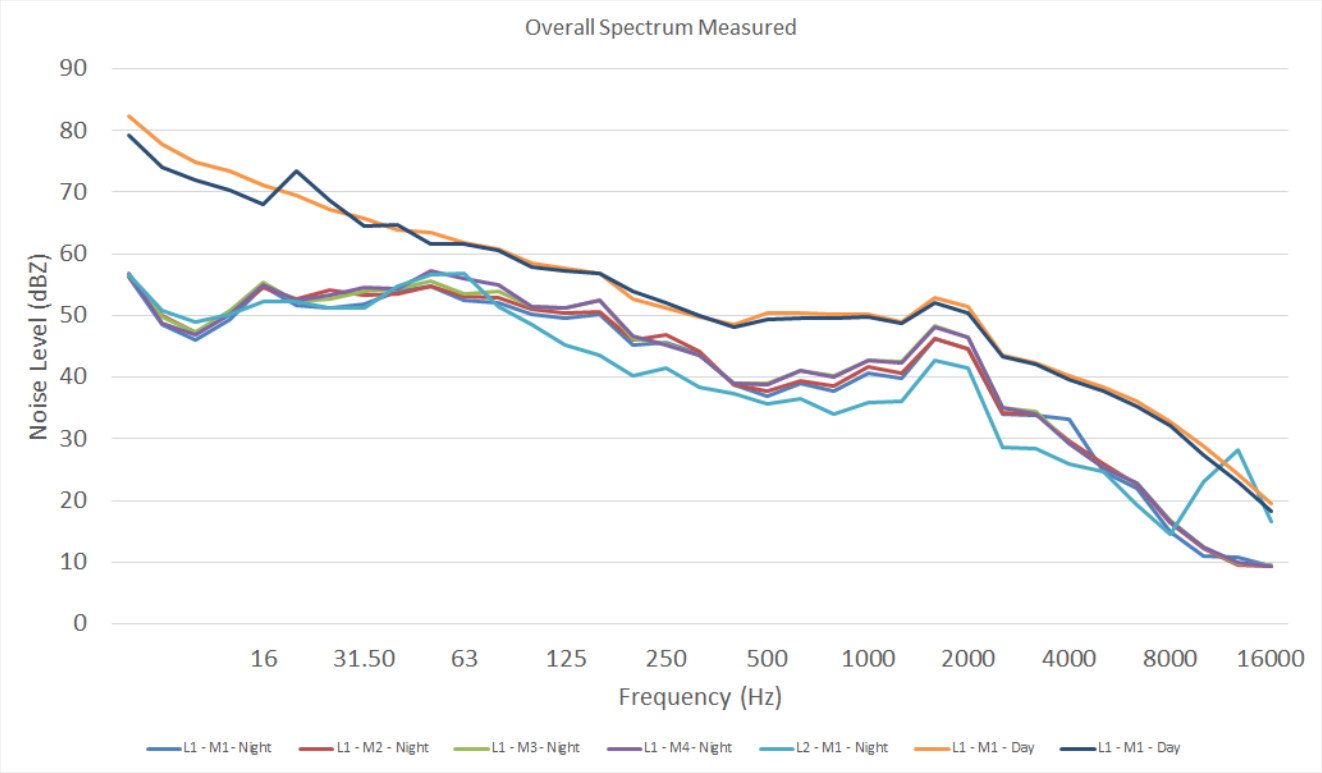
4.1.1 Modifying Factors

The Port Noise Policy (Appendix F, Vessel Noise Guideline) makes reference to the NSW Environment Protection Authority NPfI (EPA 2017) for the assessment of annoying characteristics such as tonal noise.

The noise levels measured was observed to have a noticeable tone that influenced both the 1.6kHz and 2khz third octave frequency band during both the evening and night-time measurements as indicated in **Figure 2**. As the 1.6kHz and 2kHz adjancet 1/3 octave bands are elevated, they do not directly trigger a tonal penalty when assessed against Table C1 of the NPfI. However the NPfI further states that:

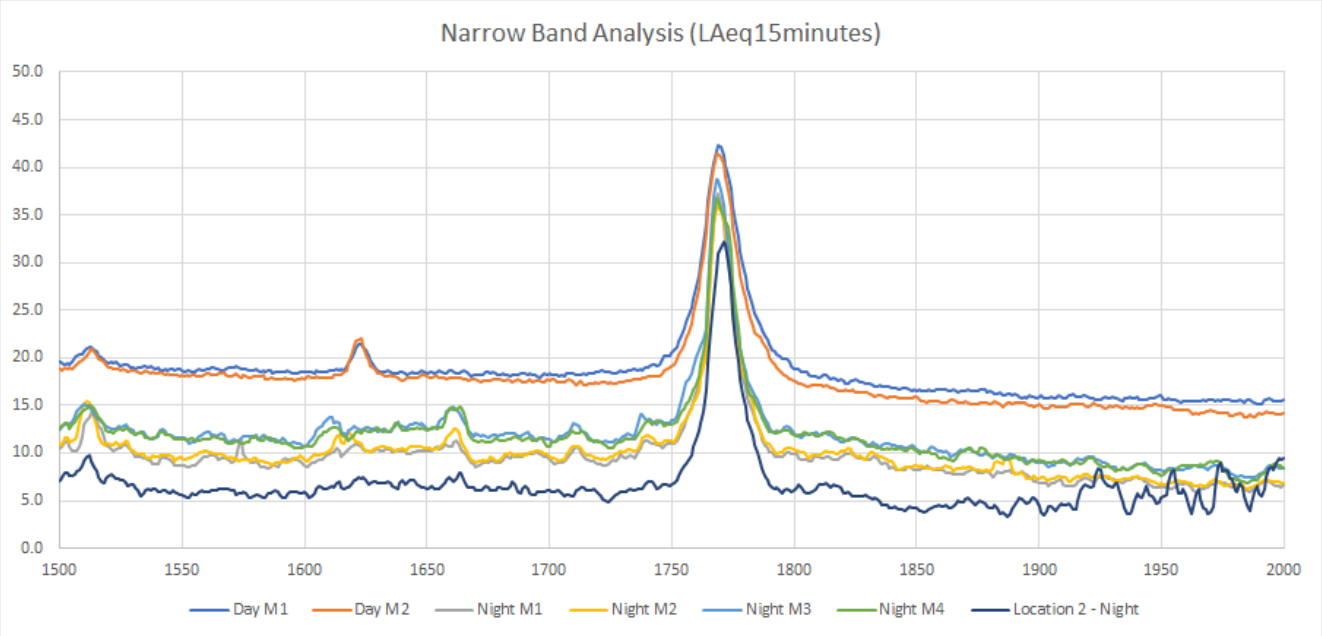
> *'narrow band analysis using the reference method in ISO1996-2:2007, Annex C may be required by the consent/regulatory authority where it appears that a tone is not being adequately identified e.g. where it appears that the tonal energy is at or close to the third octave band limits of contiguous bands'.*

Figure 2 Measured Spectrum for each measurement Location 1



To assist in understanding whether the noise emissions were tonal, a narrow band analysis was undertaken of the recorded audio data. This showed that the centre of the tone is approximately 1.77kHz which corresponds with the cross over frequency between 1.6kHz an 2kHz third octave bands. This is Illustrated in **Figure 3**. This corresponds to the observation on site of a distinct tone that was phasing in and out throughout the measurements.

Figure 3 Narrow band analysis the $L_{Aeq(15minute)}$ for each measurement



Based off this analysis, it is recommended that a 5dB penalty be applied for tonality as per Table C1 of the NPfI.

The average noise levels were observed be generally constant over consecutive measurements, although fluctuations in the loudness of the audible tone were observed throughout the measurement and be attributed to variations in operation or load of the ships mechanical plant. Fluctuations in loudness were not observed to be attributed to equipment cycling on and off.

Further measurements should be undertaken on the next occasion the ship is unloading at Glebe Island to confirm the presence of tonality.

5 Performance Assessment

5.1 Operations

Results of the operator attended noise measurements of the Wyuna on the 5 March 2021 and compared with the Vessel Noise Trigger Levels are summarised in **Table 4**.

Table 4 Compliance Assessment – 5 March 2021

Location	Estimated GI-8 Contribution			Vessel Noise Trigger Levels			Compliance	
	Day $L_{Aeq(15hour)}$	Night $L_{Aeq(1hour)}$	Night L_{Amax}	Day $L_{Aeq(15hour)}$	Night $L_{Aeq(1hour)}$	Night L_{Amax}	Day	Night
Location 1	60-61 dBA[1,2]	58 dBA[2]	65 dBA	60 dBA	55 dBA	65	-[1]	No
Location 2	-	54 dBA[2]	59 dBA	60 dBA	55 dBA	65	-[3]	Yes

Note 1: Daytime measurement is not in accordance with *AS1055 due to elevated wind speeds and should be considered indicative only*.

Note 2: Includes a 5dB penalty for tonality in accordance with the NPfI.

Note 3: No measurement conducted during the daytime at location 2.

Table 4 indicates that compliance with the Vessel Noise Trigger Level was achieved at location 2 during the night-time period. All measurements contained tonal components as detailed in **Section 4.1.1** and a 5dB penalty has been applied. As a result, the noise levels at Location 1 exceed the night-time Vessel Noise Trigger Level by up to 3dB. It is anticipated that under calm weather conditions, the noise levels will likely comply with the daytime Vessel Noise Trigger Levels at Location 1.

6 Conclusion

Noise measurements were carried out whilst the Wyuna was undertaking unloading activities at GI-8 during the daytime and night-time periods on the 5 March 2021 after the ship arrived and had commenced unloading operations.

Noise measurements undertaken at Location 1 indicate that the overall noise levels measured were below the Vessel Noise Trigger Levels, however all incurred a 5dB penalty for tonality in accordance with the NPfI. As a result, the noise levels exceed the trigger levels by up to 3dB at Location 1 during the night-time period. It is anticipated that under calm weather conditions, the noise levels will likely comply with the daytime Vessel Noise Trigger Levels at Location 1.

Noise levels at location 2 comply with the Vessel Noise Trigger Levels during the night-time including the 5dB penalty applied for tonality.

The highest L_{Amax} noise level measured was 64.9dBA which is just under the criteria of 65dBA, and therefore no exceedance was recorded, but is indicated that it has the potential exceed in the future.

APPENDIX A

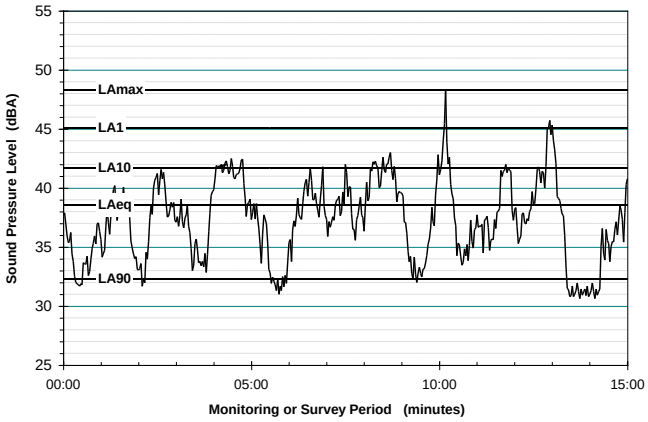
Acoustic Terminology

Typical Noise Indices

This Report makes repeated reference to certain noise level descriptors, in particular the L_{A10}, L_{A90} and L_{Aeq} and L_{Amax} noise levels.

- The L_{A10} is the A-weighted sound pressure level exceeded 10% of a given measurement period and is utilised normally to characterise typical maximum noise levels.
- The L_{Aeq} is essentially the average sound level. It is defined as the steady sound level that contains the same amount of acoustical energy as a given time-varying sound over the same measurement period. The $L_{Aeq(period)}$ is the measurement parameter used to describe the average sound level over the period. For daytime the period is 7 am to 6 pm, for evening 6 pm to 10 pm, and for night-time 10 pm to 7 am.
- The L_{A90} noise level is the A-weighted sound pressure level exceeded 90% of a given measurement period and is representative of the average minimum background sound level (in the absence of the source under consideration), or simply the "background" level.
- The L_{Amax} is simply the maximum noise level and is often represented by the $L_{A1(1min)}$, being the level exceeded 1% of 1 minute, ie the noise level exceeded for 0.6 of a second.

Graphical Display of Typical Noise Indices



Typical Noise Levels

The following table presents examples of typical noise levels.

Typical Noise Levels

Sound Pressure Level (dBA)	Typical Source	Subjective Evaluation
130	Threshold of pain	Intolerable
120	Heavy rock concert	Extremely noisy
110	Grinding on steel	
100	Loud car horn at 3 m	Very noisy
90	Construction site with pneumatic hammering	
80	Kerb side of busy street	Loud
70	Loud radio or television	
60	Department store	Moderate to
50	General Office	Quiet
40	Inside private office	Quiet to
30	Inside bedroom	Very quiet
20	Unoccupied recording studio	Almost silent

A-Weighting or dBA Noise Levels

The overall level of a sound is usually expressed in terms of dBA, which is measured using the "A-weighting" filter incorporated in sound level meters. These filters have a frequency response corresponding approximately to that of human hearing. People's hearing is most sensitive to sounds at mid frequencies (500 Hz to 4000 Hz), and less sensitive at lower and higher frequencies. Thus, the level of a sound in dBA is a good measure of the "loudness" of that sound. Different sources having the same dBA level generally sound about equally as loud, although the perceived loudness can also be affected by the character of the sound (eg the loudness of human speech and a distant motorbike may be perceived differently, although they are of the same dBA level).

Sensitivity of People to Noise Level Changes

A change of up to 3 dBA in the level of a sound is difficult for most people to detect, whilst a 3 dBA to 5 dBA change corresponds to a small but noticeable change in loudness. A 10 dBA change corresponds to an approximate doubling or halving in loudness.

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