Esperance Port Authority Noise Monitoring March 2008

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APPENDICES

1 INTRODUCTION

The Esperance Port Authority (the Port) was granted a variation to the assigned noise levels under regulation 17 of the *Environmental Protection (Noise) Regulations 1997* (the Regulations). This variation was granted from 20 July 2001 and is cited as the *Environmental Protection (Port of Esperance Noise Emissions) Approval 2001* (the Approval). The noise emissions that were current at the time (as of 2001) were generally accepted by the community and hence, these effectively became the allowable noise levels.

As part of the Approval, a number of conditions were placed on the Port as follows:

1. The existing noise emissions (which are up to 8 dB above the 'normal' L_{A10} assigned noise levels of regulation 8 for the night period) will be allowable until 31 December 2002 (Schedule 1).

2. After the above date, the L_{A10} noise emissions must be reduced by 3 dB. That is, the variation to the assigned noise levels was a reduction from + 8 dB to + 5 dB (Schedule 2).

3. Under Clause 11 of the Approval, a report was required by the end of 2001, which sets out how the Port will comply with the emission limits from 1 January 2003 onwards (i.e. Schedule 2).

4. By 30 September 2002, the Port must produce a report that documents the methods the Port has taken and will continue to take, where necessary, in order to ensure Schedule 2 is met.

5. Schedule 2 applies until 31 December 2004. By 30 June 2004, the Port must provide a report, either applying for an extension to the Approval or the methods the Port proposes to take to comply with regulation 7, including how they will meet the normal (regulation 8) assigned noise levels.

The Port has satisfied all of the above requirements. With regards to Condition 5 above, the appropriate documentation was submitted by the required date and the Port requested that the existing Approval be extended. At the time of this report, the Department of Environment & Conservation (DEC) has not processed the application to extend the Approval and hence, the assigned noise levels of the Approval are still applicable.

The noise monitoring discussed in this report started at 2250 hours on the 04 March 2008 and finished at 0445 hours on the 05 March 2008. The aim was to capture noise during the outloading of iron ore to Berth 3 to "Channel Alliance". Unfortunately this vessel arrived earlier than expected and had therefore finished loading prior to the measurements. The relevant vessels were:

Berth	Vessel	Commodity	Date / Time in	Date / Time Out
1	Pos Leader	Canola	03-Mar-08 1410	05-Mar-08 2230
2	Spirit of Esperance	Container	04-Mar-08 0937	06-Mar-08 0945
3	Channel Alliance	Iron Ore	02-Mar-08 0654	04-Mar-08 2127

There were two train movements during the monitoring on 5th March 2008 being:

- Nickel (Lake Johnson) Arrived at 0430 and Departed at 0500 hours; and
- Iron Ore Arrived at 0050 and departed at 0327 hours

The noise levels reported are representative of these scenarios and the weather conditions at the time, which were generally easterly at 4m/s, with gusts of 6m/s.

2 DEFINITIONS

The following is an explanation of the terminology used throughout this report.

Decibel

The decibel (dB) describes the sound pressure level of a noise source. It is a logarithmic scale referenced to the threshold of hearing.

A-Weighting

An A-weighted noise level has been filtered in such a way as to represent the way in which the human ear perceives sound. This weighting reflects the fact that the human ear is not as sensitive to lower frequencies as it is to higher frequencies. An A-weighted sound pressure level is described by the symbol dB(A) or L_A dB.

L_{A10}

An L_{A10} level is an A-weighted noise level which is exceeded for 10 percent of the measurement period. An L_{A10} level is considered to represent the "*intrusive*" noise level.

L_{A1}

An L_{A1} level is an A-weighted noise level which is exceeded for one percent of the measurement period.

L_{Amax}

An L_{Amax} level is the maximum A-weighted noise level measured during the measurement period.

L_{A95}

An L_{A95} level is an A-weighted noise level which is exceeded for 95 percent of the measurement period. An L_{A95} level is considered to represent the "*background*" noise level, that is the noise that is present for the majority of the time.

L_{Aeq}

This is the equivalent continuous A-weighted sound pressure level over a specified time period. The L_{Aeq} is often said to be the *"average"* noise level.

L_{Apeak}

This is the maximum A-weighted reading using the peak time weighting to reflect the sharp increase in noise level associated with some events (i.e. banging) and allows the assessment of impulsiveness.

Representative Assessment Period

As the assessment parameters are time-based, these are to be determined over a time period of not less than 15 minutes, and not exceeding 4 hours, determined by an inspector or authorised person to be appropriate for the assessment of a noise emission, having regard to the type and nature of the noise emission.

I.F.

I.F. is the abbreviation for influencing factor, which is applied to the assigned noise levels to reflect the surrounding environment to a receiver location. Thus, a receiver that is surrounded by industrial land and major roads would have a high I.F. compared to a receiver in a rural environment.

Impulsiveness

Impulsiveness means a variation in the emission of a noise where the difference between L_{Apeak} and $L_{Amax\ Slow}$ is more than 15dB when determined for a single representative event. An example of an impulsive sound would be the banging together of metal objects.

Modulation

Modulation means a variation in the emission of noise that –

(a) is more than 3dB $L_{A\ Fast}$ or is more than 3dB $L_{A\ Fast}$ in any one-third octave band;

(b) is present for more at least 10% of the representative assessment period; and

(c) is regular, cyclic and audible.

Tonality

Tonality means the presence in the noise emission of tonal characteristics where the difference between –

(a) the A-weighted sound pressure level in any one-third octave band; and

(b) the arithmetic average of the A-weighted sound pressure levels in the 2 adjacent one-third octave bands,

is greater than 3dB when the sound pressure levels are determined as $L_{Aeq,T}$ levels where the time period T is greater than 10% of the representative assessment period, or greater than 8dB at any time when the sound pressure levels are determined as $L_{A\ Slow}$ levels. An example of a tonal noise source is a compressor or fan.

3 CRITERIA

The *Environmental Protection (Port of Esperance Noise Emissions) Approval 2001* is derived from regulation 17 of the Regulations, and varies the assigned noise levels specified under regulation 8. The assigned noise levels of regulation 8 are shown below in *Table 3.1*.

Table 3.1 – Assigned Noise Levels – Regulation 8

Type of Premises Receiving Noise	Time of Day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Noise Sensitive – within 15 metres of a noise sensitive building	0700 to 1900 hours Monday to Saturday	45 + I.F.	55 + I.F.	65 + I.F.
	0900 to 1900 hours Sunday and public holidays	40 + I.F.	50 + I.F.	65 + I.F.
	1900 to 2200 hours all days	40 + I.F.	50 + I.F.	55 + I.F.
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays	35 + I.F.	45 + I.F.	55 + I.F.
Noise Sensitive – further than 15 metres from a noise sensitive building	All hours	60	75	80
Commercial	All hours	60	75	80
Industrial and Utility	All hours	65	80	90

The I.F. is calculated by the following equation:

$$\frac{1}{10}\left(\%\ \text{Type A}_{100} + \%\ \text{Type A}_{450}\right) + \frac{1}{20}\left(\%\ \text{Type B}_{100} + \%\ \text{Type B}_{450}\right)$$

where:

$\%\ \text{Type A}_{100}$ = the percentage of industrial land within a100m radius of the premises receiving the noise

$\%\text{TypeA}_{450}$ = the percentage of industrial land within a 450m radius of the premises receiving the noise

$\%\ \text{Type B}_{100}$ = the percentage of commercial land within a100m radius of the premises receiving the noise

$\%\text{TypeB}_{450}$ = the percentage of commercial land within a 450m radius of the premises receiving the noise

+ Traffic Factor (maximum of 6 dB)

= 2 for each secondary road within 100m

= 2 for each major road within 450m

= 6 for each major road within 100m

Schedule 2 of the Approval, varies the assigned noise levels by + 5 dB, over the assigned noise levels of regulation 8 (*Table 3.1*). The Schedule 2 assigned noise levels are shown below in *Table 3.2*.

Table 3.2 – Assigned Noise Levels – Schedule 2

Type of Premises Receiving Noise	Time of Day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Noise Sensitive – within 15 metres of a noise sensitive building	0700 to 1900 hours Monday to Saturday	50 + I.F.	60 + I.F.	70 + I.F.
	0900 to 1900 hours Sunday and public holidays	45 + I.F.	55 + I.F.	70 + I.F.
	1900 to 2200 hours all days	45 + I.F.	55 + I.F.	60 + I.F.
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays	40 + I.F.	50 + I.F.	60 + I.F.
Noise Sensitive – further than 15 metres from a noise sensitive building	All hours	60	75	80
Commercial	All hours	60	75	80
Industrial and Utility	All hours	65	80	90

Under clause 8 of the Approval, the following are not required to meet the requirements of Schedule 2:

1. Trains, aircraft, emergency vehicles and safety warning devices needed to comply with occupational safety and health laws (these are exempt under regulation 3 of the Regulations).
2. Construction work.
3. Noise emissions from Cooperative Bulk Handling Ltd (CBH).
4. Noise received at the premises occupied by CBH.
5. Noise received at premises that are owned by the Port Authority.

Furthermore, noise originating from the Port must be free from annoying characteristics (tonality, modulation and impulsiveness) for at least 99% of any 4-hour period.

Previous assessments have identified 13 locations used to determine the noise compliance status of the Port. These locations are listed below and shown in *Appendix A*.

Location 1 – End of Bostock Street (Lot 16):
The Port has purchased the majority of properties on the north side of Bostock Street (and some on the south side) and hence, the criteria do not apply at these locations (as per the Approval). Lot 16 is not owned by the Port and has a dwelling on the property. It is understood by the Port that the resident does not consider noise to be an issue. A conversation, at the time of previous measurements, between the resident and the author verified this. The silos of CBH typically shield noise from the Port and CBH noise emissions would be more dominant at this location.

Location 2 - Lot 10 Bostock Street:
This is a vacant lot owned by the Port, has line of sight to a number of the Port operations and is a location where Port and CBH noise is dominant above background noise. As the Port owns this land, the Approval does not apply at this location. It is considered that this location is representative of Lot 14, which is a vacant lot not owned by the Port. As there is no dwelling on this Lot, it is the 'further than 15 metres' criteria that currently applies (i.e. 60 dB(A) L_{A10}). However, the Port should be aware that the criteria would change to the 'within 15 metres' assigned levels should a dwelling be constructed on this lot. During previous measurements, Lot 14 was noted as privately under offer. Port investigations found that the sale fell through and they are investigating purchasing the lot, however it is currently no longer on the market.

Location 3 - Lot 40 Panorama Place:
This lot is currently vacant and is representative of a number of lots with dwellings that are not owned by the Port (both on the south side of Bostock Street and on Panorama Place).

Location 4 - Lot 34 Panorama Place:
This is a vacant lot not owned by the Port but again, representative of dwellings located in this area. A new residence was being constructed immediately east of this lot during measurements.

Location 5 – Lot 4 Bostock Street:
This is a vacant lot owned by the Port, but can be used for guidance as to the type of noises that may be heard at non-port owned houses further away.

Location 6 - Lot 8 Bostock Street:
This house is now owned by the Port and occupied by one of their employees. The measurement location is on the road verge and can still be used to assess noise emissions to houses between Smith Street and Bostock Close, which are not owned by the Port.

L*ocation 7 - Southeast corner of Hardy Street and The Esplanade:*
Measurements were recorded closer to the Port than the dwellings, which are located further south, up a hill. For the scenario where loaders are working in Sheds 1 and 2 (as in this case), the noise reduction between the measurement location and houses is expected to be 3 – 5 dB.

Location 8 - Caravan Park:
Located on the corner of Harbour Road and The Esplanade, a fence has been constructed around the park, by the Port, to minimise any impact from road traffic (particularly grain trucks). Measurements are recorded on the Port side of the fence and thus any attenuation of Port noise provided by the fence (considered minimal) has not been taken into account.

Location 9 – Corner of Taylor Street and The Esplanade:
There are some noise sensitive properties in this area and some commercial properties. Noise from the ocean (wave noise) can influence measurements at this location.

Location 10 - Tea Rooms:
A commercial property located towards the jetty opposite Taylor Street. Esperance Bay separates the Tea Rooms from the Port. Ocean noise is the dominant source at this location.

Location 11 - Lot 8 Bostock Street (House):
As per Location 6, except further north to represent the closest part of the house to the Port. This was used in the noise modelling as an assessment location, rather than a measurement location.

Location 12 - Corner of Corry and Hardy Streets:
To the west of the Port at a location where the I.F. is at a minimum.

Location 13 - Lot 6 The Esplanade:
Located between William Street and Andrew Street, again a location where the influencing factor I.F. was low.

Note that only the most relevant locations were utilised as measurement locations in this instance.

Table 3.3 shows the I.F. and Schedule 2 night-time assigned noise levels for each of the above locations.

Table 3.3 – Night-Time Assigned Noise Levels

Location	I.F., dB	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
1#	13	53	63	73
2*	N/A (9)	60 (49)	75 (59)	80 (69)
3	9	49	59	69
4	8	48	58	68
5#	8	48	58	68
6#	8	48	58	68
7	5	45	55	65
8	4	44	54	64
9	2	42	52	62
10	N/A	60	75	80
11	8	48	58	68
12	0	40	50	60
13	1	41	51	61

* The levels shown are for those of a vacant lot not owned by the Port (i.e. further than 15 metres from building directly associated with a noise sensitive use). Those shown in brackets are for the scenario of a building being constructed on the vacant lot (not owned by the Port).

\# These specific measurement locations are properties owned by the Port and hence the assigned noise levels are not applicable. However, the location may be used to assess noise levels to surrounding, non-port owned residences.

4 METHODOLOGY

Noise level measurements were undertaken using a *Bruel & Kjaer Type 2260 Observer* (S/No. 2447555), which satisfies regulation 22 of the Regulations. The meter was hand held at least 1.2 metres above the ground and was positioned at least 3 metres from reflecting facades, satisfying Regulation 20.

Noise levels were recorded starting on the 04 of March 2008 at 2250 hours and finishing at 0445 hours on the 05 March 2008, being within the most critical night-time period of the Regulations. Each of the assessment locations was attended, however, noise levels were not always recorded. Where measurements were undertaken, one-third-octave band information was obtained for the relevant parameters being the L_{A10}, L_{A1}, L_{Amax}, L_{A90}, and L_{Aeq}. Obtaining these parameters allows assessment against the assigned noise levels as well as determining the presence of annoying characteristics.

Observations were made during the measurements including type of noise audible and the weather conditions.

5 MEASUREMENT RESULTS

As discussed in *Section 1*, the iron ore vessel had already departed prior to the night-time measurements and as such only the vessels at Berths 1 and 2 were present.

Results of the measurements are tabulated below in *Table 5.1*.

Table 5.1 – Noise Level Measurements

Location	Time (hrs)	Parameter					Comments
		L_{A90}	L_{A10}	L_{A1}	L_{Amax}	L_{Apeak}	
1. East End of Bostock St	2253	49	51	51	52	74	CBH dominant noise source. Power station audible.
	0404	41	53	54	55	75	CBH not operating. Train moving at Port.
2. Lot 10 Bostock St	2250	50	51	52	52	75	CBH dominant noise source.
	2357	43	46	46	47	82	CBH not operating. Power station audible and Berth 1 vessel.
	0402	44	45	46	46	67	CBH not operating. Power station audible and Berth 1 vessel.
3. Lot 40 Panorama Pl	2308	47	49	49	49	68	CBH dominant noise source. Power station audible.
	0419	41	43	43	43	57	CBH not operating. Power station audible and Berth 1 vessel.

Location	Time (hrs)	Parameter					Comments
		L_{A90}	L_{A10}	L_{A1}	L_{Amax}	L_{Apeak}	
4. Lot 34 Panorama Pl	2305	44	46	47	47	73	CBH dominant noise source. Power station audible.
	0417	40	42	42	42	64	CBH not operating. Power station audible and Berth 1 vessel.
5. Lot 4 Bostock Street	2257	47	49	49	49	63	CBH dominant noise source.
	0410	40	43	44	44	66	CBH not operating. Berth 1 vessel and power station.
6. Lot 8 Bostock St	2300	47	49	50	50	65	CBH audible but tonal noise dominant from HVAS Air Quality station.
	0412	45	45	46	46	65	CBH not operating. HVAS Air Quality station dominant.
7. CBH Entry	2320	43	46	47	47	68	CBH dominant noise source.
	0429	40	42	42	43	64	CBH not operating. Berth 1 vessel and HVAS Air Quality station opposite caravan park.
8. Caravan Park	2323	45	48	48	48	76	Strong tonal noise from HVAS Air Quality station located in park opposite.
	0431	45	47	47	47	60	CBH not operating. HVAS Air Quality station located in park opposite dominant. Berth 1 vessel audible.
9. Cnr Taylor & The Esplanade	2338	43	47	47	47	61	CBH & Port intermittently audible but dominant source is ocean and gusting winds.
	0441	38	39	40	40	55	Berth 1 vessel and HVAS Air Quality station contributing.
10. Tea Rooms	2342	45	48	49	50	65	CBH & Port intermittently audible but dominant source is ocean and gusting winds.
	0439	42	45	46	47	65	Ocean lapping noise and Berth 1 vessel.
12. Cnr Corry & Hardy Street	2314	32	35	35	35	64	CBH dominant noise source.
	0424	31	36	39	40	56	Wind gusting but Port audible between gusts.
13. Lot 6 The Esplanade	2351	48	49	50	50	78	Sprinklers in opposite park dominant and gusting winds.
	0445	40	41	42	42	71	Berth 1 vessel audible but wind and yacht masts dominant.

6 DISCUSSION AND ASSESSMENT

In the earlier measurements, it was not the Port noise that was dictating the measured levels but rather that of CBH. Once CBH stopped operating, noise levels decreased and although some Port noise became audible, it complied with the assigned noise levels of Schedule 2 of the Approval

Two HVAS Air Quality stations (opposite caravan park & measurement location 6) were identified as emitting tonal noise (refer *Figure 6.1*) and should be investigated for noise control. For instance the measurements at the caravan park showed a noise level of 47 dB L_{A10} which is 4 dB above the allowable night-time level of 44 dB L_{A10} (ignoring attenuation provided by the Caravan Park fence). The tone is likely to be associated with a variable speed fan providing ventilation. Once the source of the noise is identified, an internally lined sheet metal duct should be installed to provide attenuation.

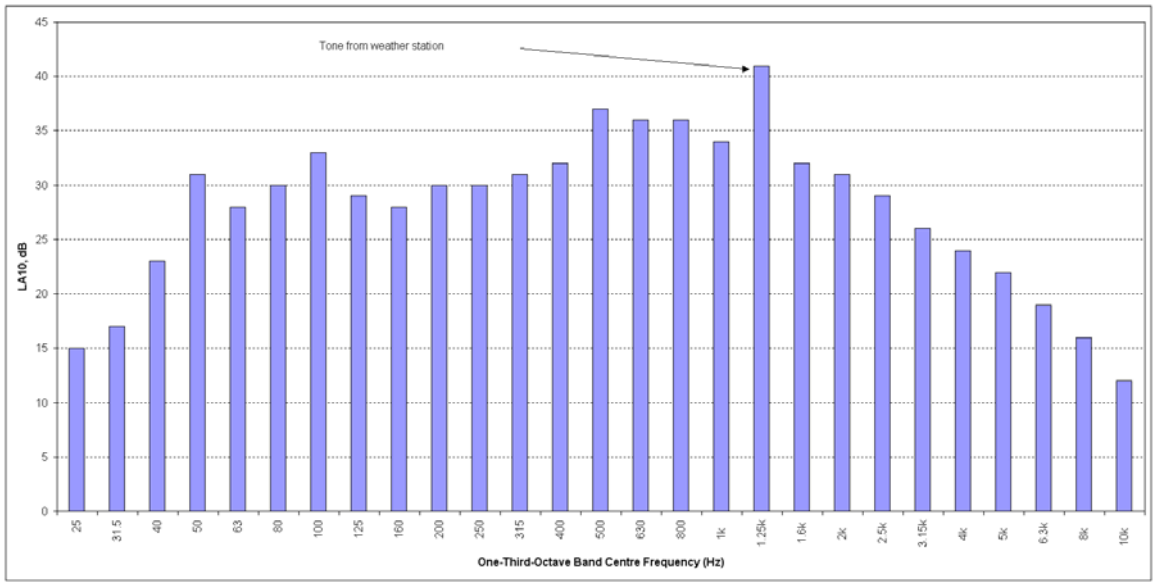
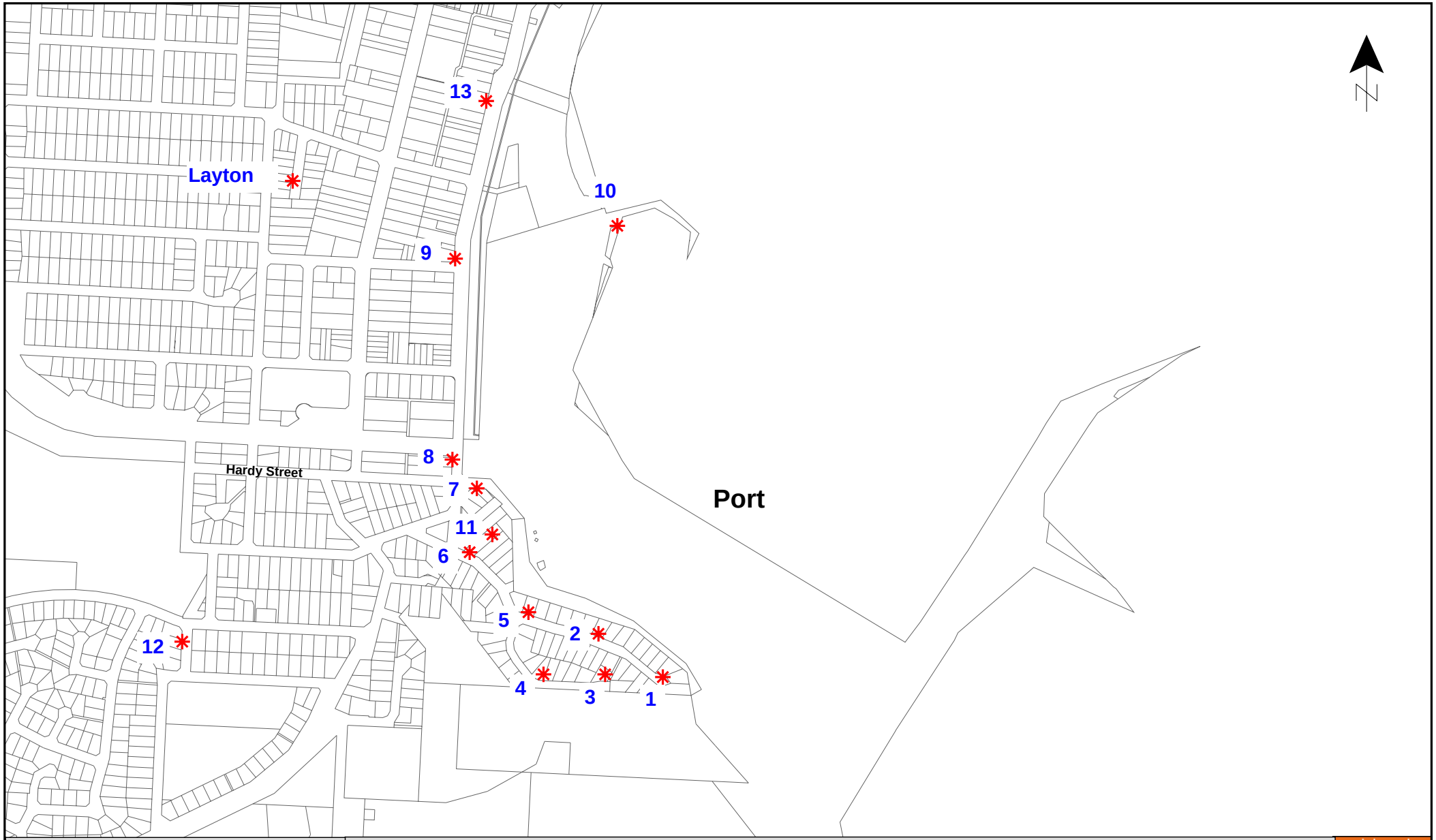


Figure 6.1 – One-Third-Octave Band Spectra at Caravan Park

If there are other air quality stations located near residences, these should also be investigated for noise control.

APPENDIX A

LOCALITY MAP



Length scale 1:10000

0 50 100 200 300 400 500 m

ESPERANCE PORT AUTHORITY
Locality Map

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FIGURE A01