global environmental solutions

28-32 Somerset Street, Kingswood

Development Application

Acoustic Consultancy Services

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Pure Projects
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28-32 Somerset Street, Kingswood

Development Application

Acoustic Consultancy Services

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APPENDICES

1 INTRODUCTION

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Pure Projects to undertake a noise impact assessment for the proposed mixed-use development located at 28-32 Somerset Street, Kingswood.

The assessment addresses the noise impact from the existing road and other ambient sources on the amenity of the residential apartments, sets criteria for noise emissions from the development with respect to mechanical plant and establishes appropriate acoustic design requirements for sound insulation between residential apartments.

Specific acoustic terminology is used within this assessment. An explanation of common acoustic terms is included as **Appendix A**.

The acoustic assessment references the DA drawings A0098 to A0106 and A0200 to A0203 dated 20/05/2016.

2 DEVELOPMENT DESCRIPTION

The development is located at 28-32 Somerset Street, Kingswood. The development will include 54 units for residential accommodation spread over six levels as wells as a commercial space on the ground floor. The site is bounded by residential dwellings to the north, east and south, with Nepean Hospital site located opposite Somerset Street to the west of the site.

Figure 1 shows an aerial of the project site and indicates the noise monitoring locations.

Figure 1 Site Location showing noise monitoring locations (L01 and L02)

3 EXISTING ACOUSTICAL ENVIRONMENT

3.1 Unattended Noise Monitoring

3.1.1 Methodology

In order to quantify the existing acoustical environment of the area, unattended noise monitoring was conducted between Friday 16 October 2015 and Monday 26 October 2015. The monitoring was conducted at the monitoring locations indicated in **Figure 1**.

Noise levels measured at L01 were used to measure the typical road traffic noise impact. The noise survey undertaken at L02 was used to establish background noise levels in order to determine noise emission criteria for the development.

Instrumentation used for the survey is outlined in **Table 1**.

Table 1 Noise monitoring locations

Noise Monitoring Location ID	Noise Monitoring Location Address	Equipment Serial Number
L01	30 Somerset Street (front garden)	ARL316 16-203-524
L02	30 Somerset Street (rear garden)	ARL316 16-203-530

Calibration of the logger was checked prior to and following measurements. Drift in calibration did not exceed ±0.5 dB. All equipment carried appropriate and current NATA (or manufacturer) calibration certificates.

Charts presenting summaries of the measured daily noise data are attached in **Appendix B**. The charts present each 24 hour period by incorporating the LA1, LA10, LAeq and LA90 noise levels for the corresponding 15 minute periods.

The measured data has been filtered to remove periods affected during adverse weather conditions following consultation of weather reports recorded at the Bureau of Meteorology (BOM) Observatory Hill weather station.

3.1.2 Results

3.1.2.1 Estimated Road Traffic Noise

In order to assess road traffic noise impacts on the site, the data obtained from the noise logging has been processed to establish the $L_{Aeq(period)}$ noise level. The results are presented in **Table 2**.

Table 2 Measured Road Traffic Noise Levels

Logger Location	Period	LAeq(period)
L01	Daytime 7:00 am – 10:00 pm	56 $L_{Aeq(15hour)}$
	Night-time 10:00 pm – 7:00 am	49 $L_{Aeq(9hour)}$

The $L_{Aeq(period)}$ descriptor represents the logarithmic average noise energy during the measurement period. The "Daytime" represents the period between 7:00 am to 10:00 pm and "Night-time" represents the period between 10:00 pm to 7:00 am.

The data presented in **Table 2**, indicates that L01 (at the front of the site on Somerset Street) has the higher noise levels during the daytime of the two monitoring locations. This is likely due to traffic movements on Somerset Street, including those accessing the adjacent hospital car parking area. Measured night-time noise levels at both locations are significantly lower than daytime noise levels.

3.1.2.2 Background Noise Level

In order to assess the potential noise impacts of the development at the residential receivers to the rear of the development, the measured background noise data at L02 was processed in accordance with the NSW Environment Protection Authority's (EPA) *Industrial Noise Policy*. **Table 3** details the Rating Background Level (RBL) and L_{Aeq} noise levels recorded during the daytime, evening and night-time periods.

Table 3 Measured Background Noise Levels

Location	Daytime		Evening		Night-time	
	RBL[2]	LAeq[3]	RBL[2]	LAeq[3]	RBL[2]	LAeq[3]
L02	41	54	38	52	33	47

Note 1: 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.

Note 2: The RBL noise level is representative of the "average minimum background sound level" in the absence of the source under consideration, or simply the background level.

Note 3: The L_{Aeq} is essentially the "average sound level". It is defined as the steady sound level that contains the same amount of acoustical energy as a given time-varying sound.

4 ASSESSMENT CRITERIA

4.1 Noise Intrusion

It is understood that Penrith City Council sets no specific requirement for traffic noise intrusion.

As there is no council requirement, guidance for setting an assessment criteria for the control of traffic noise intrusion is referenced from Australian / New Zealand Standard AS/NZS 2107:2000 *Design sound levels and reverberation times for building interiors*. The Standard provides recommended design sound levels for a range of building types

Based on guidance from AS 2107 (for residences near major roads) and the design expectations of the project, the recommended design noise levels for apartments in this development are:

Living areas: 40 dBA L_{eq}

Bedrooms: 35 dBA L_{eq}

4.2 Noise Emissions

4.2.1 External Noise Criteria – Industrial Noise Policy

Responsibility for the control of noise emissions in New South Wales is vested in Local Government and the NSW Environment Protection Authority (EPA).

The EPA oversees the *Industrial Noise Policy* (INP) which provides a framework and processes for deriving noise criteria. The INP criteria for industrial noise sources have two objectives:

- Controlling the intrusive noise impacts for residents and other sensitive receivers in the short term; and
- Maintaining noise level amenity of particular land uses for residents and sensitive receivers in other land uses.

4.2.1.1 Intrusiveness Criterion

For assessing intrusiveness, the background noise generally needs to be measured. The intrusiveness criterion essentially means that the equivalent continuous noise level (L_{Aeq}) of the source should not be more than 5 dBA above the measured Rated Background Level (RBL), over any 15 minute period.

4.2.1.2 Amenity Criterion

The amenity criterion is based on land use and associated activities (and their sensitivity to noise emission). The cumulative effect of noise from industrial sources needs to be considered in assessing the impact. The criteria relate only to industrial-type noise sources and do not include road, rail or community noise. The existing noise level from industry is measured. If it approaches the criterion value, then noise levels from new industrial-type noise sources, (including air-conditioning mechanical plant) need to be designed so that the cumulative effect does not produce total noise levels that would significantly exceed the criterion.

4.2.1.3 Area Classification

The INP, for the purposes of determining the appropriate noise amenity criteria, characterises an "Urban" noise environment as an acoustical environment that:

- Is dominated by "urban hum" or industrial source noise
- Has through traffic with characteristically heavy and continuous traffic flows during peak periods
- Is near commercial districts or industrial districts, and
- Has any combination of the above.

Where "urban hum" means the aggregate sound of many unidentifiable, mostly traffic-related sound sources.

For the purposes of this assessment, the area surrounding the nearest sensitive receivers satisfies the "Urban" area classification.

4.2.1.4 Modifying Factors

Where a noise source contains certain characteristics, such as tonality, impulsiveness, intermittency, irregularity or dominant low-frequency content, there is evidence to suggest that it can cause greater annoyance than other less-obtrusive noise sources at the same level.

To account for this additional annoyance, the INP describes modifying factors to be applied when assessing amenity and intrusiveness. The definition of the modifying factors is described in **Table 4** below.

Table 4 INP Modifying Factor Adjustments (Table 4.1 INP)

Factor	Assessment/ measurement	When to apply	Correction[1]	Comments
Low Frequency Noise	Measurement of C-weighted and A-weighted level	Measure/assess C- and Aweighted levels over same time period. Correction to be applied if the difference between the two levels is 15 dB or more	5 dB[2]	C-weighting is designed to be more responsive to low-frequency noise

Factor	Assessment/ measurement	When to apply	Correction[1]	Comments
Tonal Noise	One-third octave or narrow band analysis	Level of one-third octave band exceeds the level of the adjacent bands on both sides by: —5 dB or more if the centre frequency of the band containing the tone is above 400 Hz —8 dB or more if the centre frequency of the band containing the tone is 160 to 400 Hz inclusive —15 dB or more if the centre frequency of the band containing the tone is below 160 Hz	5 dB[2]	Narrow-band frequency analysis may be required to precisely detect occurrence

Note 1: Corrections to be added to the measured or predicted levels

Note 2: Where a source emits tonal and low-frequency noise, only one 5-dB correction should be applied if the tone is in the low-frequency range

4.2.2 Project Specific Noise Criteria

The intrusiveness noise emission criteria for the operation of any mechanical plant at the project site have been established based on ambient noise levels presented in **Table 3** and the NSW INP methodology outlined in **Section 3.1**

The amenity criteria have also been derived in accordance with the INP.

The resulting project specific criteria for operation of the plant associated with the development are shown in **Table 5**. For each assessment period, the more stringent for the amenity or intrusive criteria are adopted.

Table 5 Operational Noise Criteria for Sensitive Receivers Surrounding the Development Site

Receiver	Time of Day	ANL [1] LAeq(period)	Measured RBL [2] LA90(15minute)	Measured LAeq(period) Noise Level	Criteria for New Sources	
					Intrusive LAeq(15minute)	Amenity [3] LAeq(period)
Residential	Day	60	41	54	46	55
	Evening	50	38	52	43	42
	Night	45	33	47	38	37

Note 1: ANL = "Acceptable Noise Level" for residences in Urban Areas.

Note 2: RBL = "Rating Background Level".

4.3 Internal Sound Insulation

The development shall be designed and constructed to meet the National Construction Code (NCC) requirements, most notably Part F5 *Sound Transmission and insulation.* **Table 6** details the minimum acoustic performance required for the development to comply with NCC.

Table 6 NCC 2015 Sound Insulation Requirements

Construction	NCC Requirements	
	Laboratory Rating	Verification
Walls between sole occupancy units	$R_w + C_{tr}$ not < 50	$D_{nT,w} + C_{tr}$ not < 45
Walls between a bathroom, sanitary compartment, laundry or kitchen in one sole occupancy unit and a habitable room (other than a kitchen) in an adjoining unit	$R_w + C_{tr}$ not < 50 and **Must have a minimum 20 mm cavity between two separate leaves**	$D_{nT,w} + C_{tr}$ not < 45 "Expert Judgment" Comparison to the "Deemed to satisfy" Provisions

Construction	NCC Requirements	
	Laboratory Rating	**Verification**
Walls between sole occupancy units and a plant room or lift shaft	R_w not < 50 and **Must have a minimum 20 mm cavity between two separate leaves**[1]	$D_{nT,w}$ not < 45
Walls between sole occupancy units and a stairway, public corridor, public lobby or the like, or parts of a different classification	R_w not < 50	$D_{nT,w}$ not < 45
Door assemblies located in a wall between a sole-occupancy unit and a stairway, public corridor, public lobby or the like	R_w not < 30 [2]	$D_{nT,w}$ not < 25
Floors between sole-occupancy units or between a sole-occupancy unit and a plant room, lift shaft, stairway, public corridor, public lobby or the like, or parts of a different classification	$R_w + C_{tr}$ not < 50 $L_{n,w} + C_l$ not > 62	$D_{nT,w} + C_{tr}$ not < 45 $L'_{nT,w} + C_l$ not > 62
Soil, waste, water supply and stormwater pipes and ductwork to habitable rooms	$R_w + C_{tr}$ not < 40	n/a
Soil, waste, water supply and stormwater pipes and ductwork to kitchens and other rooms	$R_w + C_{tr}$ not < 25	n/a
Intra-tenancy Walls	There is no statutory requirement for airborne isolation via intra-tenancy walls.	

Note 1: A wall must be of "discontinuous construction" if it separates a sole occupancy unit from a plant room or lift shaft. Clause F5.3(c) defines "discontinuous construction" as a wall having a minimum 20 mm cavity between two separate leaves with no mechanical linkage except at the periphery.

Note 2: Clause FP5.3(b) in the 2012 BCA states that the required insulation of a floor or wall must not be compromised by a door assembly.

5 DESIGN RECOMMENDATIONS

5.1 Road Noise Intrusion

5.1.1 Roof/Ceiling Construction

It is recommended that the roof/ceiling should achieve a minimum rating of R_W 40.

A composite roof and ceiling construction can achieve R_W 40 using sheet metal roofing with a 13mm plasterboard ceiling underneath and R2 insulation batts in the roof cavity. The batts must cover 100 percent of the ceiling area.

Additionally it is recommended that Bradford Anticon 55 be directly fixed between the purlins and the roof to dampen rain noise.

5.1.2 External Wall Construction

It is recommended that the external walls should achieve a minimum acoustic rating of R_W 40.

5.1.3 Glazing

In principle glazing recommendations to meet specific internal noise levels are provided in **Table 7**. Laboratory acoustical certifications for rated glazing systems must accompany the commissioned glazing systems.

Table 7 Glazing Recommendations

Façade	Type of Occupancy	Minimum Rw Required
West (fronting Somerset Street) & North and south with direct line of sight to Somerset Street	Living	28
	Bedrooms	28
North and South without direct line of sight to Somerset Street	Living	28
	Bedrooms	28
East (rear of site)	Living	26
	Bedrooms	26

The frames and sealing of all glazing units would need to be of a good standard.

If sliding or swing doors are required then the performance of the units should be increased to account for inherent acoustic weaknesses of this type of system. Provisionally, door systems to the west facade (Somerset Street) and north/south facades with direct line of sight to Somerset Street would be recommended at 32 dB Rw, however this would be refined during detailed design when the specific units are finalised.

5.2 Mechanical Plant Noise Emissions

At this stage, details of the proposed mechanical plant and its precise location are not available, as this will take place during the detailed design stage of the project.

The external noise emission and location of mechanical plant associated with the development should be controlled so that the operation of such plant does not adversely impact upon neighbouring residential receivers and occupants within the proposed development. The criteria for the noise emissions from mechanical plant and equipment are documented in **Section 4.2**. Detailed assessment and verification of mechanical noise emissions should be carried out during the detailed design stage of the project ensuring that the nominated criteria for mechanical plant emissions are met.

It is envisaged that the mechanical plant noise sources will be controllable by common engineering methods that may consist of:

- Selection of low-noise units
- Judicious location
- Barriers/enclosure
- Silencers
- Acoustically lined ductwork

The selected mechanical equipment must be reviewed and assessed for conformance with established criteria at the detailed design stage of the project when specific plant selection and location is determined.

It is recommended to locate the car park supply air fans as far as practicable from the nearest receivers. A combination of the above mitigation methods may be required to satisfy the design criteria. It is also noted that noise from vehicles accessing the car park would also be considered to contribute to the site noise emissions. To minimise vehicle emissions (especially on the access ramp), it is recommended that acoustic ventilation louvres are used where ventilating open area is required.

6 CONCLUSION

SLR Consulting has conducted an Operational Noise Impact Assessment for the proposed mixed-use development 28-32 Somerset Street Kingswood.

The scope of the assessment involved establishing project specific operational noise criteria in accordance with the NSW *Industrial Noise Policy* and the identification and assessment of potential noise emissions for submission to Council.

In relation to on-site amenity impacts a full acoustical specification will be developed for the building that addresses all such noise sources and ensures they are controlled to the appropriate targets developed within this report.

Based upon the findings of this assessment, the development as proposed appears satisfactory in terms of its general planning arrangement. Acceptable internal noise levels can be achieved within residential apartments with the incorporation of recommended controls.

Mechanical plant equipment details will be assessed as part of the detailed design stage however it is envisaged that the project specific noise criteria can be met through careful selection and location of the plant on each building, and the construction of barriers or enclosures if required.

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 2×10^{-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	Heavy rock concert	Extremely noisy
110	Grinding on steel	
100	Loud car horn at 3 m	Very noisy
90	Construction site with pneumatic hammering	
80	Kerbside of busy street	Loud
70	Loud radio or television	
60	Department store	Moderate to quiet
50	General Office	
40	Inside private office	Quiet to very quiet
30	Inside bedroom	
20	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

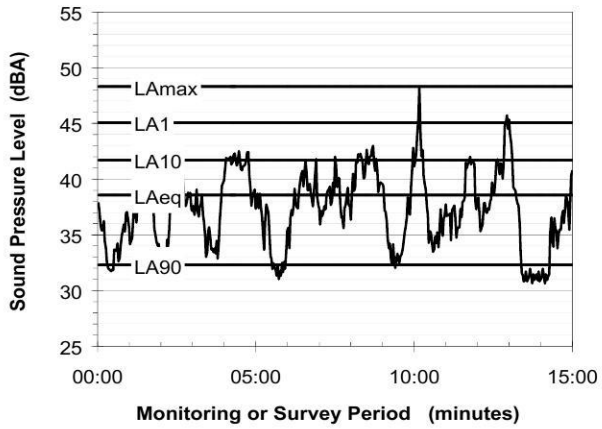
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or L_W, or by the reference unit 10^{-12} W.

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

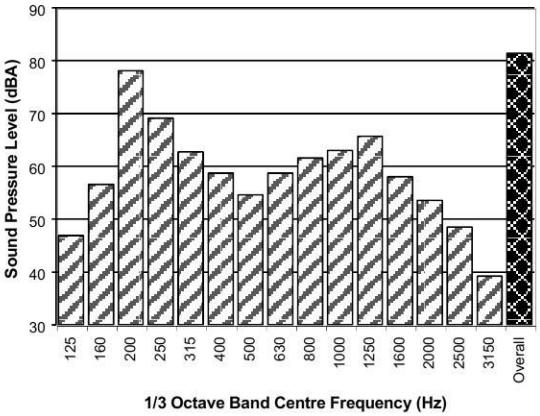
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal. This analysis was traditionally carried out using analogue electronic filters, but is now normally carried out using Fast Fourier Transform (FFT) analysers.

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 (10^{-9} m/s). Care is required in this regard, as other reference levels may be 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

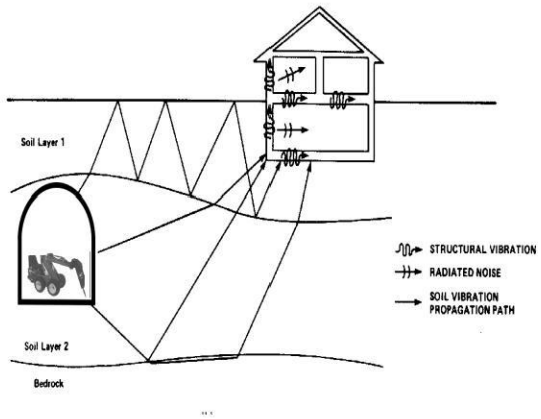
The term 'over-pressure' is used to describe the air pressure pulse emitted during blasting or similar events. The peak level of an event is normally measured using a microphone in the same manner as linear noise (ie unweighted), at frequencies both in and below the audible range.

11 Ground-borne Noise, Structure-borne Noise and Regenerated Noise

Noise that propagates through a structure as vibration and is radiated by vibrating wall and floor surfaces is termed 'structure-borne noise', 'ground-borne noise' or 'regenerated noise'. This 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 ground-borne or structure-borne noise include tunnelling works, underground railways, excavation plant (eg rockbreakers), and building services plant (eg fans, compressors and generators).

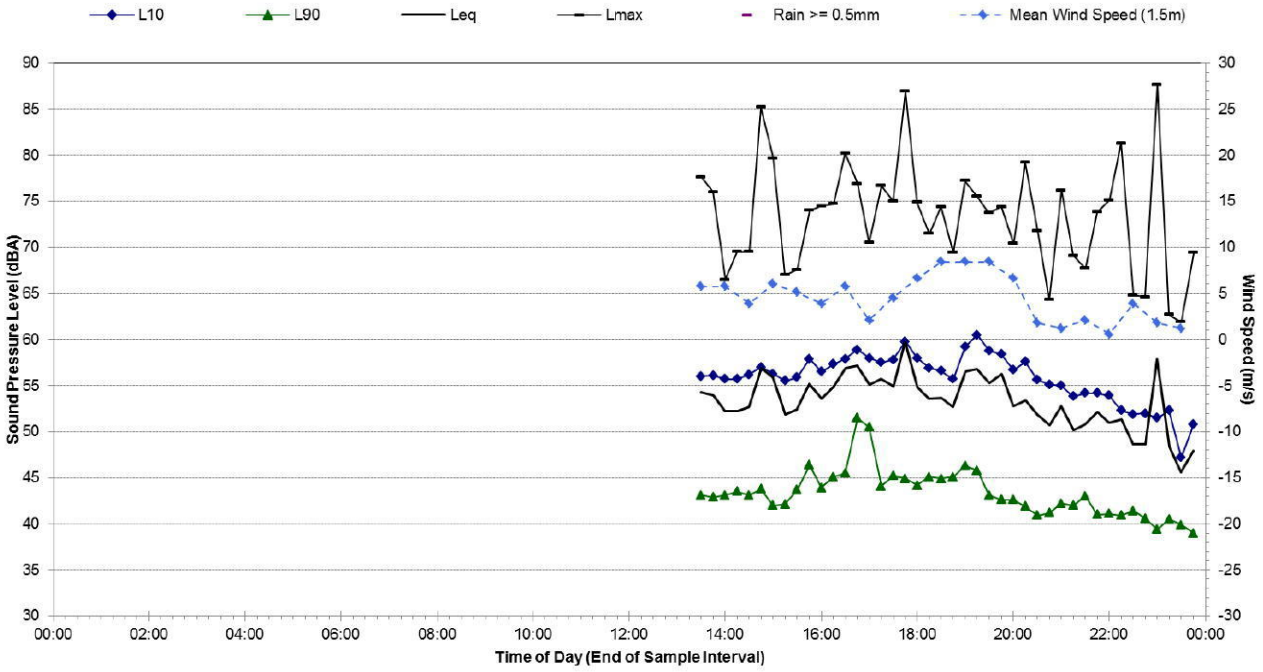
The following figure presents the various paths by which vibration and ground-borne noise may be transmitted between a source and receiver for construction activities occurring within a tunnel.



The term 'regenerated noise' is also used in other instances where energy is converted to noise away from the primary source. One example would be a fan blowing air through a discharge grill. The fan is the energy source and primary noise source. Additional noise may be created by the aerodynamic effect of the discharge grill in the airstream. This secondary noise is referred to as regenerated noise

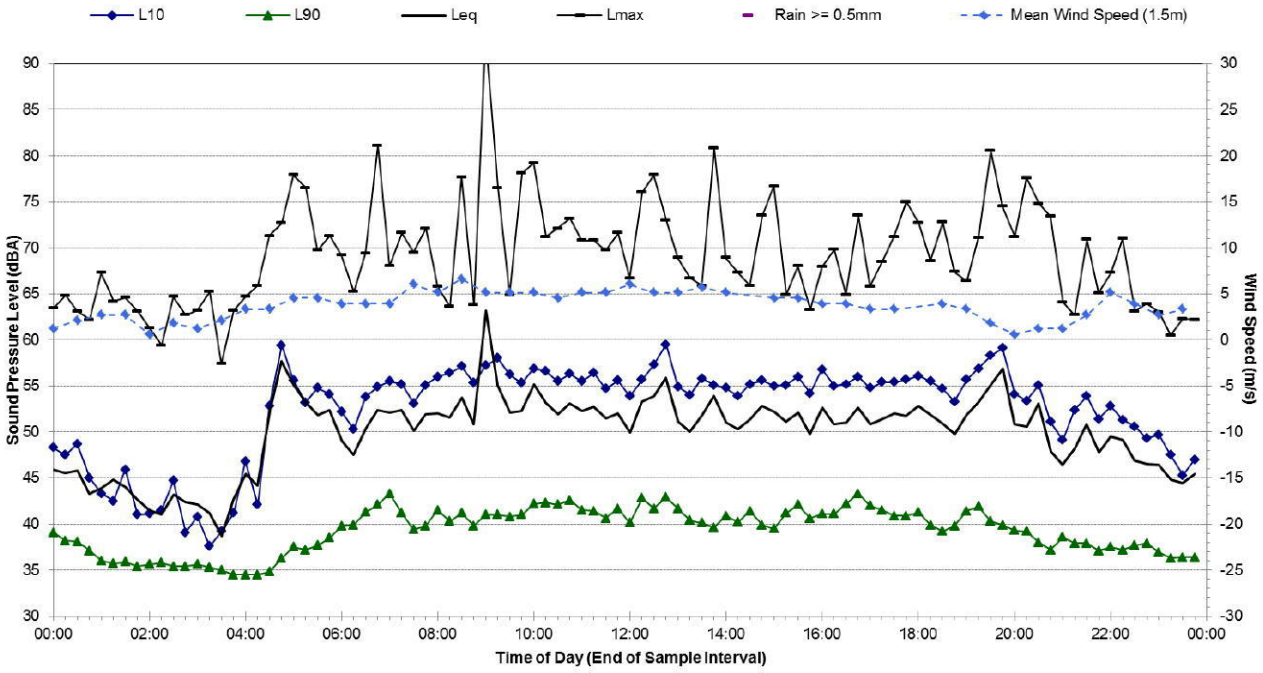
Statistical Ambient Noise Levels

Noise Logging Location L01 - Friday, 16 October 2015



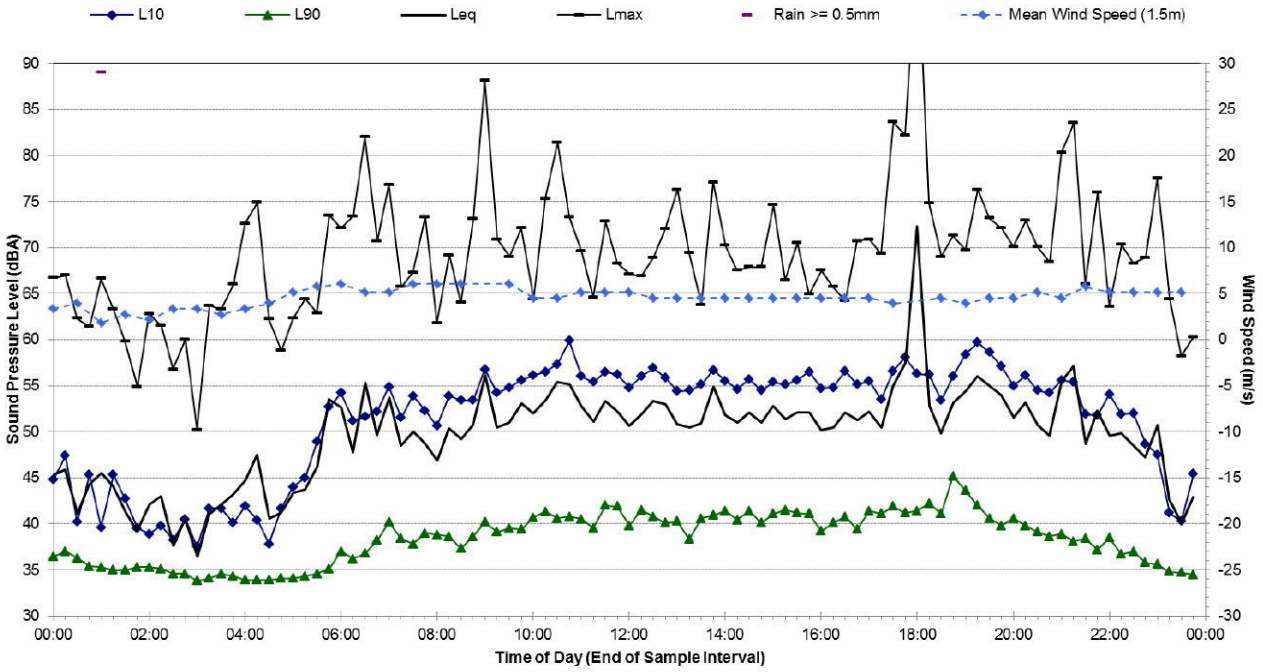
Statistical Ambient Noise Levels

Noise Logging Location L01 - Saturday, 17 October 2015



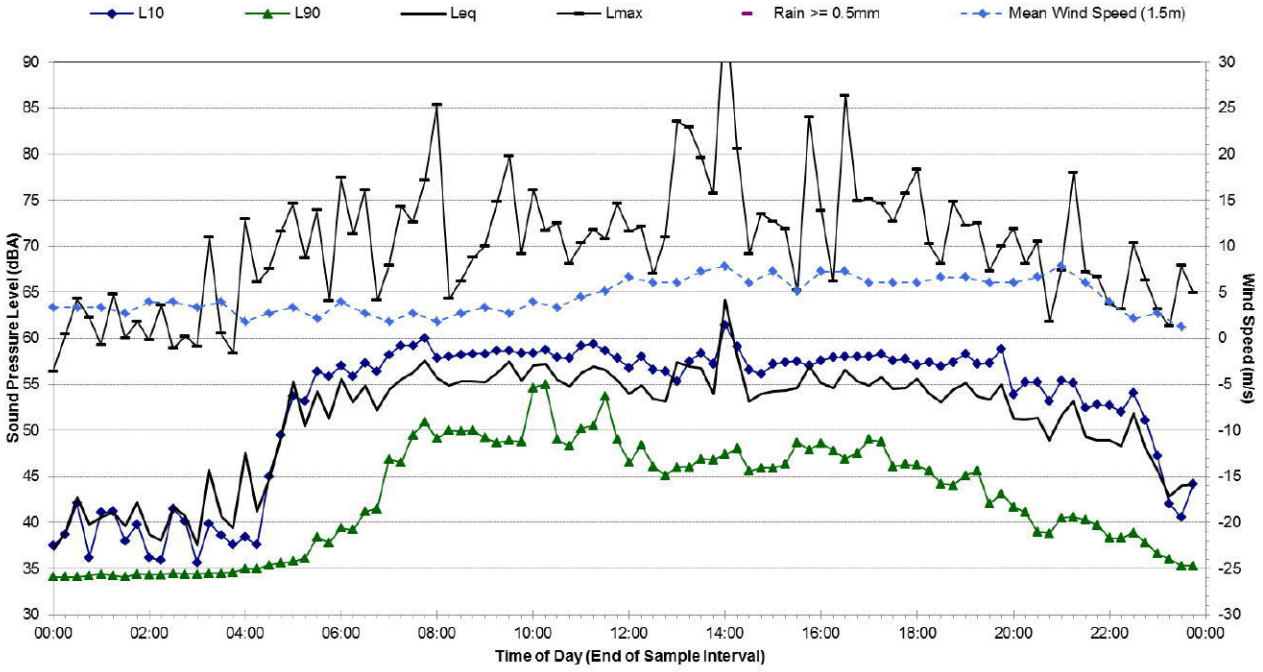
Statistical Ambient Noise Levels

Noise Logging Location L01 - Sunday, 18 October 2015



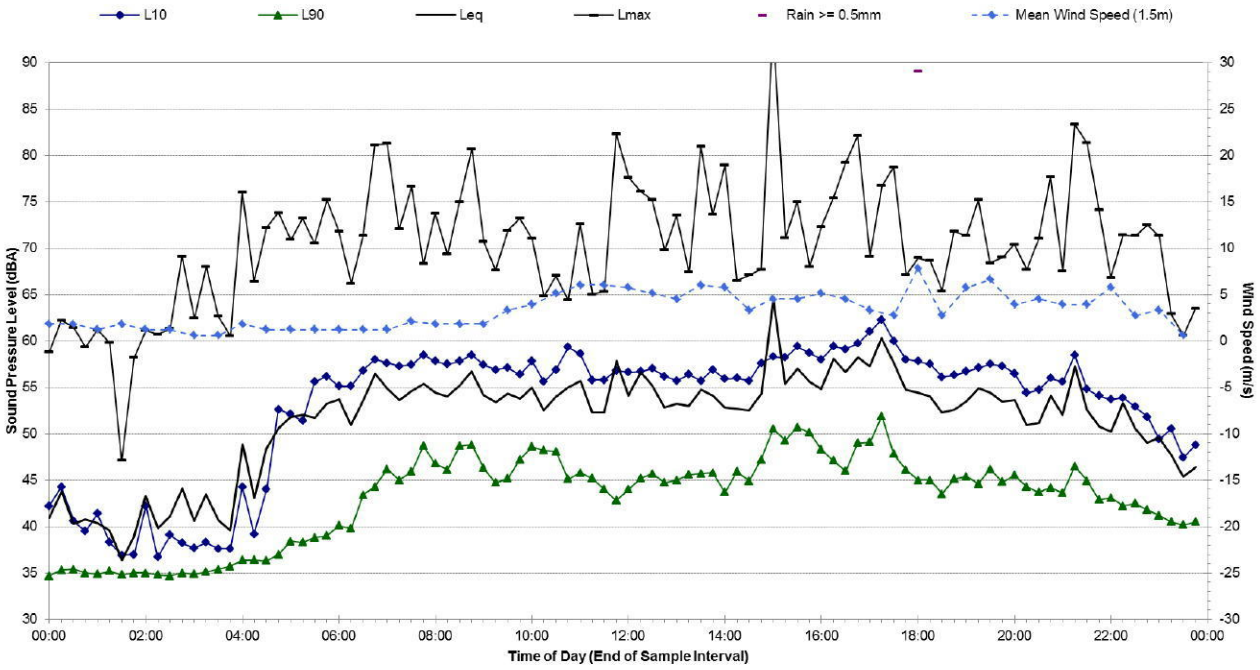
Statistical Ambient Noise Levels

Noise Logging Location L01 - Monday, 19 October 2015



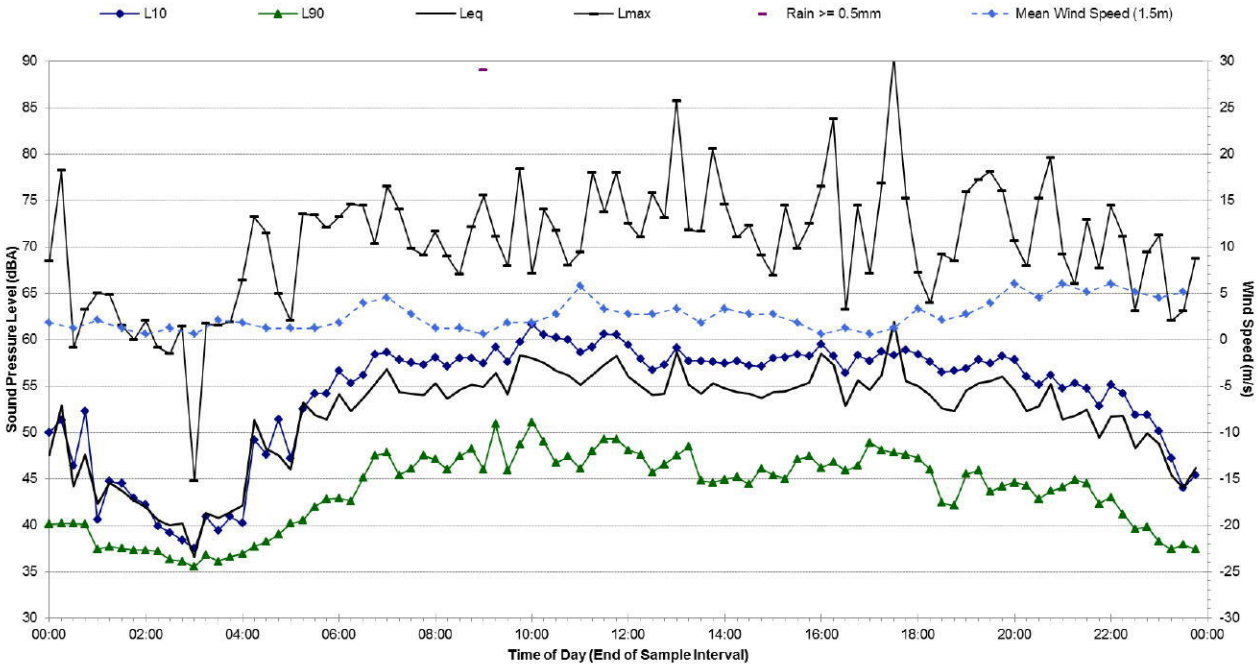
Statistical Ambient Noise Levels

Noise Logging Location L01 - Tuesday, 20 October 2015



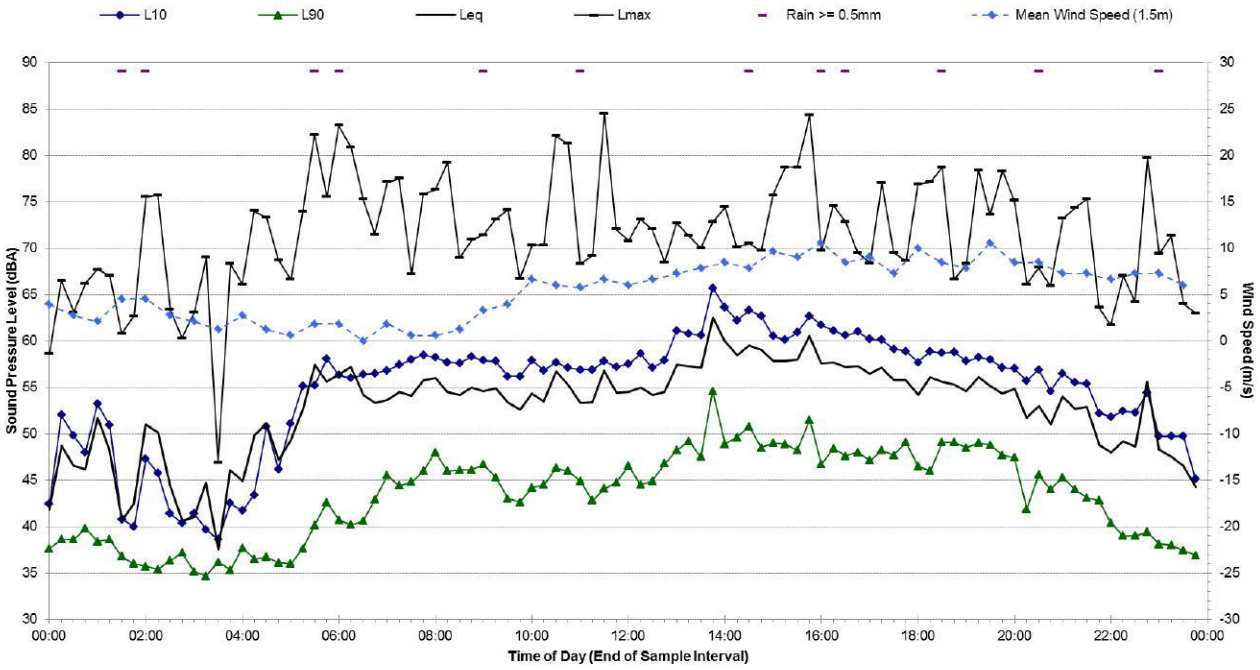
Statistical Ambient Noise Levels

Noise Logging Location L01 - Wednesday, 21 October 2015



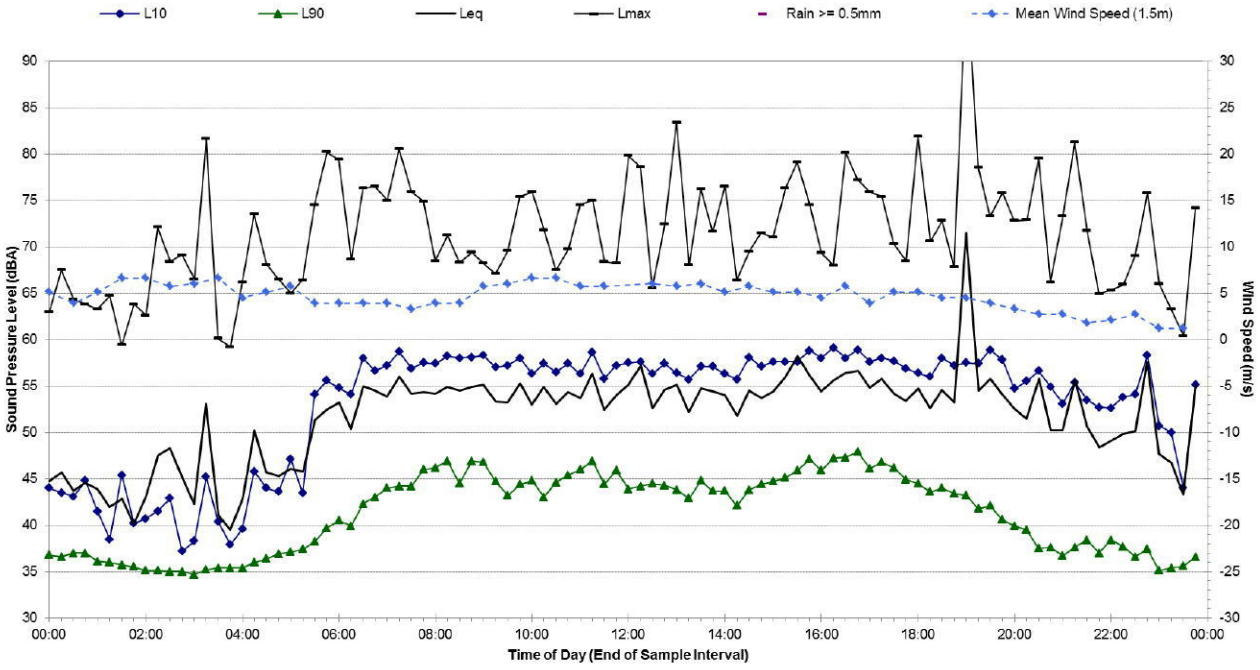
Statistical Ambient Noise Levels

Noise Logging Location L01 - Thursday, 22 October 2015



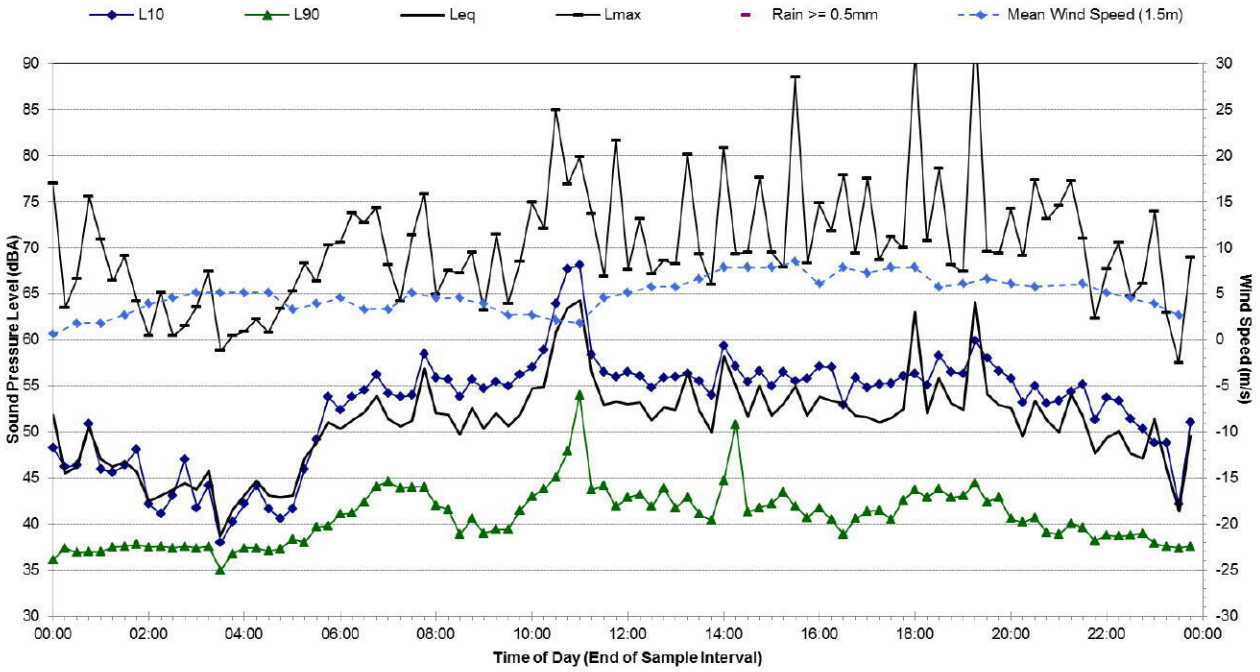
Statistical Ambient Noise Levels

Noise Logging Location L01 - Friday, 23 October 2015



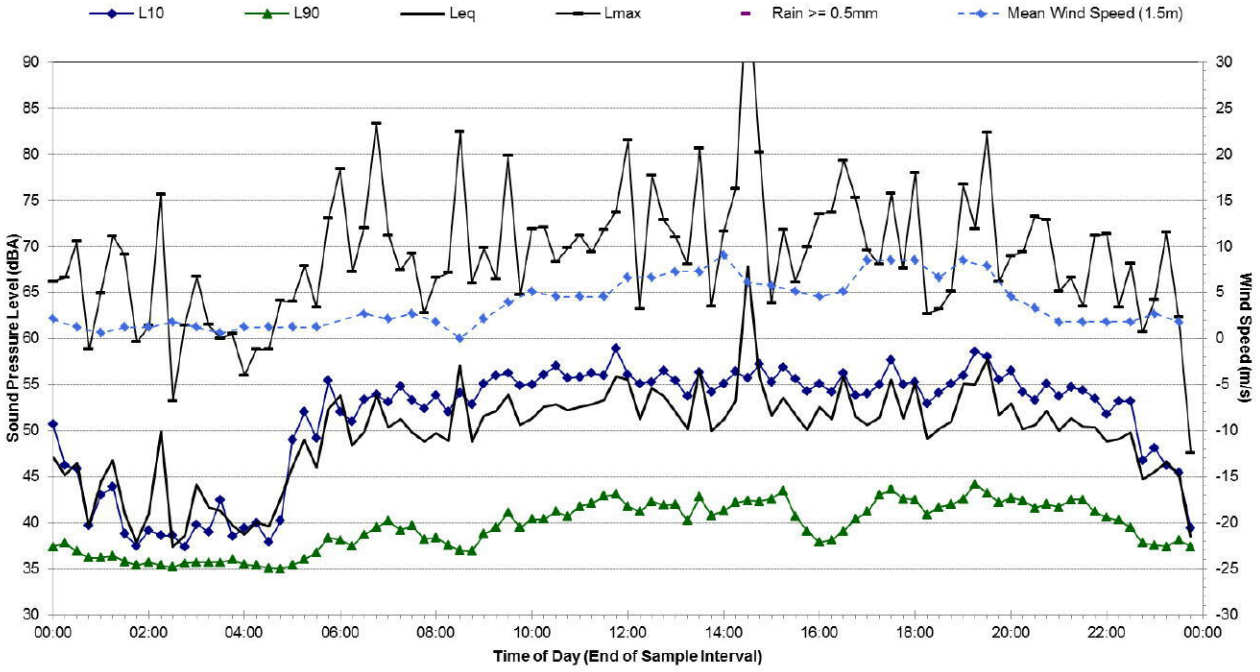
Statistical Ambient Noise Levels

Noise Logging Location L01 - Saturday, 24 October 2015



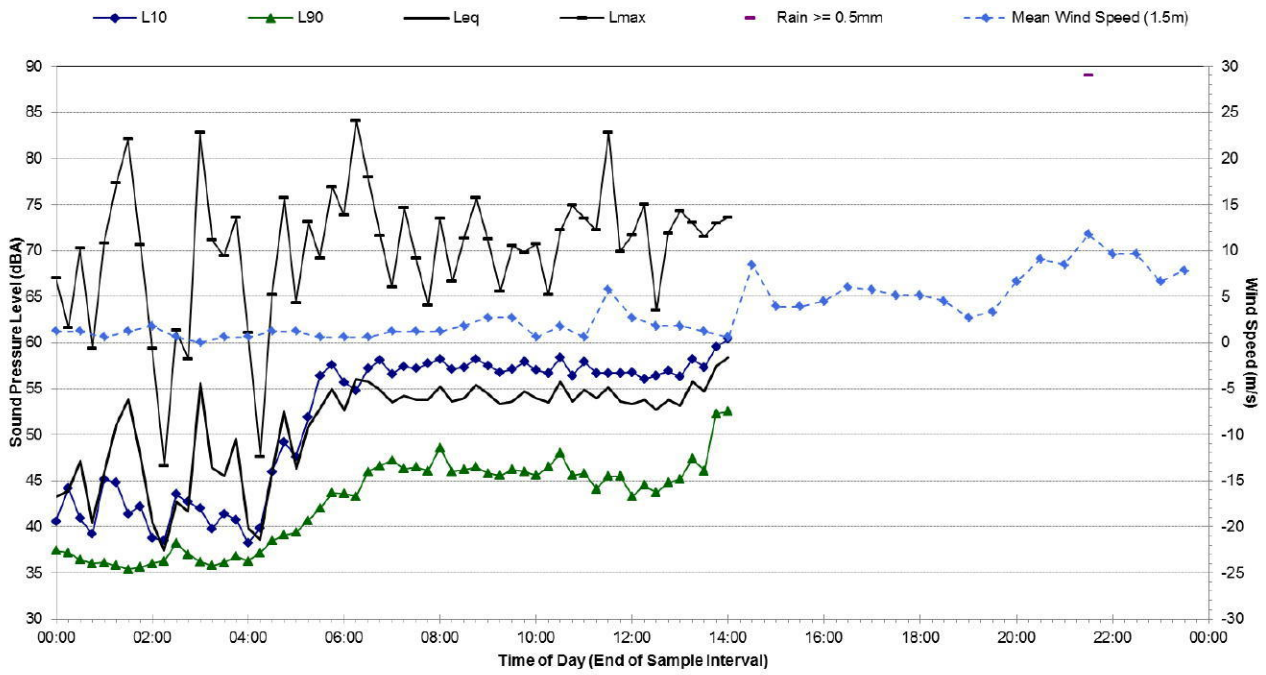
Statistical Ambient Noise Levels

Noise Logging Location L01 - Sunday, 25 October 2015



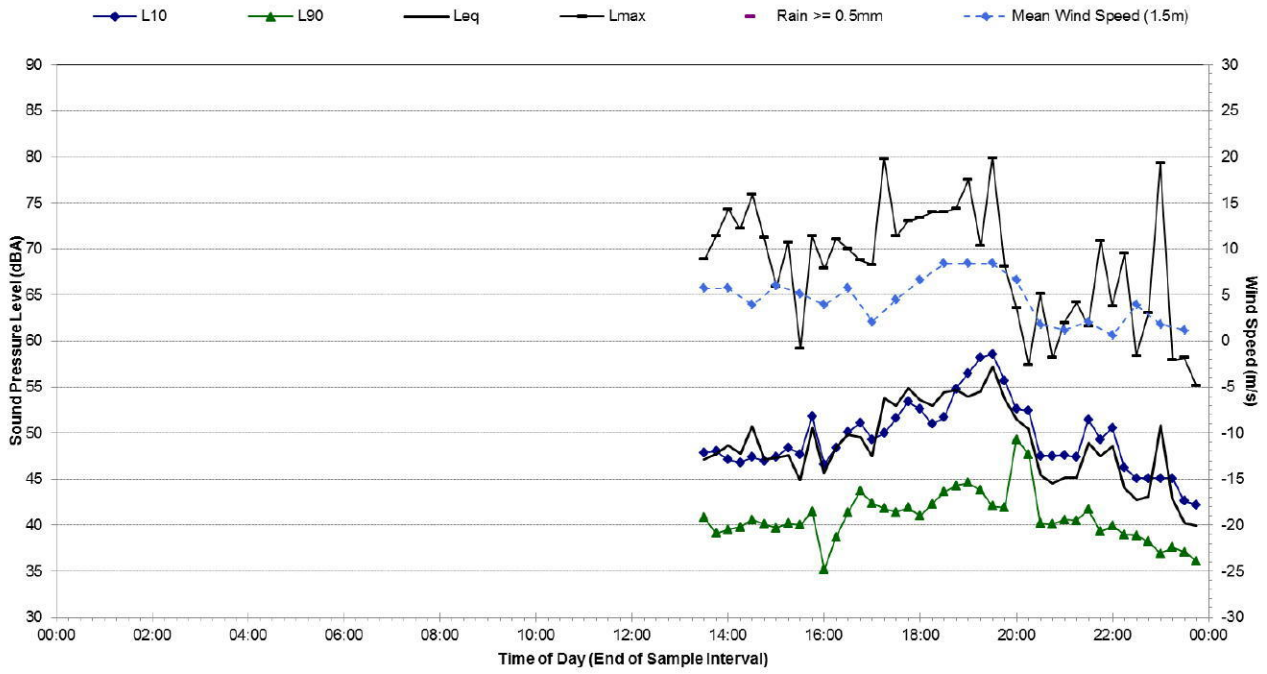
Statistical Ambient Noise Levels

Noise Logging Location L01 - Monday, 26 October 2015



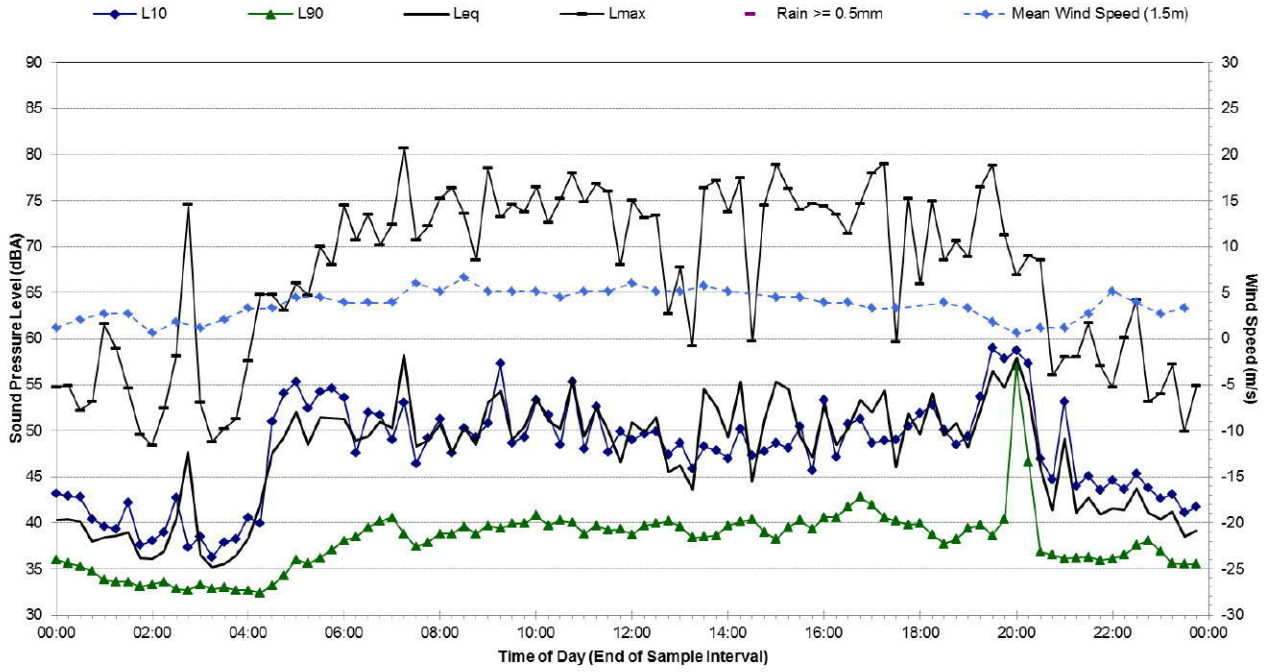
Statistical Ambient Noise Levels

Noise Logging Location L02 - Friday, 16 October 2015



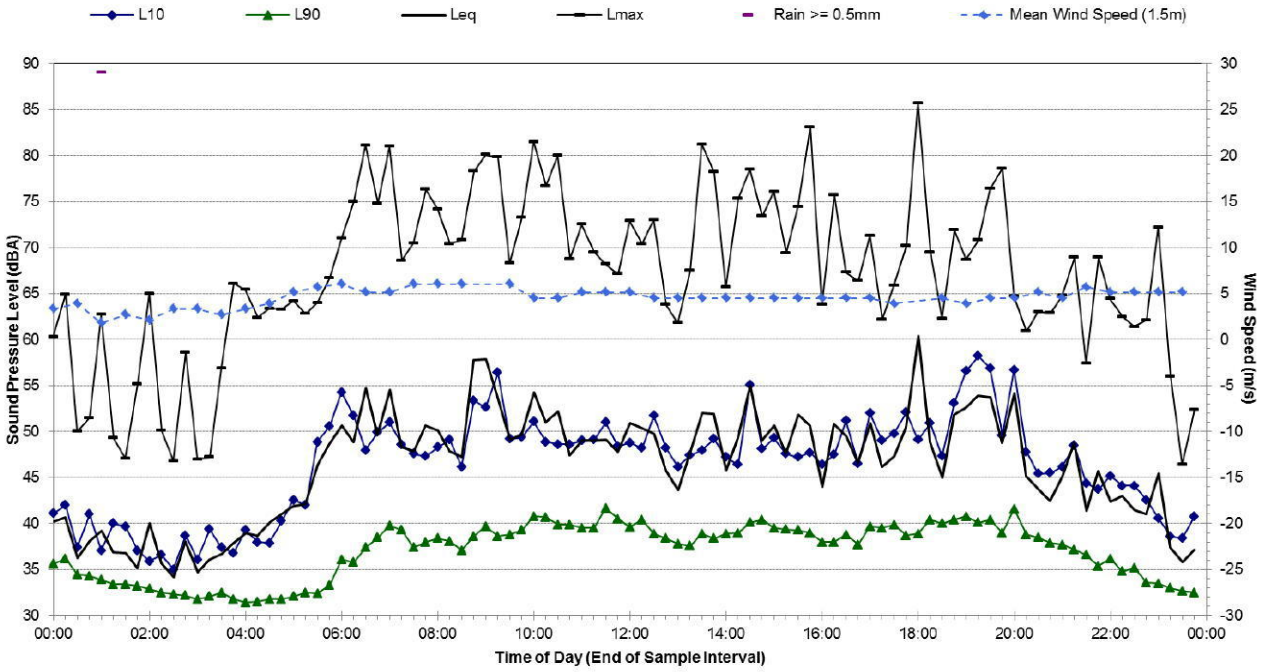
Statistical Ambient Noise Levels

Noise Logging Location L02 - Saturday, 17 October 2015



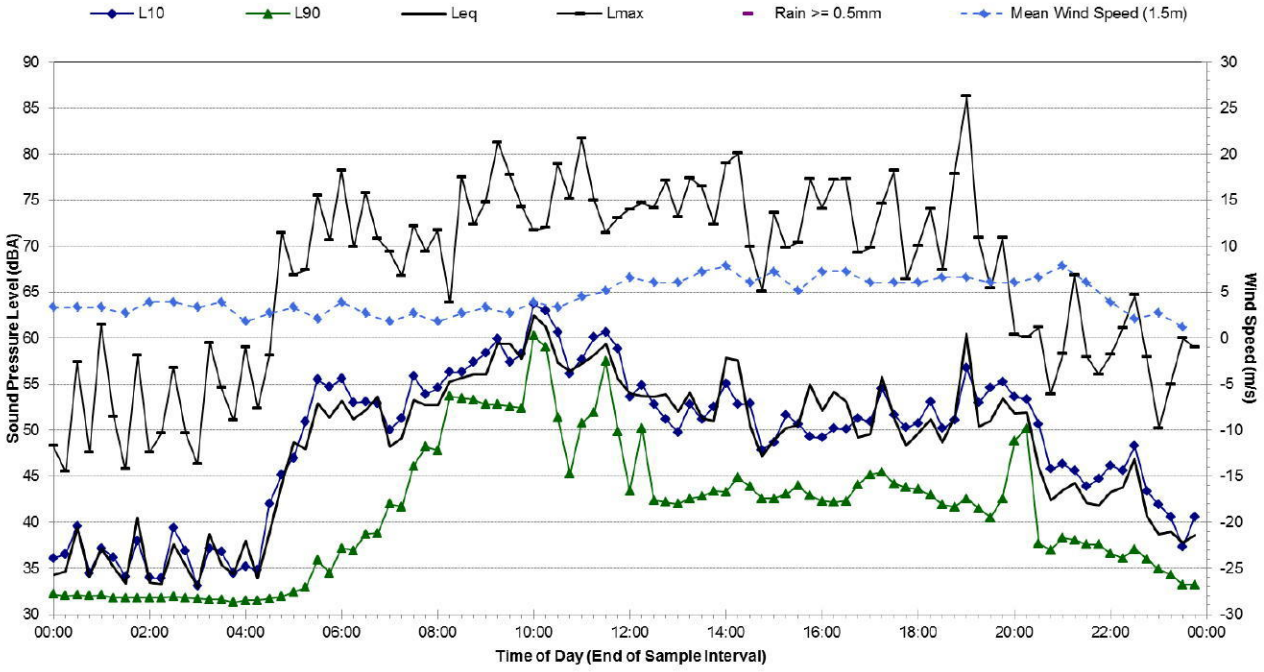
Statistical Ambient Noise Levels

Noise Logging Location L02 - Sunday, 18 October 2015



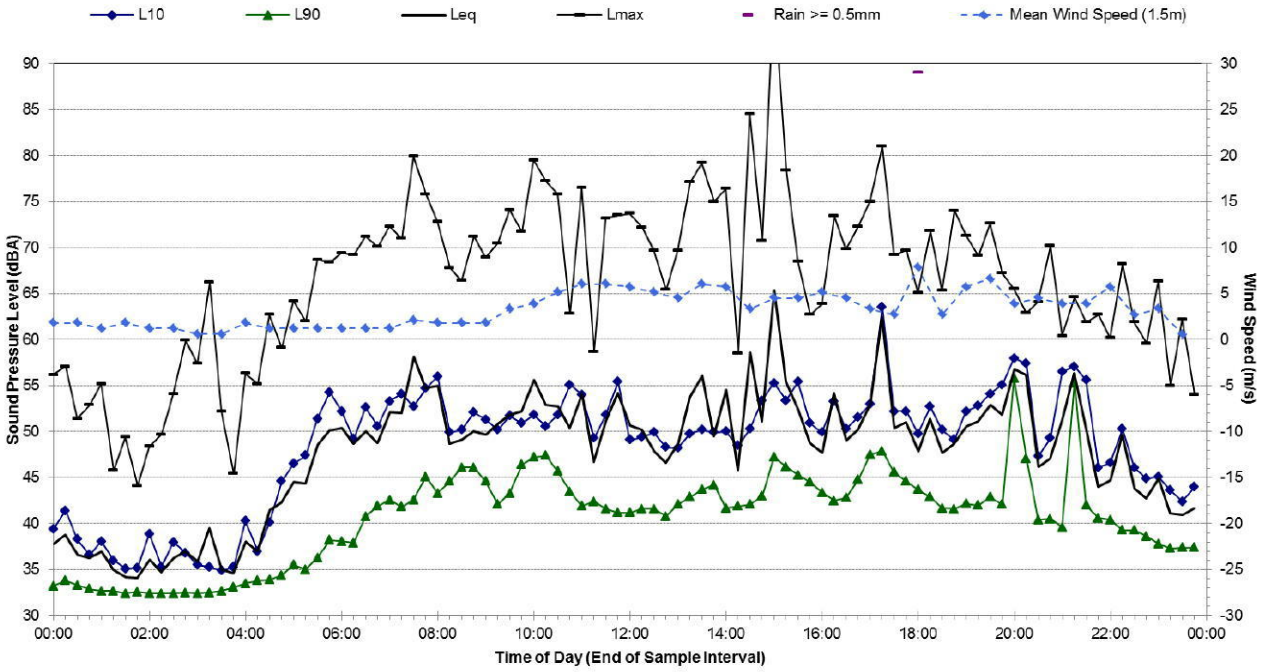
Statistical Ambient Noise Levels

Noise Logging Location L02 - Monday, 19 October 2015



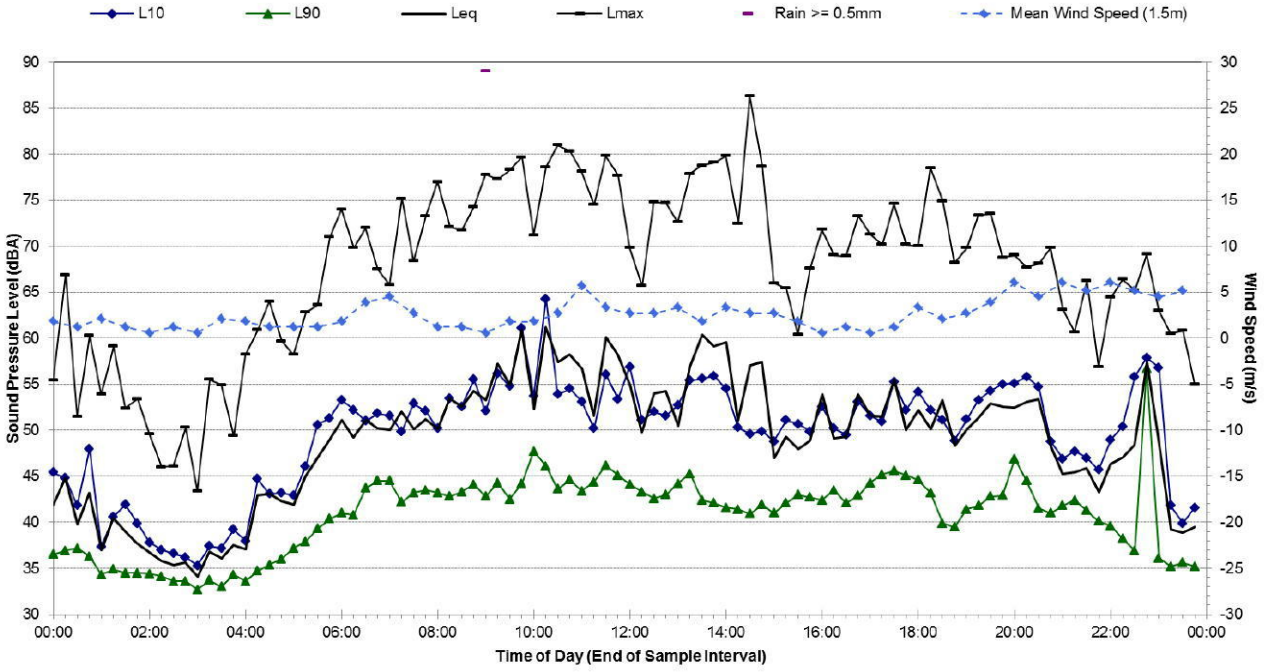
Statistical Ambient Noise Levels

Noise Logging Location L02 - Tuesday, 20 October 2015



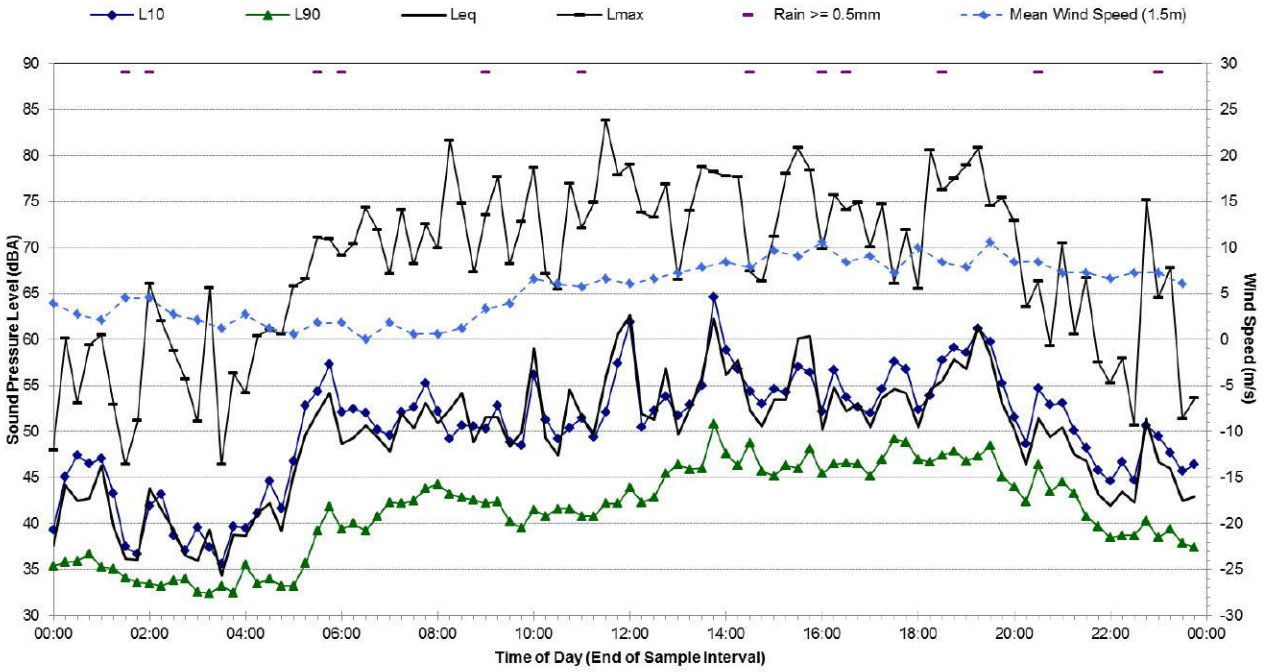
Statistical Ambient Noise Levels

Noise Logging Location L02 - Wednesday, 21 October 2015



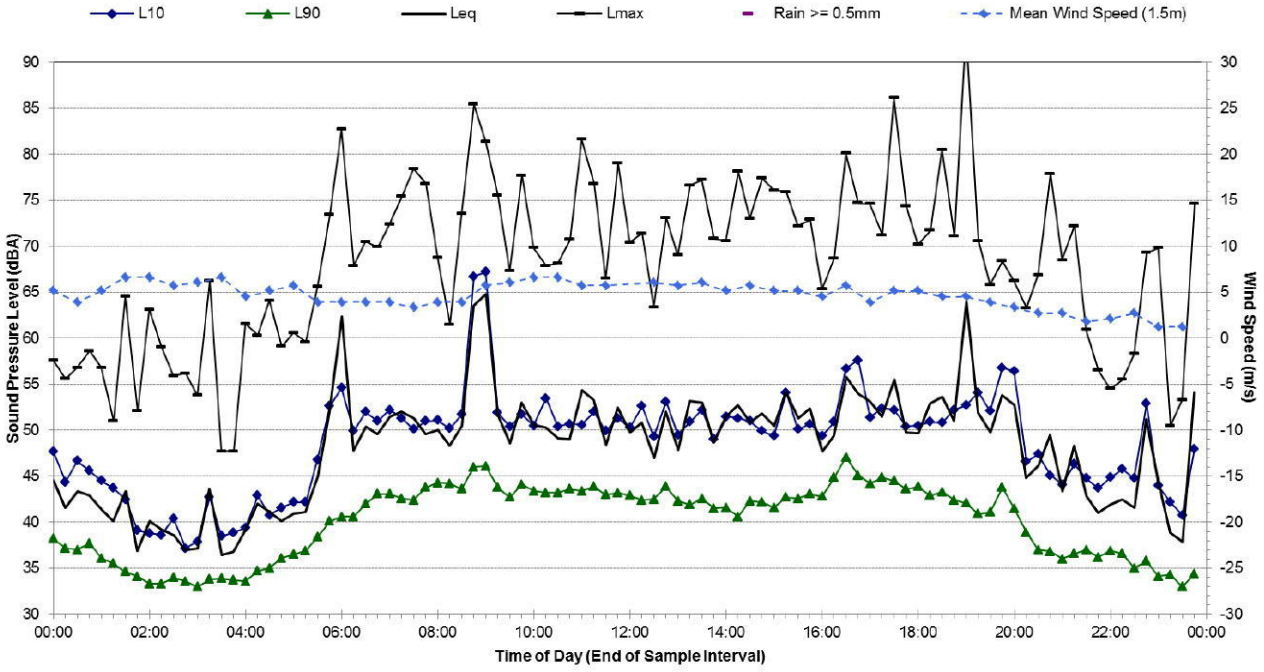
Statistical Ambient Noise Levels

Noise Logging Location L02 - Thursday, 22 October 2015



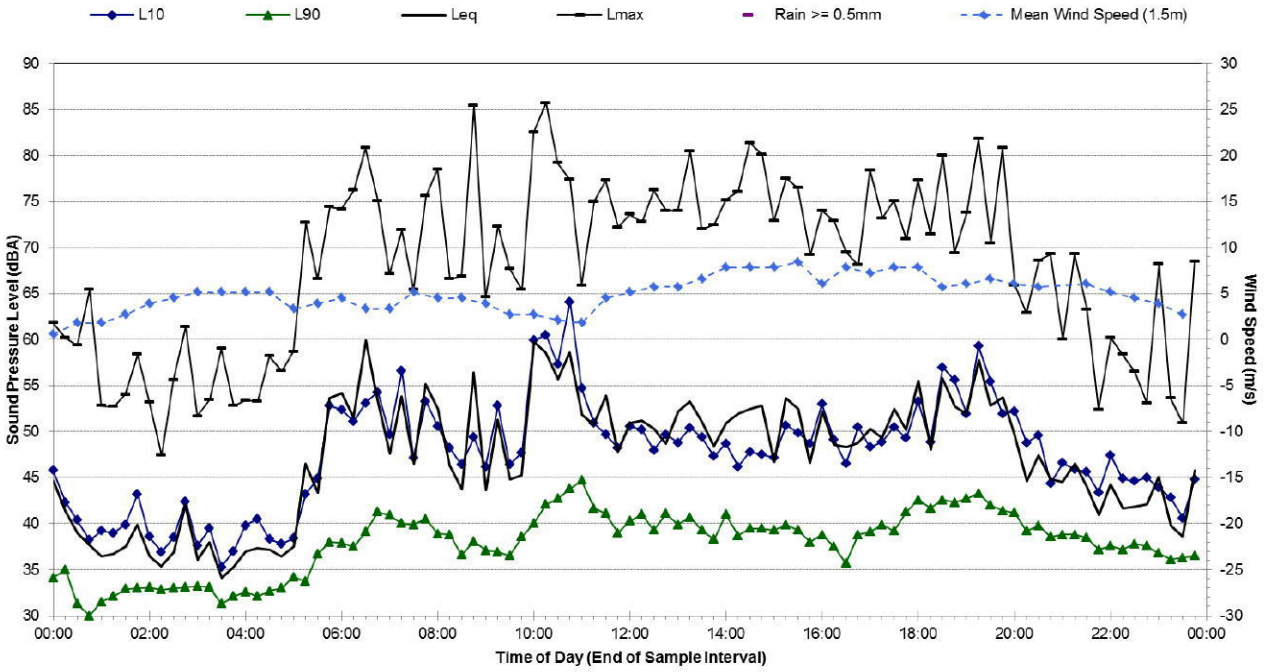
Statistical Ambient Noise Levels

Noise Logging Location L02 - Friday, 23 October 2015



Statistical Ambient Noise Levels

Noise Logging Location L02 - Saturday, 24 October 2015



Statistical Ambient Noise Levels

Noise Logging Location L02 - Sunday, 25 October 2015