VESUVIUS INDUSTRIAL FACILITY

CNR DARCY ROAD AND GLOUCESTER BOULDEVARD PORT KEMBLA
NOISE IMPACT ASSESSMENT

ACOUSTICS AND AIR

REPORT NO. 11098
VERSION A

WILKINSON MURRAY

VESUVIUS INDUSTRIAL FACILITY

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NOISE IMPACT ASSESSMENT

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VERSION A

MAY 2011

PREPARED FOR

VESUVIUS
LOT 2 STURDEE ROAD
BULLI NSW 2516
SYDNEY NSW 2000

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1 INTRODUCTION

Wilkinson Murray has been commissioned by Vesuvius to undertake a noise impact assessment in relation to the new factory proposed to be located at the corner of Darcy Road and Gloucester Boulevard, Port Kembla.

This report considers:

- existing background noise levels of the area;
- relevant noise criteria for potentially-affected receivers;
- an assessment of operational noise impacts on nearby residences; and
- an assessment of noise from traffic movements associated with the proposal.

The assessment has been carried out based on the Office of Environment and Heritage (formerly the Department of Environment, Climate Change and Water) assessment guidelines.

2 PROJECT & SITE DESCRIPTION

Vesuvius proposes to construct and operate a refractory industrial plant facility at Lots 101,102 and 103 DP 839149 Darcy Road, Port Kembla, NSW.

The site is located within the Port Kembla Heavy Industrial Estate, adjacent to other heavy industrial activities including the Port Kembla Street Works. The site is located approximately 460 m to the North of the nearest residences at Port Kembla.

The site and surrounds are presented in Figure 2-1 .

Figure 2-1: Site Location

Potentially sensitive receptors in the area around the proposed plant are detailed in Table 2-1.

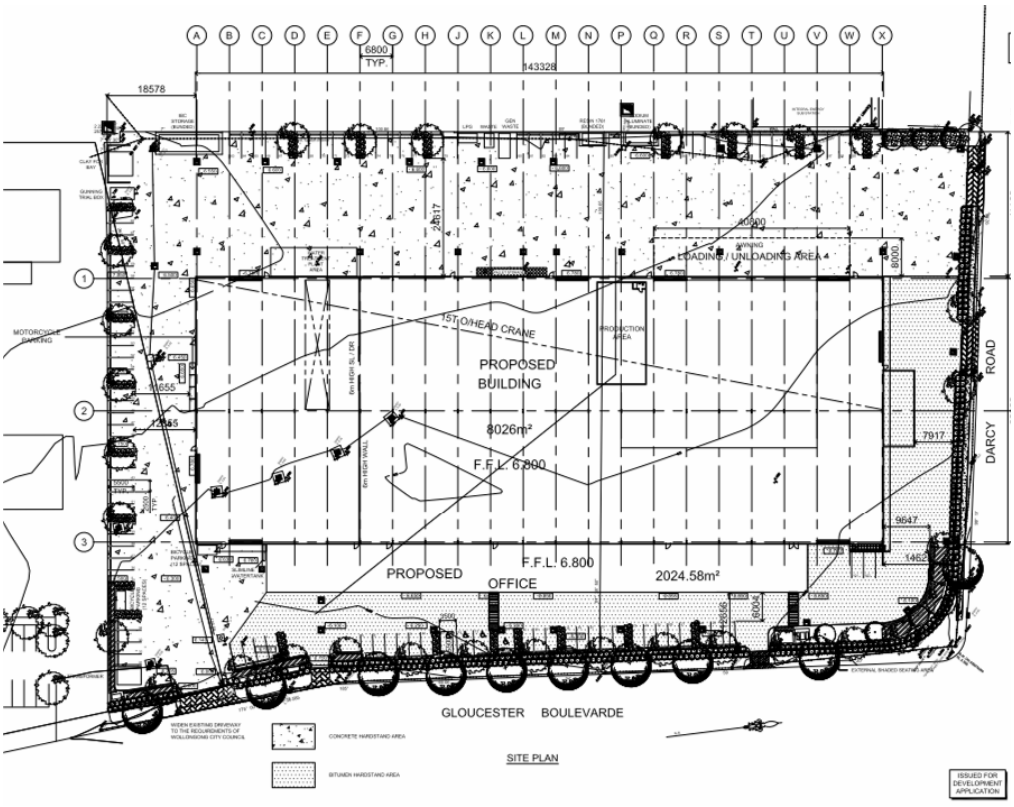
Table 2-1: Surrounding Residential Receivers

Receiver Area	Direction from Site	Approximate Distance - metres	Zoning
Port Kembla South (Residences to the South of the Industrial Area)	S	480	Residential
Port Kembla West (Residences to the West of the Industrial Area)	W	880	Residential
St Joesph's Primary School	W	960	School
Port Kembla Public School	S	570	School

The proposed development site has a building area of 8026 m^2 comprising manufacturing, material storage, plant and office areas. Figure 2-1 shows the proposed site layout.

Access to the site is via Five Island Road and Darcy Road. This route is already subject to significant heavy vehicle volumes.

Figure 2-1 Proposed Site Layout



The application proposes to operate the facility on a 24 hour 7 day a week basis.

3 AMBIENT NOISE LEVELS

Ambient noise levels were monitored between Tuesday, 5 and Tuesday, 12 April 2010 at 15 Reservoir Street Port Kembla. The noise monitoring equipment consisted of an environmental noise logger set to A-weighted, fast response, continuously monitoring over 15-minute sampling periods. This equipment is capable of remotely monitoring and storing statistical noise level descriptors for later detailed analysis. The equipment calibration was checked before and after the survey and no significant drift was noted.

The logger determines L_{A1}, L_{A10}, L_{A90} and L_{Aeq} levels of the ambient noise. L_{A1}, L_{A10} and L_{A90} are the levels exceeded for 1%, 10% and 90% of the sample time respectively (see Appendix A for definitions). The L_{A1} is indicative of maximum noise levels due to individual noise events such as the occasional pass-by of a heavy vehicle. The L_{A90} level is normally taken as the background noise level during the relevant period.

Detailed results for this monitoring location are shown in graphical form in Appendix B. The graphs show measured values of L_{Aeq}, L_{A90}, L_{A10} and L_{A1} for each 15-minute monitoring period.

Table 3-1 summarises the results, for daytime, evening and night time periods using units defined in the NSW Office of Environment and Heritage (OEH) *NSW Industrial Noise Policy (INP)*. The summary values are:

- $L_{Aeq,Period}$ – the overall L_{Aeq} noise level measured over the assessment period; and
- RBL – Rating Background Level. This is a measure of typical background noise levels which is used in determining noise criteria.

Table 3-1 Summary of Measured Noise Levels

Noise Logging Site	Period		
	Daytime 7am-6pm	Evening 6-10pm	Night Time 10pm-7am
RBL (dBA)	40	40	41
$L_{Aeq,Period}$ (dBA)	51	48	47

It was noted that there was no noticeable continuous industrial noise at this site during the noise measurements. Discussions with the owner of the property indicated that this was generally the case, however, it was noted that intermittent noise from the industrial area was evident which was characterised by occasional bangs and crashes.

In addition, a visit to the western residential area, being Kembla Street, was conducted. This area is more remote from the site and it was noted that no continuous industrial noise was evident at this site. Discussions with a resident at 15 Kembla Street confirmed this fact.

4 ACOUSTIC PERFORMANCE CRITERIA

The following section details the applicable noise criteria based on various guidelines of the OEH.

4.1 Industrial Noise Criteria

The *NSW Industrial Noise Policy (INP)* recommends two criteria, "Intrusiveness" and "Amenity", both of which are relevant for the assessment of noise. In most situations, one of these is more stringent than the other and becomes the dominate noise criteria. The criteria are based on the L_{Aeq} descriptor, which is explained in Appendix B.

For sources such as the fixed plant associated with the facilities, appropriate noise criteria are specified in the *INP*. The criterion depends on whether existing noise levels in an area are close to recommended amenity levels for different types of residential receiver areas (i.e. urban, rural, near existing roads).

Where noise levels are currently low, noise levels from the proposed operation are limited by the intrusiveness criterion. In general, the L_{Aeq} noise level from such sources should not exceed the Rating Background Level (RBL) by more than 5dBA. This is assessed over a typical worst case 15 minute period.

The amenity criterion sets an upper limit to control the total L_{Aeq} noise level from all industrial sources. For example, the potentially affected residences to the North East are in an area which would be classified as "suburban" and the relevant recommended "acceptable" amenity criteria for $L_{Aeq,period}$ are 55, 45 and 40 dBA for daytime, evening and night time periods respectively. "Maximum" recommended levels are all 5dBA higher.

Where noise levels from industrial sources are close to or above the acceptable levels, the amenity criterion, which incorporates a sliding scale to set limits, applies. The sliding scale prevents the overall noise level exceeding the acceptable level due to the addition of a new noise source. The amenity criterion also needs to consider the possibility of other developments which may affect noise levels.

Table 4-1 presents the relevant noise industrial noise criteria for this project based on a suburban classification.

Table 4-1 Industrial Intrusiveness & Amenity Criteria

Receiver Area	Time Period	RBL (dBA)	Intrusiveness Criterion $L_{Aeq,15min}$ (dBA)	Project-Specific Amenity Criterion $L_{Aeq,Period}$ (dBA)
Western and Southern Residences	Daytime (7.00am–6.00pm)	40	45	55
	Evening (6.00–10.00pm)	40	45	45
	Night time (10.00pm–7.00am)	41	45*	40

* Where the night-time RBL exceeds the day-time or evening value, the OEH generally recommends that the lower value be used in setting criteria

In addition the INP recommends the following noise levels for other land uses:

- Schools Internal $L_{Aeq(1\ hr)}$ 45 dBA. (Allowing a reduction of 10 dBA through an open window, this translates to an external noise goal of 55 dBA.)

As the plant is proposed to potentially operate on a 24 hour basis the established night time period noise criteria will control the permissible level of noise emanating from the site.

4.1.1 Sleep Disturbance Noise Criteria

Intermittent noises due to activities such as reversing alarms during the night-time period are not directly addressed by the *INP*.

In order to minimise the risk of sleep disturbance from the operations during night-time operation the OLH recommends that sleep disturbance is assessed in terms of the emergence of the $L_{A1,1min}$ level above the $L_{A90,15min}$ level at the time. Appropriate screening criteria for sleep disturbance are determined to be an $L_{A1,1min}$ level 15dBA above the Rating Background Level (RBL) for the night time period.

Based on the measured night-time RBL of 41 dBA a sleep disturbance screening criterion of 56 dBA has been established.

5 NOISE SOURCE LEVELS

Acoustically significant plant and operations have been identified and measured at the existing Vesuvius factory at Bulli. Table 5-1 details these noise levels.

Table 5-1 Vesuvius Plant Source Sound Power Levels – dB

No	Plant Equipment	SWL LAeq (dBA)	Octave Leq Sound Power Level (dB Linear)								
			32	63	125	250	500	1K	2K	4K	8K
1	Dust Extractor (40 Bag) - Top Building N/W	89	77	91	82	90	88	83	79	74	69
2	Ball Mill dust extractor (Horizontal) - Top Building East	99	87	89	85	96	99	92	91	82	71
3	Ball Mill dust extractor (Vertical) - Top Building East	95	83	85	81	92	95	88	87	78	67
4	Crusher - Exhaust North end of building	99	95	100	98	95	94	97	92	84	74
5	Crusher Vibrating screen	95	106	96	94	92	90	92	87	82	79
6	Outside dust collector (Bin filler) (East end of bottom building)	96	84	92	87	94	94	90	88	84	82
7	Mortar Mixer	83	81	85	85	80	80	78	72	71	74
8	Ball Mill (Door)	79	84	82	79	80	76	74	73	68	61
9	Crusher Building (Door)	86	98	91	89	88	83	80	75	73	70
10	Comcast (Door)	110	90	110	118	109	108	104	100	96	88
11	Tap Hole Clay*(Vibrator)	121	100	104	101	111	115	117	113	112	106
12	Reversing Alarm LA1	109	105	113	111	106	103	104	102	95	88
13	Forklift	96	88	101	98	98	93	90	86	82	73
14	Semi - Trailer	104	97	103	100	94	96	100	98	93	86

*It is noted that noise emanating from the Tap Hole Clay vibrator exhibits a tonal characteristic.

6 METEOROLOGY

At relatively large distances from a source, the received noise levels will be influenced by meteorological conditions, particularly wind and temperature gradients, and hence can vary from hour to hour and night to night. Where these factors are a feature of an area their affect on resultant noise levels are required to be taken into account.

The procedures described in the INP are directed toward finding a single set of meteorological conditions, representing generally adverse conditions for noise propagation, which should be used in noise assessment. It is Wilkinson Murray's view that for complex developments it is more appropriate to assess noise impacts under the entire range of meteorological conditions applying at the location.

However the procedures of the INP have been adopted as this is considered adequate for this project, as the site is relatively straight forward and compact.

6.1 Wind

Wind can increase noise at a receiver when it blows from the direction of the noise source. An increase in wind strength results in a corresponding increase in wind noise at the receiver which masks noise from the source under investigation.

The affectation of noise due to wind should be considered when wind is a feature of the area under consideration. The *INP* defines this as where wind blows at speeds up to 3m/s for more than 30% of the time in any season. In this situation wind is considered to be a feature of the area and noise level predictions must be made under these conditions.

Twelve month weather data for the year 2006 were obtained for the OLH air quality monitoring station located at Kembla Grange race course. These data were analysed to determine the frequency of occurrence of seasonal winds up to speeds of 3m/s for the daytime, evening and night periods.

Seasonal wind records indicate that westerly winds of up to 2 m/s are a feature of the area during the evening and night periods in the area. Appendix C presents wind roses for the site.

6.2 Temperature Inversion

Temperature inversions can increase noise levels at surrounding receivers by the reflection of sound waves from warmer upper layers of air. Temperature inversions occur predominantly at night. For a temperature inversion to be a significant characteristic of the area it needs to occur for approximately 30% of the total night-time during a season, typically winter.

Temperature inversions are generally associated with Pasquill Stability Classes F and G. Stability Class data for the area were assessed, and showed no occurrence of Stability Class G. The percentage occurrence of Stability Class F is detailed in Table 6-1.

Table 6-1 Percentage of Frequency F of class Stability.

Season	Period		
	Day	Evening	Night
Spring	0	5%	8%
Summer	0	7%	7%
Autumn	0	8%	8%
Winter	0	8%	8%

It has been determined that temperature inversions are not a characteristic of this area at night.

Based on these findings, the meteorological conditions considered in this assessment are:

- “neutral” conditions – no wind or temperature inversion; and
- a wind of 2 m/s from the west

7 OPERATIONAL NOISE ASSESSMENT

Noise predictions associated with the operation of the proposed facility on the surrounding receivers have been conducted.

Site related noise emissions were modeled using CONCAWE algorithms, implemented in the "Cadna A" acoustic noise prediction software. Factors that are addressed in the modeling are:

- equipment sound level emissions and location;
- screening effects from buildings;
- Sound Transmission Loss of the building structure;
- receiver locations;
- ground topography;
- noise attenuation due to geometric spreading;
- ground Absorption; and
- atmospheric absorption.

Computation of noise emission was carried out based on calm meteorological conditions, and a drainage flow wind of 2 m/s blowing from the west quadrant. The latter meteorological condition is the worst-case condition required for assessment within the INP, to account for possible enhancement of noise emissions. It is intended to provide an indication of the potential upper bound of impact associated with possible acoustically adverse meteorological conditions.

Initial noise modelling indicated that noise from the Tap Hole Clay vibrator, which would attract a modifying factor of 5 dB due to tonality, and an additional 5 dB for intermittency, would result in an adjusted noise level of up to 55 dBA at residences. This information was conveyed to Vesuvius and it was determined that the process can be modified so that the vibrating metal bin, which is the source of Tap Hole Clay noise, will be replaced by the use of a bag. As such this change will eliminate this item of plant as an acoustically significant noise source.

Therefore, following the above determination, the following scenario has been modelled:

- the Comcast Vibrator operating for 6 minutes in every 15 minute period;
- dust extractors located on the western side of the building operating continuously;
- two fork lifts operating in the yard continuously;
- the crusher and screen, located at the northern end of the building, operating continuously; and
- doors to the factory on the western and southern side of the building open.

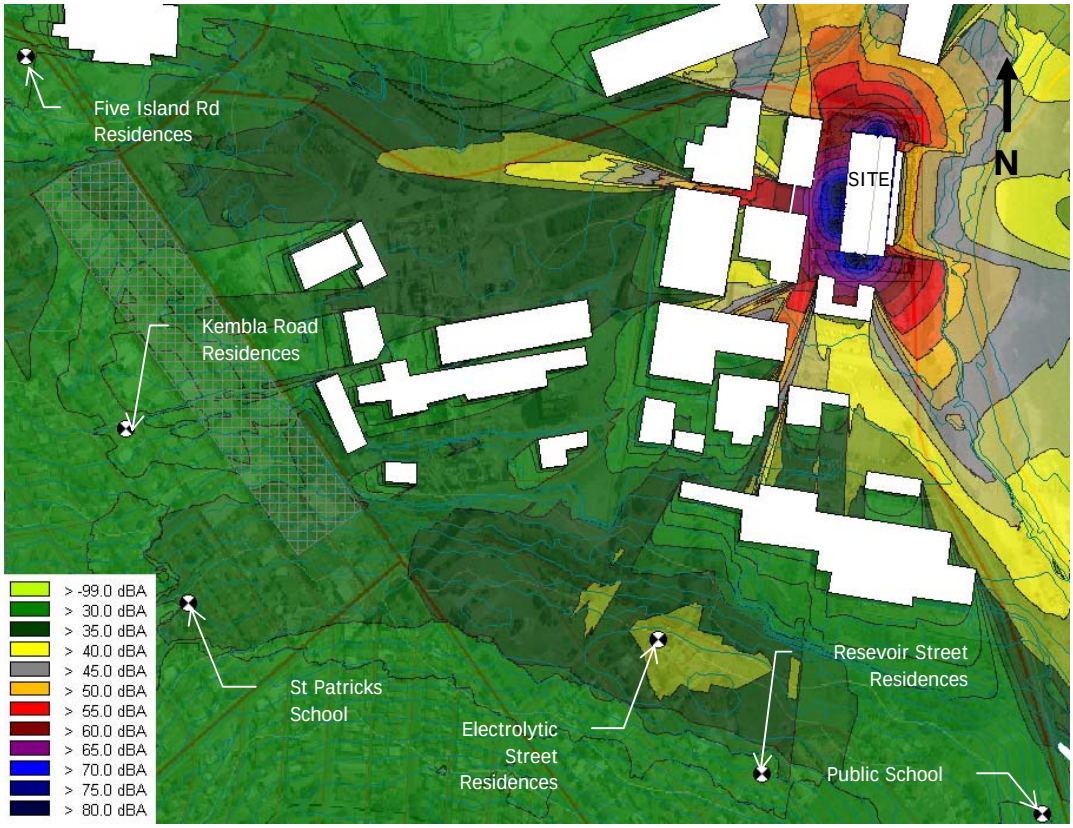
Table 7-1 presents the results of modelling.

Table 7-1 Predicted $L_{Aeq(15\ min)}$ Noise Levels at Residences due to Plant Operating

Receiver Location	Predicted Noise Level - dBA		Most Stringent Noise Criterion - dBA
	Calm Conditions	Adverse Wind Condition	
2 Electrolytic Road	38	36	40
Reservoir Street Residences	31	31	40
15 Kembla Street	28	26	40
Five Islands Road Residences	30	27	40
Public School	29	32	55
St Josephs School	33	31	55

A review of the results indicates that compliance is achieved at all receivers for 24 hour operation. In addition, noise levels at nearby schools will comply with INP criteria. Figure 7-1 shows noise propagation associated with the modelling for calm conditions.

Figure 7-1 Noise Emission Contours (Calm Conditions)



7.1 Sleep Disturbance

Noise from standard fork lift reversing alarms operating at night has been assessed with respect to the potential for sleep disturbance in the night period. A review of predicted noise levels presented in Table 7-2 indicates no exceedance of sleep disturbance criteria at residences.

Table 7-2 Predicted Reversing Alarm Noise Levels at Residences – dBA

Receiver Location	Predicted Noise Level – dBA		Noise Criteria -dBA
	Calm Conditions	Adverse Condition	
2 Electrolytic Road	28	23	56
Reservoir Street Residences	18	18	56
15 Kembla Street	15	11	56
Five Islands Road Residences	18	14	56

8 TRAFFIC NOISE

8.1 Traffic Noise Criteria

Criteria for assessment of road traffic noise are set out in the NSW Government's *Environmental Criteria for Road Traffic Noise (ECRTN)*. Under the definitions in that document, the haulage route associated with this project would be assessed under "*Land use developments with potential to create additional traffic on collector roads*". The main road in question, being the Princes Highway, has been bypassed by the freeway in this area therefore we have conservatively classified this road as a collector road.

Table 9-1 shows the relevant noise criteria for this case. The criteria in columns 2 and 3 of the table are referred to as "base" criteria. These should be met in all cases, where possible. Criteria in the fourth column of the table are referred to as "allowance" criteria. The "existing" noise levels referred to here represent traffic noise levels in the year of opening of the project.

In summary the noise level goals at the residential receivers, for this project, based on the *ECRTN* are:

- $L_{Aeq,1hr}$ day= 60dBA;
- $L_{Aeq,1hr}$ night = 55dBA; or
- where base criteria are already exceeded, *an ECRTN allowance criterion (existing +2 dBA) applies*.

Table 9-1 Traffic noise criteria extracted from the NSW *ECRTN*

TYPE OF DEVELOPMENT	CRITERIA		
	DAY (7AM-10PM) dB(A)	NIGHT (10PM-7AM) dB(A)	WHERE CRITERIA ARE ALREADY EXCEEDED
Land use developments with potential to create additional traffic on collector roads	$L_{Aeq,1hr}$ 60	$L_{Aeq,1hr}$ 55	Where feasible and reasonable, existing noise should be mitigated to meet the noise criteria. Examples of applicable strategies include appropriate location of private access roads; regulating times of use; clustering; using 'quiet' vehicles; and using barriers and acoustic treatments. In all cases, traffic arising from the development should not increase in existing levels of more than 2 dB

Accordingly all residences potentially affected by traffic noise will be assessed with respect to the above criteria.

8.2 Traffic Noise Assessment

A traffic study has been prepared by ML Traffic Engineers "•Traffic and Parking Impact Report Report – A1012239N Ver 1b August 2010. In addition, advice from Vesuvius has been supplied with respect to truck movements. In summary the following is indicated;

a) *The proposed truck route to the site would involve one route along Darcey Road and Five Islands Road.*

b) Day time Truck Movements (6 am to 6 pm)

- *Typically 2 x B-Doubles and 2 x Smaller trucks (say 12.5 m) per day*
- *Maximum of 4 x B-Doubles and 4 x Smaller trucks (say 12.5 m) per day*

c) Night time Truck Movements (6 pm to 6 am)

- *Typically no trucks*

Therefore a "worse case" scenario is likely to be 2 truck movements past residences in the one-hour period between 6am and 7am, which is in the ECRTN "night" period.

The haulage route is presented in Figure 9-1.

Figure 9-1 Likely Truck Haulage Route

Whilst overall traffic noise levels at identified receivers are not known, the noise contribution of the two hourly trucks can be determined. Resultant facade reflected noise levels have been predicted based on trucks passing by residences on the nearside lane at a speed of 60 km/hr, using the CORTN algorithm. The noise contribution at a distance of 16 metres from the nearside lane is 48.3 dBA

The resultant noise levels are well below the night-time time noise criterion of $L_{Aeq,\ 1hr}$ 55 dBA. If the total traffic noise level exceeds this criterion, the exceedance would be due almost entirely to existing traffic on the road, and the additional traffic due to the proposal would not result in an increase of more than 2dBA. Therefore compliance with OLH criteria is indicated.

In the case of car trips generated by the development, the maximum movements are predicted to occur in the AM peak hour. Based on the traffic flows in the ML traffic report, in Table 9.1 shows the predicted AM peak traffic noise levels at the nearest residence on Five Island Road and Military Road

Table 9-1 Predicted AM Peak Hour Traffic Noise Level – $L_{Aeq(1\ hr)}$ - dBA

Residences	Existing AM Peak	Future AM Peak	Difference
Five Island Road	64.7	64.9	0.2
Military Road	66.1	66.4	0.3

A review of predicted noise levels indicates an exceedance of design goal already occurs for the most-affected residences along these roads during peak hour. Therefore noise levels as a result of the development should not increase noise levels by more than 2 dB. It is noted that the increase will be well below 2 dB, and therefore compliance with traffic noise objective is indicated.

9 CONCLUSION

This assessment considers potential noise emissions of the proposed Port Kembla Vesuvius Site. The assessment is based on site specific criteria that were established in accordance with relevant standards and regulations.

With regard to the impact of noise, the following is concluded.

- Plant operational noise levels in the area will comply with established daytime, evening and night noise criteria. This finding is contingent of the Tap Hole Clay metal bin being replaced by a bag process.
- Noise from traffic movements associated with the site has been assessed and it has also been determined to be within relevant criteria.

10 REFERENCES

- NSW Office of Environment and Heritage, 2001 – *NSW Industrial Noise Policy*
- NSW Office of Environment and Heritage, 1999 – *Environmental Criteria for Road Traffic Noise.*
- Traffic and Parking Impact Report - ML Traffic Engineers Report – A1012239N Ver 1b August 2010

Note
All materials specified by Wilkinson Murray Pty Limited have been selected solely on the basis of acoustic performance. Any other properties of these materials, such as fire rating, chemical properties etc. should be checked with the suppliers or other specialised bodies for fitness for a given purpose.

Quality Assurance
We are committed to and have implemented AS/NZS ISO 9001:2000 "Quality Management Systems – Requirements". This management system has been externally certified and Licence No. QEC 13457 has been issued.

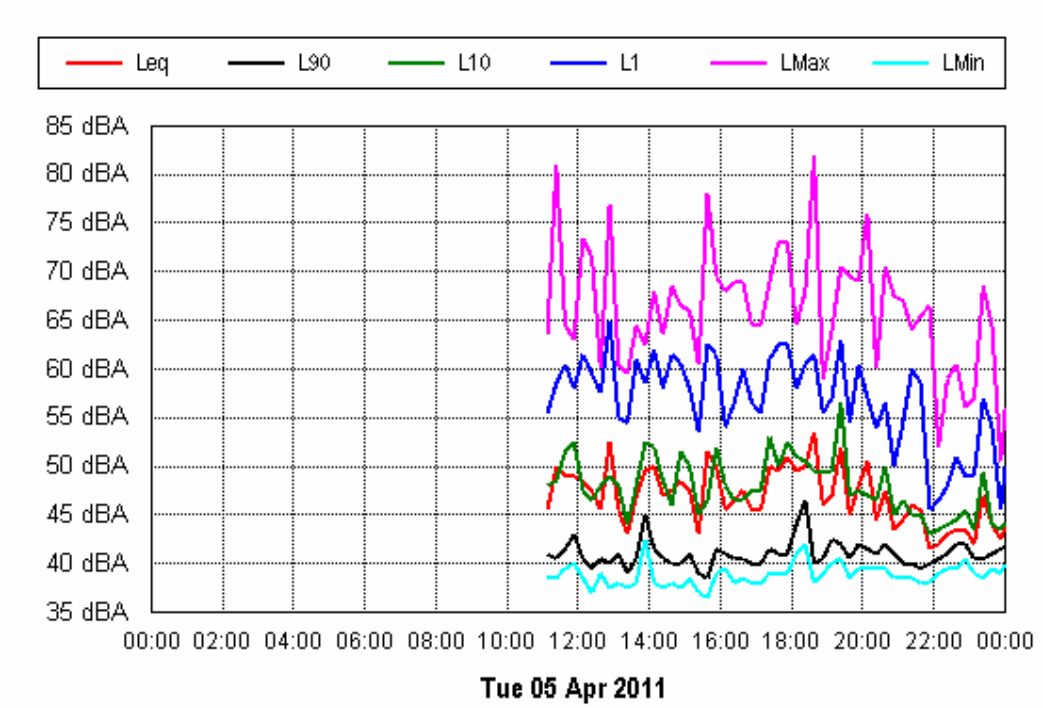
AAAC
This firm is a member firm of the Association of Australian Acoustical Consultants and the work here reported has been carried out in accordance with the terms of that membership.

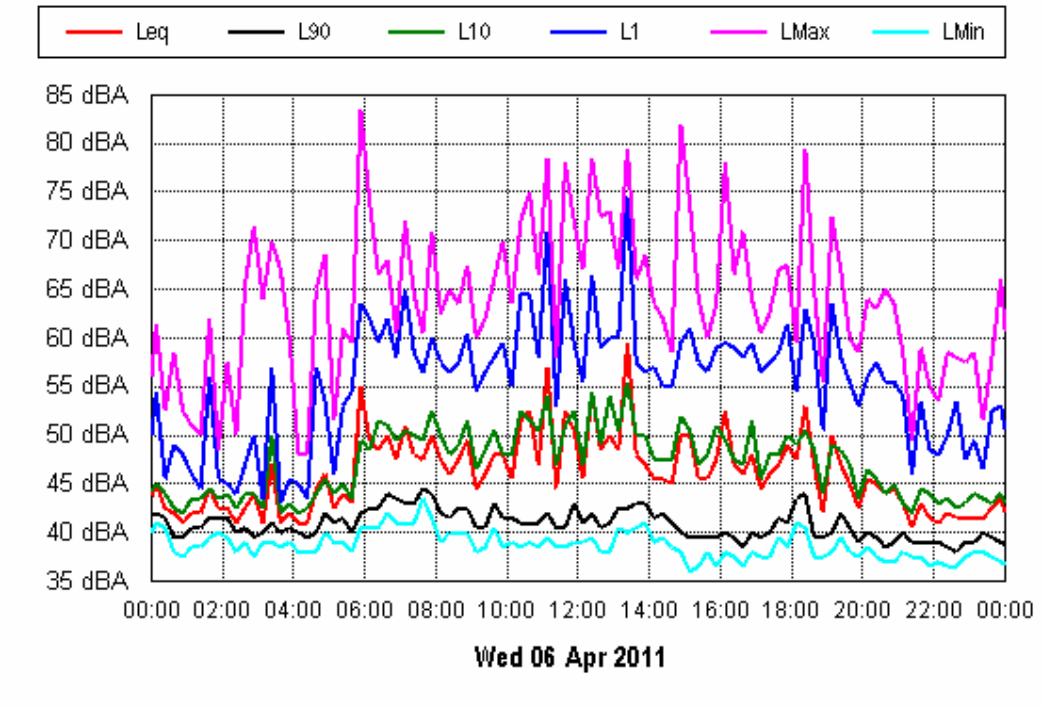
Version	Status	Date	Prepared by	Checked by
A	Final	4 May 2011	Brian Clarke	Rob Bullen

APPENDIX A

Results of Noise Logging

Location: 15 Resevior Street





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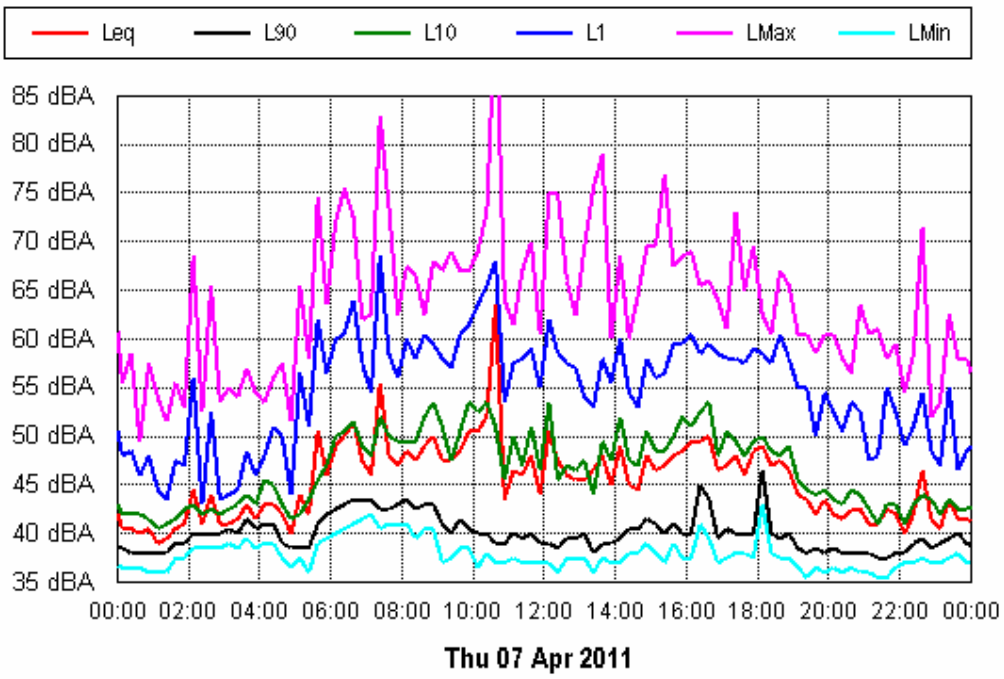
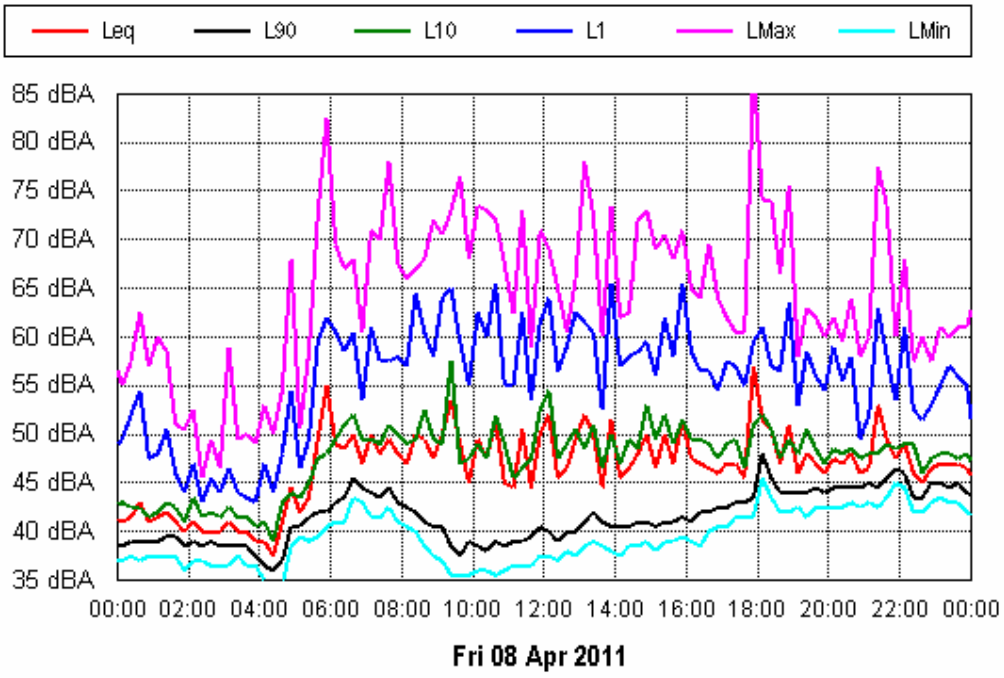


Thu 07 Apr 2011



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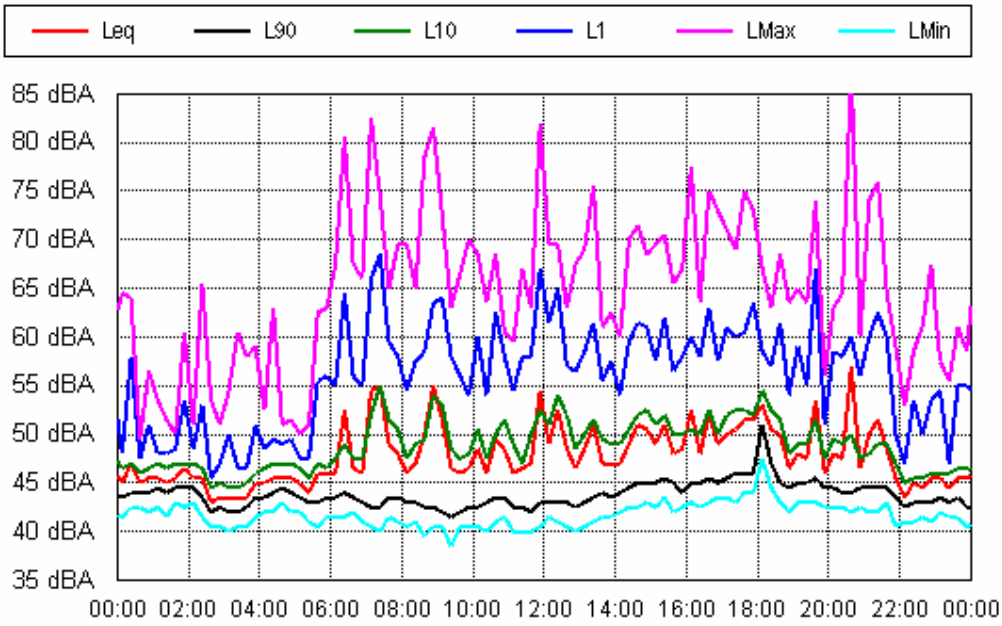

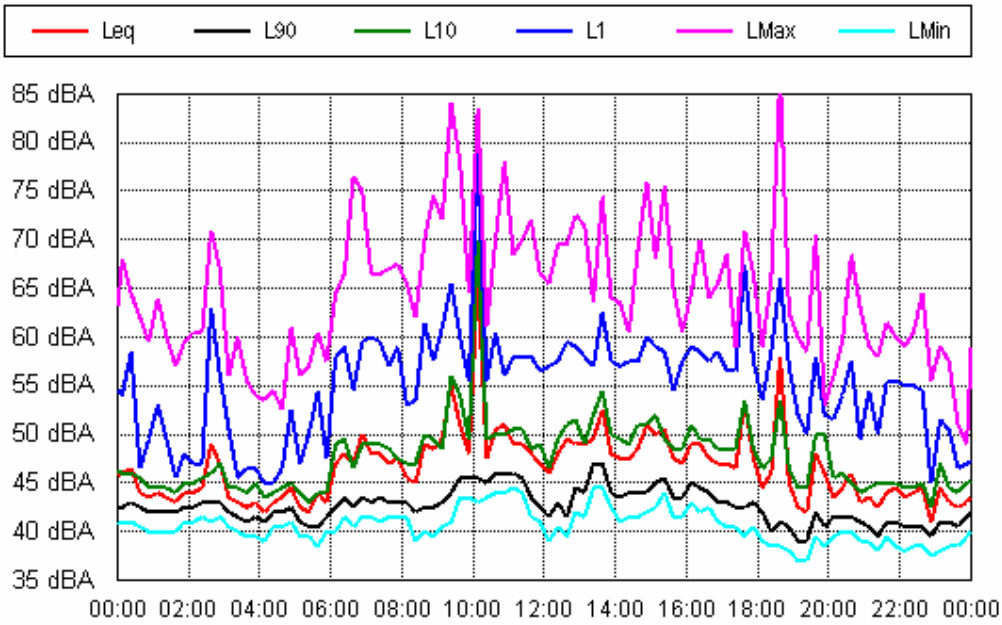

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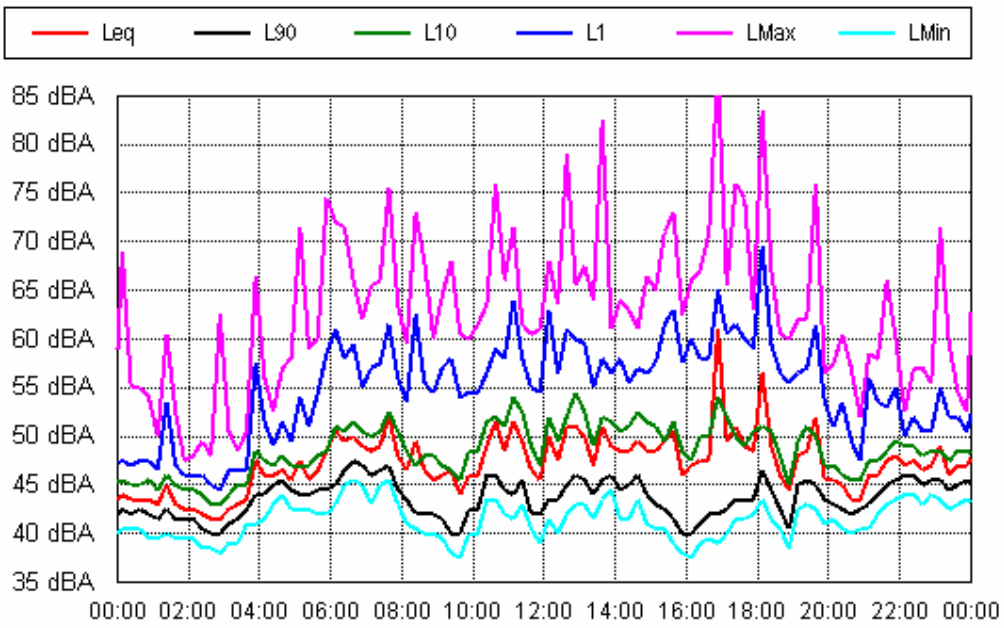
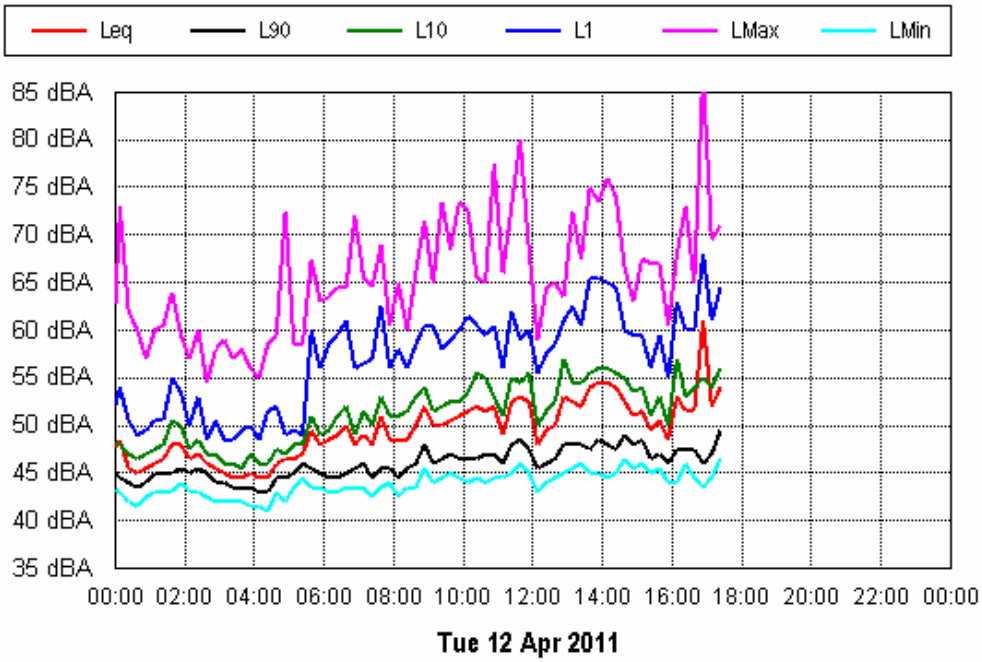




APPENDIX B

GLOSSARY OF TERMS

GLOSSARY

Most environments are affected by environmental noise which continuously varies, largely as a result of road traffic. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are demonstrated in the graph overleaf, are here defined.

Maximum Noise Level (L_{Amax}) – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

L_{A1} – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

L_{A50} – The L_{A50} level is the noise level which is exceeded for 50% of the sample period. During the sample period, the noise level is below the L_{A50} level for 50% of the time.

L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

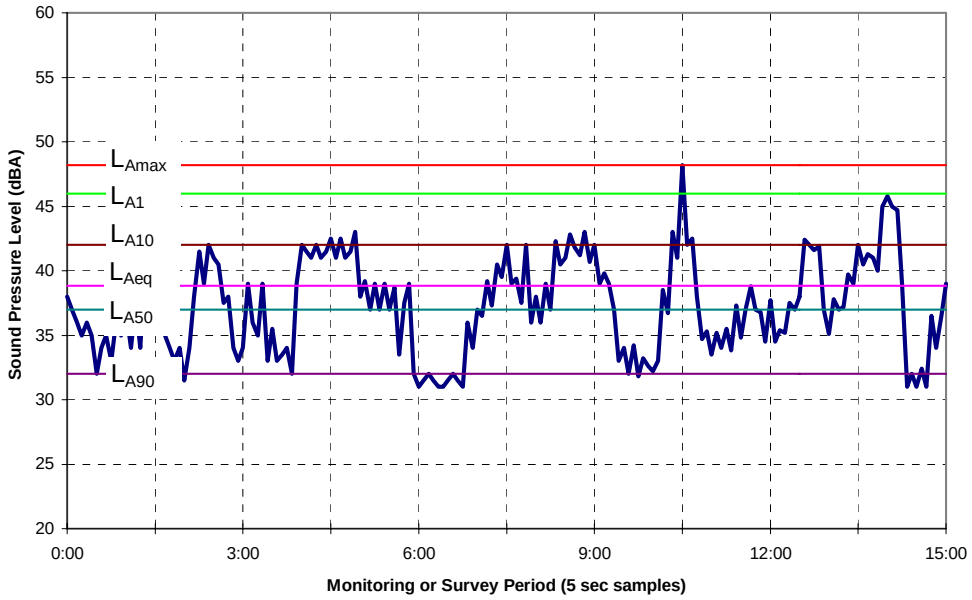
ABL – The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening and night time) for each day. It is determined by calculating the 10^{th} percentile (lowest 10^{th} percent) background level (L_{A90}) for each period.

RBL – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period **–** daytime, evening and night time.

OLH – NSW Office of Environment and Heritage

INP – NSW Industrial Noise Policy

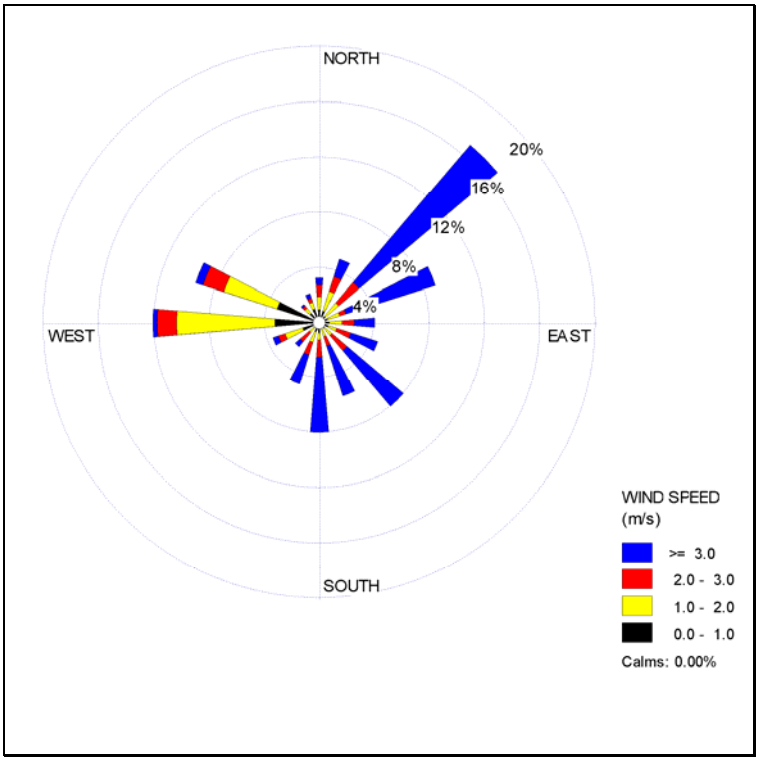
ECRTN – Environmental Criteria for Road Traffic Noise


60
55
50
45
40
35
30
25
20
Sound Pressure Level (dBA)
LAmax
LA1
LA10
LAeq
LA50
LA90
0:00
3:00
6:00
9:00
12:00
15:00
Monitoring or Survey Period (5 sec samples)

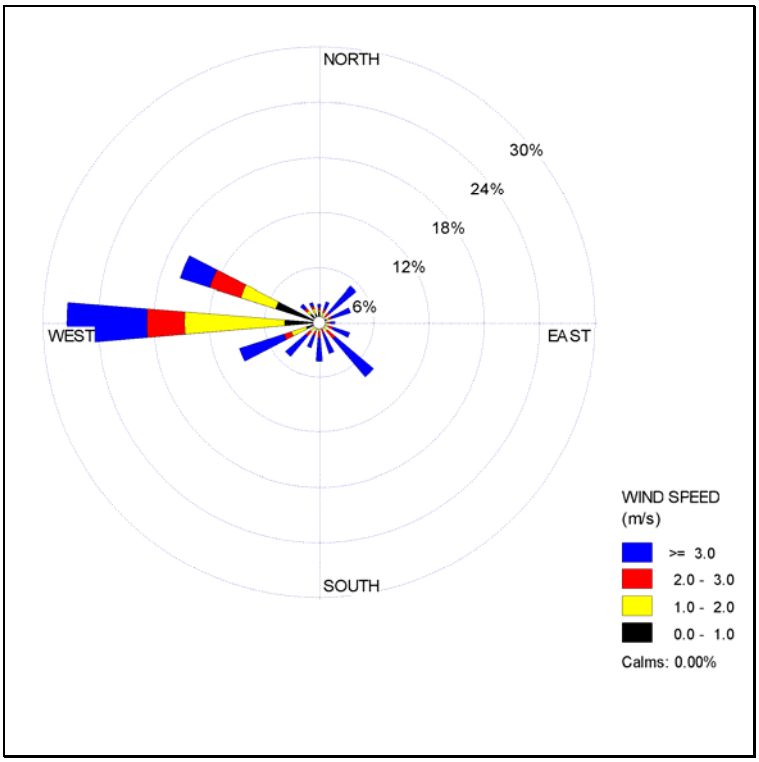
APPENDIX C

WIND ROSES

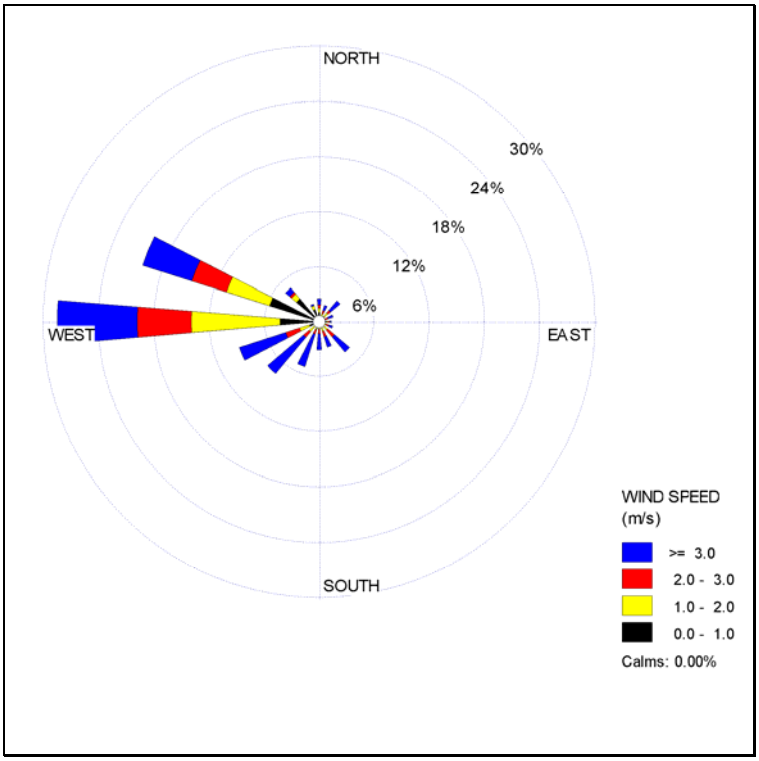
Summer



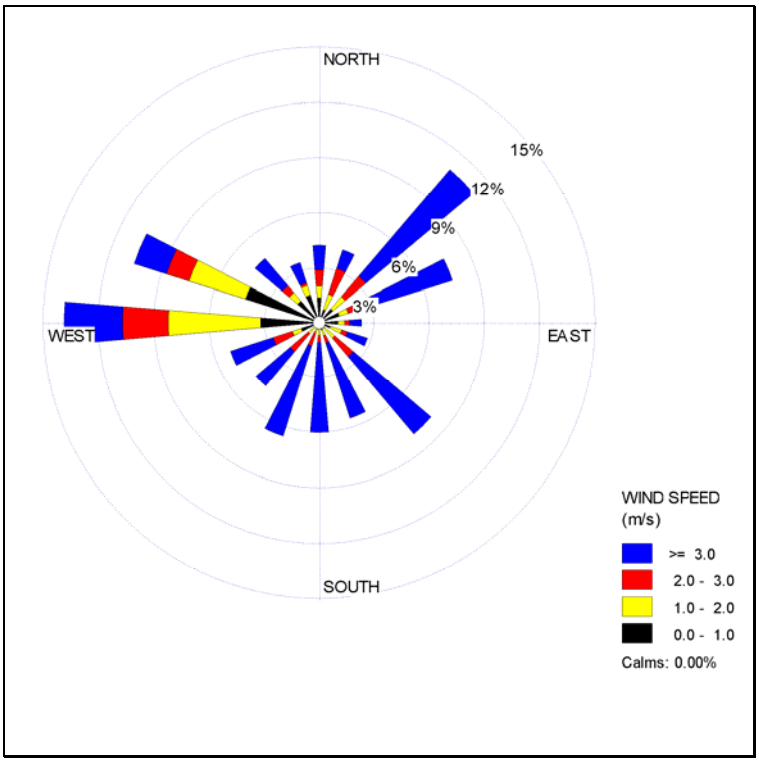
Autumn Winds



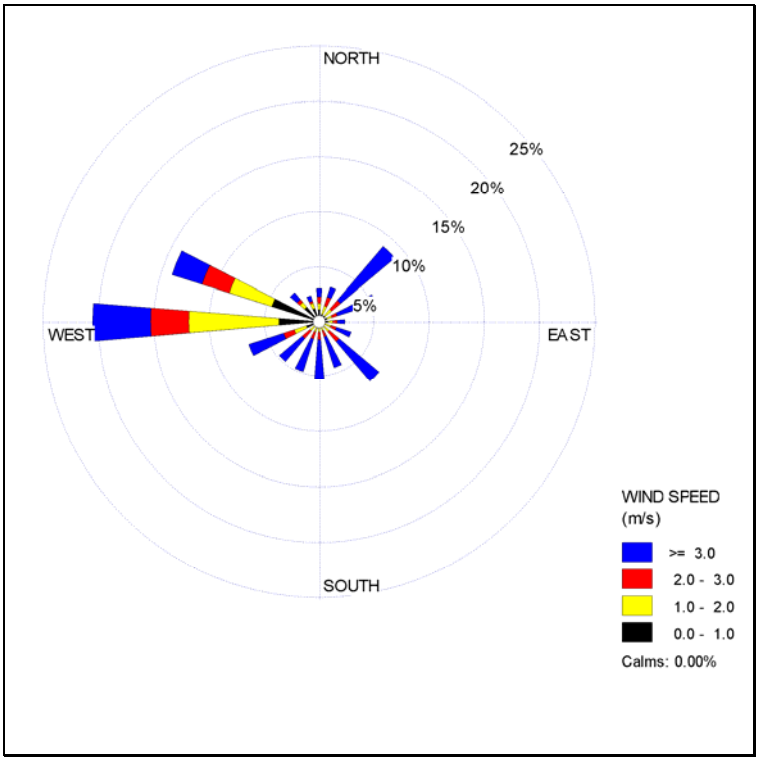
Winter Winds



Spring Winds



Yearly Winds


NORTH
25%
20%
15%
10%
5%
WEST
EAST
SOUTH
WIND SPEED
(m/s)
>= 3.0
2.0 - 3.0
1.0 - 2.0
0.0 - 1.0
Calms: 0.00%