HEGGIES
AUSTRALIA

REPORT 10-4309R3
Revision 0

White Bay Berth 4 Bulk Liquids Terminal
Botany Tradition
Ship Noise Monitoring Report

PREPARED FOR

Sydney Ports Corporation
207 Kent Street
Sydney NSW 2000

9 DECEMBER 2005

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Botany Tradition

Ship Noise Monitoring Report

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EXECUTIVE SUMMARY

Heggies Australia has been commissioned by Sydney Ports Corporation (SPC) to conduct monitoring of noise emissions during the unloading of Botany Tradition (a bulk liquids vessel) at White Bay Berth 4 (WB-4), as required by Clause M7.1(1a) of the EPA's Environment Protection Licence (Licence No. 12095).

Measured L_{Aeq} and L_{A90} levels are assessed against the EPA licence imposed noise goals. $L_{Aeq(15\ min)}$ exceedances of noise goals range between 4 dBA and 6 dBA in Balmain, while in Pyrmont the measured levels exceed the $L_{Aeq(15\ min)}$ noise goals by 5 dBA. An exceedance of the $L_{Aeq(night)}$ descriptor of between 10 dBA and 12 dBA is seen to occur in Balmain during the pumping operation.

The ambient noise sources unrelated to the bulk liquids operations at WB-4 contributed to the overall L_{Aeq} levels measured at the 2 Point Street monitoring location. Taking these into account, and the generally constant nature of WB-4 related noise at Pyrmont, the measured L_{A90} levels are considered to better represent the true (WB-4 related) L_{Aeq} levels in absence of extraneous noise. On this basis, the noise levels from the licenced operations are found to exceed the $L_{Aeq(15min)}$ criteria in Pyrmont by 3 dBA.

Bulk liquids terminal related maximum (L_{Amax}) noise levels during unloading of this ship were found to be generated by truck based pressure release valves.

Subject to feasibility, practicality and reasonability, potential noise control measures that may be considered (as required by condition R4.1) in order to meet the Licence imposed noise goals, include a combination of engineering noise controls and on-site noise management strategy.

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1 INTRODUCTION

Heggies Australia has been commissioned by Sydney Ports Corporation (SPC) to conduct monitoring of noise emissions during the unloading of Botany Tradition (a bulk liquids vessel), as required by Clause M7.1(1a) of the EPA's Environment Protection Licence (Licence No. 12095).

The measurements of activities have been conducted at locations representative of the potentially most exposed residential receivers during unloading operations (ship pumps and truck activity on the wharf in addition to APUs).

Measured noise levels are assessed against the noise goals set out in Table U1 of the Environment Protection Licence. The feasible and reasonable noise mitigation measures are discussed in broad terms, with the aim of minimising the noise impacts from the operations, where the noise goals are exceeded.

2 SITE DESCRIPTION

The White Bay Port facility is located at the southern end of the Balmain peninsula. The facility sits on about 40 hectares of waterfront land, and forms a crescent around White Bay, with a water frontage of about 2,100 m in length.

The facility layout comprises the following main elements:

- Six multiple-use berths spread along the northern side of White Bay.
- Storage warehouse situated to the north east of White Bay, Berth 4 (WB-4); and
- Internal road continuing from Robert Street, providing truck access to storage areas of docks 1 to 6.

Berth 4 is approximately located in the middle of the northern side of White Bay, as shown in **Figure 1** To the north and north-west of the site is a mixture of residential dwellings consisting of 1 and 2 storey detached houses and terraces. A number of recently constructed 4 and 5 storey residential developments are situated directly west of Berth 4, and incorporate acoustic façade treatments to achieve satisfactory internal noise levels. In addition, buildings in direct view were designed to provide significant acoustical shielding to the rest of the development. The storage warehouse (on port land) to the north-east of WB-4 is about 20 metres at the highest point, and provides significant acoustic shielding to the residential properties directly behind. To the south-east of the site is Glebe Island, another working port area with four berths, two of which are currently used as car terminals, and two as multiple-use berths. To the south west of WB 4, about 550 m across the water is the Pyrmont Peninsula, with a number of high-rise residential apartments near the waterfront.

2.1 Measurement Locations

The Noise Impact Assessment (NIA) Study (Report Number 10-4309R1 prepared by Heggies) for the proposed bulk liquid terminal operation has previously identified 5 Waite Street and 36 Refinery Drive as the most affected receiver locations within the Balmain / Rozelle and Pyrmont / Glebe areas respectively.

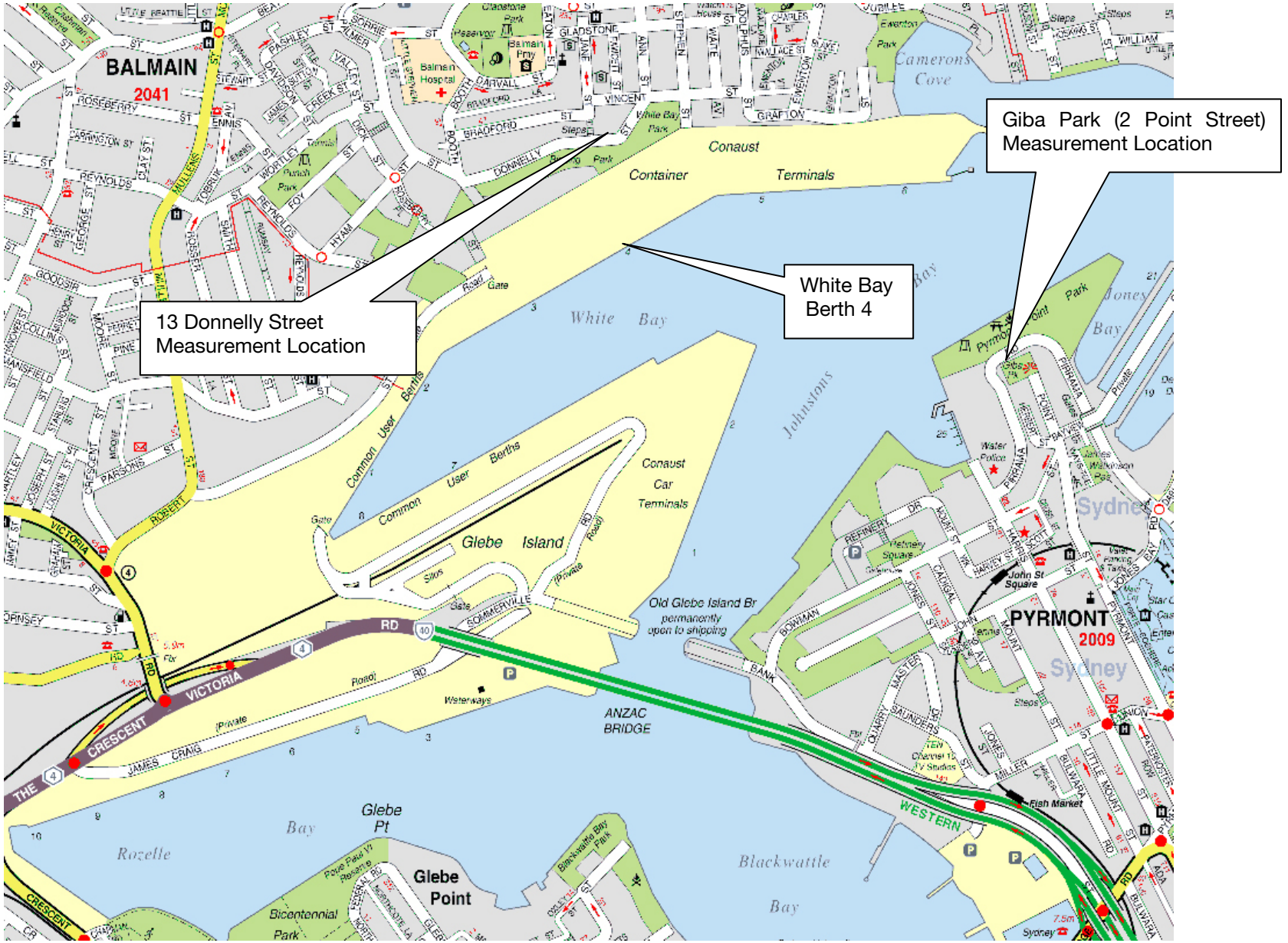
For the current study, in the Balmain / Rozelle area, monitoring was carried out at 13 Donnelly Street (also assessed in the noise impact assessment) due to the availability of day/night access to the property boundary. Note that noise measurements at 13 Donnelly Street can be carried out off street, whereas at 5 Waite Street, noise measurements require backyard access. Furthermore, the location at 13 Donnelly Street is in close proximity of 5 Waite Street. It is approximately the same distance away and is also directly exposed to unloading operations at WB-4. It is therefore considered to be of similar acoustical environment to that of 5 Waite Street, Balmain.

The monitoring location at 36 Refinery Drive, identified by the NIA as the most affected receiver in the Pyrmont / Glebe area was found to be exposed to high levels of traffic related noise from the Anzac Bridge. Giba Park (a publicly accessible park situated at the top of the 4 level apartment complex at 2 Point Street) was therefore selected as the representative measurement location for the Pyrmont / Glebe area, as it allowed ship noise measurements to be taken in relative absence of traffic noise. Giba Park is considered to be equivalent to level 5, 2 Point Street. **Table 1** below summarises the receiver locations where measurements were conducted in each area, and give a brief description of each location. A more detailed description and photos of the selected monitoring locations are presented in **Appendix B** and **Appendix C**.

Table 1 Representative Receiver Locations

Location	Representative Receiver Location	Description
Balmain and Rozelle	13 Donnelly Street, Balmain	Ground level at the front of residence, about 1.5 m away from the facade
Pyrmont and Glebe	2 Point Street, Pyrmont	At Giba Park, on top of a 4 storey building at 2 Point Street (i.e. height equivalent of a 5 storey building)

Figure 1 White Bay / Glebe Island Layout with Attended Noise Monitoring Locations



3 EPA LICENCE NOISE GOALS

For the purpose of the bulk liquid cargo handling operations at White Bay Berth 4 (WB-4), the environment protection licence granted by the EPA sets out the project noise goals at the neighbouring residential communities. The noise goals are set out in Table U1 of the licence conditions and reproduced in **Table 2** below.

Table 2 EPA License Noise Goals (Reproduced from Table U1)

Location	Night		
	$L_{Aeq(15\ min)}$	$L_{Aeq(night)}$	$L_{A(max)}$
Balmain and Rozelle	47dBA	41 dBA	57dBA
Pyrmont and Glebe	41 dBA	Not Applicable	51 dBA

Explanatory notes:

1. $L_{A(max)}$ means maximum A-weighted sound pressure level measured on fast time weighting during the time over which sound is measured

2. All other acoustic terms including 'night' have the same meaning as in the INP

3. Not Applicable: In instances where the amenity criteria $L_{Aeq(night)}$ has been determined to be a higher number than the intrusive criteria LAeq(15 min) that the amenity criteria is less stringent than the intrusive criteria, then the amenity criteria becomes 'not applicable'. This is because compliance with the criteria will ensure compliance with the intrusive criteria will ensure compliance with the amenity criteria.

Heggies is aware that SPC is currently engaged in discussion with DEC regarding the LAeq(15 min) and LAmax noise goals.

4 MEASUREMENT METHODOLOGY AND INSTRUMENTATION

Sound pressure measurements were made at 1.5 m above ground level at 13 Donnelly Street, and 1.5 m above ground level at Giba Park, located on top of the residential apartment complex at 2 Point Street, Pyrmont. The measurements were carried out using a precision sound level meter conforming to the requirements of AS 1259-1982 "Sound Level Meters". Calibration was checked prior to and subsequent to the survey. Any drift in calibration was within 0.5 dBA and considered acceptable.

The survey instrumentation used during the studies is set out in **Table 3**.

Table 3 Noise Survey Instrumentation

Type	Serial Number	Instrument Description
2260	2335702	Brüel & Kjær Modular Precision Sound Level Meter
4189	2378026	Brüel & Kjær 12.5 mm Prepolarised Condenser Microphone
4231	2022772	Brüel & Kjær Calibrator

The licence calls for L_{Aeq} (A-weighted equivalent continuous) sound pressure level measurements to be carried out at locations representative of those potentially most affected (i.e. waterfront) locations during periods of inactivity (e.g. ship Auxiliary Power Units (APUs) operating) and during unloading operations (e.g. ship pumps and truck activity on the wharf in addition to APUs), in accordance with Clause M7.1 (2).

A window of opportunity to measure ship noise levels during periods of unloading inactivity exists immediately after the ship berths, while the unloading equipment is being set up (hoses unrolled and connected to the ship's manifold etc). The equipment setup phase usually lasts less than 2 hours, after which the unloading is continuous, with one road tanker being filled at any one time. Ship noise measurements during periods of activity can be measured at any time after unloading commences.

The previous ship noise monitoring report prepared by Heggies (Report Number 10-4309R2R1) concluded that measurements are best carried out at night (preferably after 1 am). Extraneous noise (not related to the activity) is generally at a minimum at this time and results are likely to be much more meaningful.

The ship Botany Tradition was scheduled to berth at 7:00 am on Friday 18 November 2005. In light of the expected high levels of extraneous noise from peak traffic during this time, noise measurements during ship inactivity (i.e. measurement of Auxiliary Power Unit (APU) noise) were not carried out on this occasion. Instead, measurements during periods of activity were carried out on the night of the 19th of November, commencing at 3 am, as the extraneous ambient noise is generally at a minimum at this time. It should be noted however, that pump noise appeared to be controlling the overall noise levels, thus indicating that APU noise is relatively lower than the overall levels measured during unloading activity.

Environmental noise measurements were carried out with reference to the guidelines contained within the NSW Industrial Noise Policy (INP).

In circumstances where it was not practical to carry out measurements at the potentially worst affected receiver locations as predicted by the Noise Impact Assessment, locations of similar noise characteristics were chosen, as described in **Section 2.1.**

Given the relatively constant nature of noise related to the bulk liquids cargo handling operations, short term measurements (15 minute duration) were considered to be sufficient to provide an estimate of the LAeq(night) noise levels at the selected residential receivers. A brief description of acoustic terminology used in this report is presented in **Appendix A**.

5 RESULTS

The results of the attended noise monitoring are summarised in **Table 4** below. Discussion of the results is presented in **Section 6** of this report. It should be noted that the measured levels include noise from unloading activities as well as ambient noise unrelated to the unloading activity.

Table 4 Measured Noise Levels - Unloading Activity

Address	Start Time	L_{Aeq}	L_{A90}	L_{Amax} Range[1]
13 Donnelly Street (Balmain / Rozelle)	03:15 am	53 dBA	49 dBA	None observed during monitoring period
	03:32 am	51 dBA	48 dBA	53 dBA – 69 dBA (53 dBA – 65 dBA)
Level 5, 2 Point Street (Pyrmont / Glebe)	04:20 am	46 dBA	44 dBA	52 dBA (52 dBA)
	04:36 am	46 dBA	44 dBA	None observed during monitoring period

Notes: 1 Range of observed L_{Amax} values with WB-4 related L_{Amax} noise levels shown in brackets

At 2 Point Street, the measured noise levels were generally subject to frequent (almost constant) noise from crickets and seagulls. Due to the highly frequent nature of ambient (cricket and seagull) noise and the generally constant nature of WB-4 related noise, the measured L_{A90} levels at this location are considered to better represent the true (WB-4 related) L_{Aeq} levels, as this descriptor is less sensitive to transient extraneous noise.

At 13 Donnelly Street on the other hand, the measured noise levels were dominated by noise related to the bulk liquids unloading operations. Substantial variations in noise levels emanating from the ship were noted during the measurements at the Donnelly Street location. Subsequent correlation of activities with wharf staff revealed the possibility that the observed varying noise levels may have been related to the varying levels of liquid within the (ship's) tanks. These variations were not observed during measurements at 2 Point Street, Pyrmont.

Noise from both the ship's Auxiliary Power Units (APUs) and pump / fan operations were constant in nature. Noise from trucks was observed to be the main contributor to (L_{Amax}) maximum noise level events. Detailed summaries of the L_{Amax} events are presented in **Table 5** and **Table 6**.

The $L_{Aeq(15\ minute)}$ noise measurements at 2 Point Street were considered to be affected by background noise, unrelated to the bulk liquids unloading (WB-4 related) activity, as discussed in **Section 6**.

An assessment of the measured noise levels against goals listed in the Licence Conditions are presented in **Table 7**, **Table 8** and **Table 9**.

Table 5 Summary of Attended LAmax Noise Levels at 13 Donnelly Street, Balmain

LAmax Source	LAmax Range	Notes
Pressure release Valve (truck based)	56 dBA – 65 dBA	Truck based pressure release valve (possibly related to use of hand brakes) could be heard coming from the truck at arrival and immediately prior to departure from the site. The event lasts for approximately 1 second
Car passby on Donnelly Street	66 dBA – 69 dBA	Car passby noise levels ranged from 66 dBA for cars rolling downhill to 69 dBA for cars engaged in gear going uphill

NOTE: Car Passby on Donnelly Street unrelated to bulk liquids unloading operation at White Bay berth 4.

Table 6 Summary of Attended LAmax Noise Levels at 2 Point Street, Pyrmont

LAmax Source	LAmax Range	Notes
Pressure release valve (truck based)	52 dBA	Single LAmax event recorded during the monitoring period at 2 Point Street

Table 7 Assessment of Measured Noise Levels Against LAeq(15 min) Noise Goals

Measurement Location	Measured levels		LAeq(15 min) Noise Goals	LAeq (15 minute) Exceedance of Licence Goals	LA90 Exceedance of Licence Goals
	LAeq	LA90			
13 Donnelly Street (Balmain / Rozelle)	53 dBA	49 dBA	47 dBA	**6 dBA**	2 dBA
	51 dBA	48 dBA		**4 dBA**	1 dBA
Level 5, 2 Point Street (Pyrmont / Glebe)	46 dBA	44 dBA	41 dBA	5 dBA	**3 dBA**
	46 dBA	44 dBA		5 dBA	**3 dBA**

Table 8 Assessment of Measured Noise Levels Against LAeq(night) Noise Goals

Measurement Location	Measured levels		LAeq(night) Noise Goals	LAeq Exceedance of Licence Goals	LA90 Exceedance of Licence Goals
	LAeq	LA90			
13 Donnelly Street (Balmain / Rozelle)	53 dBA	49 dBA	41 dBA	**12 dBA**	8 dBA
	51 dBA	48 dBA		**10 dBA**	7 dBA
Level 5, 2 Point Street (Pyrmont / Glebe)	46 dBA	44 dBA	N/A	N/A	N/A
	46 dBA	44 dBA			

Table 9 Assessment of (WB-4 Related) Measured Noise Levels Against LAmax Noise Goals

Measurement Location	Range of Maximum Measured Levels (LAmax Range)	LAmax Noise Goals	Range of Recorded LAmax Exceedances of the Licence Noise Goals
13 Donnelly Street (Balmain / Rozelle)	54 dBA – 65[1] dBA	57dBA	0 dBA - 8 dBA
Level 5, 2 Point Street (Pyrmont / Glebe)	52 dBA[2]	51 dBA	1 dBA

1 Three events registered during the 30 min monitoring period; 65 dBA and 58 dBA due to truck compressor blow-off valve, and 54 dBA caused by a truck reversing alarm.

2 Only one Lmax event distinctly due to WB-4 related activity was recorded during the two 15 minute monitoring periods. This event was caused by a blow off valve, lasting approximately 1 second. It was not clear whether the noise source was ship or truck based.

6 DISCUSSION

Measured L_{Aeq} and L_{A90} levels are assessed against the stated goals in **Table 7**, **Table 8** and **Table 9**. $L_{Aeq(15\ min)}$ exceedances of noise goals range between 4 dBA and 6 dBA in Balmain, while in Pyrmont the measured levels exceed the $L_{Aeq(15\ min)}$ noise goals by 5 dBA. An $L_{Aeq(night)}$ exceedance of between 10 dBA and 12 dBA occurs in Balmain.

Due to the relatively high level of ambient noise and the generally constant nature of WB-4 related noise at Pyrmont, the measured L_{A90} levels are considered to better represent the true (WB-4 related) L_{Aeq} noise levels at this location. On this basis, the noise levels from the licenced operations are found to exceed the L_{Aeq} criteria in Pyrmont by 3 dBA.

It should be noted that during the measurements at 13 Donnelly Street, variations in the noise levels of up to 8 dBA were observed between start (3:15 am) and finish (3:45 am) of the measurement. In subsequent discussions with the wharf staff, it was suggested that the variation potentially coincided with cargo being pumped from a tank with low levels of liquid (resulting in LAeq levels of between 54 dBA and 55 dBA) and switching to a new tank (resulting in L_{Aeq} levels of between 47 dBA and 49 dBA). It was suggested that pumping from a low tank increases the potential of cavitation (formation of air bubbles in the liquid) in the pump to occur, thus resulting in higher noise levels. This observation would suggest that, although measurements during ship inactivity could not be carried out (i.e. measurement of Auxiliary Power Unit noise), it appears to be significantly lower than the overall noise levels measured, as these (overall noise levels) appeared to be controlled by pump noise.

Pressure release (blow-off) valves were identified as the only sources of noise responsible for exceedances of L_{Amax} noise levels. The events were found to be very short in duration, typically not lasting more than 1 second. The L_{Amax} criteria was exceeded by up to 8 dBA in the Balmain / Rozelle area, while a 1 dBA exceedance was registered at the representative Pyrmont / Glebe location.

Potential conceptual noise control measures for the sources identified during attended monitoring are discussed below, in order to fulfil the requirement of Licence condition R4.1 and in relation to compliance with Licence conditions O4.1 and O4.2.

Noise from pressure release valves could be managed through identifying the sources (both truck and ship based) and investigating the potential use of attenuator or mufflers, where this is feasible. As the truck fleet used to transport the cargo off-site is dependant on subcontractors, it may not be practical to fit all trucks with appropriate muffling or silencing devices. Identifying the offending vehicles however, will help minimise the occurrence of associated noise level events through the management of vehicles permitted on the site.

Two mechanisms are potentially responsible for noise generation by the pump when cavitation occurs. Firstly, the formation of bubbles in the low pressure area around the pump impeller results in noisier pump operation. Secondly, it degrades pump performance, hence there is potential for pumps to be run harder to result in the same fluid flow, thus potentially resulting in even higher levels of noise being generated. Further detailed investigation in relation to this noise source would be required to clearly identify the cause of the cavitation and the potential engineering noise reduction options available. This would potentially involve redesigning the plumbing in the tank to ensure the pressure reduction in the pump is not large enough to cause cavitation to occur. The above engineering control measure may not be practical or economically viable. Other mitigation measures to be considered and investigated include identifying instances when cavitation is likely to occur and minimising the associated noise emissions through regulating the liquid transfer rates accordingly or terminating the pumping when the liquid level reaches a point at which cavitation commences.

Based on subjective observation, three significant sources of noise were identified on the ship. These include engine noise emanating from approximately deck height, a noise source coming from mid-deck (possibly pump noise) and noise from a ventilator shaft at the aft of the deck. It should be noted that on this occasion, pump noise was subjectively found to be controlling the overall noise levels. Further detailed investigation however, would be required to clearly identify and rank the individual noise sources and to evaluate the appropriate at-source engineering noise reduction options available. These would likely involve one or more of the following:

- Sound proofing the engine bay,

- Redesigning the plumbing in the tank to ensure the pressure reduction in the pump is not large enough to cause cavitation to occur and / or enclosing the pumps, or potentially investigating alternative flow rates to minimise or eliminate cavitation.

- Fitting noise attenuation devices to the ventilator shaft.

Based on the monitoring, an overall noise level reduction of 12 dBA would be required to comply with the Licence imposed noise goals.

The combination of mitigation measures described above could in concept enable compliance with Licence conditions O4.1 and O4.2 as their implementation could potentially meet the Licence imposed noise criteria. However, detailed investigation of ship based noise sources would be required to confirm subjective observations and to recommend the most effective mitigation measures.

7 CONCLUSION

Noise measurements were carried out on the night of 19th November 2005 during the unloading of Botany Tradition, a bulk liquids delivery vessel. The measured noise levels (presented in **Table 7**, **Table 8** and **Table 9)** were assessed against the noise goals imposed by the EPA licence conditions. It was found that $L_{Aeq(15\ minute)}$ exceedances of noise goals range from between 4 dBA and 6 dBA, while the $L_{Aeq(night)}$ exceedance ranges between 10 dBA and 12 dBA in Balmain. The large exceedances in Balmain were possibly caused by cavitation in the pumps, as suggested by wharf personnel.

It should also be noted that ambient noise sources unrelated to the WB-4 activities contributed to the overall LAeq levels measured at the 2 Point Street monitoring location. Taking into account these, and the generally constant nature of WB-4 related noise at Pyrmont, the measured L_{A90} levels are considered to better represent the true (WB-4 related) L_{Aeq} levels in absence of extraneous noise. On this basis, the noise levels from the licenced operations are found to exceed the $L_{Aeq(15min)}$ criteria in Pyrmont by 3 dBA.

Maximum (L_{Amax}) noise levels were found to be caused by truck based pressure release valves.

Potential noise control measures required to meet the Licence imposed noise goals that may be considered (as required by condition R4.1) subject to feasibility, practicality and reasonability include a combination of engineering noise controls and an on-site noise management strategy.

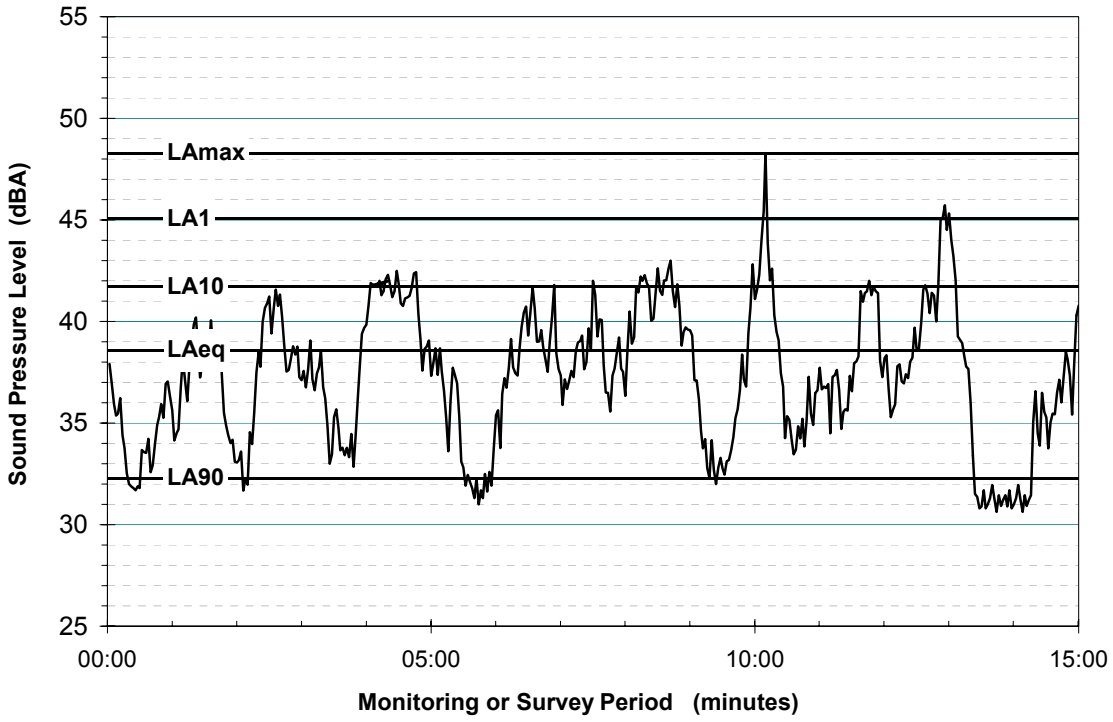
ACOUSTIC TERMINOLOGY USED IN THE REPORT

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 $L_{Aeq(15hour)}$ is the measurement parameter used to describe the road traffic noise level over the entire daytime (7.00 am to 10.00 pm) period. The $L_{Aeq(9hour)}$ is the measurement parameter used to describe the road traffic noise level over the entire night-time (10.00 pm to 7.00 am) period. Similarly, the $L_{Aeq(1hour)}$ is the measurement parameter used to describe the road traffic noise level during the loudest 1-hour period during the daytime or night-time periods.
- 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} noise level is the maximum A-weighted noise level associated with road traffic movements.

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
130 120 110	Threshold of pain Heavy rock concert Grinding on steel	Intolerable Extremely noisy
100 90	Loud car horn at 3 m Construction site with pneumatic hammering	Very noisy
80 70	Kerb side of busy street Loud radio or television	Loud
60 50	Department store General Office	Moderate to Quiet
40 30	Inside private office Inside bedroom	Quiet 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

13 DONNELLY STREET, BALMAIN

The location is situated approximately 170 m away from and directly overlooking White Bay Berth 4 (across the park). It is elevated some 15 m above dock level. The measurement was conducted from street level (from a footpath) with Donnelly Street traffic less than 2 m away.

Aerial Photo showing the monitoring location at 13 Donnelly Street, relative to White Bay Berth 4 (WB-4).

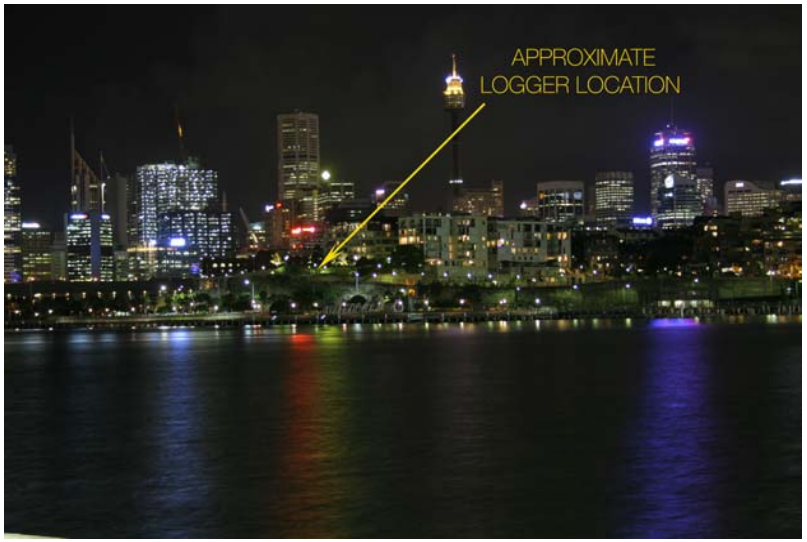
View from WB-4 deck towards 13 Donnelly Street

View from 13 Donnelly St towards Botany Tradition berthed at WB-4

2 POINT STREET, PYRMONT

This monitoring location is situated approximately 660 m away from White Bay Berth 4 (across the bay). Monitoring was conducted at a height equivalent of a 5 storey building, on the cliffs edge. Pirrama Road encircles the park from west, north and east sides, approximately 15 m below.

Aerial Photo showing the monitoring location at 2 Point Street, relative to White Bay Berth 4 (WB-4).



View from WB-4 deck towards 2 Point Street

View from 2 Point Street towards Botany Tradition berthed at WB-4