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Huntingwood West Estate

Noise Impact Assessment

Report Number 630-02154-R2

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Level 10, 60 Castlereagh St
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Huntingwood West Estate

Noise Impact Assessment

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1 INTRODUCTION

Heggies Pty Ltd (Heggies) has been commissioned by Goodman International Limited (Goodman) to prepare a noise impact assessment (NIA) to be included in a Part 3A application for Stage 1 of the Huntingwood West Estate (formerly know as Bungarribee Industrial Estate). This first stage will involve the construction of a Metcash distribution warehouse with associated offices.

Broadly, the objectives of the assessments are as follows:

- Identify the potential impacts of noise from the construction and operation of the facility and provide advice with regard to effective mitigation strategies where necessary.

The NIA has been be prepared with reference to Australian Standard AS 1055:1997 *Description and Measurement of Environmental Noise* Parts 1, 2 and 3 and in accordance with the Department of Environment, Climate Change and Water (DECCW) NSW Industrial Noise Policy (INP). Where issues relating to noise are not addressed in the INP, such as sleep disturbance, reference has been made to the NSW Environmental Noise Control Manual (ENCM), Interim Construction Noise Guideline and the Environmental Criteria for Road Traffic Noise (ECRTN).

The Scope for the NIA has been designed to address the Director General's Requirements (DGR's) with regard to the assessment of noise emissions. Comments on the DGR's have also been provided by other government agencies. These have been reviewed with regard to their relevance to the assessment of noise impacts.

1.1 Acoustic Terminology

The following report uses specialist acoustic terminology. An explanation of common terms is provided in **Appendix A**.

1.2 Project Description

The Huntingwood West Industrial Estate is a State Significant Site (SSS) that was rezoned as IN1 General Industrial under the Major Projects SEPP. A Part 3A Concept Plan was approved for the subdivision of the Industrial Estate into 47 lots for future employment usage. This application is in relation to the construction and operation of a Metcash Warehouse and Distribution Centre. The proposed development will consist of a warehouse and associated office. The site is located on land to the east of the M7 and south of the Great Western Highway and is bounded to the south by the M4 motorway and the east by an existing industrial estate (refer to **Figure 1** and **Figure 2**)

Drawings upon which this acoustic assessment was based were supplied by Goodman Property Service, and are as follows:

- BIE – 3A-A01 – Cover Sheet & Location Plan
- BIE - 3A-A12 – Site Elevations North, South, East & West
- BIE – 3A-A14 – Main Office Floor Plan – Ground Level
- BIE – 3A-A15 – Main Office Floor Plan – Level 1
- BIE – 3A-A16 – Main Office Floor Plan – Level 2
- BIE – 3A-A17 – Main Ofiice Floor Plan – Level 3
- BIE – 3A-A18 – Main Office Floor Plan – Level 4
- BIE – 3A-A19 – Main Office Sections
- BIE – 3A-A23 – WH1 –A, B & C – Floor Plan & Elevations
- BIE – 3A-A24 – WH2-A Office & Gatehouse – Floor Plan and Elevations
- BIE – 3A-A25 – WH3-A Office – Floor Plan & Elevations
- BIE – SITE –A000 – Site Plan – Stage 3
- BIE-WH1-A102 – Dry Warehouse Roof Plan
- BIE-WH2-A201 – WH2 Plantrooms
- LD DA 1002 (rev 00) – Bungarribee Industrial Estate Infrastructure Works
- 21-18115-C2010 – Metcash Concept Bulk Earthworks Design General Arrangement Plan

Also, the traffic report produced by Halcrow Pacific Highway Pty Ltd '*Metcash Site, Huntingwood West Traffic Impact Assessment, 6 August 2010* has been referenced in this report.

Figure 1 Locality Map

Figure 2 Metcash Estate Masterplan

2 NOISE IMPACT ASSESSMENT PROCEDURES

2.1 General Objectives - Industrial Noise Policy

The Industrial Noise Policy (INP) was released in January 2000 and provides a framework and process for deriving noise criteria for consents and licences that enables the DECCW to regulate premises that are scheduled under the Protection of the Environment Operations Act, 1997.

The specific policy objectives are:

- To establish noise criteria that would protect the community from excessive intrusive noise and preserve amenity for specific land uses.
- To use the criteria as the basis for deriving project specific noise levels.
- To promote uniform methods to estimate and measure noise impacts, including a procedure for evaluating meteorological effects.
- To outline a range of mitigation measures that could be used to minimise noise impacts.
- To provide a formal process to guide the determination of feasible and reasonable noise limits for consents or licences that reconcile noise impacts with the economic, social and environmental considerations of industrial development.
- To carry out functions relating to the prevention, minimisation and control of noise from premises scheduled under the Act.

The INP provides two forms of noise criteria with the aim of achieving environmental noise objectives; one to account for intrusive noise which involves setting a noise goal relative to the existing acoustic environment and the other to protect the amenity of particular land uses.

For assessing intrusiveness, the background noise needs to be measured. The intrusiveness criterion essentially means that the equivalent continuous noise level of the source over any 15 minute period ($L_{Aeq(15minute)}$) should not be more than five (5) decibels above the measured background level (L_{A90}).

The amenity assessment is based on noise criteria specific to land use and associated activities. The criteria relate only to industrial-type noise and do not include road, rail or community noise. An extract from the INP that relates to the amenity criteria is given in **Table 1**.

Table 1 Amenity Criteria
Recommended L_{Aeq} Noise Levels from Industrial Noise Sources

Type of Receiver	Indicative Noise Amenity Area	Time of Day	Recommended $L_{Aeq(Period)}$ Noise Level (dBA)	
			Acceptable	Recommended Maximum
Residence	Rural	Day	50	55
		Evening	45	50
		Night	40	45
	Suburban	Day	55	60
		Evening	45	50
		Night	40	45
	Urban	Day	60	65
		Evening	50	55
		Night	45	50
	Urban/Industrial Interface (for existing situations only)	Day	65	70
		Evening	55	60
		Night	50	55
School classrooms - internal	All	Noisiest 1 hour period when in use	35	40
Hospital wards	All	Noisiest 1 hour period		
- internal			35	40
- external			50	55
Place of worship - internal	All	When in use	40	45
Area specifically reserved for passive recreation (eg National Park)	All	When in use	50	55
Active recreation area (eg school playground, golf course)	All	When in use	55	60
Commercial premises	All	When in use	65	70
Industrial premises	All	When in use	70	75

Note: Daytime 7.00 am to 6.00 pm; Evening 6.00 pm to 10.00 pm; Night-time 10.00 pm to 7.00 am, On Sundays and Public Holidays, Daytime 8.00 am - 6.00 pm; Evening 6.00 pm - 10.00 pm; Night-time 10.00 pm - 8.00 am.
The L_{Aeq} index corresponds to the level of noise equivalent to the energy average of noise levels occurring over a measurement period.

If the measured existing noise level from industry approaches the criterion value, then noise levels from new industries need to be designed so that the cumulative effect does not produce noise levels that would significantly exceed the criterion. In this case, the amenity criteria provided in **Table 1** would need to be adjusted in accordance with the INP as per **Table 2**.

Table 2 Modification to Acceptable Noise Level (ANL)* to Account for Existing Levels of Industrial Noise

Total Existing L_{Aeq} noise level from Industrial Noise Sources	Maximum L_{Aeq} Noise Level for Noise from New Sources Alone, dBA
≥ Acceptable noise level plus 2 dBA	If existing noise level is *likely to decrease* in future acceptable noise level minus 10 dBA If existing noise level is *unlikely to decrease* in future existing noise level minus 10 dBA
Acceptable noise level plus 1 dBA	Acceptable noise level minus 8 dBA
Acceptable noise level	Acceptable noise level minus 8 dBA
Acceptable noise level minus 1 dBA	Acceptable noise level minus 6 dBA
Acceptable noise level minus 2 dBA	Acceptable noise level minus 4 dBA
Acceptable noise level minus 3 dBA	Acceptable noise level minus 3 dBA
Acceptable noise level minus 4 dBA	Acceptable noise level minus 2 dBA
Acceptable noise level minus 5 dBA	Acceptable noise level minus 2 dBA
Acceptable noise level minus 6 dBA	Acceptable noise level minus 1 dBA
< Acceptable noise level minus 6 dBA	Acceptable noise level

* ANL = recommended acceptable L_{Aeq} noise level for the specific receiver, area and time of day from **Table 1**

2.2 Assessing Sleep Disturbance

The DECCW's current approach to assessing potential sleep disturbance is to apply an initial screening criterion of background plus 15 dBA (as described in the Application Notes to the INP), and to undertake further detailed analysis if the screening criterion cannot be achieved. The sleep disturbance screening criterion applies outside bedroom windows during the night-time period.

Where the screening criterion cannot be met, the additional analysis should consider the number of potential sleep disturbance events during the night, the level of exceedance and noise from other events. It may also be appropriate to consider other guidelines including the DECCW's ECRTN which contains additional guidance relating to the potential sleep disturbance impacts.

A review of research on sleep disturbance in the ECRTN indicates that in some circumstances, higher noise levels may occur without significant sleep disturbance. Based on studies into sleep disturbance, the ECRTN concludes that:

- "Maximum internal noise levels below 50 dBA to 55 dBA are unlikely to cause awakening reactions."
- "One or two noise events per night, with maximum internal noise levels of 65 dBA to 70 dBA, are not likely to affect health and wellbeing significantly."

It is generally accepted that internal noise levels in a dwelling, with the windows open, are 10 dBA lower than external noise levels. Based on a worst case minimum attenuation, with windows open, of 10 dBA, the first conclusion above suggests that short term external noises of 60 dBA to 65 dBA are unlikely to cause awakening reactions. The second conclusion suggests that one or two noise events per night with maximum external noise levels of 75 dBA to 80 dBA are not likely to affect health and wellbeing significantly.

2.3 Assessing Construction Noise

The DECCW released the Interim Construction Noise Guideline in July 2009. The guideline sets out noise management levels, in relation to construction type activities, for sensitive receivers and how they are to be applied. The guideline suggests restriction to the hours of construction that apply to activities that generate noise at noise-sensitive receivers above the 'highly affected' noise management level. A summary of the noise management levels relevant to residential locations from the Guideline is contained in **Table 3**.

Table 3 Interim Construction Noise Guideline (Residences)

Time of day	Management level $L_{Aeq(15minute)}$	How to apply
Recommended standard hours Monday to Friday 7am to 6pm Saturday 8am to 1pm No work Sundays or public holidays	Noise Affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. - Where the predicted or measured $L_{Aeq(15minute)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. - The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dBA	The highly noise affected level represents the point above which there may be strong community reaction to noise. - Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: 1. times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences. 2. if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise Affected RBL + 5 dB	A strong justification would typically be required for works outside the recommended standard hours. - The proponent should apply all feasible and reasonable work practices to meet the noise affected level. - Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community.

2.4 Road Traffic Noise

The DECCW released the "*Environmental Criteria for Road Traffic Noise*" (ECRTN) in May 1999. The policy sets out noise criteria applicable to different road classifications for the purpose of defining traffic noise impacts. Relevant road traffic noise criteria are identified in **Section 4.4** of this report.

3 NOISE IMPACT ASSESSMENT

3.1 Existing Acoustical and Meteorological Environment

In order to determine existing ambient noise levels at the nearest residential locations to the site, a background monitoring survey were undertaken at two (2) residences, namely Receiver 1 (711 Great Western Highway, Eastern Creek) and Receiver 2 (47 Pikes Lane, Eastern Creek), as shown in **Figure 3**.

The background noise monitoring consisted of continuous, unattended noise logging and operator attended noise surveys. The operator attended noise surveys help to define noise sources and the character of noise in the area and are, therefore, used to qualify unattended noise logging results.

Figure 3 Nearest Affected Receiver Locations

Source: Google Earth

The acoustical environment adjacent to the Great Western Highway and M7 typifies an urban environment, with heavy and continuous traffic flows, and residences near industrial districts. Therefore, the nearest potentially affect residences in Eastern Creek have been assessed under the "Urban" receiver type.

3.2 Unattended Continuous Noise Monitoring

The objective of the background monitoring survey was to measure $L_{A90(15minute)}$ and $L_{Aeq(15\ minute)}$ noise levels at the nearest potentially affected receivers during proposed operational periods to determine the intrusiveness and amenity criteria for the development.

The noise monitoring commenced on Friday 3 September 2010 and concluded on Friday 10 September 2010. The noise monitoring was conducted using ARL Type EL215 environmental noise loggers.

Any noise data during periods of rainfall and/or wind speeds in excess of 5 m/s (approximately 18 km/h) were discarded in accordance with INP weather affected data exclusion methodology. The weather data for this purpose was obtained from the nearest Bureau of Meteorology weather station at Horsley Park, approximately 6km south of the subject site.

A summary of the results of the unattended continuous noise monitoring is given in **Table 4**. The ambient noise levels are presented in graphical format in **Appendix B** and **C**.

Table 4 Summary of Existing Ambient Noise Levels

Location	Period	RBL, Background L_{A90} Noise Level (dBA)	$L_{Aeq(15minute)}$ Noise Level
Receiver 1 47 Pikes Lane	Daytime	50	55
	Evening	51	54
	Night	46	54
Receiver 2 711 Great Western Highway	Daytime	50	56
	Evening	50	56
	Night	46	55

Notes For Monday to Saturday, Daytime 7.00 am - 6.00 pm; Evening 6.00 pm - 10.00 pm; Night-time 10.00 pm - 7.00 am. On Sundays and Public Holidays, Daytime 8.00 am - 6.00 pm; Evening 6.00 pm - 10.00 pm; Night-time 10.00 pm - 8.00 am.
The LA90 represents the level exceeded for 90% of the interval period and is referred to as the average minimum or background noise level
The LAeq index corresponds to the level of noise equivalent to the energy average of noise levels occurring over a measurement period.

All noise levels reported here are from free-field measurements, meaning that no noise reflections occurred from building/structure facades near the logging sites.

Also, background noise levels present in **Table 4** have not been affected from existing industrial activities in the area and therefore are applicable levels to be used in the establishment of project specific noise criteria.

The results of long-term unattended background noise monitoring indicate that the calculated Rating Background Level (RBL, defined in the Industrial Noise Policy) for the evening period is higher than the RBL for the daytime period at Receiver 1 location. This situation can often arise due to increased noise from, for example, insects or frogs during the evening in the warmer months or due to temperature inversion conditions during winter. In this instance, it is also likely that the noise contribution from the Great Western Highway and the M7 increases during the evening time period due to a significant increase in the number of heavy vehicles.

The RBL is used in determining relevant noise criteria for an industrial development. The intrusiveness criterion essentially means that the equivalent continuous noise level (L_{Aeq}) of the source should not be more than five decibels above the measured background level (L_{A90}).

In determining project-specific noise criteria the INP Application Notes state that the community's expectation also needs to be considered. The community generally expects greater control of noise during the more sensitive evening and night-time periods than the less sensitive daytime period. Therefore, in determining project-specific noise criteria for a particular development, it is generally recommended that the intrusive noise criteria for evening be set at no greater than the intrusive noise criteria for daytime. The intrusive noise criteria for night-time should be no greater than the intrusive noise level for day or evening.

In this case, given that the lowest measured RBL between the day and evening time period was during the daytime at Receiver 1 monitoring location, the daytime RBL would be utilised in determining relevant project specific noise criteria for the evening time period at receiver 1 monitoring location. Hence, a criteria of $L_{Aeq(15minute)}$ 55 dBA would apply for the day and evening time period at receiver 1 monitoring location.

3.3 Operator Attended Noise Monitoring

An operator-attended noise survey was conducted at the noise monitoring location to verify the unattended logging results and to determine the character and contribution of noise sources to the total ambient noise level.

The operator attended noise survey was conducted during logger retrieval on Friday 10 September 2010. Results of this survey are shown in. Ambient noise levels given in **Table 5** include all noise sources such as traffic and residential activities.

Table 5 Operator Attended Noise Measurements

Location	Date/ Start Time/ Weather	Primary Noise Descriptor (dBA re 20μPa)					Description of Noise Emission and Typical Maximum Levels LAmax (dBA)
		LAmax	LA1	LA10	LA90	LAeq	
Receiver 1 47 Pikes Lane	10/9/10 11:29 am Calm 19^0C	68	60	57	52	55	Constant Road Traffic – Great West Highway and M7 (Dominate) 54- 68 Birds 57-66
Receiver 2 711 Great Western Highway	10/9/10 11:58 am Calm 19^0C	68	63	58	49	56	Constant Road Traffic – Great West Highway and M7 (Dominate) 57- 62 Birds 50-68

The ambient noise environment at Receiver 1 and 2 was typical of an urban location. Noise sources included heavy and continuous traffic flow from the M7 and Great Western Hwy.

3.4 INP Assessment of Prevailing Weather Conditions

3.4.1 Wind

Wind has the potential to increase noise at a receiver when it is light and stable and blows from the direction of the source of the noise. As the strength of the wind increases the noise produced by the wind will obscure noise from most industrial and transport sources.

Wind effects need to be considered when wind is a feature of the area under consideration. The INP states that where wind blows from the source to the receiver at speeds up to 3 m/s for more than 30% of the time in any season, then wind is considered to be a feature of the area and noise level predictions must be made under these conditions.

In order to determine the prevailing conditions for the subject site, 12 months of weather data was obtained from a Bureau of Meteorology automatic weather station at Horsley Park, approximately 6km south of the subject site.

This data was analysed to determine the frequency of occurrence of winds of speeds up to 3 m/s in each season during the day, evening and night time periods. The results of the wind analysis for daytime, evening, and night-time winds are presented in **Table 6**, **Table 7** and **Table 8**, respectively. In each table, the wind directions and percentage occurrence are those dominant during each season.

Table 6 Seasonal Frequency of Occurrence of Wind Speed Intervals – Daytime

Period	Calm	Wind Direction	0.5 to 2 m/s	2 to 3 m/s	0.5 to 3 m/s
Summer	2.0%	N±45	4.4%	6.6%	10.9%
Autumn	4.8%	NNW±45	8.2%	7.8%	16.0%
Winter	10.7%	NW±45	8.1%	7.1%	15.2%
Spring	2.2%	N±45	3.4%	5.5%	8.9%

Table 7 Seasonal Frequency of Occurrence of Wind Speed Intervals – Evening

Period	Calm	Wind Direction	0.5 to 2 m/s	2 to 3 m/s	0.5 to 3 m/s
Summer	6.4%	SE±45	4.8%	9.4%	14.2%
Autumn	16.4%	SW±45	7.7%	9.8%	17.5%
Winter	17.6%	WSW±45	7.1%	11.2%	18.3%
Spring	10.5%	E±45	5.3%	7.7%	13.0%

Table 8 Seasonal Frequency of Occurrence of Wind Speed Intervals – Night-time

Period	Calm	Wind Direction	0.5 to 2 m/s	2 to 3 m/s	0.5 to 3 m/s
Summer	21.2%	SSW±45	10.0%	15.2%	25.2%
Autumn	24.4%	WSW±45	12.1%	15.8%	27.9%
Winter	19.7%	W±45	11.0%	9.7%	20.7%
Spring	23.9%	SW±45	9.7%	9.2%	18.9%

From the above weather data, significant wind (ie wind speed of up to 3 m/s) was recorded but not more than the assessment threshold of 30 % during the period between September 2009 and September 2010 and therefore prevailing wind condition was not considered in this assessment.

3.4.2 Temperature Inversion

Temperature inversions, when they occur, have the ability to increase noise levels by focusing sound waves. Temperature inversions occur predominantly at night during the winter months. 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 winter, or about two nights per week.

The NSW INP states that temperature inversions need only be considered for the night-time noise assessment period (10.00 pm to 7.00 am). Temperature inversion data was not attainable from the Horsley Park weather station. Therefore, in accordance with the INP, operational noise levels representing a worst case scenario were modelled using the INP default temperature inversion value of 3^{o}C/100 m for the night-time period (10 pm – 7 am).

4 PROJECT SPECIFIC NOISE CRITERIA

4.1 Operational Noise Criteria

The noise emission design criteria for the proposed development have been established with reference to the INP outlined in **Section 2.1** of this report.

The amenity criteria have been established using the results of ambient noise measurements. The acoustical environment adjacent to the Great Western Highway, M4 and M7 typifies an urban environment, with heavy and continuous traffic flows, and residences near industrial districts. Therefore, the nearest potentially affect residences in Eastern Creek (refer to **Figure 3**) have been assessed under the "urban" receiver type.

The resulting operational project specific noise criteria for Receiver 1 and 2 will be based on L_{A90} and L_{Aeq} noise levels measured at each of these residences.

The resulting operational project specific noise criteria for the proposed development are shown in **bold** within **Table 9.** Since the noise emissions associated with the operation of Metcash facility are considered to be continuous, the $L_{Aeq(15minute)}$ and the $L_{Aeq(period)}$ noise criteria are directly comparable parameters and the more stringent of the intrusiveness or the amenity criteria sets the project specific noise criteria.

Table 9 Project Specific Noise Criteria

Location	Period	Intrusiveness Criteria $L_{Aeq(15minute)}$	DECCW Acceptable Amenity Criteria $L_{Aeq(Period)}$	Project Specific Noise Criteria $L_{Aeq(15minute)}$
Receiver 1	Daytime	**55**	60	**55**
47 Pikes Lane	Evening	55	**50**	**50**
	Night	51	**45**	**45**
Receiver 2	Daytime	**55**	60	**55**
711 Great Western Highway	Evening	55	**50**	**50**
	Night	51	**45**	**45**

Note 1: As described in **Table 2**, a modification factor has been applied to acceptable noise level to account for existing level of industrial noise.

4.2 Sleep Disturbance Noise Goals

Night-time sleep disturbance noise goals have been set with reference to the INP Application Notes as outlined in **Section 2.2** of this report and are presented in **Table 10.** These noise goals have been determined based on the minimum $L_{A90(15minute)}$ noise level recorded at Residences 1, 6 and 7 during the night-time over the noise monitoring period.

Table 10 Sleep Disturbance Noise Goals

Location	Period	Sleep Disturbance $L_{A1(1minute)}$ Noise Goal
Receiver 1 47 Pikes Lane	Night-time (10 pm – 7 am)	61
Receiver 2 711 Great Western Highway		

4.3 Construction Noise Criteria

The daytime background noise level (L_{A90}) has been determined at the most potentially affected residential locations. The project specific construction noise goals are presented in **Table 11** and would be applicable for the proposed development.

Table 11 Construction Noise Goals – Potentially Affected Residential Areas

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Location	Construction $L_{Aeq(15minute)}$ Nose Goal (dBA)	
	Noise Affected	Highly Noise Affected
Receiver 1 47 Pikes Lane	60	75
Receiver 2 711 Great Western Highway		

Note: Recommended standard hours: Monday to Friday 7am to 6pm, Saturday 8am to 1pm and no work Sundays or public holidays

4.4 Road Traffic Noise Criteria

The site is located on land to the east of the M7 and south of the Great Western Highway and is bounded to the south by the M4 motorway and the east by an existing industrial estate (refer to **Figure 1**)

The proposed development involves the construction of a new Metcash warehouse and distribution facility. The proposed development will be accessed from either Brabham Drive or Huntingwood Drive via Great Western Highway.

We note that no residentially zone land is located near Brabham Drive or Huntingwood Drive and only industrial/commercial zoned land surrounds Brabham Drive or Huntingwood Drive. Therefore in accordance with the ECRTN, only Great Western Highway has been assessed with relation to road traffic noise from the proposed development.

Great Western Highway falls into the category of “Freeway/arterial” road and it is for this reason the noise criteria outlined in **Table 12** have been adopted.

Table 12 DECCW Environmental Criteria for Road Traffic Noise

Type of Development	Descriptor	Traffic Noise Goal
7. Land use developments with potential to create additional traffic on existing freeway/arterials	$L_{Aeq(15hour)}$ Daytime	60 dBA*
	$L_{Aeq(9hour)}$ Night-time	55 dBA*

* In all cases, traffic arising from the development should not lead to an increase in existing noise levels of more than 2 dBA.

5 NOISE IMPACT ASSESSMENT

5.1 Noise Modelling Parameters

A computer model will be used to predict noise emissions from the proposed development. SoundPLAN V7 with CONCAWE algorithm has been used to calculate the noise emissions from the subject development. A three-dimensional digital terrain map giving all relevant topographic information was used in the modelling process. The model used the following parameters to predict noise levels at the nearest potentially affected receivers:

- The topographic map,
- The noise source data, which was complied from a Heggies database,
- Ground cover,
- Shielding by barriers and/or adjacent buildings, and
- Atmospheric information. Prediction of operational noise under calm and prevailing meteorological condition (temperature inversion) was conducted. Atmospheric parameters under which noise predictions were made are given in **Table 13**.

Table 13 Meteorological Parameters for Noise Predictions

	Temperature	Humidity	Wind Speed	Wind Direction	Temperature Gradient
Calm (all Periods)	20^0C	70%	N/A	N/A	N/A
Temperature inversion	10^0C	90%	N/A	N/A	3^oC/100 m

The following assumptions were made in predicting $L_{Aeq(15minute)}$ noise emission levels from the existing and proposed developments:

Proposed Operations

Fresh Warehouse

- 8 forklifts operate continuously outside the factory building at any one time.
- 8 delivery trucks are on site and operating continuously.
- 5 External Condenser units operating continuously
- 5 rooftop compressors

Perishables

- 17 forklifts operate continuously outside the factory building at any one time.
- 17 delivery trucks are on site and operating continuously.
- 7 External Condenser units operating continuously
- 10 rooftop compressors

IGAD Warehouse

- 47 forklifts operate continuously outside the factory building at any one time.
- 47 delivery trucks are on site and operating continuously.

ALM Warehouse

- 13 forklifts operate continuously outside the factory building at any one time
- 13 delivery trucks are on site and operating continuously

CSD Warehouse

- 5 forklifts operate continuously outside the factory building at any one time
- 5 delivery trucks are on site and operating continuously

Carpark

- 44 vehicles parking

Warehouse Offices

- 5 Rooftop air-conditioning units

5.2 Operational Noise Emission

5.2.1 Equipment Sound Power Levels

Sound power levels for acoustically significant items of plant and equipment have been obtained from Heggies noise source database of similar equipment. The L_{Aeq} sound power levels of plant and equipment from proposed operations are given below in **Table 14**. **Appendix D** provides the octave band plant and equipment sound power levels used in the noise modelling.

Table 14 Equipment Sound Power Levels

Plant and Equipment	L_{Aeq} Sound Power Level (dBA re 10^{-12} W)
Truck departure/arrival	92
Condenser unit (single unit)	95
Gas powered forklift	95
Carpark (per level 22 car movements)	92
Air-conditioning Unit (single unit)	65
Compressor Unit (single unit)	92

5.2.2 Operational Noise Modelling Scenario

Noise levels were predicted at all nearest affect residential location (as indicated in **Figure 3** from the proposed Metcash operations. The following scenarios were modelled:

Scenario 1

- Proposed Metcash facility operations
- Calm weather conditions

Scenario 2

- Proposed Metcash facility operations
- Prevailing weather condition (Temperature Inversion)

5.2.3 Operational Noise Modelling Results

The operational noise levels were predicted at two (2) nearest potentially affected residential locations (see **Figure 3**). A summary of the results of these predictions for scenario 1 and 2 are contained within **Table 15** and **Table 16** respectively.

Table 15 Scenario 1 - Predicted Operational Noise Levels at Residential Receivers Under Calm Weather Condition

Residential Receiver Location	Predicted $L_{Aeq(15minute)}$ Noise Level (dBA)	INP Project Specific Noise Criteria		
	Proposed Operations	Day	Evening	Night
Receiver 1 47 Pikes Lane	37	55	50	45
Receiver 2 711 Great Western Highway	33			

The $L_{Aeq(15minute)}$ noise levels for the proposed Metcash operations under calm weather conditions are predicted to meet the INP $L_{Aeq(15minute)}$ project specific noise criteria at all residences.

Table 16 Scenario 2 - Predicted Operational Noise Levels at Residential Receivers Under Temperature Inversion Condition

Residential Receiver Location	Predicted $L_{Aeq(15minute)}$ Noise Level (dBA)	INP Project Specific Noise Criteria		
	Proposed Operations	Day	Evening	Night
Receiver 1 47 Pikes Lane	41	55	50	45
Receiver 2 711 Great Western Highway	38			

The $L_{Aeq(15minute)}$ noise levels for existing and proposed Metcash operations under temperature inversion condition are predicted to meet the INP $L_{Aeq(15minute)}$ project specific noise criteria at all residences.

The potential for sleep disturbance at nearby residence locations has been assessed as the facility is proposed to operate 24 hours a day 7 days per week. Typical L_{Amax} noise levels for these activities are provided in **Table 17**.

The predicted sleep disturbance worst case scenario noise levels associated with the proposed Metcash facility operations are present in **Table 18**. **Appendix D** provides the octave band plant and equipment sound power levels used in the noise modelling.

Table 17 Equipment Maximum Sound Power Levels

Plant and Equipment	L_{Aeq} Sound Power Level (dBA re 10^{-12} W)
Truck departure/arrival	97
Condenser unit (single unit)	100
Gas powered forklift	100
Carpark (per level)	97
Air-conditioning Unit (single unit)	70
Compressor Unit (single unit)	97

Table 18 Predicted Sleep Disturbance Noise Levels at Residential Receivers

Assessment Location	Predicted $L_{A1(1minute)}$ Noise Level (dBA)	Night-time $L_{A1(1minute)}$ Noise Consent Criterion (dBA)
	Proposed Operations	
Receiver 1 47 Pikes Lane	42	61
Receiver 2 711 Great Western Highway	38	

The $L_{A1(1minute)}$ noise levels are predicted to be below the sleep disturbance noise goals specified in **Table 10** for night-time operation of the Metcash facility. This being the case, sleep disturbance is unlikely to occur at residential locations surrounding the proposed Metcash facility.

5.2.4 Cumulative Noise Assessment

The proposed development site is situated within a developed industrial area in Huntingwood, NSW. Existing industrial properties are located to the north and east of the subject site.

Potential cumulative noise impacts from existing and successive developments are embraced by the INP procedures by ensuring that the appropriate noise emission criteria (and consent limits) are established with a view to maintaining acceptable noise *amenity* levels for residences. Therefore, the cumulative impact of the proposed development with existing industrial noise sources has been assessed in the determination of the amenity levels at surrounding potentially noise sensitive areas.

5.3 Construction Noise Emission

Acoustically significant plant and equipment proposed during the construction period will consist of the following:

Earthworks

- Scraper (3 off)
- Compactor
- Dozer (2 off)
- Articulated dump truck (2 off)

Building Construction

- Concrete agitators
- Concrete boom pump
- Cranes
- Hand tools (various)
- Delivery trucks
- Genset

5.3.1 Equipment Sound Power Levels

The sound power levels of the major noise generating plant and equipment to be used in the construction of the Metcash facility are given in **Table 19**. Sound power levels for equipment used in the assessment have been obtained from a Heggies database of similar equipment. Details of these levels are given in **Appendix D**.

Table 19 Acoustically Significant Equipment Sound Power Levels

Building Construction Equipment	Sound Power Level (dBA re 10^{-12} W)
Earthworks	
Scraper	111
Compactor	110
Dozer (2 off)	110
Articulated dump trucks (2 off)	102
Building Construction	
Concrete transit mixers	111
Concrete boom pump	107
Mobile Cranes	104
Hand tools	up to 104
Delivery trucks	92
Genset	107

5.3.2 Construction Noise Modelling Results

The noise levels from the proposed construction were predicted at two (2) nearest potentially affected residential locations (see **Figure 3**). A summary of the results of these predictions are contained within **Table 20**.

Table 20 Predicted Construction Noise Levels at Residential Receivers

Assessment Location	Predicted $L_{Aeq(15minute)}$ Noise Level (dBA)	Construction $L_{Aeq(15minute)}$ Design Goal (dBA)	
		Noise Affected	Noise Affected
Receiver 1 47 Pikes Lane	43	60	75
Receiver 2 711 Great Western Highway	41		

The modelling results in **Table 20** indicate that the predicted $L_{Aeq(15minute)}$ noise levels for construction meet all construction noise goals at all residences.

5.4 Road Traffic Noise Assessment

The traffic report by Halcrow Pacific Pty Ltd '*Metcash Site, Huntingwood West Traffic Impact Assessment, 6 August 2010,* provided the predicted traffic flows from the development on the surrounding road network and has been reproduced in **Table 21** along with the calculated noise level increase on the surrounding road network from the proposed development.

Also, the NSW Roads and Traffic Authority (RTA) produce Annual Average Daily Traffic Data (AADT) for the Great western Highway and have been referred to in this assessment

Table 21 Existing Two-Way (Sum of Both Directions) Peak Hour Traffic Flows Plus Development Traffic

Road/location	Day (vehicles/hour)			Night (vehicles/hour)		
	Existing	Proposed development		Existing	Proposed development	
		Traffic Count	Road Traffic noise level increase (dBA)		Traffic Count	Road Traffic noise level increase (dBA)
Great Western Highway	1778	218	0.5	818	218	1

The ECRTN states that in all cases, traffic arising from the development should not lead to an increase in existing noise levels of more than 2 dBA. **Table 21** predicts that all roads surrounding the proposed development will likely meet the project specific noise criteria presented in **Section 4.4**.

6 DISCUSSION AND CONCLUSIONS

Heggies has undertaken a noise impact assessment for the construction and the operation of the proposed Metcash warehouse and distribution facility.

Computer noise modelling has been carried out to predict the noise level, from the Metcash facility, at the nearest residential receiver locations.

Operational Noise Assessment

The noise emissions from the proposed operation of Metcash facility have been assessed against noise criteria described with in INP noise criteria in **Section 4.1**.

The noise modelling has been carried out under two meteorological conditions (ie Scenario 1: Calm weather and Scenario 2: Prevailing weather including wind and temperature inversion). From the noise modelling results in **Table 15** and **Table 16**, the $L_{Aeq(15minute)}$ noise levels are predicted to be less than 30 dBA at all assessment residential locations for calm and prevailing weather conditions. Therefore the noise emissions from the proposed operations of Metcash facility are predicted to comply with the INP noise criteria under both meteorological conditions.

Also, the cumulative noise impacts have been assessed and comply with the relevant project specific noise goal criteria outline in **Section 4.1**.

Sleep Disturbance Assessment

The potential for sleep disturbance at nearby residence locations due to the noise emissions from the night-time operations of the proposed Metcash facility has been assessed. From the noise modelling results in **Table 18**, the $L_{A1(1minute)}$ noise levels are predicted to be less than 30 dBA at all residential locations. These noise levels are below the sleep disturbance noise goals described in project specific noise goals presented in **Section 4.2**. Therefore it is unlikely that the noise emissions from the operations of Metcash facility at night-time will cause sleep disturbance at the residence locations.

Construction Noise Assessment

The potential noise emissions from the proposed construction of the Metcash facility have been assessed in accordance with the DECCW's Interim Construction Noise Guideline. From the noise modelling results in **Table 20**, the $L_{Aeq(15minute)}$ noise level at the nearest residences are predicted to be less than 30 dBA at all residence locations. These noise levels indicate compliance with noise goals in **Section 4.3**.

On the basis of above, the noise emissions from the proposed construction and operation of Metcash facility is predicted to comply with the relevant noise criteria and the potential noise impact is likely to be negligible.

Road Traffic Noise Assessment

The predicted road traffic noise levels increases presented in **Table 21** shows that all roads surrounding the proposed development are likely to meet the project specific noise criteria presented in **Section 4.4**.

Acoustic Terminology

1 Sound Level or Noise Level

The terms "sound" and "noise" are almost interchangeable, except that in common usage "noise" is often used to refer to unwanted sound.

Sound (or noise) consists of minute fluctuations in atmospheric pressure capable of evoking the sense of hearing. The human ear responds to changes in sound pressure over a very wide range. The loudest sound pressure to which the human ear responds is ten million times greater than the softest. The decibel (abbreviated as dB) scale reduces this ratio to a more manageable size by the use of logarithms.

The symbols SPL, L or L_P are commonly used to represent Sound Pressure Level. The symbol L_A represents A-weighted Sound Pressure Level. The standard reference unit for Sound Pressure Levels expressed in decibels is 2E-5 Pa.

2 "A" Weighted Sound Pressure Level

The overall level of a sound is usually expressed in terms of dBA, which is measured using a sound level meter with an "A-weighting" filter. This is an electronic filter having 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 loud.

A change of 1 dBA or 2 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. The table below lists examples of typical noise levels

Sound Pressure Level (dBA)	Typical Source	Subjective Evaluation
130	Threshold of pain	Intolerable
120 110	Heavy rock concert Grinding on steel	Extremely noisy
100 90	Loud car horn at 3 m Construction site with pneumatic hammering	Very noisy
80 70	Kerbside 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

Other weightings (eg B, C and D) are less commonly used than A-weighting. Sound Levels measured without any weighting are referred to as "linear", and the units are expressed as dB(lin) or dB.

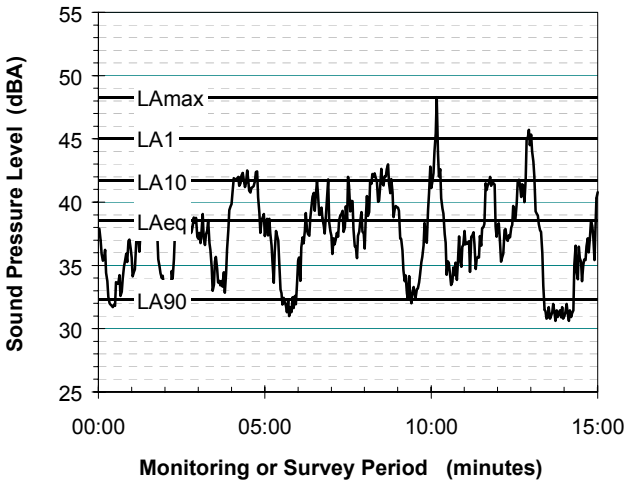
3 Sound Power Level

The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or LW, or by the reference unit 1E-12 W.
The relationship between Sound Power and Sound Pressure may be likened to an electric radiator, which is characterised by a power rating, but has an effect on the surrounding environment that can be measured in terms of a different parameter, temperature.

4 Statistical Noise Levels

Sounds that vary in level over time, such as road traffic noise and most community noise, are commonly described in terms of the statistical exceedance levels L_{AN}, where L_{AN} is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the L_{A1} is the noise level exceeded for 1% of the time, L_{A10} the noise exceeded for 10% of the time, and so on.

The following figure presents a hypothetical 15 minute noise survey, illustrating various common statistical indices of interest.



Of particular relevance, are:

L_{A1} The noise level exceeded for 1% of the 15 minute interval.

L_{A10} The noise level exceed for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.

L_{A90} The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.

L_{Aeq} The A-weighted equivalent noise level (basically the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.

When dealing with numerous days of statistical noise data, it is sometimes necessary to define the typical noise levels at a given monitoring location for a particular time of day. A standardised method is available for determining these representative levels.

This method produces a level representing the "repeatable minimum" L_{A90} noise level over the daytime and night-time measurement periods, as required by the EPA. In addition the method produces mean or "average" levels representative of the other descriptors (L_{Aeq}, L_{A10}, etc).

5 Tonality

Tonal noise contains one or more prominent tones (ie distinct frequency components), and is normally regarded as more offensive than "broad band" noise.

6 Impulsiveness

An impulsive noise is characterised by one or more short sharp peaks in the time domain, such as occurs during hammering.

7 Frequency Analysis

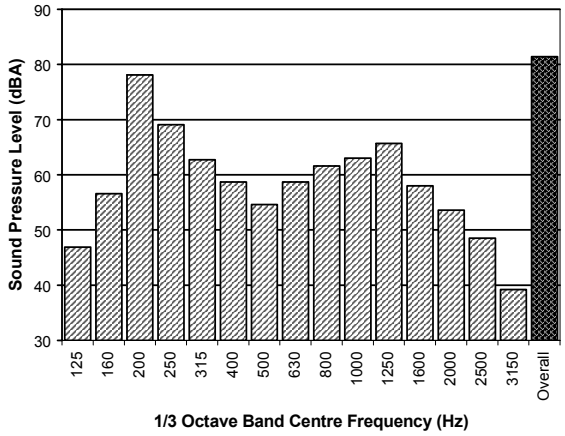
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal. This analysis was traditionally carried out using analogue electronic filters, but is now normally carried out using Fast Fourier Transform (FFT) analysers.

The units for frequency are Hertz (Hz), which represent the number of cycles per second.

Frequency analysis can be in:

- Octave bands (where the centre frequency and width of each band is double the previous band)
- 1/3 octave bands (3 bands in each octave band)
- Narrow band (where the spectrum is divided into 400 or more bands of equal width)

The following figure shows a 1/3 octave band frequency analysis where the noise is dominated by the 200 Hz band. Note that the indicated level of each individual band is less than the overall level, which is the logarithmic sum of the bands.



8 Vibration

Vibration may be defined as cyclic or transient motion. This motion can be measured in terms of its displacement, velocity or acceleration. Most assessments of human response to vibration or the risk of damage to buildings use measurements of vibration velocity. These may be expressed in terms of "peak" velocity or "rms" velocity.

The former is the maximum instantaneous velocity, without any averaging, and is sometimes referred to as "peak particle velocity", or PPV. The latter incorporates "root mean squared" averaging over some defined time period.

Vibration measurements may be carried out in a single axis or alternatively as triaxial measurements. Where triaxial measurements are used, the axes are commonly designated vertical, longitudinal (aligned toward the source) and transverse.

The common units for velocity are millimetres per second (mm/s). As with noise, decibel units can also be used, in which case the reference level should always be stated. A vibration level V, expressed in mm/s can be converted to decibels by the formula $20 \log (V/V_o)$, where V_o is the reference level (1E-6 mm/s). Care is required in this regard, as other reference levels are used by some organizations.

9 Human Perception of Vibration

People are able to "feel" vibration at levels lower than those required to cause even superficial damage to the most susceptible classes of building (even though they may not be disturbed by the motion). An individual's perception of motion or response to vibration depends very strongly on previous experience and expectations, and on other connotations associated with the perceived source of the vibration. For example, the vibration that a person responds to as "normal" in a car, bus or train is considerably higher than what is perceived as "normal" in a shop, office or dwelling.

10 Over-Pressure

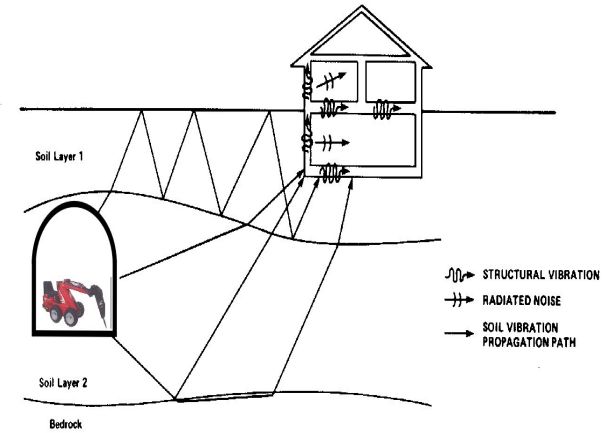
The term "over-pressure" is used to describe the air pressure pulse emitted during blasting or similar events. The peak level of an event is normally measured using a microphone in the same manner as linear noise (ie unweighted), at frequencies both in and below the audible range.

11 Regenerated Noise

Noise that propagates through a structure as vibration and is radiated by vibrating wall and floor surfaces is termed "regenerated noise", "structure-borne noise", or sometimes "ground-borne noise". Regenerated noise originates as vibration and propagates between the source and receiver through the ground and/or building structural elements, rather than through the air.

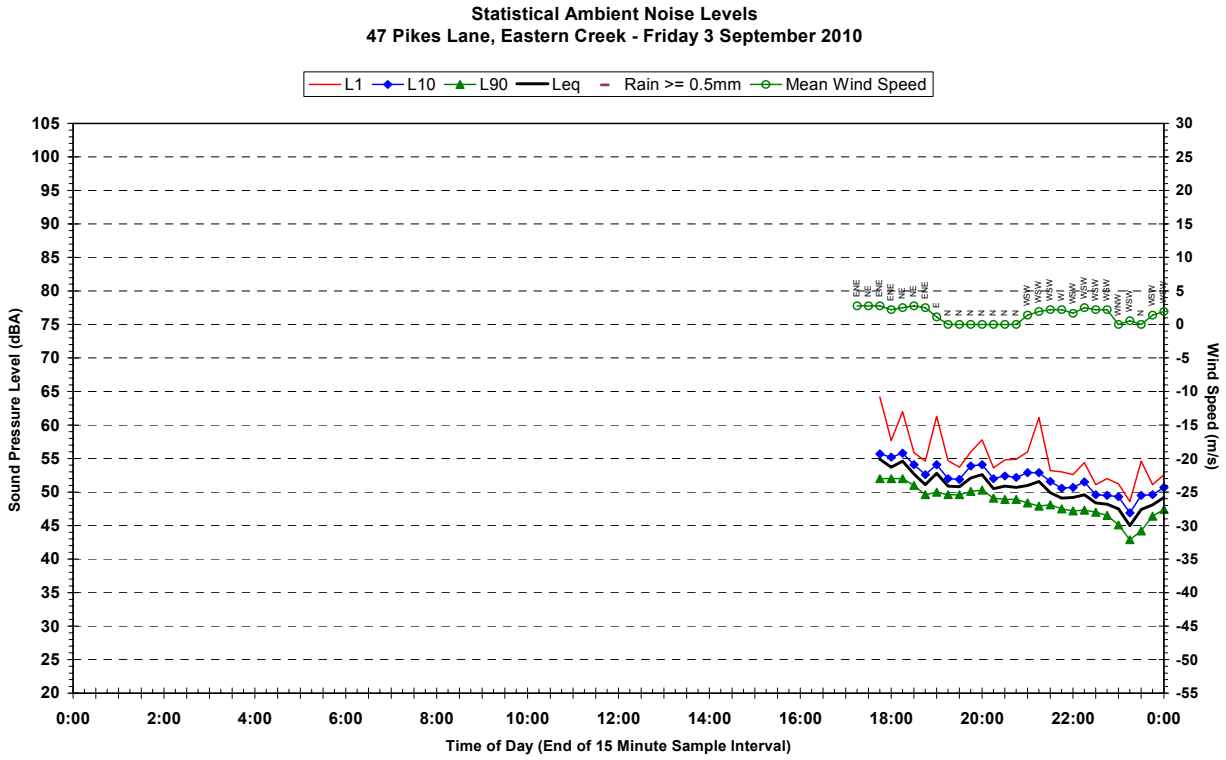
Typical sources of regenerated noise include tunnelling works, underground railways, excavation plant (eg rockbreakers), and building services plant (eg fans, compressors and generators).

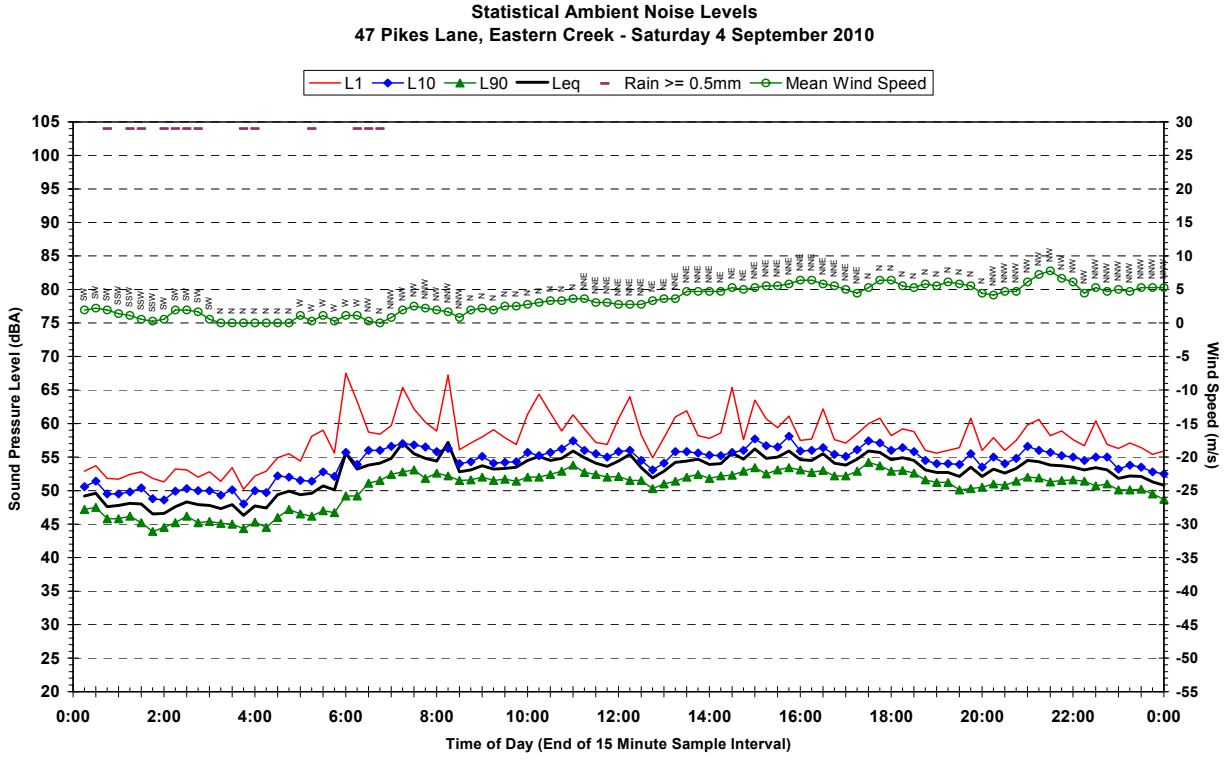
The following figure presents the various paths by which vibration and regenerated noise may be transmitted between a source and receiver for construction activities occurring within a tunnel.



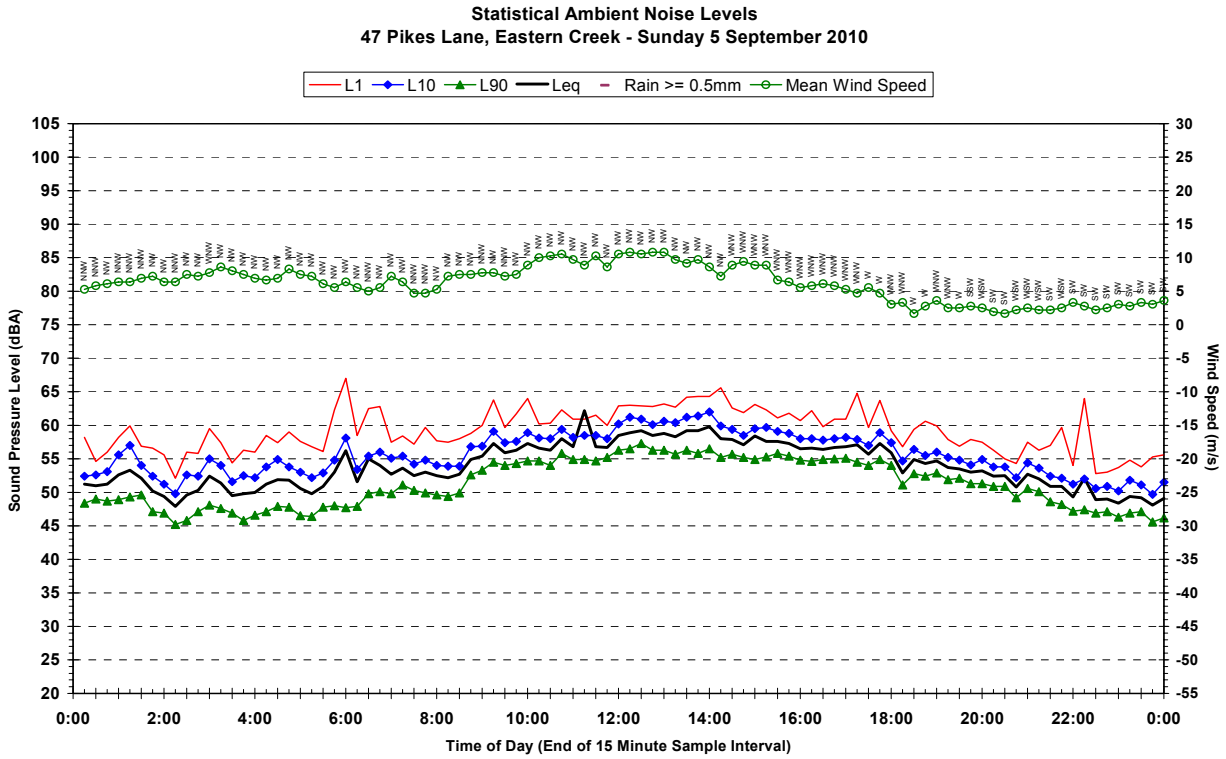
The term "regenerated noise" is also used to describe other types of noise that are emitted from the primary source as a different form of energy. One example would be a fan with a silencer, where the fan is the energy source and primary noise source. The silencer may effectively reduce the fan noise, but some additional noise may be created by the aerodynamic effect of the silencer in the airstream. This "secondary" noise may be referred to as regenerated noise.

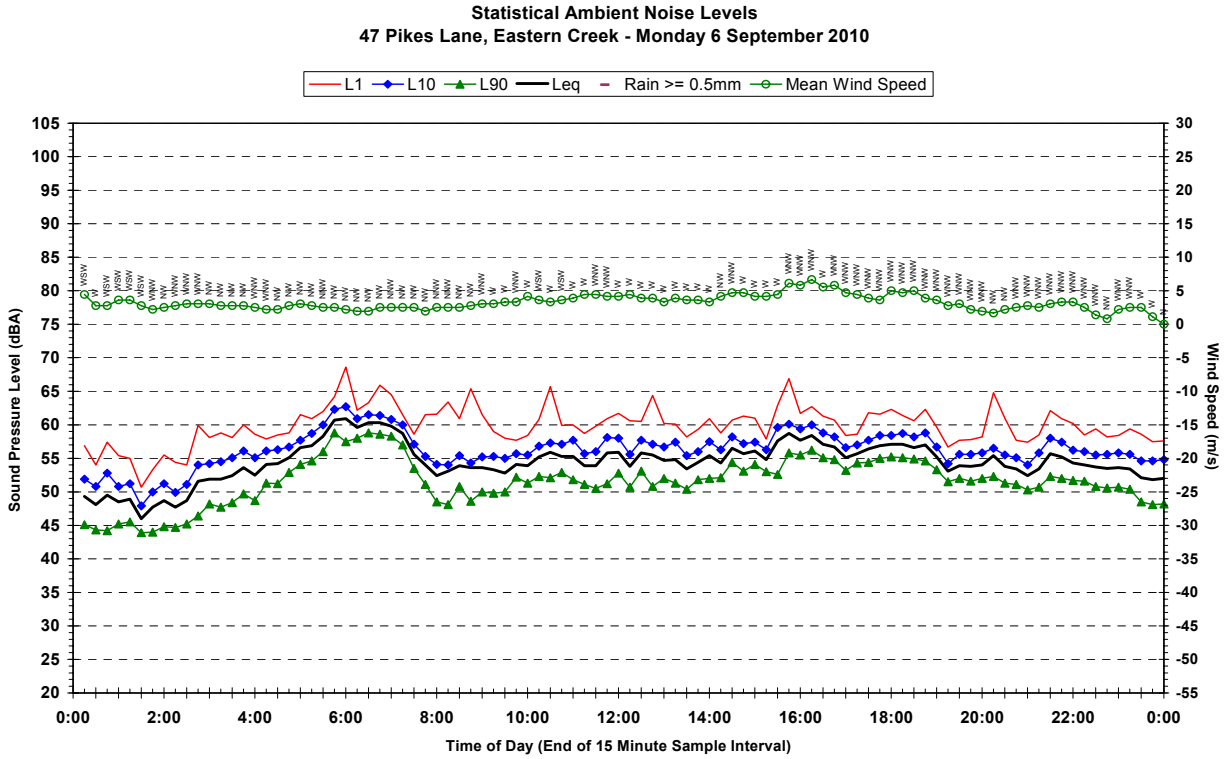
Statistical Ambient Noise Levels - 47 Pikes Lane, Eastern Creek



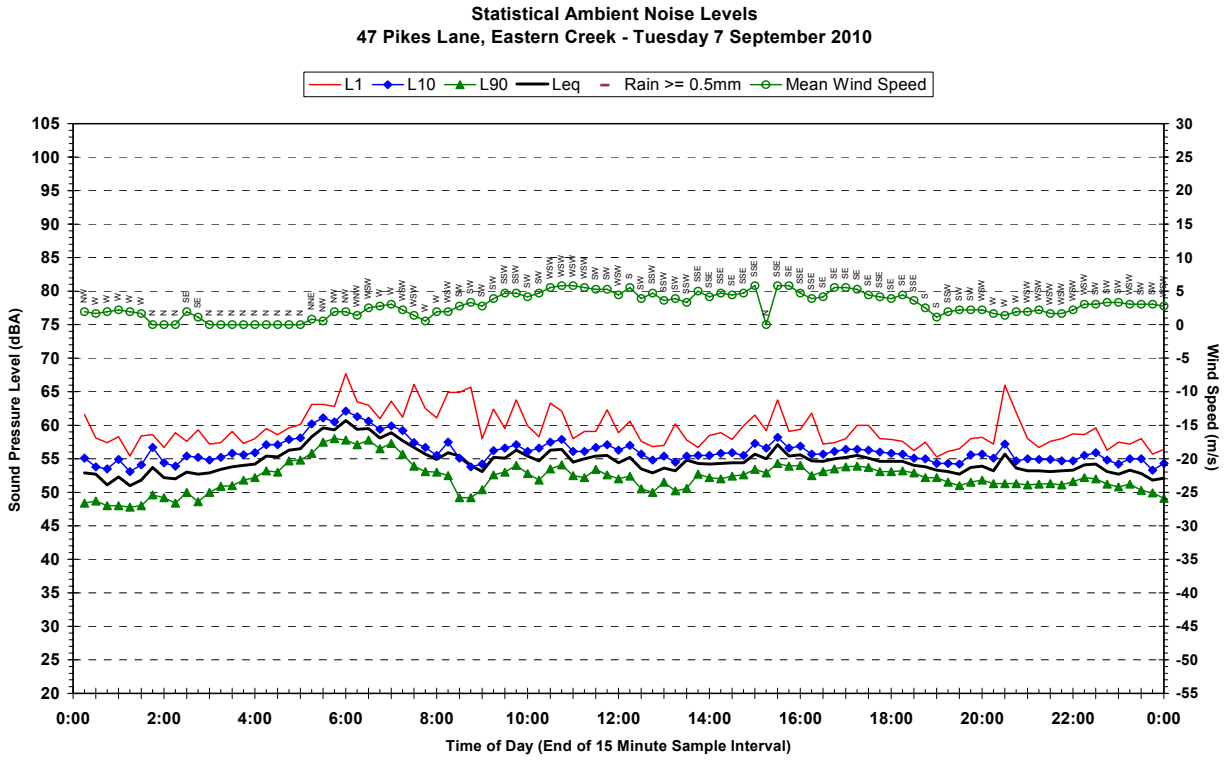


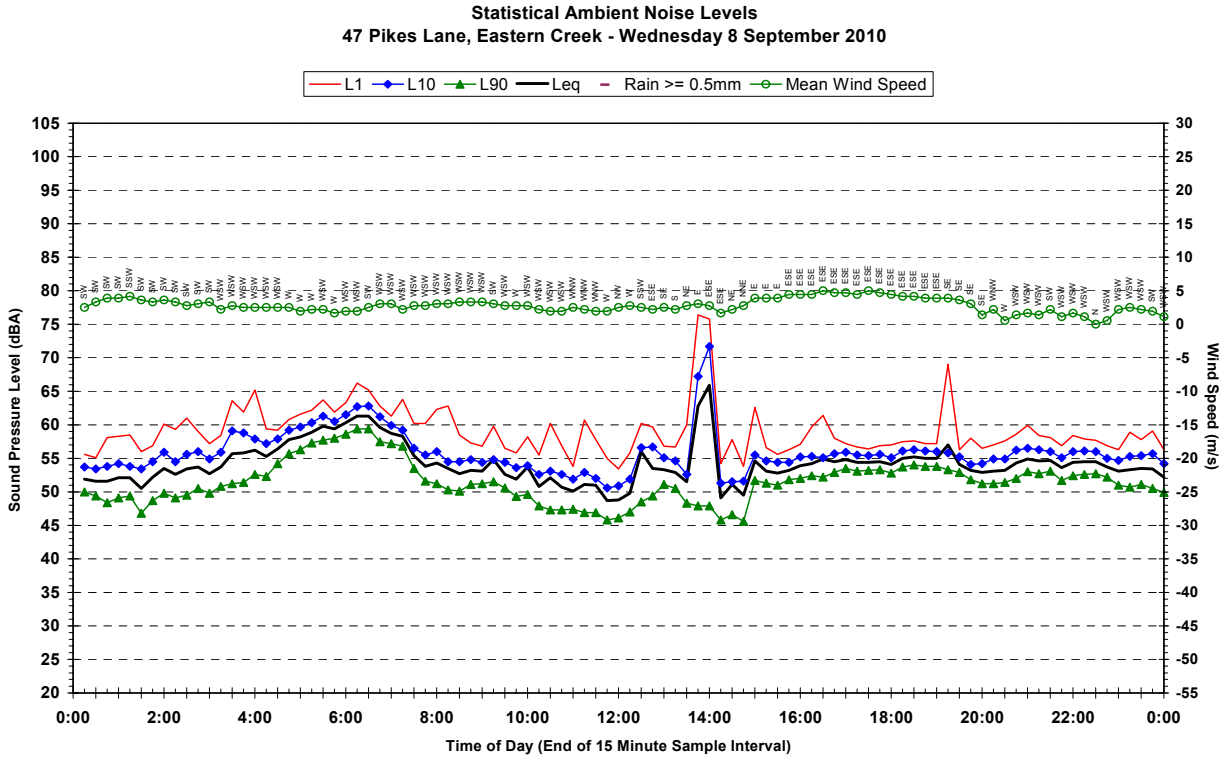
Statistical Ambient Noise Levels - 47 Pikes Lane, Eastern Creek



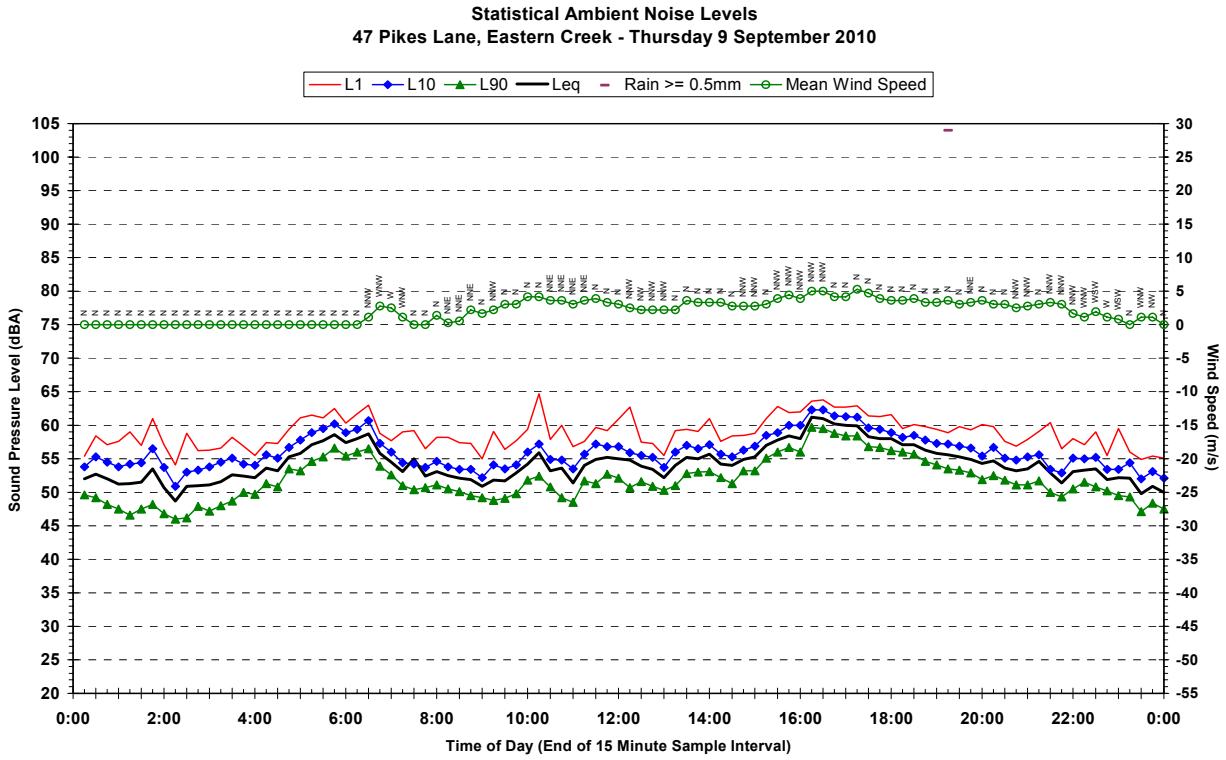


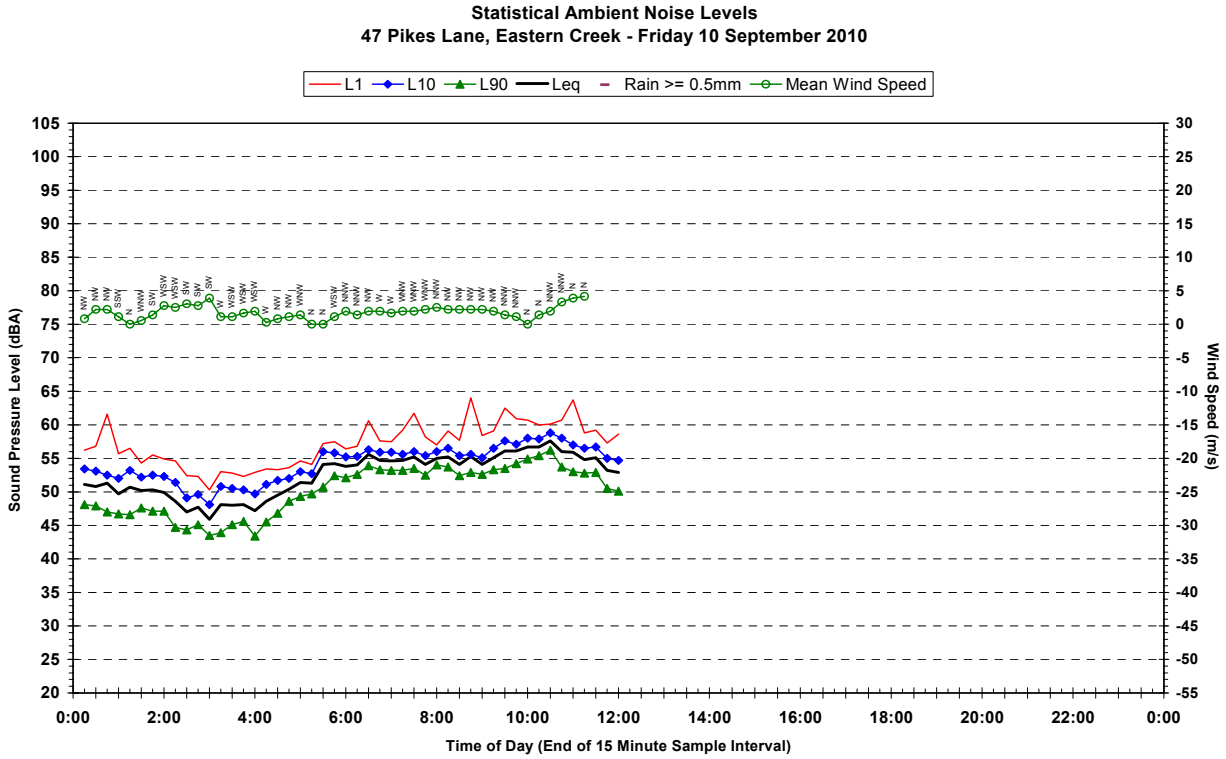
Statistical Ambient Noise Levels - 47 Pikes Lane, Eastern Creek



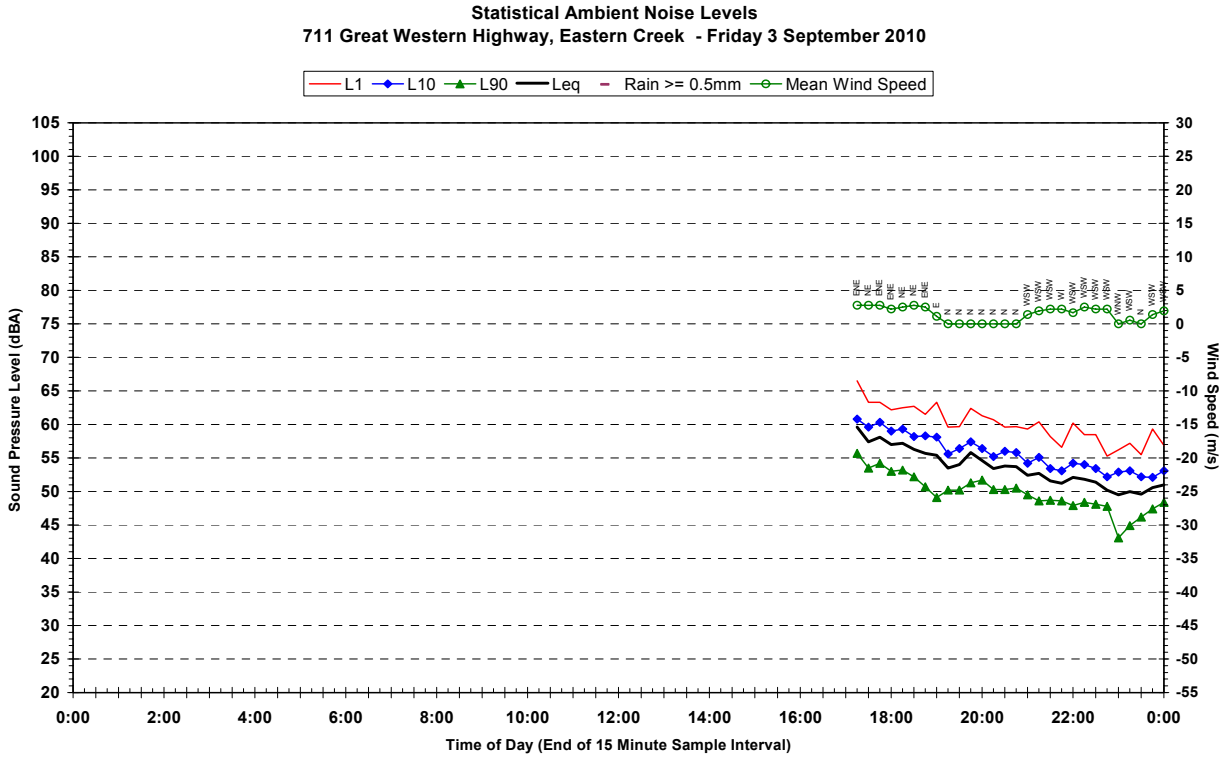


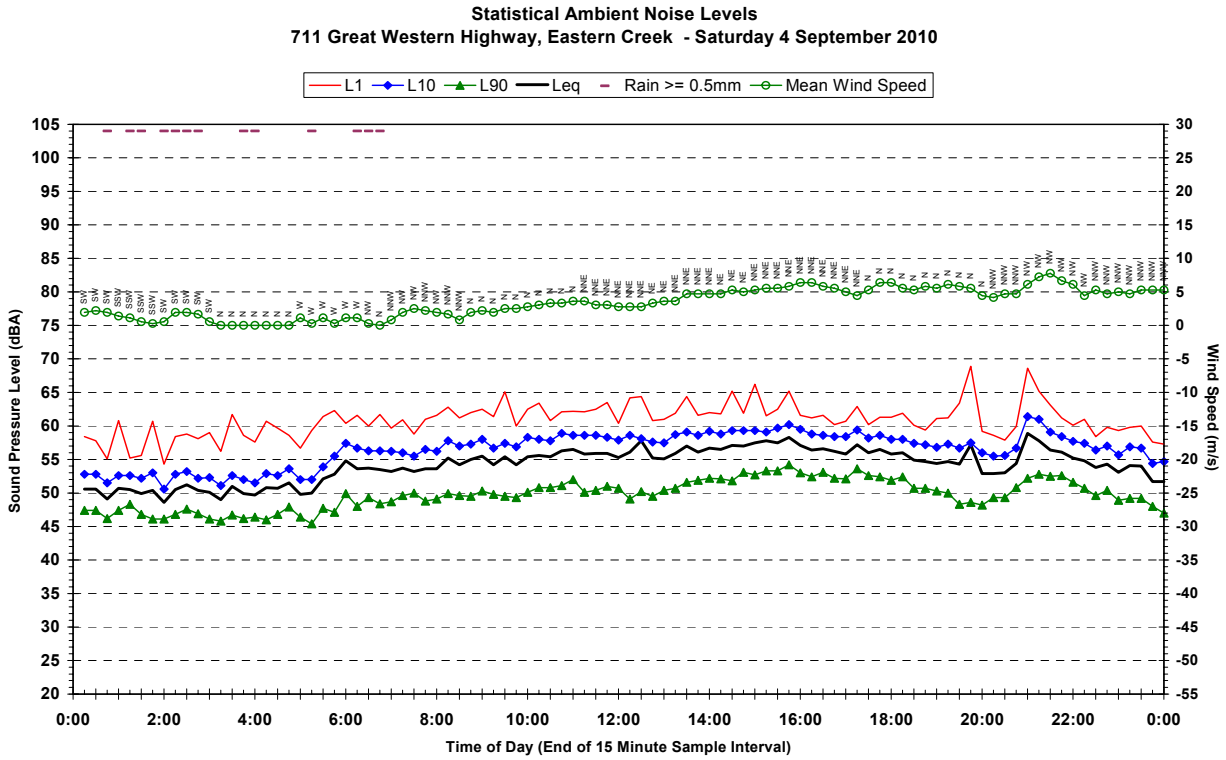
Statistical Ambient Noise Levels - 47 Pikes Lane, Eastern Creek



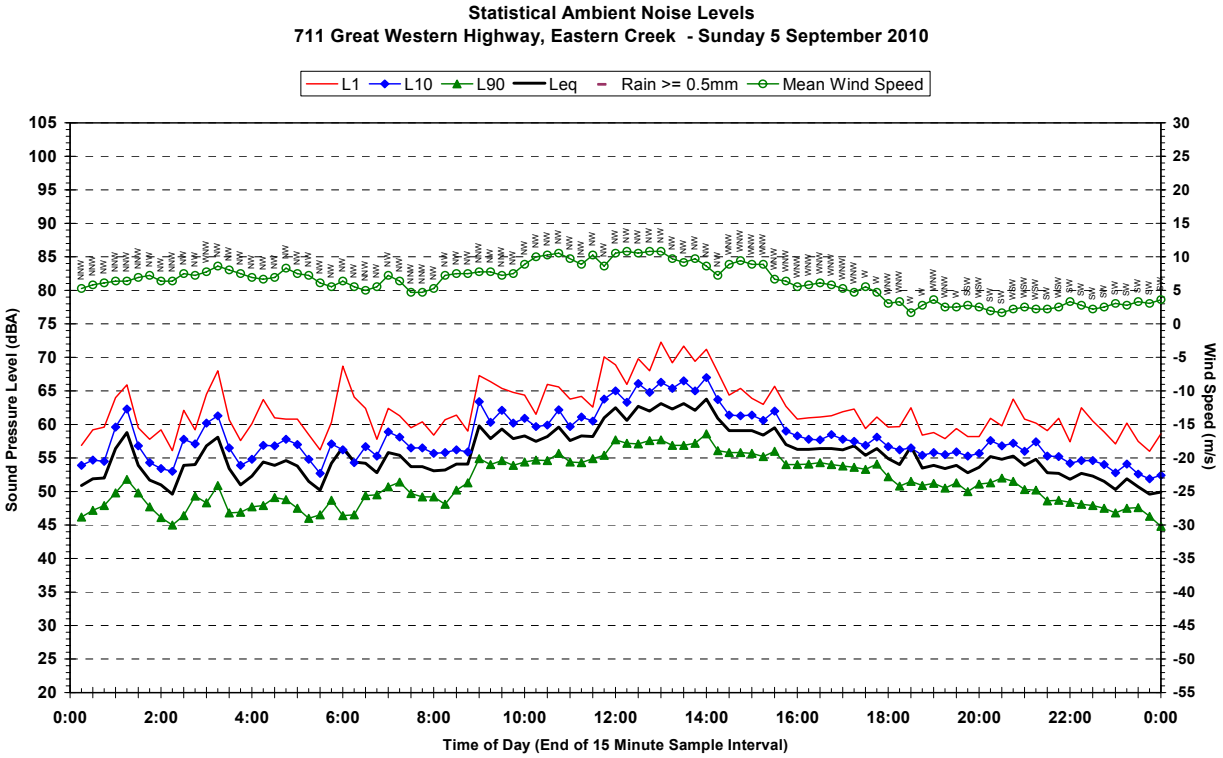


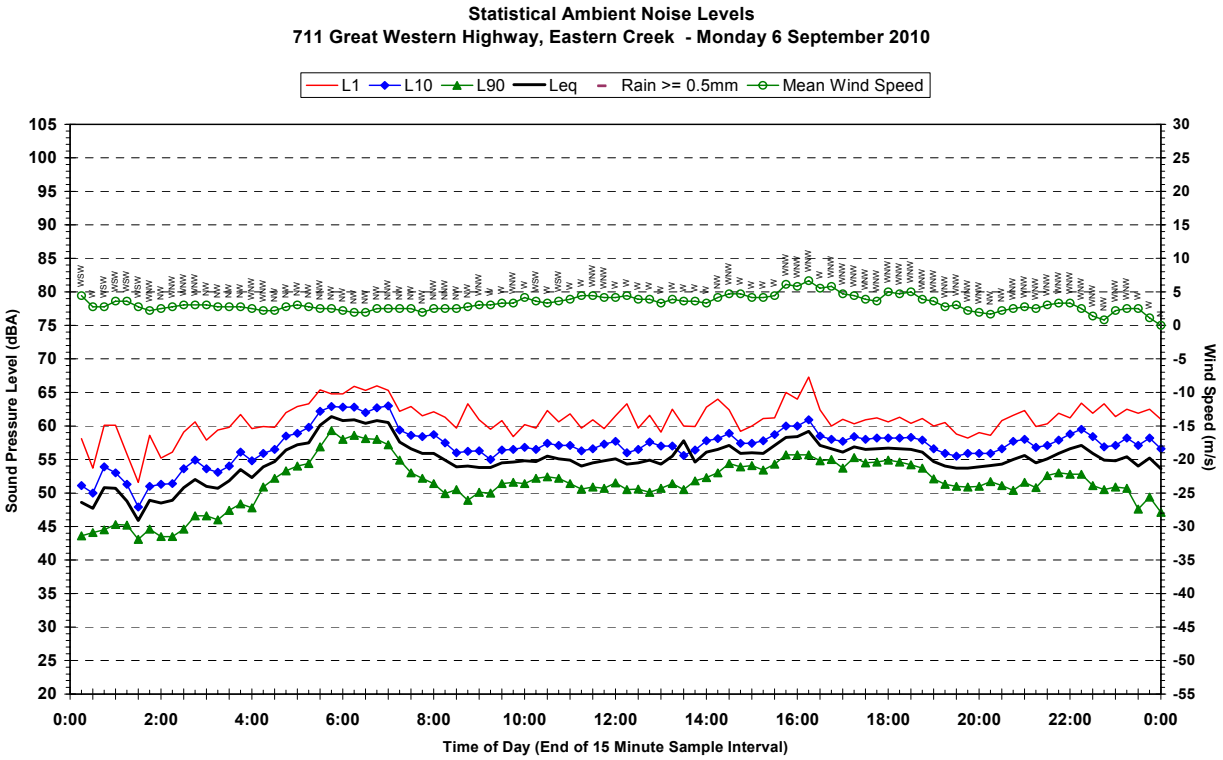
Statistical Ambient Noise Levels - 711 Great Western Highway, Eastern Creek



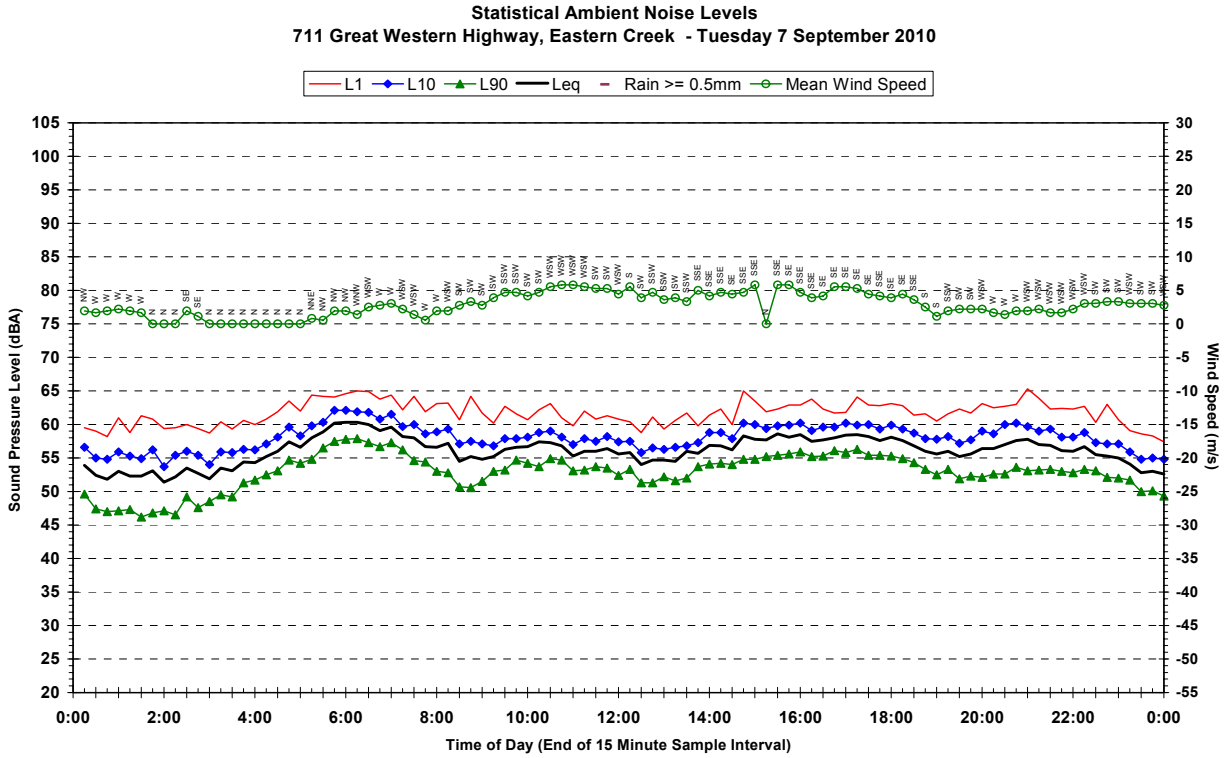


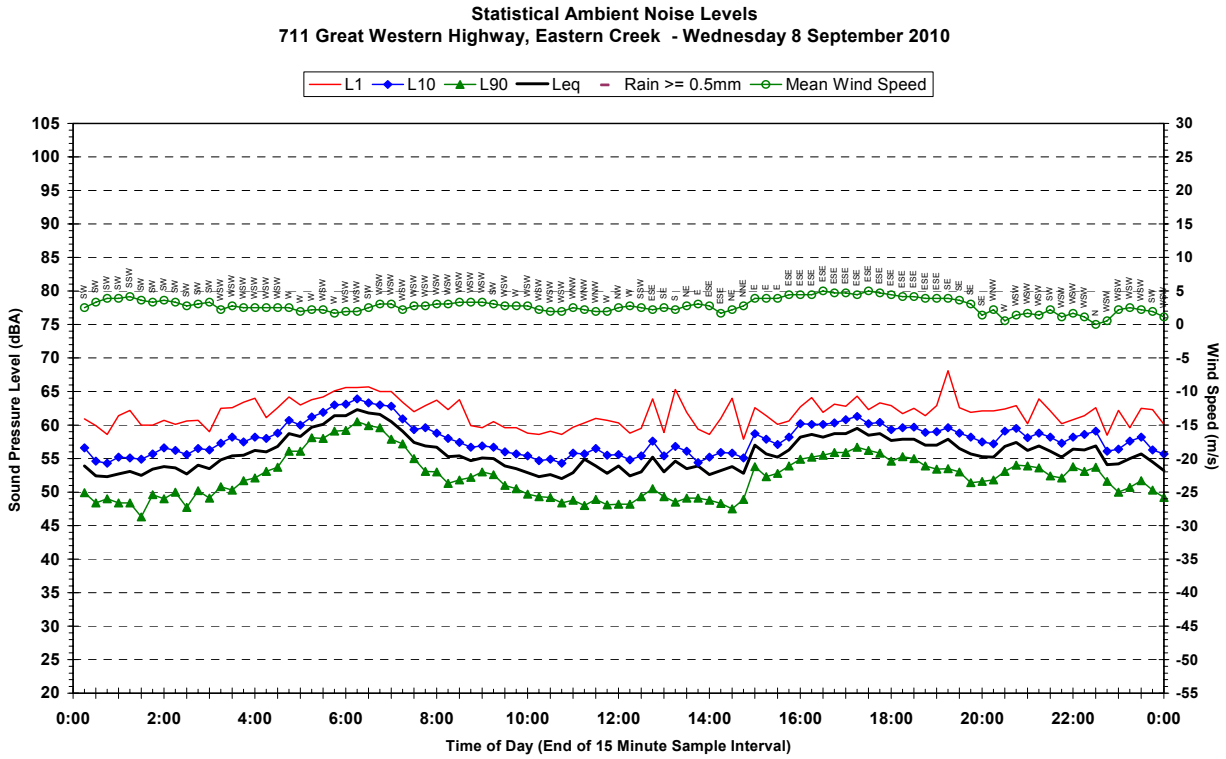
Statistical Ambient Noise Levels - 711 Great Western Highway, Eastern Creek



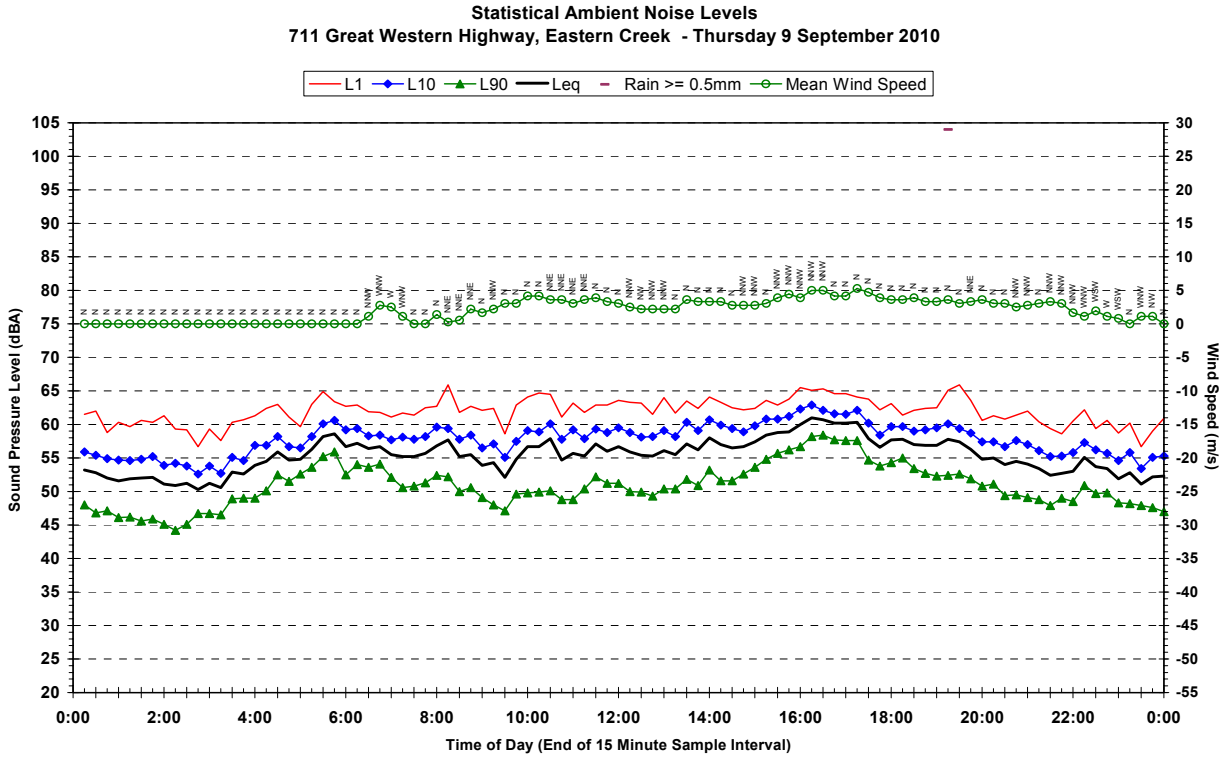


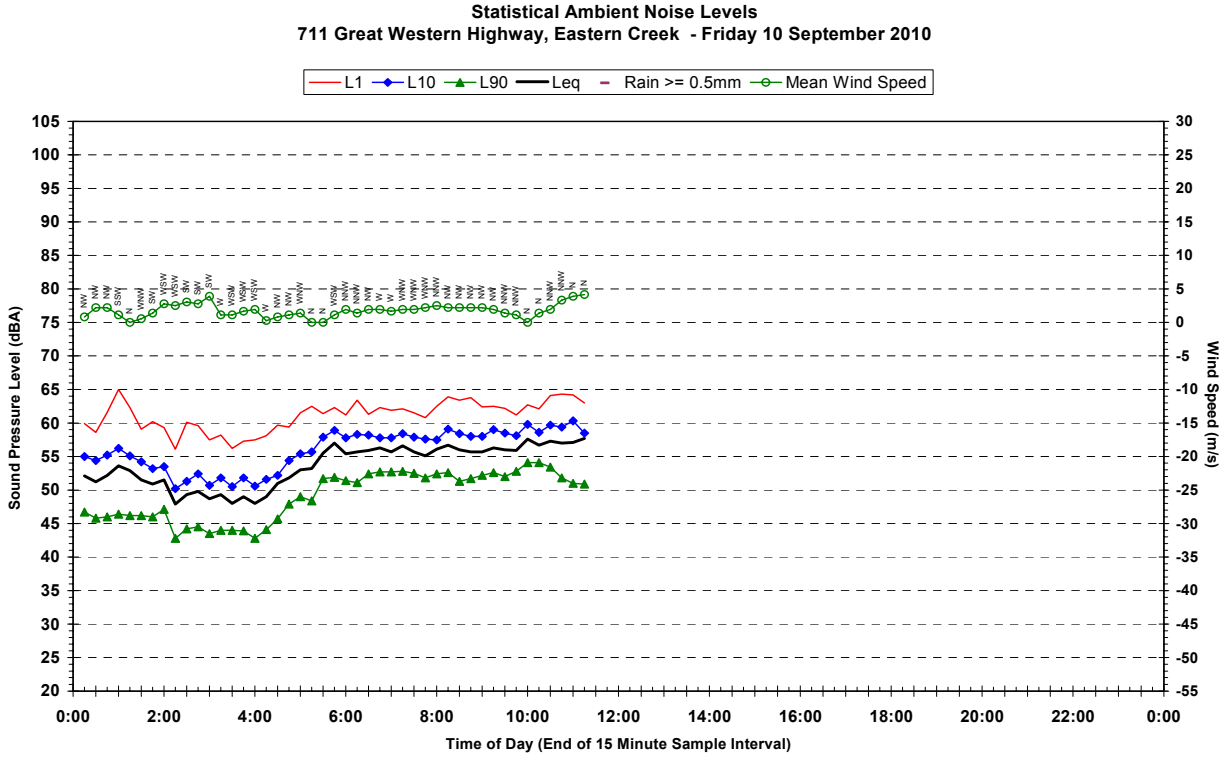
Statistical Ambient Noise Levels - 711 Great Western Highway, Eastern Creek





Statistical Ambient Noise Levels - 711 Great Western Highway, Eastern Creek





Equipment Sound Power Levels

Equipment Description	1/1 Octave Band LAeq Sound Power Levels (dB)										Overall (dBA)
	31.5	63	125	250	500	1k	2k	4k	8k	16k	
Truck departure/arrival	100	95	93	88	88	88	85	81	76	72	92
Gas powered forklift	-	102	93	93	91	89	88	80	72	-	95
Genset	109	112	113	110	101	102	99	93	84	76	107
Condenser unit (single unit)	84	85	98	93	90	90	88	84	75	66	95
Carpark (per level 22 car movements)	100	95	93	88	88	88	85	81	76	72	92
Air-conditioning Unit (single unit)	54	55	69	63	60	60	58	54	45	42	65
Compressor Unit (single unit)	81	82	96	90	87	87	85	81	72	69	92
Concrete Transit mixer	103	108	108	105	106	107	105	99	94	86	111
Concrete boom pump	100	106	113	110	104	98	97	92	88	88	107
Delivery truck	96	104	106	99	100	98	92	85	77	77	102
Mobile Crane	103	109	99	99	102	100	96	92	90	90	104
Hand tools (grinder)	63	67	65	67	75	84	95	100	100	95	104
Scraper	103	108	108	105	106	107	105	99	94	86	111
Compactor	61	74	84	91	97	100	101	101	99	93	110
Dozer	61	74	84	91	97	100	101	101	99	93	110
Articulated dump trucks	96	104	106	99	100	98	92	85	77	77	102

Equipment Description	1/1 Octave Band Typical Maximum Sound Power Levels (dB)										Overall (dBA)
	31.5	63	125	250	500	1k	2k	4k	8k	16k	
Truck departure/arrival	105	100	98	93	93	93	90	86	81	77	97
Gas powered forklift	-	107	98	98	96	94	93	85	77	-	100
Condenser unit (single unit)	89	90	103	98	95	95	93	89	80	71	100
Carpark (per level 22 car movements)	105	100	98	93	93	93	90	86	81	77	97
Air-conditioning Unit (single unit)	59	60	74	68	65	65	63	59	50	47	70
Compressor Unit (single unit)	86	87	101	95	92	92	90	86	77	74	97