

AKUNA

**Glebe Island 8
Compliance Noise Monitoring Report**

Prepared for:

Port Authority of New South Wales
PO Box 25
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SLR Ref: 610.04309-R100
Version No: -v1.2
May 2021

SLR 

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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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DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
610.04309-R100-v1.2	26 May 2021	Jason Rasquinha	Aaron McKenzie	Aaron McKenzie
610.04309-R100-v1.1	25 May 2021	Jason Rasquinha	Aaron McKenzie	Aaron McKenzie
610.04309-R100-v1.0	11 May 2021	Jason Rasquinha	Aaron McKenzie	Aaron McKenzie
610.04309-R100-v0.1	3 May 2021	Jason Rasquinha	Aaron McKenzie	Draft

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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 of the “Akuna” (a bulk cargo 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 one location considered representative of the potentially most exposed residential receiver adjacent to Batty Street, Rozelle during the daytime period and night-time period as required by the Port Noise Policy. In addition to this location, additional night-time measurements were conducted at the most exposed residential receiver adjacent to Buchanan Street, Rozelle.

The measurements were conducted at GI-8 during the night-time between 00:34 and 01:13 and during the daytime between 11:34 and 12:43 on 24 April 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 LAeq(15hour) ¹ (7am to 10pm)	Night LAeq(1hour) (10pm to 7am)	Night L _{max} (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.

Four 15-minute measurements were undertaken during the daytime and night-time at Location 1 and one measurement was undertaken at Location 2 during the night-time to confirm receiver noise levels.

At the time of the measurements another ship, the Promise 3 was docked at berth 7 (GI-7). The measured noise levels were from by both ships and the emissions were observed to be from the engine exhaust of both ships, the operation of the cranes of the Promise 1 and the blowers of the Akuna. SLR has determined the overall contribution of the Akuna using the known levels from the Promise 3 operating in isolation and measured on 23 April 2021. While the engine noise was relatively constant at both locations, more variation was observed in the levels from the blowers.

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).

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
4231	2022772	Bruel & Kjaer 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 as well as ambient noise unrelated to GI-8.

Table 3 Summary of Measurement Results – 24 April 2021

Location	Period/ Weather	Start Time	LAeq	LCeq	LCeq - LAeq	LA10	LA90	GI-8 Related LAmix	Comments
Location 2	Night Temp: 10°C Wind: calm	00:34	54	63	9	56	52	57	<p>Site related noise events Akuna (GI 8) and Promise 3 (GI 7): Blowers¹: 50-64 dBA Exhaust: 52-55 dBA</p> <p>Akuna: <i>Estimated contribution</i> LAeq(1hour): 47 dBA LAmix: 55 dBA</p> <p>Other noise events short term: Vehicles: 45-52 dBA Rock-breaker: 52 dBA</p>
Location 1	Night Temp: 10°C Wind: calm	01:01	57	65	8	59	55	63	<p>Site related noise events Akuna (GI 8) and Promise 3 (GI 7): Blowers¹: 50-64 dBA Exhaust: 52-55 dBA Crane: 50-56 dBA</p> <p>Akuna: <i>Estimated contribution</i> LAeq(1hour): 54 dBA LAmix: 63 dBA</p> <p>Other noise events: Vehicles: 55 dBA Rock-breaker: 55-53 dBA</p>
		01:21	57	65	9	59	54	63	
		01:41	57	65	9	59	55	63	
		01:58	57	65	9	59	54	64	
Location 1	Daytime Temp: 20°C Wind: 1.5m/s W	11:34	56	66	11	58	54	65	<p>Site related noise events Akuna (GI 8) and Promise 3 (GI 7): Blowers¹: 50-64 dBA Exhaust: 52-55 dBA Crane: 50-58</p> <p>Akuna: <i>Estimated contribution</i> LAeq(1hour): 53 dBA</p> <p>Other noise events: Vehicles: 54-60 dBA Rock-breaker: 55-53 dBA Birds: 59-64 dBA Helicopter: 55-57 dBA Activity at residences: 54-55 dBA Aircraft: 54-55 dBA</p>
		11:52	56	66	11	58	54	64	
		12:11	56	67	11	57	53	60	
		12:28	56	66	10	58	54	64	

Note 1: Noise emissions from the blower were observed to be tonal in nature.

4.1.1 Modifying Factors

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

The Port Noise Policy does not currently have a method for assessing low frequency noise. Low frequency noise impacts from shipping are currently under investigation and will be reviewed following collection of a database of ship low frequency noise data by the Port Authority .

Furthermore, the noise levels were also observed to be generally constant and therefore were not considered to be intermittent as defined in the NPfl.

5 Performance Assessment

5.1 Operations

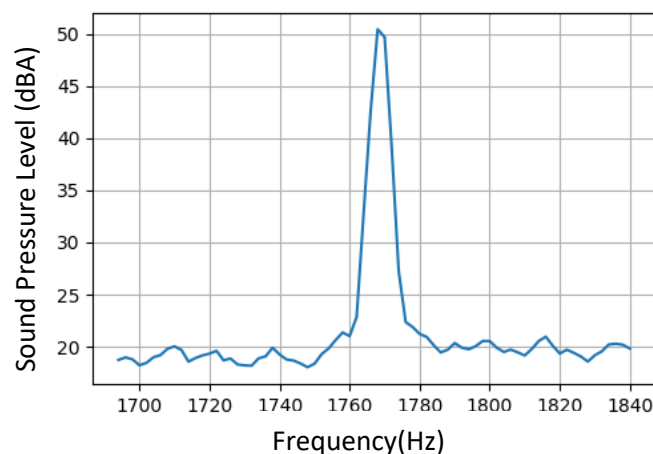
Results of the operator attended noise measurements compared with the Vessel Noise Trigger Levels indicates that compliance with the Vessel Noise Trigger Level was achieved during the daytime at Location 1 and during the night-time at Location 2. The application of the tonality penalty resulted in the exceedance of the Vessel Noise Trigger Level During the night-time at Location 1.

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 daytime and night-time measurements. As the 1.6kHz and 2kHz adjacent 1/3 octave bands are elevated, they do not directly trigger a tonal penalty when assessed against Table C1 of the NPfl. However the NPfl 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’.

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 shown in **Figure 2**.

Figure 2 Narrow-Band Spectrum – Location 1 (Night)



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

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.

Table 4 Compliance Assessment

Location	Estimated GI-8 Contribution			Vessel Noise Trigger Levels			Compliance	
	Day LAeq(15hour)	Night LAeq(1hour)	Night LAm _{ax}	Day LAeq(15hour)	Night LAeq(1hour)	Night LAm _{ax}	Day	Night
Location 1	58 ¹ dBA	59 ¹ dBA	63 dBA	60 dBA	55 dBA	65 dBA	Yes	No
Location 2	-	52 ¹ dBA	57 dBA	60 dBA	55 dBA	65 dBA	-	Yes

Note 1: 5 dB penalty applied for tonal noise.

6 Conclusion

Noise measurements were carried out whilst the Akuna was berthed at GI-8 during the daytime and night-time periods on the 24 April 2021.

Noise measurements undertaken at Location 1 and 2 indicate that estimated noise levels from the Akuna were below the Vessel Noise Trigger Levels during all measurement periods. However, due to the tonality of the ship's blowers, the 5 dB penalty was applied to all noise levels. Hence, the night-time noise levels at Location 1 exceeded the trigger levels by up to 4 dB, resulting in a non-compliance.

Observed L_{Amax} noise level were under the criteria of 65dBA.

APPENDIX A

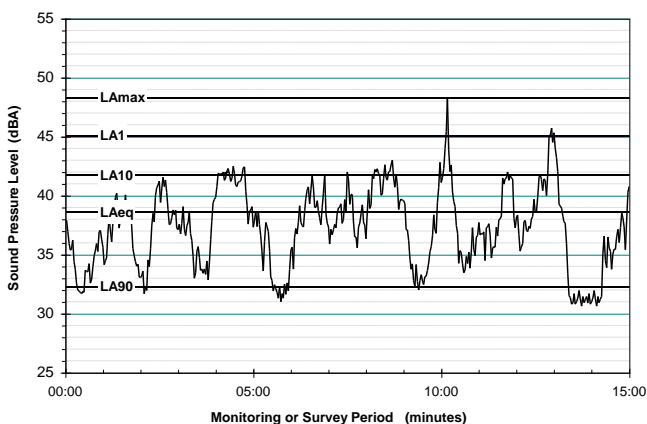
Acoustic Terminology

Typical Noise Indices

This Report makes repeated reference to certain noise level descriptors, in particular the LA10, LA90 and LAeq and LAmax noise levels.

- The LA10 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 LAeq 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 LAeq(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 LA90 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 LAmax is simply the maximum noise level and is often represented by the LA1(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
50	General Office	to Quiet
40	Inside private office	Quiet
30	Inside bedroom	to 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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