

APPENDIX A

Acoustic Terminology

1. Sound Level or Noise Level

The terms ‘sound’ and ‘noise’ are almost interchangeable, except that ‘noise’ often refers to unwanted sound.

Sound (or noise) consists of minute fluctuations in atmospheric pressure. The human ear responds to changes in sound pressure over a very wide range with the loudest sound pressure to which the human ear can respond being 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 LP are commonly used to represent Sound Pressure Level. The symbol LA 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 dB(A), 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 4,000 Hz), and less sensitive at lower and higher frequencies. Different sources having the same dB(A) level generally sound about equally loud.

A change of 1 dB or 2 dB in the level of a sound is difficult for most people to detect, whilst a 3 dB to 5 dB change corresponds to a small but noticeable change in loudness. A 10 dB change corresponds to an approximate doubling or halving in loudness. The table below lists examples of typical noise levels.

Sound Pressure Level dB(A)	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	Loud
80	Kerbside of busy street	
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

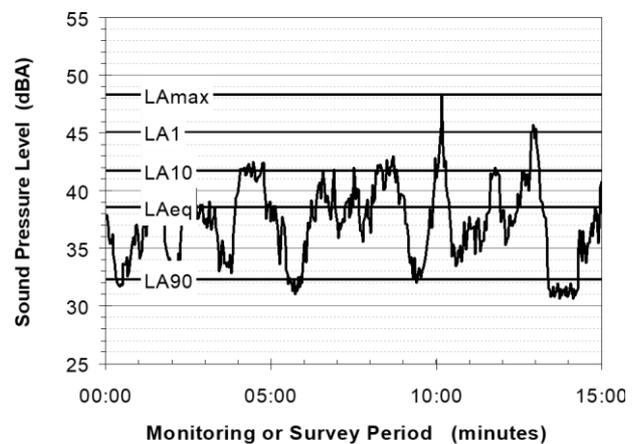
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or LW, or by the reference unit 10^{-12} W.

The relationship between Sound Power and Sound Pressure is similar to the effect of 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 LAN, where LAN is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the LA1 is the noise level exceeded for 1% of the time, LA10 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:

- LA1 The noise level exceeded for 1% of the 15 minute interval.
- LA10 The noise level exceeded for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.
- LA90 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.
- LAeq 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.

5. Frequency Analysis

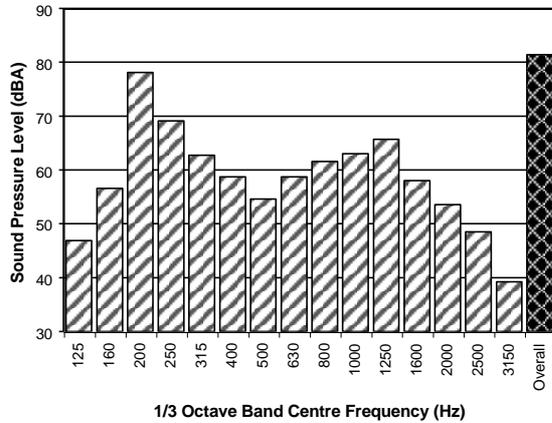
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal.

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 (three 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.



6. Annoying Noise (Special Audible Characteristics)

A louder noise will generally be more annoying to nearby receivers than a quieter one. However, noise is often also found to be more annoying and result in larger impacts where the following characteristics are apparent:

- **Tonality** - tonal noise contains one or more prominent tones (ie differences in distinct frequency components between adjoining octave or 1/3 octave bands), and is normally regarded as more annoying than 'broad band' noise.
- **Impulsiveness** - an impulsive noise is characterised by one or more short sharp peaks in the time domain, such as occurs during hammering.
- **Intermittency** - intermittent noise varies in level with the change in level being clearly audible. An example would include mechanical plant cycling on and off.
- **Low-Frequency Noise** - low-frequency noise contains significant energy in the lower frequency bands, which are typically taken to be in the 10 to 160 Hz region.

7. 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 (ie vertical, longitudinal 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 $20 \log (V/V_0)$, where V_0 is the reference level (10⁻⁹ m/s). Care is required in this regard, as other reference levels may be used.

8. Human Perception of Vibration

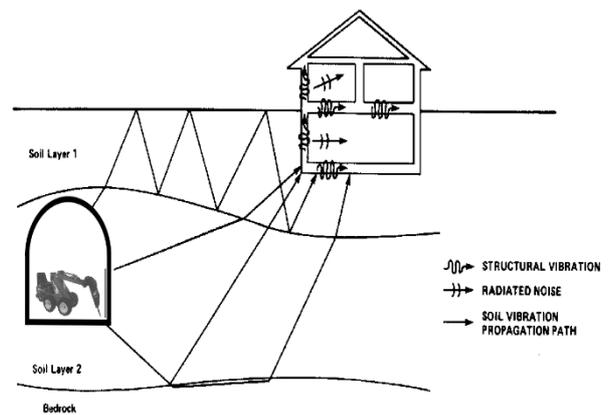
People are able to 'feel' vibration at levels lower than those required to cause even superficial damage to the most susceptible classes of building (even though they may not be disturbed by the motion). An individual's perception of motion or response to vibration depends very strongly on previous experience 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.

9. 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 an example of 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.

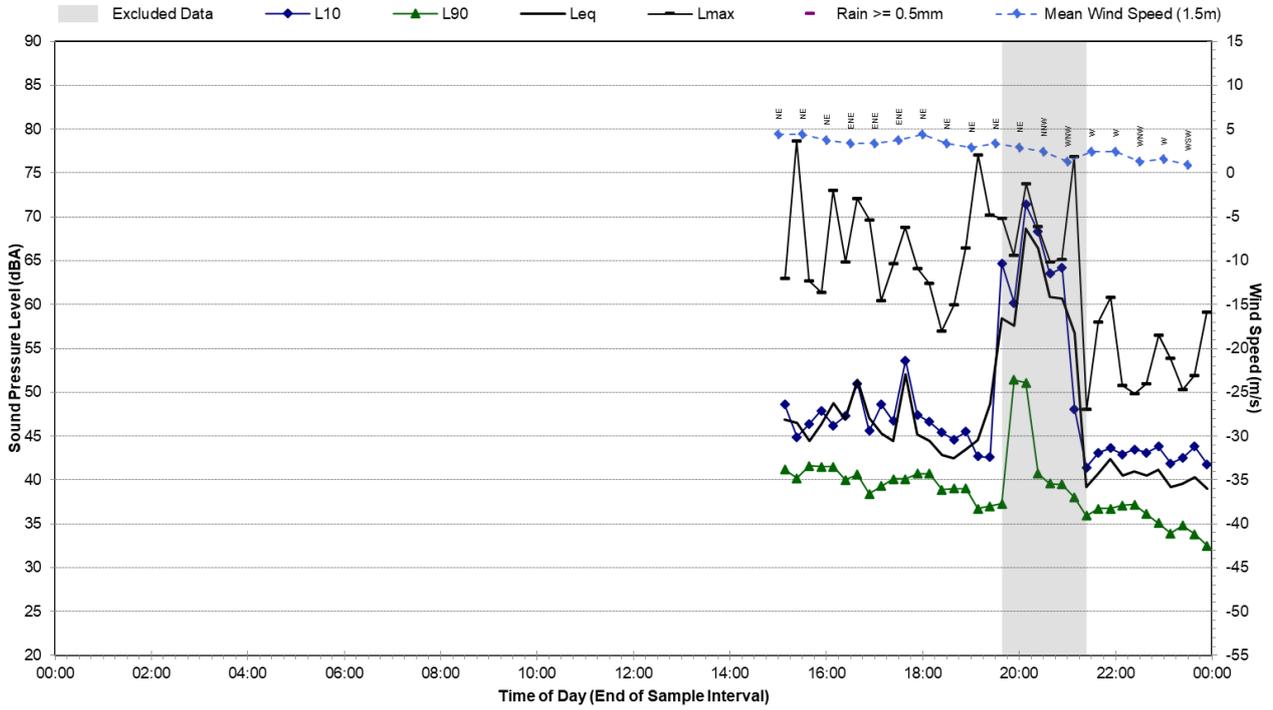
APPENDIX B

Ambient Noise Monitoring Results

Noise Monitoring Location		L01			Map of Noise Monitoring Location				
Noise Monitoring Address		Greenmeadows Estate							
<p>Logger Device Type: Svantek 957, Logger Serial No: 21423 Sound Level Meter Device Type: Brüel and Kjær 2250L, Sound Level Meter Serial No: 3004636</p> <p>Ambient noise logger deployed adjacent to the Greenmeadows Estate on Cleary Bros property. The Cleary Bros Albion Park Quarry processing area is located to the south of the logger location, with East West Link and Albion Park Rail Bypass to the south.</p> <p>Background noise during the measurement was a combination of road traffic noise from East West Link and equipment noise from Albion Park Rail Bypass construction. Birds, aircraft and a helicopter also contributed to the LAeq at this location during the measurement. The Albion Park Quarry was not audible at this location during the measurement.</p> <p>Recorded Noise Levels (LAm_{ax}): 12/10/2020: APRB construction equipment: 42-46 dBA, APRB rockbreaker: up to 51 dBA, APRB impact noise: up to 58 dBA, East West Link traffic: 42-44 dBA, Trucks on East West Link: up to 51 dBA, Birds: up to 52 dBA, Aircraft: 58 dBA, Helicopter: 62 dBA. Albion Park Quarry not audible.</p>									
Ambient Noise Logging Results – NPfi Defined Time Periods									
Monitoring Period	Noise Level (dBA)								
	RBL	LAeq	L10	L1					
Daytime	40	51	49	55					
Evening	36	47	44	53					
Night-time	30	43	42	46					
Attended Noise Measurement Results									
Date	Start Time	Measured Noise Level (dBA)							
		LA90	LAeq	LAm _{ax}					
12/10/2020	14:53	43	47	62					
<th colspan="5">Photo of Noise Monitoring Location</th>					Photo of Noise Monitoring Location				
									

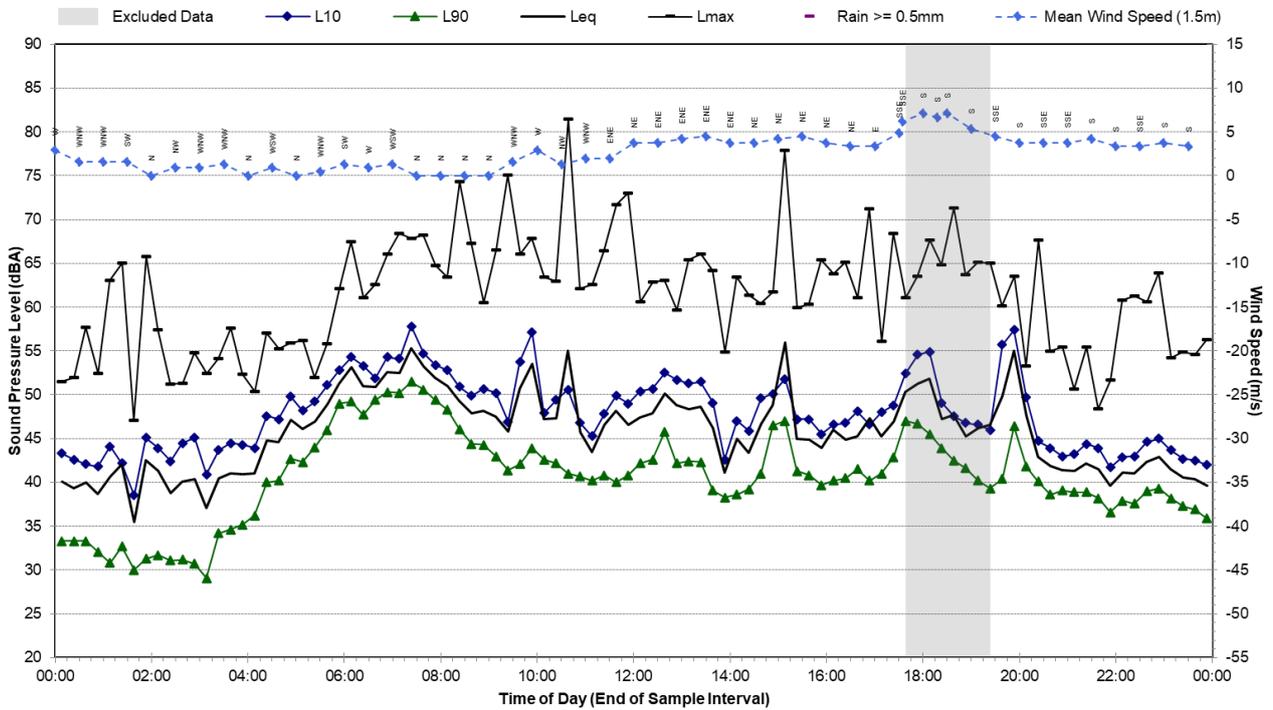
Statistical Ambient Noise Levels

L01 - Greenmeadows Estate - Monday, 12 October 2020



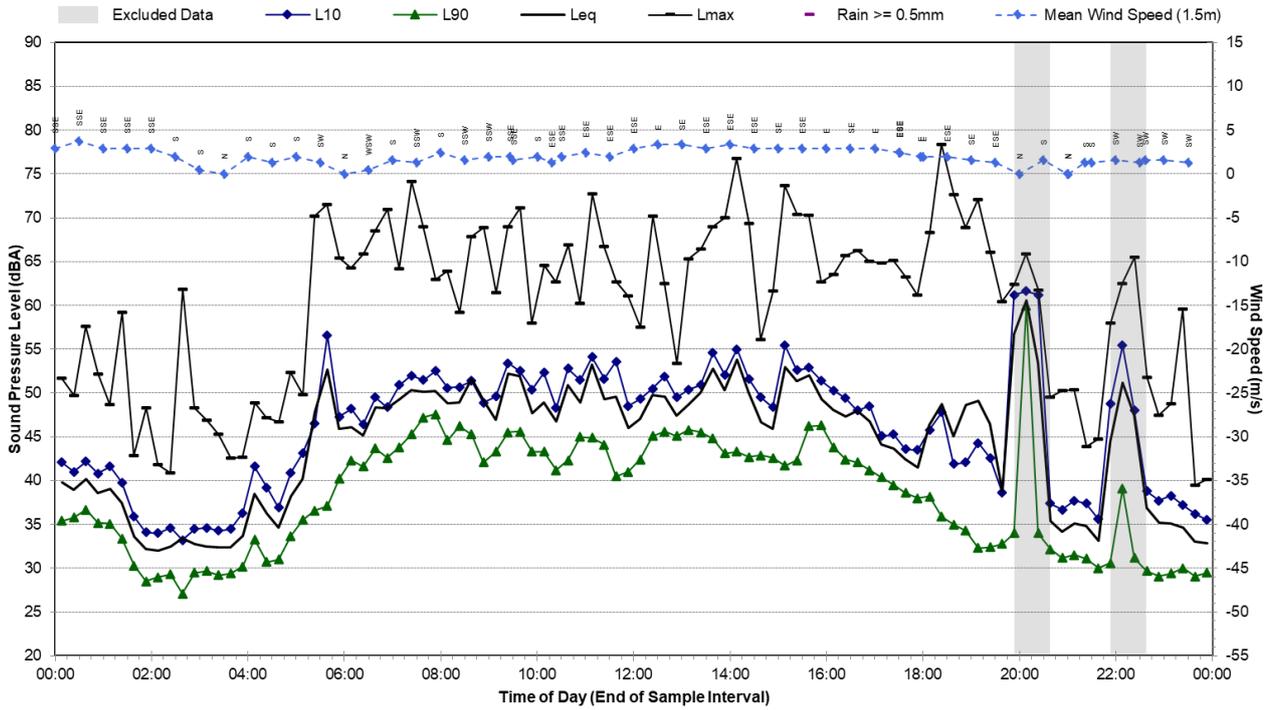
Statistical Ambient Noise Levels

L01 - Greenmeadows Estate - Tuesday, 13 October 2020



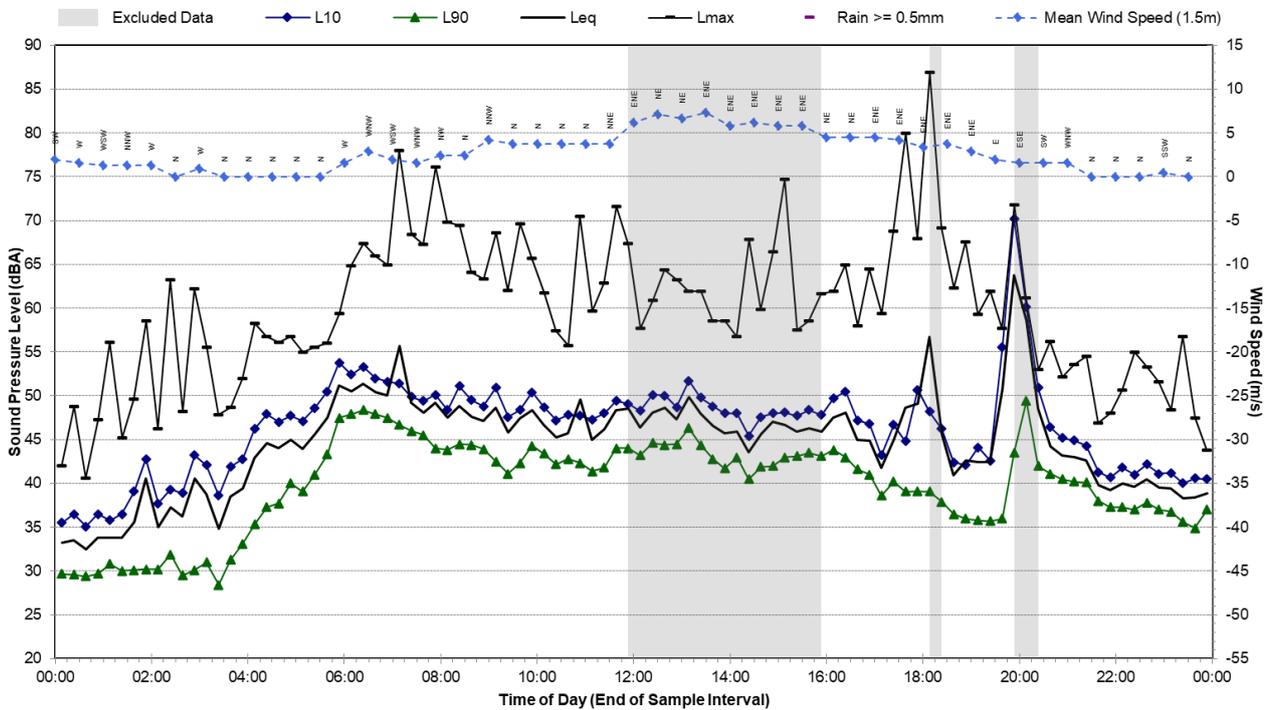
Statistical Ambient Noise Levels

L01 - Greenmeadows Estate - Wednesday, 14 October 2020



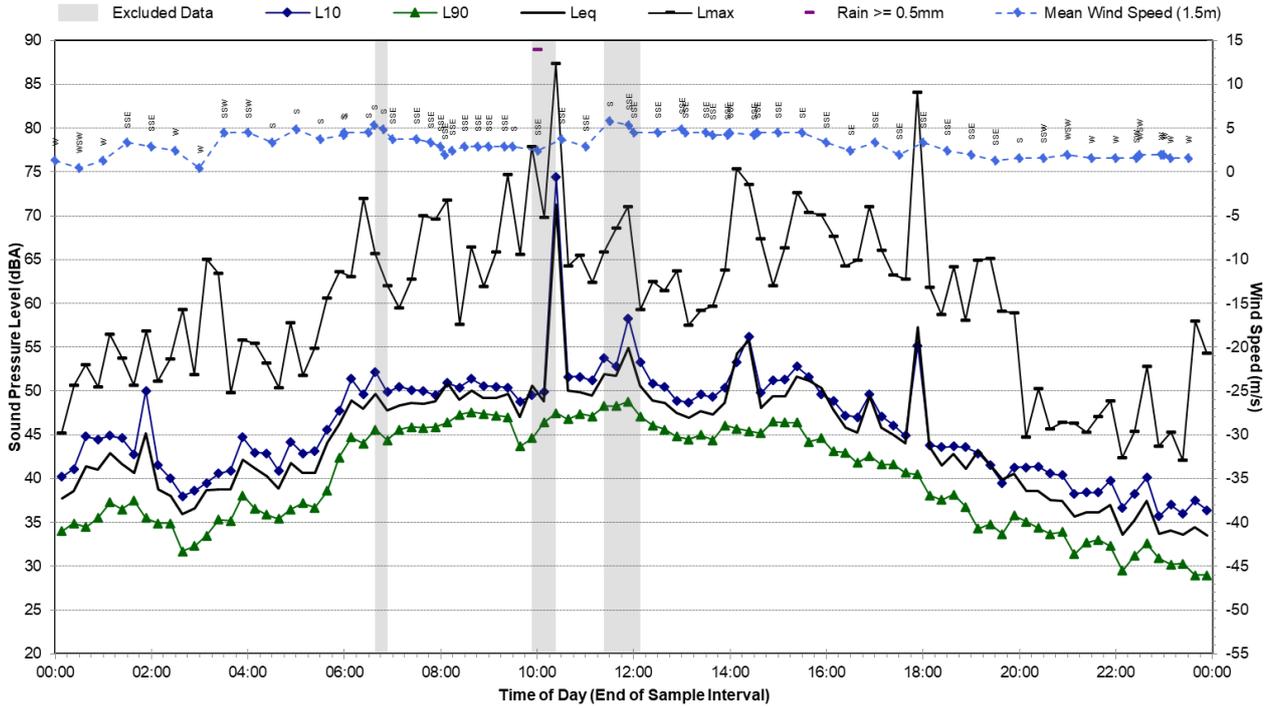
Statistical Ambient Noise Levels

L01 - Greenmeadows Estate - Thursday, 15 October 2020



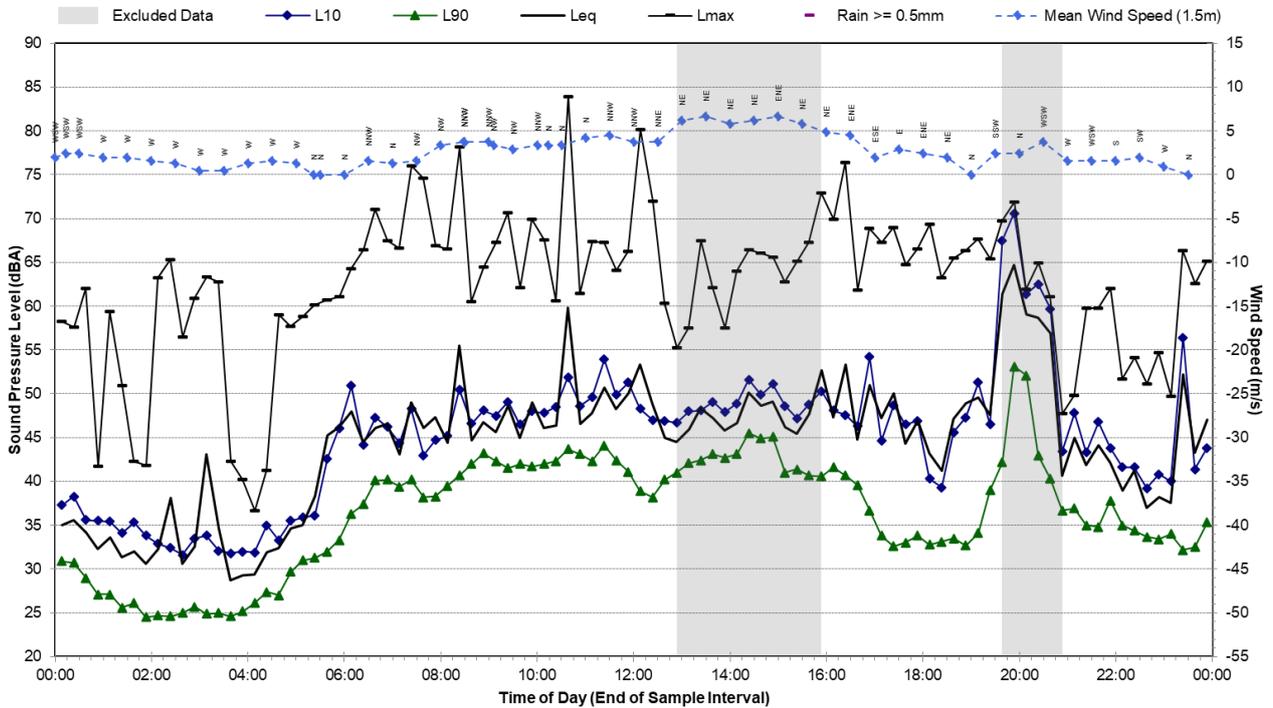
Statistical Ambient Noise Levels

L01 - Greenmeadows Estate - Friday, 16 October 2020



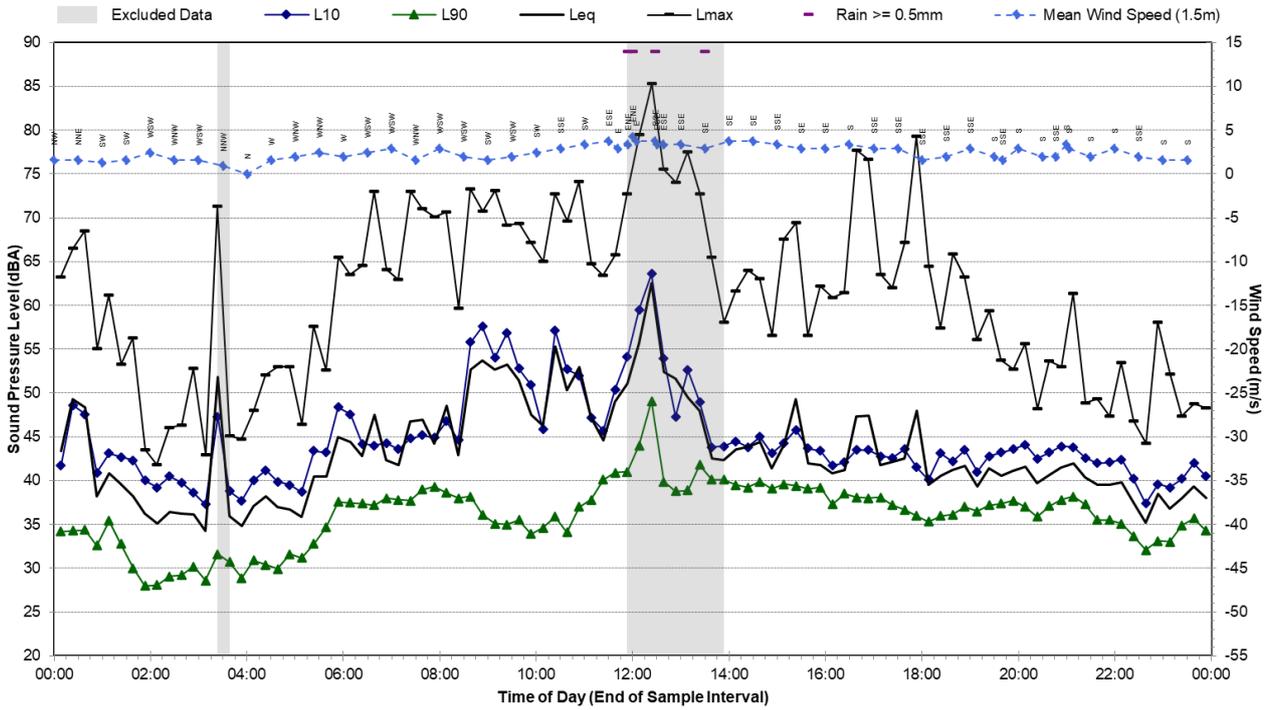
Statistical Ambient Noise Levels

L01 - Greenmeadows Estate - Saturday, 17 October 2020



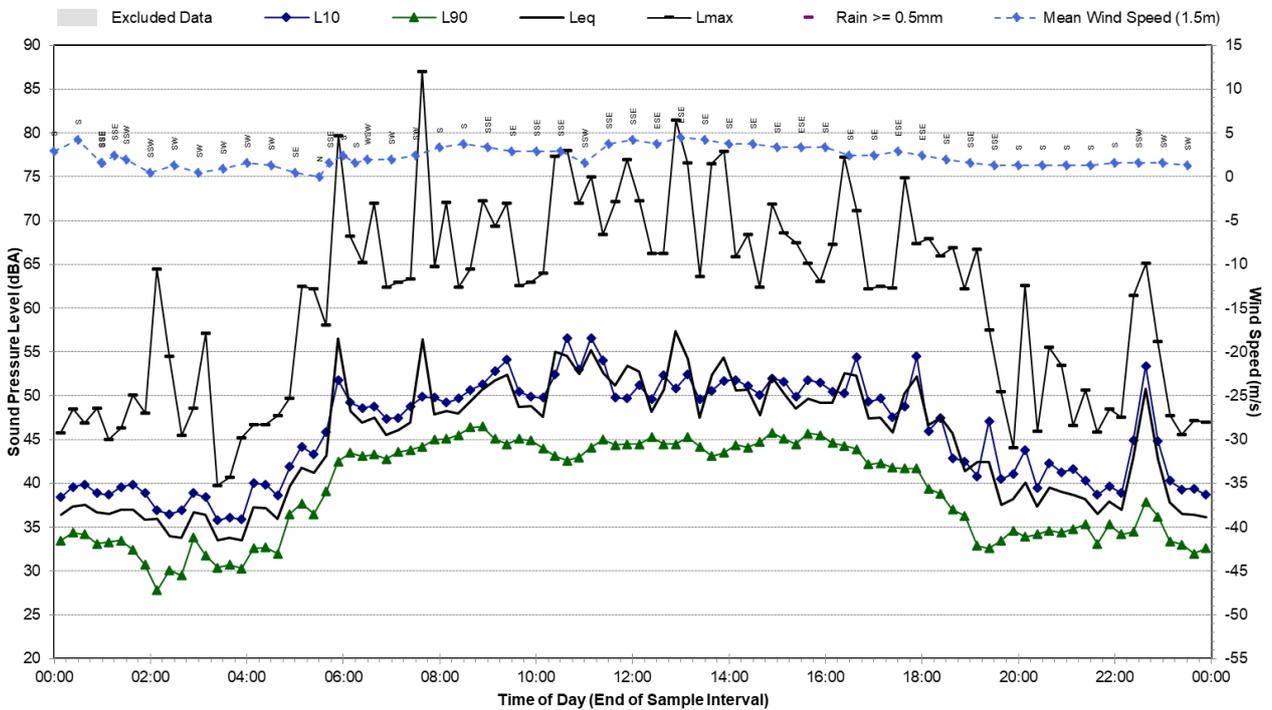
Statistical Ambient Noise Levels

L01 - Greenmeadows Estate - Sunday, 18 October 2020



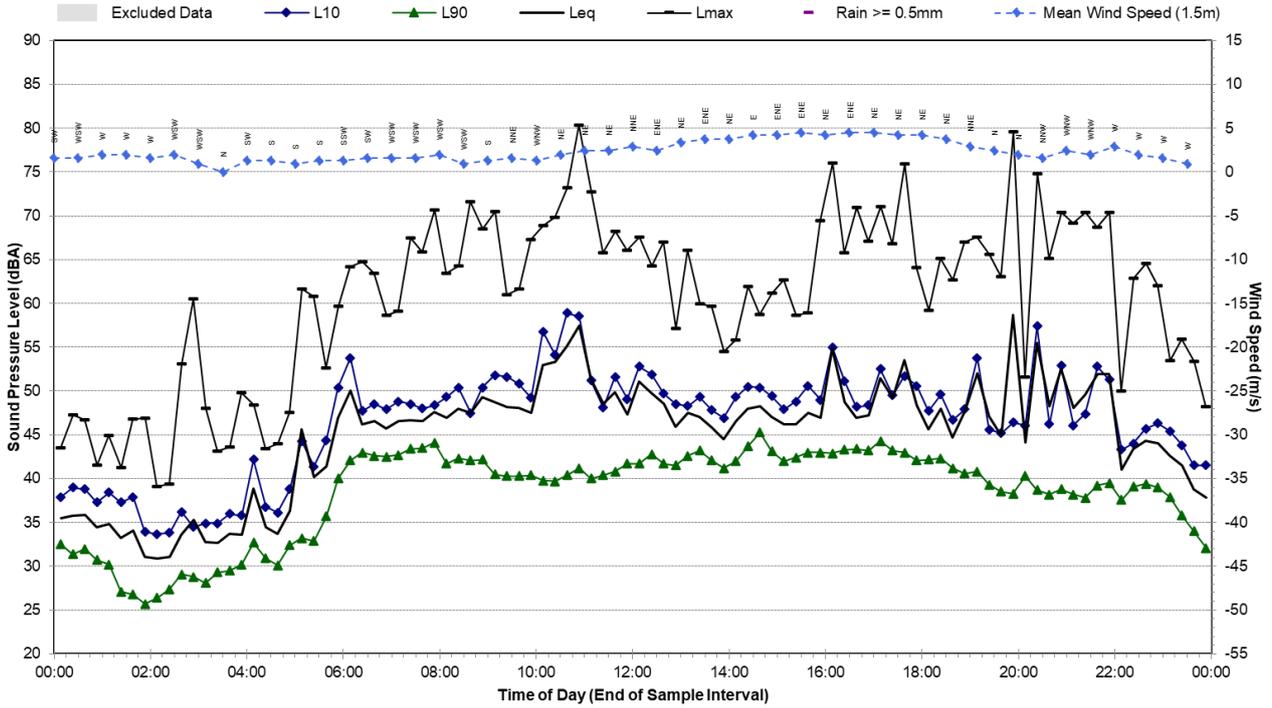
Statistical Ambient Noise Levels

L01 - Greenmeadows Estate - Monday, 19 October 2020



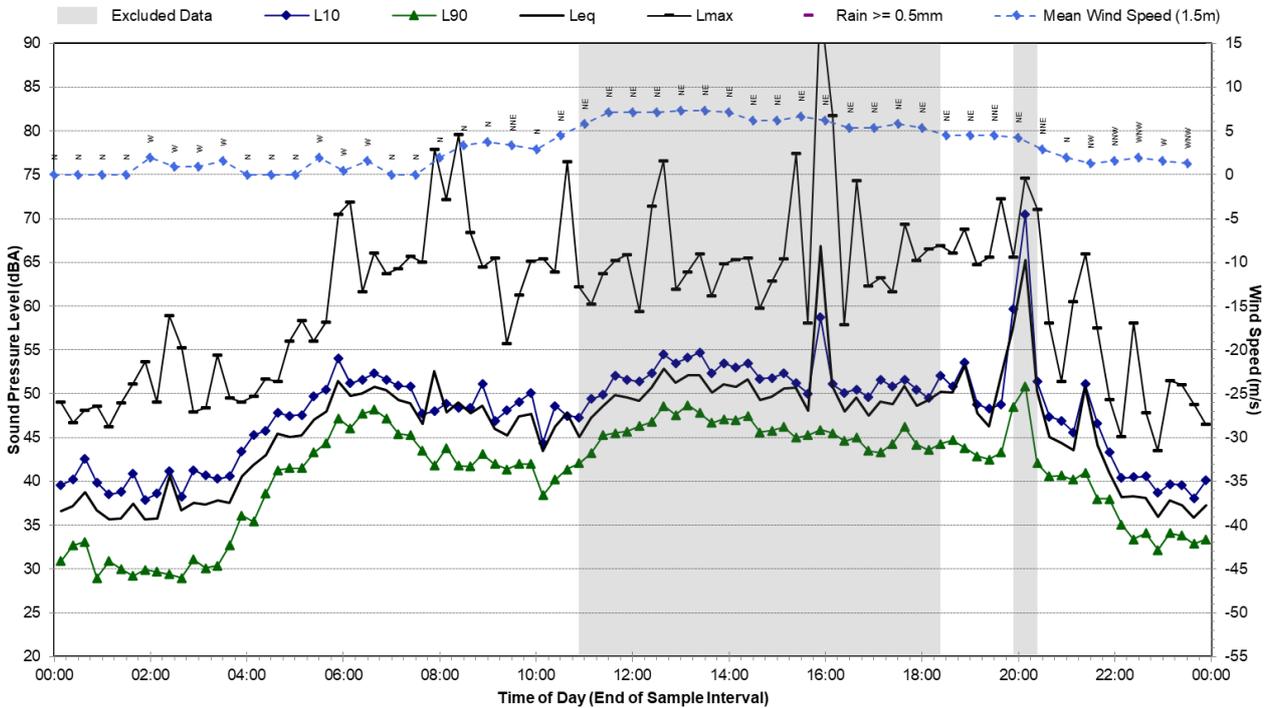
Statistical Ambient Noise Levels

L01 - Greenmeadows Estate - Tuesday, 20 October 2020



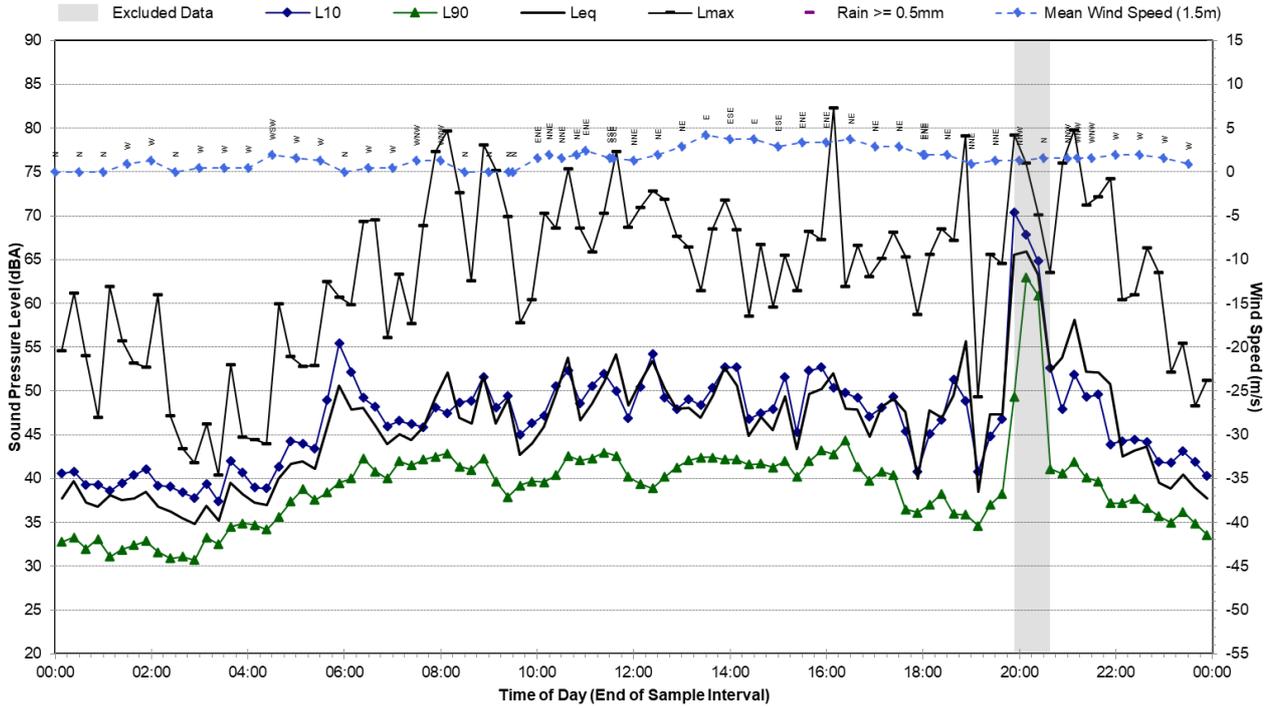
Statistical Ambient Noise Levels

L01 - Greenmeadows Estate - Wednesday, 21 October 2020



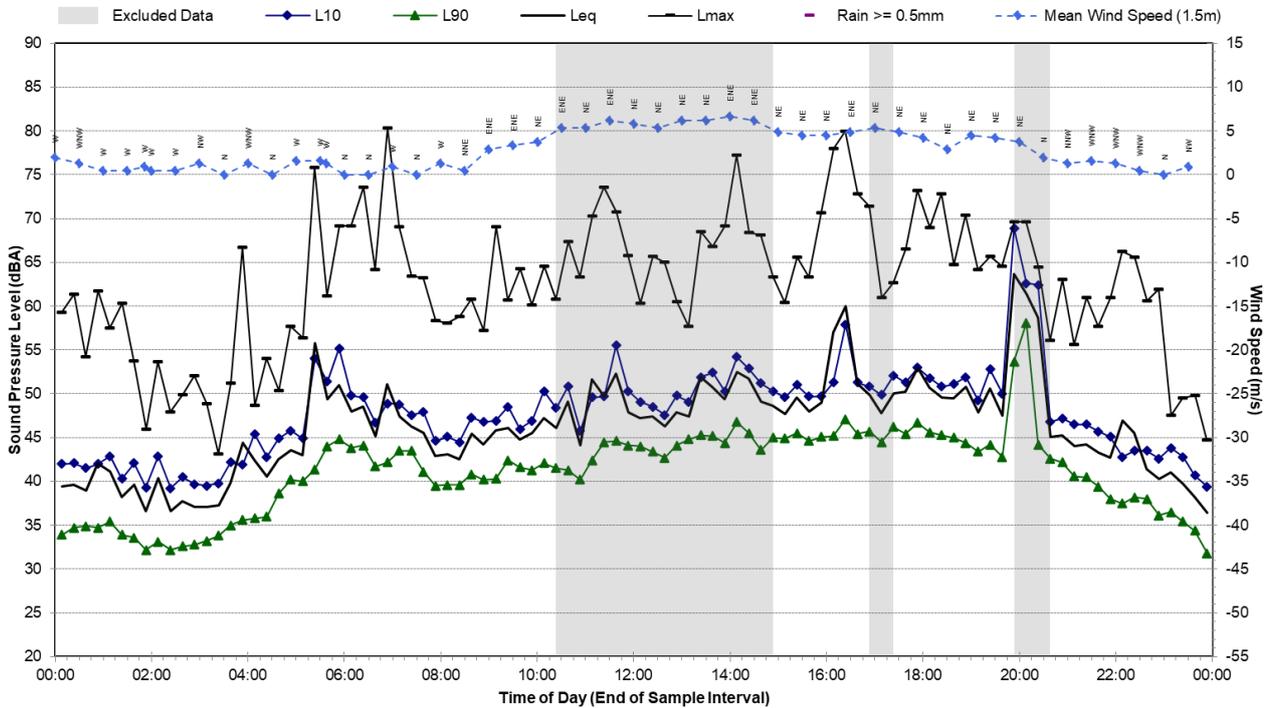
Statistical Ambient Noise Levels

L01 - Greenmeadows Estate - Thursday, 22 October 2020



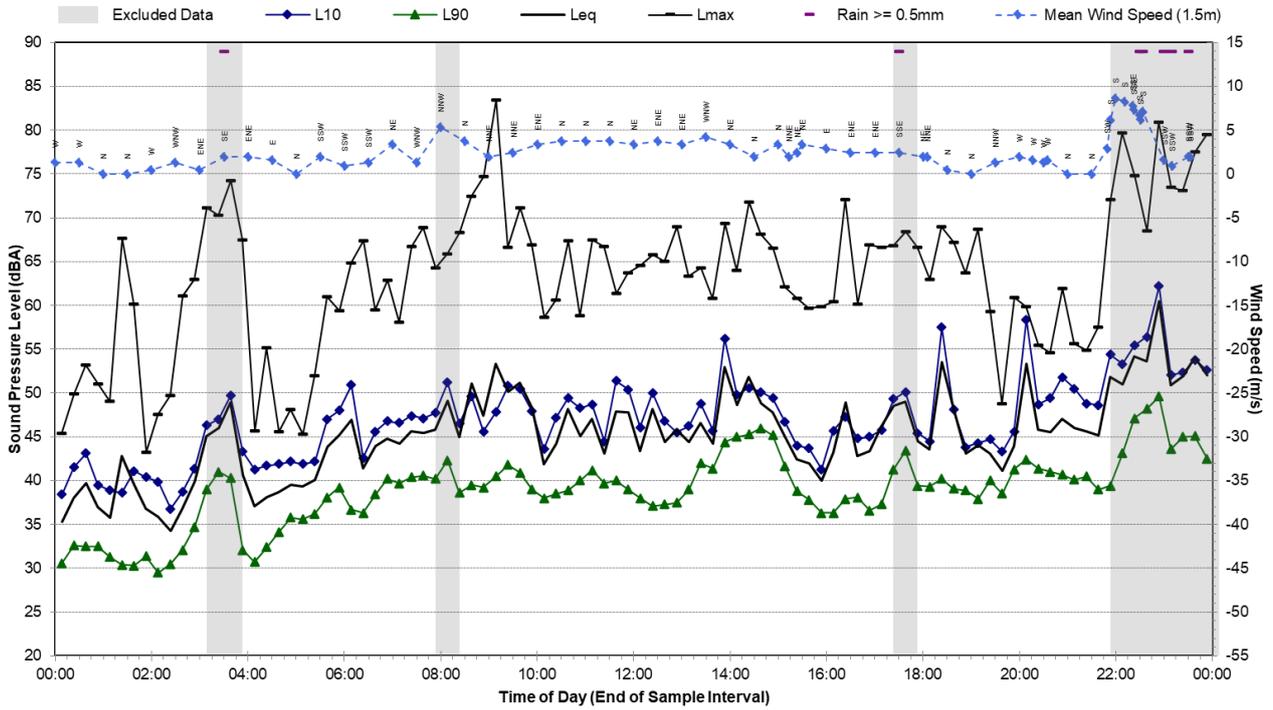
Statistical Ambient Noise Levels

L01 - Greenmeadows Estate - Friday, 23 October 2020



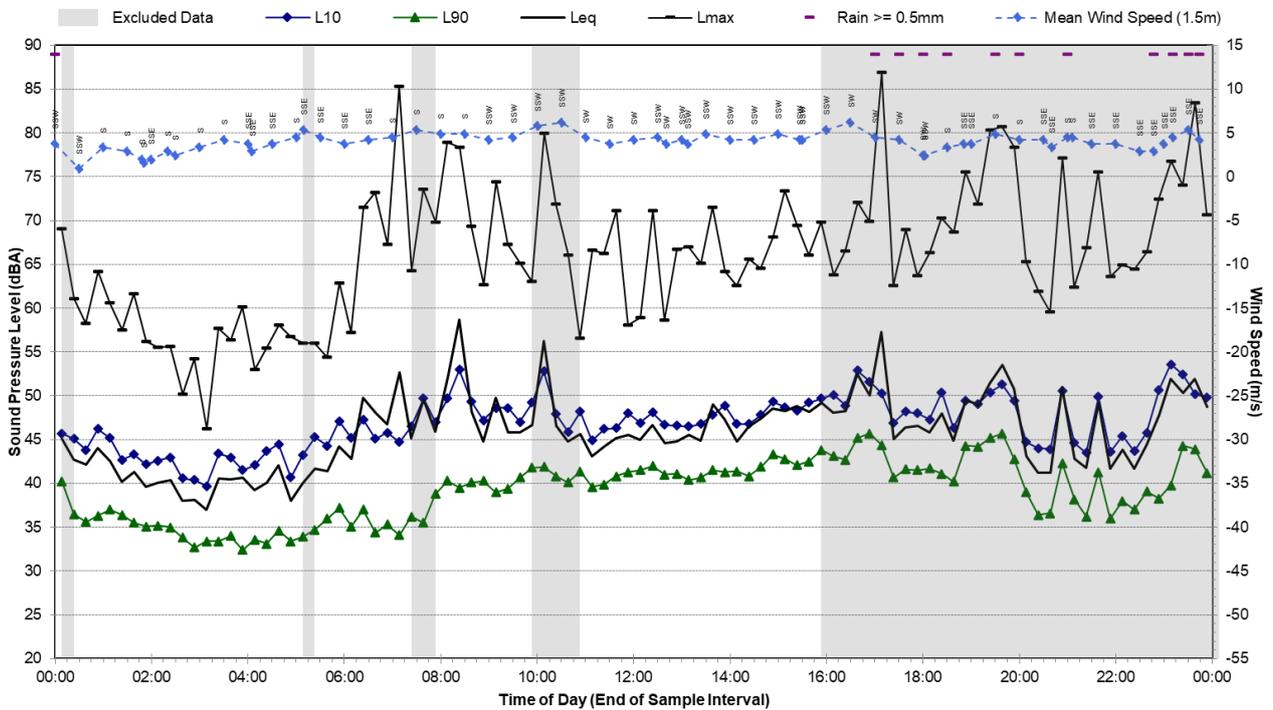
Statistical Ambient Noise Levels

L01 - Greenmeadows Estate - Saturday, 24 October 2020



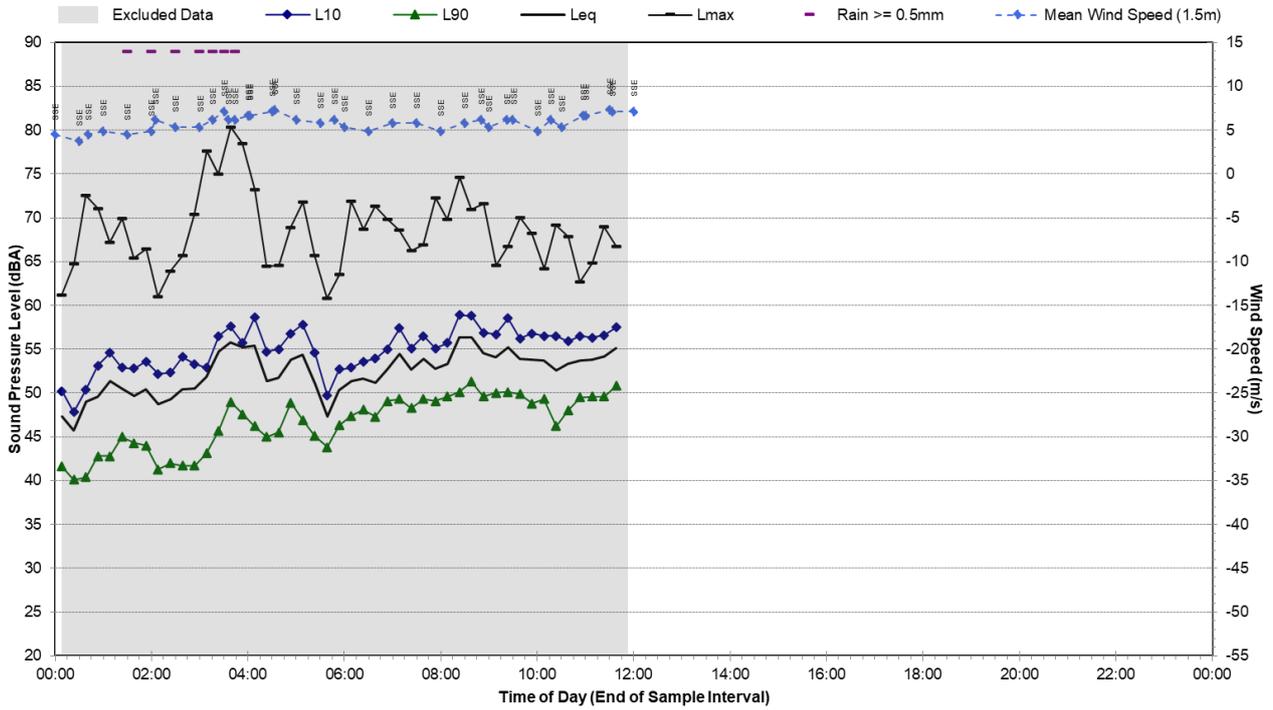
Statistical Ambient Noise Levels

L01 - Greenmeadows Estate - Sunday, 25 October 2020



Statistical Ambient Noise Levels

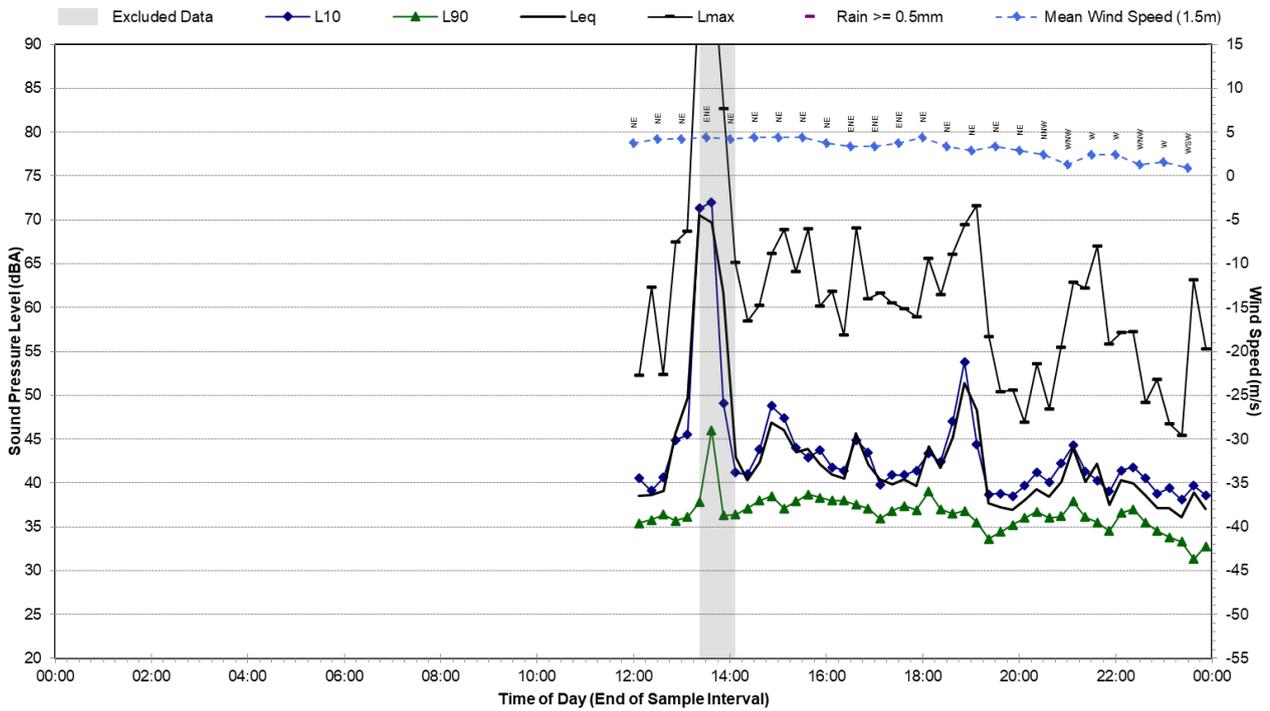
L01 - Greenmeadows Estate - Monday, 26 October 2020



Noise Monitoring Location		L02			Map of Noise Monitoring Location
Noise Monitoring Address		Figtree Hill "The Cottage" – R1			
<p>Logger Device Type: Svantek 957, Logger Serial No: 20674 Sound Level Meter Device Type: Brüel and Kjær 2250L, Sound Level Meter Serial No: 3004636</p> <p>Ambient noise logger deployed adjacent to Figtree Hill "The Cottage" (R1). The Cleary Bros Albion Park Quarry extraction area is located to the southwest of the logger location, with East West Link and Albion Park Rail Bypass to the northwest and Princes Highway to the northeast.</p> <p>Background noise during the measurement was primarily road traffic noise from Princes Highway and East West Link. Birds, livestock, aircraft and wind noise in vegetation also contributed to the LAeq at this location during the measurement. The Albion Park Quarry extraction area equipment was intermittently audible during the measurement.</p> <p>Recorded Noise Levels (LAmax): 12/10/2020: APRB construction equipment: occasionally audible, East West Link traffic: up to 38 dBA, Princes Highway traffic: up to 37 dBA, Birds: up to 63 dBA, Livestock: up to 49 dBA, Aircraft: 44 dBA, Wind in vegetation: up to 40 dBA. Albion Park Quarry extraction area equipment intermittently audible, up to 43 dBA.</p>					
Ambient Noise Logging Results – NPfi Defined Time Periods					
Monitoring Period	Noise Level (dBA)				
	RBL	LAeq	L10	L1	
Daytime	36	48	47	56	
Evening	35	43	41	47	
Night-time	28	44	38	46	
Attended Noise Measurement Results					
Date	Start Time	Measured Noise Level (dBA)			
		LA90	LAeq	LAmax	
12/10/2020	11:33	36	44	63	
					

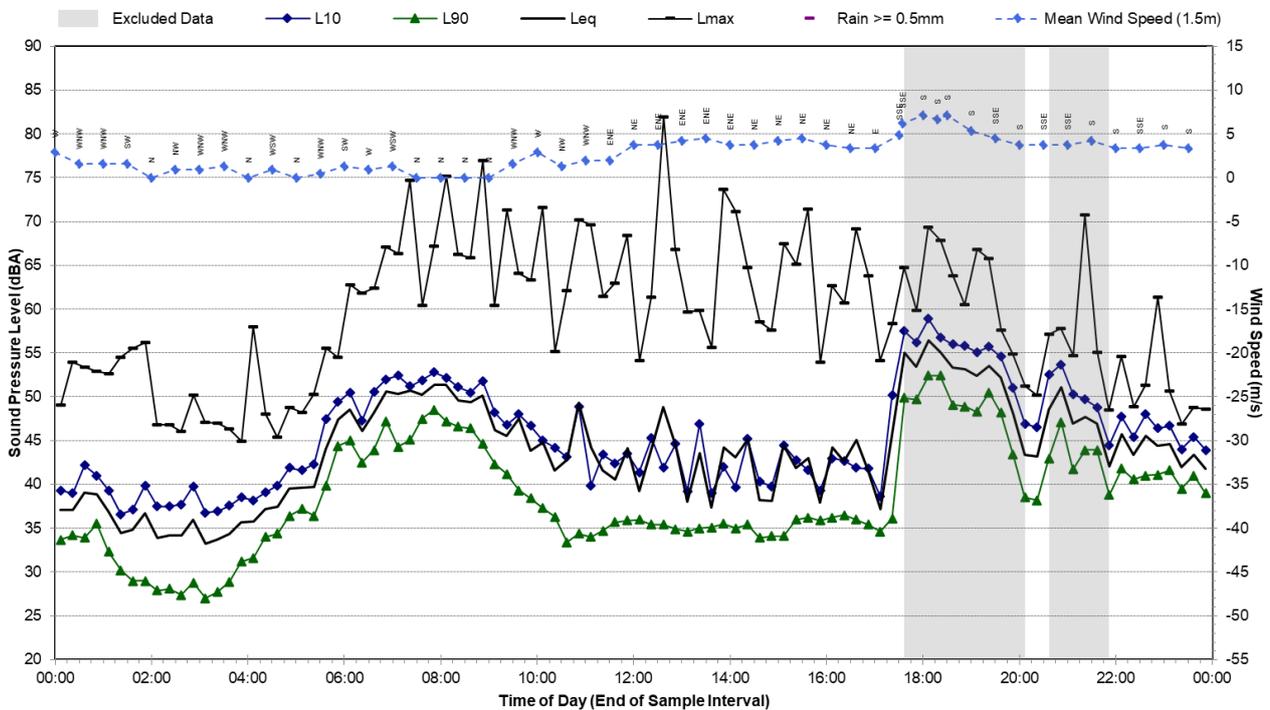
Statistical Ambient Noise Levels

L02 - Figtree Hill "The Cottage" (R1) - Monday, 12 October 2020



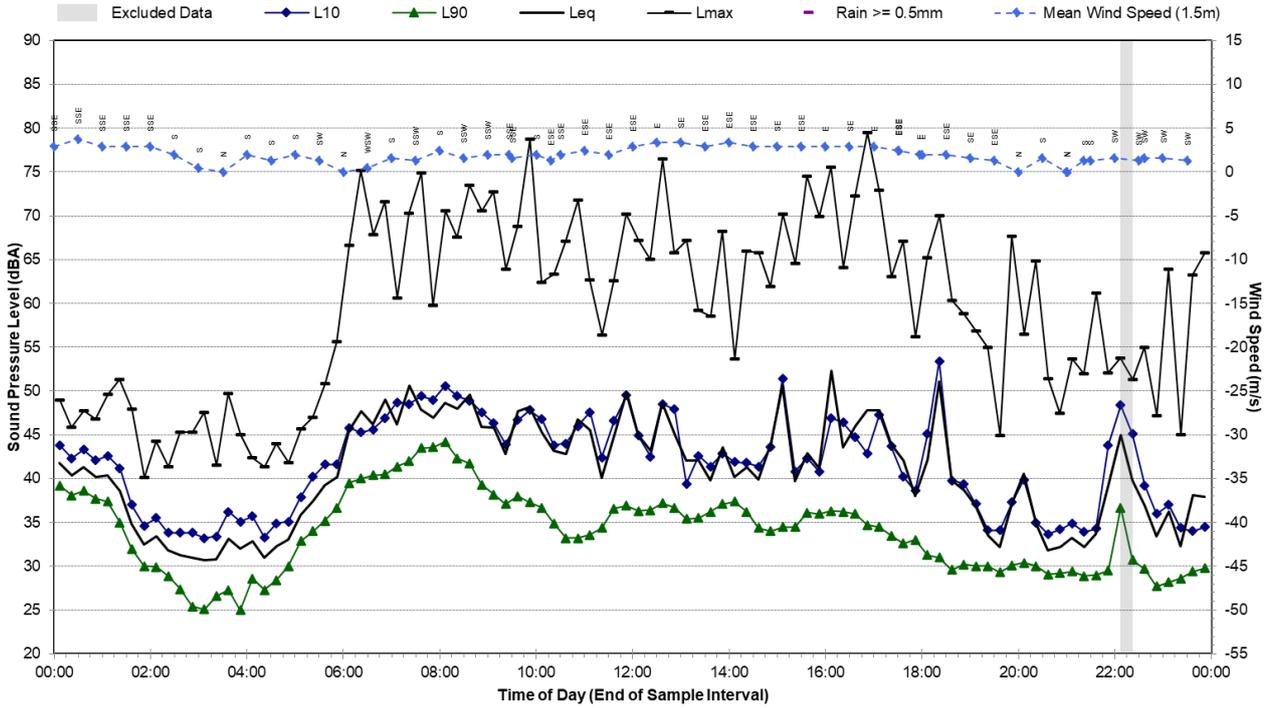
Statistical Ambient Noise Levels

L02 - Figtree Hill "The Cottage" (R1) - Tuesday, 13 October 2020



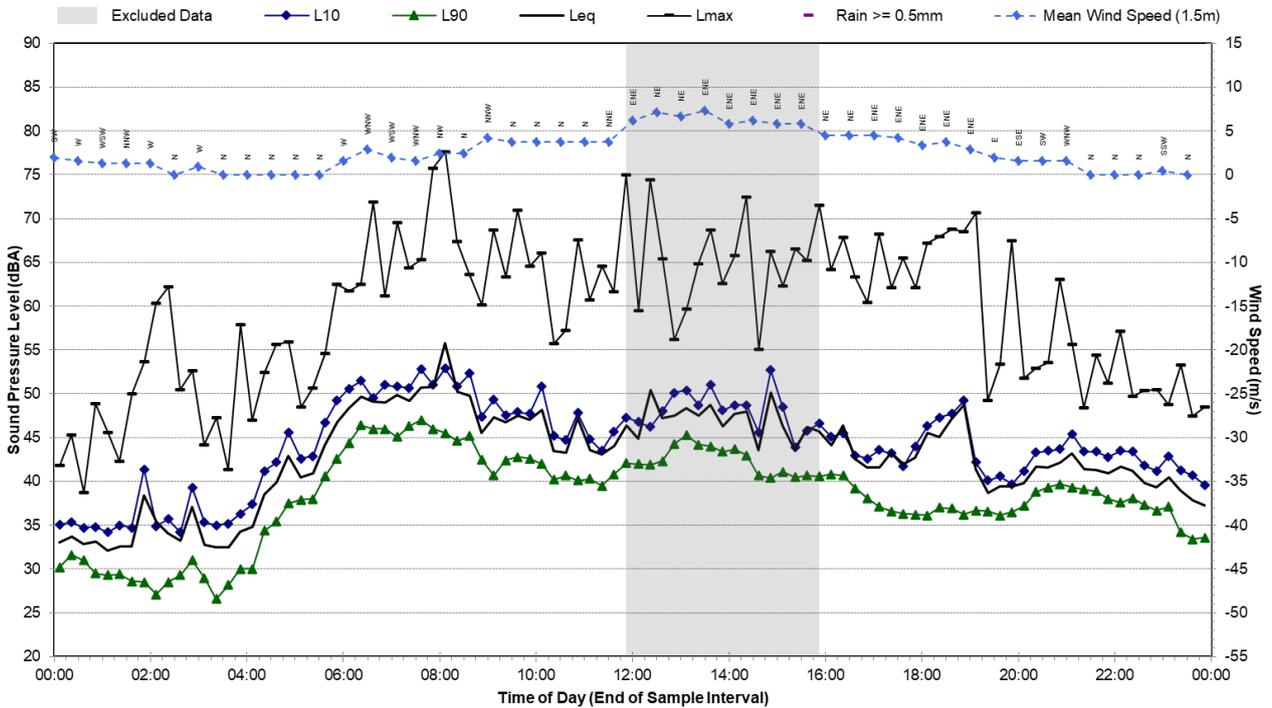
Statistical Ambient Noise Levels

L02 - Figtree Hill "The Cottage" (R1) - Wednesday, 14 October 2020



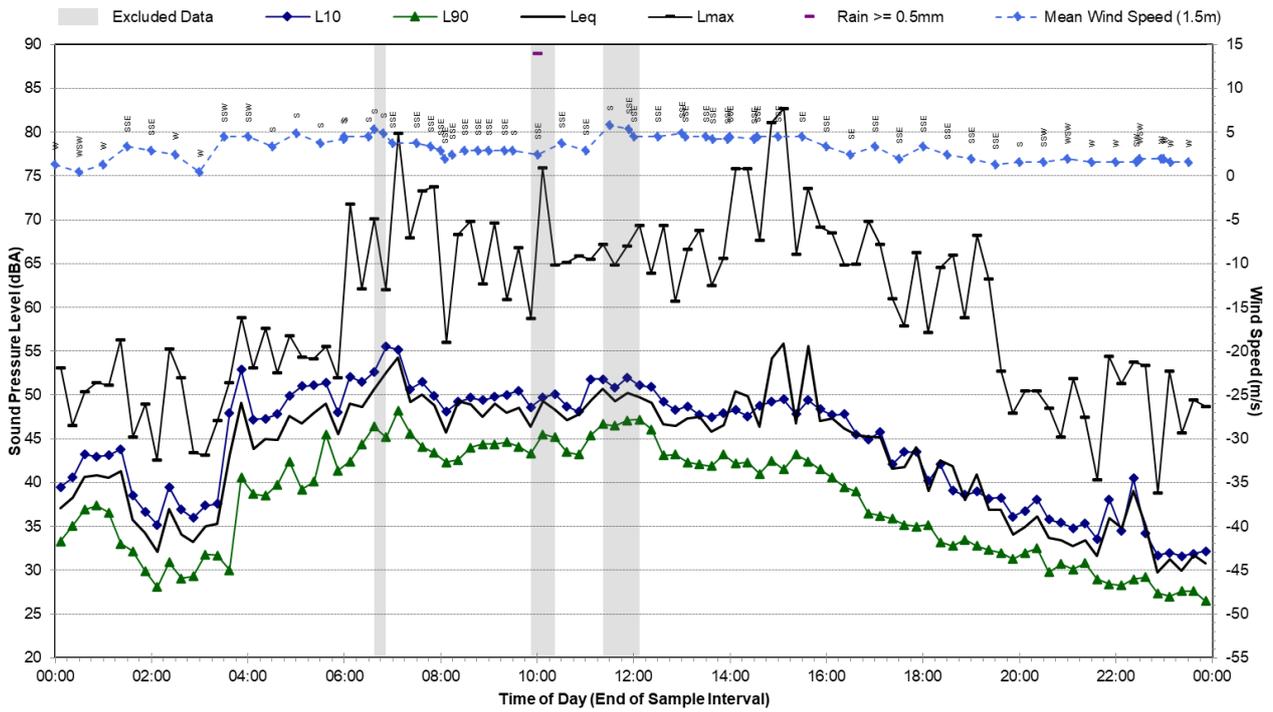
Statistical Ambient Noise Levels

L02 - Figtree Hill "The Cottage" (R1) - Thursday, 15 October 2020



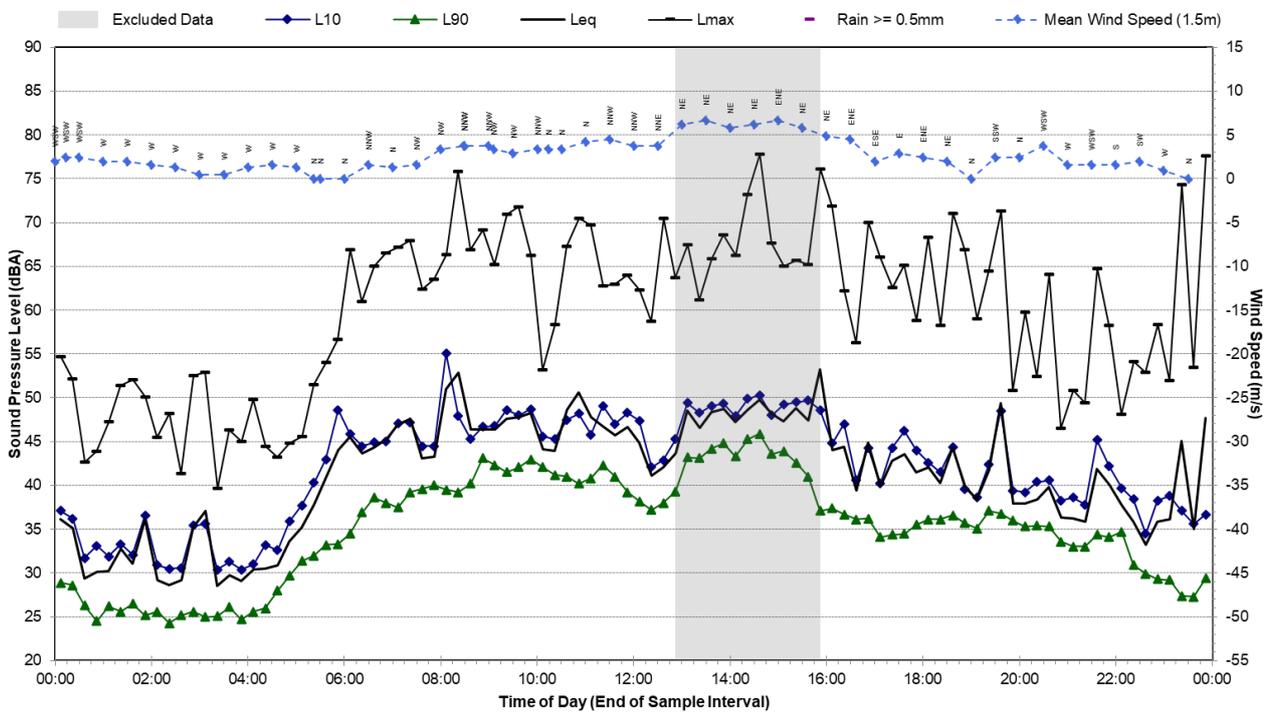
Statistical Ambient Noise Levels

L02 - Figtree Hill "The Cottage" (R1) - Friday, 16 October 2020



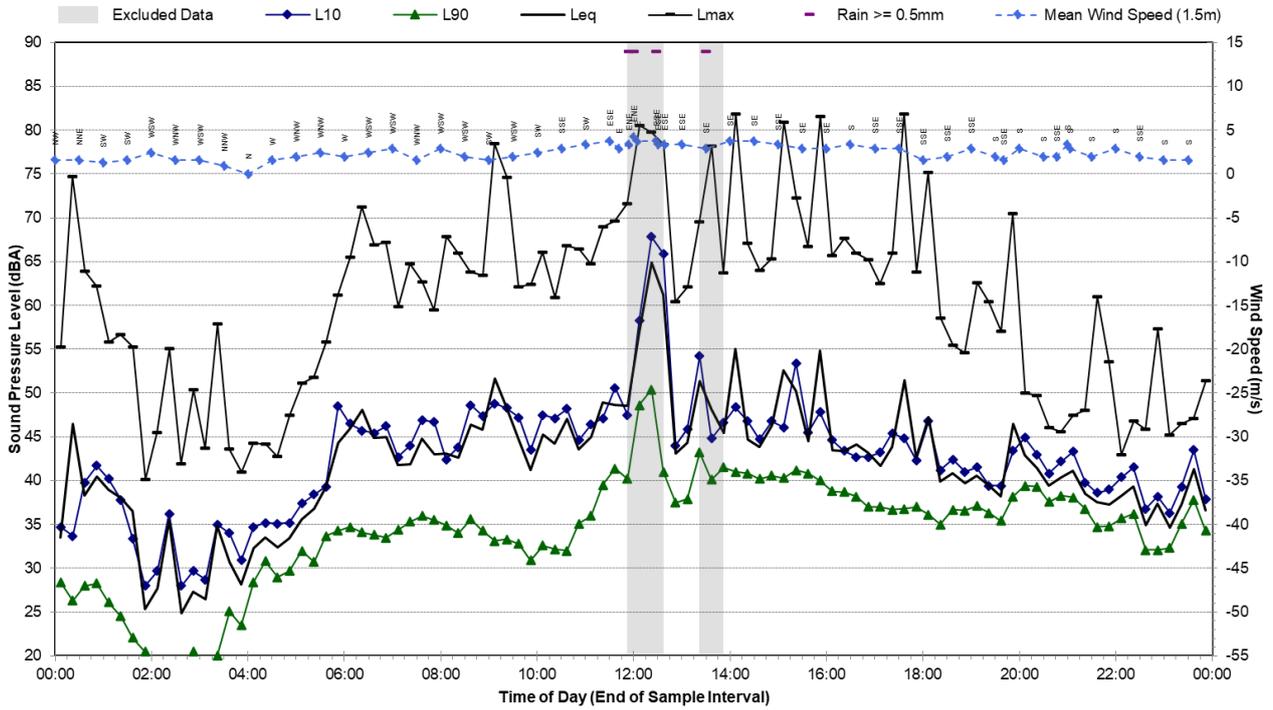
Statistical Ambient Noise Levels

L02 - Figtree Hill "The Cottage" (R1) - Saturday, 17 October 2020



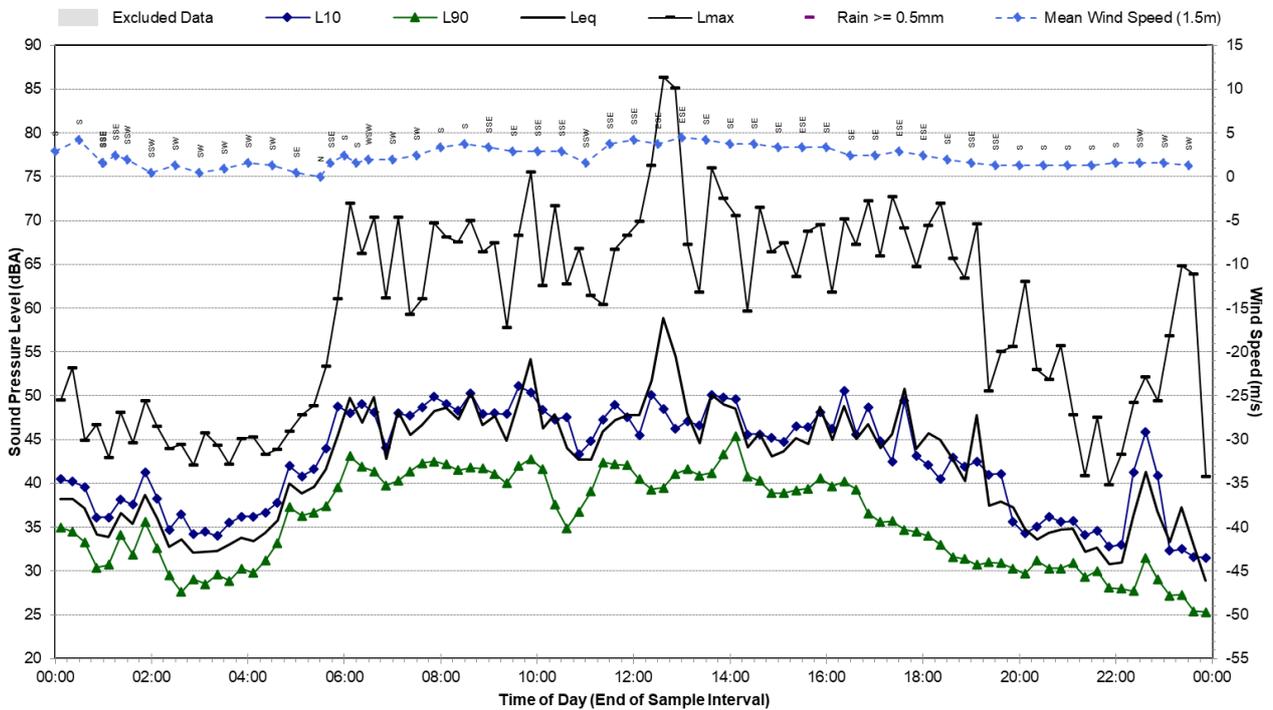
Statistical Ambient Noise Levels

L02 - Figtree Hill "The Cottage" (R1) - Sunday, 18 October 2020



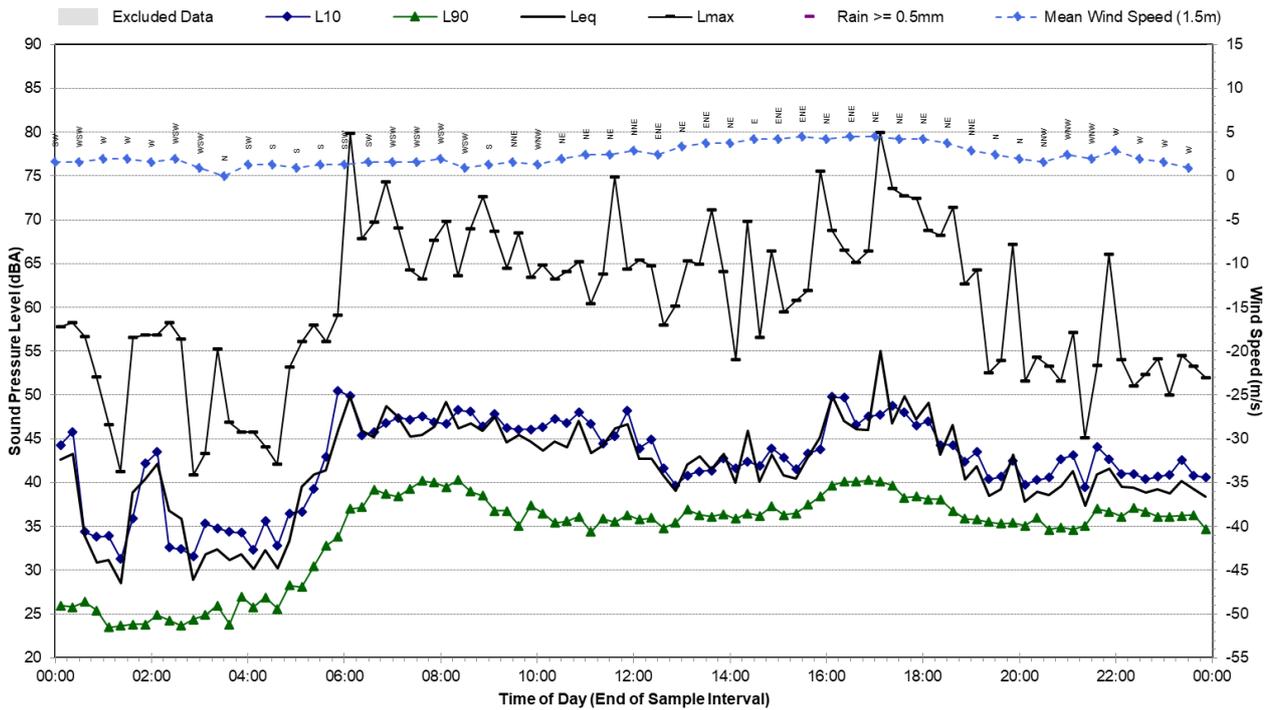
Statistical Ambient Noise Levels

L02 - Figtree Hill "The Cottage" (R1) - Monday, 19 October 2020



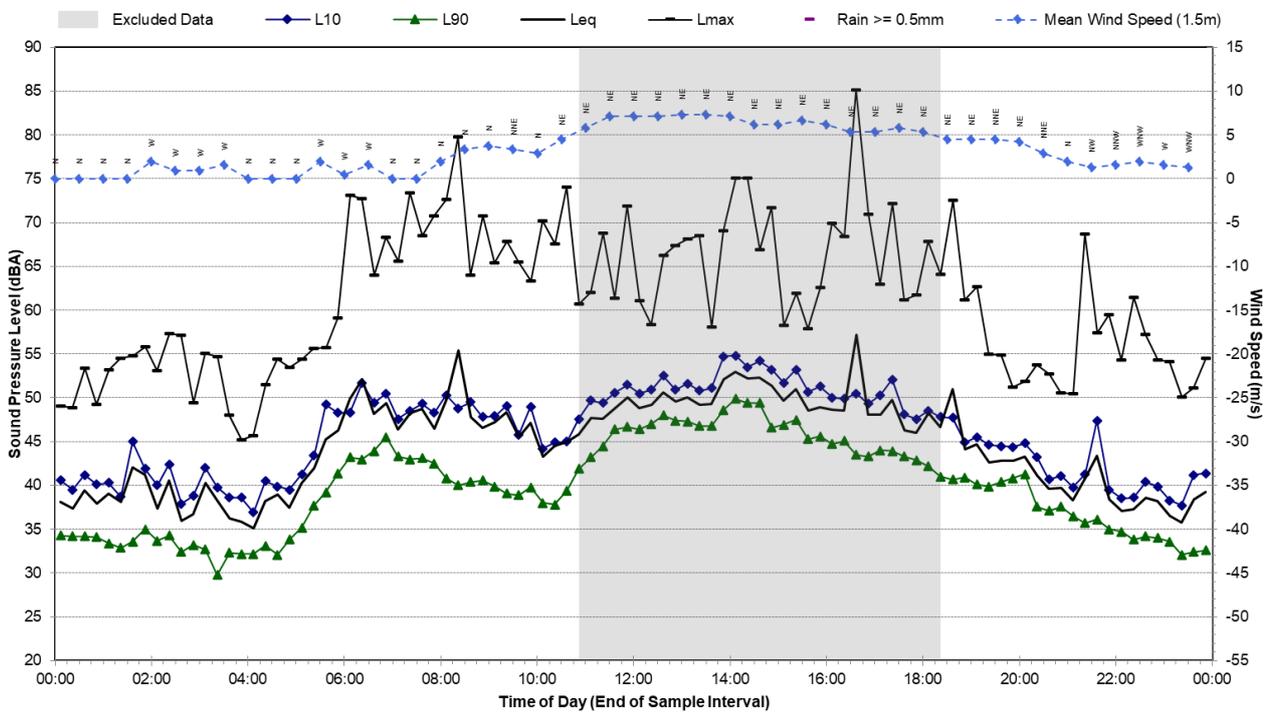
Statistical Ambient Noise Levels

L02 - Figtree Hill "The Cottage" (R1) - Tuesday, 20 October 2020



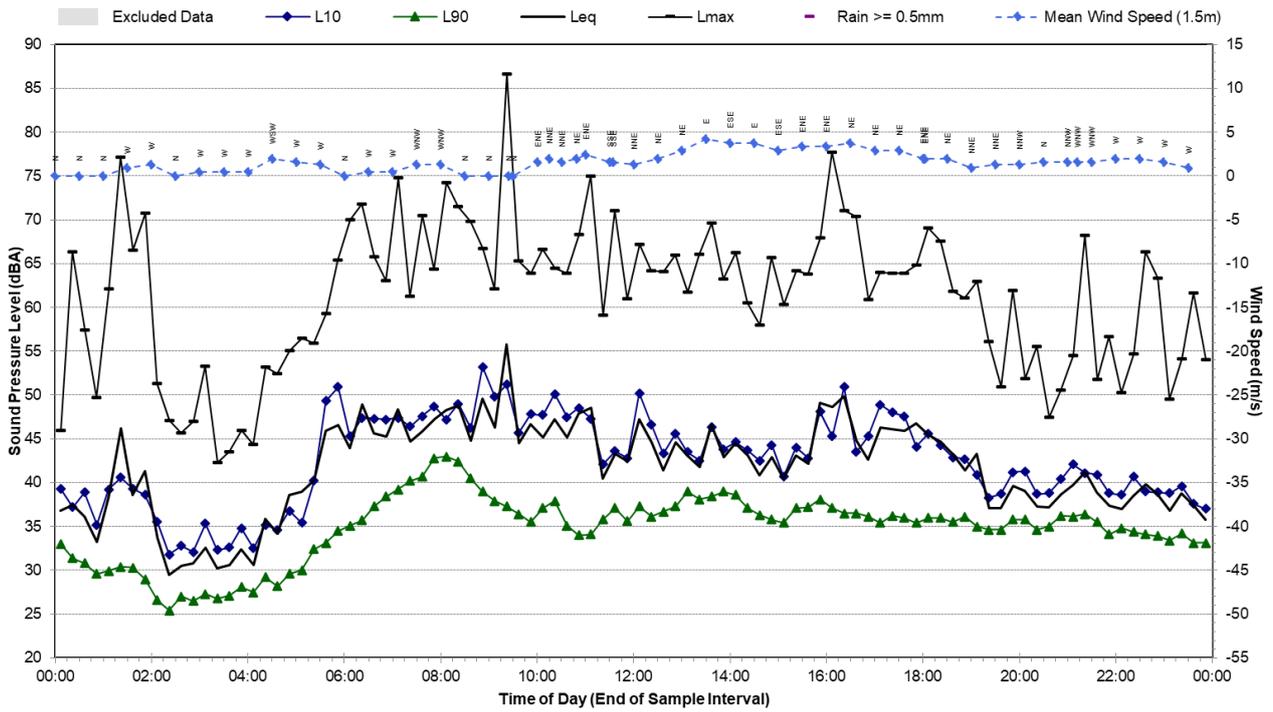
Statistical Ambient Noise Levels

L02 - Figtree Hill "The Cottage" (R1) - Wednesday, 21 October 2020



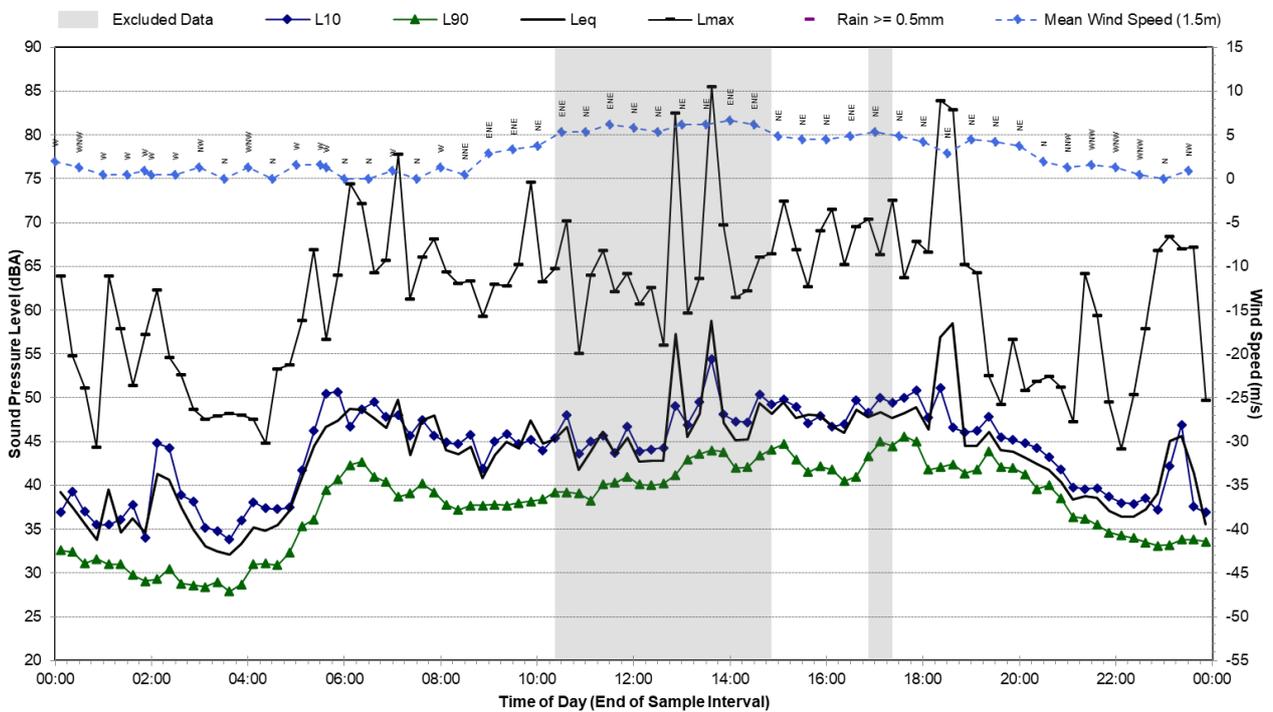
Statistical Ambient Noise Levels

L02 - Figtree Hill "The Cottage" (R1) - Thursday, 22 October 2020



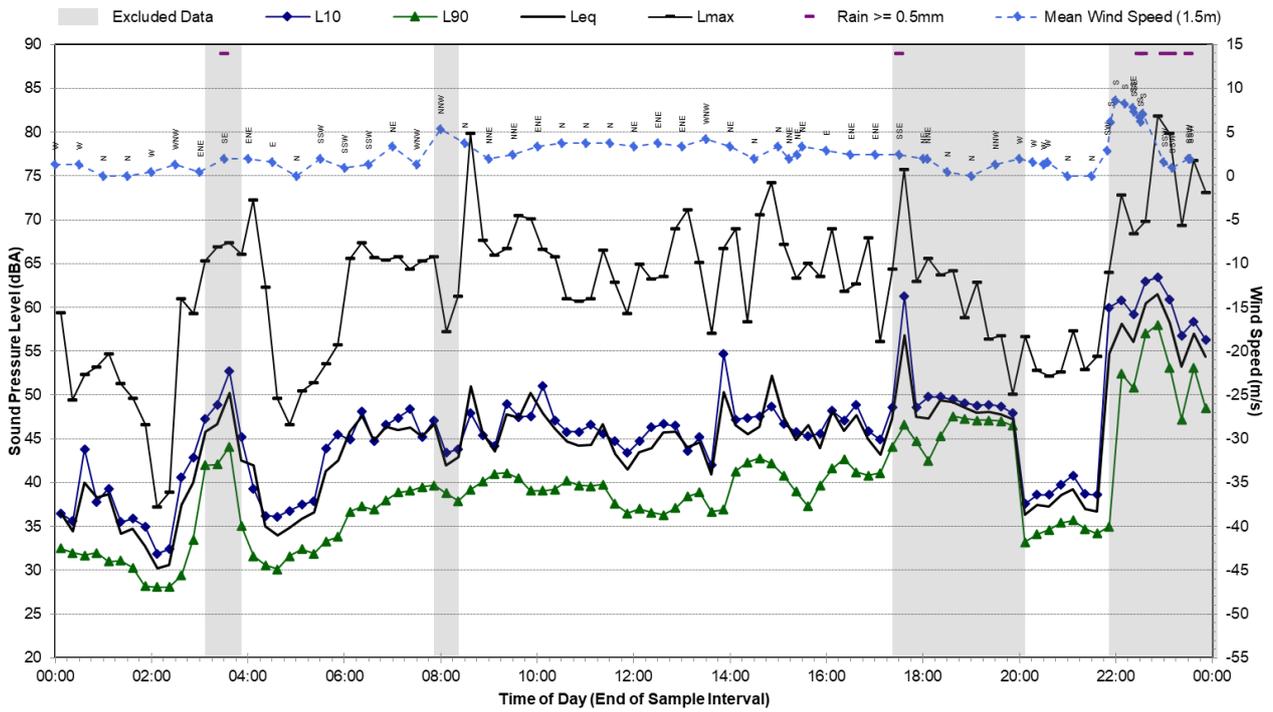
Statistical Ambient Noise Levels

L02 - Figtree Hill "The Cottage" (R1) - Friday, 23 October 2020



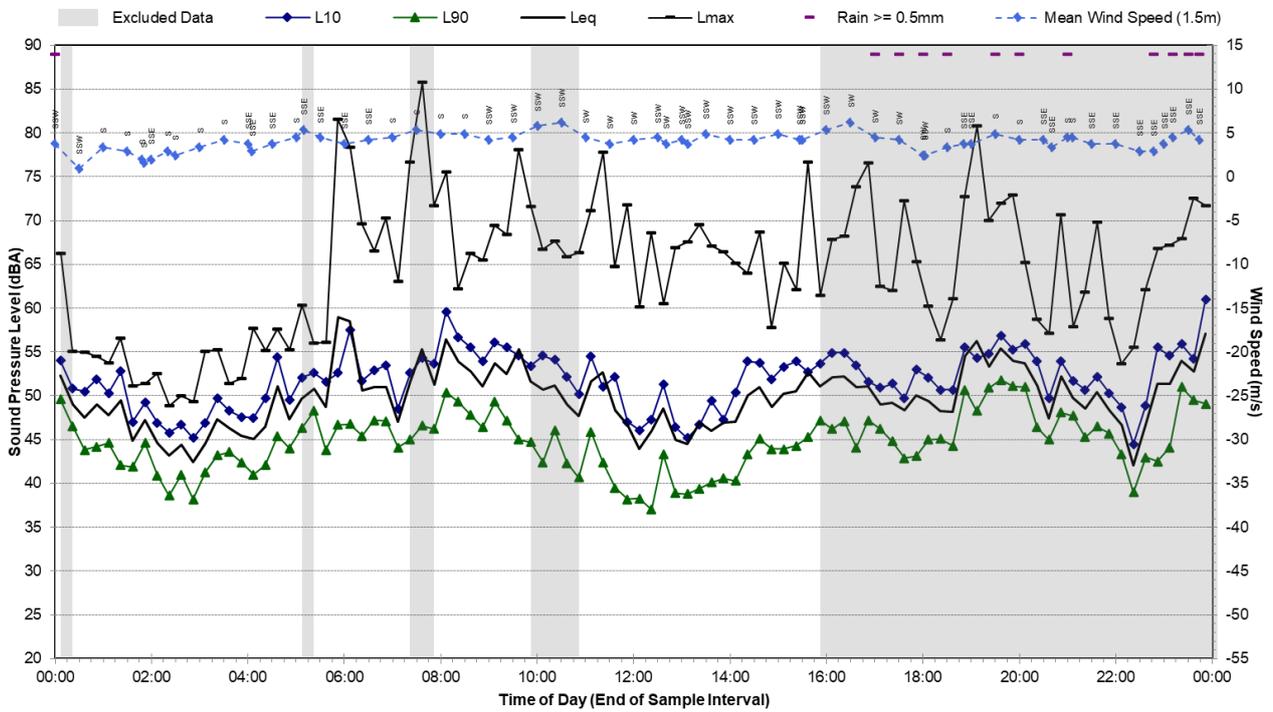
Statistical Ambient Noise Levels

L02 - Figtree Hill "The Cottage" (R1) - Saturday, 24 October 2020



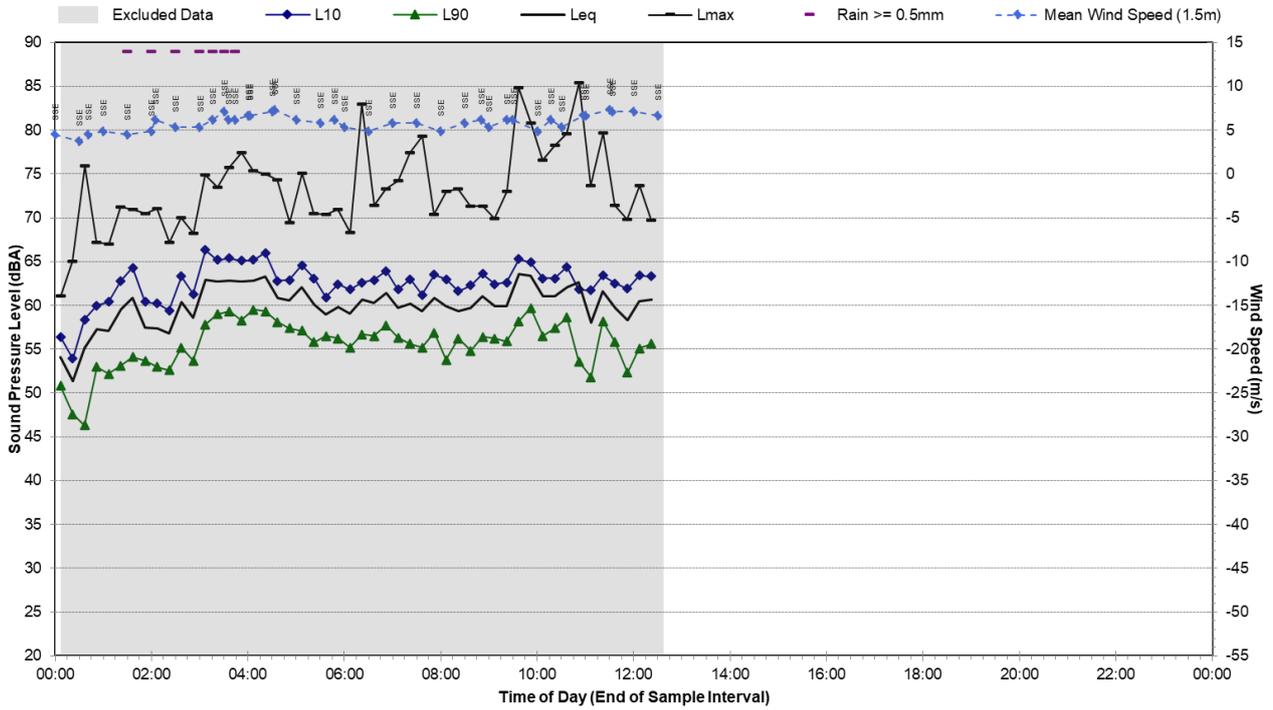
Statistical Ambient Noise Levels

L02 - Figtree Hill "The Cottage" (R1) - Sunday, 25 October 2020



Statistical Ambient Noise Levels

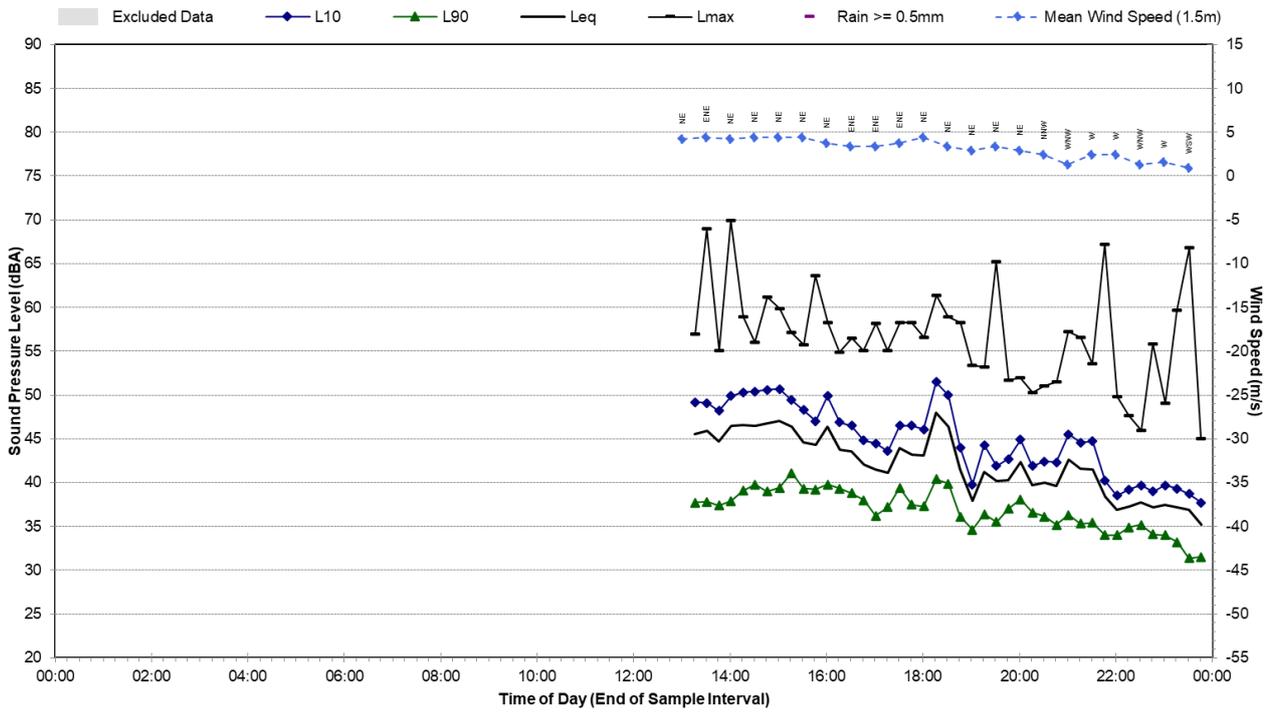
L02 - Figtree Hill "The Cottage" (R1) - Monday, 26 October 2020



Noise Monitoring Location		L03			Map of Noise Monitoring Location																							
Noise Monitoring Address		Figtree Hill "Approved Residence" – R3																										
<p>Logger Device Type: Svantek 957, Logger Serial No: 23241 Sound Level Meter Device Type: Brüel and Kjær 2250L, Sound Level Meter Serial No: 3004636</p> <p>Ambient noise logger deployed the approximate location of the Figtree Hill "Approved Residence" (R3). The Cleary Bros Albion Park Quarry extraction area is located to the west of the logger location, with Princes Highway to the northeast.</p> <p>Background noise during the measurement was primarily road traffic noise from Princes Highway. Birds, livestock and wind noise in vegetation also contributed to the LAeq at this location during the measurement. The Albion Park Quarry extraction area equipment was intermittently audible during the measurement.</p> <p>Recorded Noise Levels (LAmax): 12/10/2020: Princes Highway traffic: up to 38 dBA, Birds: up to 52 dBA, Livestock: up to 43 dBA, Wind in vegetation: up to 44 dBA. Albion Park Quarry extraction area equipment intermittently audible, up to 41 dBA.</p>																												
<p>Ambient Noise Logging Results – NPfI Defined Time Periods</p> <table border="1"> <thead> <tr> <th rowspan="2">Monitoring Period</th> <th colspan="4">Noise Level (dBA)</th> </tr> <tr> <th>RBL</th> <th>LAeq</th> <th>L10</th> <th>L1</th> </tr> </thead> <tbody> <tr> <td>Daytime</td> <td>36</td> <td>49</td> <td>48</td> <td>52</td> </tr> <tr> <td>Evening</td> <td>34</td> <td>46</td> <td>42</td> <td>47</td> </tr> <tr> <td>Night-time</td> <td>27</td> <td>46</td> <td>38</td> <td>43</td> </tr> </tbody> </table>						Monitoring Period	Noise Level (dBA)				RBL	LAeq	L10	L1	Daytime	36	49	48	52	Evening	34	46	42	47	Night-time	27	46	38
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<p>Attended Noise Measurement Results</p> <table border="1"> <thead> <tr> <th rowspan="2">Date</th> <th rowspan="2">Start Time</th> <th colspan="3">Measured Noise Level (dBA)</th> </tr> <tr> <th>LA90</th> <th>LAeq</th> <th>LAmax</th> </tr> </thead> <tbody> <tr> <td>12/10/2020</td> <td>12:58</td> <td>36</td> <td>39</td> <td>52</td> </tr> </tbody> </table>					Date	Start Time	Measured Noise Level (dBA)			LA90	LAeq	LAmax	12/10/2020	12:58	36	39	52											
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		LA90	LAeq	LAmax																								
12/10/2020	12:58	36	39	52																								
<p>Photo of Noise Monitoring Location</p> 																												

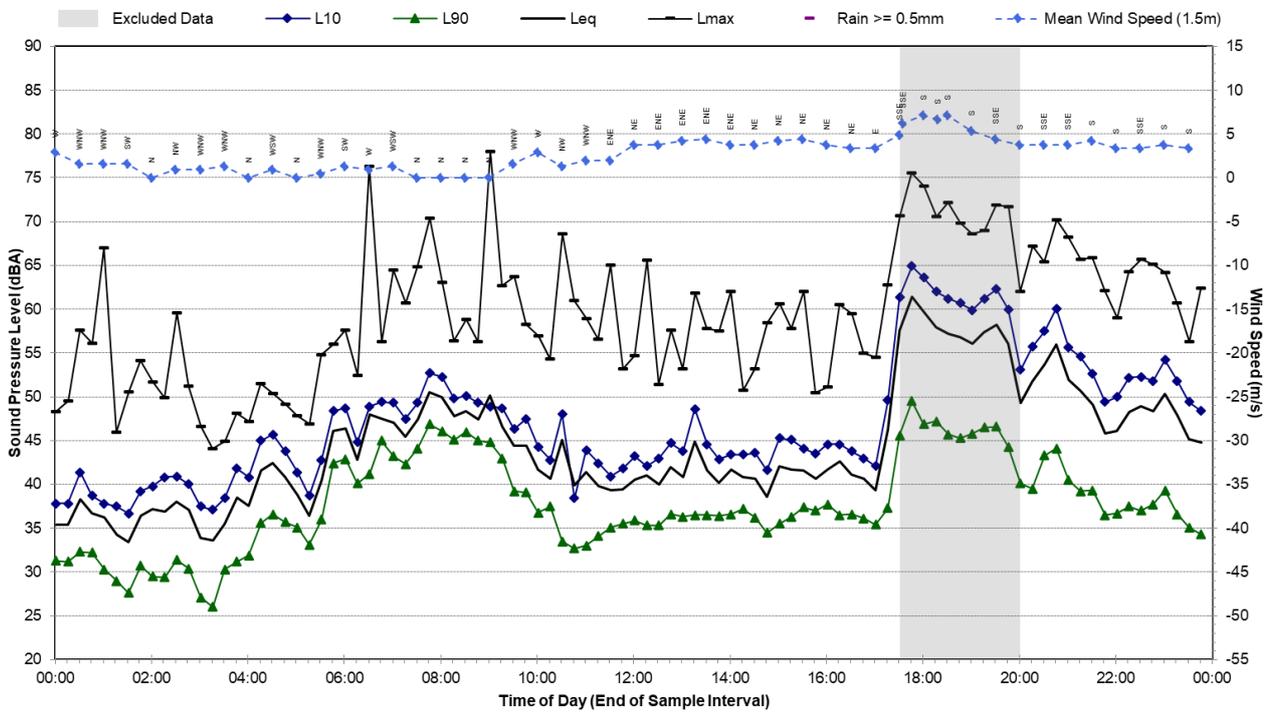
Statistical Ambient Noise Levels

L03 - Figtree Hill "Approved Residence" (R3) - Monday, 12 October 2020



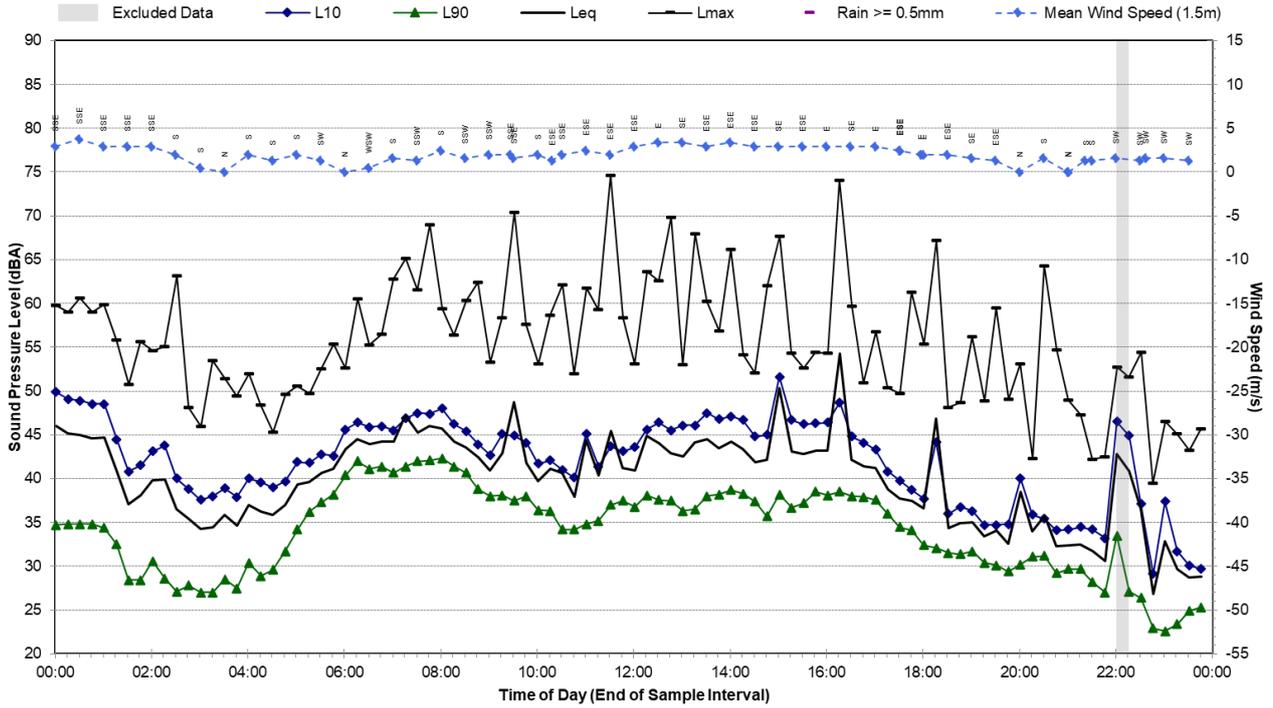
Statistical Ambient Noise Levels

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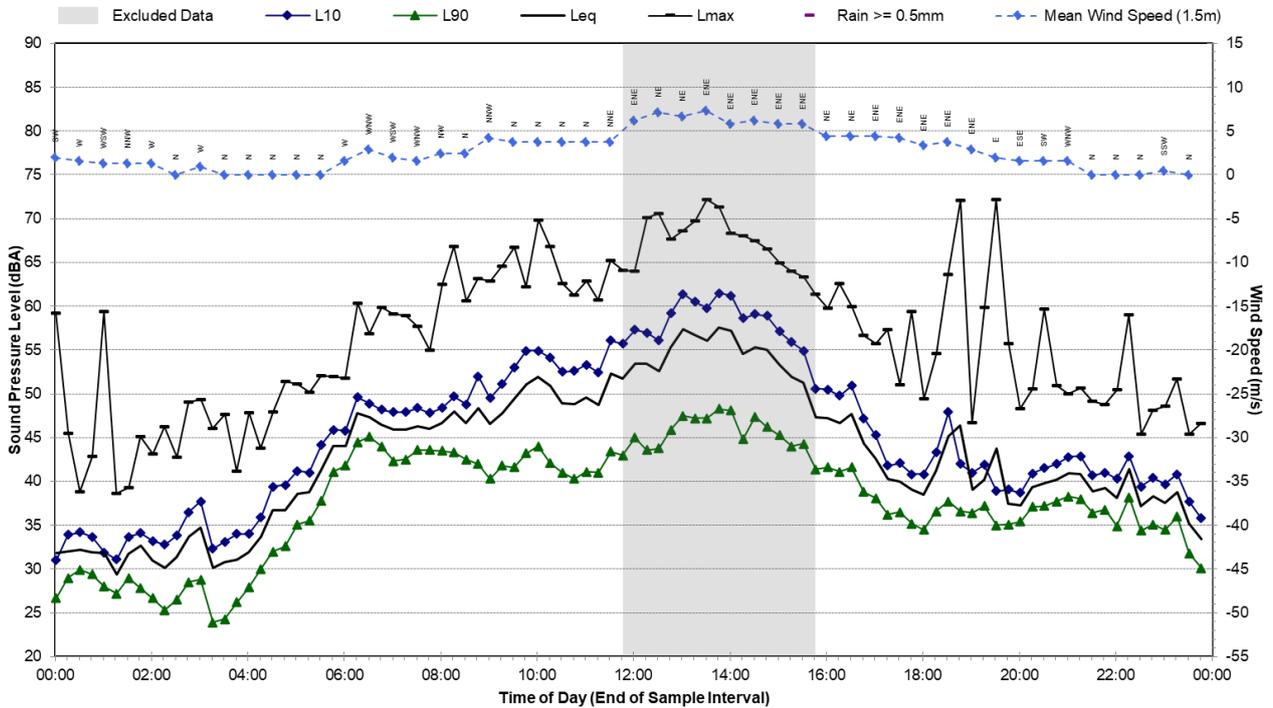
Statistical Ambient Noise Levels

L03 - Figtree Hill "Approved Residence" (R3) - Wednesday, 14 October 2020



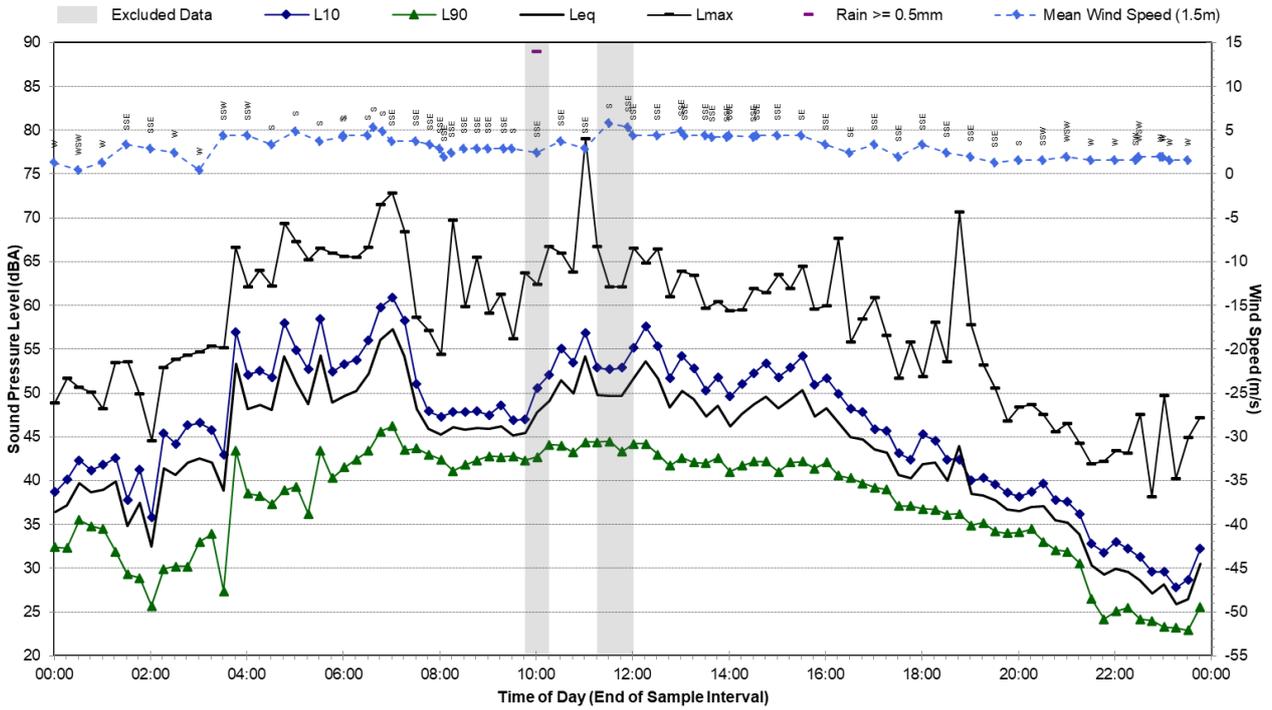
Statistical Ambient Noise Levels

L03 - Figtree Hill "Approved Residence" (R3) - Thursday, 15 October 2020



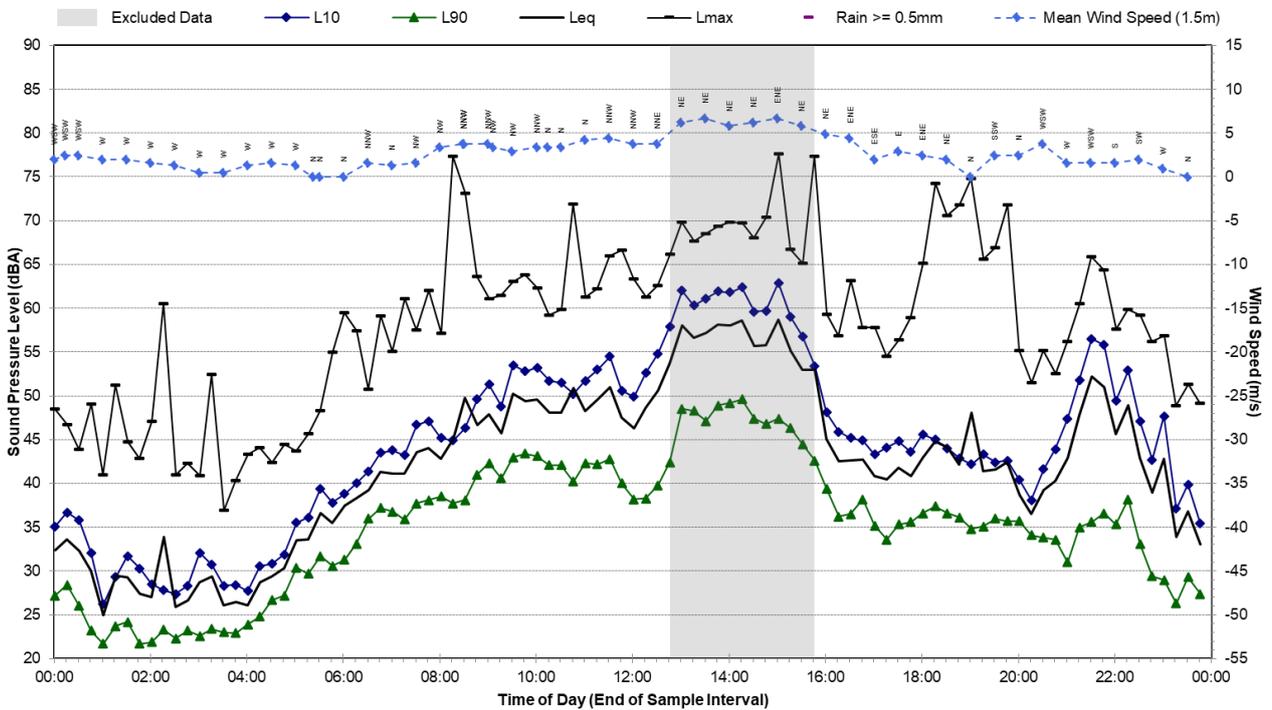
Statistical Ambient Noise Levels

L03 - Figtree Hill "Approved Residence" (R3) - Friday, 16 October 2020



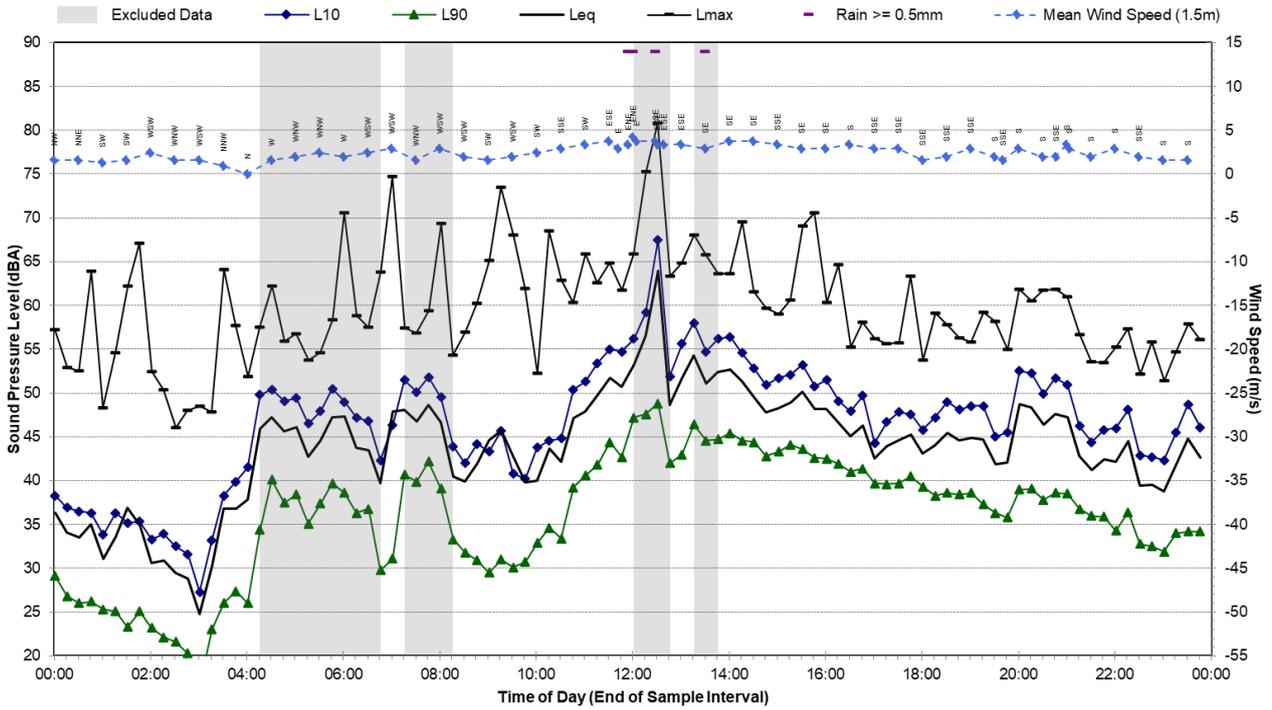
Statistical Ambient Noise Levels

L03 - Figtree Hill "Approved Residence" (R3) - Saturday, 17 October 2020



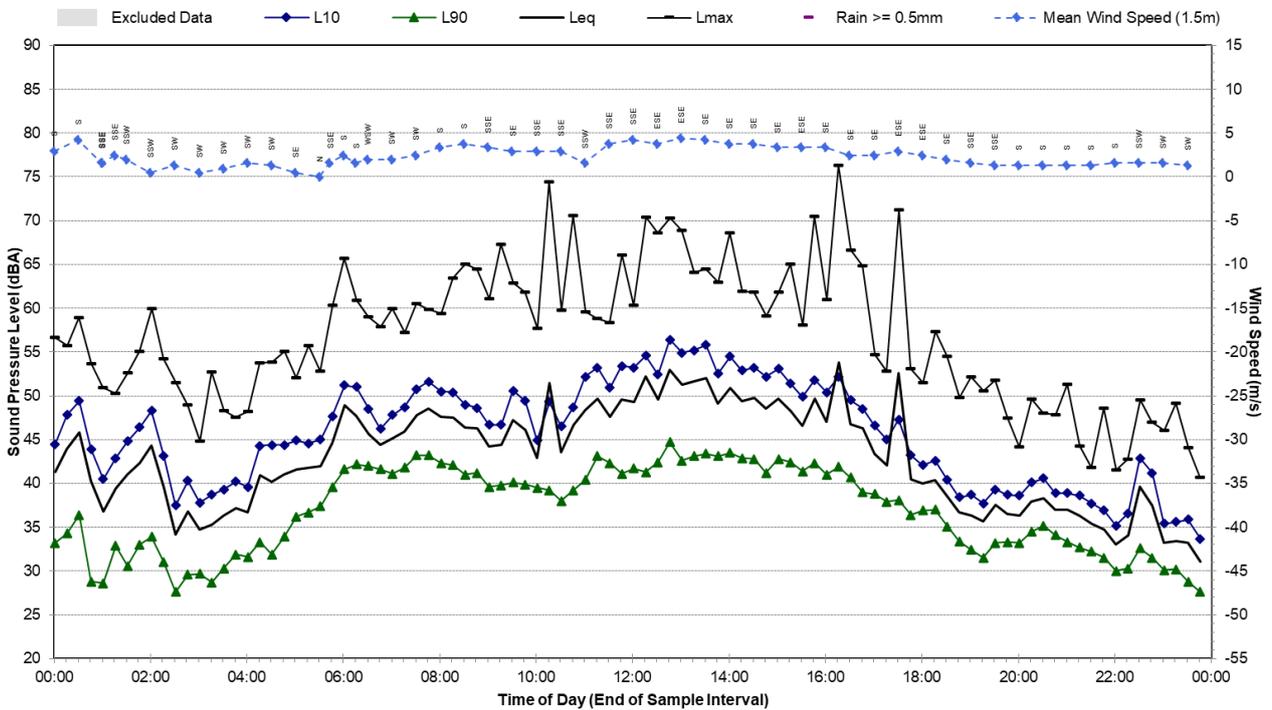
Statistical Ambient Noise Levels

L03 - Figtree Hill "Approved Residence" (R3) - Sunday, 18 October 2020



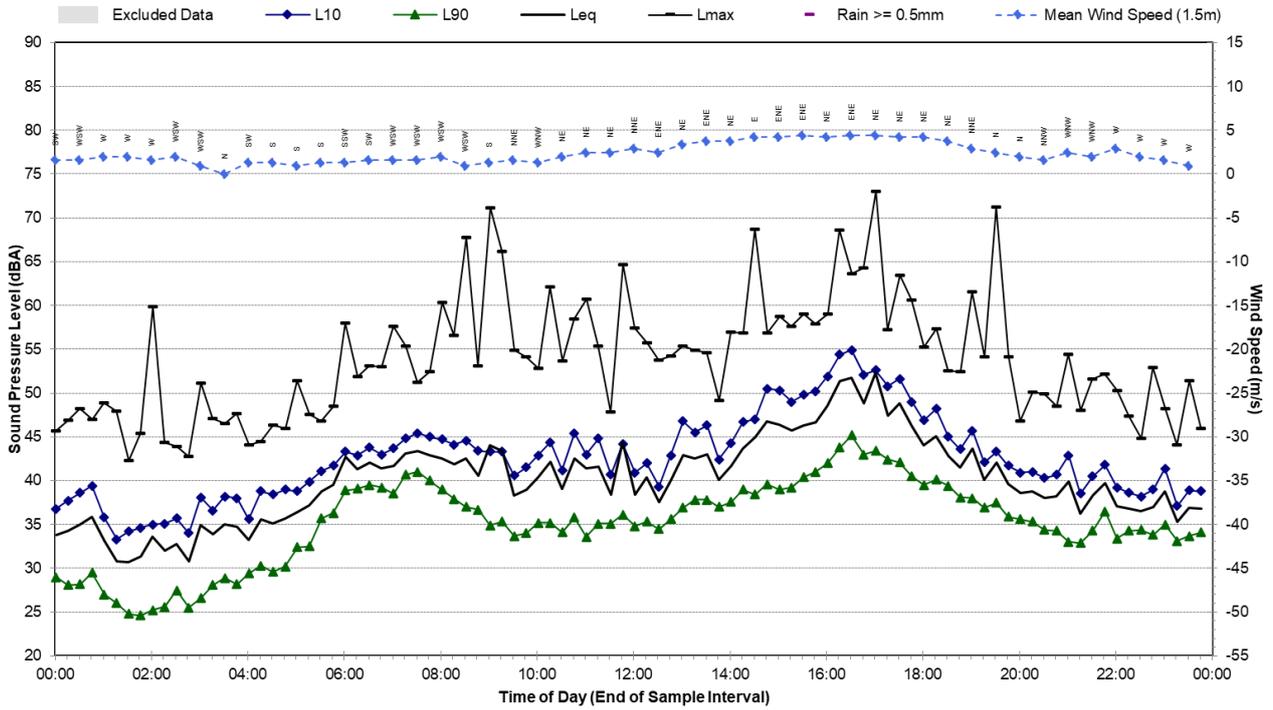
Statistical Ambient Noise Levels

L03 - Figtree Hill "Approved Residence" (R3) - Monday, 19 October 2020



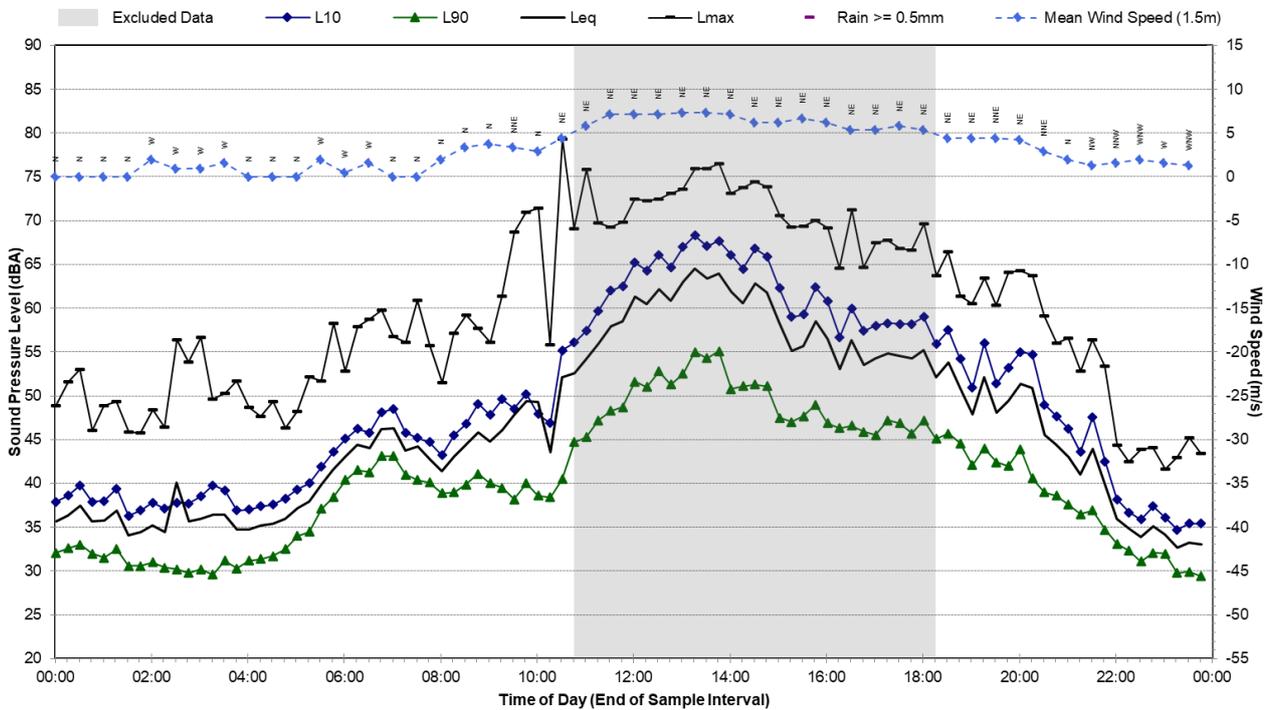
Statistical Ambient Noise Levels

L03 - Figtree Hill "Approved Residence" (R3) - Tuesday, 20 October 2020



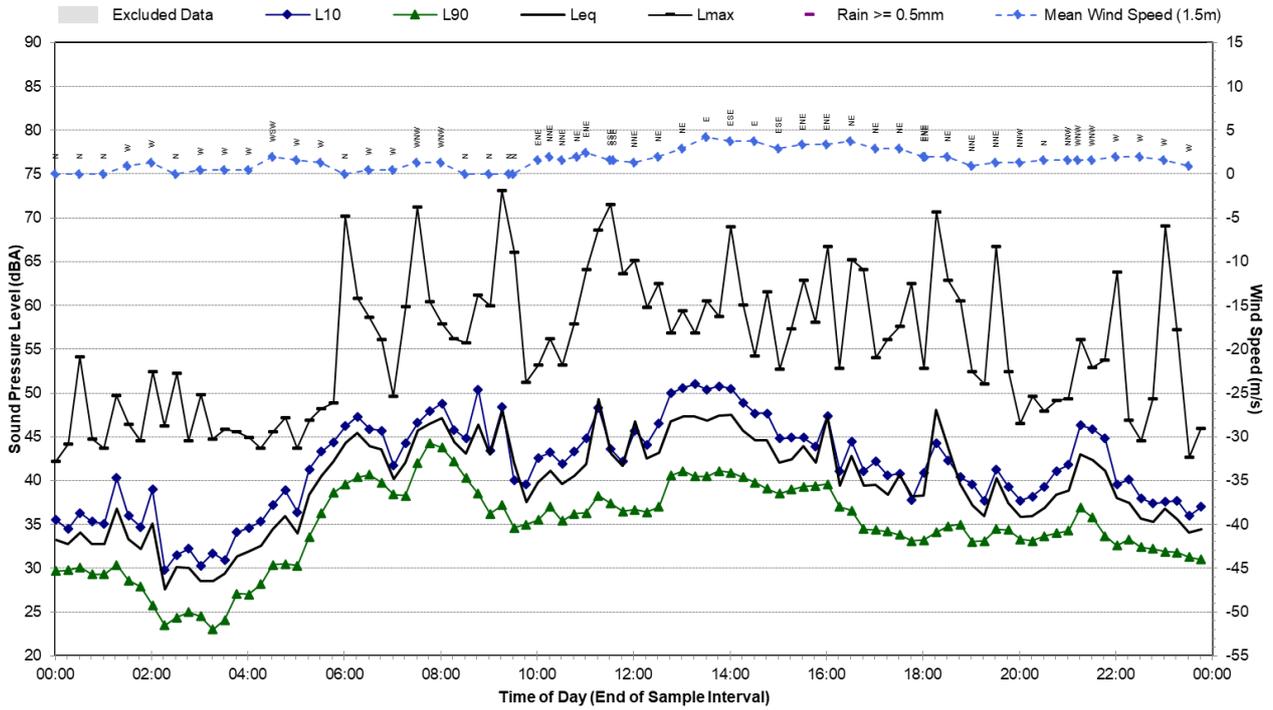
Statistical Ambient Noise Levels

L03 - Figtree Hill "Approved Residence" (R3) - Wednesday, 21 October 2020



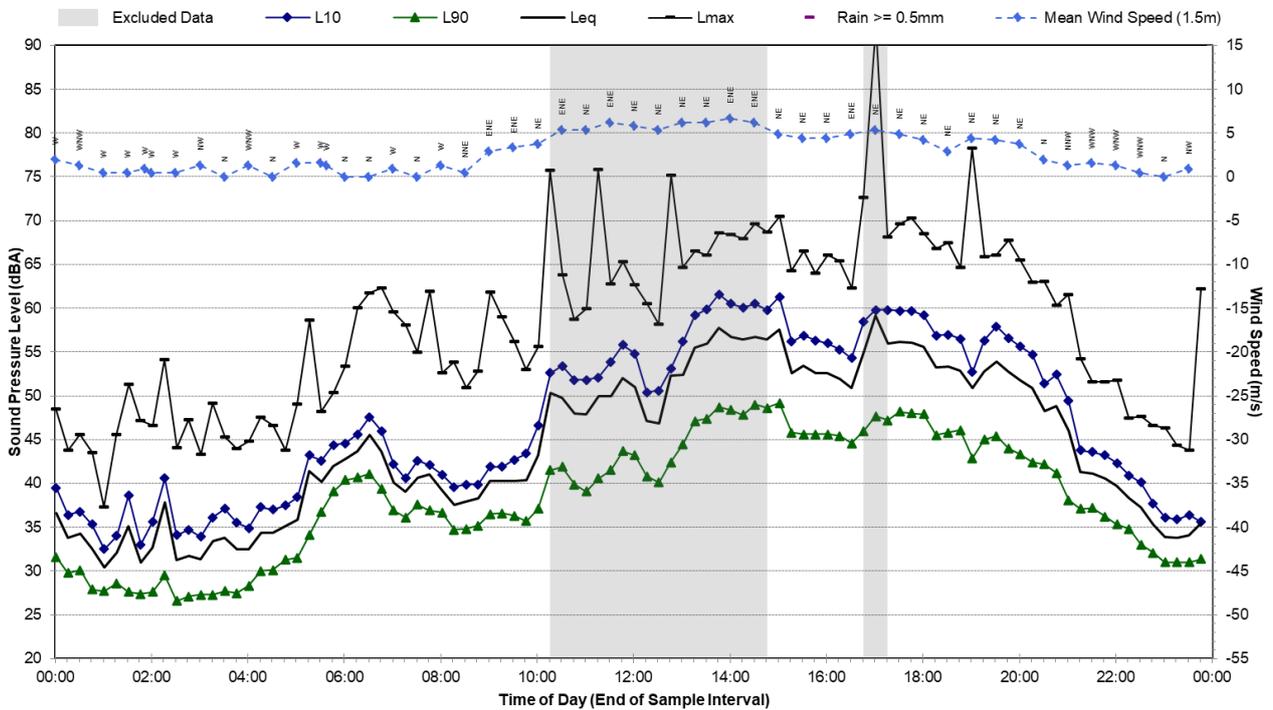
Statistical Ambient Noise Levels

L03 - Figtree Hill "Approved Residence" (R3) - Thursday, 22 October 2020



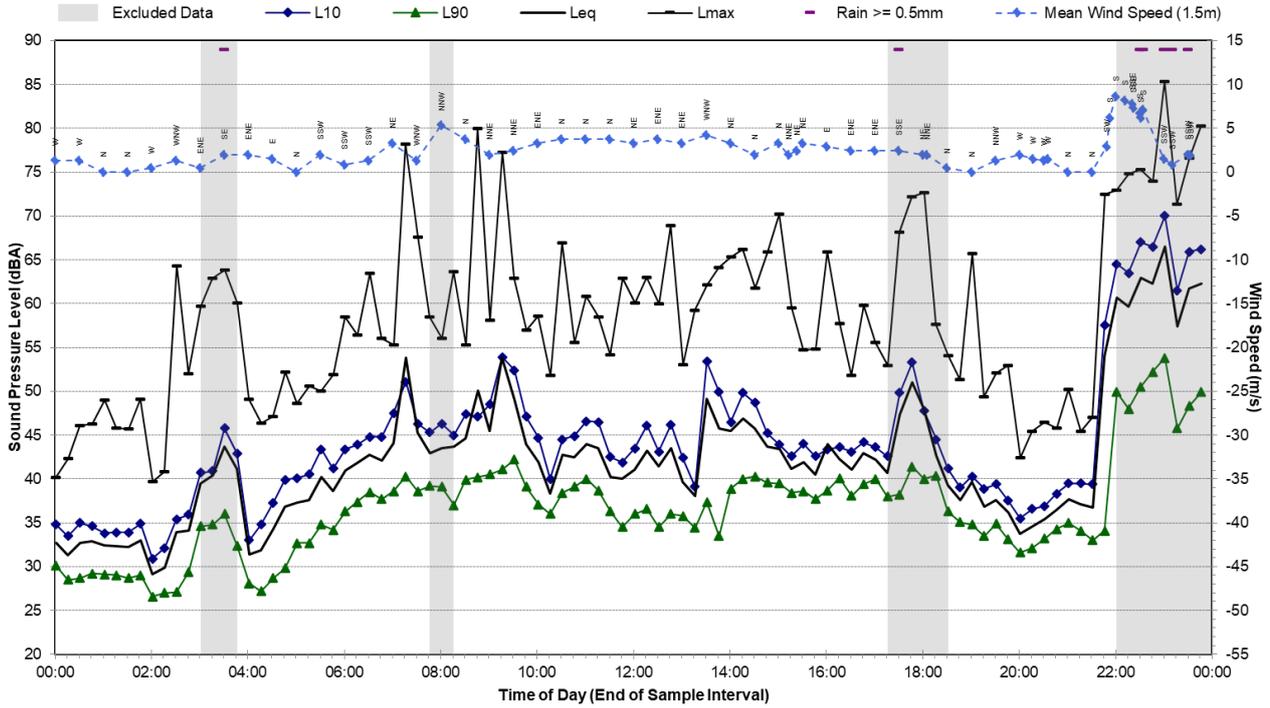
Statistical Ambient Noise Levels

L03 - Figtree Hill "Approved Residence" (R3) - Friday, 23 October 2020



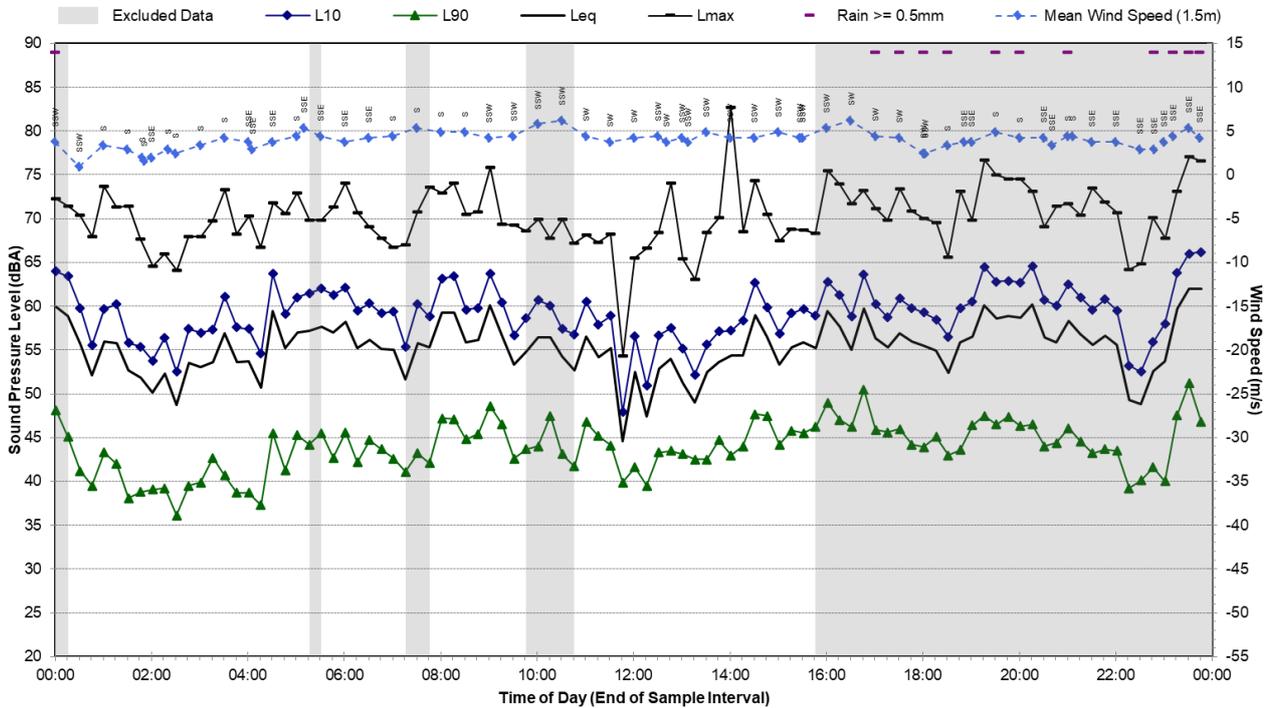
Statistical Ambient Noise Levels

L03 - Figtree Hill "Approved Residence" (R3) - Saturday, 24 October 2020



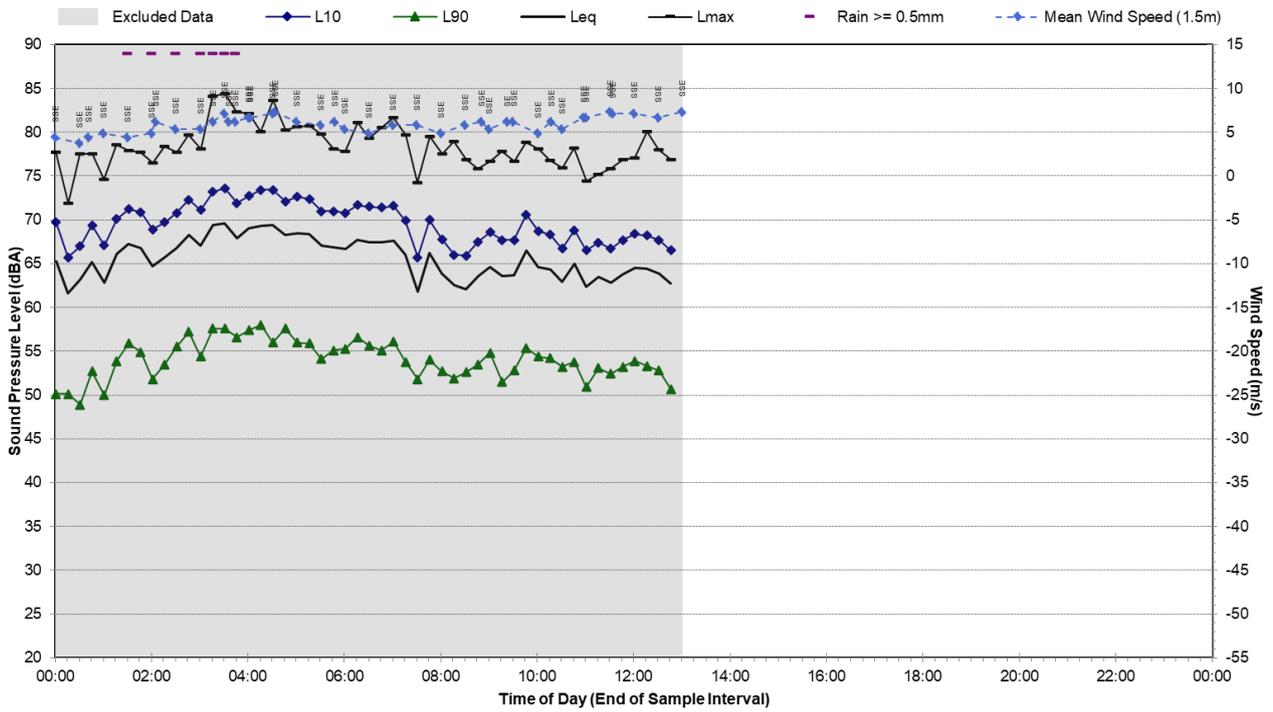
Statistical Ambient Noise Levels

L03 - Figtree Hill "Approved Residence" (R3) - Sunday, 25 October 2020



Statistical Ambient Noise Levels

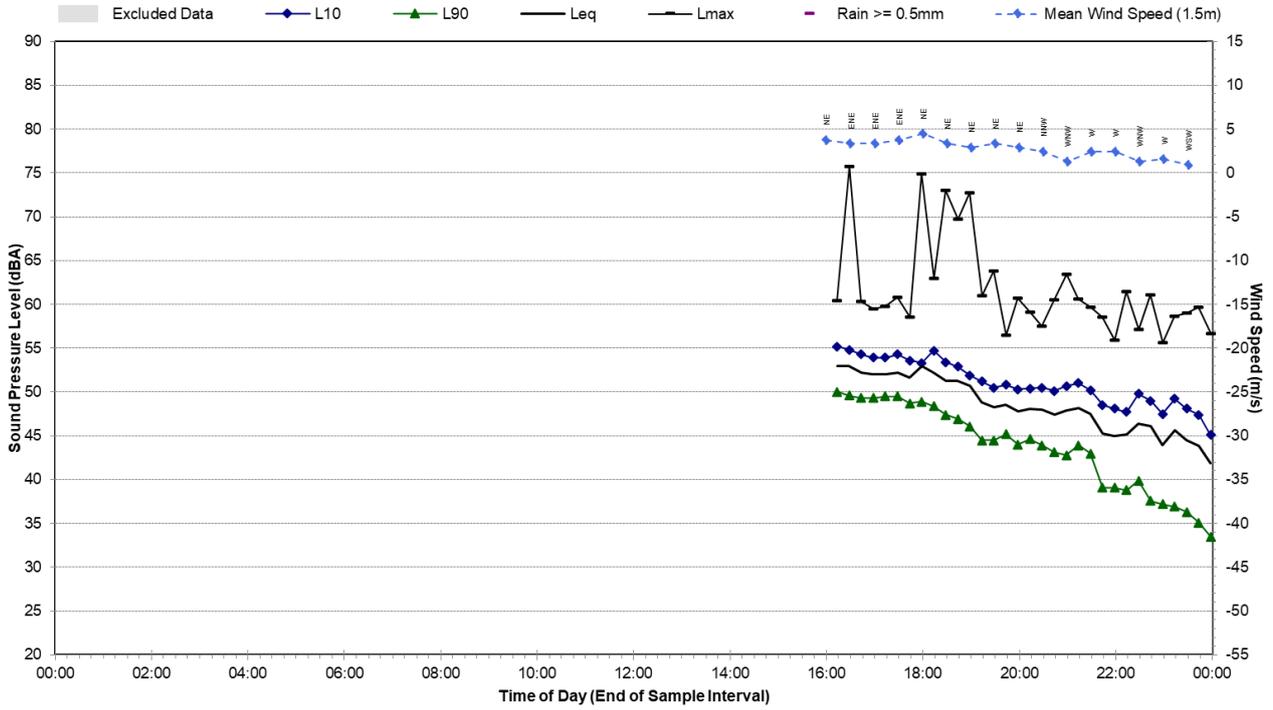
L03 - Figtree Hill "Approved Residence" (R3) - Monday, 26 October 2020



Noise Monitoring Location		L04			Map of Noise Monitoring Location
Noise Monitoring Address		Property 10 – R5			
Logger Device Type: Svantek 957, Logger Serial No: 20668 Sound Level Meter Device Type: Brüel and Kjær 2250L, Sound Level Meter Serial No: 3004636					
Ambient noise logger deployed adjacent to dwelling on Property 10 (R5) off James Road. The Cleary Bros Albion Park Quarry extraction area is located to the west of the logger location, with James Road and Princes Highway to the east.					
Background noise during the measurement was road traffic noise from Princes Highway. Birds, livestock and wind noise in vegetation also contributed to the LAeq at this location during the measurement. The Albion Park Quarry was not audible at this location during the measurement.					
Recorded Noise Levels (LAmax): 12/10/2020: Princes Highway traffic: 49-58 dBA, Trucks on Princes Highway: up to 60 dBA, Birds: up to 56 dBA, Livestock: audible. Albion Park Quarry not audible.					
Ambient Noise Logging Results – NPfi Defined Time Periods					Photo of Noise Monitoring Location
Monitoring Period	Noise Level (dBA)				
	RBL	LAeq	L10	L1	
Daytime	45	52	54	57	
Evening	40	49	51	54	
Night-time	30	47	47	52	
Attended Noise Measurement Results					
Date	Start Time	Measured Noise Level (dBA)			
		LA90	LAeq	LAmax	
12/10/2020	15:58	50	53	60	

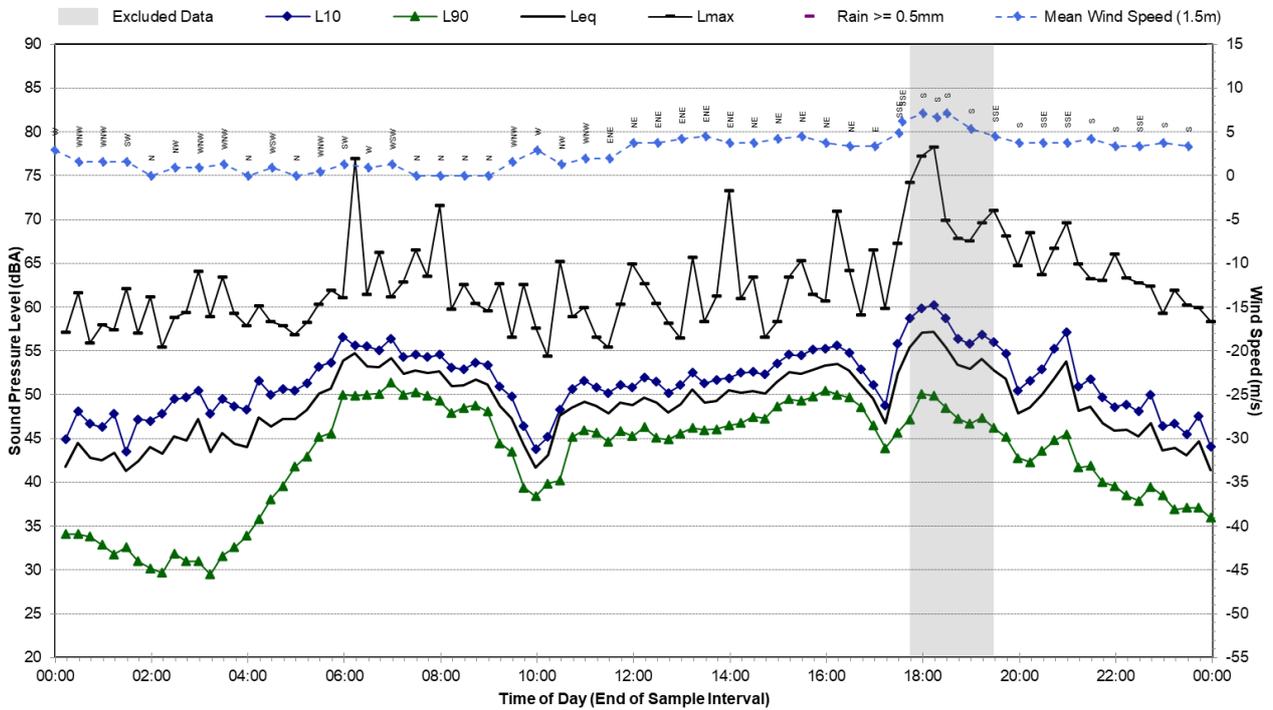
Statistical Ambient Noise Levels

L04 - Property 10 (R5) - Monday, 12 October 2020



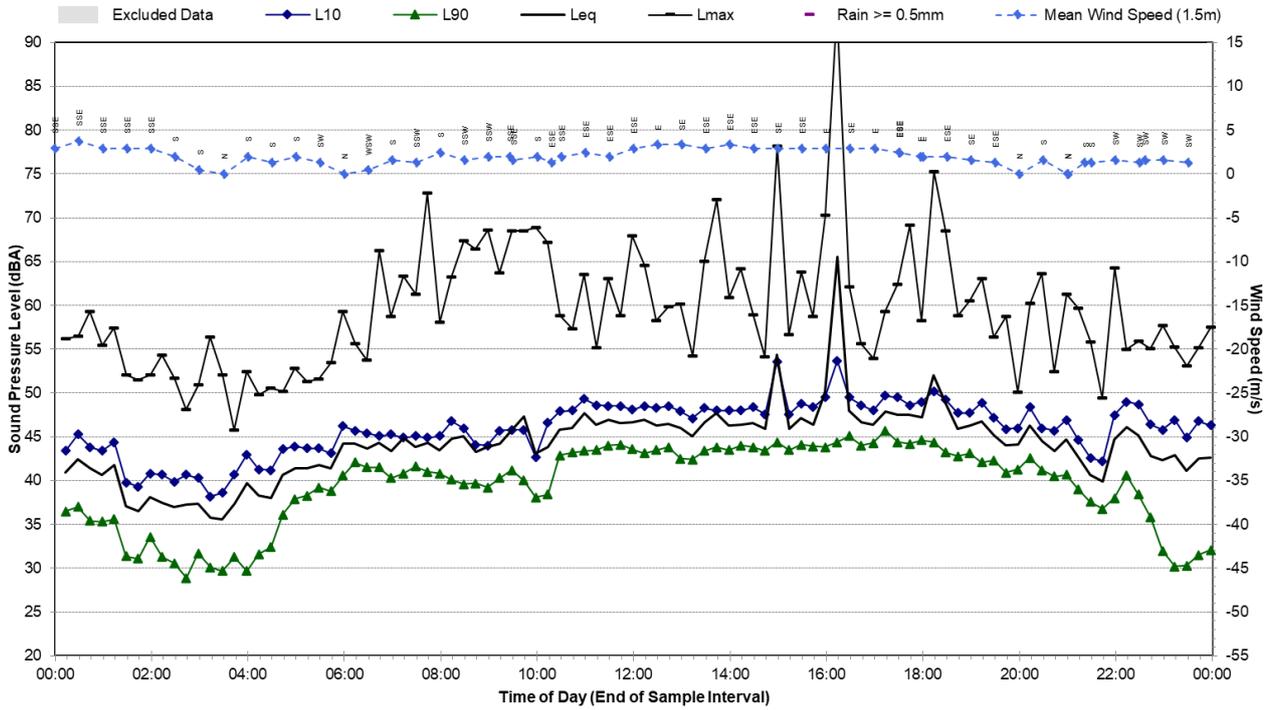
Statistical Ambient Noise Levels

L04 - Property 10 (R5) - Tuesday, 13 October 2020



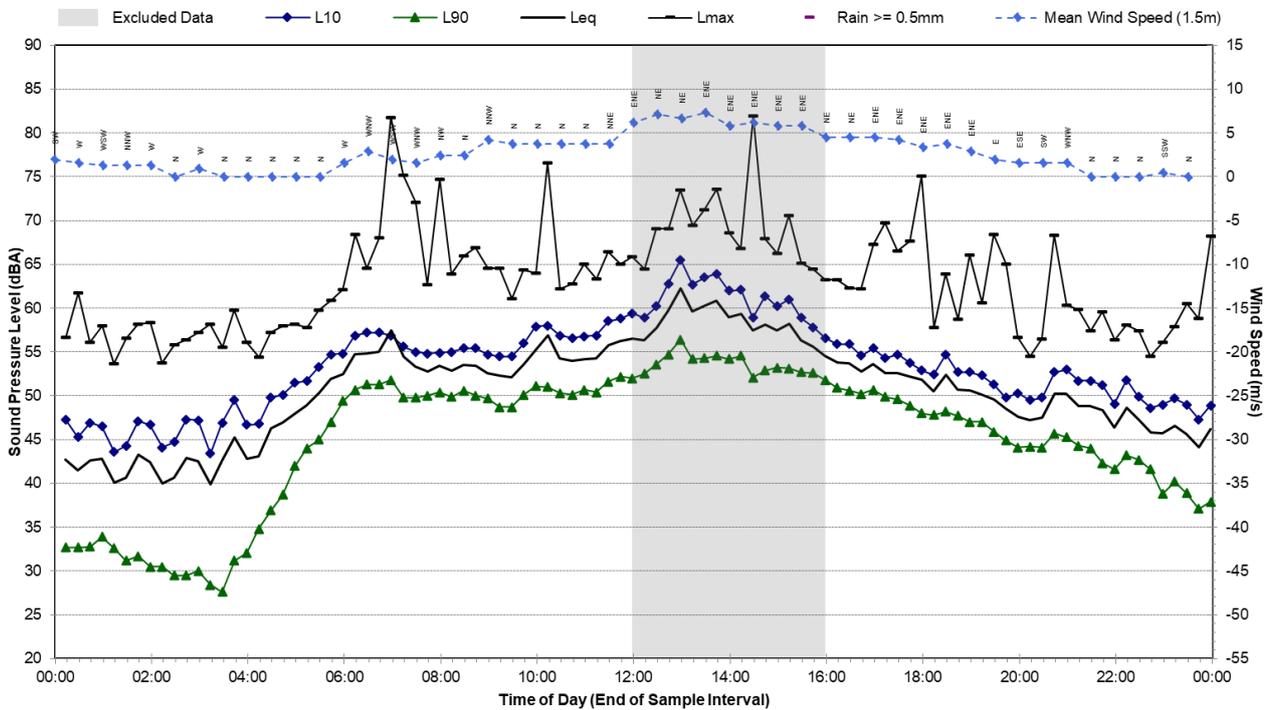
Statistical Ambient Noise Levels

L04 - Property 10 (R5) - Wednesday, 14 October 2020



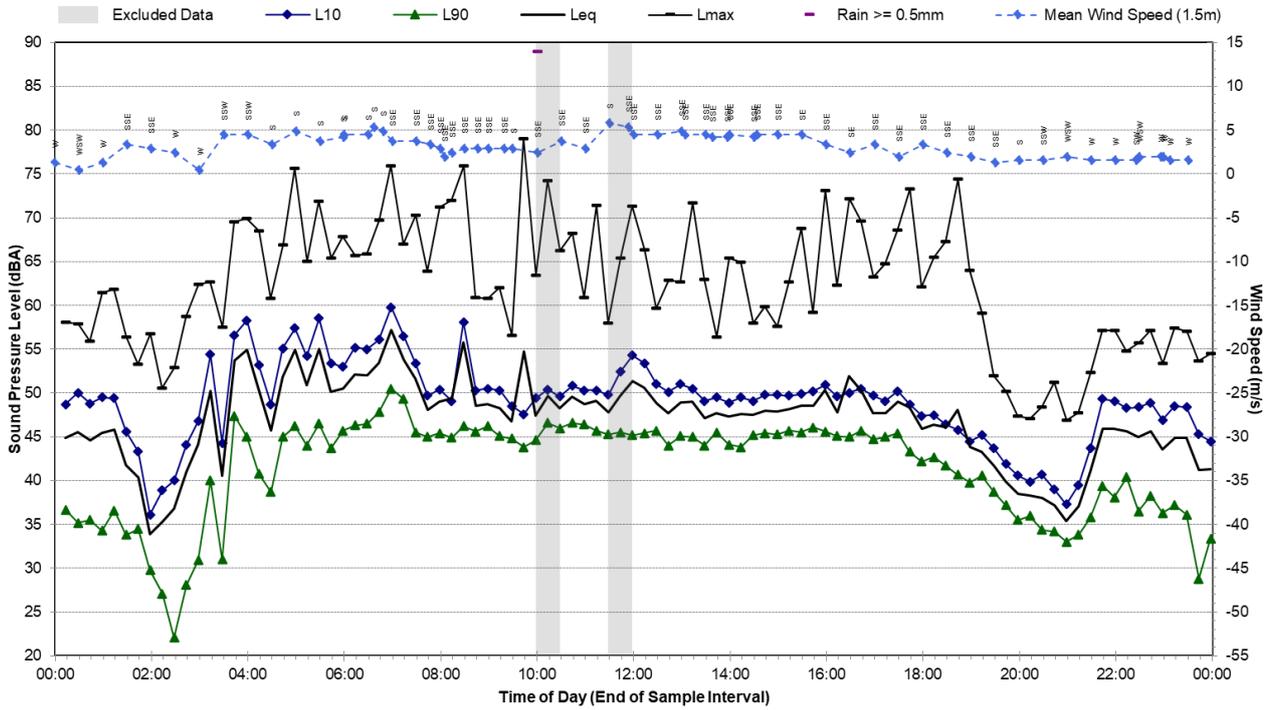
Statistical Ambient Noise Levels

L04 - Property 10 (R5) - Thursday, 15 October 2020



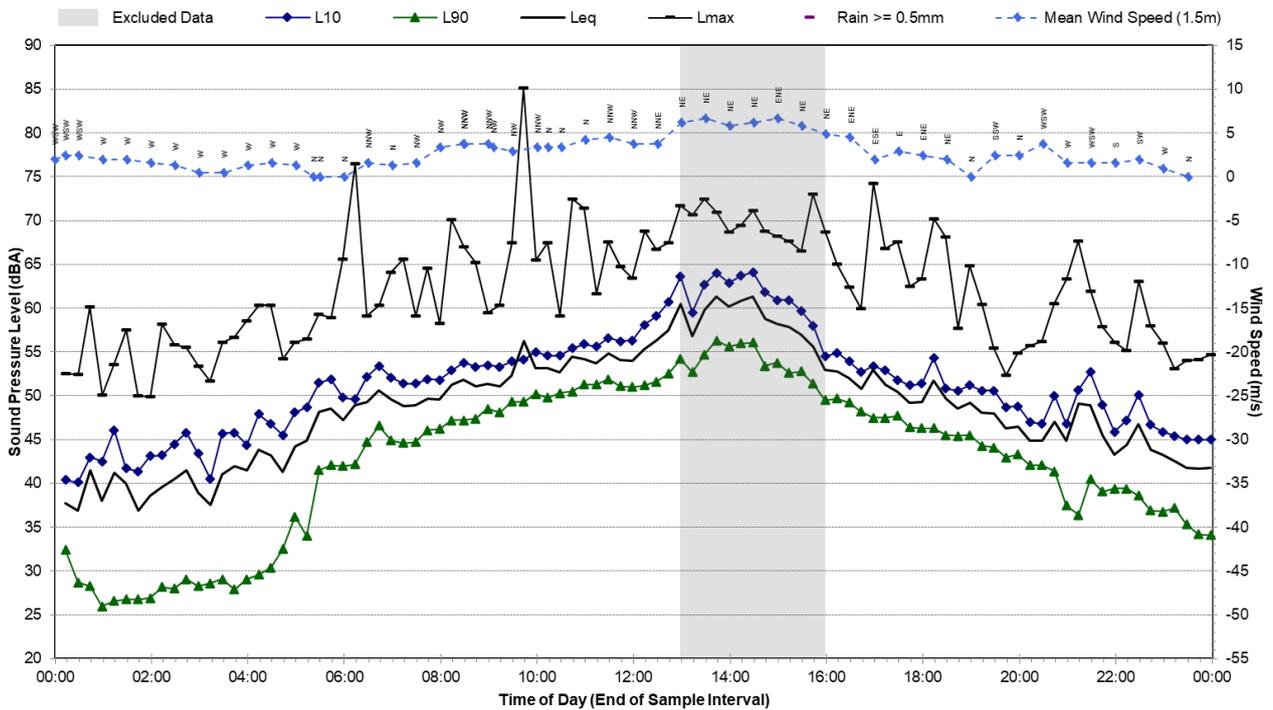
Statistical Ambient Noise Levels

L04 - Property 10 (R5) - Friday, 16 October 2020



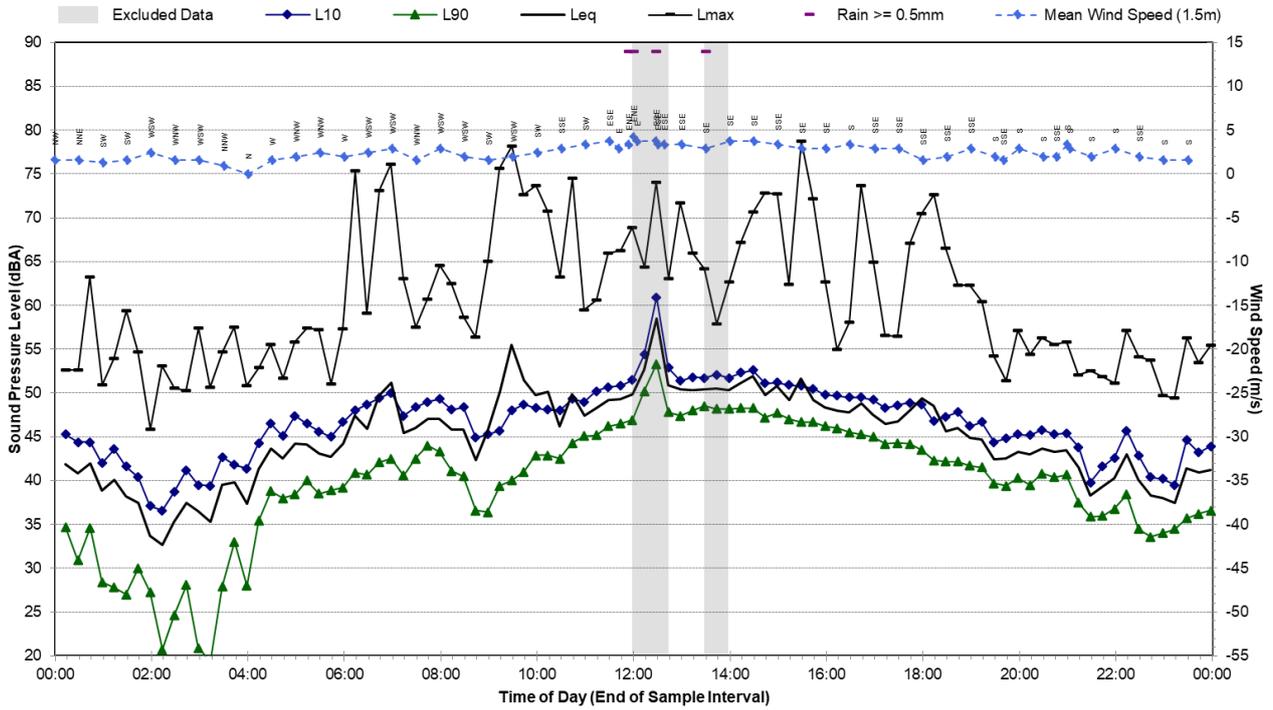
Statistical Ambient Noise Levels

L04 - Property 10 (R5) - Saturday, 17 October 2020



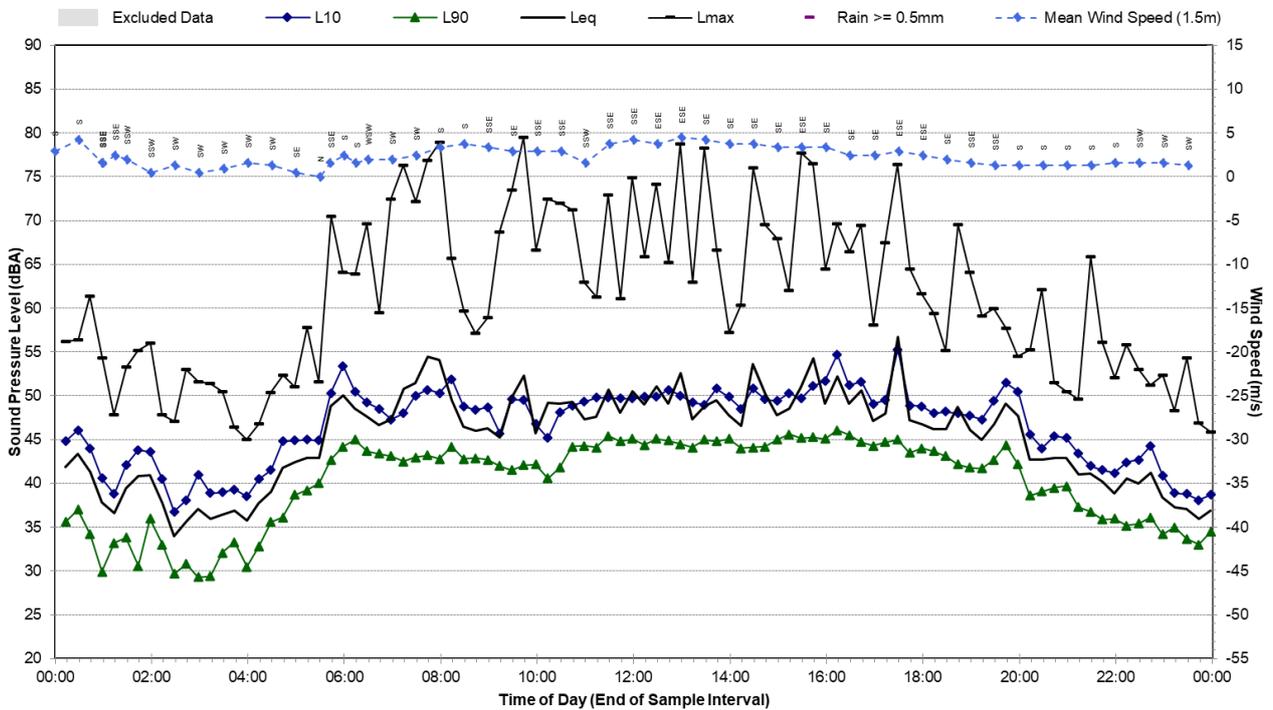
Statistical Ambient Noise Levels

L04 - Property 10 (R5) - Sunday, 18 October 2020



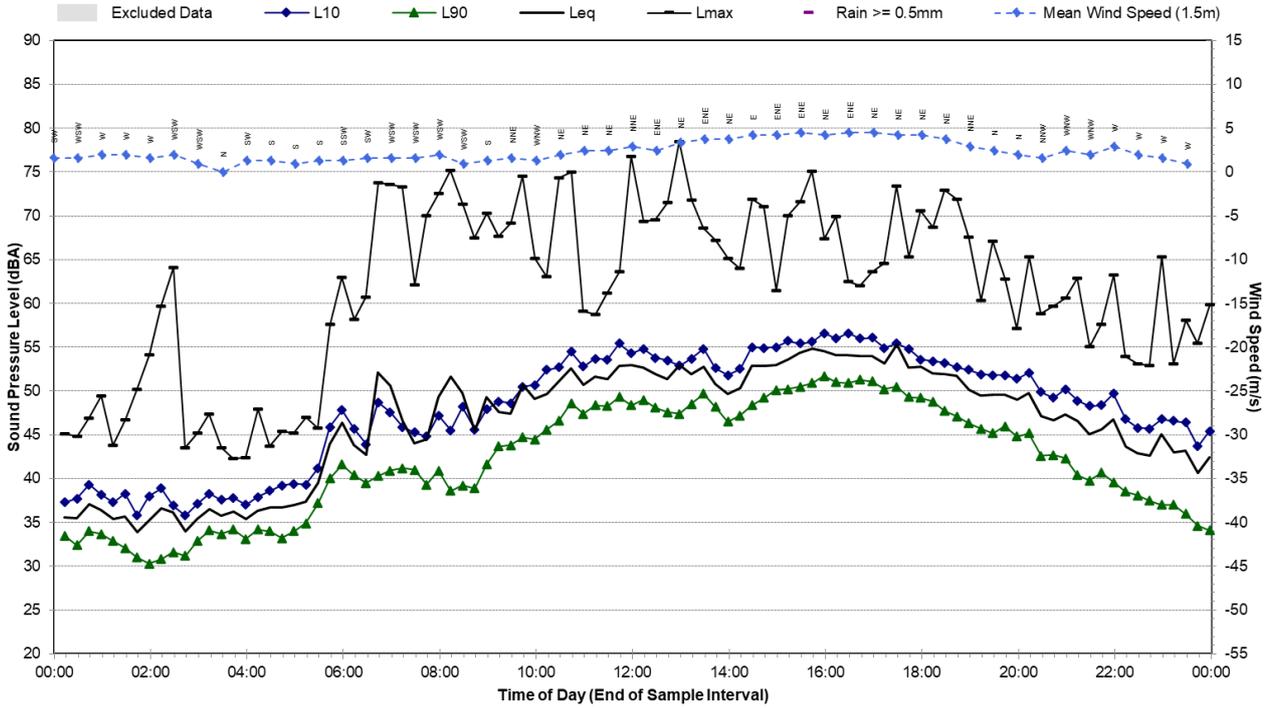
Statistical Ambient Noise Levels

L04 - Property 10 (R5) - Monday, 19 October 2020



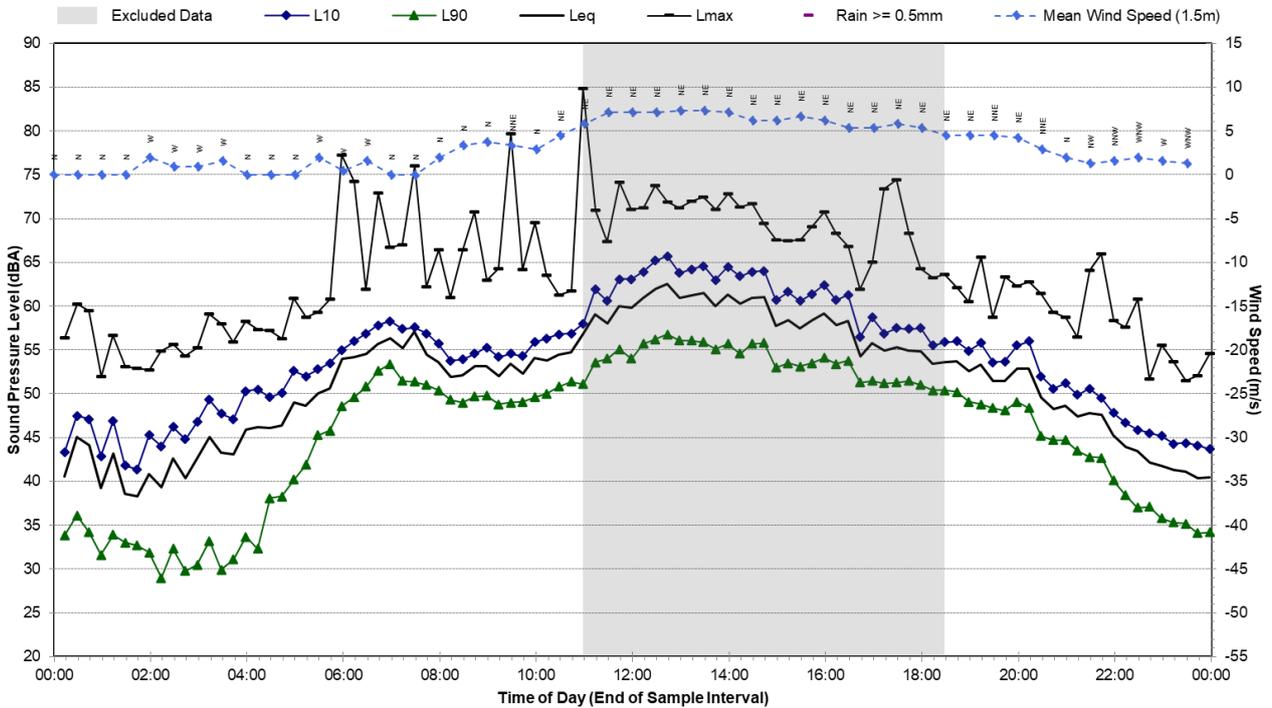
Statistical Ambient Noise Levels

L04 - Property 10 (R5) - Tuesday, 20 October 2020



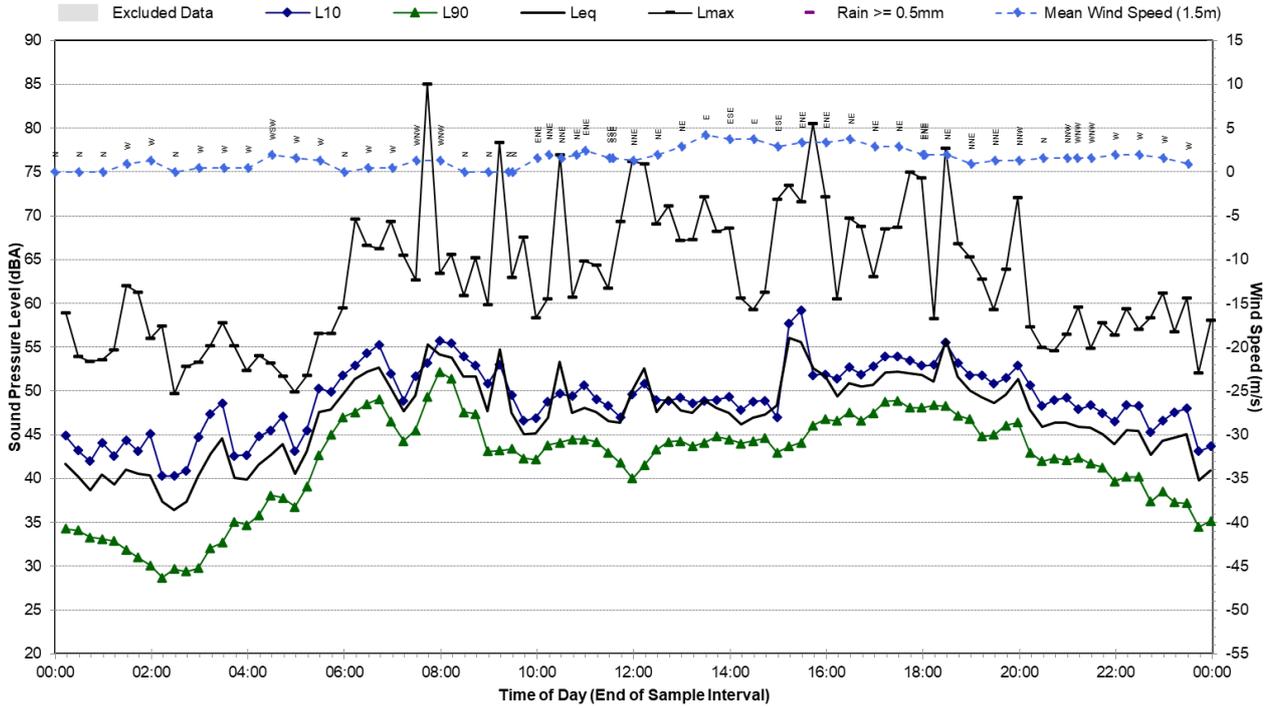
Statistical Ambient Noise Levels

L04 - Property 10 (R5) - Wednesday, 21 October 2020



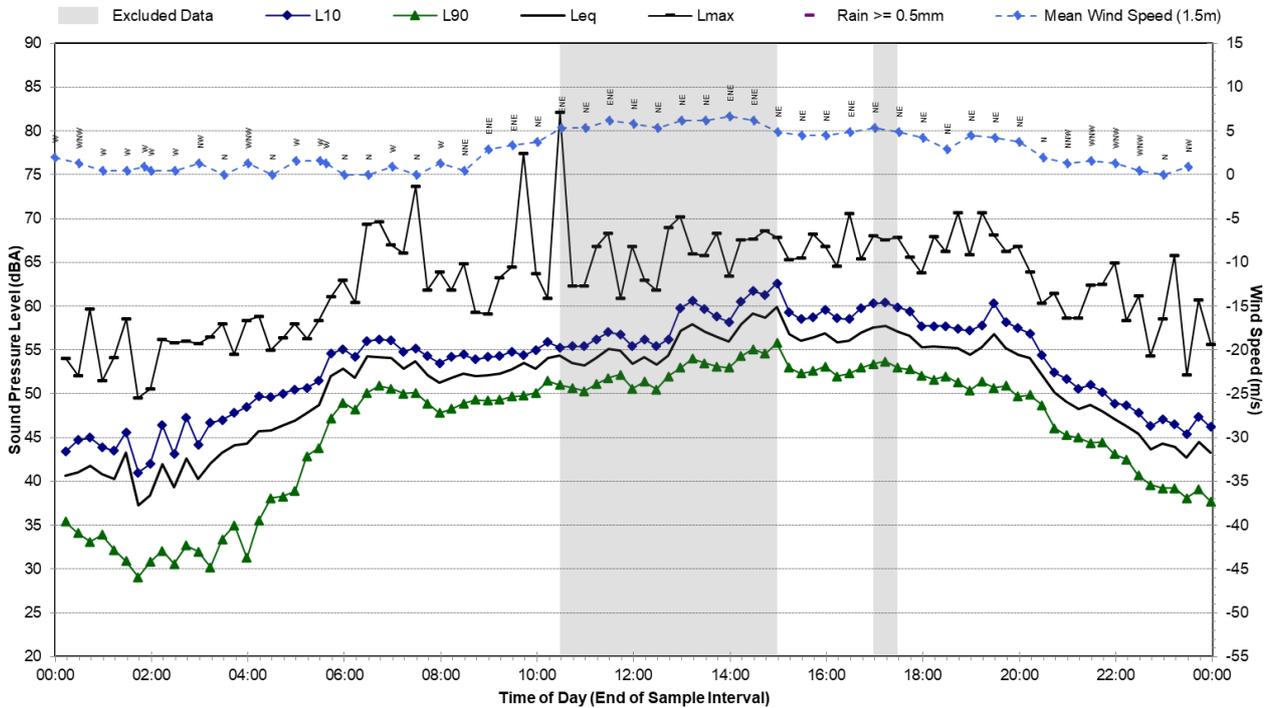
Statistical Ambient Noise Levels

L04 - Property 10 (R5) - Thursday, 22 October 2020



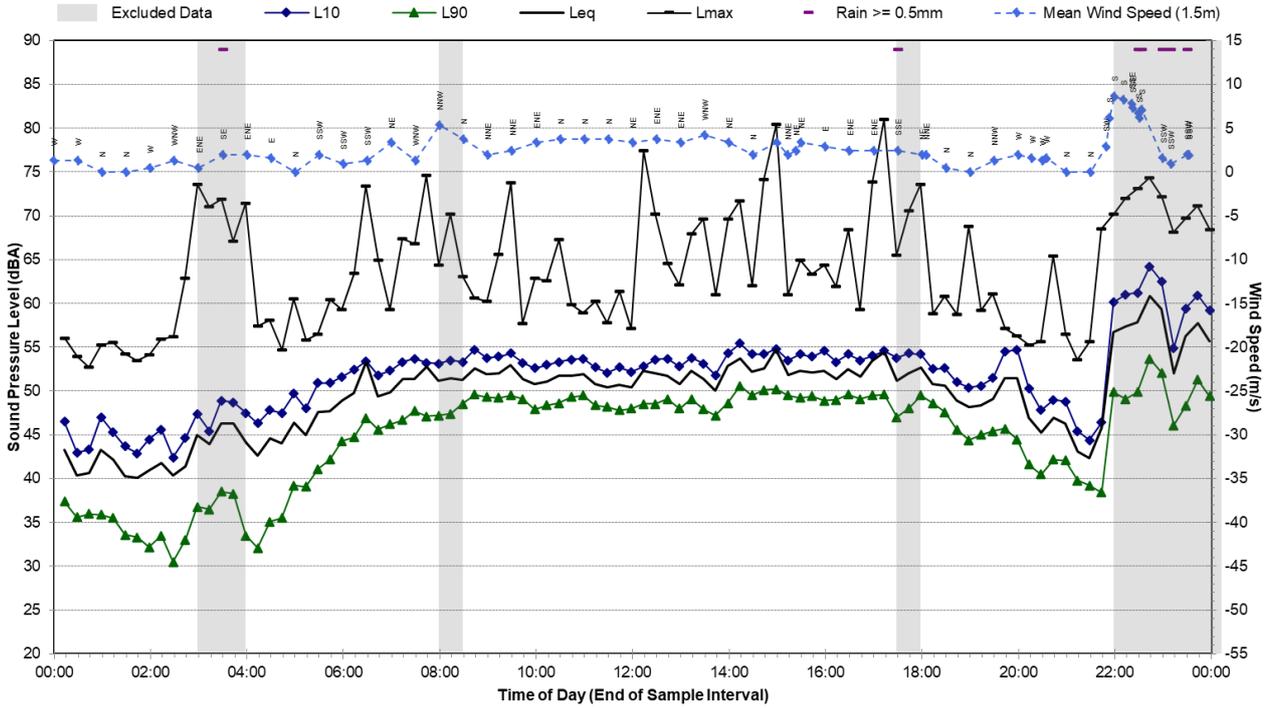
Statistical Ambient Noise Levels

L04 - Property 10 (R5) - Friday, 23 October 2020



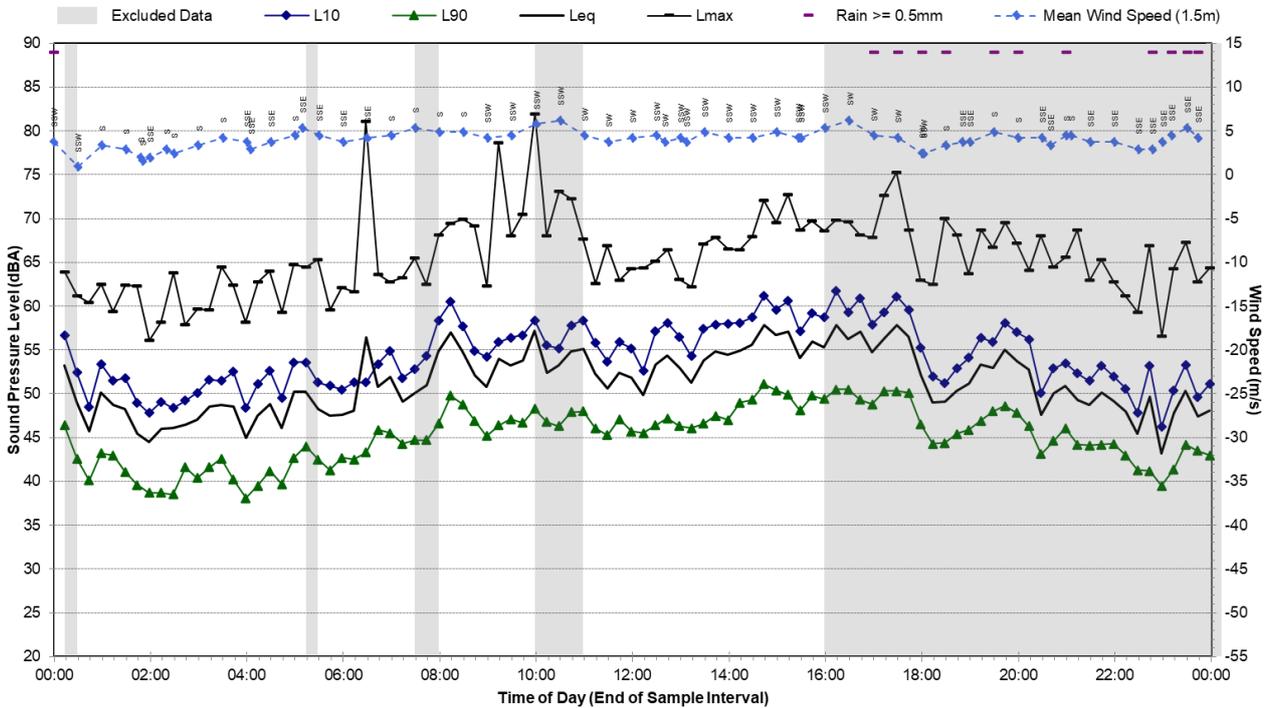
Statistical Ambient Noise Levels

L04 - Property 10 (R5) - Saturday, 24 October 2020



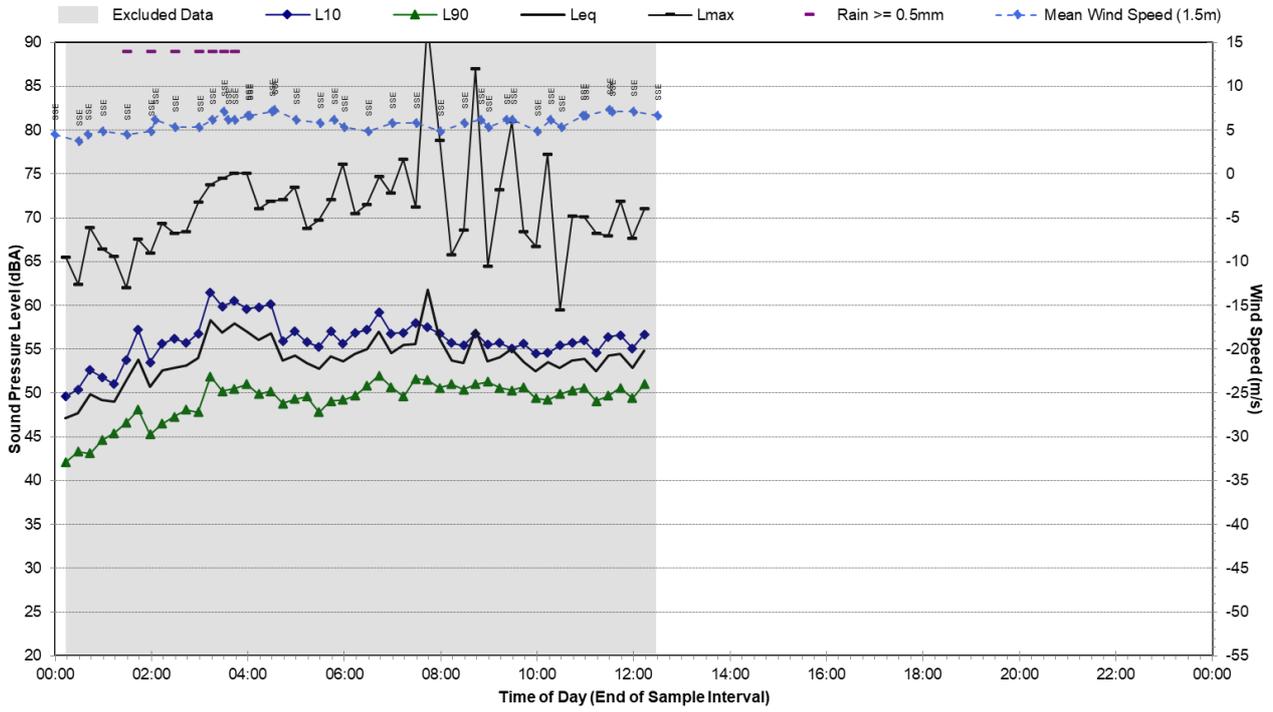
Statistical Ambient Noise Levels

L04 - Property 10 (R5) - Sunday, 25 October 2020



Statistical Ambient Noise Levels

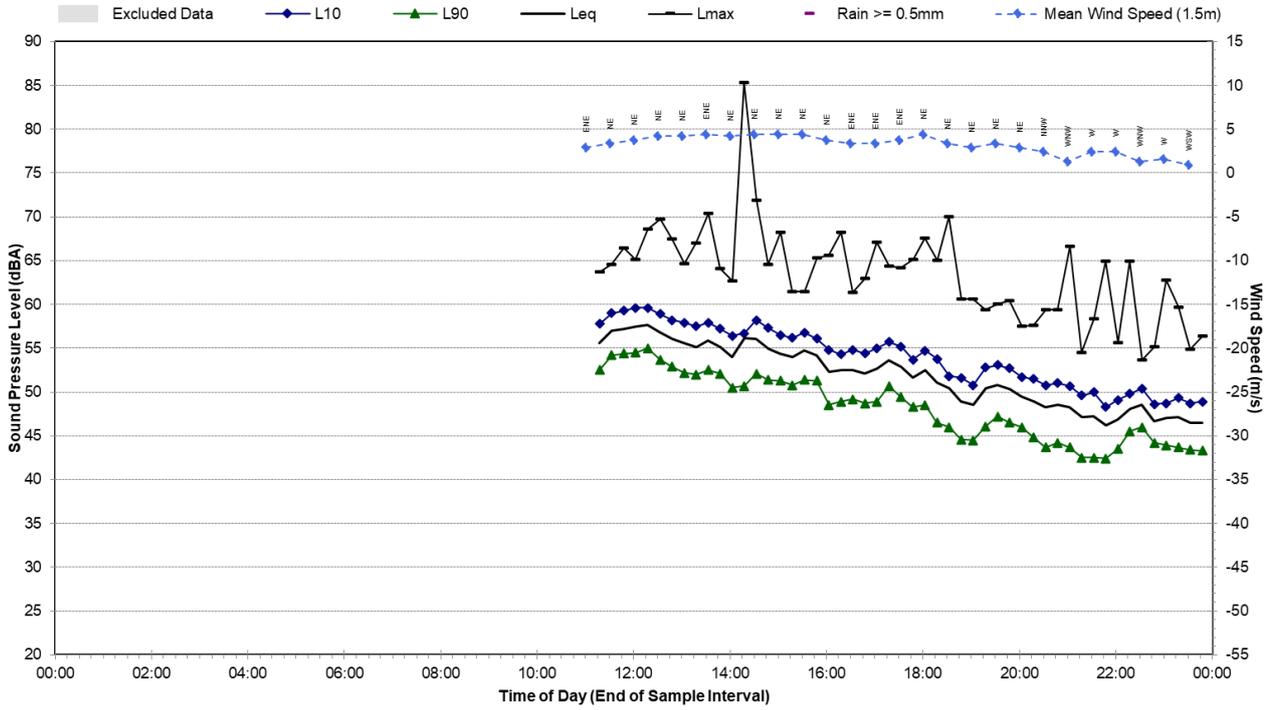
L04 - Property 10 (R5) - Monday, 26 October 2020



Noise Monitoring Location		L05			Map of Noise Monitoring Location
Noise Monitoring Address		Property 14 – R10			
<p>Logger Device Type: Svantek 957, Logger Serial No: 27578 Sound Level Meter Device Type: Brüel and Kjær 2250L, Sound Level Meter Serial No: 3004636</p> <p>Ambient noise logger deployed adjacent to dwelling on Property 14 (R10) off James Road. The Cleary Bros Albion Park Quarry extraction area is located to the northwest of the logger location, with James Road and Princes Highway to the east.</p> <p>Background noise during the measurement was road traffic noise from Princes Highway. Birds, livestock and wind noise in vegetation also contributed to the LAeq at this location during the measurement. The Albion Park Quarry was not audible at this location during the measurement.</p> <p>Recorded Noise Levels (LAm_{ax}): 12/10/2020: Princes Highway traffic: 51-54 dBA, Trucks on Princes Highway: up to 62 dBA, Birds: up to 63 dBA, Livestock: audible. Albion Park Quarry not audible.</p>					
Ambient Noise Logging Results – NPfI Defined Time Periods					
Monitoring Period	Noise Level (dBA)				
	RBL	LAeq	L10	L1	
Daytime	48	56	57	61	
Evening	44	53	54	58	
Night-time	34	51	50	55	
Attended Noise Measurement Results					
Date	Start Time	Measured Noise Level (dBA)			
		LA90	LAeq	LAm_{ax}	
12/10/2020	10:44	52	55	63	
Photo of Noise Monitoring Location					
					

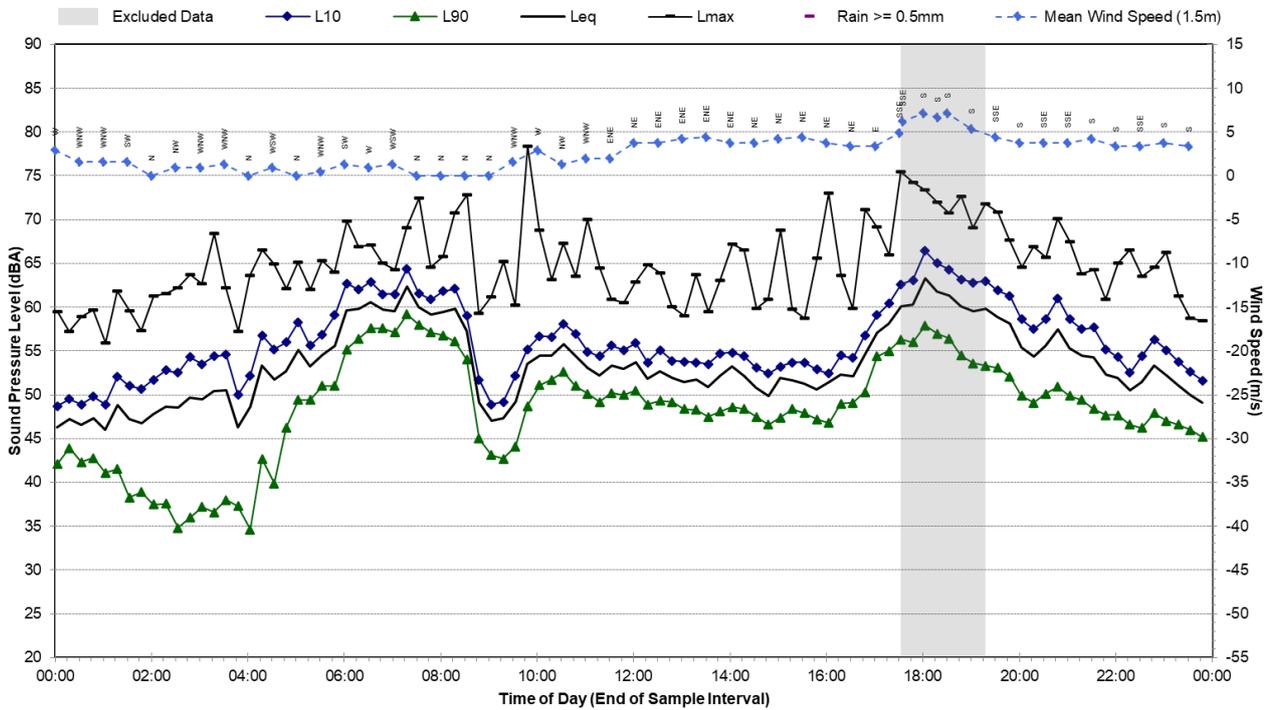
Statistical Ambient Noise Levels

L05 - Property 14 (R10) - Monday, 12 October 2020



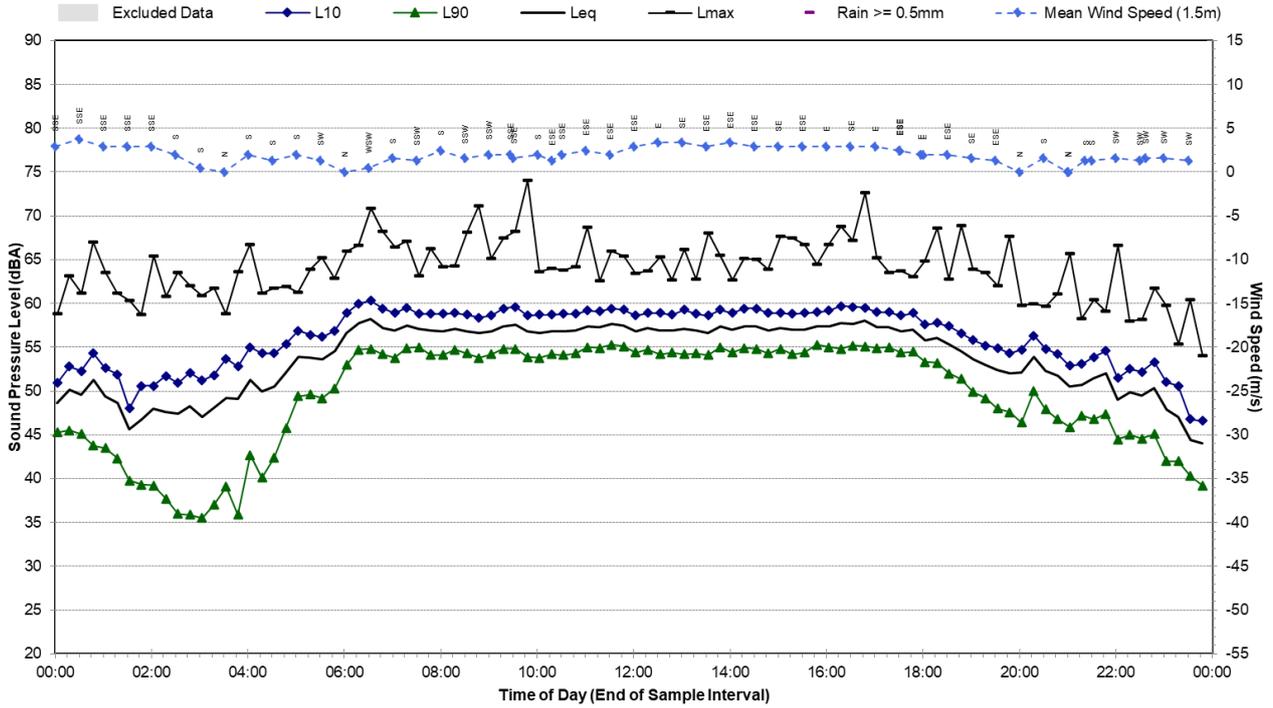
Statistical Ambient Noise Levels

L05 - Property 14 (R10) - Tuesday, 13 October 2020



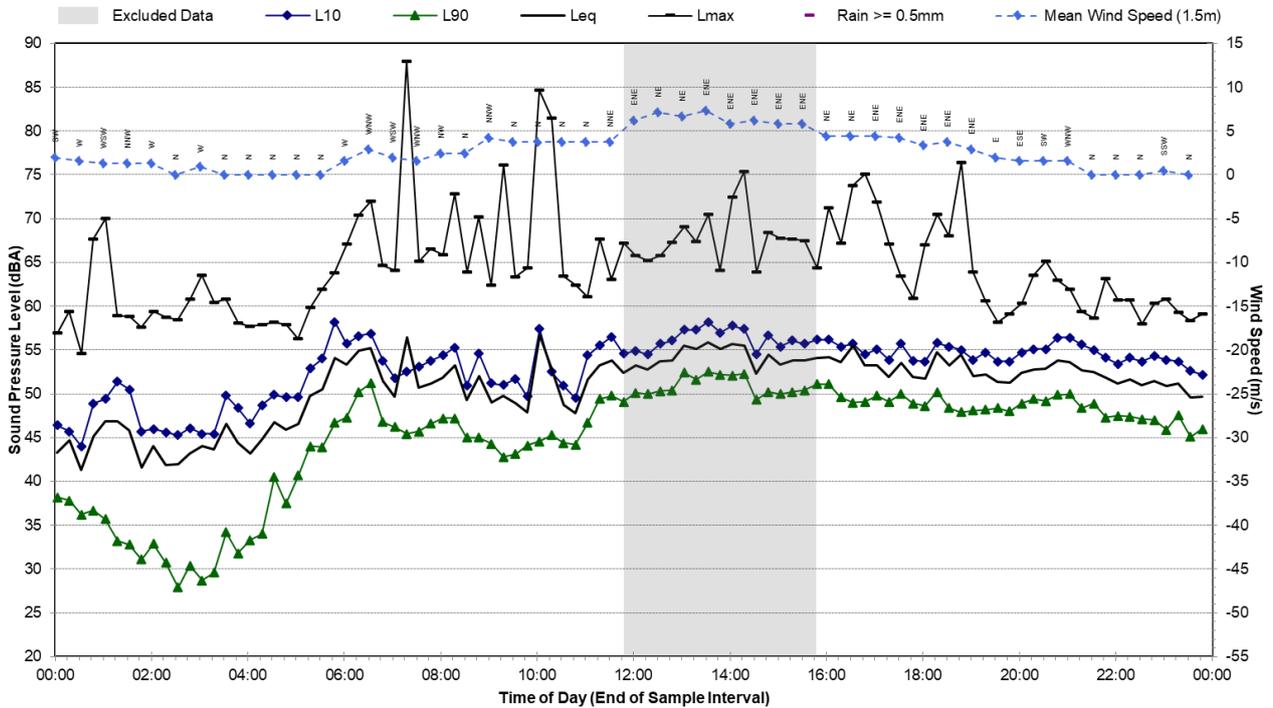
Statistical Ambient Noise Levels

L05 - Property 14 (R10) - Wednesday, 14 October 2020



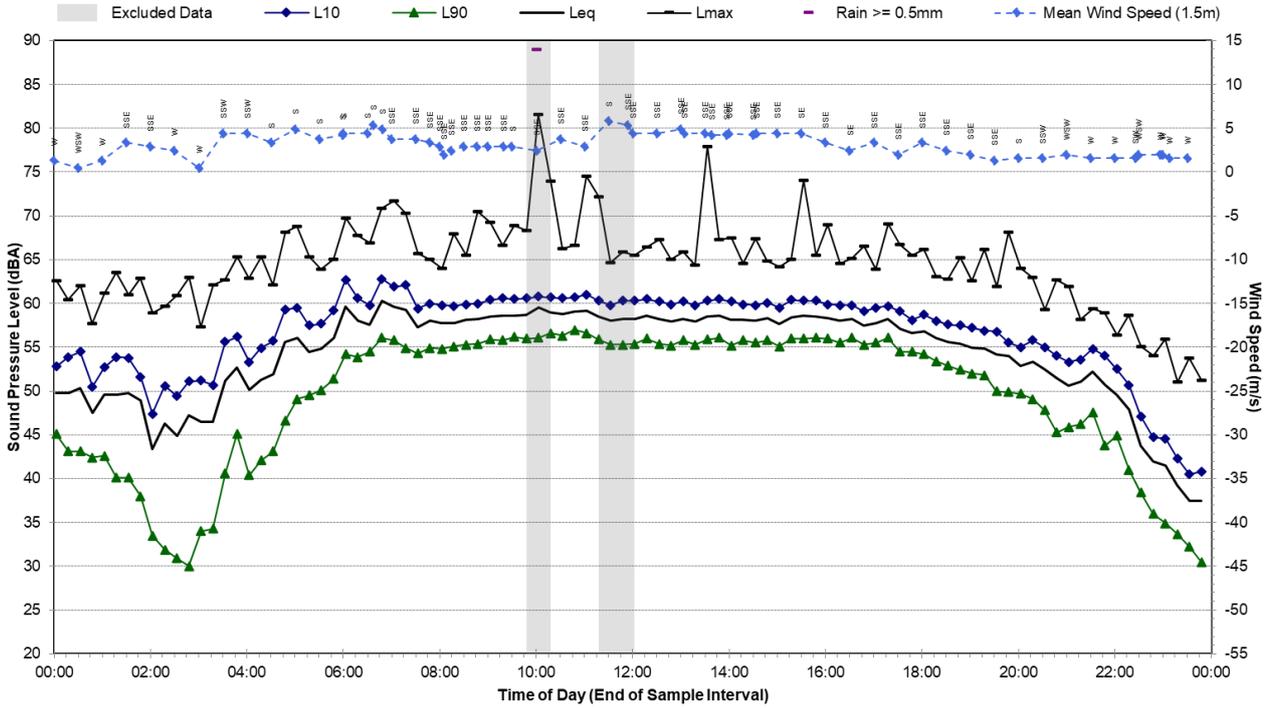
Statistical Ambient Noise Levels

L05 - Property 14 (R10) - Thursday, 15 October 2020



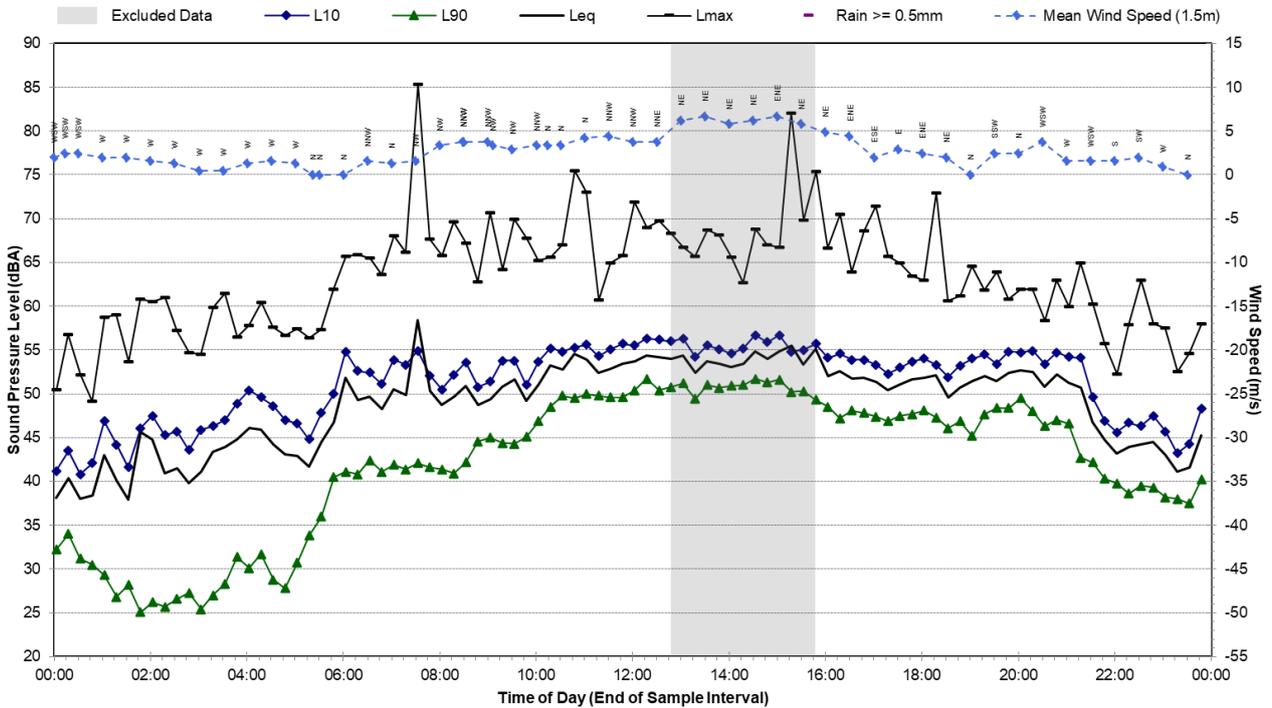
Statistical Ambient Noise Levels

L05 - Property 14 (R10) - Friday, 16 October 2020



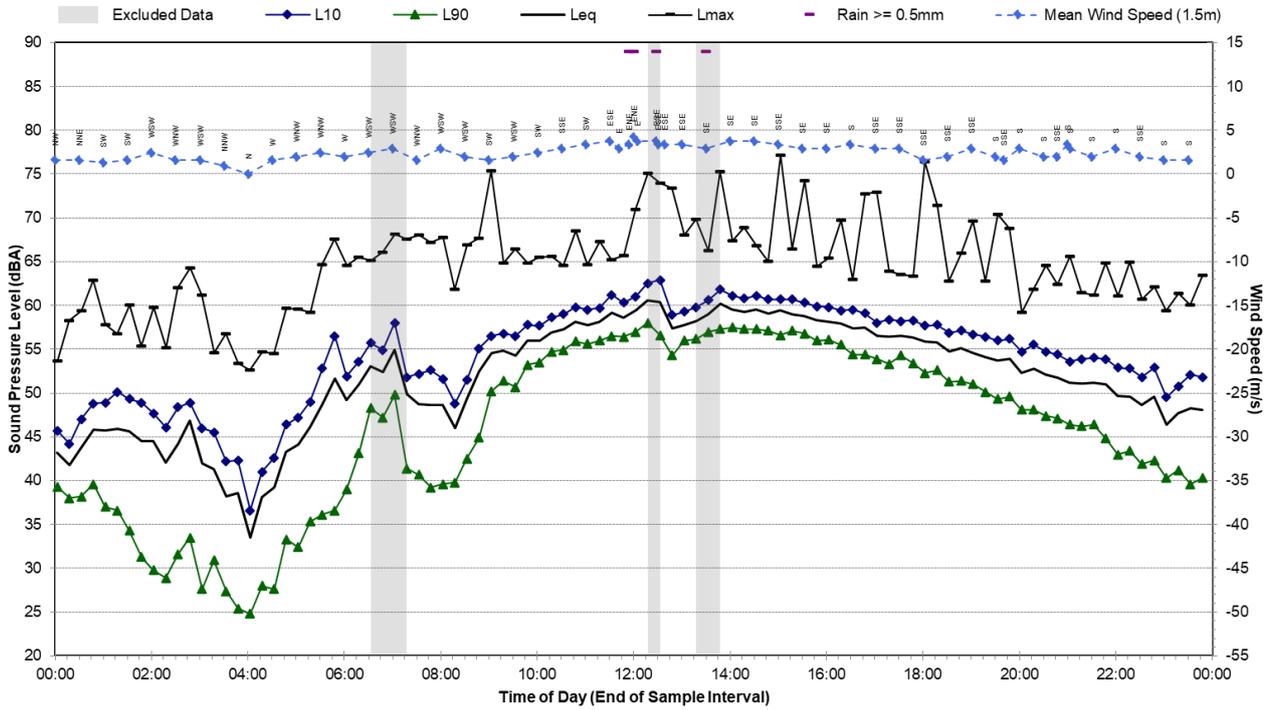
Statistical Ambient Noise Levels

L05 - Property 14 (R10) - Saturday, 17 October 2020



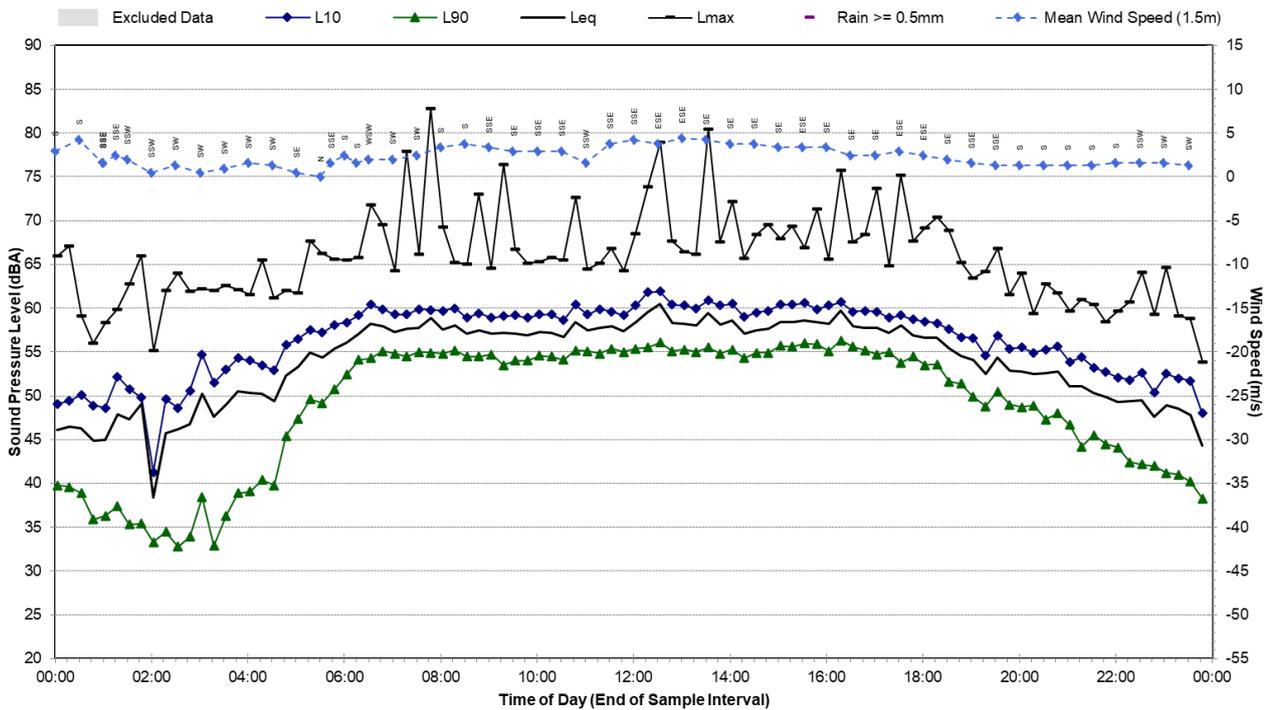
Statistical Ambient Noise Levels

L05 - Property 14 (R10) - Sunday, 18 October 2020



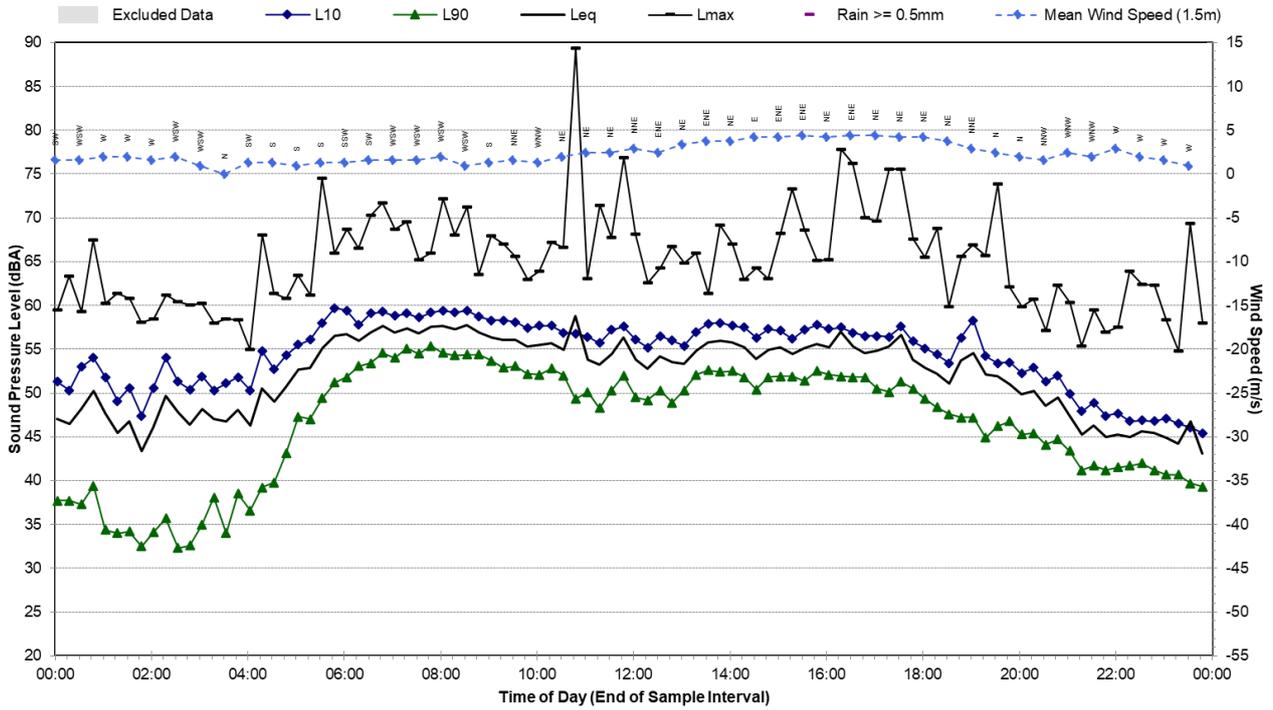
Statistical Ambient Noise Levels

L05 - Property 14 (R10) - Monday, 19 October 2020



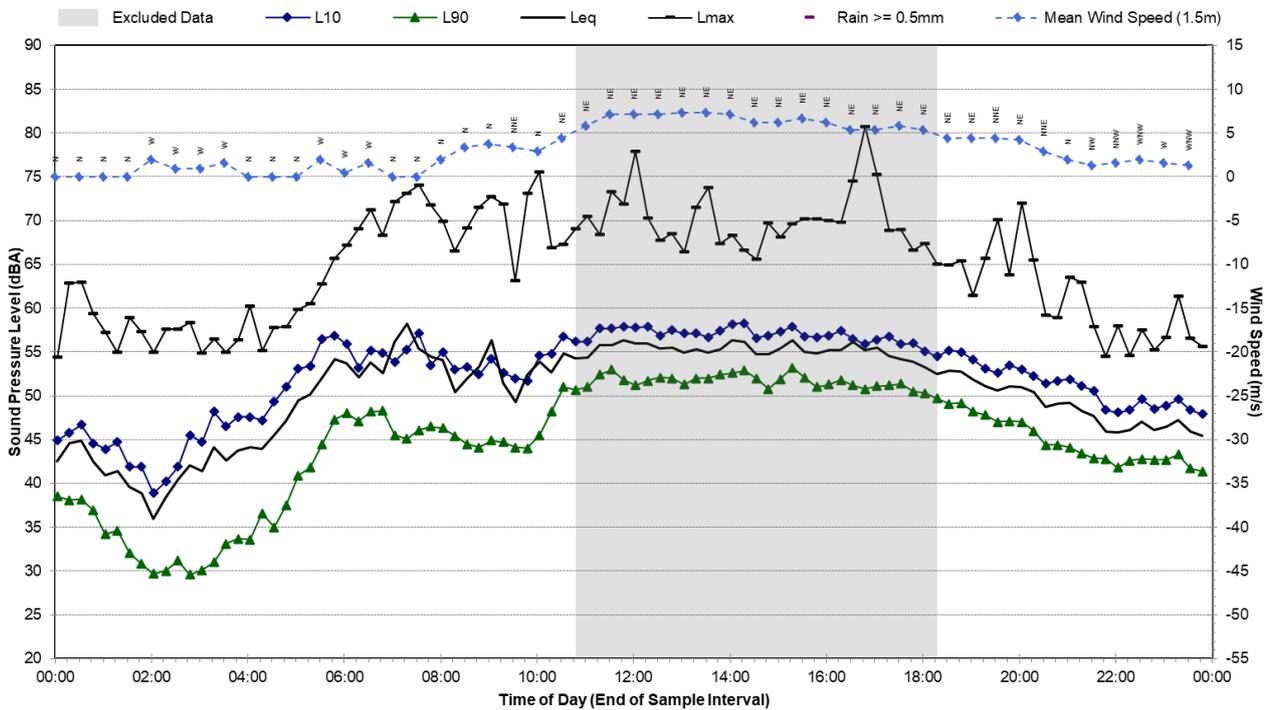
Statistical Ambient Noise Levels

L05 - Property 14 (R10) - Tuesday, 20 October 2020



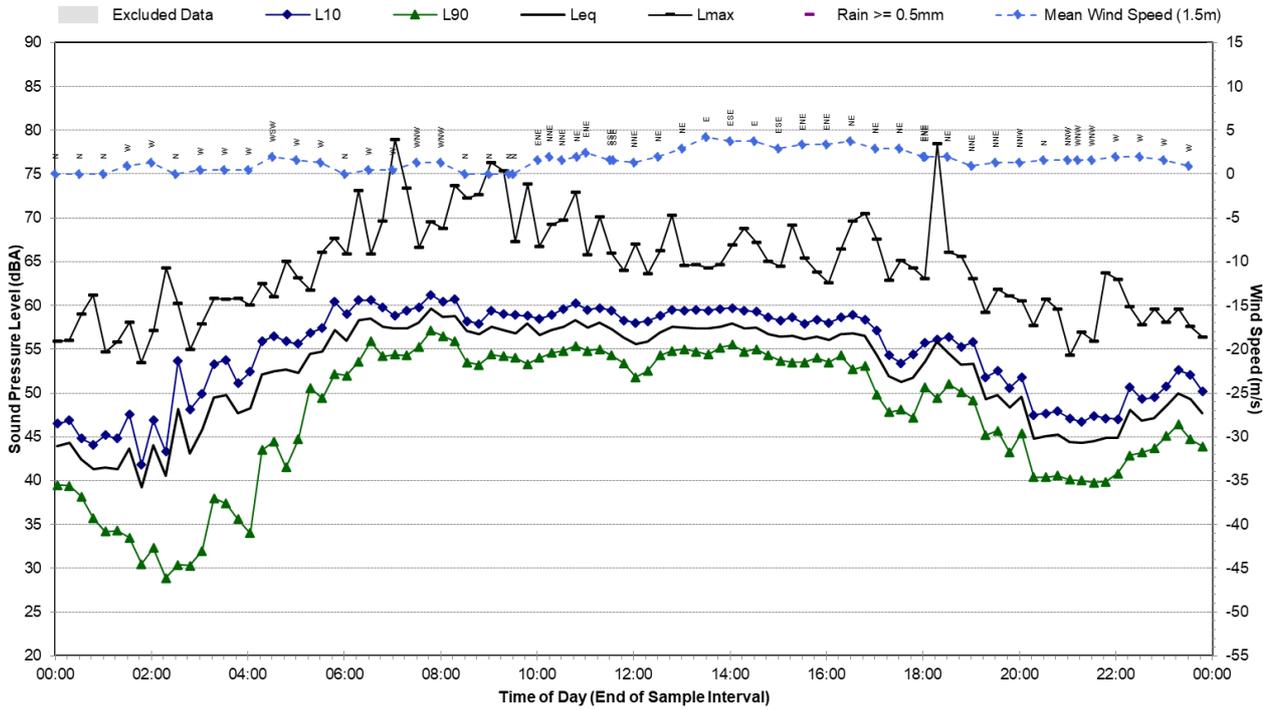
Statistical Ambient Noise Levels

L05 - Property 14 (R10) - Wednesday, 21 October 2020



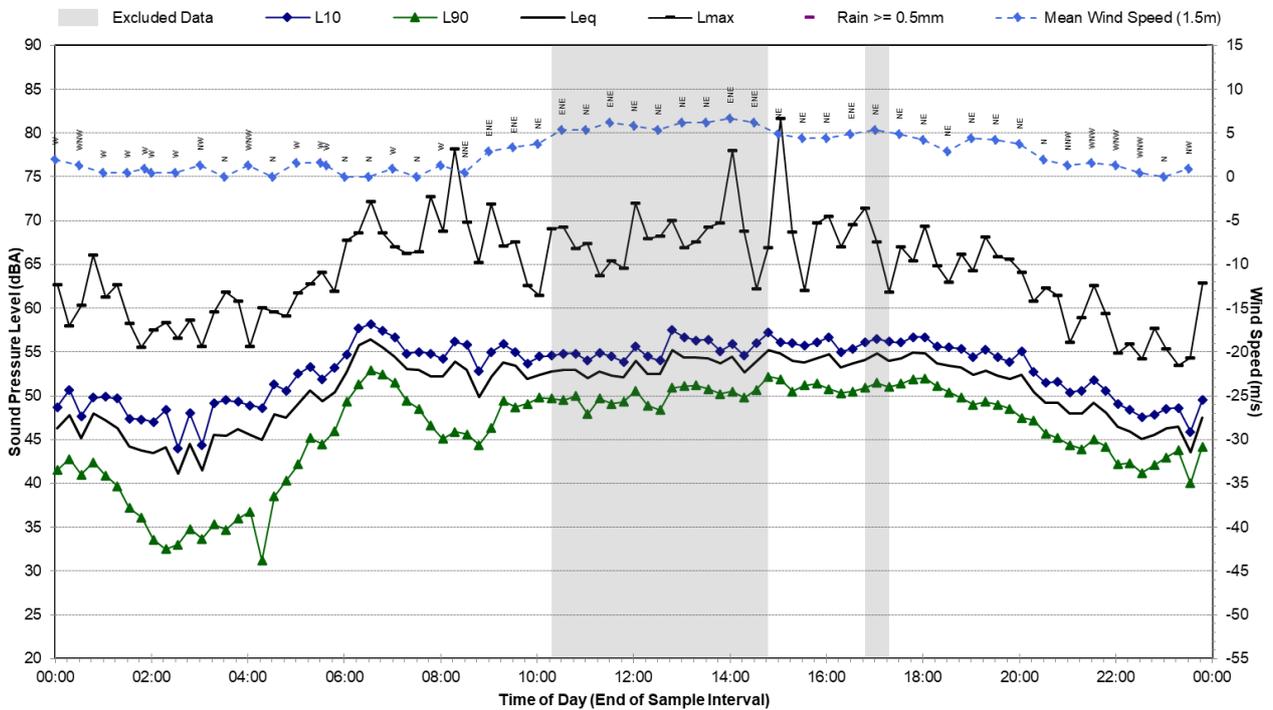
Statistical Ambient Noise Levels

L05 - Property 14 (R10) - Thursday, 22 October 2020



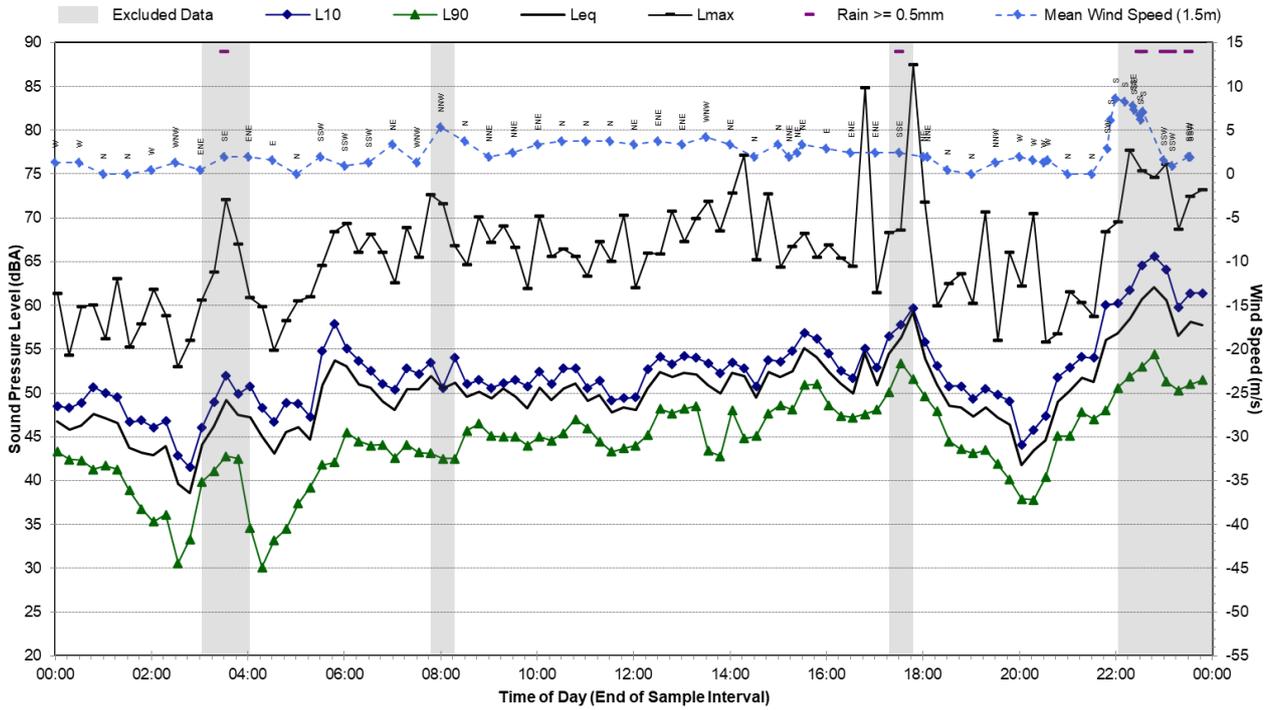
Statistical Ambient Noise Levels

L05 - Property 14 (R10) - Friday, 23 October 2020



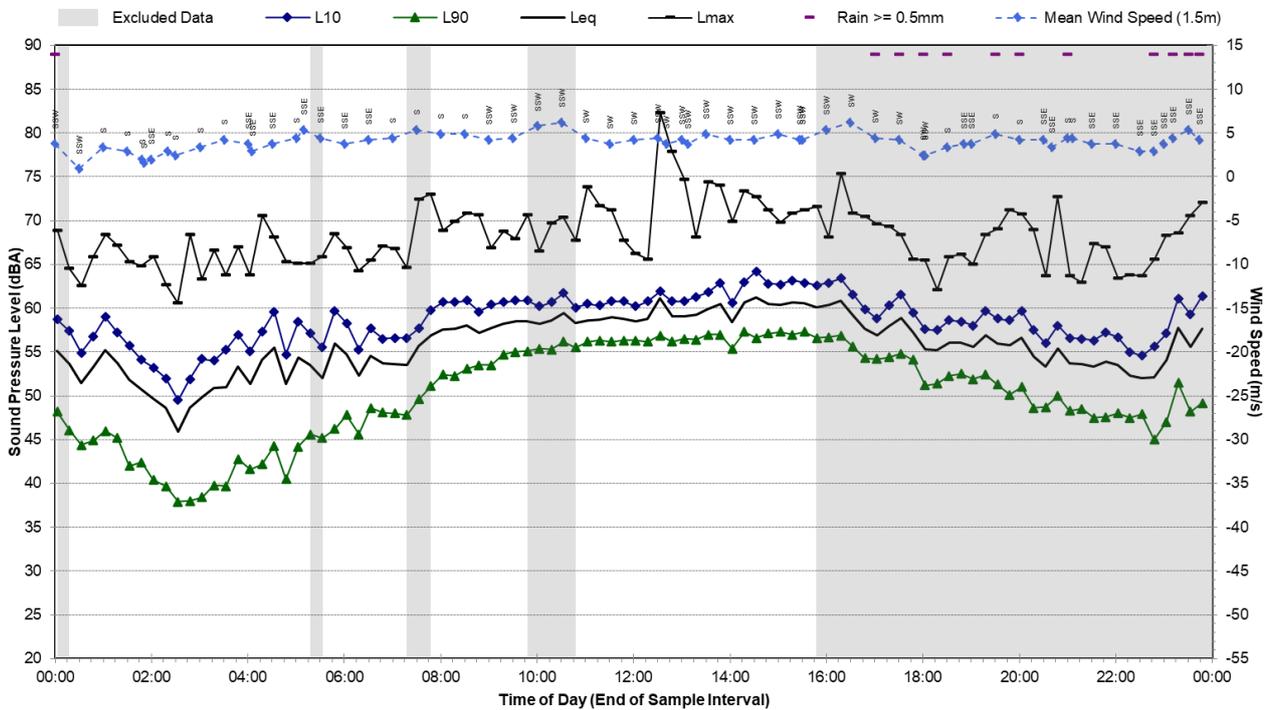
Statistical Ambient Noise Levels

L05 - Property 14 (R10) - Saturday, 24 October 2020



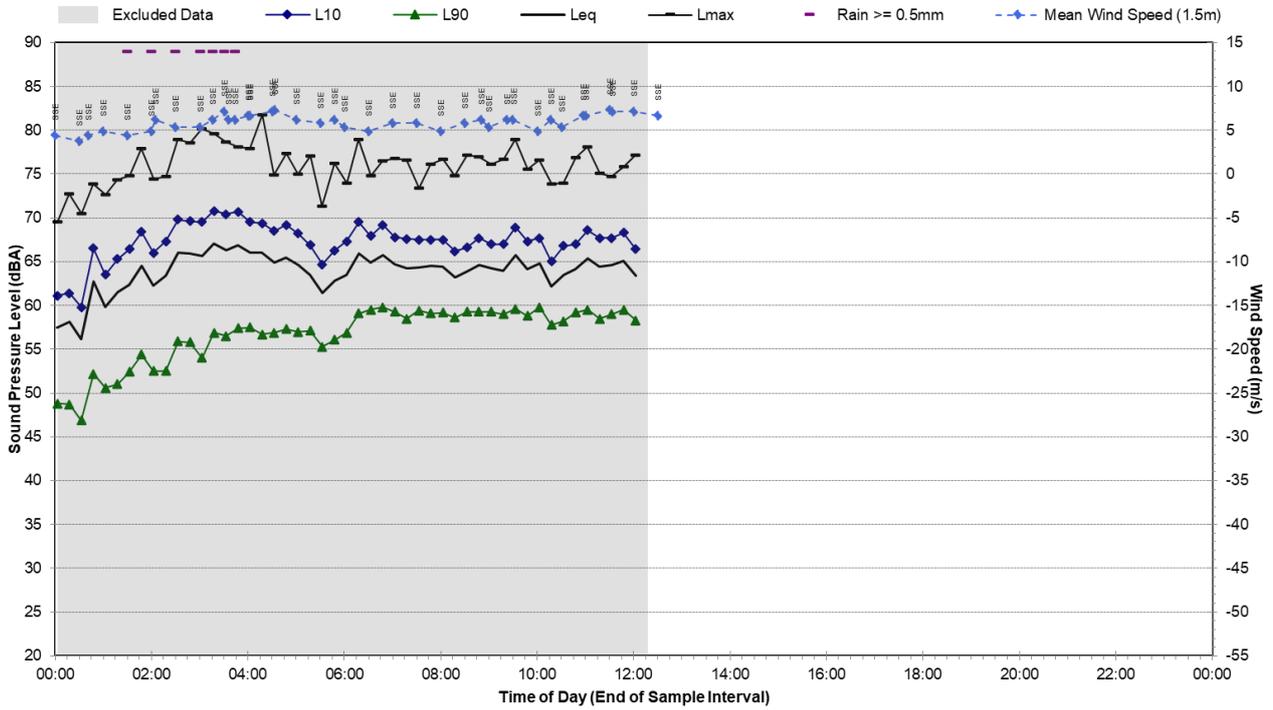
Statistical Ambient Noise Levels

L05 - Property 14 (R10) - Sunday, 25 October 2020



Statistical Ambient Noise Levels

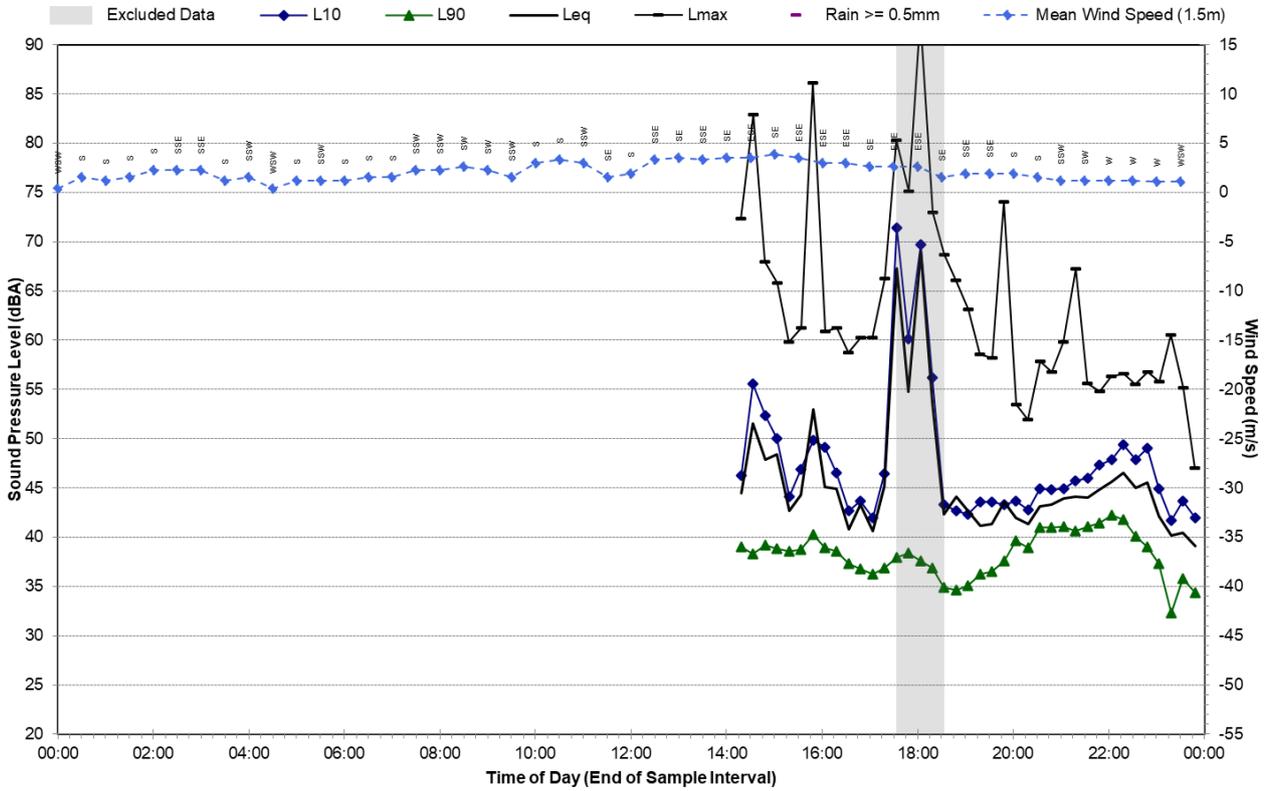
L05 - Property 14 (R10) - Monday, 26 October 2020



Noise Monitoring Location		L06			Map of Noise Monitoring Location																							
Noise Monitoring Address		5 Moonah Way, Shell Cove West																										
<p>Logger Device Type: Svantek 957, Logger Serial No: 23245 Sound Level Meter Device Type: Brüel and Kjær 2250L, Sound Level Meter Serial No: 3004635</p> <p>Ambient noise logger deployed adjacent to dwelling on 5 Moonah Way, Shell Cove West. The Cleary Bros Albion Park Quarry extraction area is located to the west of the logger location, with Princes Highway and Dunmore Road also to the west and Bass Point Quarry Road to the north.</p> <p>Background noise during the measurement was road traffic noise from Princes Highway. Road traffic on Dunmore Road and Bass Point Quarry Road, along with residential noise also contributed to the LAeq at this location during the measurement. The Albion Park Quarry was not audible at this location during the measurement.</p> <p>Recorded Noise Levels (LAmax): 3/03/2021: Princes Highway traffic: 38-42 dBA, Dunmore Road traffic: 40-43 dBA, Trucks on Bass Point Quarry Road: up to 47 dBA, Dogs: up to 58 dBA, Pedestrians: up to 50 dBA, Insects: audible. Albion Park Quarry not audible.</p>																												
<p>Ambient Noise Logging Results – NPfl Defined Time Periods</p> <table border="1"> <thead> <tr> <th rowspan="2">Monitoring Period</th> <th colspan="4">Noise Level (dBA)</th> </tr> <tr> <th>RBL</th> <th>LAeq</th> <th>L10</th> <th>L1</th> </tr> </thead> <tbody> <tr> <td>Daytime</td> <td>37</td> <td>49</td> <td>48</td> <td>55</td> </tr> <tr> <td>Evening</td> <td>38</td> <td>46</td> <td>45</td> <td>53</td> </tr> <tr> <td>Night-time</td> <td>33</td> <td>47</td> <td>45</td> <td>50</td> </tr> </tbody> </table>						Monitoring Period	Noise Level (dBA)				RBL	LAeq	L10	L1	Daytime	37	49	48	55	Evening	38	46	45	53	Night-time	33	47	45
Monitoring Period	Noise Level (dBA)																											
	RBL	LAeq	L10	L1																								
Daytime	37	49	48	55																								
Evening	38	46	45	53																								
Night-time	33	47	45	50																								
<p>Attended Noise Measurement Results</p> <table border="1"> <thead> <tr> <th rowspan="2">Date</th> <th rowspan="2">Start Time</th> <th colspan="3">Measured Noise Level (dBA)</th> </tr> <tr> <th>LA90</th> <th>LAeq</th> <th>LAmax</th> </tr> </thead> <tbody> <tr> <td>3/03/2021</td> <td>14:06</td> <td>39</td> <td>43</td> <td>61</td> </tr> </tbody> </table>					Date	Start Time	Measured Noise Level (dBA)			LA90	LAeq	LAmax	3/03/2021	14:06	39	43	61											
Date	Start Time	Measured Noise Level (dBA)																										
		LA90	LAeq	LAmax																								
3/03/2021	14:06	39	43	61																								
<p>Photo of Noise Monitoring Location</p>																												

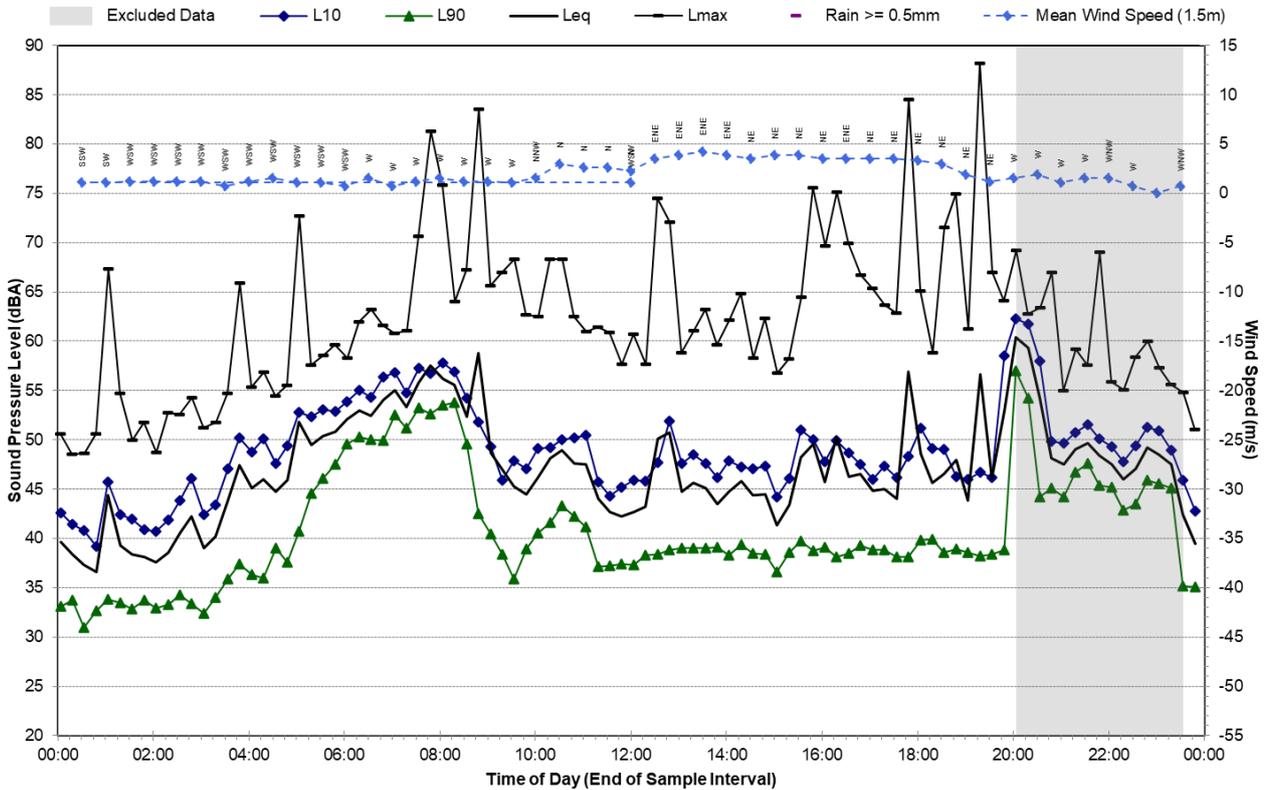
Statistical Ambient Noise Levels

L06 - 5 Moonah Way, Shell Cove West - Wednesday, 3 March 2021



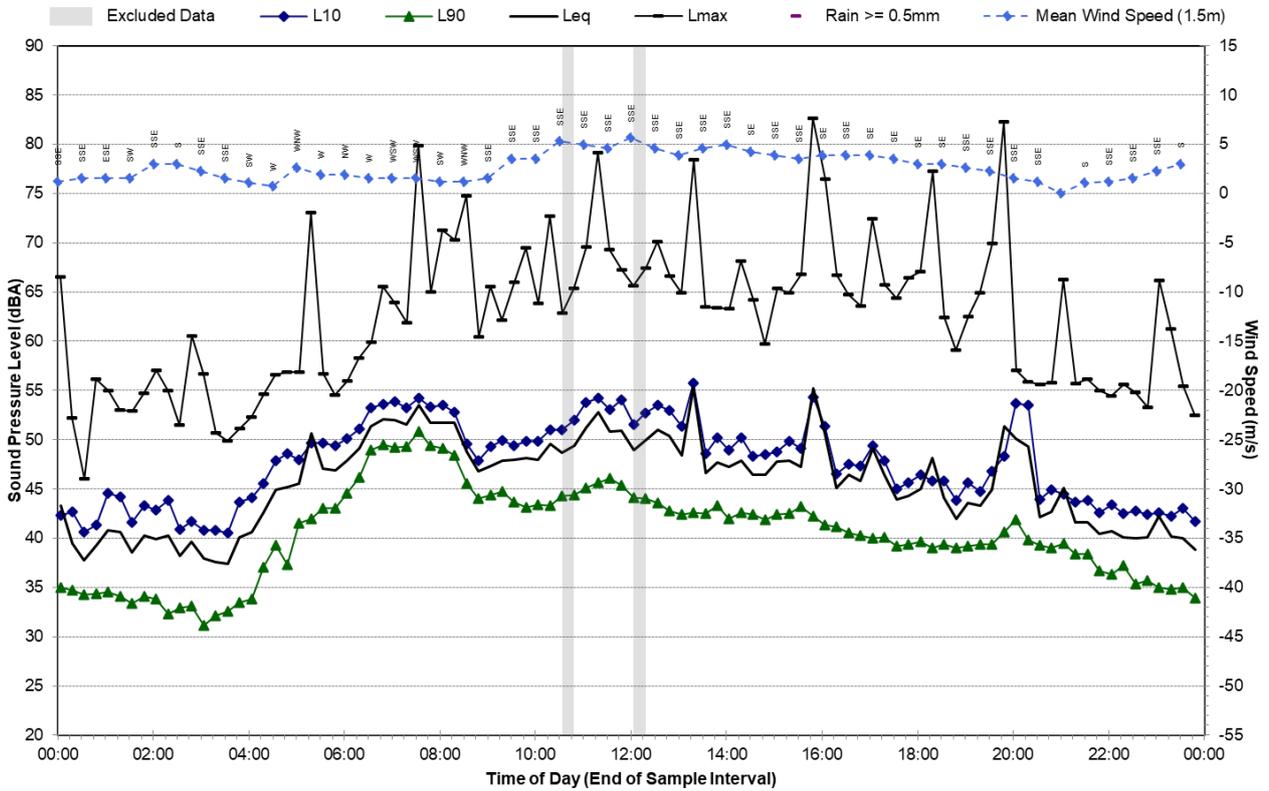
Statistical Ambient Noise Levels

L06 - 5 Moonah Way, Shell Cove West - Thursday, 4 March 2021



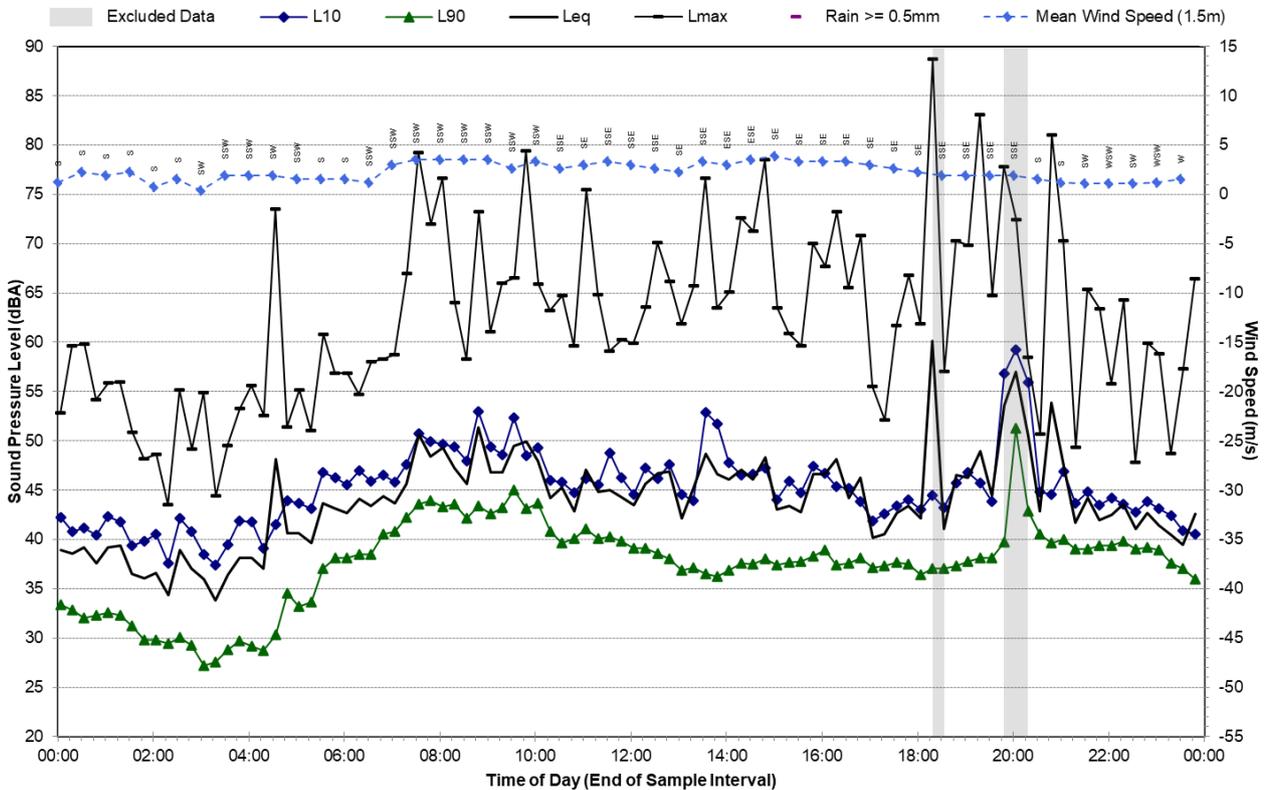
Statistical Ambient Noise Levels

L06 - 5 Moonah Way, Shell Cove West - Friday, 5 March 2021



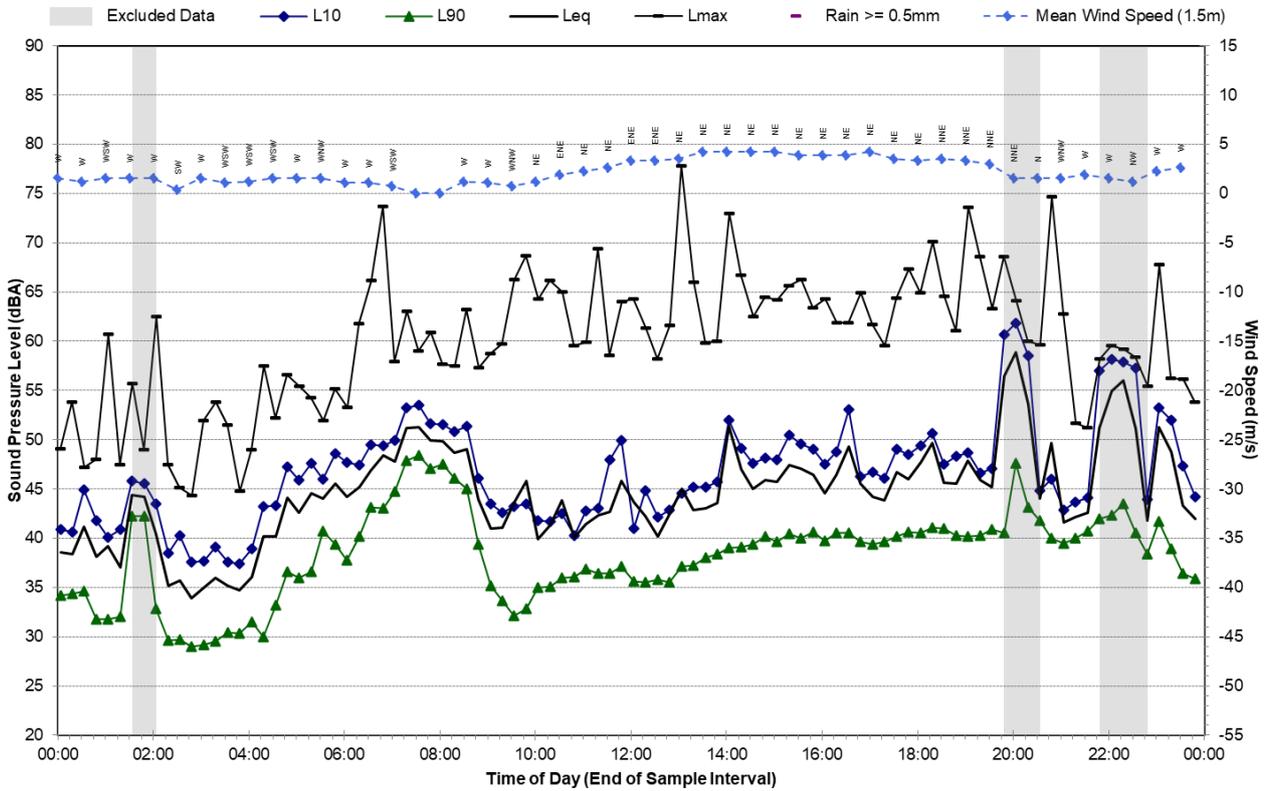
Statistical Ambient Noise Levels

L06 - 5 Moonah Way, Shell Cove West - Saturday, 6 March 2021



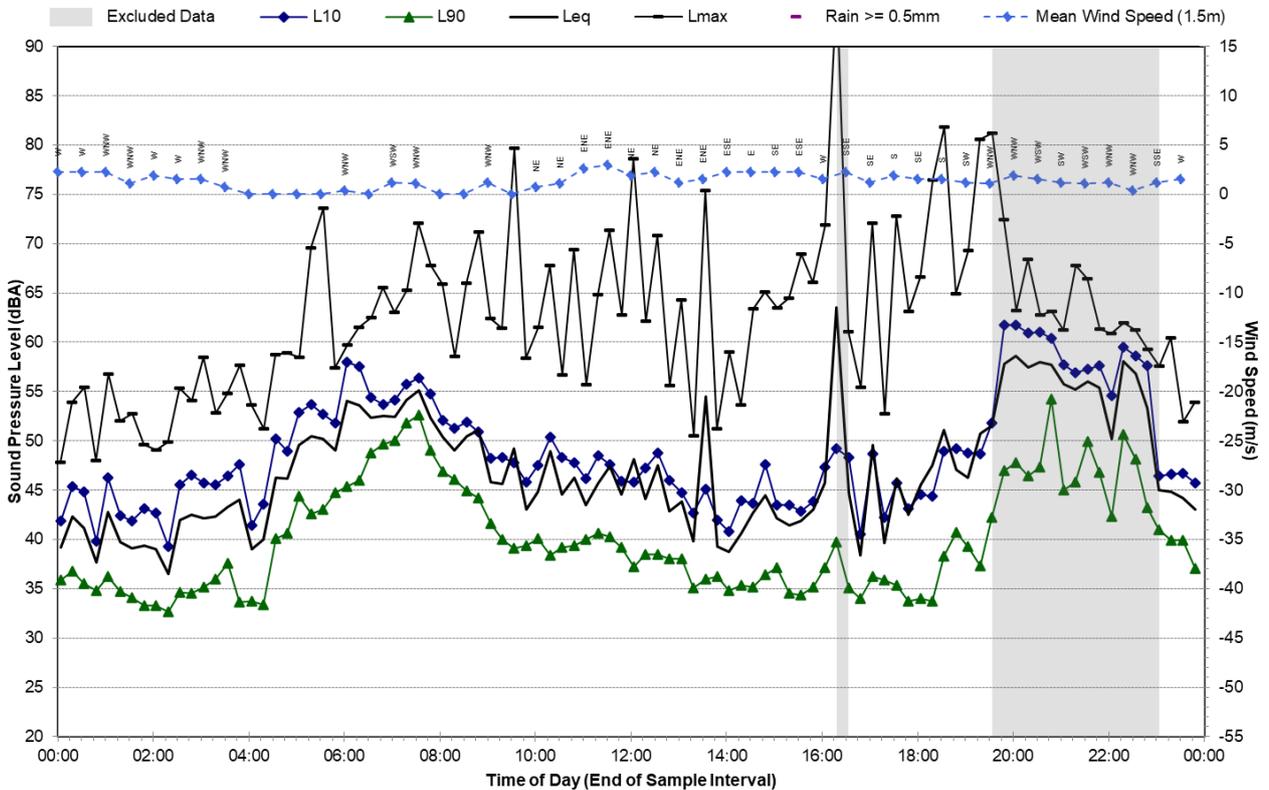
Statistical Ambient Noise Levels

L06 - 5 Moonah Way, Shell Cove West - Sunday, 7 March 2021



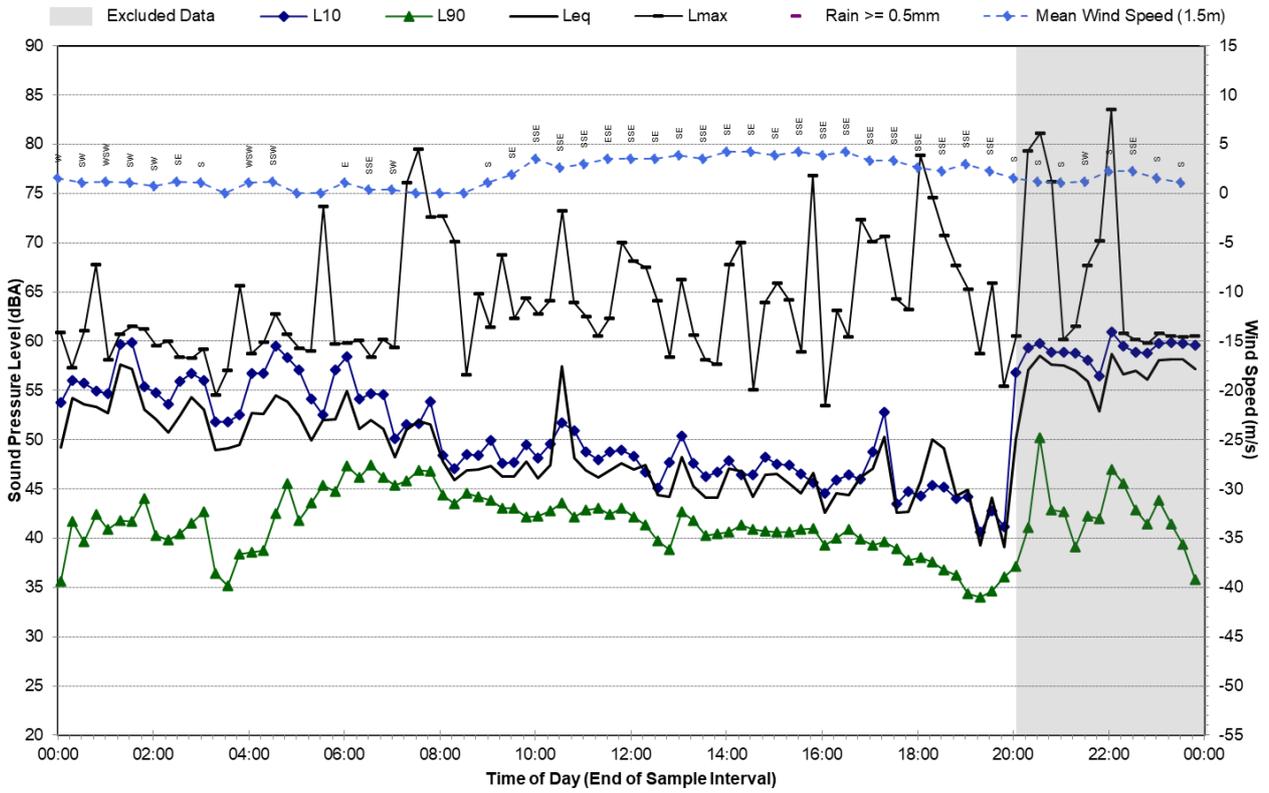
Statistical Ambient Noise Levels

L06 - 5 Moonah Way, Shell Cove West - Monday, 8 March 2021



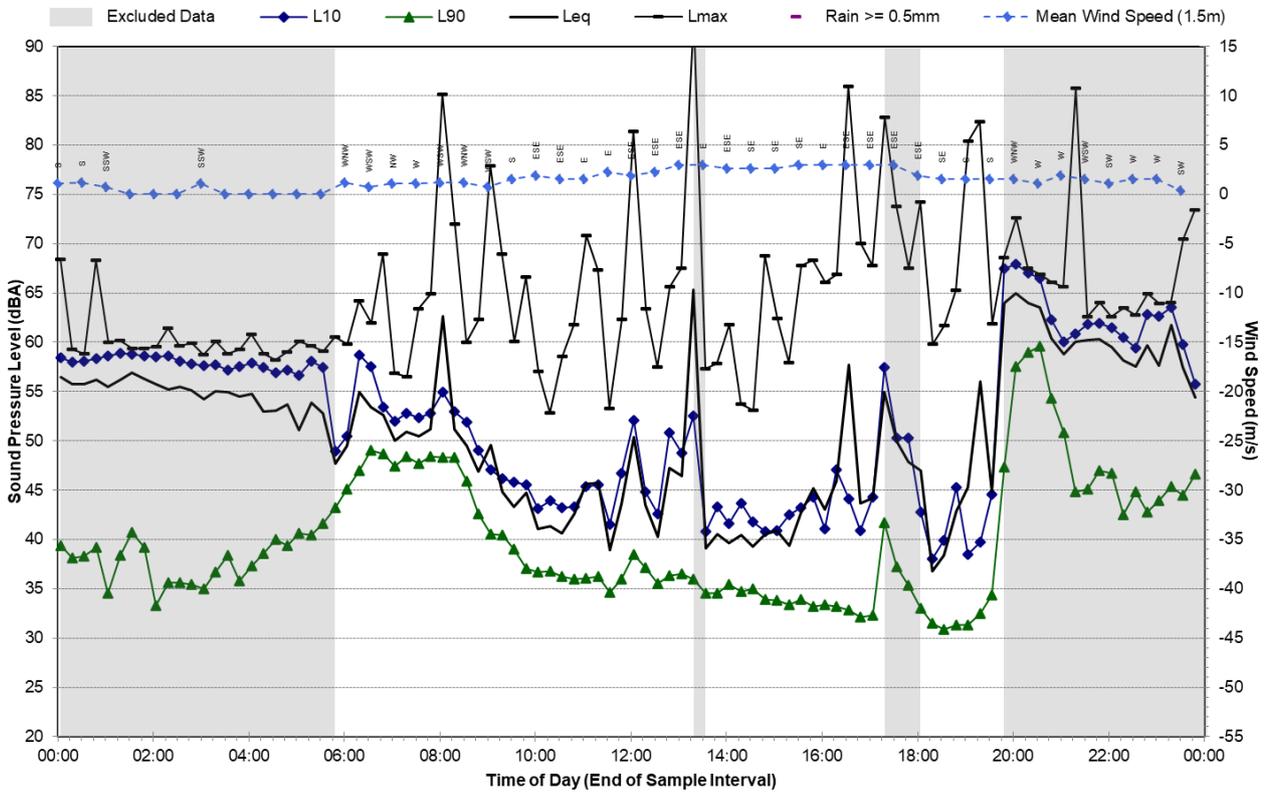
Statistical Ambient Noise Levels

L06 - 5 Moonah Way, Shell Cove West - Tuesday, 9 March 2021



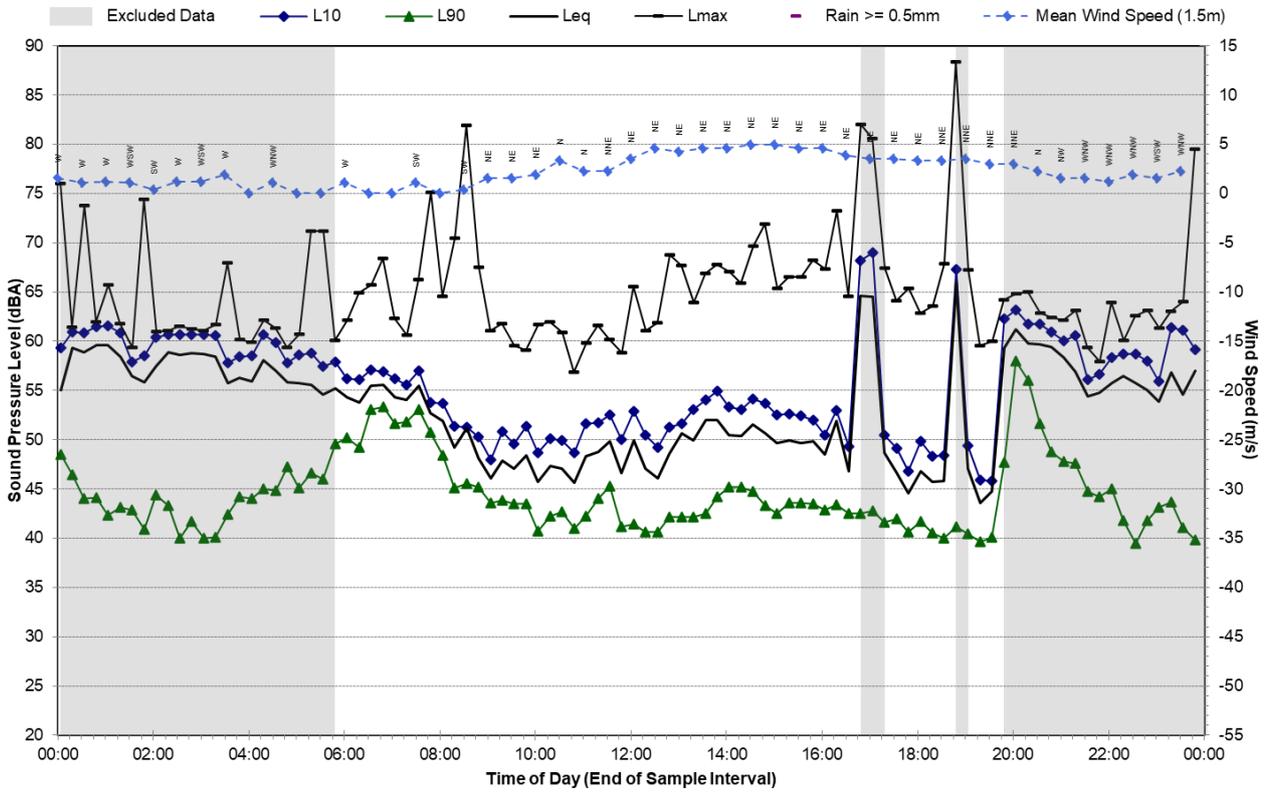
Statistical Ambient Noise Levels

L06 - 5 Moonah Way, Shell Cove West - Wednesday, 10 March 2021



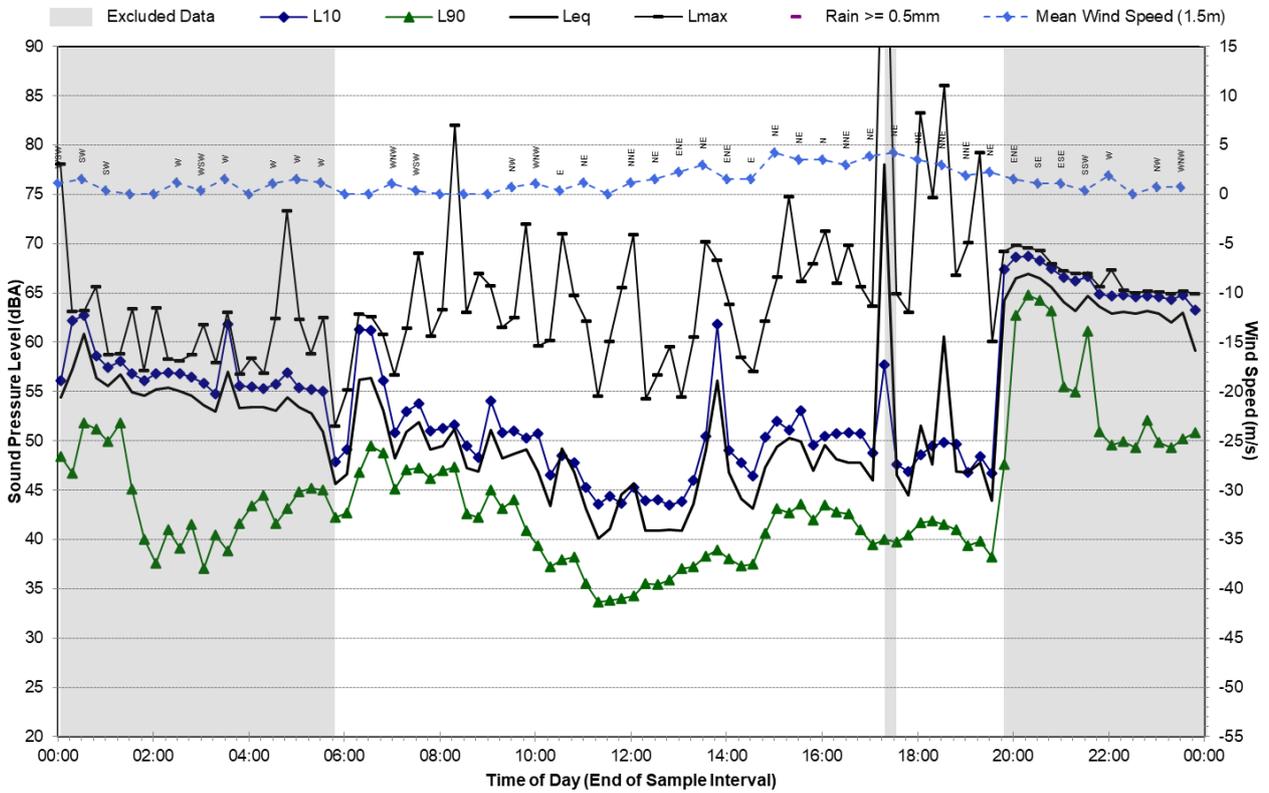
Statistical Ambient Noise Levels

L06 - 5 Moonah Way, Shell Cove West - Thursday, 11 March 2021



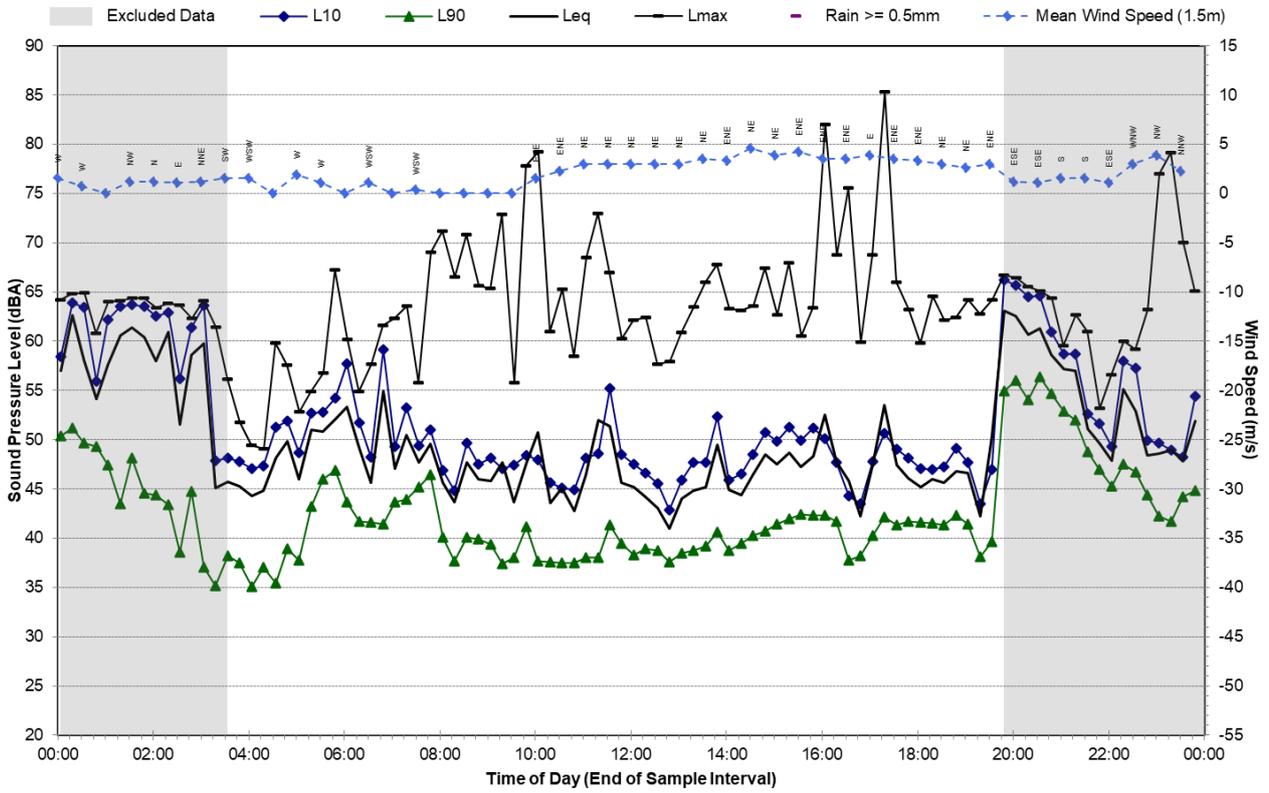
Statistical Ambient Noise Levels

L06 - 5 Moonah Way, Shell Cove West - Friday, 12 March 2021



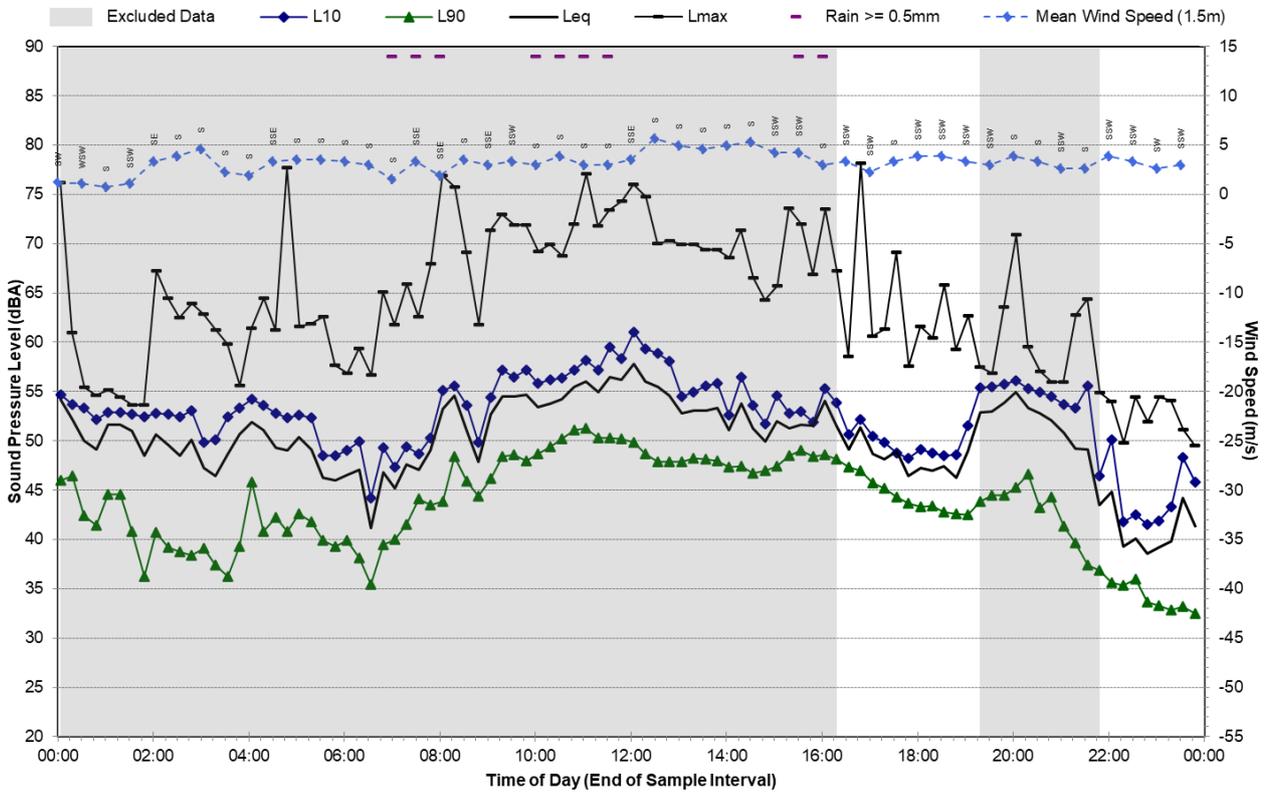
Statistical Ambient Noise Levels

L06 - 5 Moonah Way, Shell Cove West - Saturday, 13 March 2021



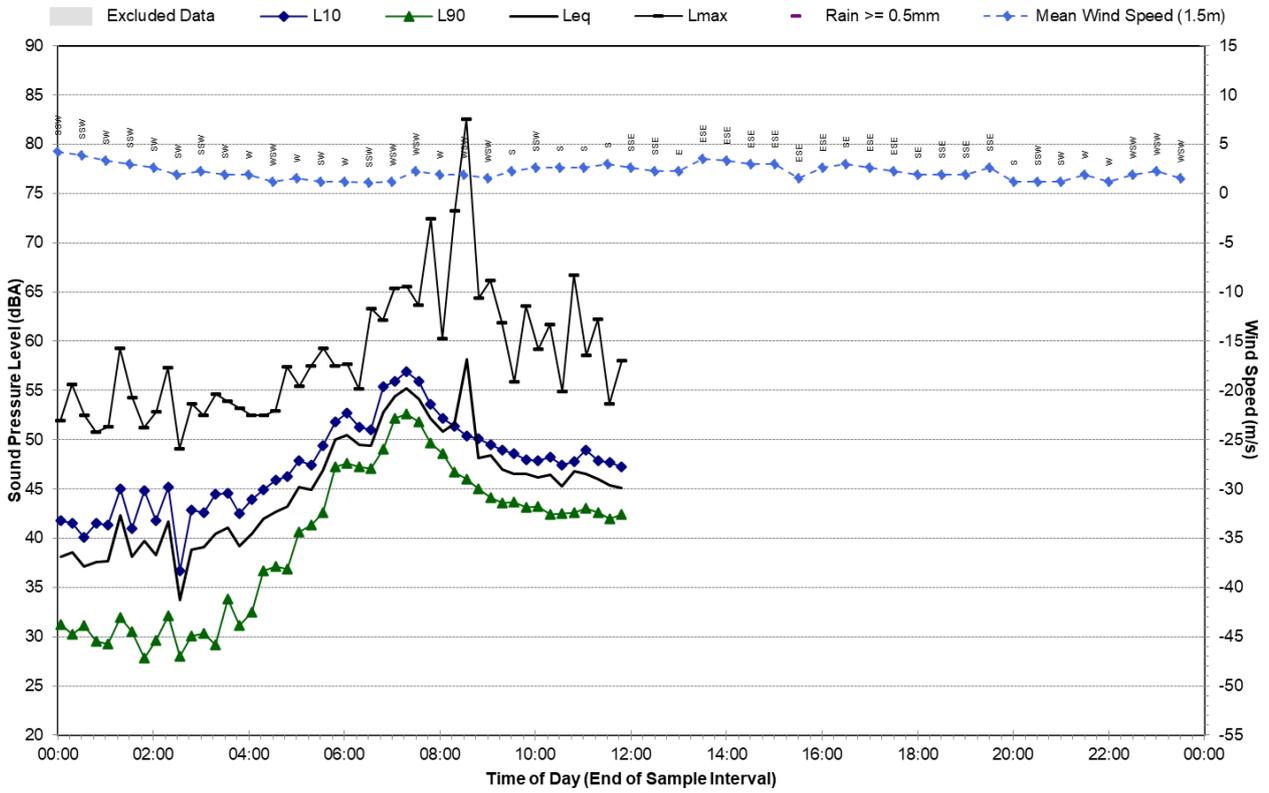
Statistical Ambient Noise Levels

L06 - 5 Moonah Way, Shell Cove West - Sunday, 14 March 2021



Statistical Ambient Noise Levels

L06 - 5 Moonah Way, Shell Cove West - Monday, 15 March 2021



APPENDIX C

Low-Frequency Noise Analysis

Table 1 Low-Frequency Noise Analysis

Stage	Receiver	Predicted Noise Level											C minus A >=15 dB	Exceeds Octave Band Limit ¹	Low-Frequency Correction Required		
		Linear Spectrum dB(L)										Overall Linear dB(L)				Overall A-weighted dB(A)	Overall C-weighted dB(C)
		16 Hz	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz						
Stage 7a	Greenmeadows Estate	26	29	28	<20	<20	<20	<20	<20	<20	<20	33	<20	30	Yes	No	No
	Figtree Hill "The Cottage" R1	50	53	49	37	28	29	30	28	<20	<20	56	34	53	Yes	No	No
	Figtree Hill "The Hill" R2	48	51	47	35	26	28	29	26	<20	<20	54	33	51	Yes	No	No
	Figtree Hill "Approved Residence" R3	50	53	49	37	28	29	29	26	20	<20	56	34	53	Yes	No	No
	R4	40	43	39	26	<20	<20	<20	<20	<20	<20	46	23	43	Yes	No	No
	R5	41	44	40	27	<20	<20	<20	<20	<20	<20	47	24	44	Yes	No	No
	R6	40	43	37	25	<20	<20	<20	<20	<20	<20	46	21	42	Yes	No	No
	R7	32	34	34	23	<20	<20	<20	<20	<20	<20	38	<20	36	Yes	No	No
	R8	30	33	32	20	<20	<20	<20	<20	<20	<20	37	<20	34	Yes	No	No
	R9	38	41	37	24	<20	<20	<20	<20	<20	<20	44	21	41	Yes	No	No
	R10	39	42	36	24	<20	<20	<20	<20	<20	<20	45	20	41	Yes	No	No
	R11	39	42	36	24	<20	<20	<20	<20	<20	<20	45	<20	41	Yes	No	No

Stage	Receiver	Predicted Noise Level											C minus A >=15 dB	Exceeds Octave Band Limit ¹	Low- Frequency Correction Required		
		Linear Spectrum dB(L)										Overall Linear dB(L)				Overall A-weighted dB(A)	Overall C-weighted dB(C)
		16 Hz	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz						
Stage 7b	Greenmeadows Estate	26	29	28	<20	<20	<20	<20	<20	<20	<20	33	<20	30	Yes	No	No
	Figtree Hill "The Cottage" R1	47	50	46	34	25	27	28	26	<20	<20	53	32	50	Yes	No	No
	Figtree Hill "The Hill" R2	47	50	45	33	24	26	27	24	<20	<20	52	31	49	Yes	No	No
	Figtree Hill "Approved Residence" R3	51	53	47	34	25	27	27	24	<20	<20	56	31	52	Yes	No	No
	R4	42	45	38	25	<20	<20	<20	<20	<20	<20	47	21	44	Yes	No	No
	R5	46	49	43	30	20	23	23	<20	<20	<20	51	26	48	Yes	No	No
	R6	47	52	42	27	21	21	<20	<20	<20	<20	53	24	50	Yes	No	No
	R7	33	34	32	21	<20	<20	<20	<20	<20	<20	38	<20	35	Yes	No	No
	R8	32	34	31	<20	<20	<20	<20	<20	<20	<20	37	<20	34	Yes	No	No
	R9	44	47	40	27	<20	21	20	<20	<20	<20	49	24	46	Yes	No	No
	R10	45	50	41	27	20	21	<20	<20	<20	<20	51	24	48	Yes	No	No
R11	44	48	41	28	<20	20	<20	<20	<20	<20	50	23	47	Yes	No	No	

Stage	Receiver	Predicted Noise Level											C minus A >=15 dB	Exceeds Octave Band Limit ¹	Low- Frequency Correction Required		
		Linear Spectrum dB(L)										Overall Linear dB(L)				Overall A-weighted dB(A)	Overall C-weighted dB(C)
		16 Hz	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz						
Stage 7c/7d	Greenmeadows Estate	31	35	32	<20	<20	<20	<20	<20	<20	<20	38	<20	35	Yes	No	No
	Figtree Hill "The Cottage" R1	59	62	54	41	32	32	33	30	26	<20	64	38	60	Yes	No	No
	Figtree Hill "The Hill" R2	56	58	52	39	29	30	31	29	23	<20	60	36	57	Yes	No	No
	Figtree Hill "Approved Residence" R3	60	63	56	43	35	34	34	32	27	<20	65	39	62	Yes	No	No
	R4	37	39	40	26	<20	<20	<20	<20	<20	<20	44	23	41	Yes	No	No
	R5	45	48	43	31	21	24	24	<20	<20	<20	51	27	48	Yes	No	No
	R6	46	52	47	38	28	30	28	<20	<20	<20	54	32	51	Yes	No	No
	R7	34	37	35	24	<20	<20	<20	<20	<20	<20	40	20	38	Yes	No	No
	R8	32	35	33	21	<20	<20	<20	<20	<20	<20	38	<20	36	Yes	No	No
	R9	41	45	41	28	<20	21	21	<20	<20	<20	48	24	45	Yes	No	No
	R10	40	45	39	29	<20	<20	<20	<20	<20	<20	47	21	44	Yes	No	No
R11	40	45	40	28	<20	20	<20	<20	<20	<20	47	22	44	Yes	No	No	

Note 1: Octave band limit derived from Table C2 in Fact Sheet C of the NPfl.

APPENDIX D

Historic Blast Emissions Levels

Table 1 Historic Blast Emissions Levels

Date	Blast ID Number	Ground Vibration PPV (mm/s)	Airblast (dB Linear Peak)
04-Aug-20	22/20	1.89	110.50
24-Jul-20	21/20	2.20	104.40
17-Jul-20	20/20	2.16	106.70
10-Jul-20	19/20	4.84	111.30
03-Jul-20	18/20	2.78	110.10
26-Jun-20	17/20	3.00	107.30
17-Jun-20	16/20	2.06	108.80
04-Jun-20	15/20	3.25	110.10
27-May-20	14/20	1.31	111.80
14-May-20	13/20	3.59	110.50
29-Apr-20	12/20	3.23	111.70
21-Apr-20	11/20	2.87	106.50
09-Apr-20	10/20	4.46	110.70
27-Mar-20	09/20	4.74	109.40
20-Mar-20	08/20	1.98	108.00
13-Mar-20	07/20	2.20	110.10
04-Mar-20	06/20	2.63	107.50
18-Feb-20	05/20	3.80	103.10
06-Feb-20	04/20	1.04	113.70
29-Jan-20	03/20	2.27	112.60
21-Jan-20	02/20	0.80	103.50
14-Jan-20	01/20	3.42	104.20
07-Jan-20	32/19	1.42	99.60
12-Dec-19	31/19	0.58	99.60
10-Dec-19	30/19	3.57	114.50
06-Dec-19	29/19	2.01	106.30
29-Nov-19	28/19	4.11	107.20
19-Nov-19	27/19	1.55	105.60
13-Nov-19	26/19	2.79	106.30
01-Nov-19	25/19	2.88	100.20
01-Oct-19	24/19	2.11	104.80
20-Sep-19	23/19	2.82	103.10
03-Sep-19	21/19	2.99	105.20
20-Aug-19	20/19	1.36	106.30
27-Aug-19	19/19	2.28	109.30
07-Aug-19	18/19	3.80	109.60
02-Aug-19	17/19	3.55	105.60
26-Jul-19	16/19	3.26	110.00
12-Jul-19	15/19	3.83	108.30
28-Jun-19	14/19	2.62	109.30
21-Jun-19	13/19	3.38	111.40
11-Jun-19	12/19	1.87	106.60
04-Jun-19	11/19	3.48	110.20
28-May-19	10/19	2.91	104.80
10-May-19	09/19	1.97	104.40
18-Apr-19	08/19	1.46	103.10

Date	Blast ID Number	Ground Vibration PPV (mm/s)	Airblast (dB Linear Peak)
12-Apr-19	07/19	3.21	106.30
05-Apr-19	06/19	2.33	102.60
22-Mar-19	05/19	3.86	103.50
06-Mar-19	04/19	1.25	99.60
01-Mar-19	03/19	3.19	107.20
08-Feb-19	02/19	1.51	103.10
11-Jan-19	01/19	1.62	104.80
14-Dec-18	17/18	2.41	107.20
27-Nov-18	16/18	2.14	105.20
14-Nov-18	15/18	1.96	105.90
30-Oct-18	14/18	1.64	102.60
09-Oct-18	13/18	0.88	107.80
02-Oct-18	12/18	2.73	106.90
04-Sep-18	11/18	1.87	103.50
31-Jul-18	10/18	0.86	104.80
19-Jul-18	09/18	0.86	104.80
09-Jul-18	08/18	1.33	108.80
26-Jun-18	07/18	2.09	102.60
29-May-18	06/18	3.87	102.60
08-May-18	05/18	3.97	105.60
17-Apr-18	04/18	1.95	108.10
03-Apr-18	03/18	3.57	105.20
15-Feb-18	02/18	1.79	101.90
22-Jan-18	01/18	1.12	99.50
12-Dec-17	19/17	2.29	101.90
04-Dec-17	18/17	1.88	109.90
15-Nov-17	17/17	1.46	98.70
10-Nov-17	16/17	1.29	101.90
13-Oct-17	15/17	1.97	100.10
19-Sep-17	14/17	1.23	105.10
11-Sep-17	13/17	1.33	101.90
29-Aug-17	12/17	2.57	112.00
22-Aug-17	11/17	1.02	107.90
01-Aug-17	10/17	1.95	107.90
11-Jul-17	09/17	2.54	110.1
04-Jul-17	08/17	1.16	101.4
21-Jun-17	07/17	1.23	109.9
01-Jun-17	06/17	1.20	106.1
02-May-17	05/17	1.93	109.2
28-Mar-17	04/17	1.91	106.8
21-Mar-17	03/17	1.20	101.9
24-Feb-17	02/17	2.07	102.8
03-Feb-17	01/17	2.48	102.8
20-Dec-16	21/16	1.98	107.2
06-Dec-16	20/16	1.45	106.8
18-Nov-16	19/16	3.71	107.0
25-Dec-16	18/16	2.24	103.5
21-Oct-16	17/16	3.57	101.0

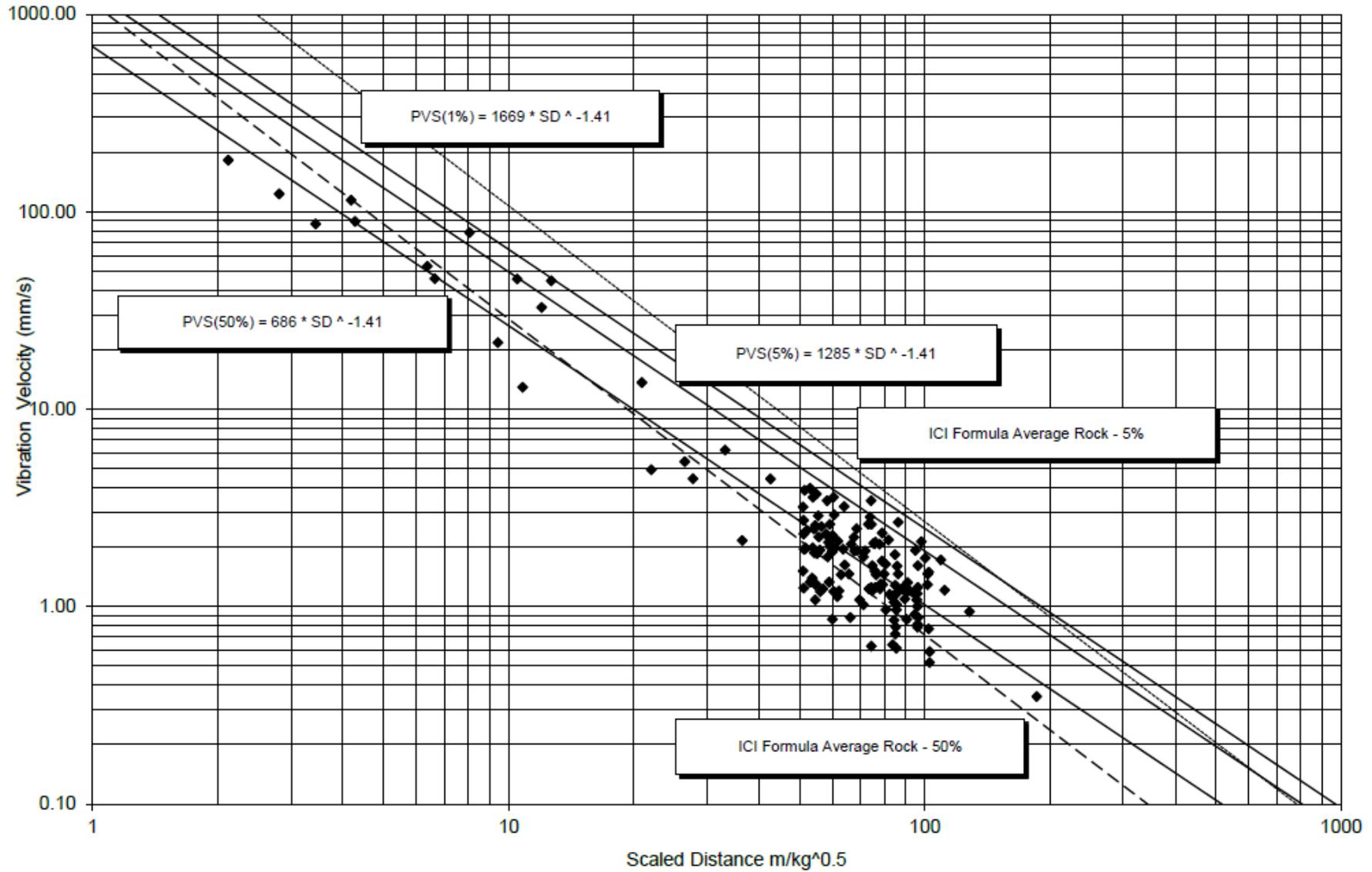
Date	Blast ID Number	Ground Vibration PPV (mm/s)	Airblast (dB Linear Peak)
27-Sep-16	16/16	2.88	103.5
02-Sep-16	15/16	1.30	107.5
26-Aug-16	14/16	3.43	105.1
08-Jul-16	13/16	1.19	104.2
01-Jun-16	12/16	2.11	107.5
20-May-16	11/16	2.25	107.0
06-May-16	10/16	1.89	104.9
20-Apr-16	09/16	1.19	108.8
13-Apr-16	08/16	2.47	106.5
22-Mar-16	07/16	1.85	106.5
11-Mar-16	06/16	0.59	109.9
08-Mar-16	05/16	1.39	104.2
01-Mar-16	04/16	1.24	101.9
12-Feb-16	03/16	1.20	101.9
05-Feb-16	02/16	1.49	107.5
12-Jan-16	01/16	1.92	105.8
09-Dec-15	14/15	2.07	103.4
02-Nov-15	13/15	2.61	104.6
12-Oct-15	12/15	1.24	107.0
06-Aug-15	11/15	1.45	102.7
30-Jul-15	09/15	1.30	108.8
30-Jun-15	08/15	2.61	102.0
17-Jun-15	07/15	1.11	108.9
25-May-15	06/16	2.35	105.9
07-May-15	05/15	0.96	113.4
10-Apr-15	04/15	1.78	108.6
18-Mar-15	03/15	3.43	100.3
12-Mar-15	02/15	2.61	107.3
19-Jan-15	01/15	2.12	106.9
08-Dec-14	16/14	1.51	101.9
04-Nov-14	15/14	1.08	104.2
23-Sep-14	14/14	0.79	101.0
09-Sep-14	13/14	0.85	101.0
05-Aug-14	12/14	1.17	105.5
16-Jul-14	11/14	1.23	108.1
23-Jul-14	10/14	2.84	104.2
04-Jun-14	09/14	0.72	101.0
06-May-14	08/14	1.30	104.9
15-Apr-14	07/14	0.81	105.1
08-Apr-14	06/14	1.91	99.6
04-Apr-14	05/14	0.62	107.0
12-Mar-14	04/14	1.46	112.2
05-Mar-14	03/14	1.83	98.8
12-Feb-14	02/14	1.09	102.8
30-Jan-14	01/14	0.79	97.5
19-Dec-13	26/13	1.15	92.6
09-Dec-13	25/13	0.35	100.0
19-Nov-13	24/13	2.67	107.0

Date	Blast ID Number	Ground Vibration PPV (mm/s)	Airblast (dB Linear Peak)
01-Nov-13	22/13	1.29	108.0
11-Oct-13	23/13	1.18	100.7
04-Sep-13	21/13	2.17	101.8
20-Aug-13	20/13	1.61	101.8
16-Aug-13	19/13	1.08	100.7
05-Aug-13	18/13	1.16	106.8
15-Jul-13	17/13	1.21	103.5
25-Jun-13	16/13	1.46	109.1
05-Jun-13	15/13	1.18	105.6
27-May-13	14/13	0.91	101.8
16-May-13	13/13	0.88	-
29-Apr-13	12/13	1.29	100.3
18-Apr-13	11/13	1.21	101.9
11-Apr-13	10/13	1.21	103.3
04-Apr-13	09/13	2.13	105.0
25-Mar-13	08/13	1.92	99.4
06-Mar-13	06/13	1.76	99.9
27-Feb-13	05/13	0.94	100.5
20-Feb-13	04/13	1.48	100.0

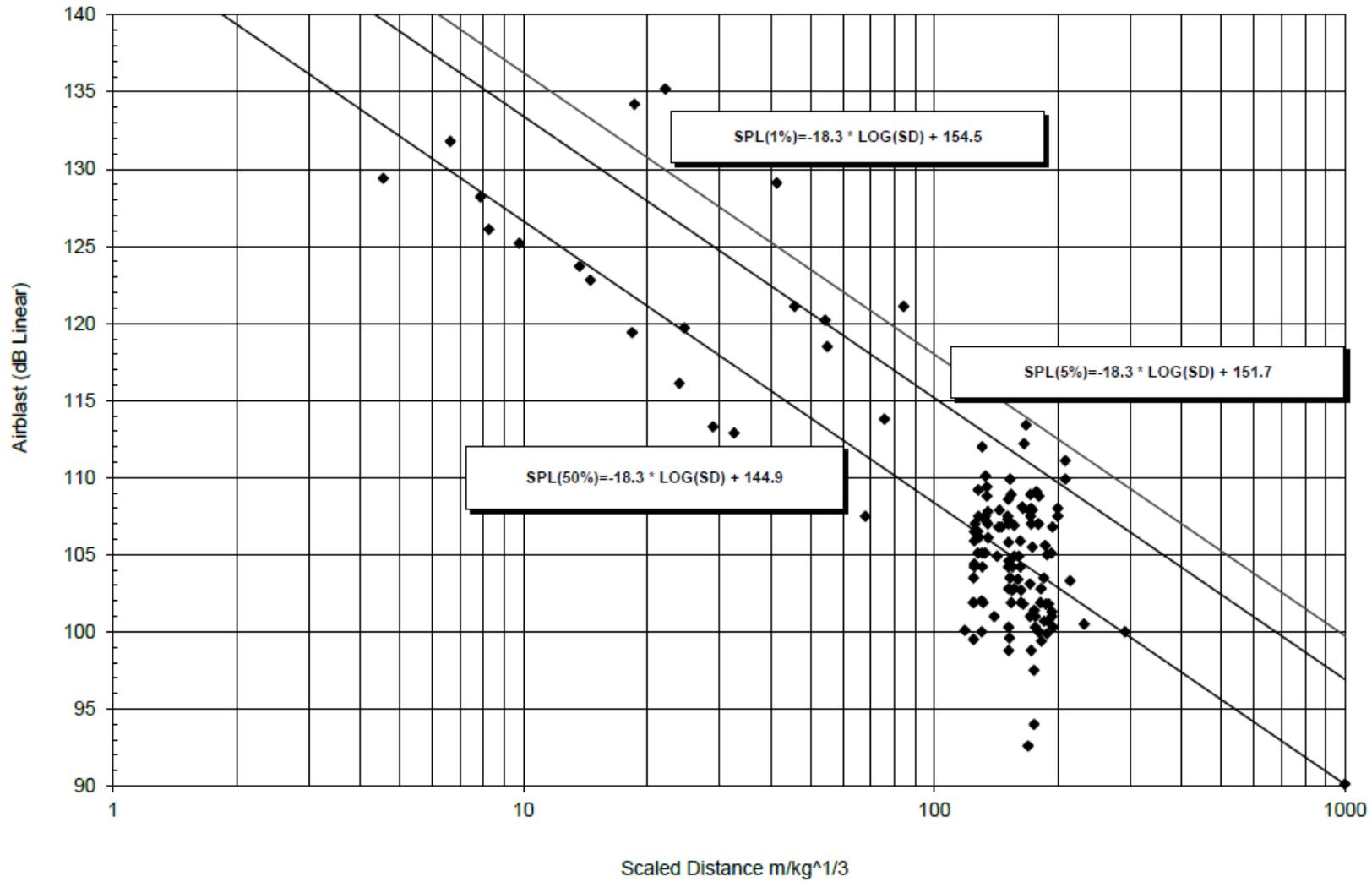
APPENDIX E

Blasting Site Laws

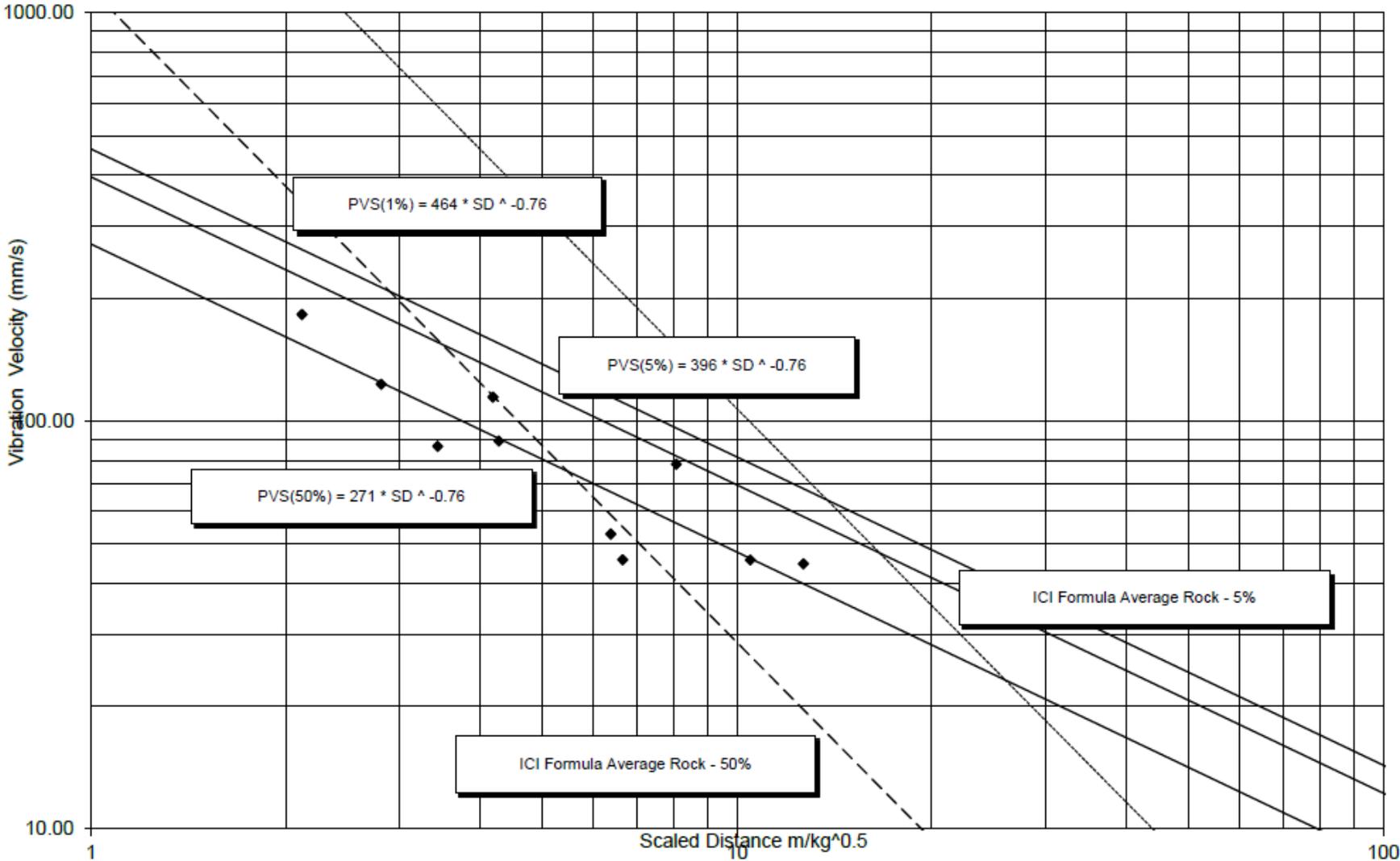
Albion Park Quarry
PVS Ground Vibration Velocity Site Law - 200 Data Points
From 20/2/2013 to Blast #22/20 - Near and Far Field Data



Albion Park Quarry
Peak Linear Airblast Site Law - 206 Data Points
From 20/2/2013 to Blast #22/20 - Near and Far Field Data



Albion Park Quarry
PVS Ground Vibration Velocity Site Law - 10 Data Points
Blast #03, 04, 08, 09/17 and 10/18 - Near Field Data



Albion Park Quarry
Peak Linear Airblast Site Law - 12 Data Points
Blasts #03, 04, 08, 09/17 and 10/18 - Near Field Data

