

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 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 4,000 Hz), and less sensitive at lower and higher frequencies. Different sources having the same dBA 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 (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

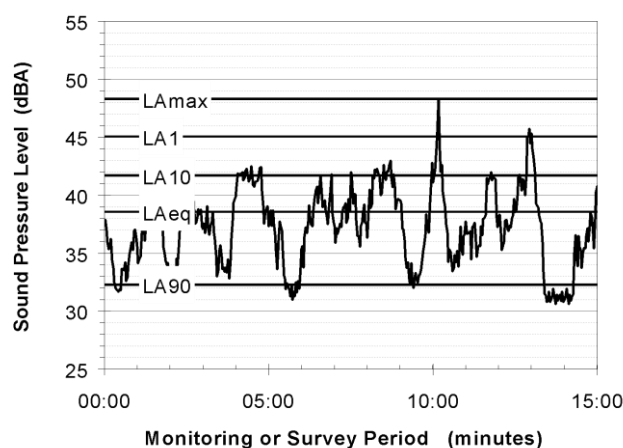
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or LW, or by the reference unit 10^{-12} W.

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

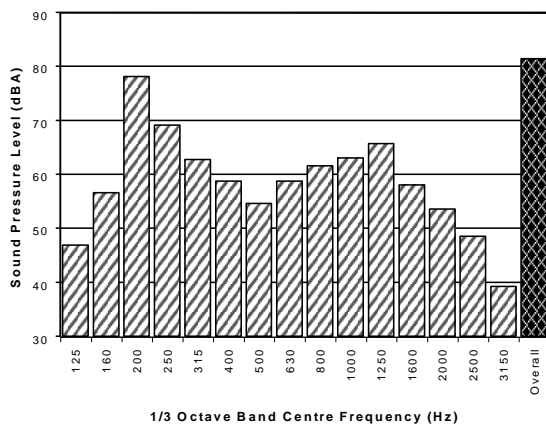
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal.

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

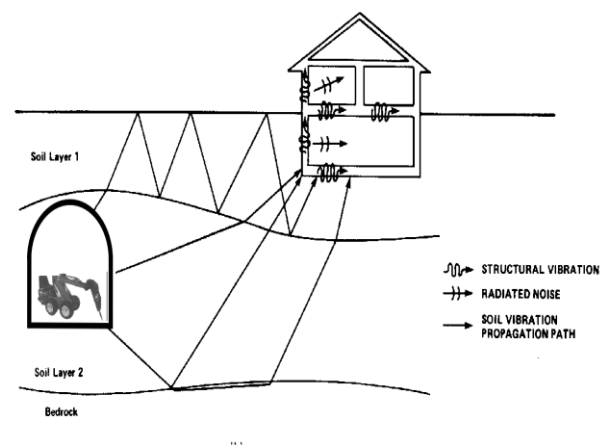
People are able to 'feel' vibration at levels lower than those required to cause even superficial damage to the most susceptible classes of building (even though they may not be disturbed by the motion). An individual's perception of motion or response to vibration depends very strongly on previous experience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

Noise Monitoring Data

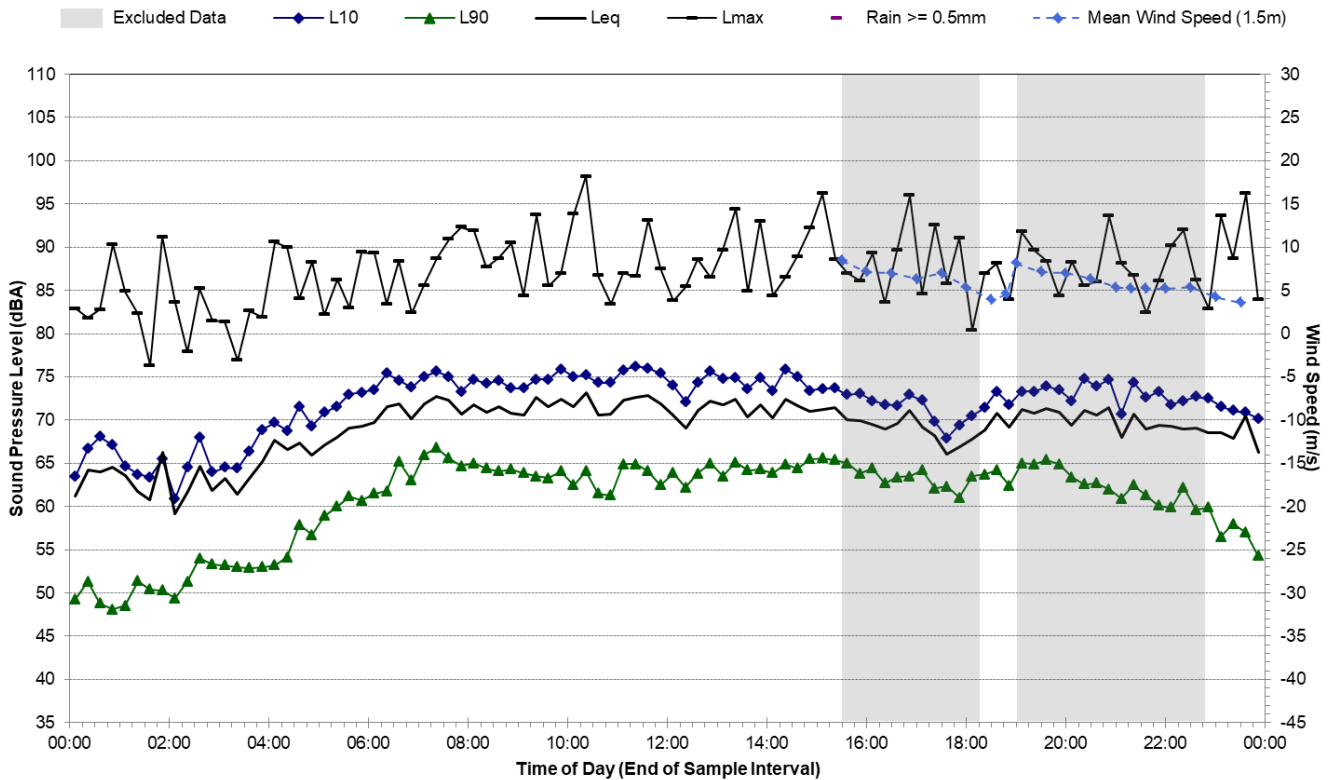
Noise Monitoring Location	L.01				Map of Noise Monitoring Location
Noise Monitoring Address	505/39 Kent Road, Botany				
Logger Device Type: Svantek 957, Logger Serial No: 20664 Sound Level Meter: Brüel and Kjær 2250L, Sound Level Meter Serial No: 2487418					
Ambient noise logger deployed on balcony of residential address 505/39 Kent Road, Botany.					
Attended noise measurements indicate the ambient noise environment at this location is dominated by road traffic noise from the Coward Street and Kent Road intersection. Flyovers from aircraft and intermittent construction noise also contributed to the noise at this location.					
Measured Attended Noise Levels (L _{Amax}): 17/09/18: Light-vehicle and heavy-vehicle traffic from intersection: 68 - 82 dBA, aircraft: 83 – 84 dBA, intermittent construction activity: 80 – 88 dBA					
Ambient Noise Logging Results – NPfI Defined Time Periods					Photo of Noise Monitoring Location
Monitoring Period	Noise Level (dBA)				
	RBL	LAeq	L10	L1	
Daytime	60	71	74	80	
Evening	56	68	72	78	
Night-time	50	67	69	77	
Ambient Noise Logging Results – RNP Defined Time Periods					
Monitoring Period	Noise Level (dBA)				
	LAeq(period)		LAeq(1hour)		
Daytime (7am-10pm)	-		-		
Night-time (10pm-7am)	-		-		
Attended Noise Measurement Results					
Date	Start Time	Measured Noise Level (dBA)			
		LA90	LAeq	L _{Amax}	
17/09/18	09:30	63	72	88	





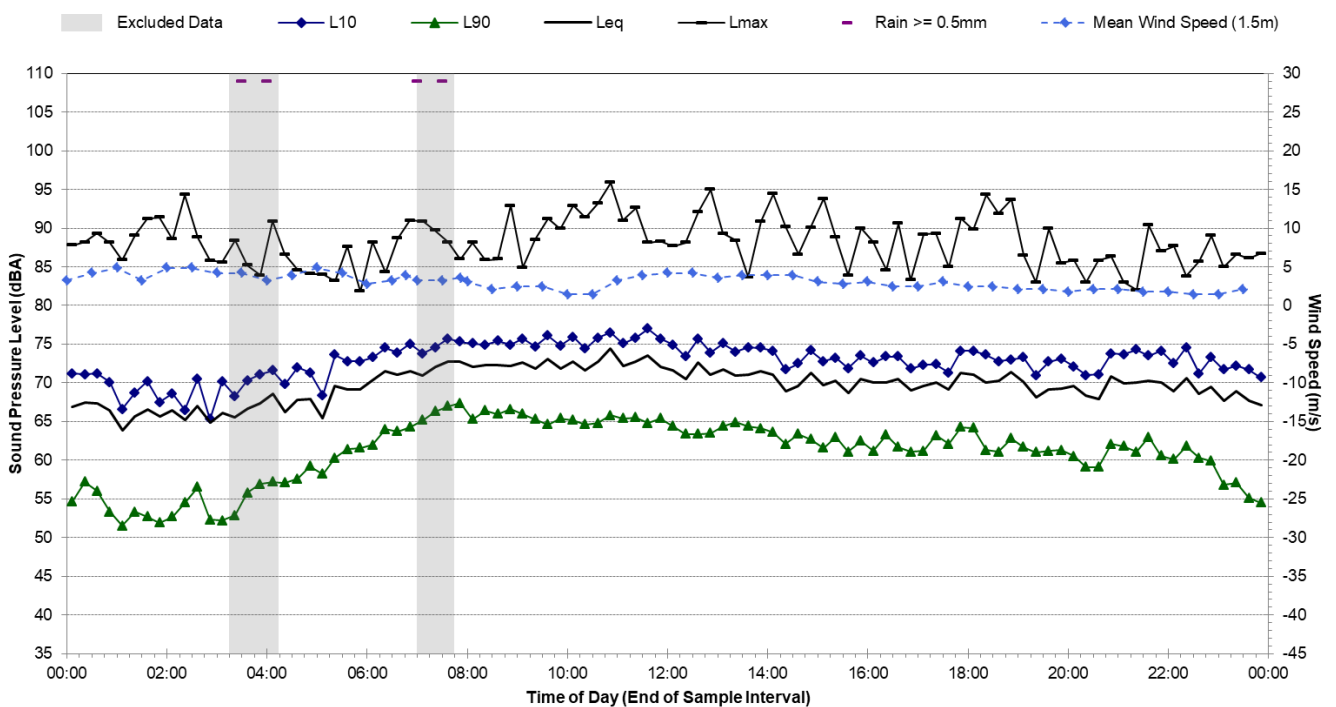
Statistical Ambient Noise Levels

505/39 Kent Road, Mascot - Wednesday, 19 September 2018



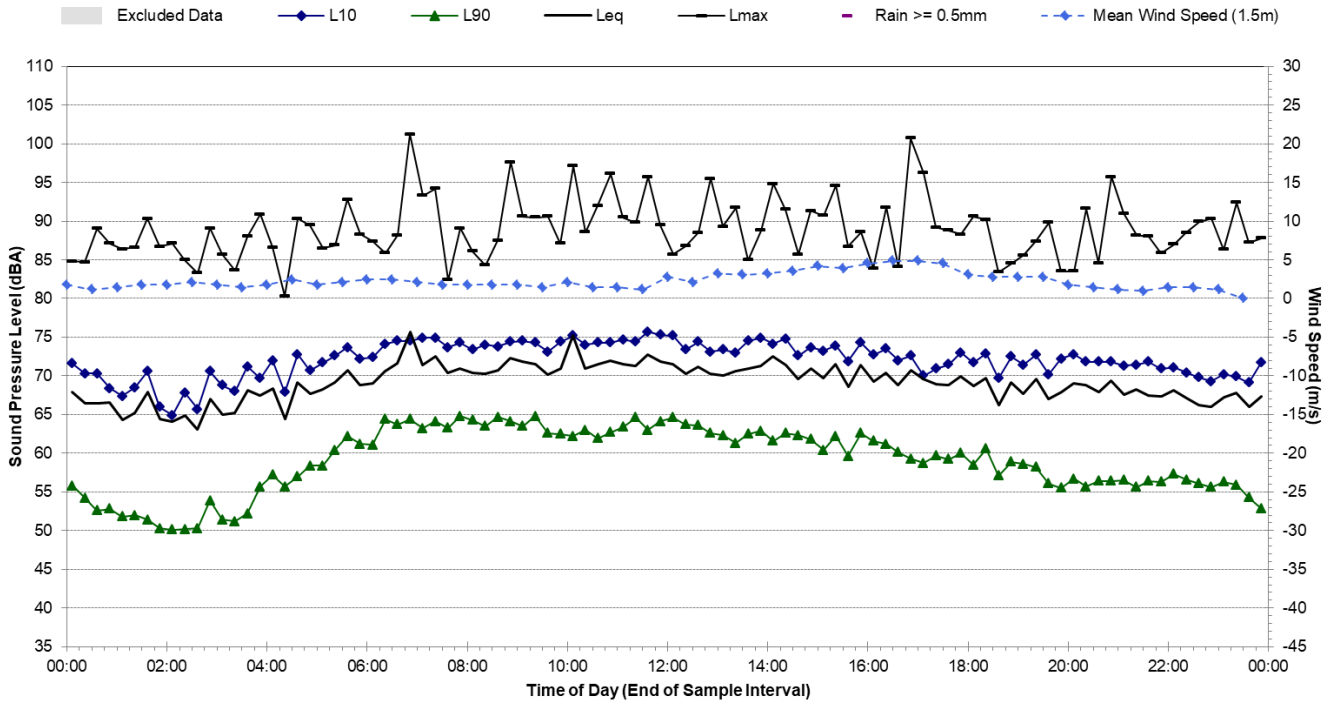
Statistical Ambient Noise Levels

505/39 Kent Road, Mascot - Thursday, 20 September 2018



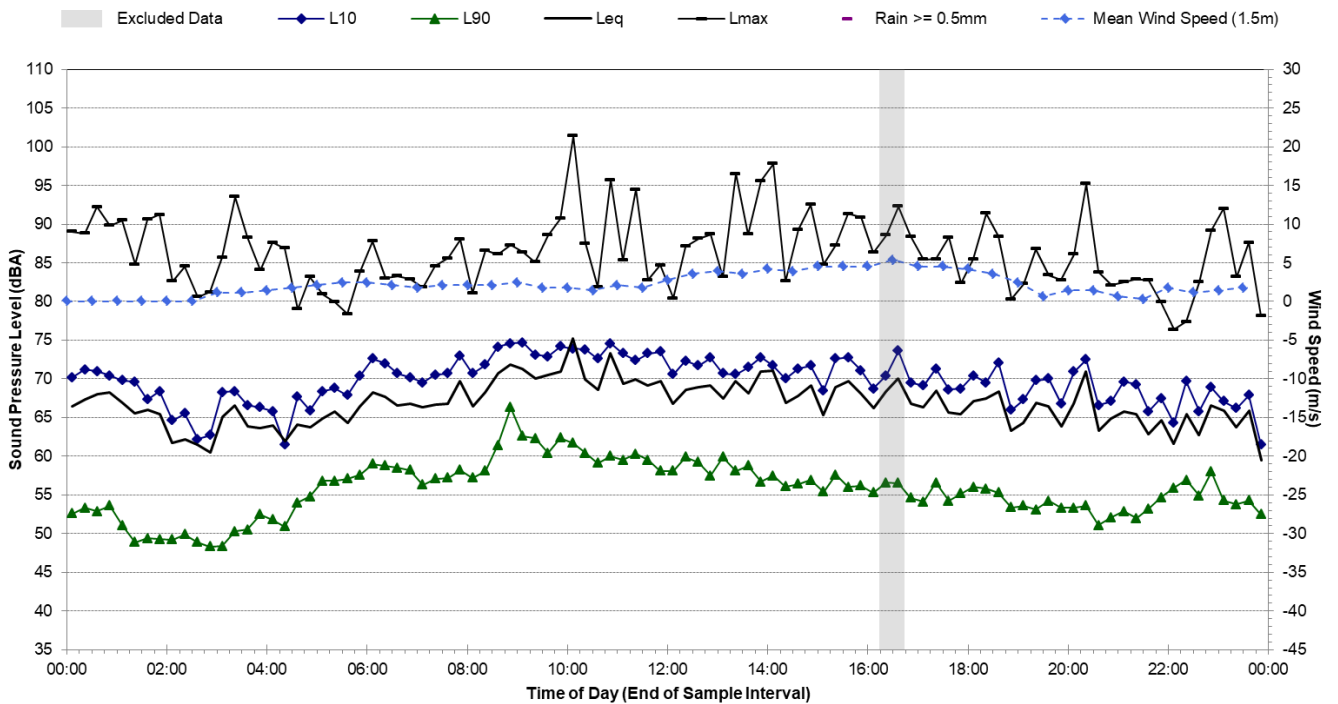
Statistical Ambient Noise Levels

505/39 Kent Road, Mascot - Friday, 21 September 2018



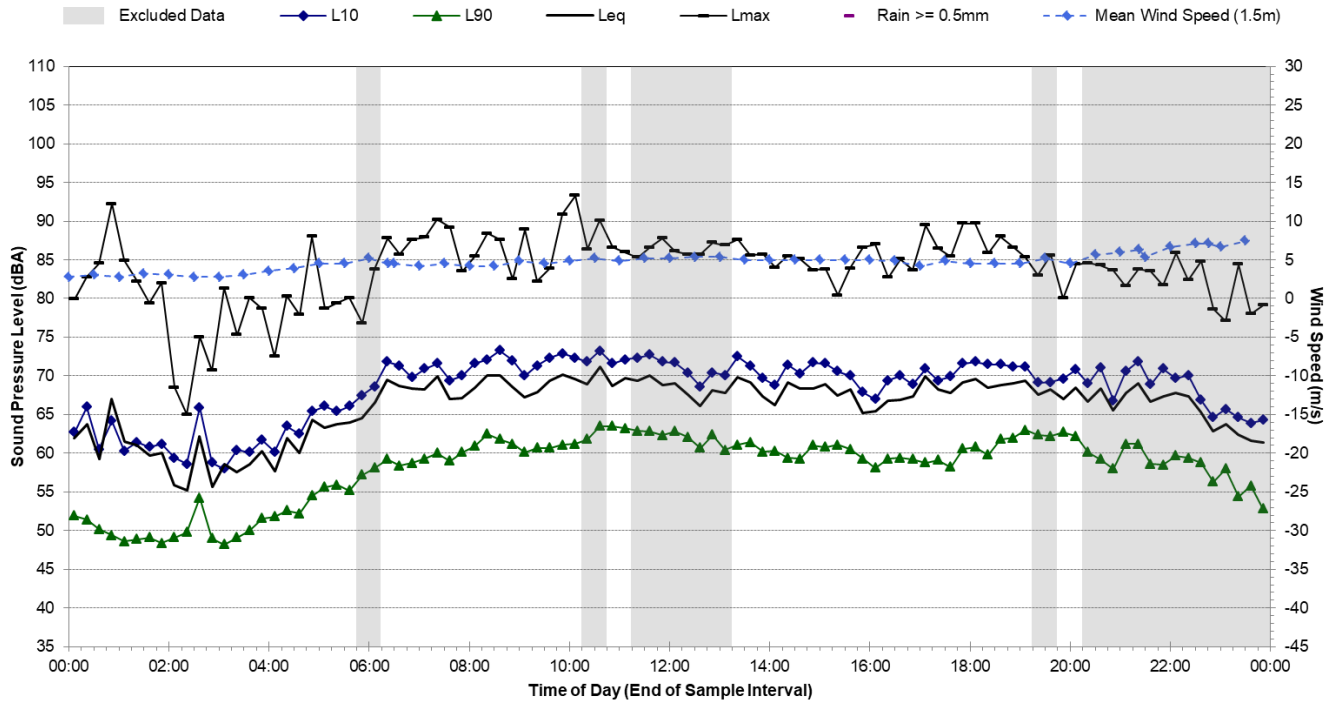
Statistical Ambient Noise Levels

505/39 Kent Road, Mascot - Saturday, 22 September 2018



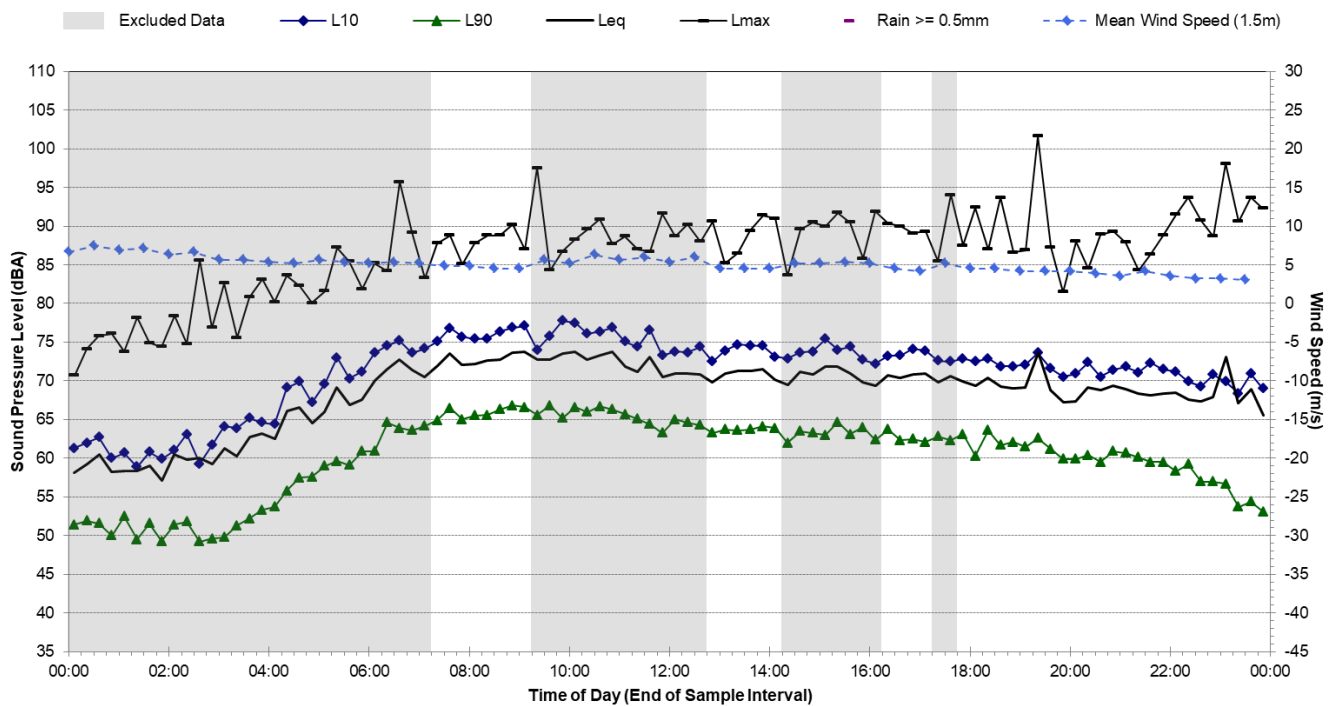
Statistical Ambient Noise Levels

505/39 Kent Road, Mascot - Sunday, 23 September 2018



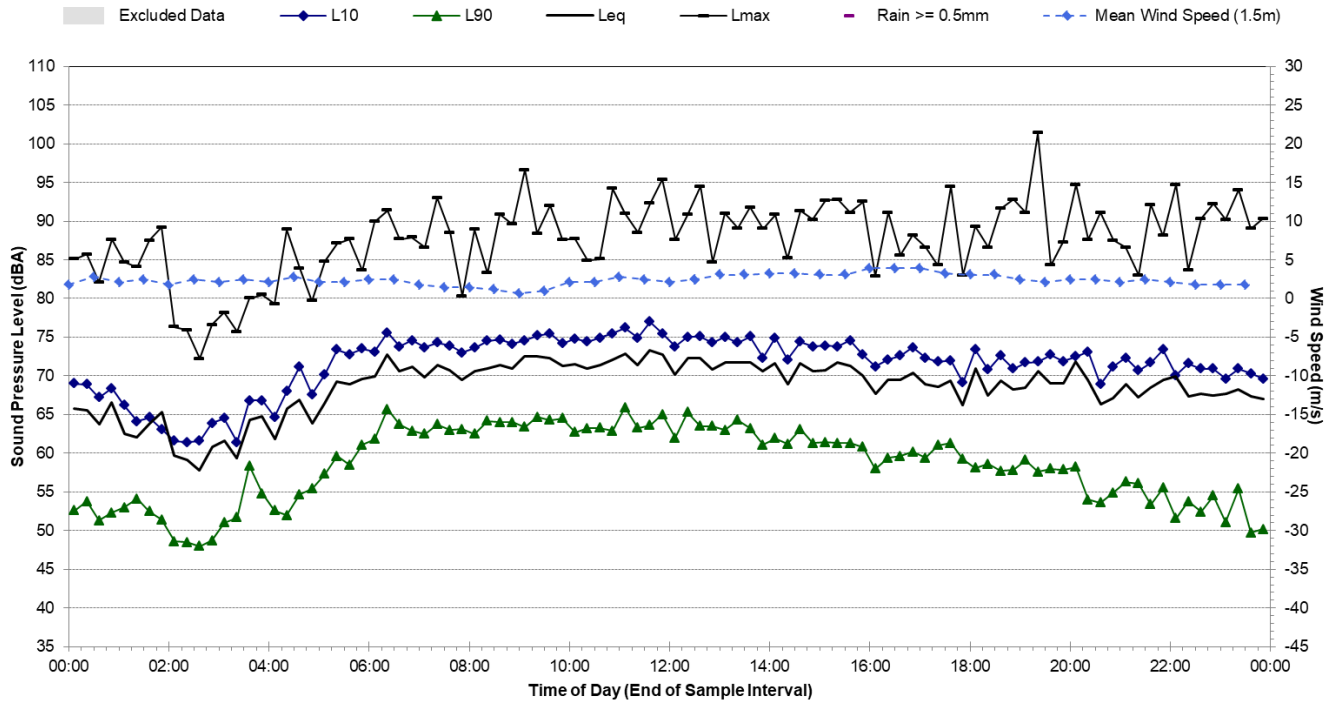
Statistical Ambient Noise Levels

505/39 Kent Road, Mascot - Monday, 24 September 2018



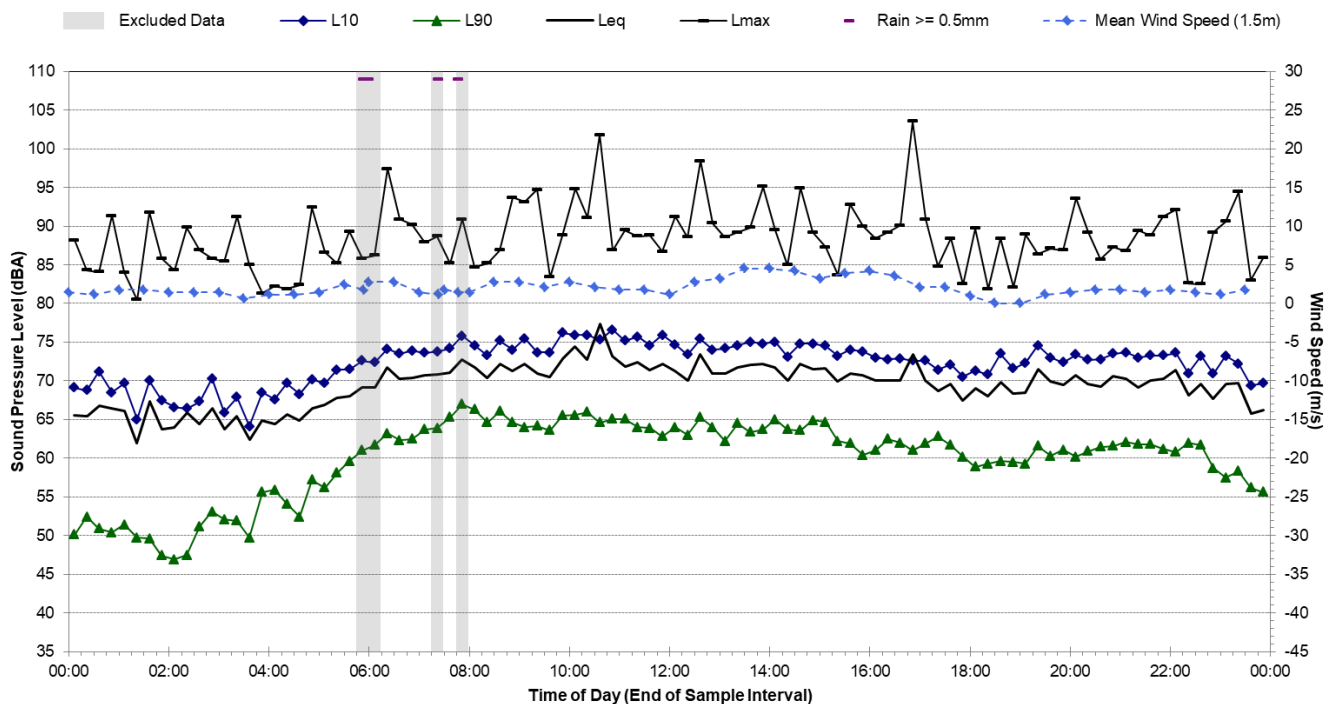
Statistical Ambient Noise Levels

505/39 Kent Road, Mascot - Tuesday, 25 September 2018



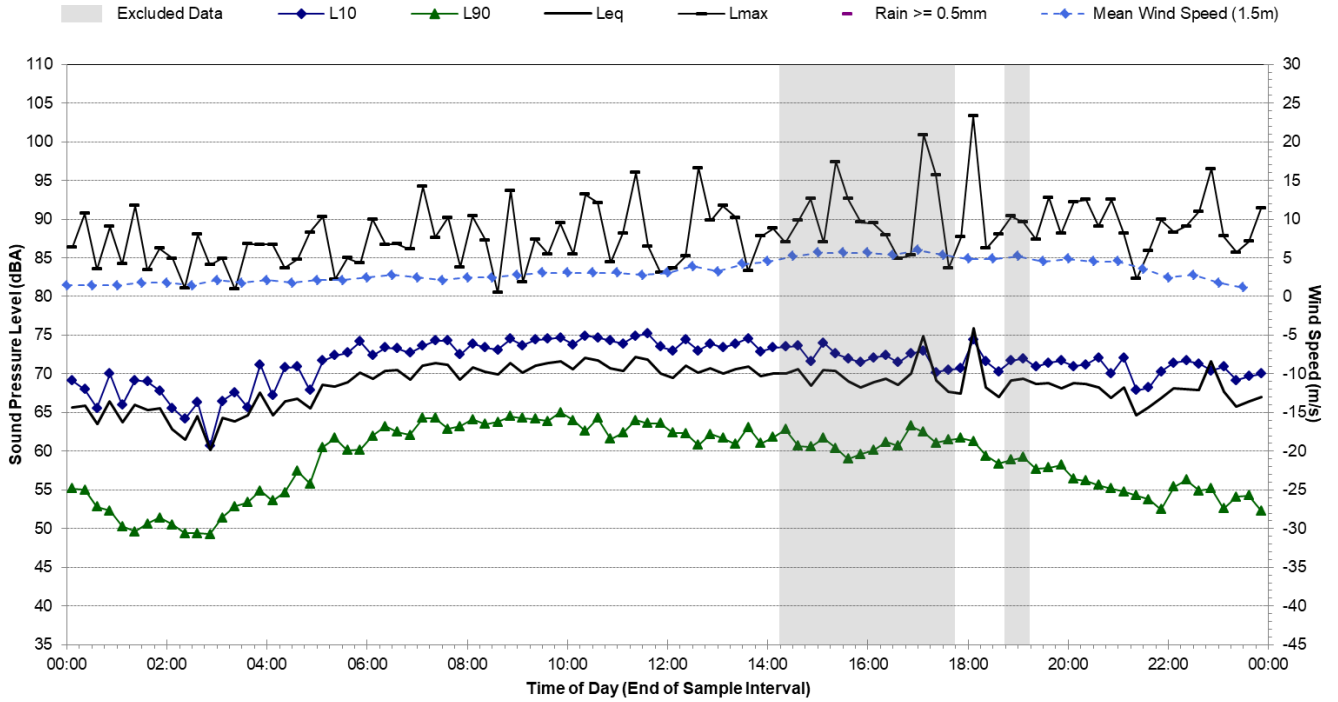
Statistical Ambient Noise Levels

505/39 Kent Road, Mascot - Wednesday, 26 September 2018



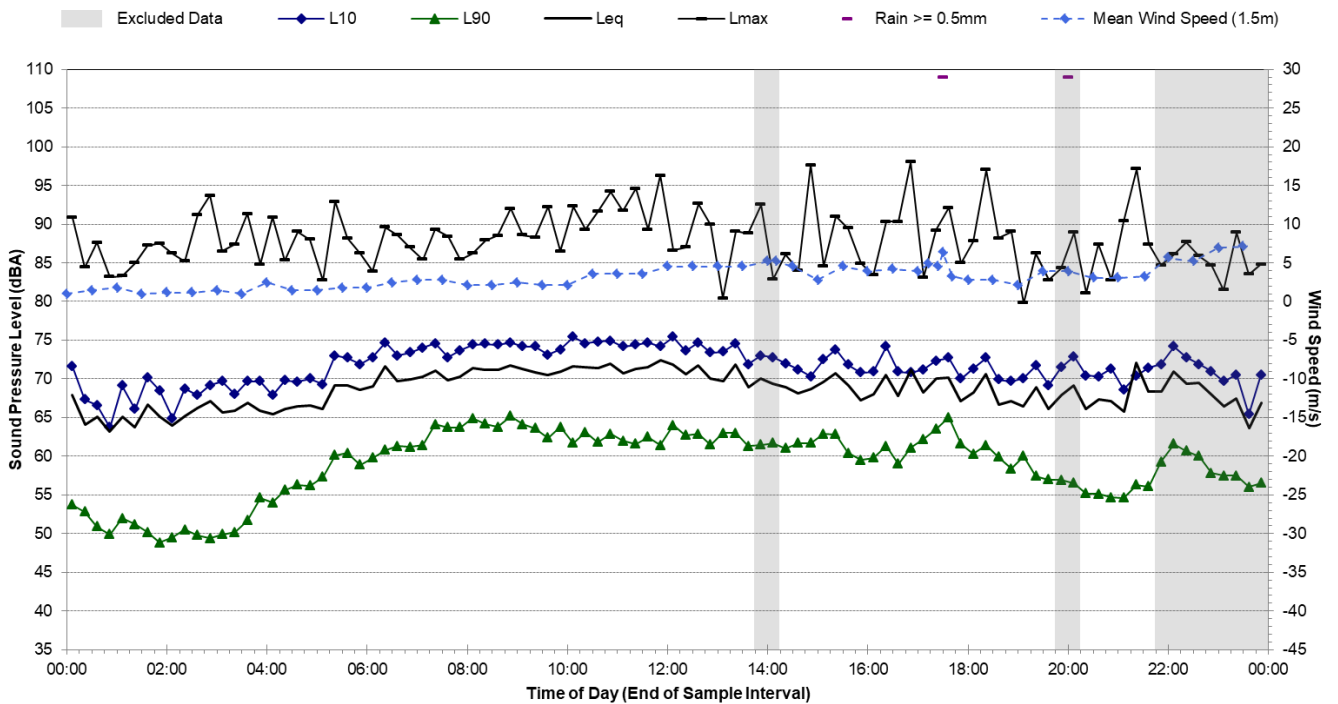
Statistical Ambient Noise Levels

505/39 Kent Road, Mascot - Thursday, 27 September 2018



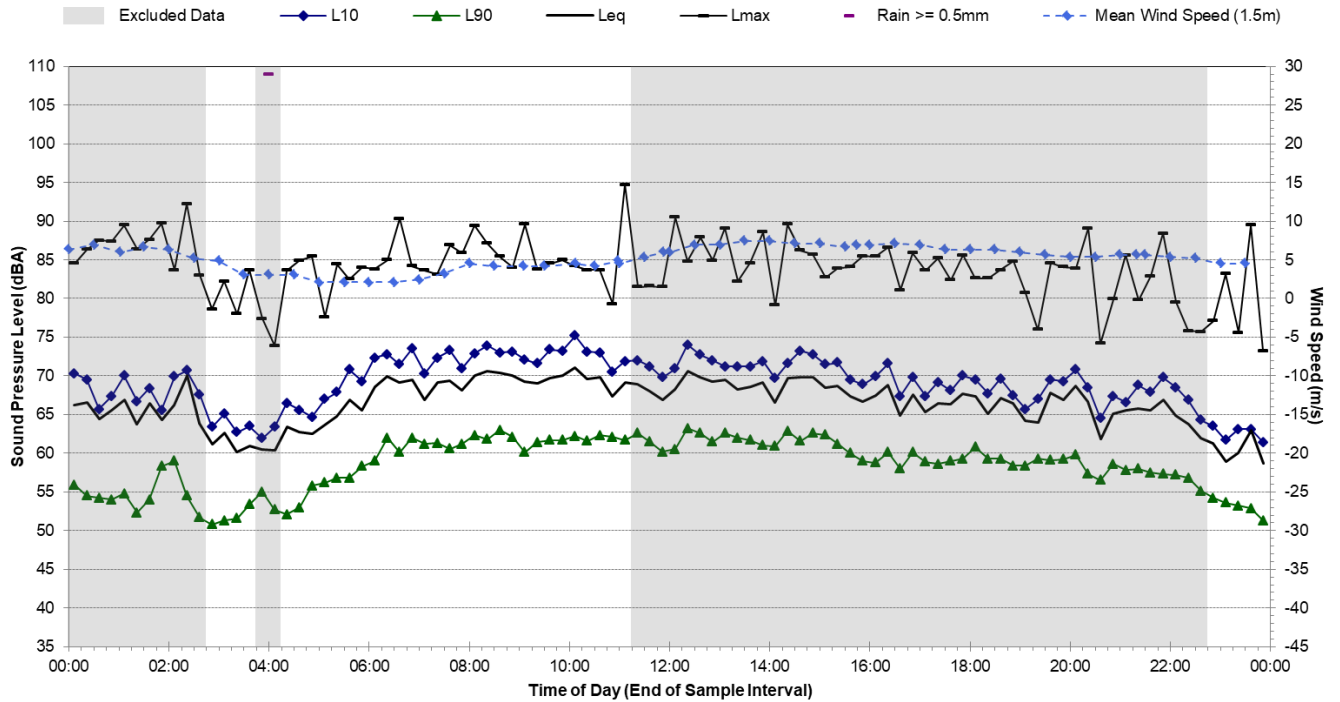
Statistical Ambient Noise Levels

505/39 Kent Road, Mascot - Friday, 28 September 2018



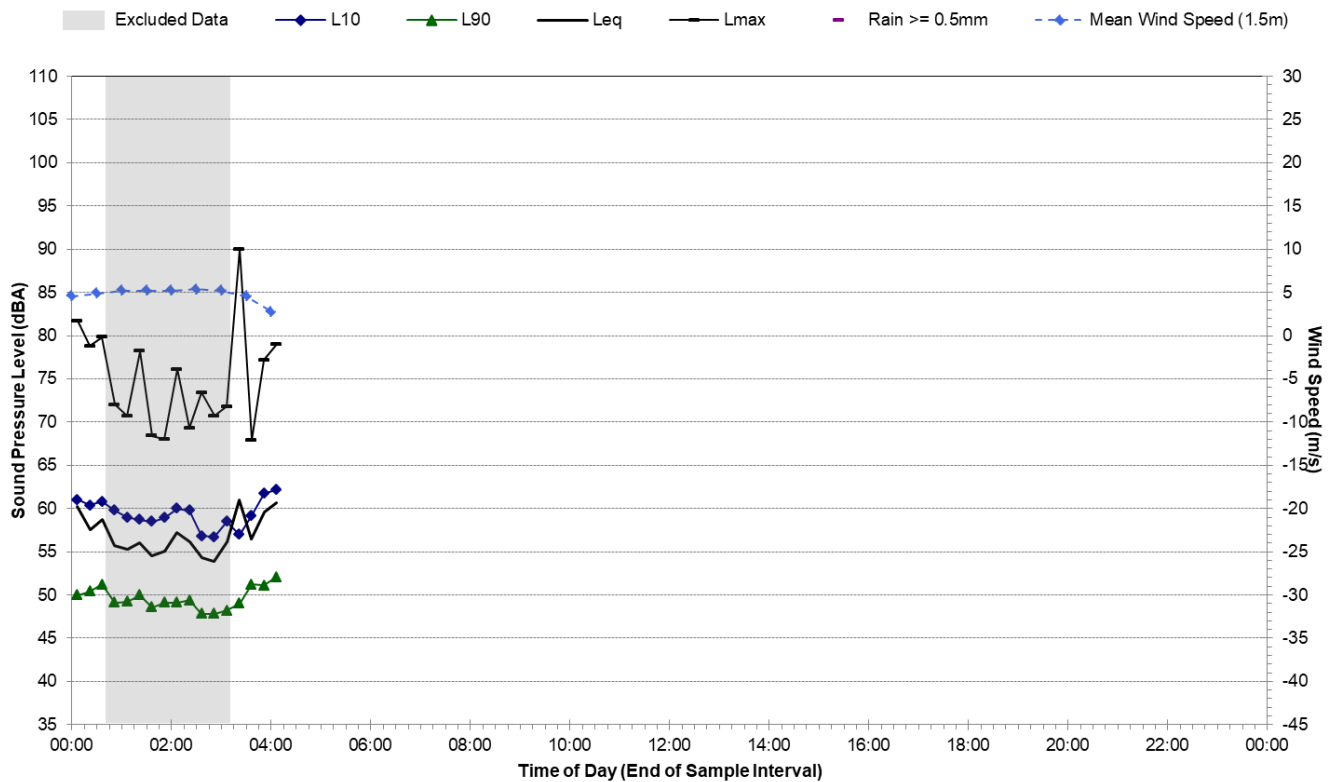
Statistical Ambient Noise Levels





505/39 Kent Road, Mascot - Saturday, 29 September 2018



Statistical Ambient Noise Levels

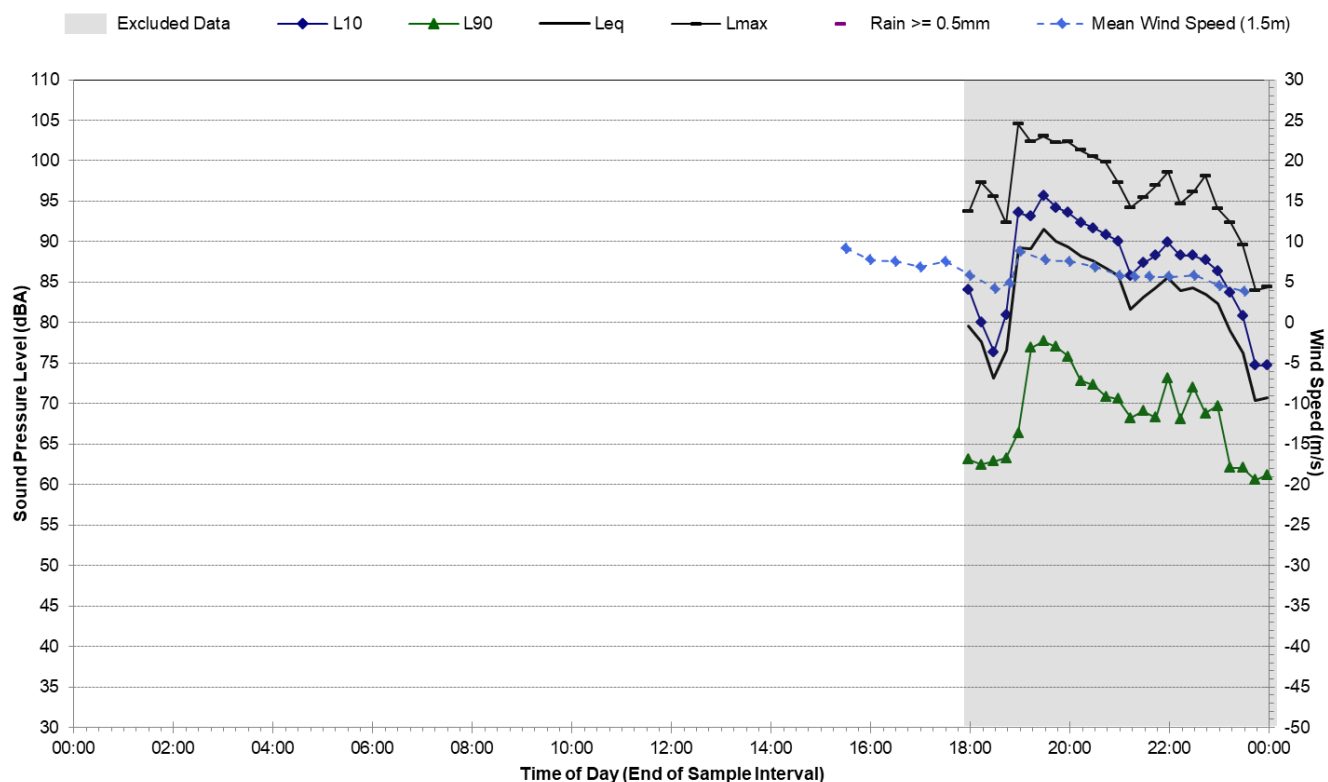
505/39 Kent Road, Mascot - Sunday, 30 September 2018



Noise Monitoring Location		L.02			Map of Noise Monitoring Location	
Noise Monitoring Address		289 King Street, Mascot				
Logger Device Type: Svantek 957, Logger Serial No: 20668 Sound Level Meter: Brüel and Kjær 2250L, Sound Level Meter Serial No: 2487418						
Ambient noise logger deployed on level 10 of commercial building located at 289 King Street, Mascot. Logger located with line of site views of the Port Botany rail line and Qantas Drive to the south west.						
Attended noise measurements indicate the ambient noise environment at this location is influenced by heavy and light-vehicle road traffic noise on Qantas Drive, aircraft flyovers and surrounding industrial activity. Construction noise also affected the measured noise levels site during certain periods, which resulted in additional data being required to be excluded.						
Measured Attended Noise Levels (LAmax): 17/09/2018: Vehicle movement on Qantas Drive and neighbouring industrial activity: 65 – 68 dBA, inbound aircraft flyovers: 80 -82 dBA, outbound aircraft flyover: 72 dBA, construction noise intermittently audible: 67 – 72 dBA.						
Ambient Noise Logging Results – NPfI Defined Time Periods						
Monitoring Period		Noise Level (dBA)				
	RBL	LAeq	L10	L1		
Daytime	60	68	70	77		
Evening	58	66	68	76		
Night-time	53	64	65	69		
Ambient Noise Logging Results – RNP Defined Time Periods						
Monitoring Period		Noise Level (dBA)				
	LAeq(period)		LAeq(1hour)			
Daytime (7am-10pm)	-		-			
Night-time (10pm-7am)	-		-			
Attended Noise Measurement Results						
Date		Start Time	Measured Noise Level (dBA)			
			LA90	LAeq	LAmx	
17/09/2018	10:30	64	68	82		

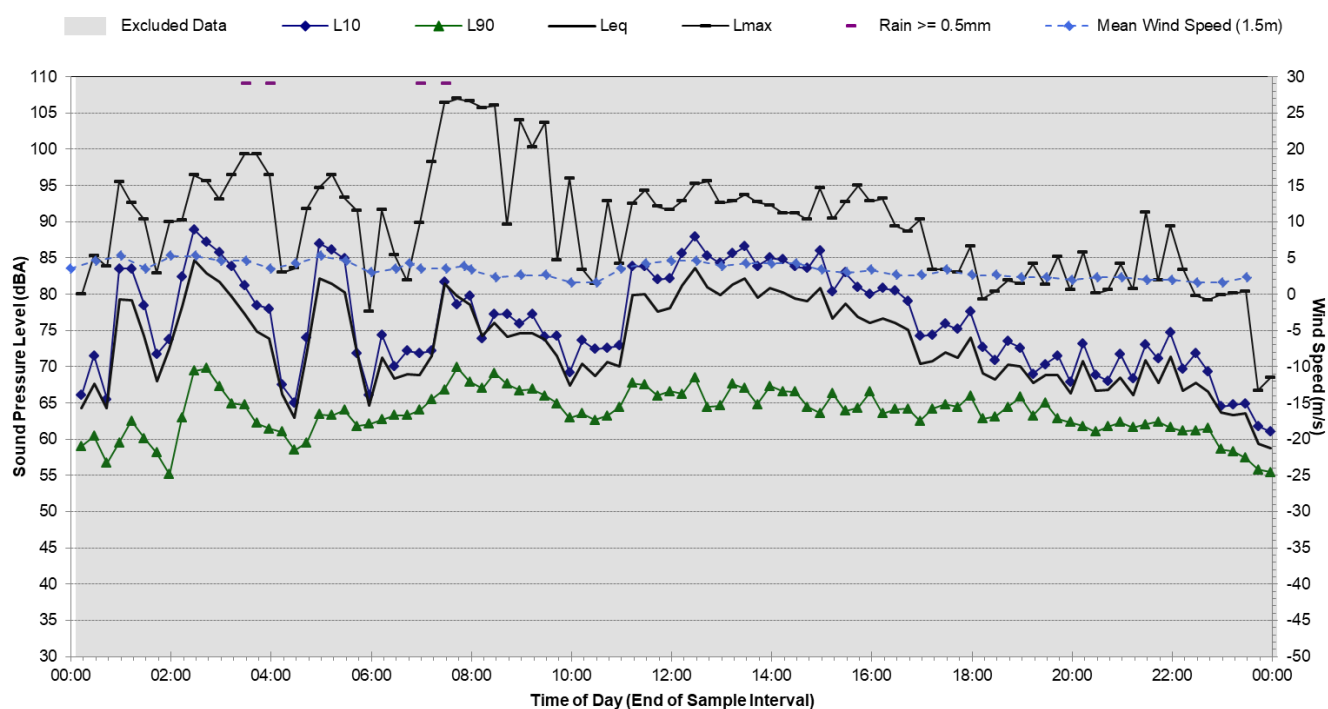
Statistical Ambient Noise Levels

289 King Street, Mascot - Wednesday, 19 September 2018



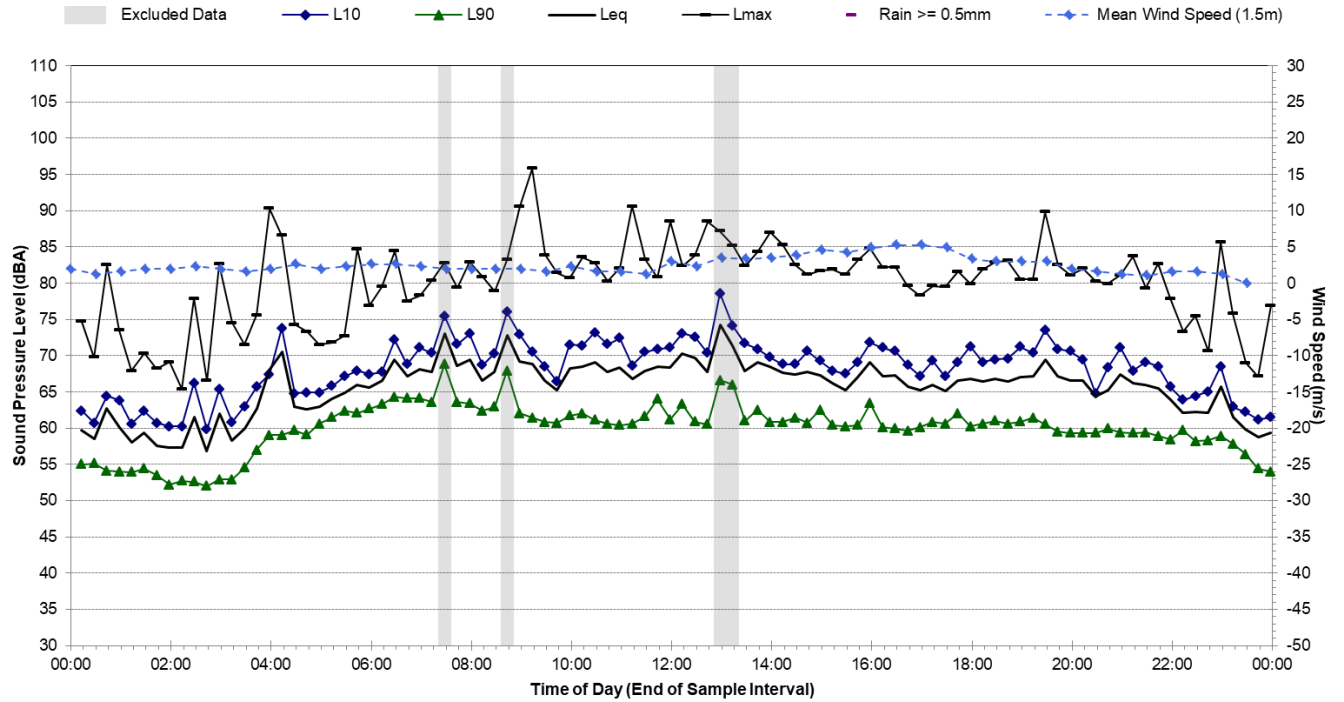
Statistical Ambient Noise Levels

289 King Street, Mascot - Thursday, 20 September 2018



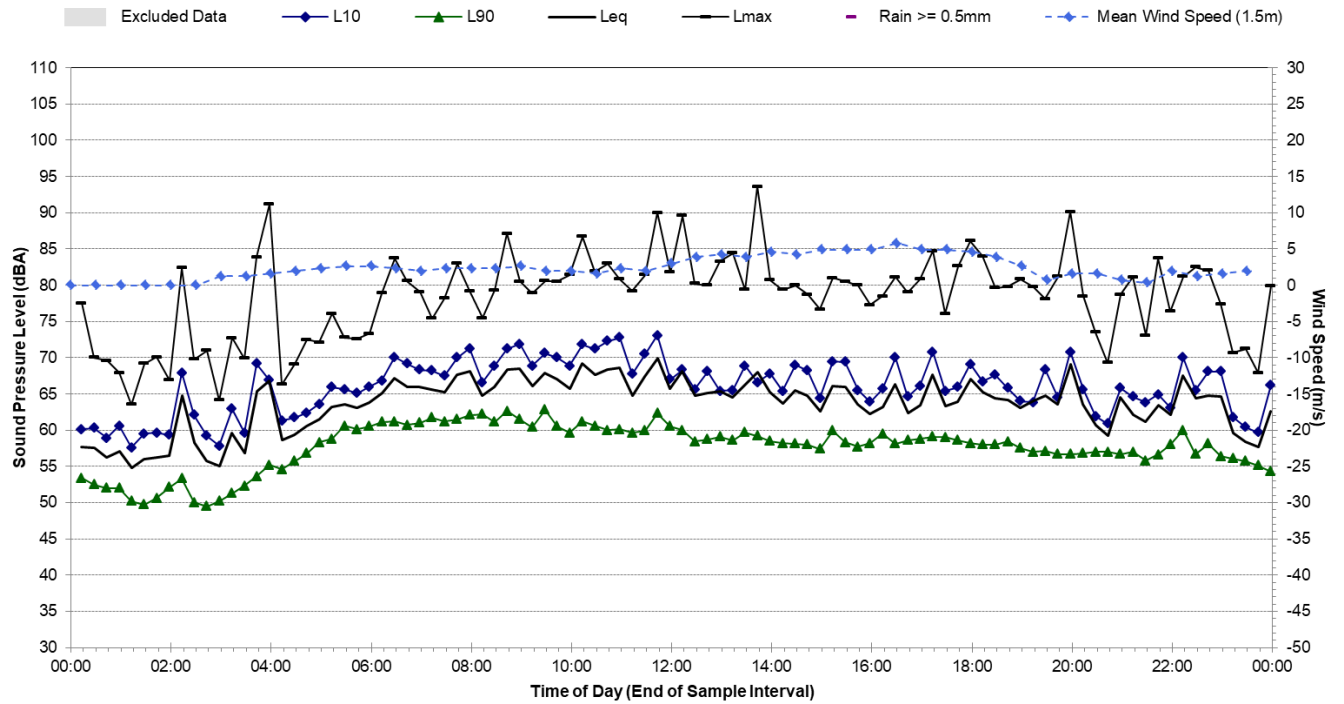
Statistical Ambient Noise Levels

289 King Street, Mascot - Friday, 21 September 2018



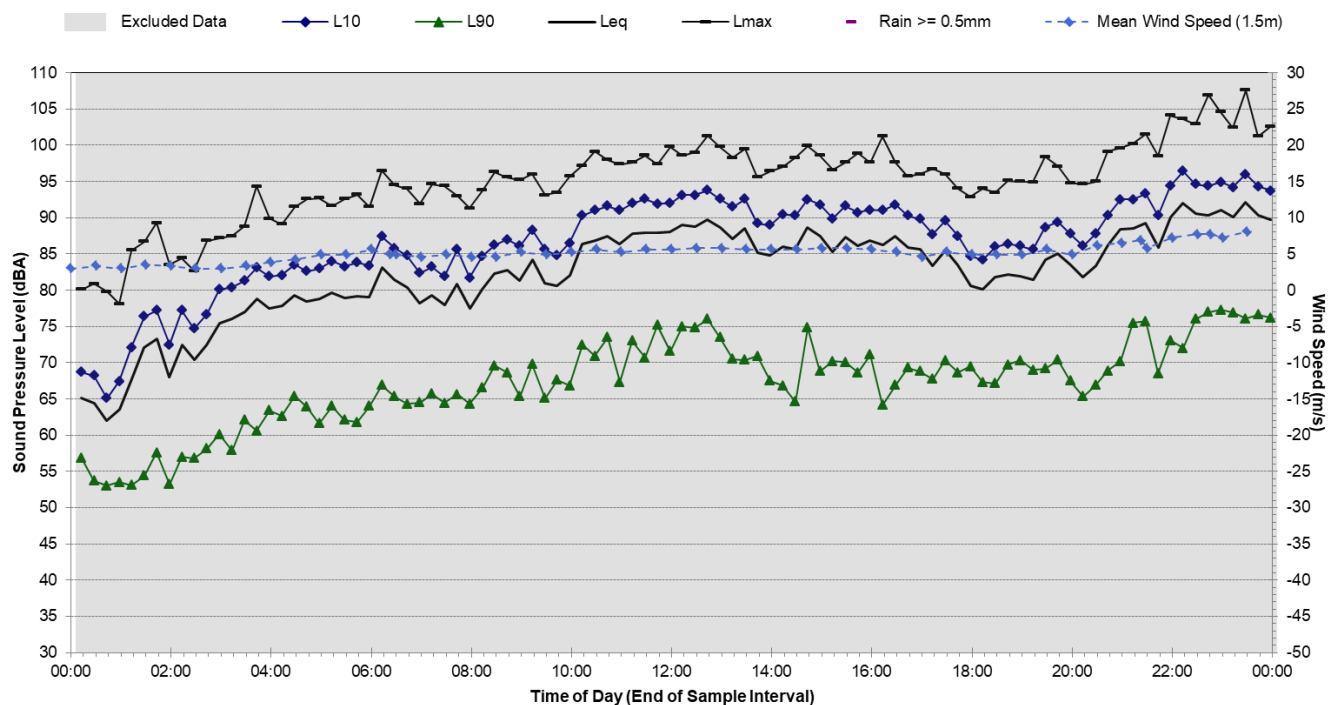
Statistical Ambient Noise Levels

289 King Street, Mascot - Saturday, 22 September 2018



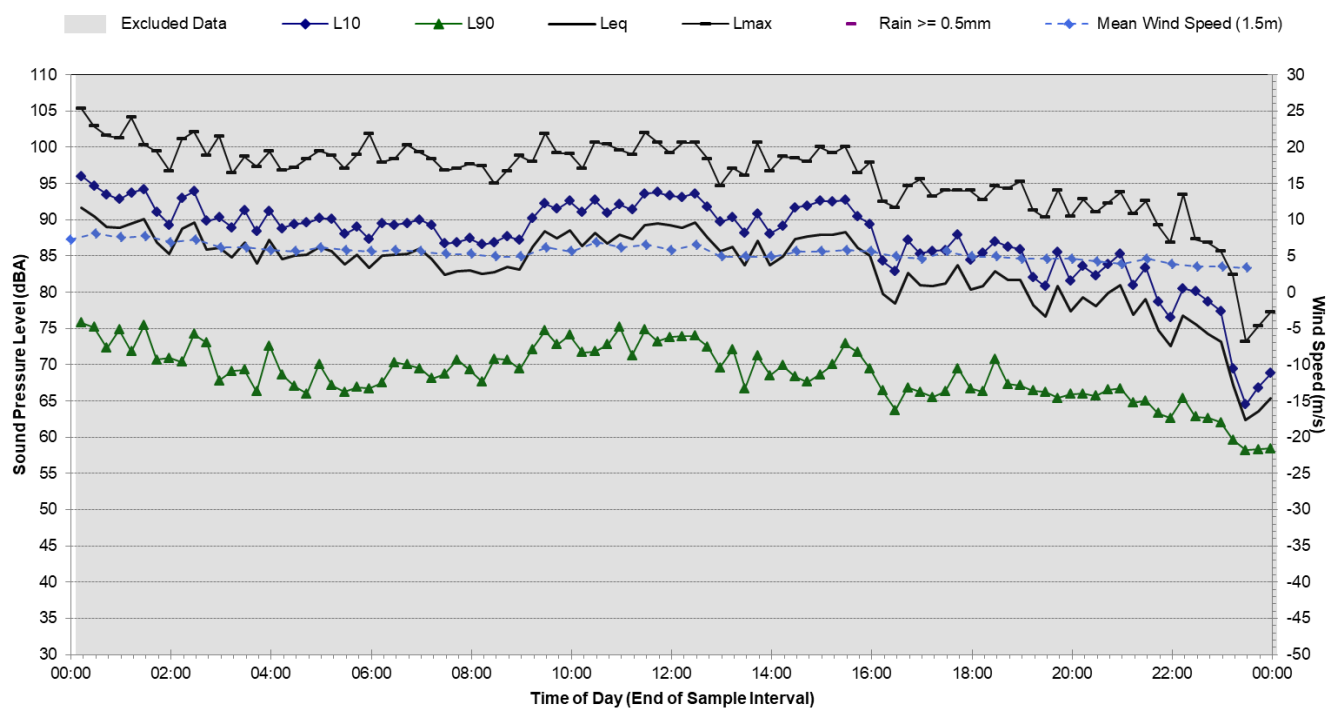
Statistical Ambient Noise Levels

289 King Street, Mascot - Sunday, 23 September 2018



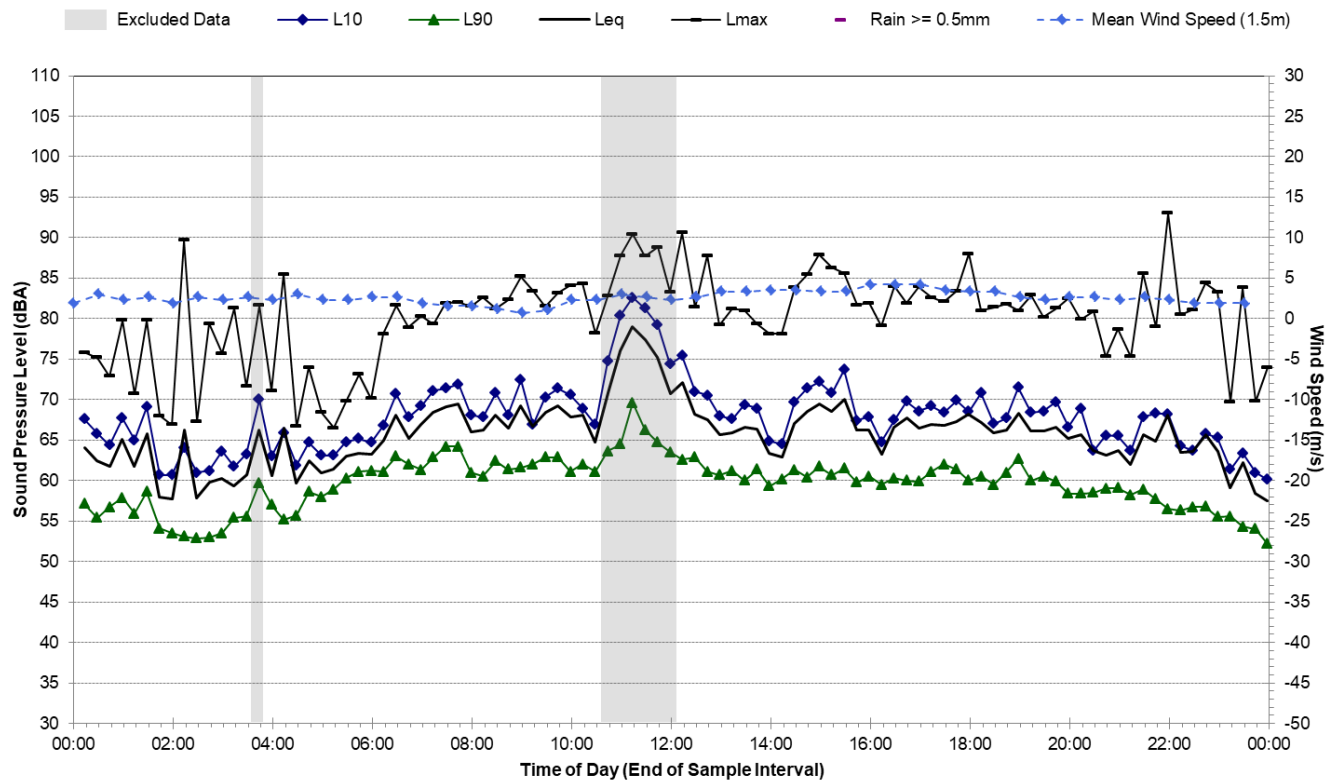
Statistical Ambient Noise Levels

289 King Street, Mascot - Monday, 24 September 2018



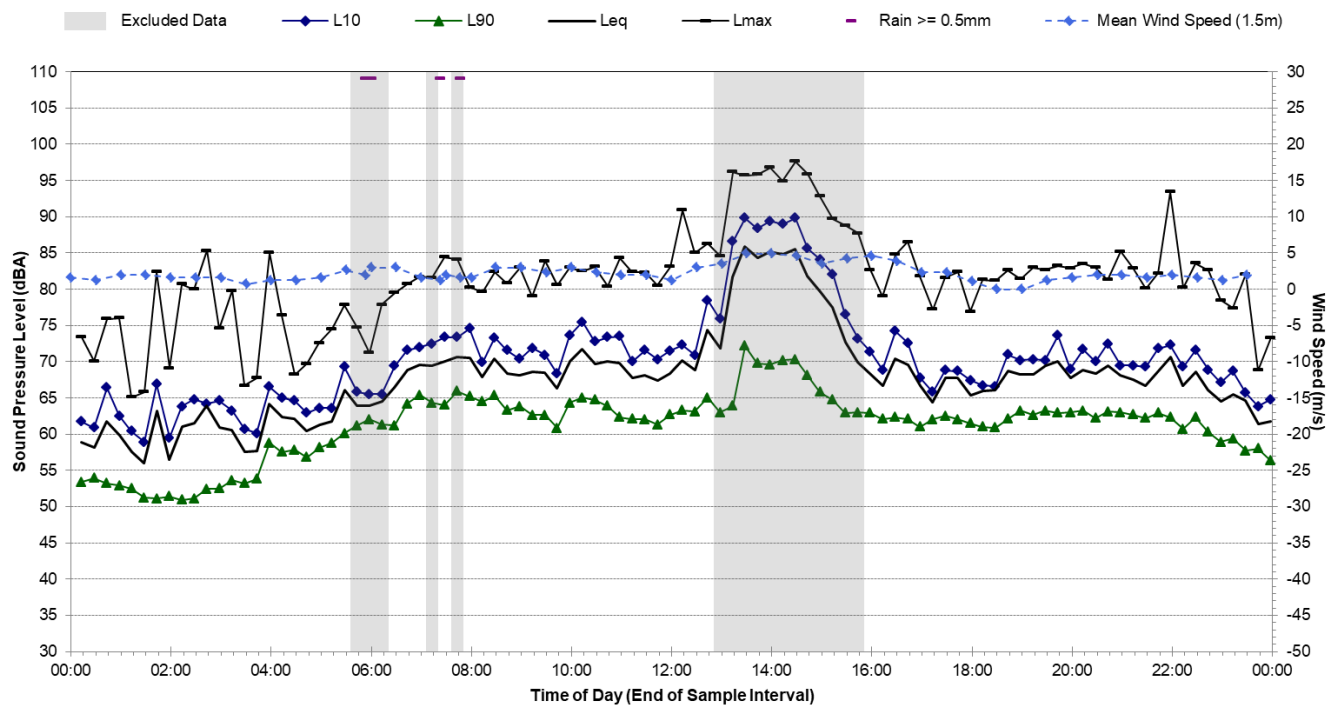
Statistical Ambient Noise Levels

289 King Street, Mascot - Tuesday, 25 September 2018



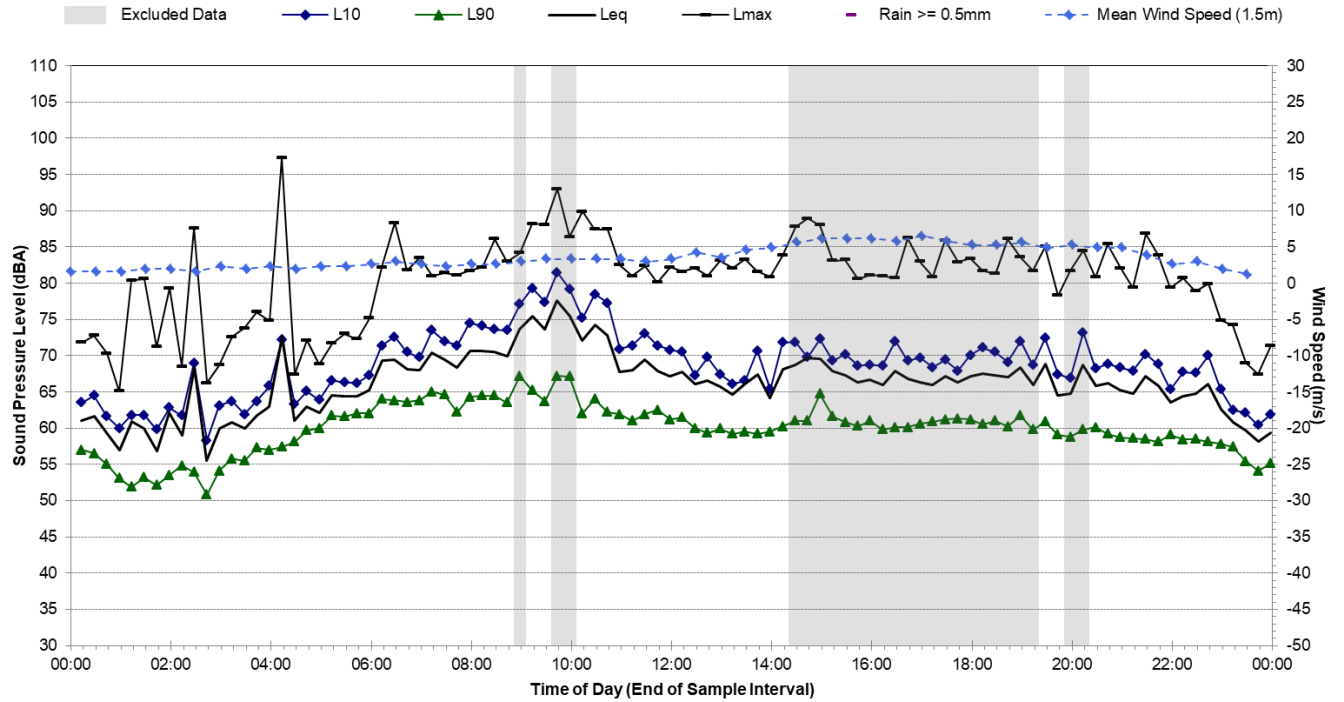
Statistical Ambient Noise Levels

289 King Street, Mascot - Wednesday, 26 September 2018



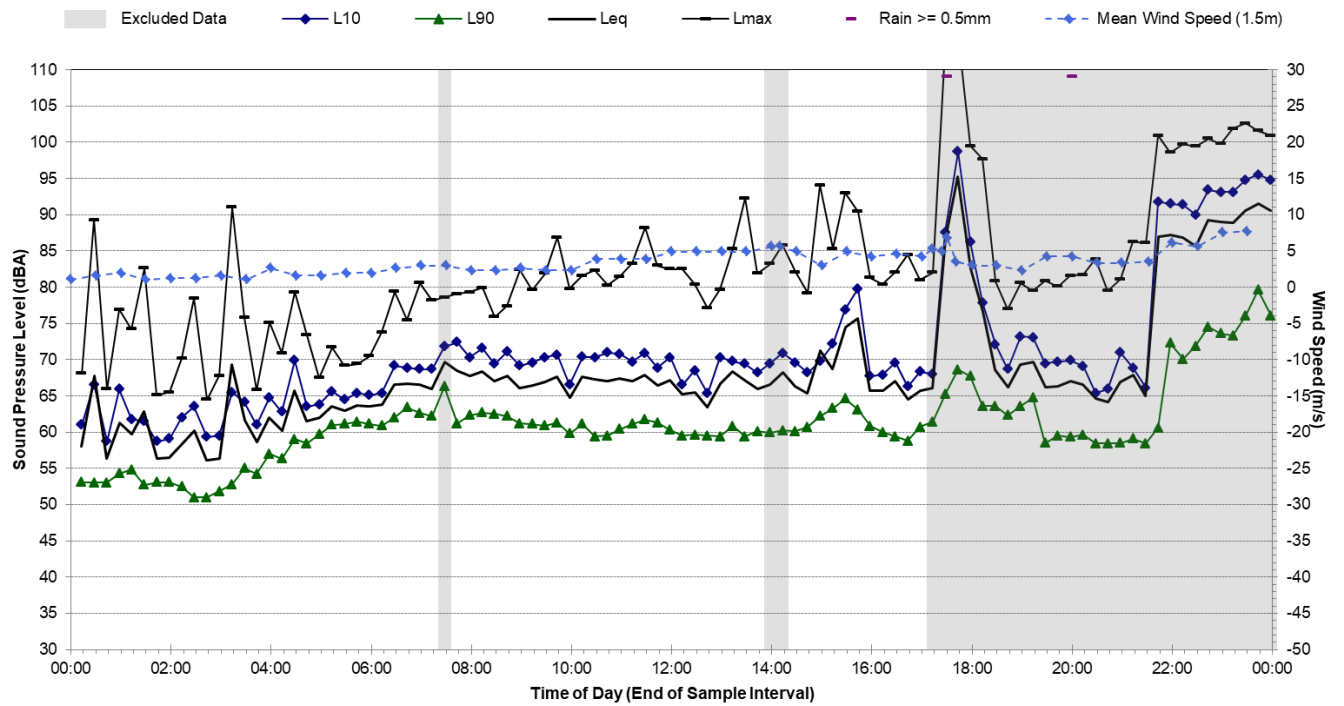
Statistical Ambient Noise Levels

289 King Street, Mascot - Thursday, 27 September 2018



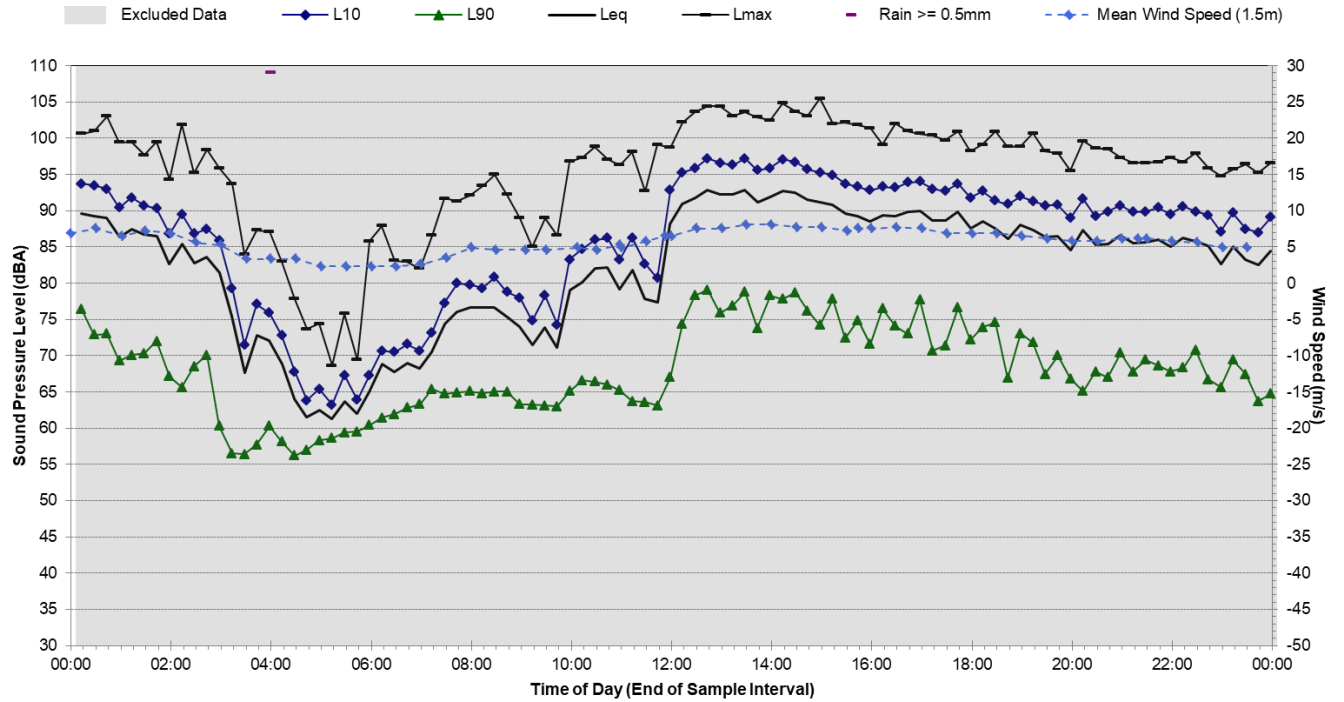
Statistical Ambient Noise Levels

289 King Street, Mascot - Friday, 28 September 2018



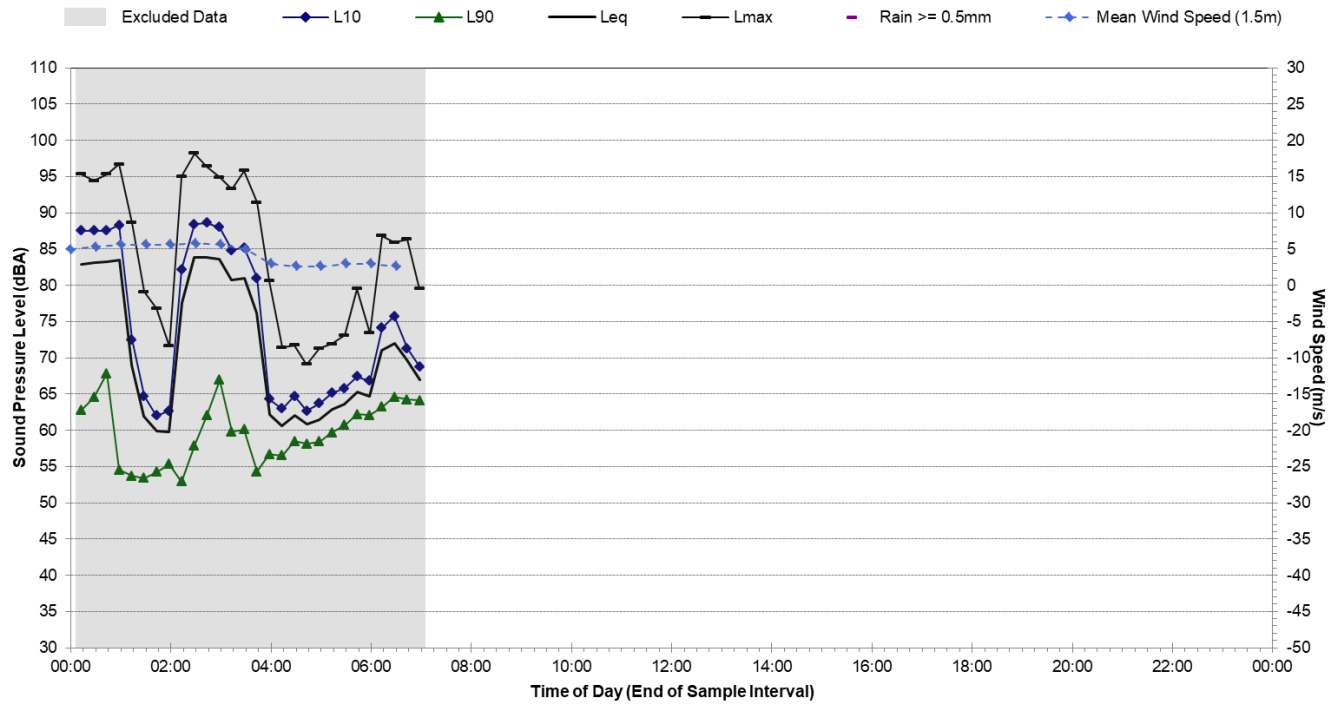
Statistical Ambient Noise Levels


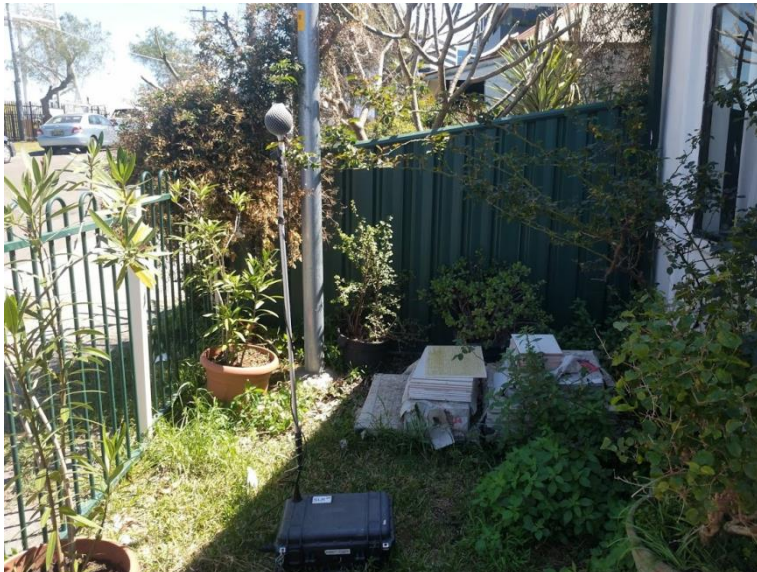
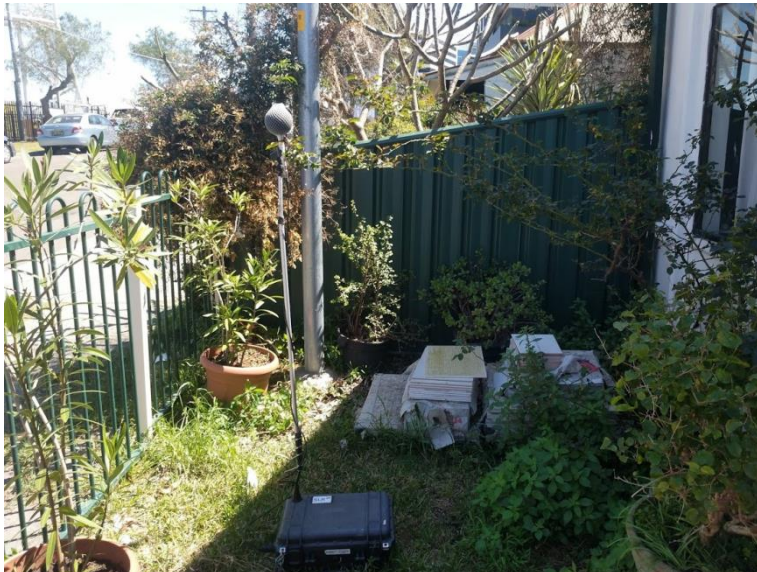
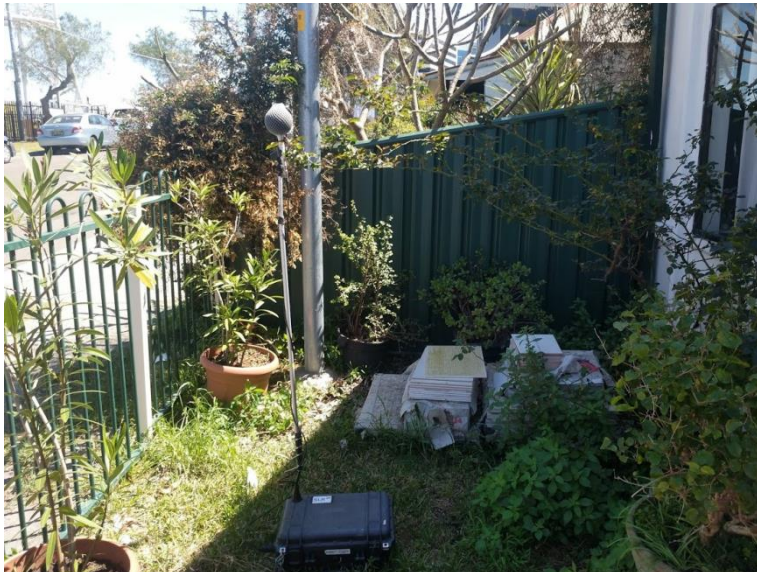
289 King Street, Mascot - Saturday, 29 September 2018



Statistical Ambient Noise Levels

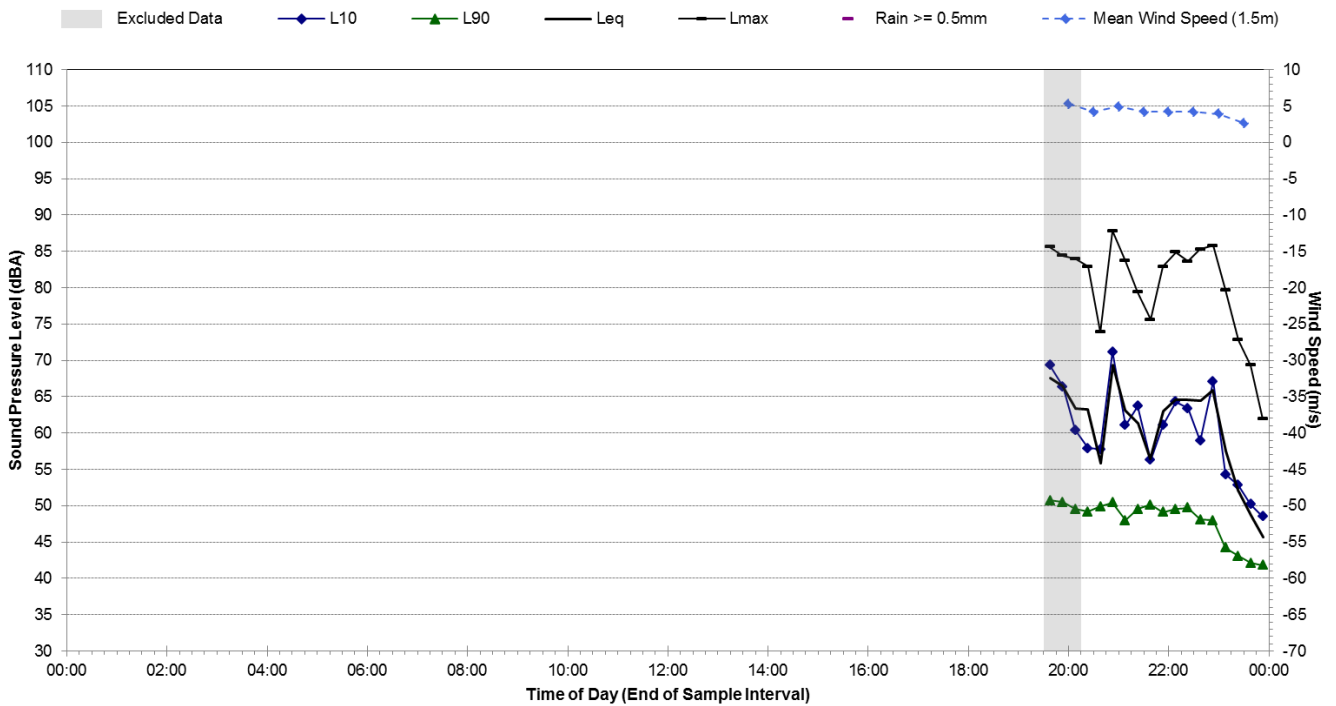
289 King Street, Mascot - Sunday, 30 September 2018



Noise Monitoring Location		L.03			Map of Noise Monitoring Location			
Noise Monitoring Address		105 Baxter Road, Mascot						
Logger Device Type: Svantek 957, Logger Serial No: 20668 Sound Level Meter: Brüel and Kjær 2250L, Sound Level Meter Serial No: 2414604								
Ambient noise logger deployed at residential address 105 Baxter Road, Mascot.								
This location was affected by adverse weather during the survey. The data has been checked against historical monitoring at this site and is consistent.								
Attended noise measurements indicate the ambient noise environment at this location is influenced by infrequent light-vehicles on Baxter Street and freight rail passbys. Aircraft flyovers from Sydney Airport and steady state road traffic noise from O’Riordan Street to the west also contributed to the noise at this location.								
Measured Attended Noise Levels (L _{Amax}): 19/09/18: Light vehicles on Baxter Street: 71-75, steady traffic from surrounding roads: 50-55 dBA, aircraft 76 dBA, freight train pass: 60-68 dBA								
Ambient Noise Logging Results – NPfI Defined Time Periods								
Monitoring Period		Noise Level (dBA)						
		RBL	LAeq	L10	L1			
Daytime		54	67	70	79			
Evening		51	65	65	75			
Night-time		45	62	59	70			
Ambient Noise Logging Results – RNP Defined Time Periods								
Monitoring Period		Noise Level (dBA)						
		LAeq(period)		LAeq(1hour)				
Daytime (7am-10pm)		-		-				
Night-time (10pm-7am)		-		-				
Attended Noise Measurement Results								
Date		Start Time		Measured Noise Level (dBA)				
				LA90	LAeq	L _{Amax}		
19/09/18		18:00		52	63	78		

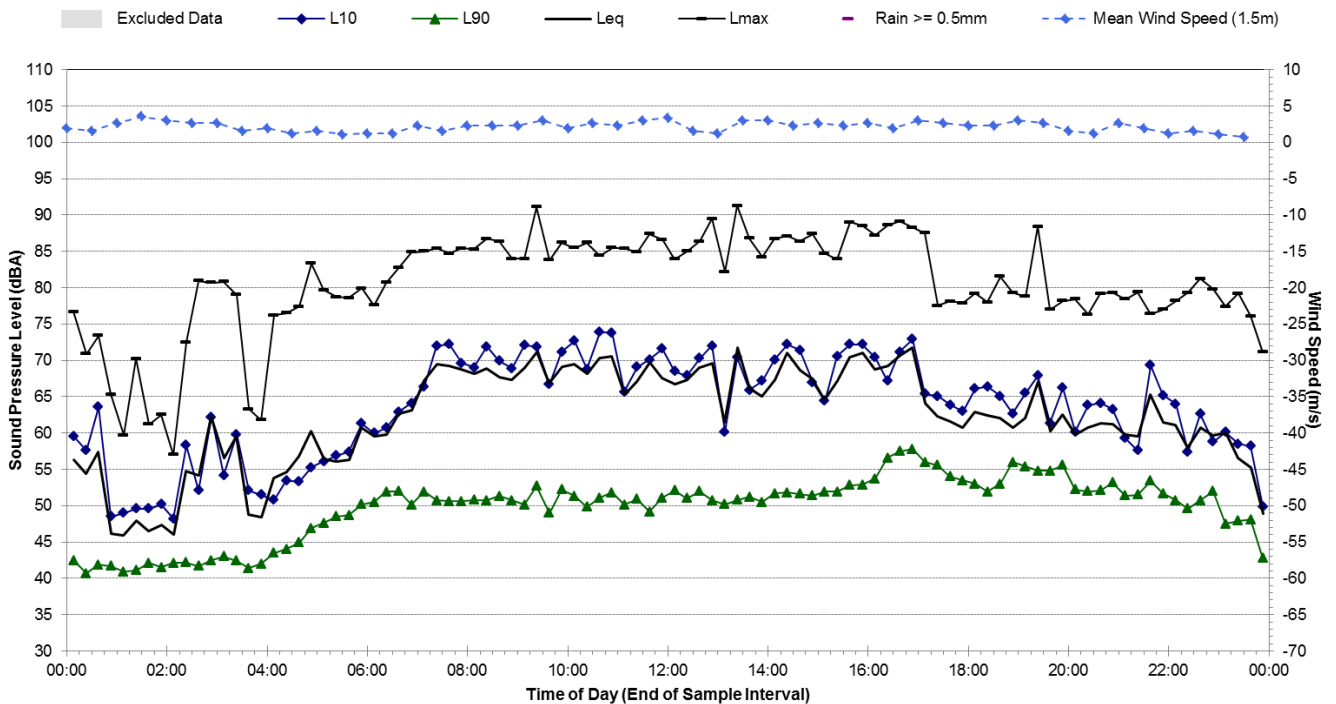
Statistical Ambient Noise Levels

105 Baxter Road, Mascot - Tuesday, 2 October 2018



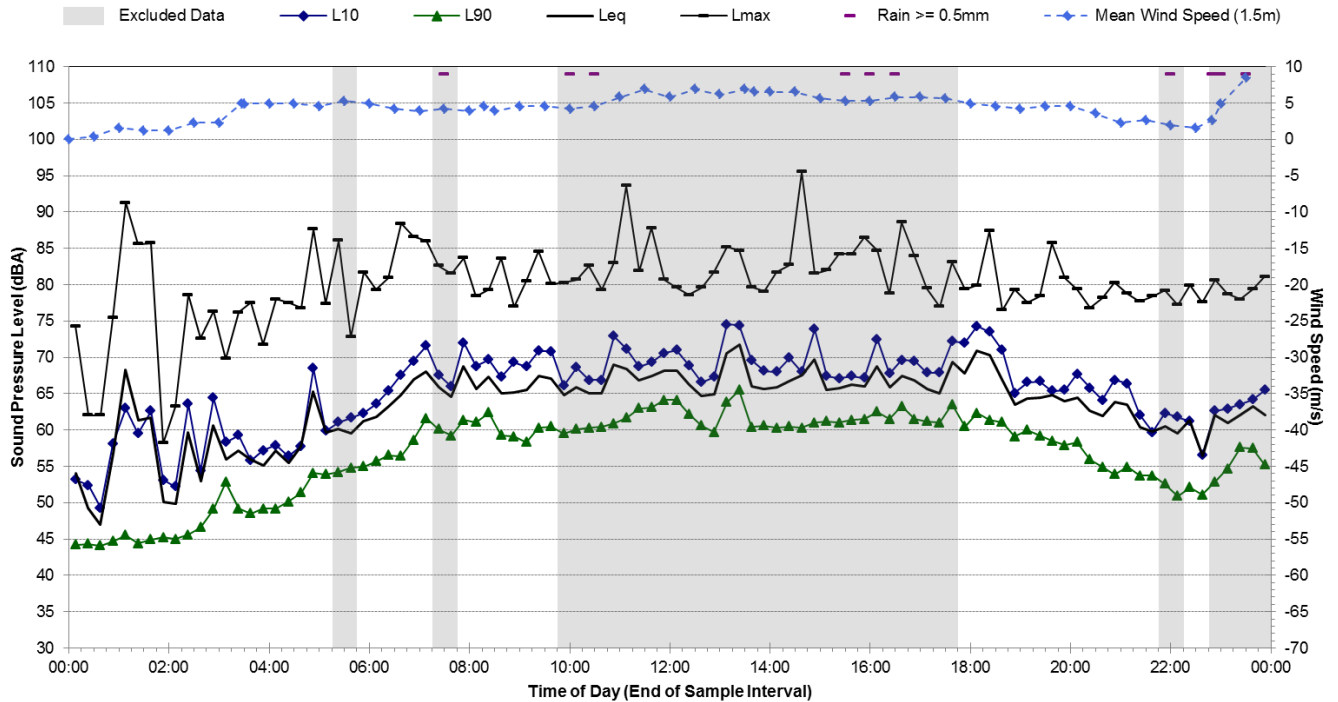
Statistical Ambient Noise Levels

105 Baxter Road, Mascot - Wednesday, 3 October 2018



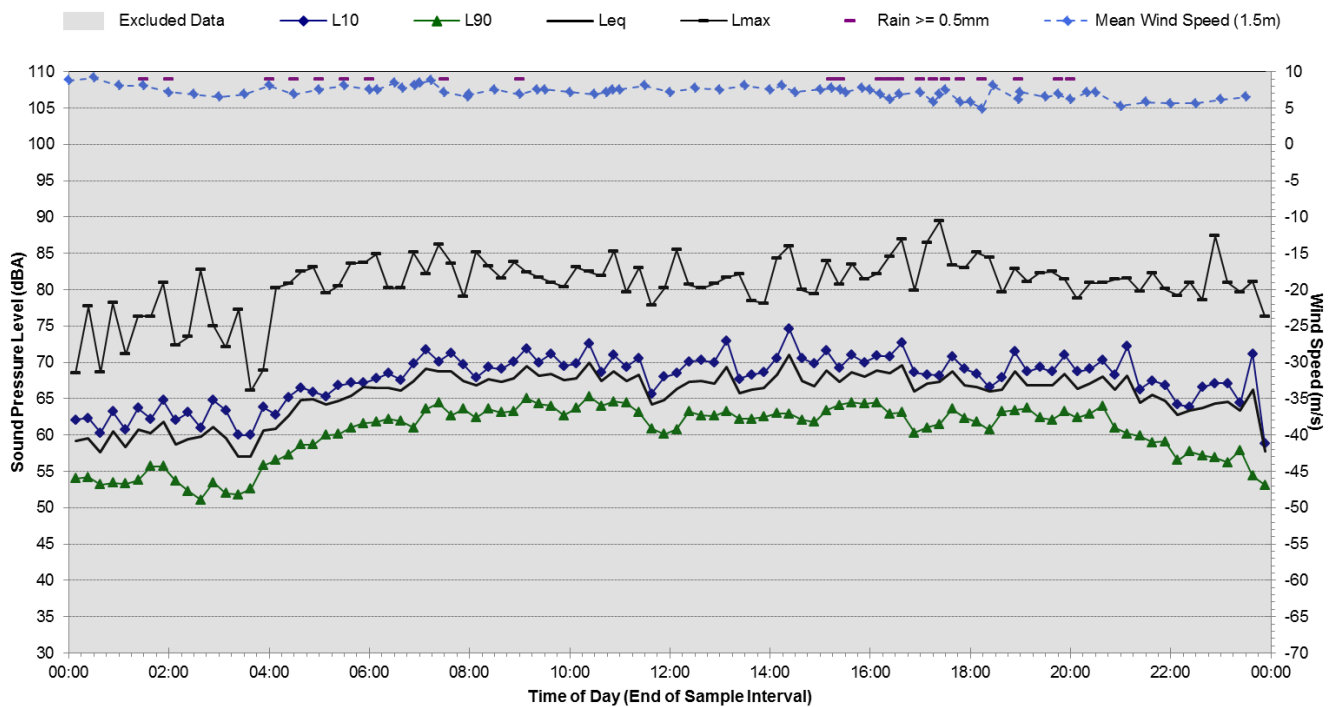
Statistical Ambient Noise Levels

105 Baxter Road, Mascot - Thursday, 4 October 2018



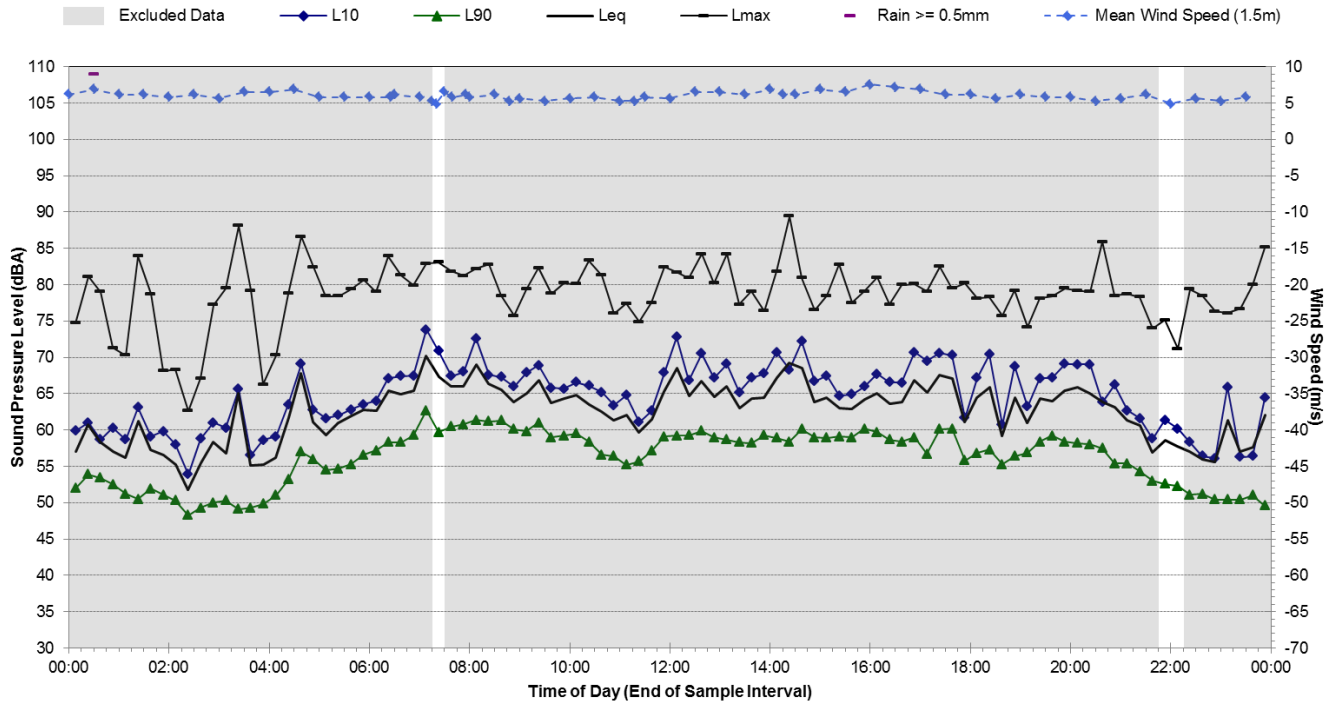
Statistical Ambient Noise Levels

105 Baxter Road, Mascot - Friday, 5 October 2018



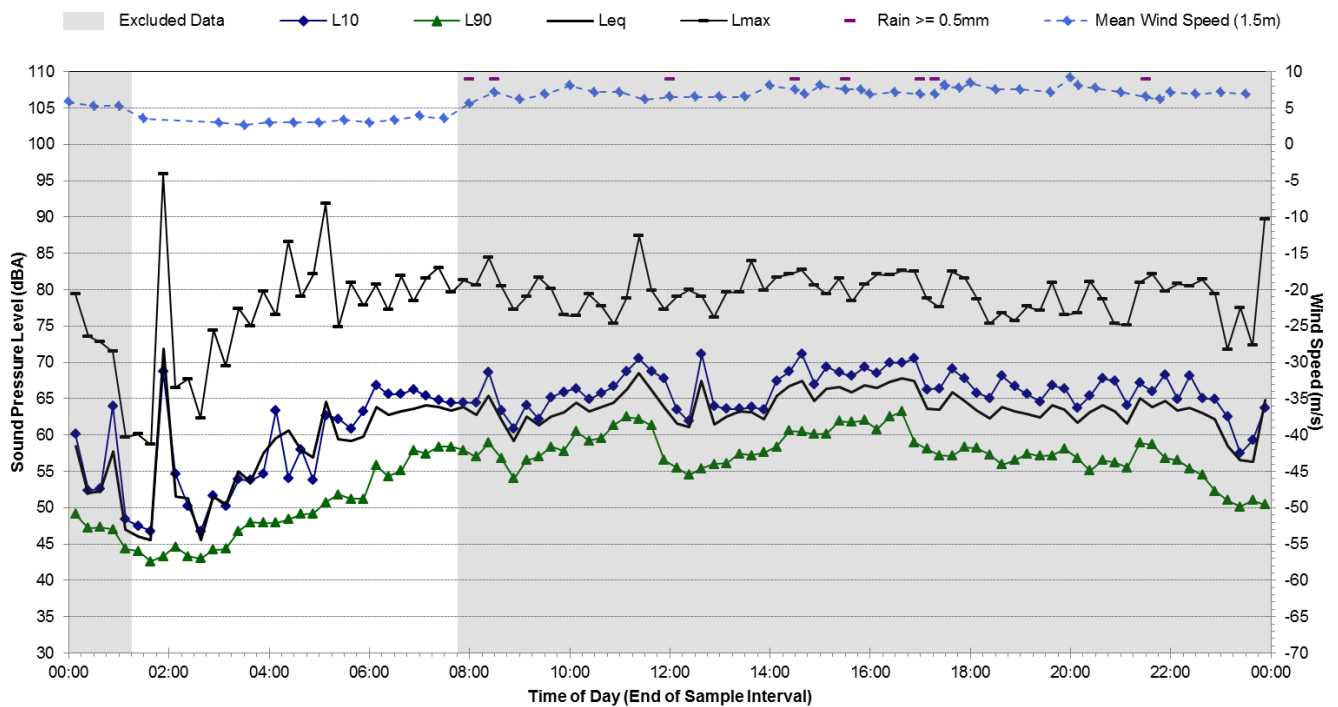
Statistical Ambient Noise Levels

105 Baxter Road, Mascot - Saturday, 6 October 2018



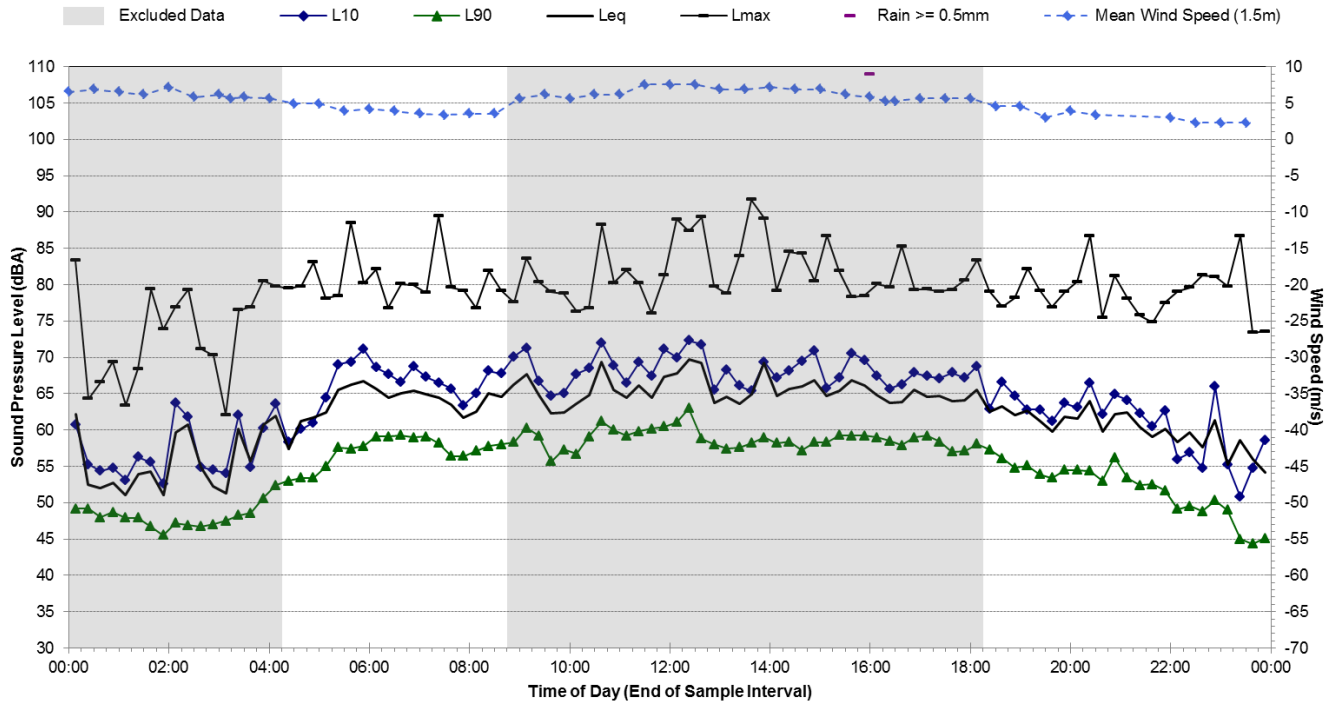
Statistical Ambient Noise Levels

105 Baxter Road, Mascot - Sunday, 7 October 2018



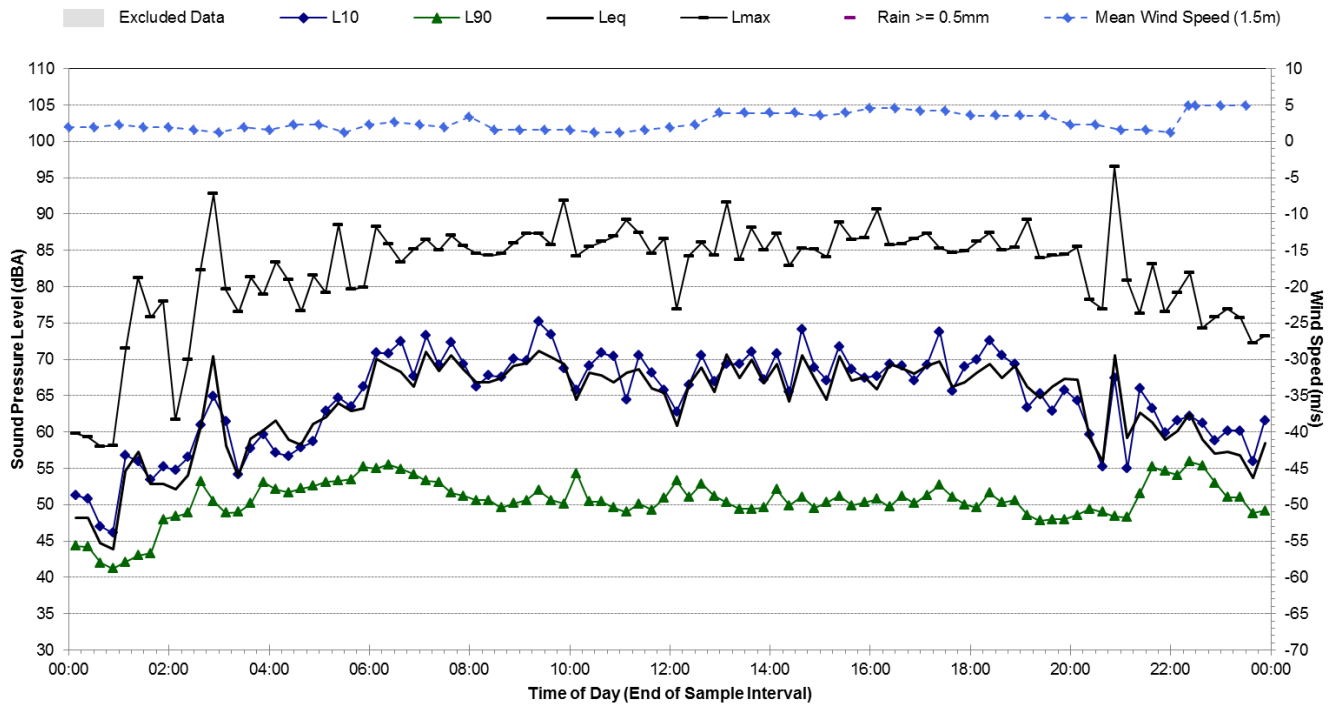
Statistical Ambient Noise Levels

105 Baxter Road, Mascot - Monday, 8 October 2018



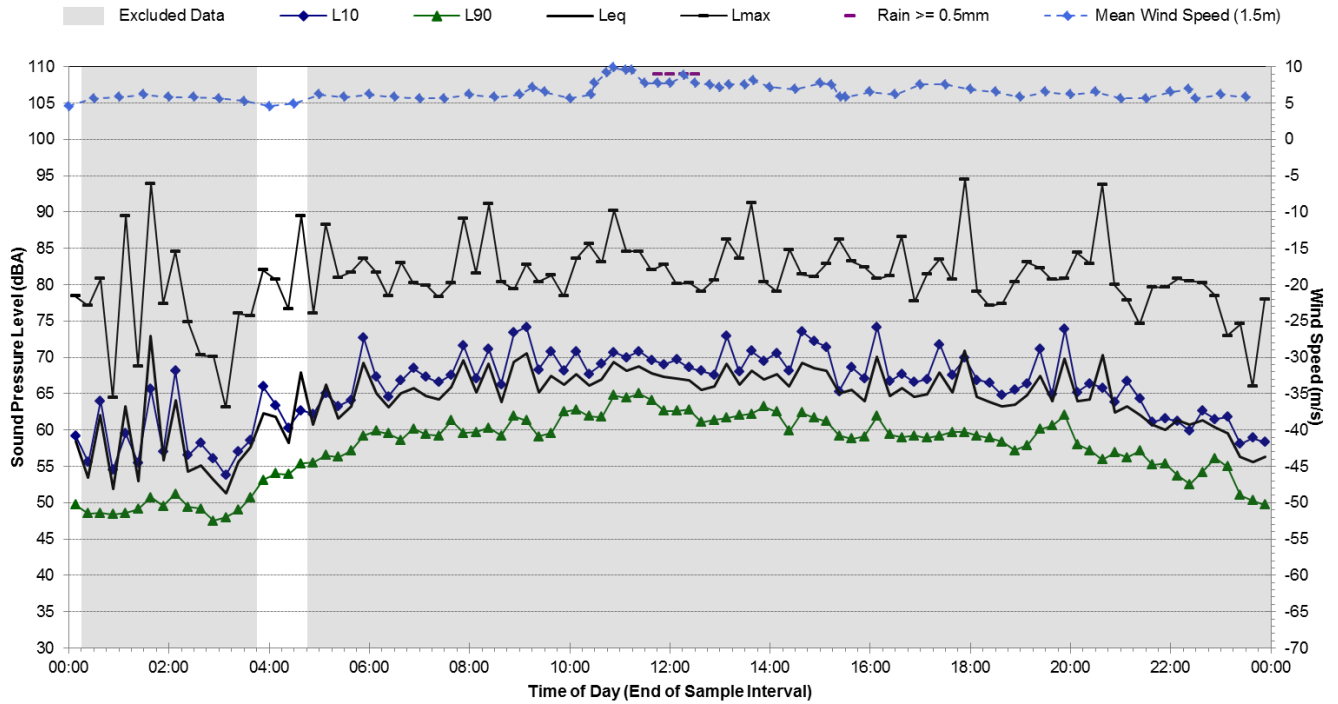
Statistical Ambient Noise Levels

105 Baxter Road, Mascot - Tuesday, 9 October 2018



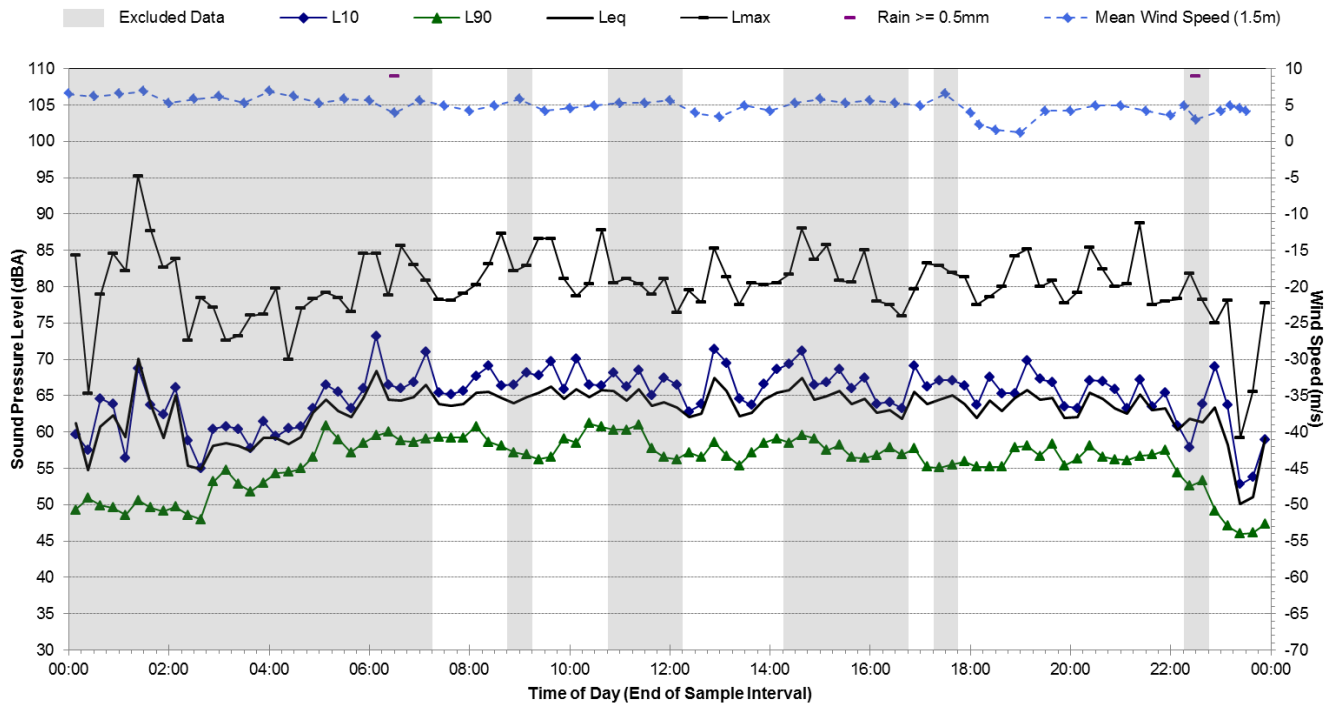
Statistical Ambient Noise Levels

105 Baxter Road, Mascot - Wednesday, 10 October 2018



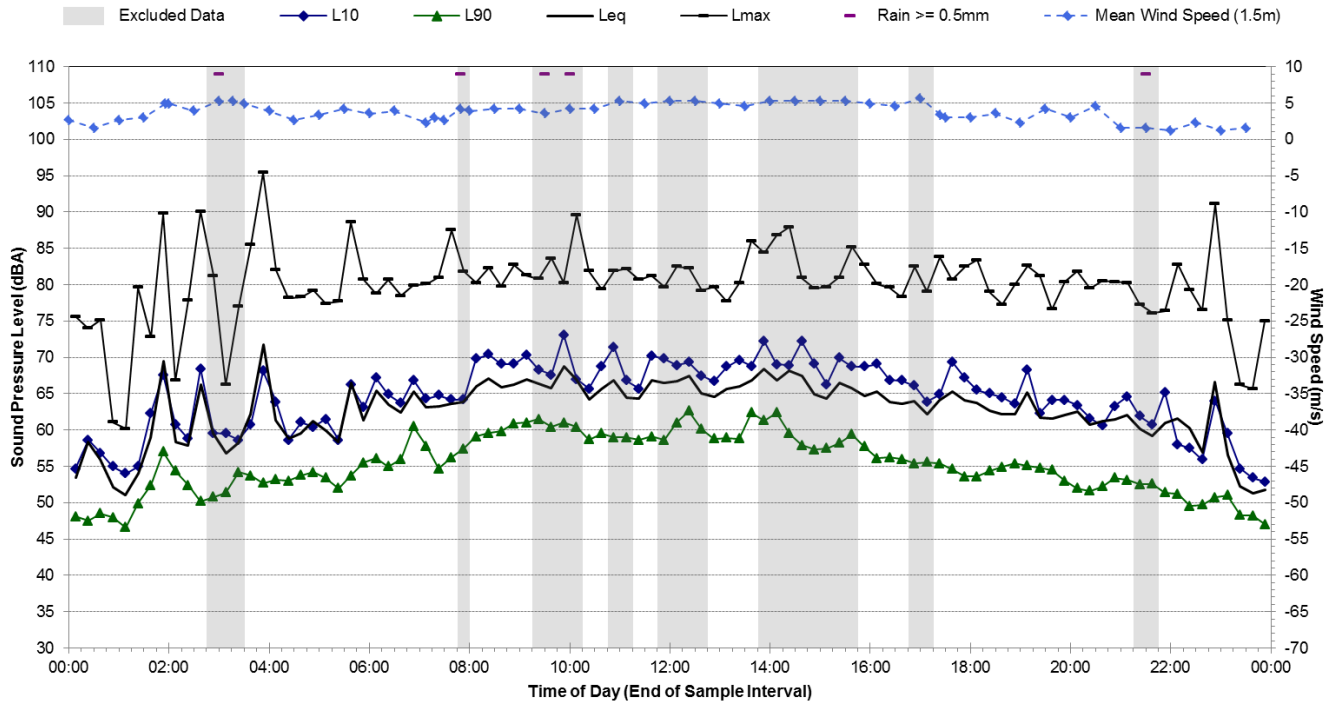
Statistical Ambient Noise Levels

105 Baxter Road, Mascot - Thursday, 11 October 2018



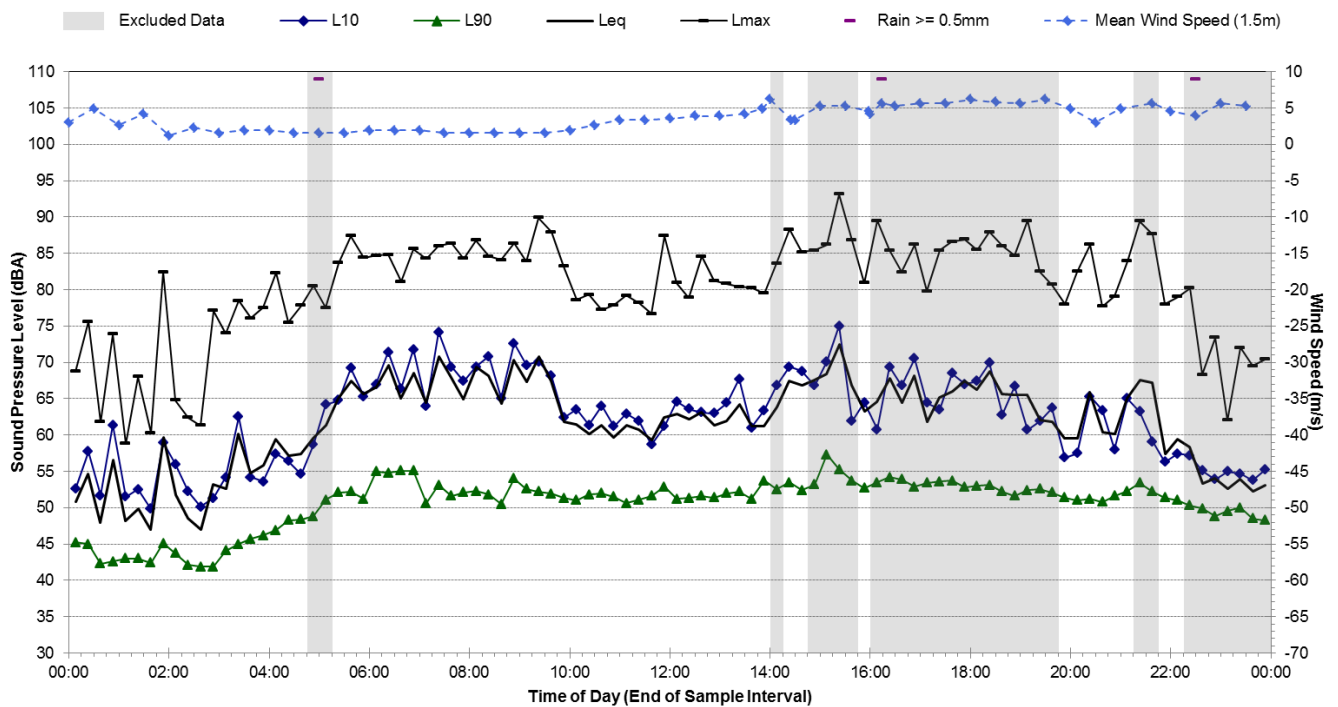
Statistical Ambient Noise Levels

105 Baxter Road, Mascot - Friday, 12 October 2018



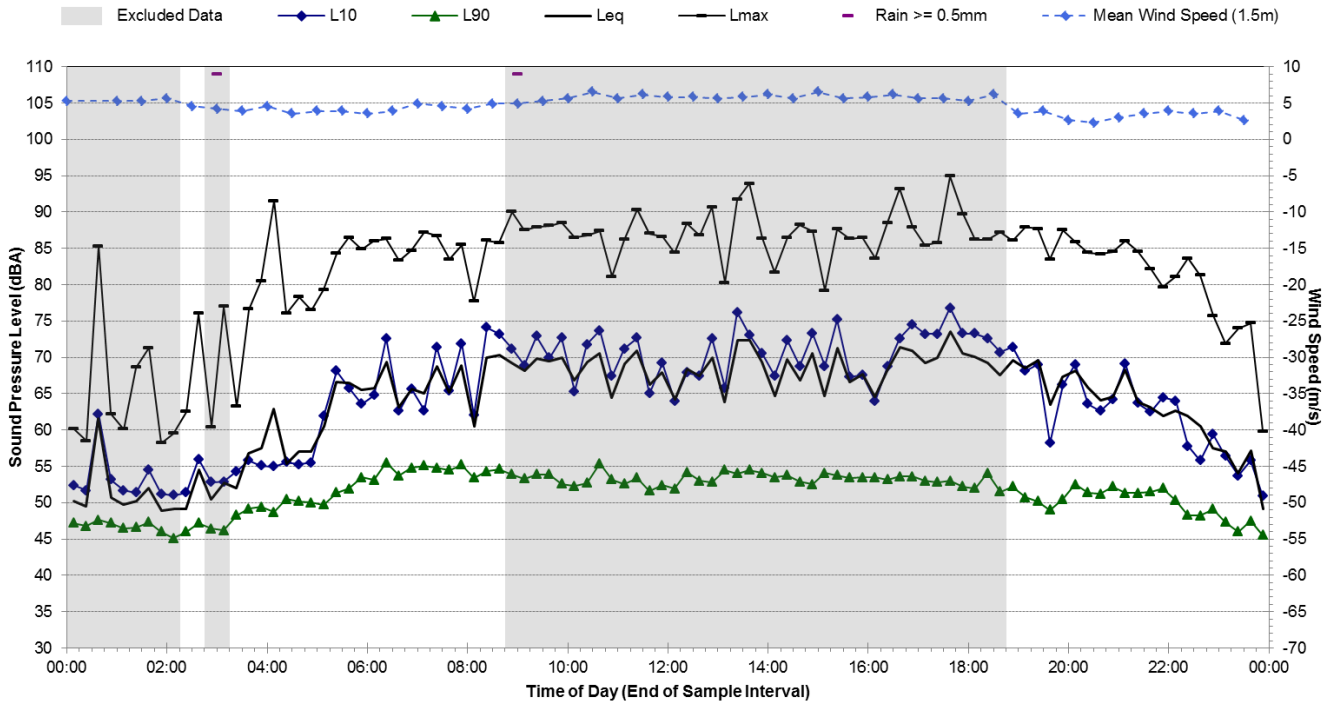
Statistical Ambient Noise Levels

105 Baxter Road, Mascot - Saturday, 13 October 2018



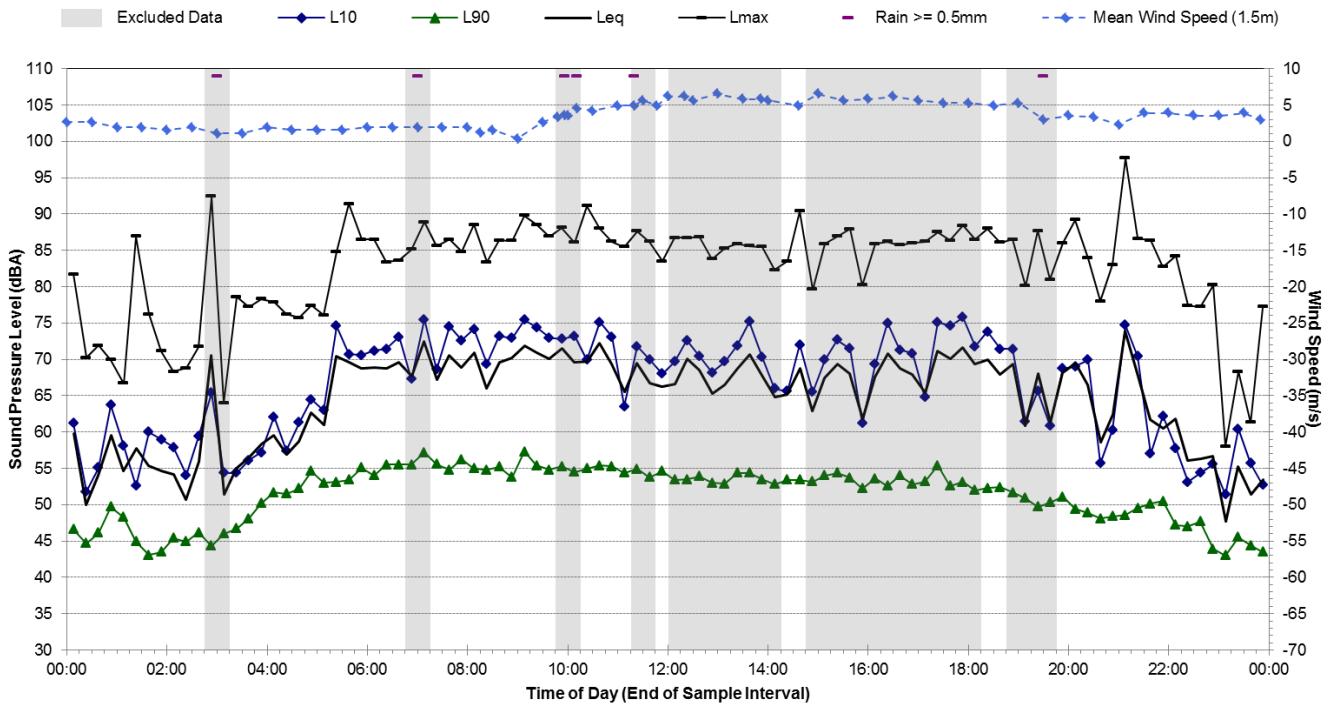
Statistical Ambient Noise Levels

105 Baxter Road, Mascot - Sunday, 14 October 2018



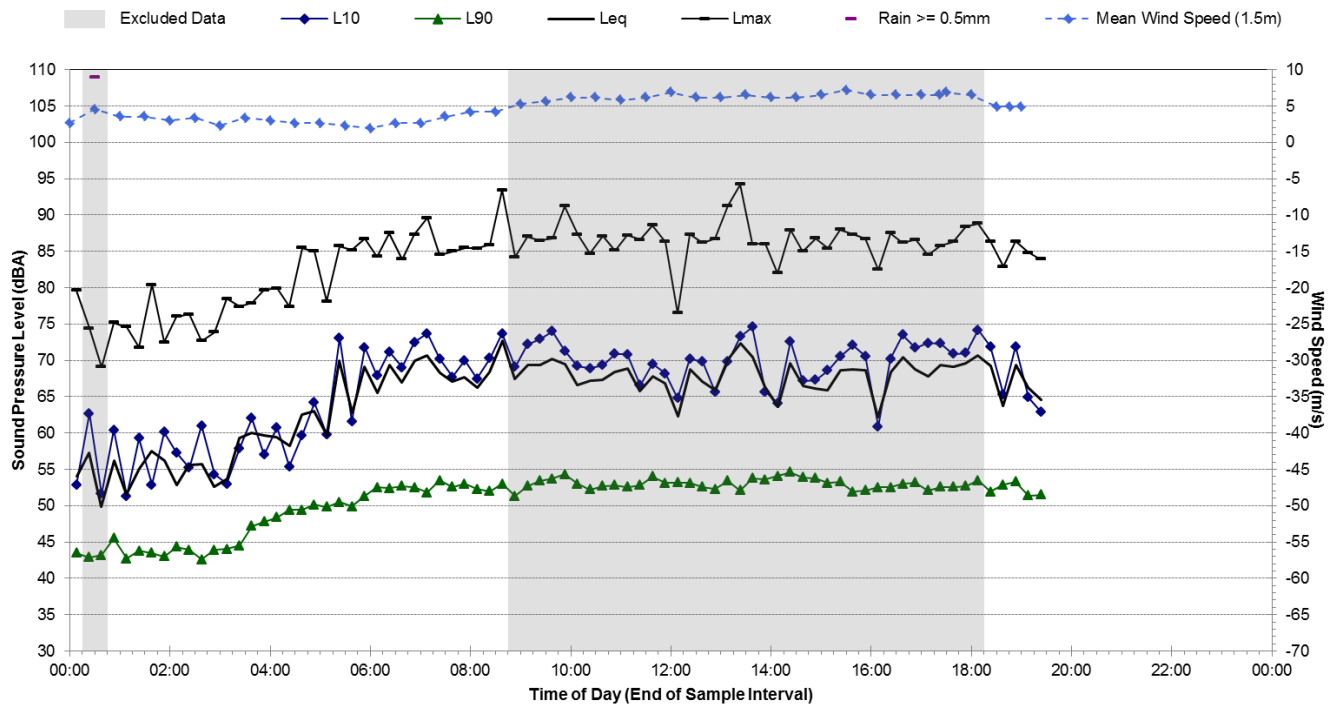
Statistical Ambient Noise Levels





105 Baxter Road, Mascot - Monday, 15 October 2018



Statistical Ambient Noise Levels

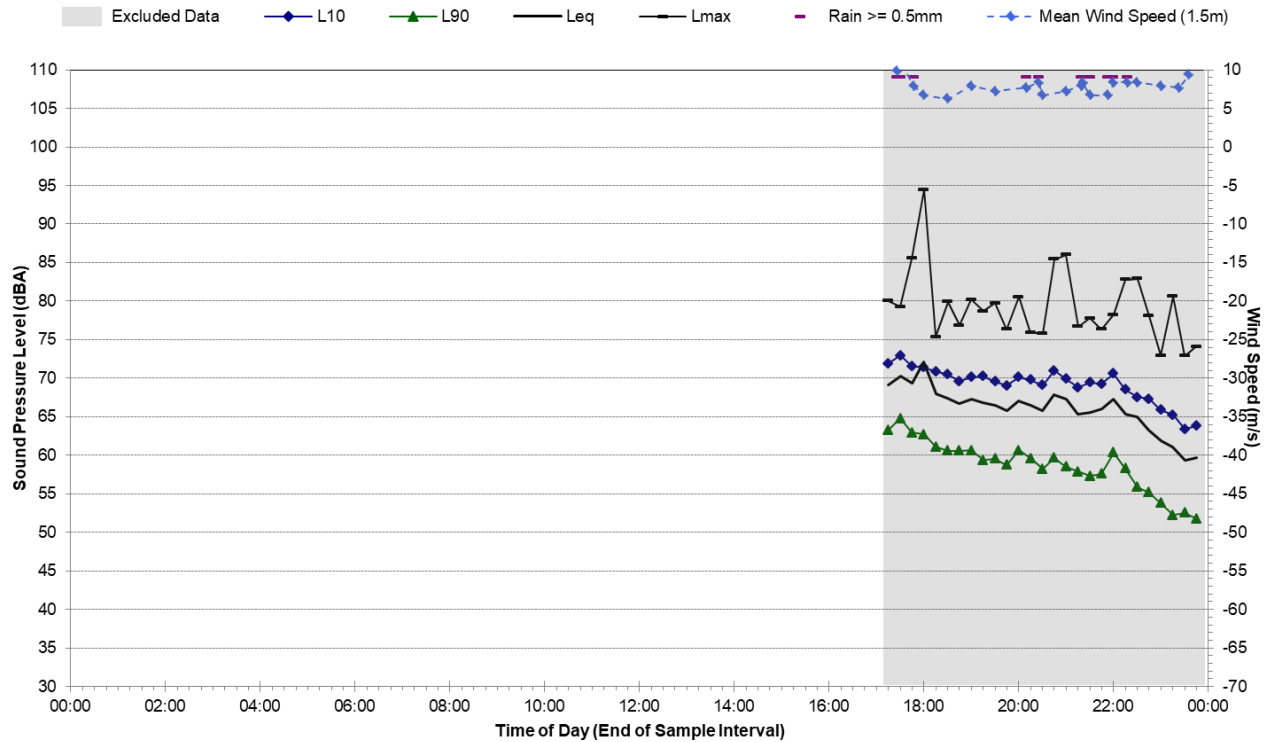
105 Baxter Road, Mascot - Tuesday, 16 October 2018



Noise Monitoring Location	L.04				Map of Noise Monitoring Location	
Noise Monitoring Address	87 Hardie Street, Mascot					
Logger Device Type: SVAN 957, Logger Serial No: 3004710 Sound Level Meter: Brüel and Kjær 2250L, Sound Level Meter Serial No: 2487418						
Ambient noise logger deployed at residential address 87 Hardie Street, Mascot.						
Attended noise measurements indicate the ambient noise environment at this location is influenced by heavy and light vehicle road traffic noise associated with Botany Road. Frequent aircraft fly overs also contribute to the ambient noise levels at this location.						
Attended Measurement Noise Levels (LAmax): 05/07/2018: Heavy-vehicle traffic: 75-80 dBA, Aircraft flyovers: 78 - 84 dBA						
Ambient Noise Logging Results –NPfI Defined Time Periods						Photo of Noise Monitoring Location
Monitoring Period	Noise Level (dBA)					
	RBL	LAeq	L10	L1		
Daytime	57	69	71	77		
Evening	54	66	68	74		
Night-time	48	64	64	71		
Ambient Noise Logging Results – RNP Defined Time Periods						
Monitoring Period	Noise Level (dBA)					
	LAeq(period)		LAeq(1hour)			
Daytime (7am-10pm)	-		-			
Night-time (10pm-7am)	-		-			
Attended Noise Measurement Results						
Date	Start Time	Measured Noise Level (dBA)				
		LA90	LAeq	LAmax		
05/07/2018	12:20	60	70	85		

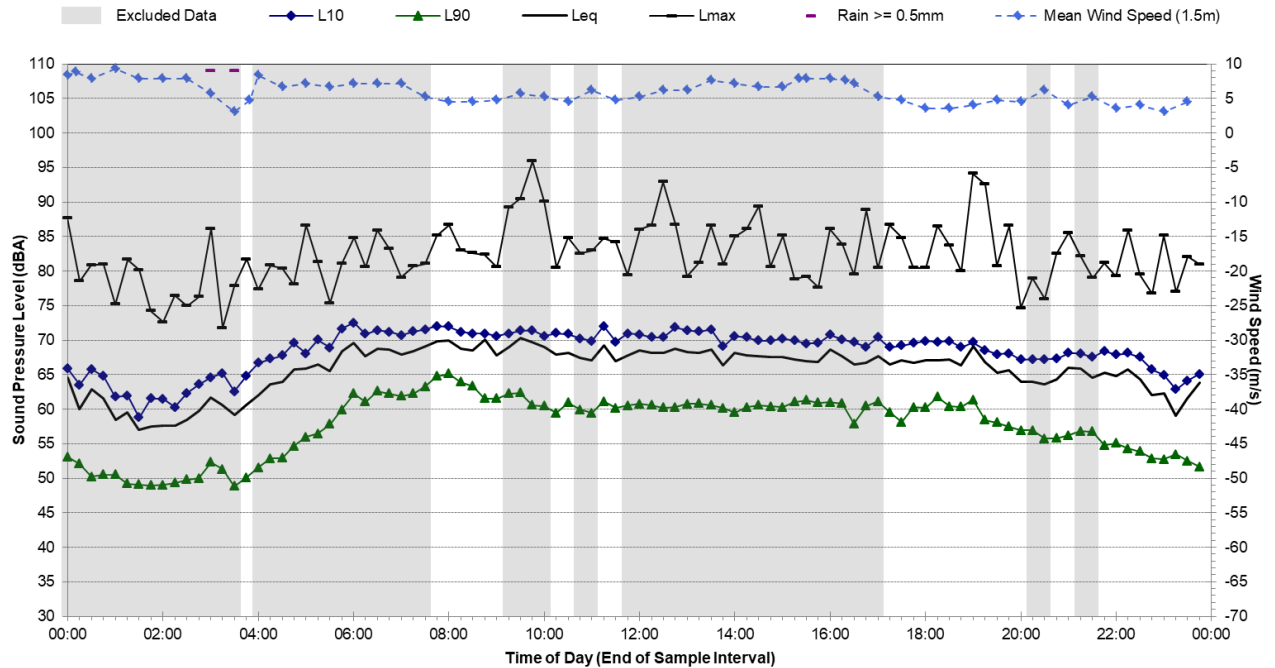
Statistical Ambient Noise Levels

L04 - 87 Hardie Street, Mascot - Tuesday, 19 June 2018



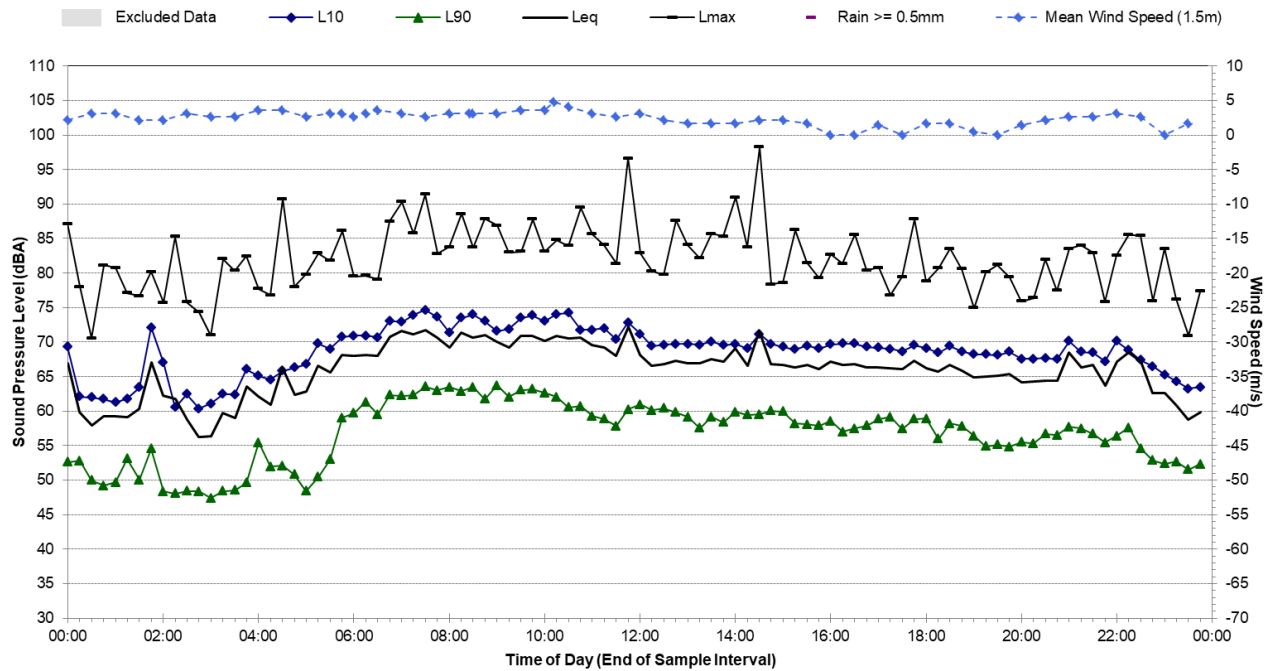
Statistical Ambient Noise Levels

L04 - 87 Hardie Street, Mascot - Wednesday, 20 June 2018



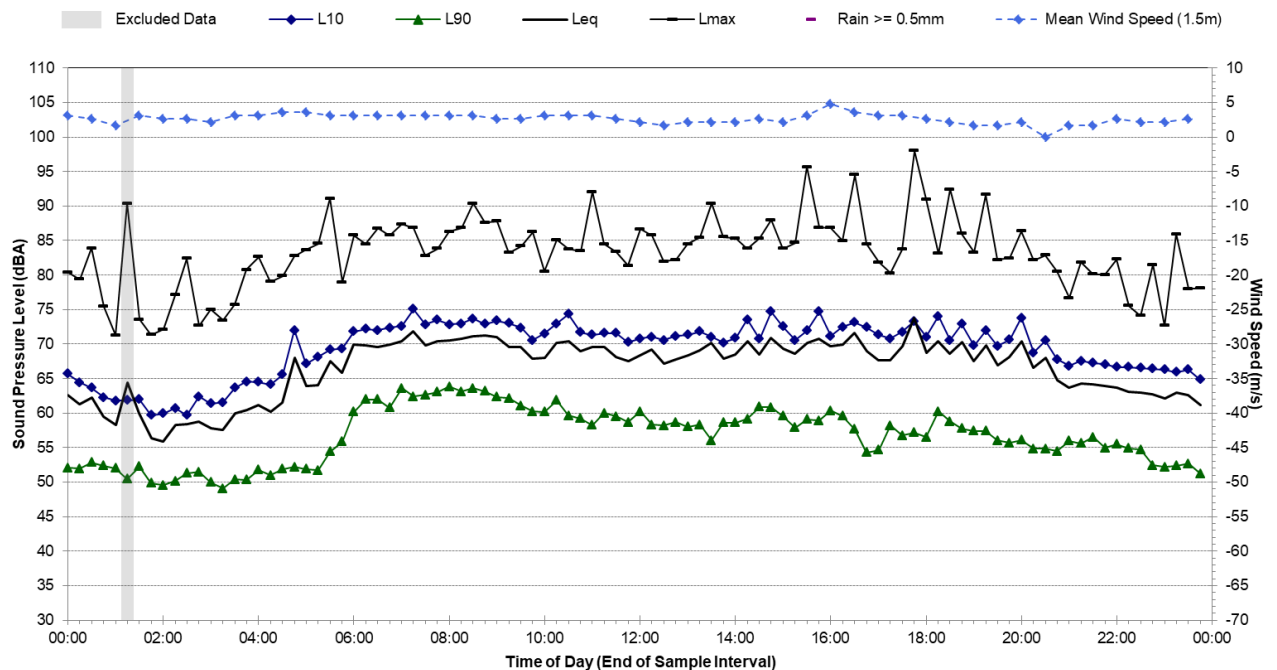
Statistical Ambient Noise Levels

L04 - 87 Hardie Street, Mascot - Thursday, 21 June 2018



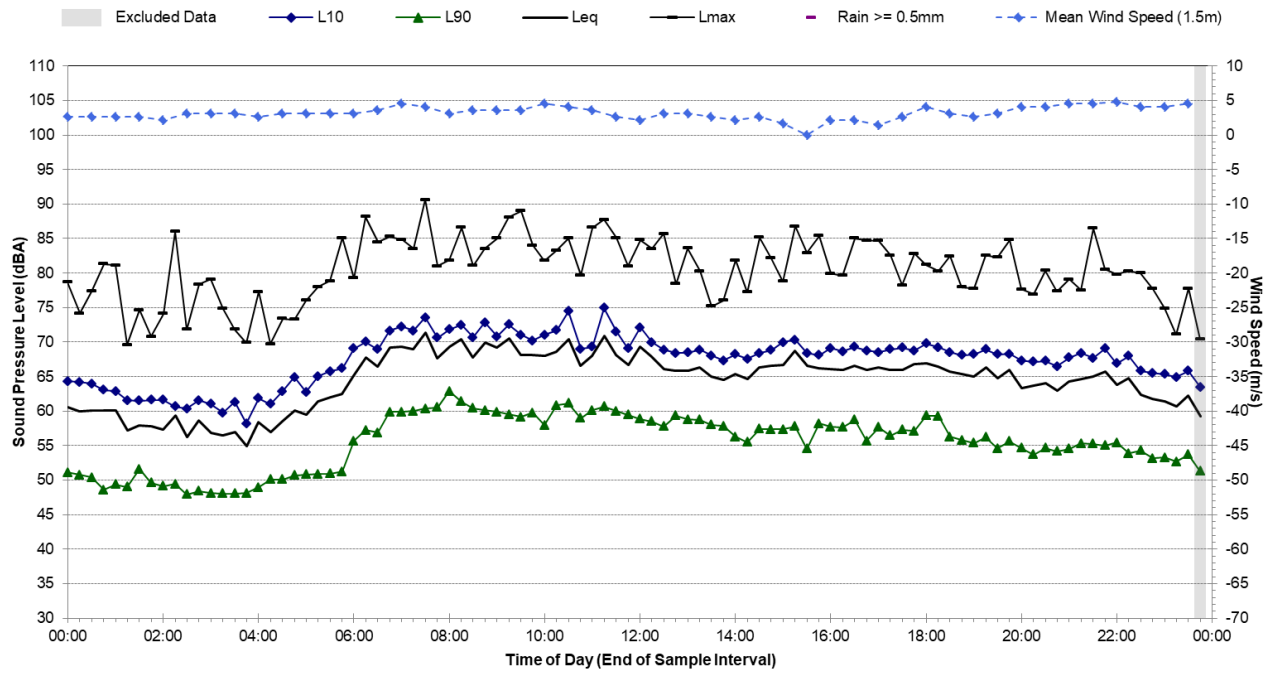
Statistical Ambient Noise Levels

L04 - 87 Hardie Street, Mascot - Friday, 22 June 2018



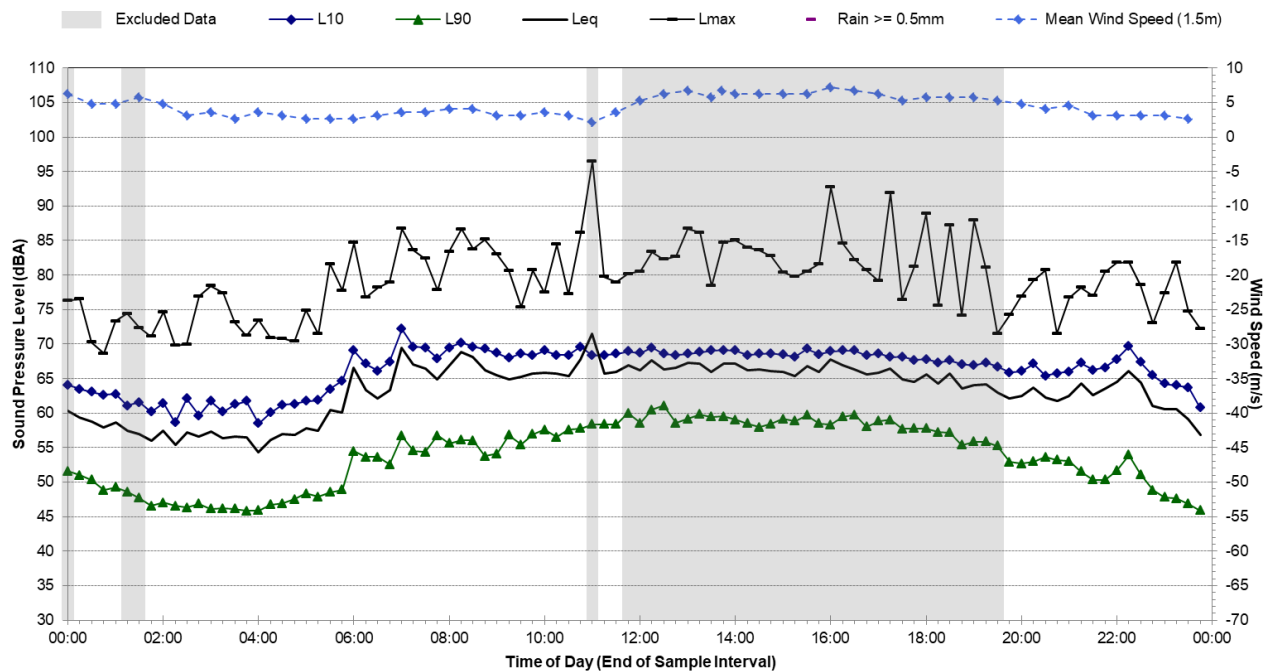
Statistical Ambient Noise Levels

L04 - 87 Hardie Street, Mascot - Saturday, 23 June 2018



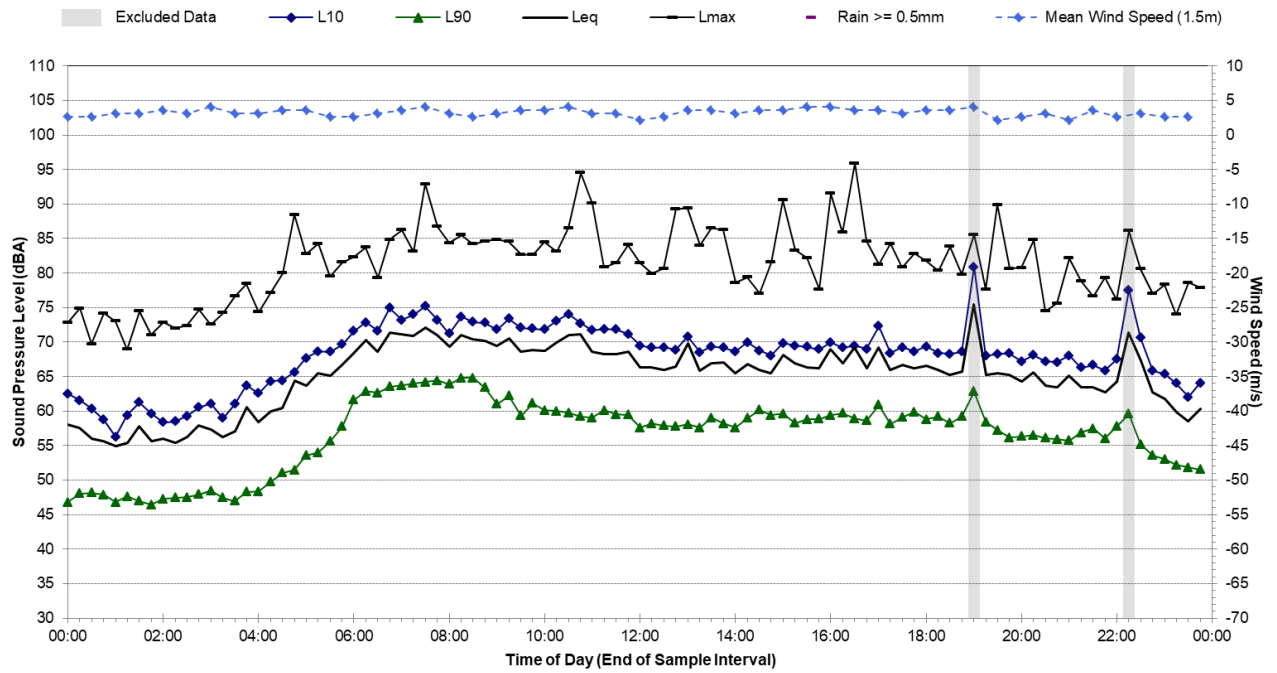
Statistical Ambient Noise Levels

L04 - 87 Hardie Street, Mascot - Sunday, 24 June 2018



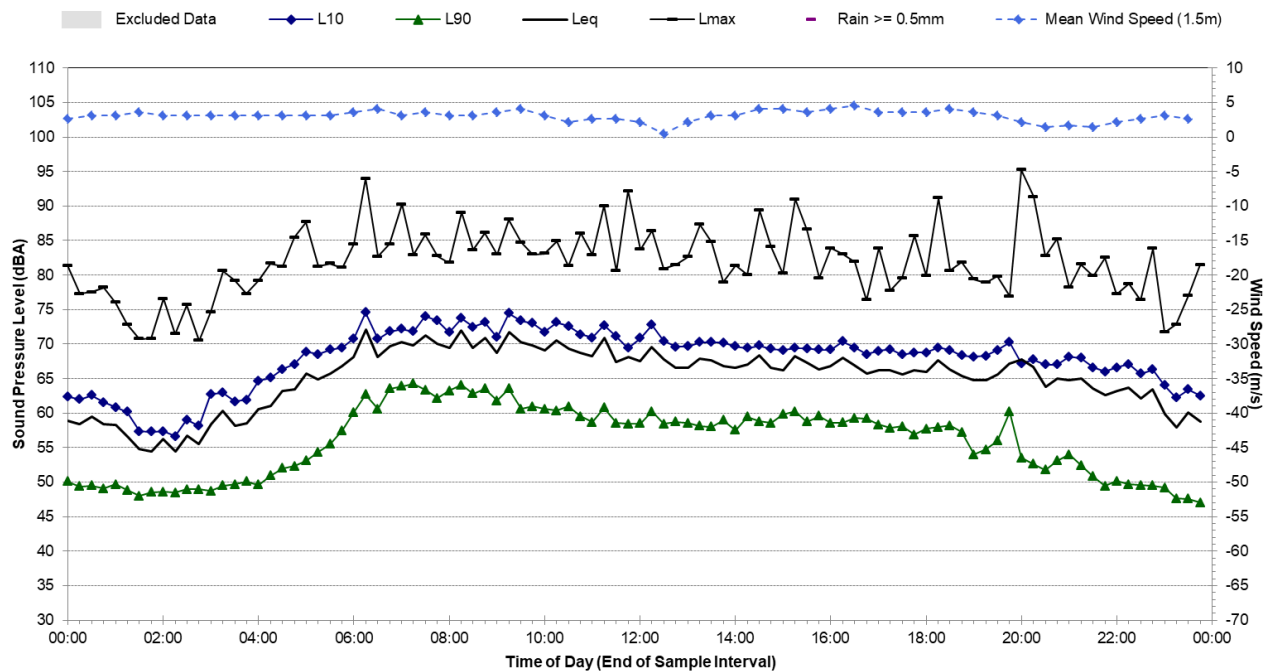
Statistical Ambient Noise Levels

L04 - 87 Hardie Street, Mascot - Monday, 25 June 2018



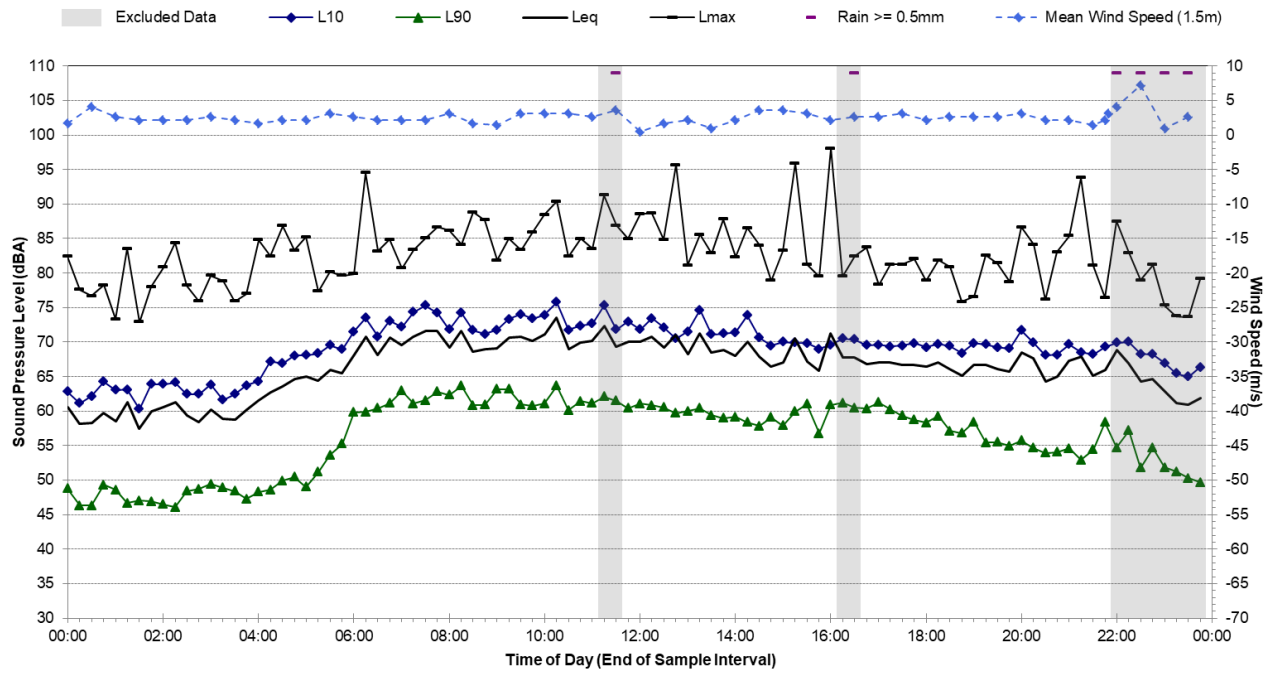
Statistical Ambient Noise Levels

L04 - 87 Hardie Street, Mascot - Tuesday, 26 June 2018



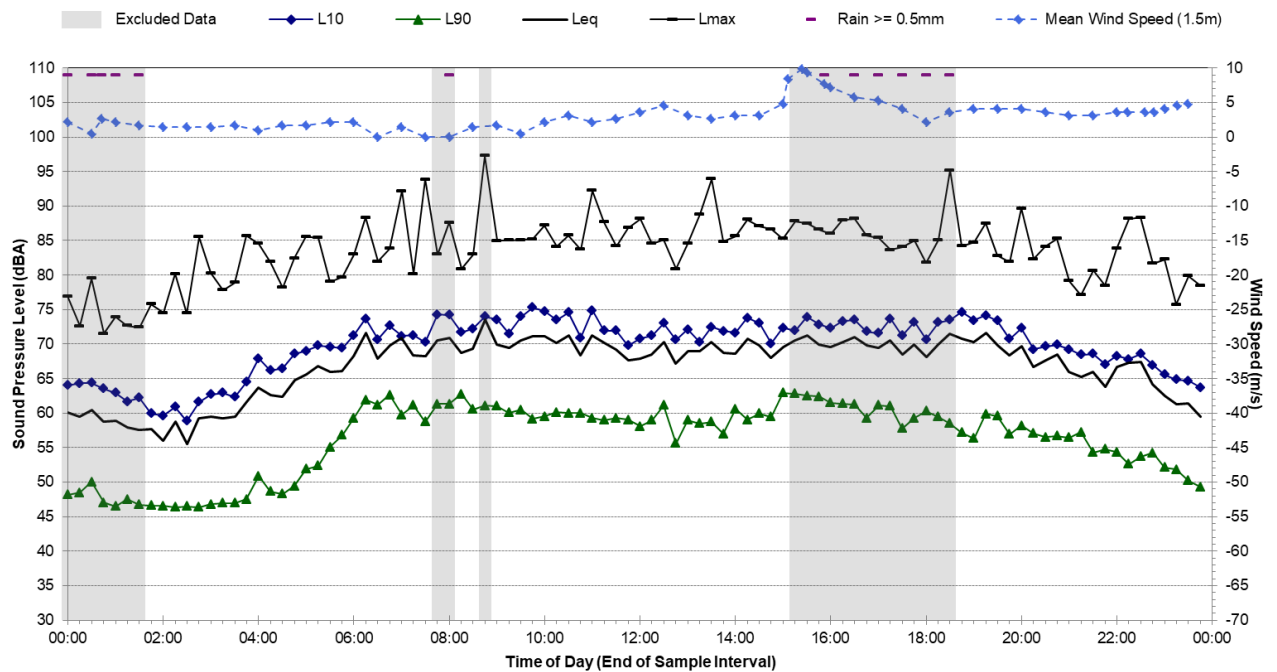
Statistical Ambient Noise Levels

L04 - 87 Hardie Street, Mascot - Wednesday, 27 June 2018



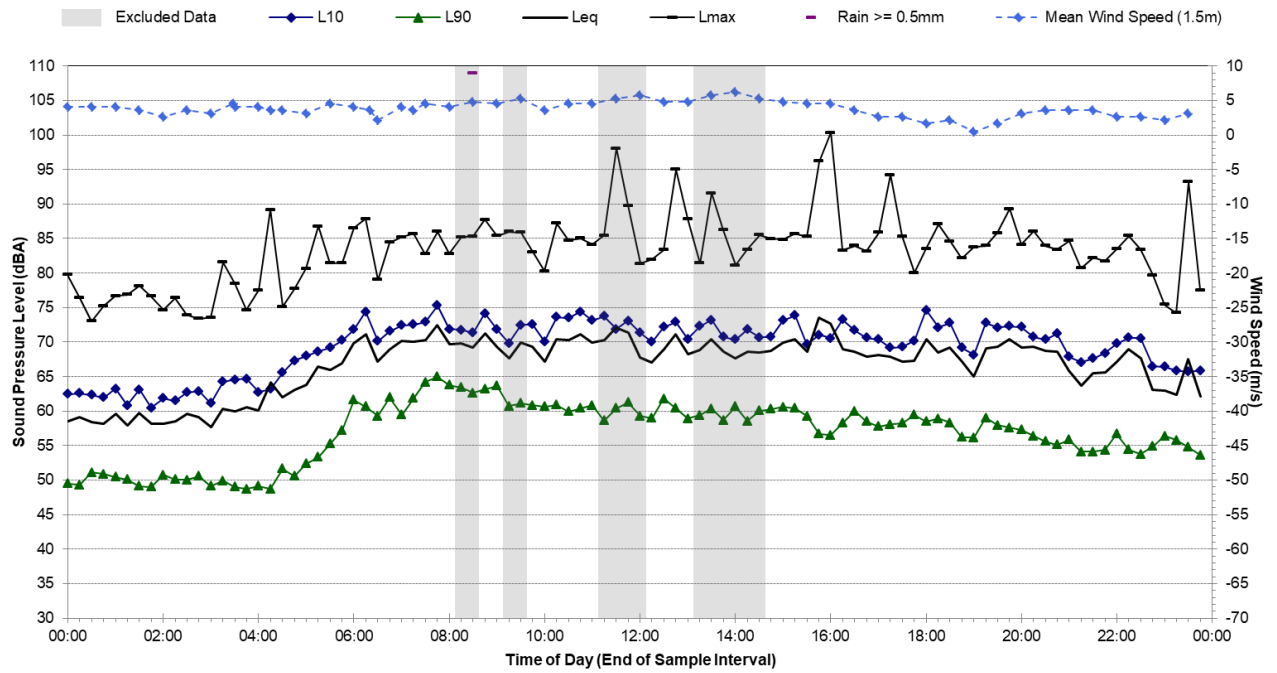
Statistical Ambient Noise Levels

L04 - 87 Hardie Street, Mascot - Thursday, 28 June 2018



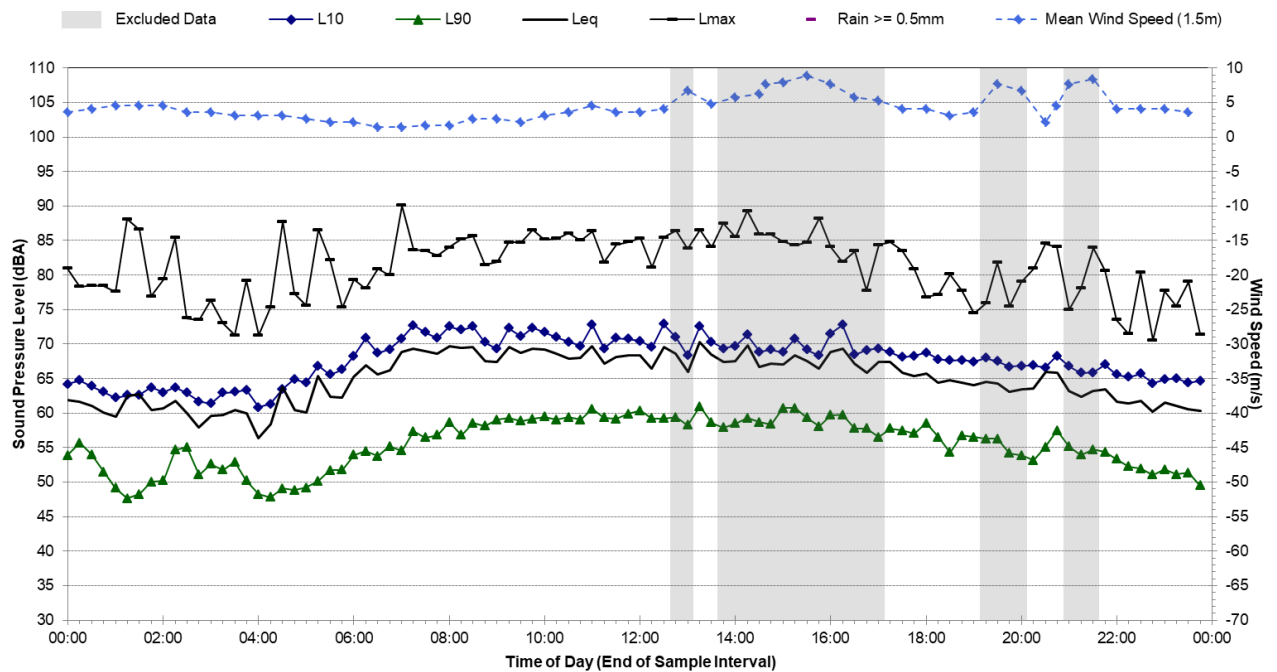
Statistical Ambient Noise Levels

L04 - 87 Hardie Street, Mascot - Friday, 29 June 2018



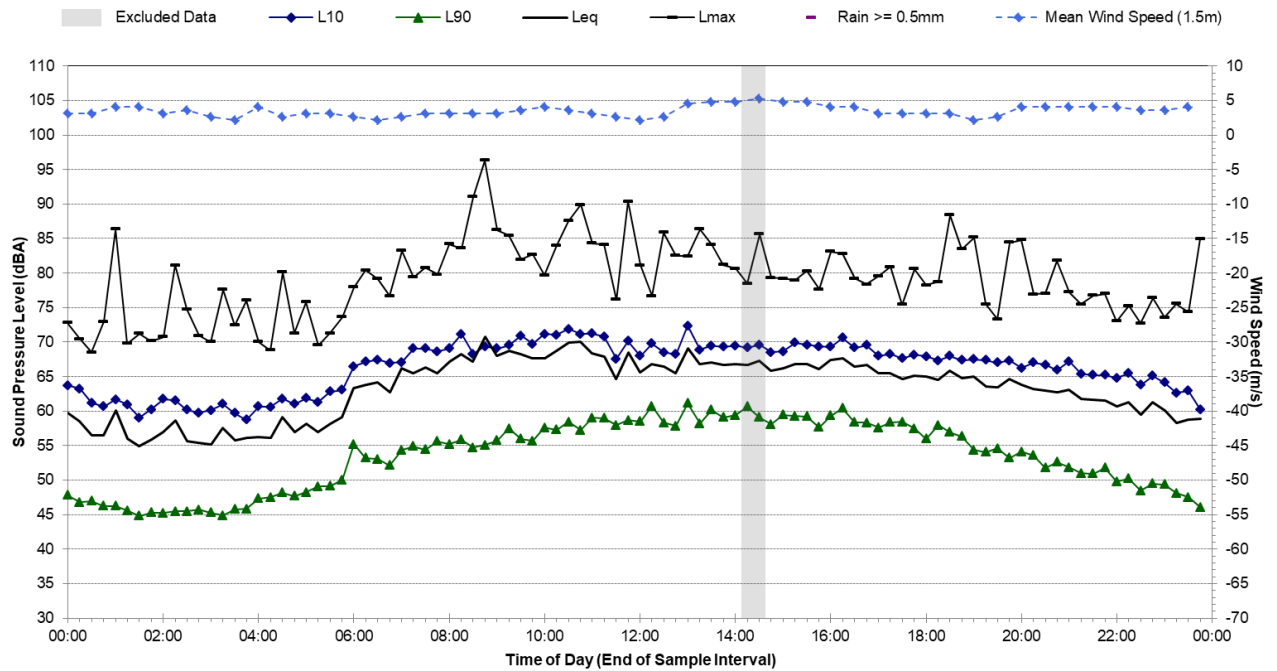
Statistical Ambient Noise Levels

L04 - 87 Hardie Street, Mascot - Saturday, 30 June 2018



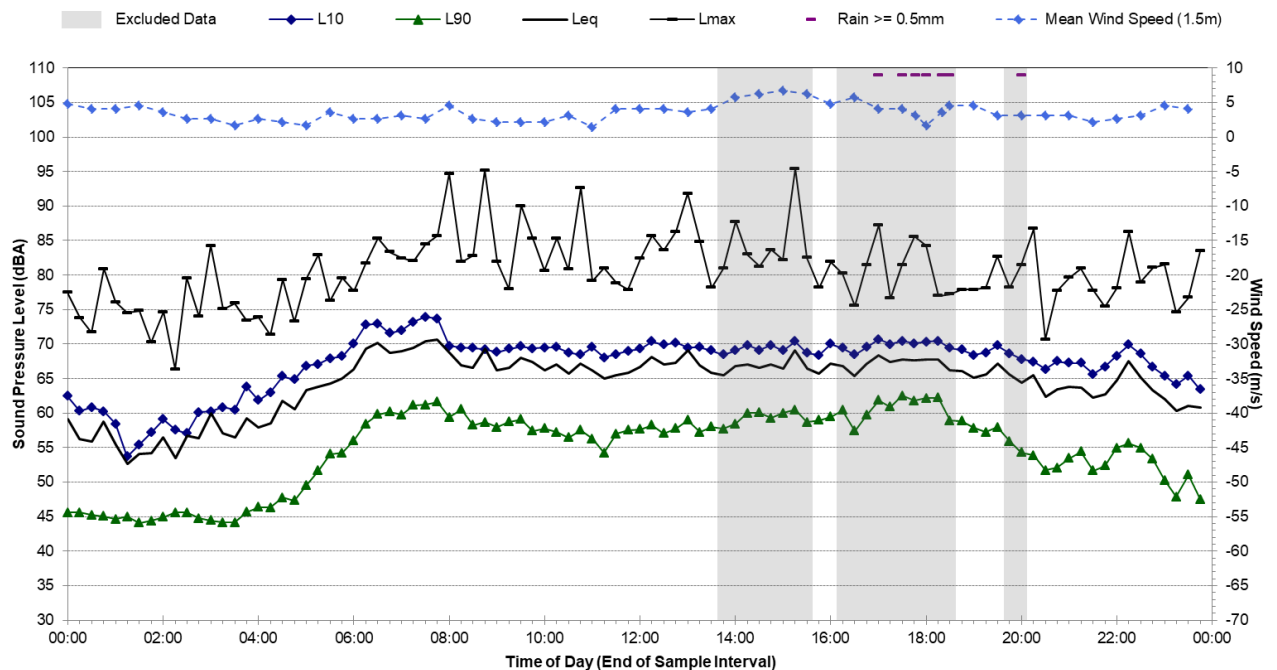
Statistical Ambient Noise Levels



L04 - 87 Hardie Street, Mascot - Sunday, 1 July 2018



Statistical Ambient Noise Levels

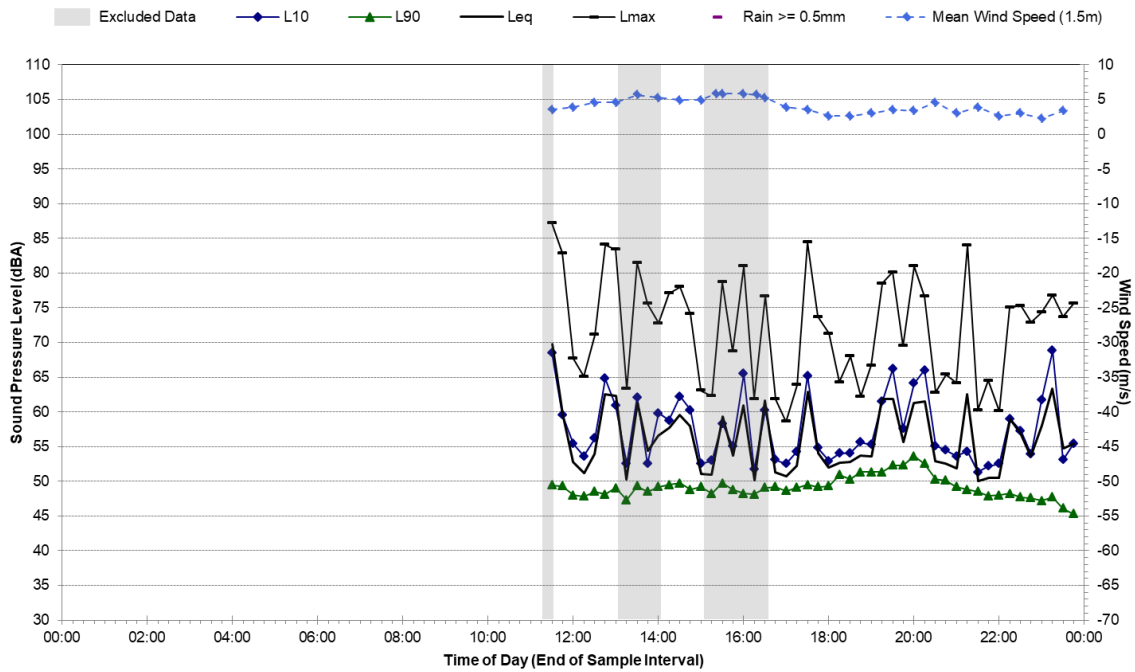
L04 - 87 Hardie Street, Mascot - Monday, 2 July 2018



Noise Monitoring Location	L.05				Map of Noise Monitoring Location
Noise Monitoring Address	Eastlakes Golf Club, Pagewood				
Logger Device Type: ARL Environmental Noise Logger , Logger Serial No: 1630645 Sound Level Meter: Brüel and Kjær 2250L, Sound Level Meter Serial No: 2414604					
Ambient noise logger deployed to the north of the rail corridor in the Eastlakes Golf Club, Pagewood.					
Attended noise measurements indicate the ambient noise environment at this location is influenced by occasional aircraft fly overs and general ‘urban hum’ associated with surrounding roads and industrial areas.					
Measured Attended Noise Levels (LAmax): 05/07/2018: Aircraft flybys: 73 – 76 dBA. Distant traffic and industrial noise: 50 -55. Birds and insects intermittently audible.					
Ambient Noise Logging Results – NPfI Defined Time Periods					
Monitoring Period	Noise Level (dBA)				
	RBL	LAeq	L10	L1	
Daytime	47	61	62	70	
Evening	49	68	56	66	
Night-time	45	57	54	58	
Ambient Noise Logging Results – RNP Defined Time Periods					
Monitoring Period	Noise Level (dBA)				
	LAeq(period)		LAeq(1hour)		
Daytime (7am-10pm)	-		-		
Night-time (10pm-7am)	-		-		
Attended Noise Measurement Results					
Date	Start Time	Measured Noise Level (dBA)			
		LA90	LAeq	LAmix	
05/07/2018	15:00	52	60	76	

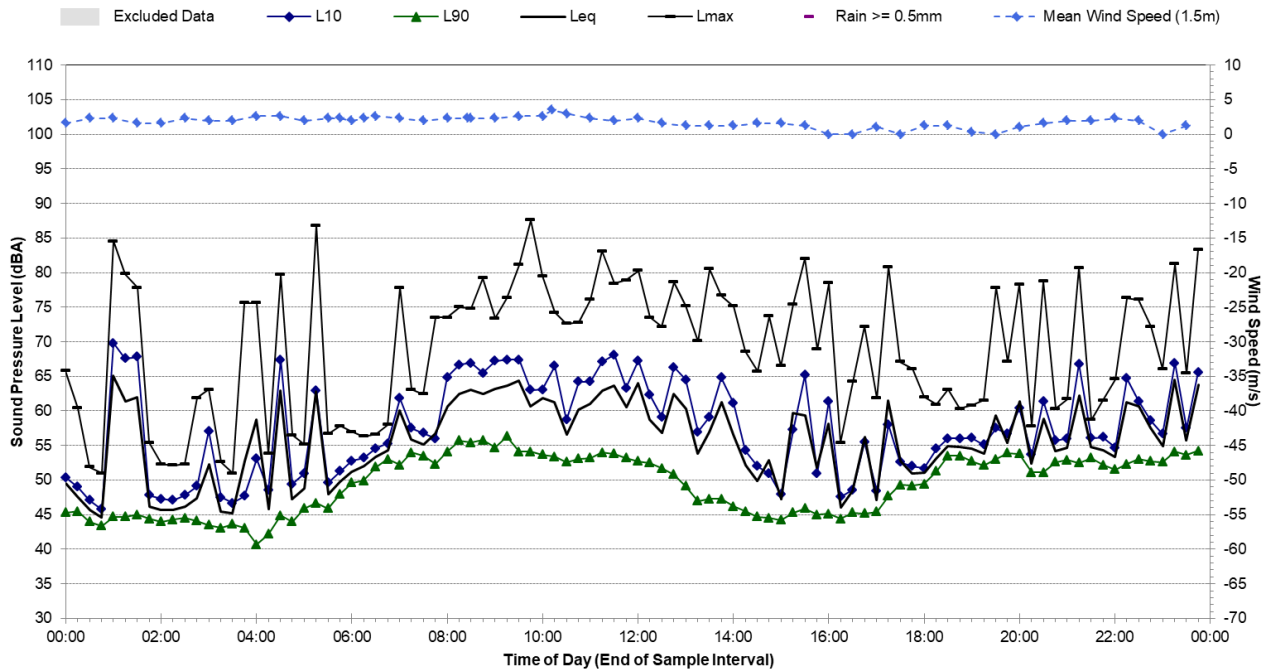
Statistical Ambient Noise Levels

Eastlakes Golf Club, Pagewood - Wednesday, 20 June 2018



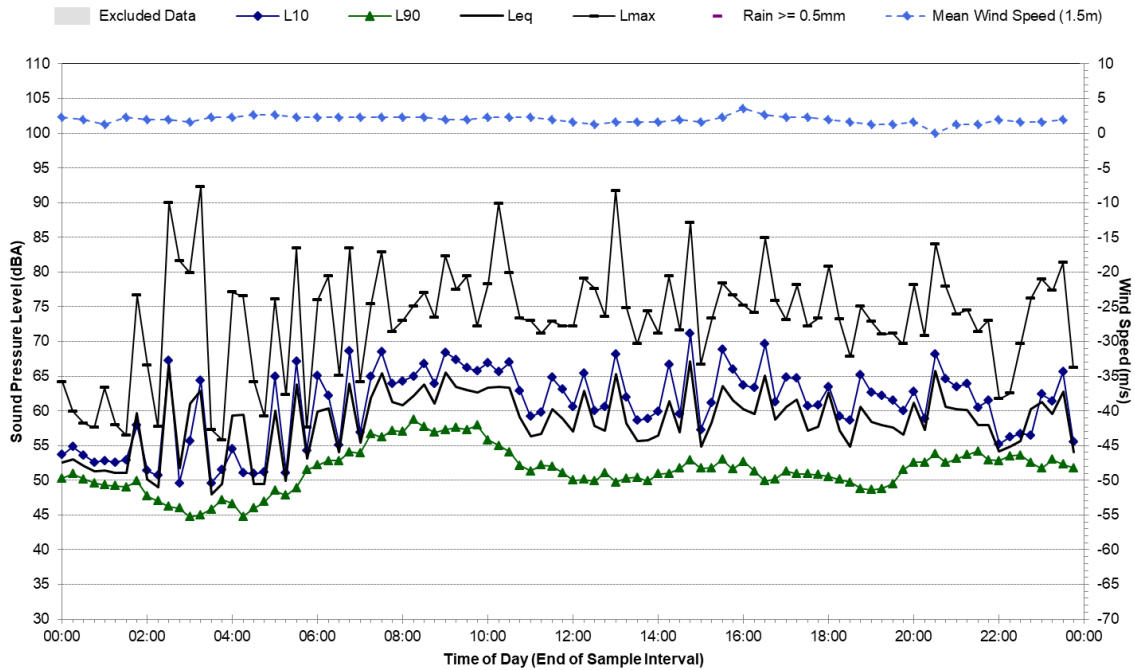
Statistical Ambient Noise Levels

Eastlakes Golf Club, Pagewood - Thursday, 21 June 2018



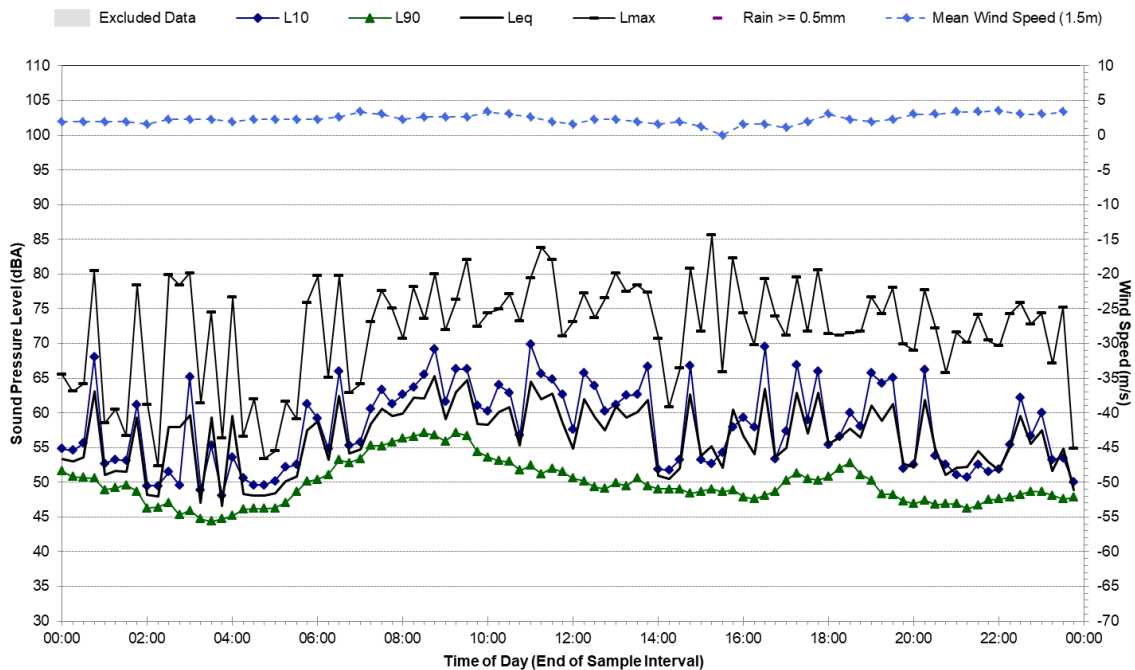
Statistical Ambient Noise Levels

Eastlakes Golf Club, Pagewood - Friday, 22 June 2018

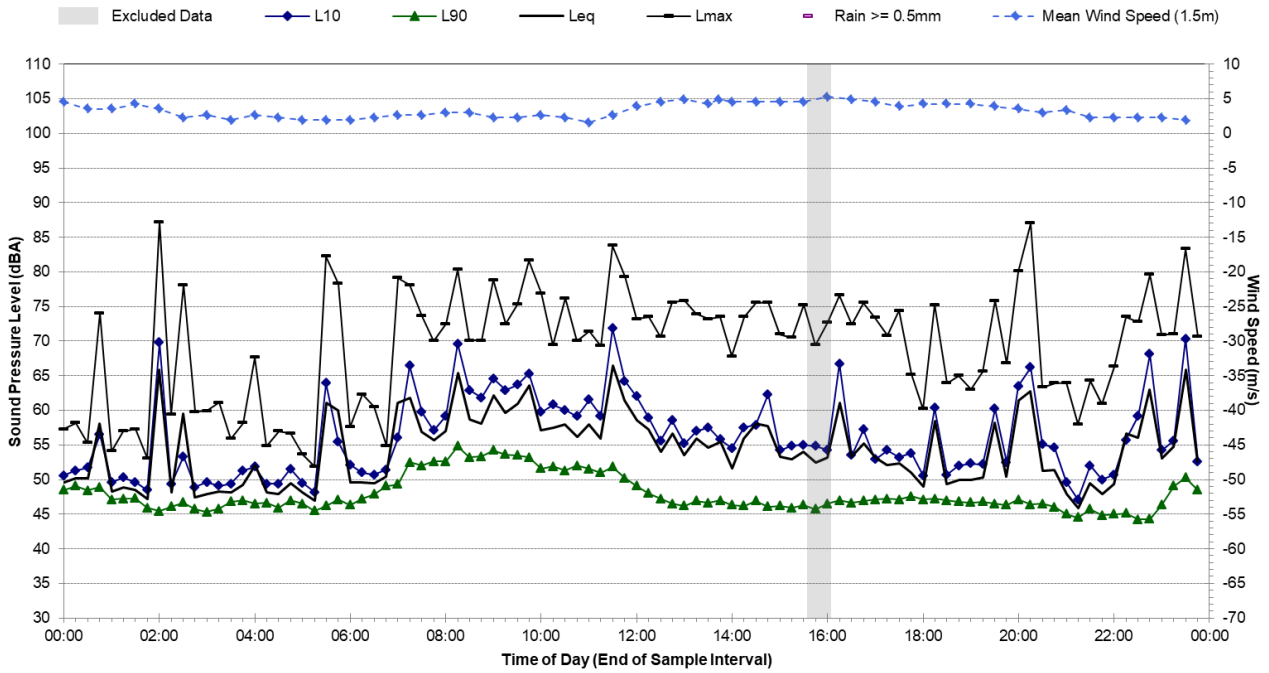


Statistical Ambient Noise Levels

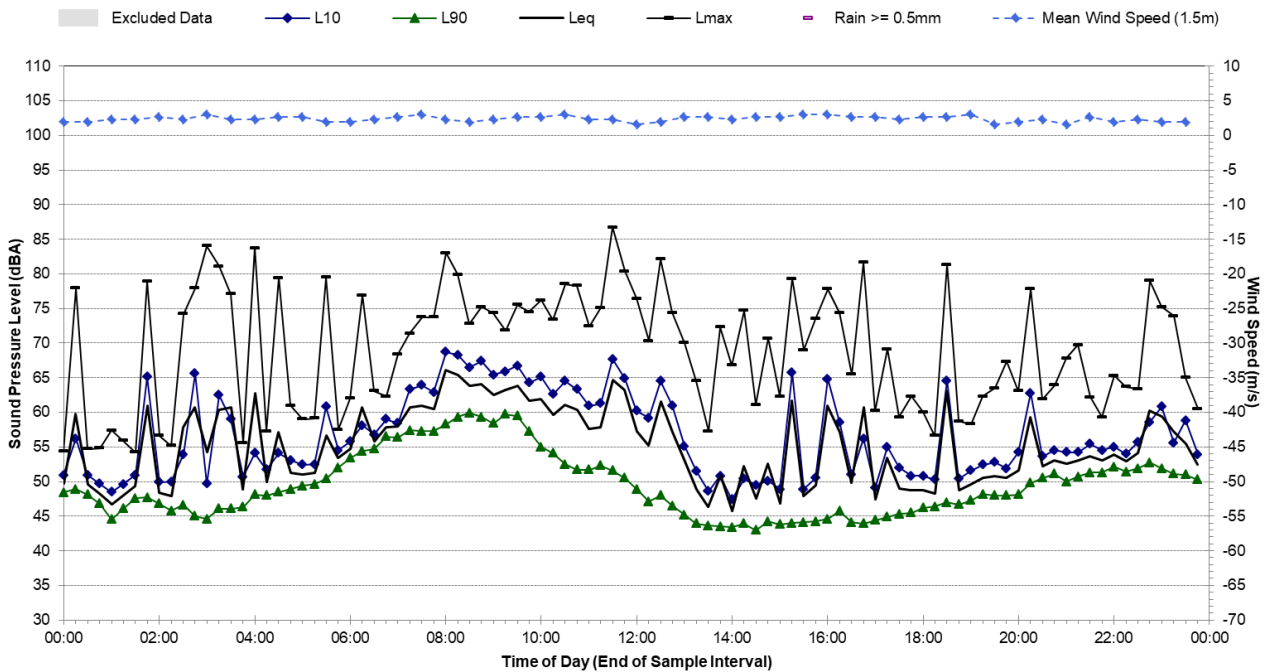
Eastlakes Golf Club, Pagewood - Saturday, 23 June 2018



Statistical Ambient Noise Levels Eastlakes Golf Club, Pagewood - Sunday, 24 June 2018

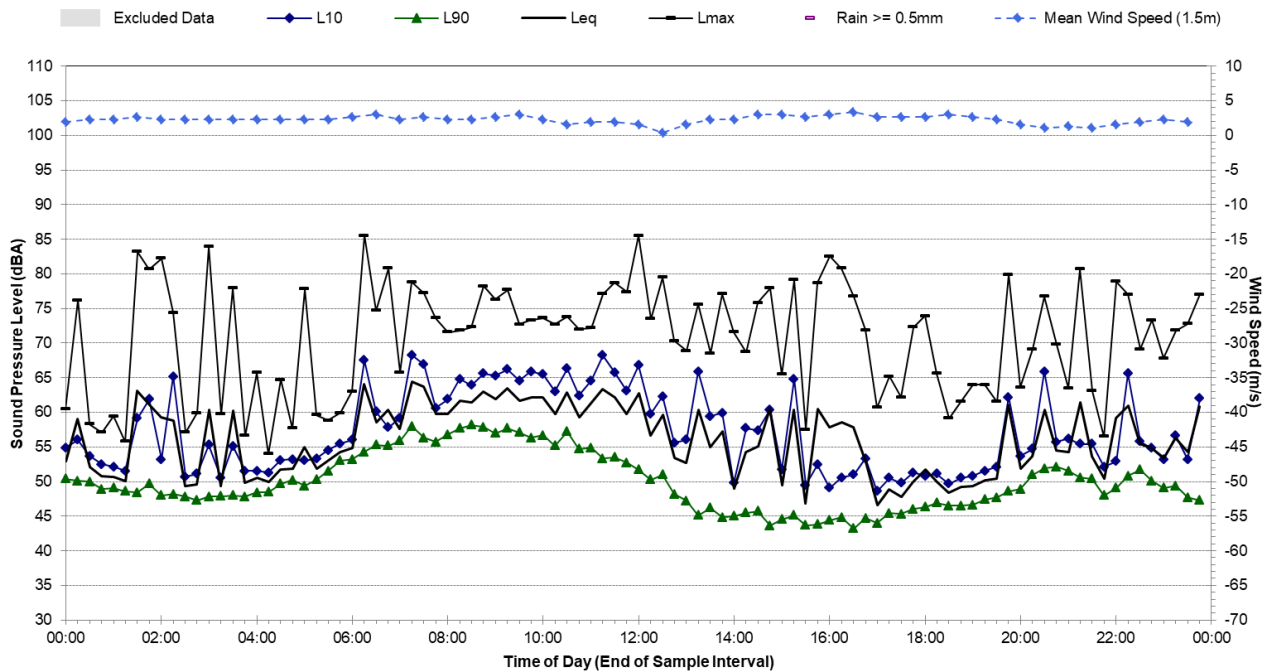


Statistical Ambient Noise Levels Eastlakes Golf Club, Pagewood - Monday, 25 June 2018



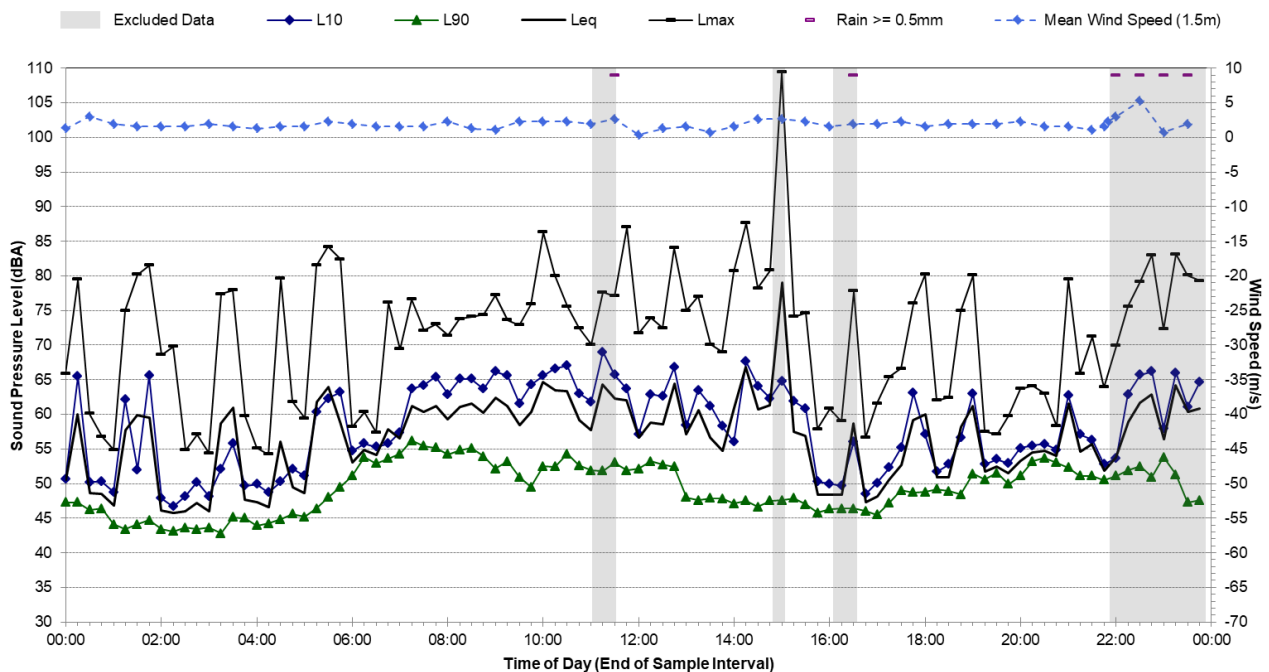
Statistical Ambient Noise Levels

Eastlakes Golf Club, Pagewood - Tuesday, 26 June 2018



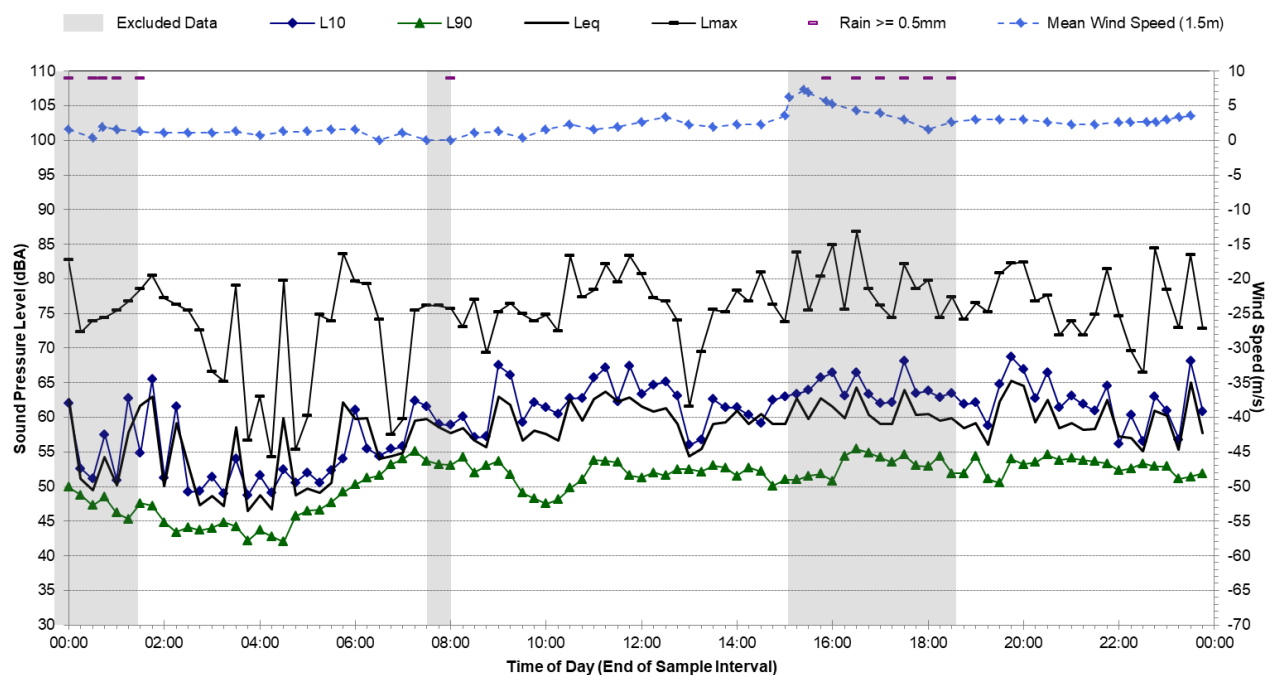
Statistical Ambient Noise Levels

Eastlakes Golf Club, Pagewood - Wednesday, 27 June 2018



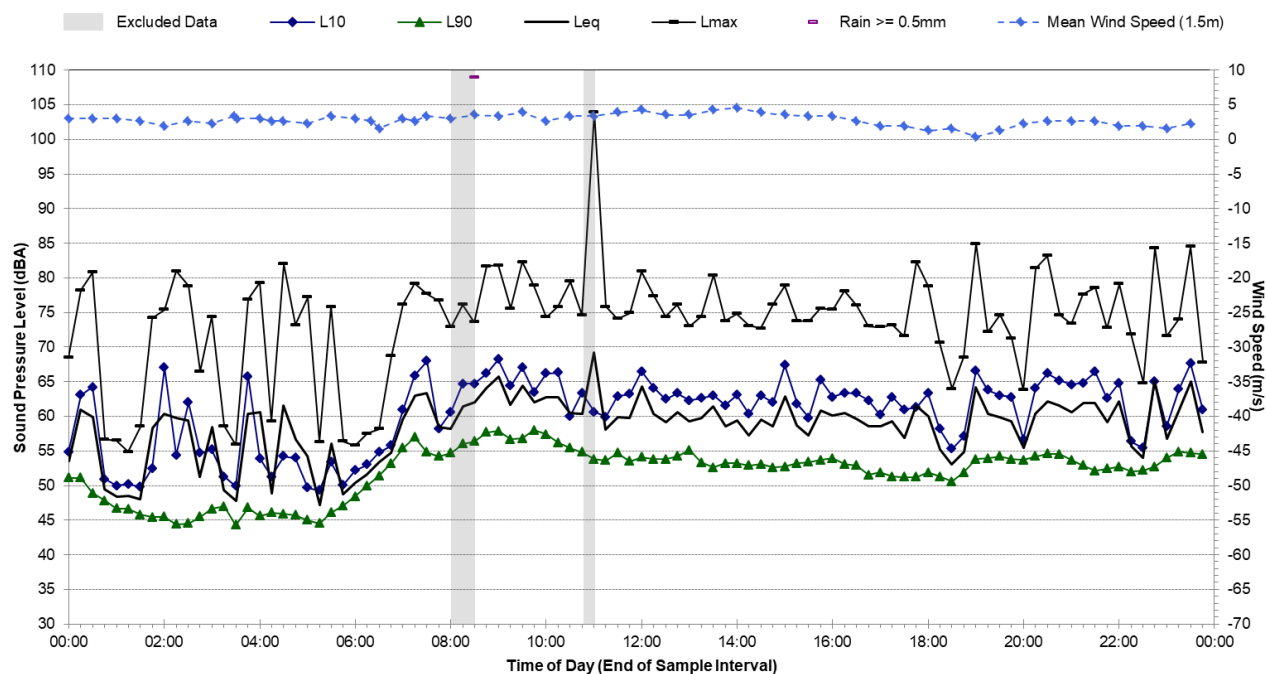
Statistical Ambient Noise Levels

Eastlakes Golf Club, Pagewood - Thursday, 28 June 2018



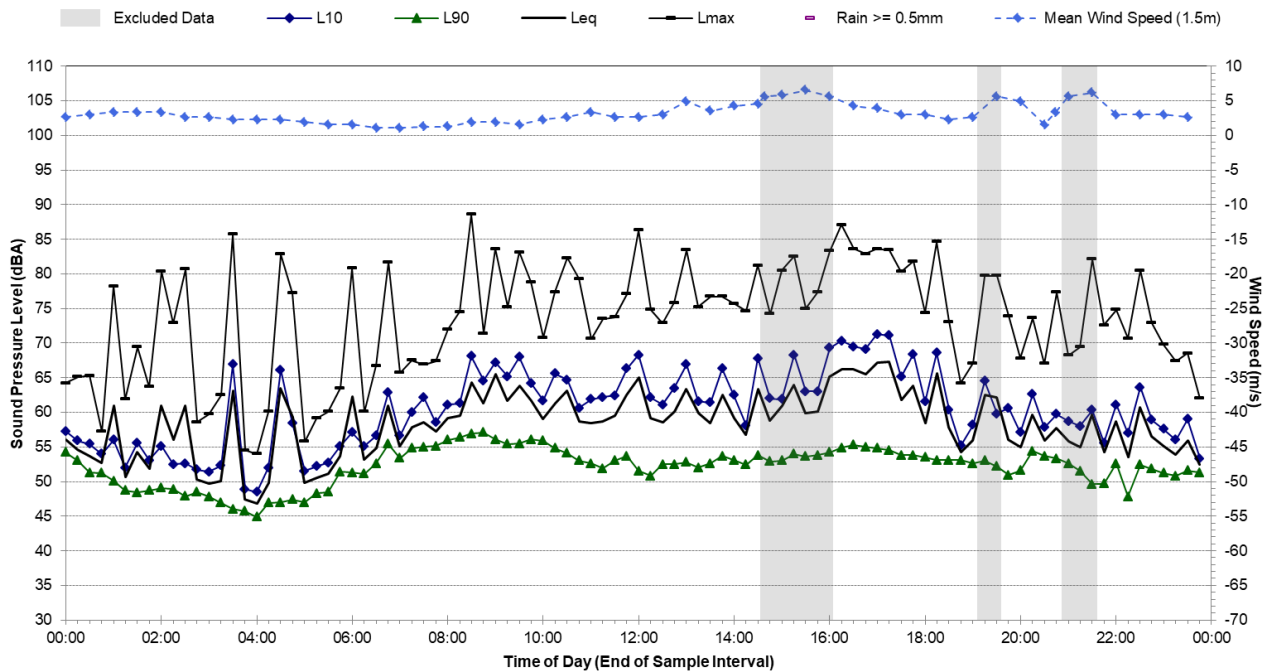
Statistical Ambient Noise Levels

Eastlakes Golf Club, Pagewood - Friday, 29 June 2018



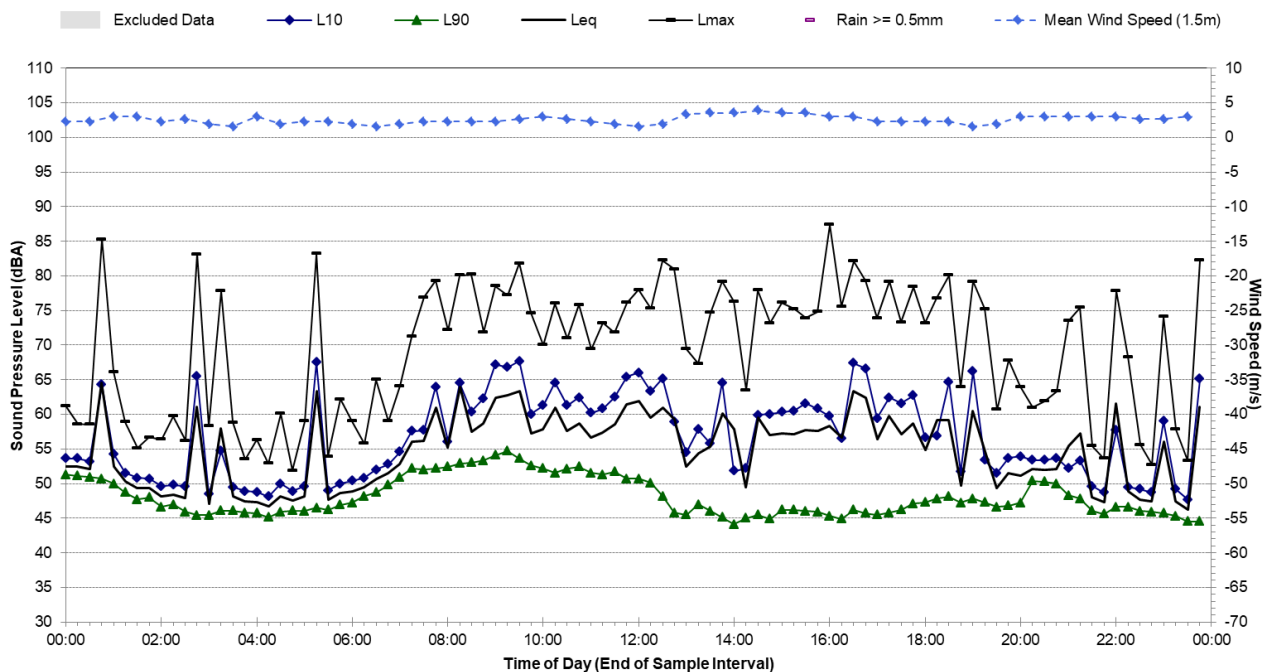
Statistical Ambient Noise Levels

Eastlakes Golf Club, Pagewood - Saturday, 30 June 2018

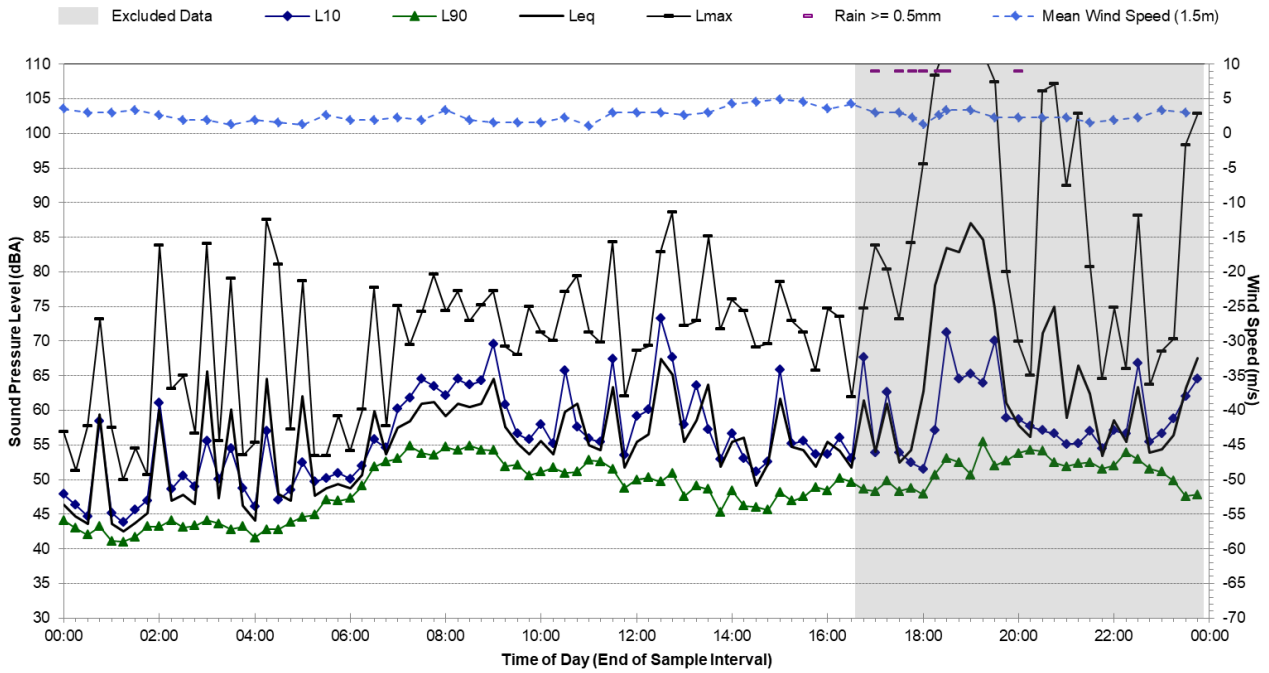


Statistical Ambient Noise Levels

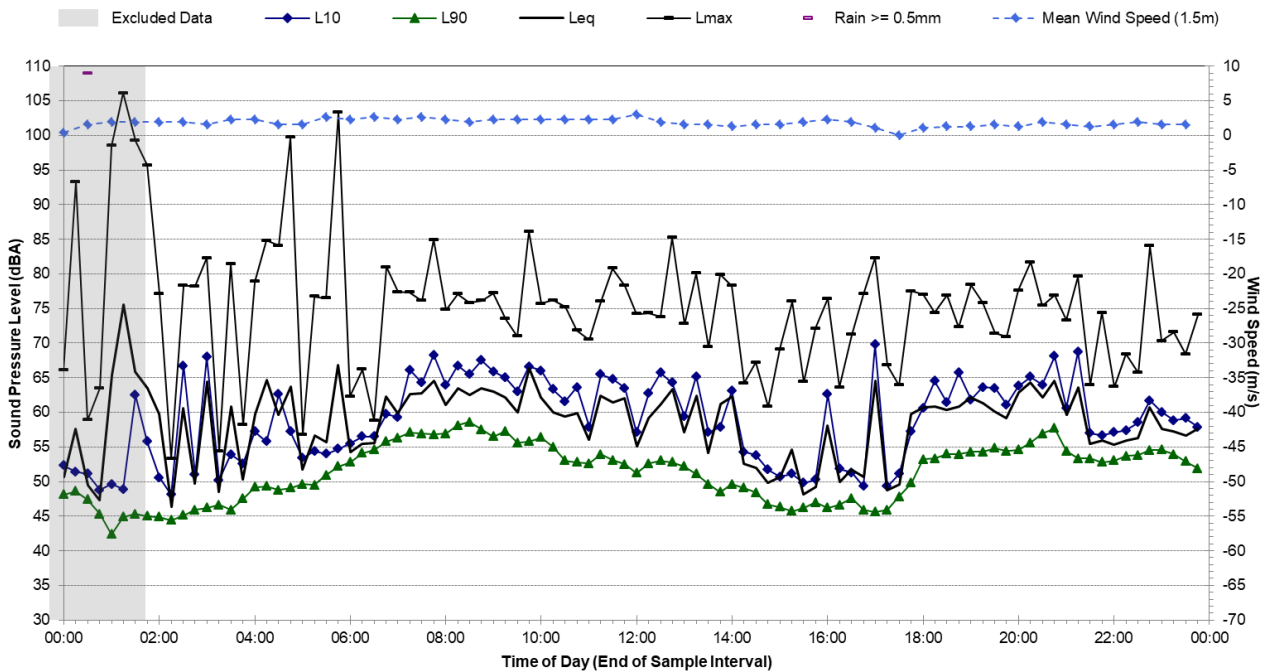
Eastlakes Golf Club, Pagewood - Sunday, 1 July 2018



Statistical Ambient Noise Levels Eastlakes Golf Club, Pagewood - Monday, 2 July 2018

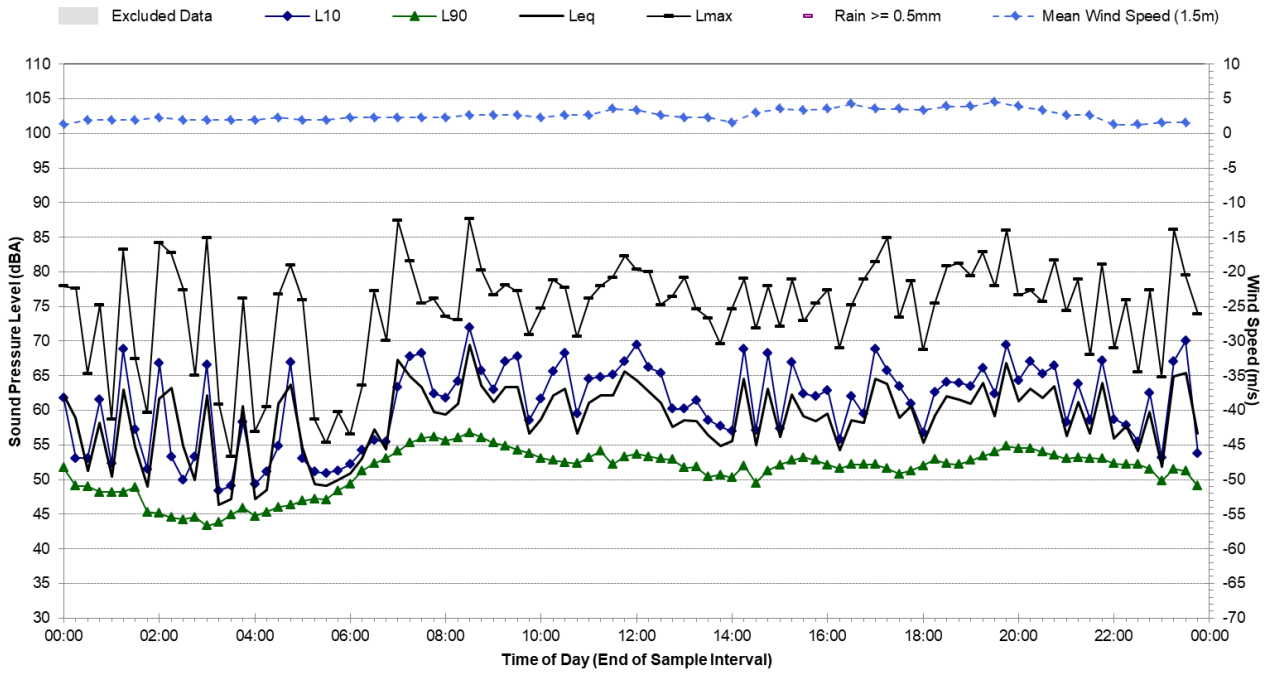


Statistical Ambient Noise Levels Eastlakes Golf Club, Pagewood - Tuesday, 3 July 2018



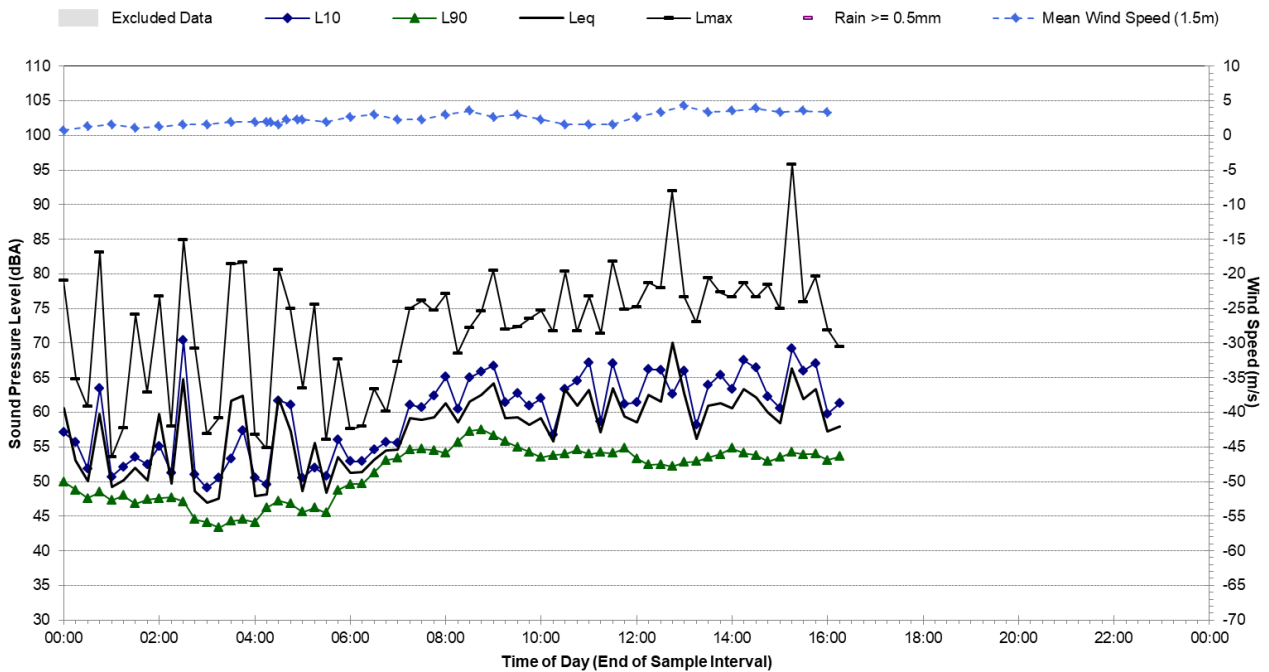
Statistical Ambient Noise Levels



Eastlakes Golf Club, Pagewood - Wednesday, 4 July 2018



Statistical Ambient Noise Levels

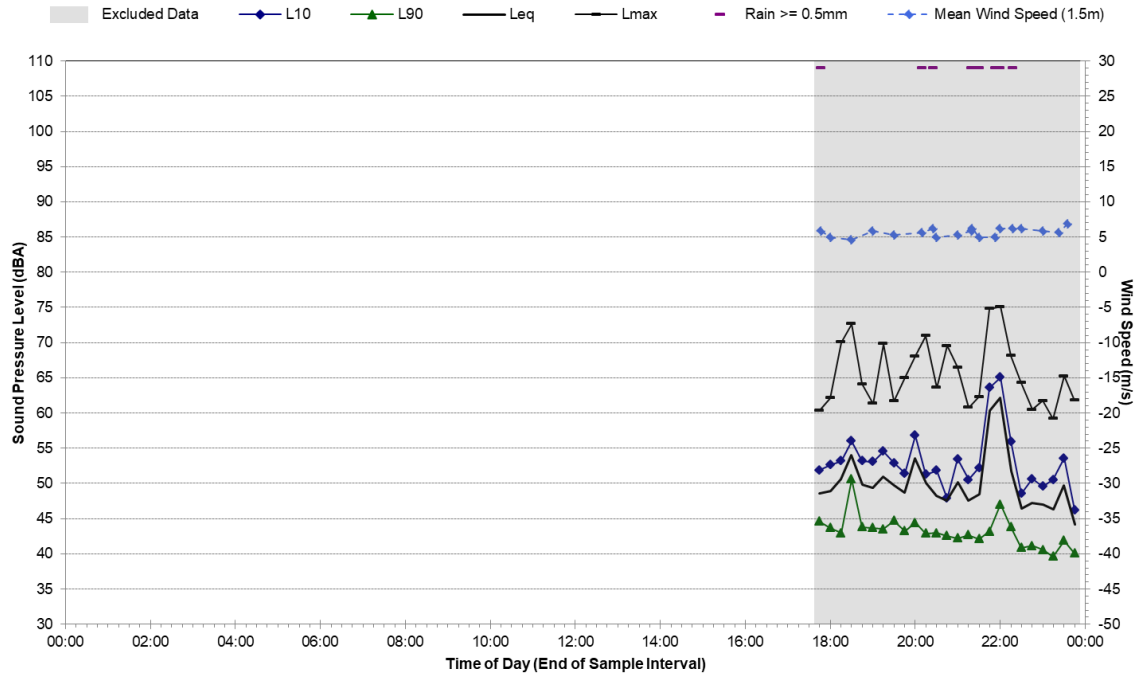
Eastlakes Golf Club, Pagewood - Thursday, 5 July 2018



Noise Monitoring Location	L.06					
Noise Monitoring Address	13 Morgan Street, Botany					
Logger Device Type: Svantek 957, Logger Serial No: 20667 Sound Level Meter: Brüel and Kjær 2250L, Sound Level Meter Serial No: 2414604						
Ambient noise logger deployed at residential address 13 Morgan Street, Botany.						
Attended noise measurements indicate the ambient noise environment at this location is influenced by distant road traffic and industrial noise. Frequent light-vehicle pass-bys on Morgan Street and aircraft flyovers also contribute to the noise levels at this location.						
Attended Measurement Noise Levels (LAmax): 05/07/2018: Light-vehicle traffic: 50-52 dBA. Aircraft Flyovers: 70-71 dBA						
Ambient Noise Logging Results – NPfI Defined Time Periods						
Monitoring Period	Noise Level (dBA)					
	RBL	LAeq	L10	L1		
Daytime	39	56	56	65		
Evening	41	53	52	59		
Night-time	37	51	47	57		
Ambient Noise Logging Results – RNP Defined Time Periods						
Monitoring Period	Noise Level (dBA)					
	LAeq(period)		LAeq(1hour)			
Daytime (7am-10pm)	-		-			
Night-time (10pm-7am)	-		-			
Attended Noise Measurement Results						
Date	Start Time	Measured Noise Level (dBA)				
		LA90	LAeq	LAmax		
05/07/2018	14:00	43	55	75		

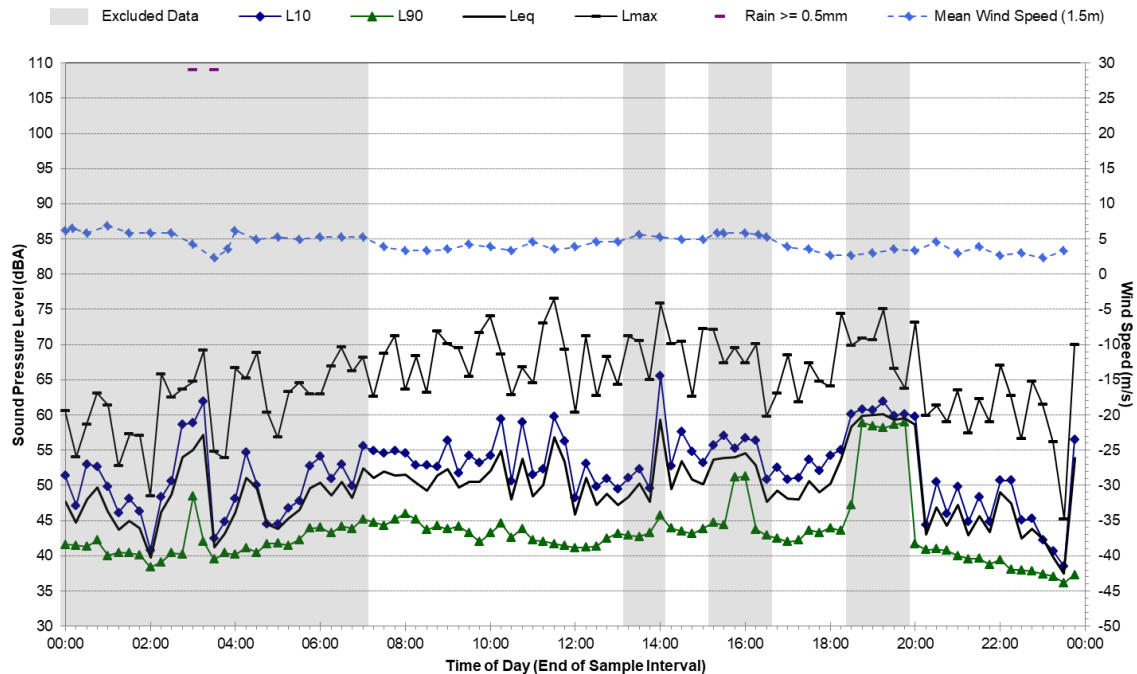
Statistical Ambient Noise Levels

13 Morgan Street, Botany - Tuesday, 19 June 2018



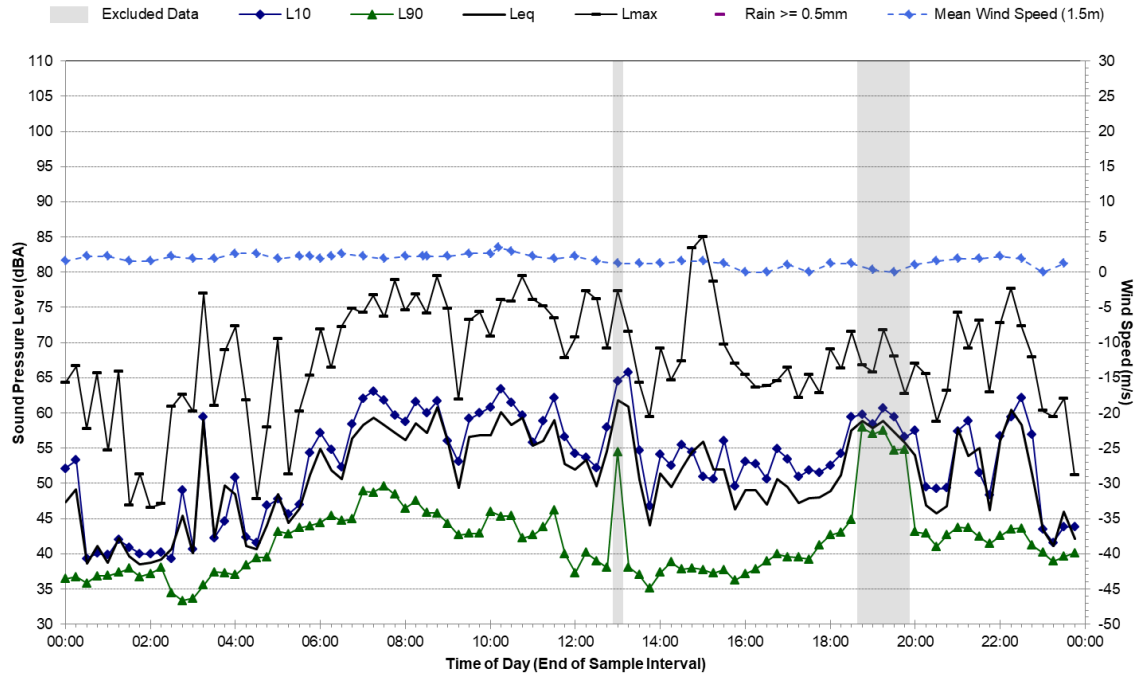
Statistical Ambient Noise Levels

13 Morgan Street, Botany - Wednesday, 20 June 2018



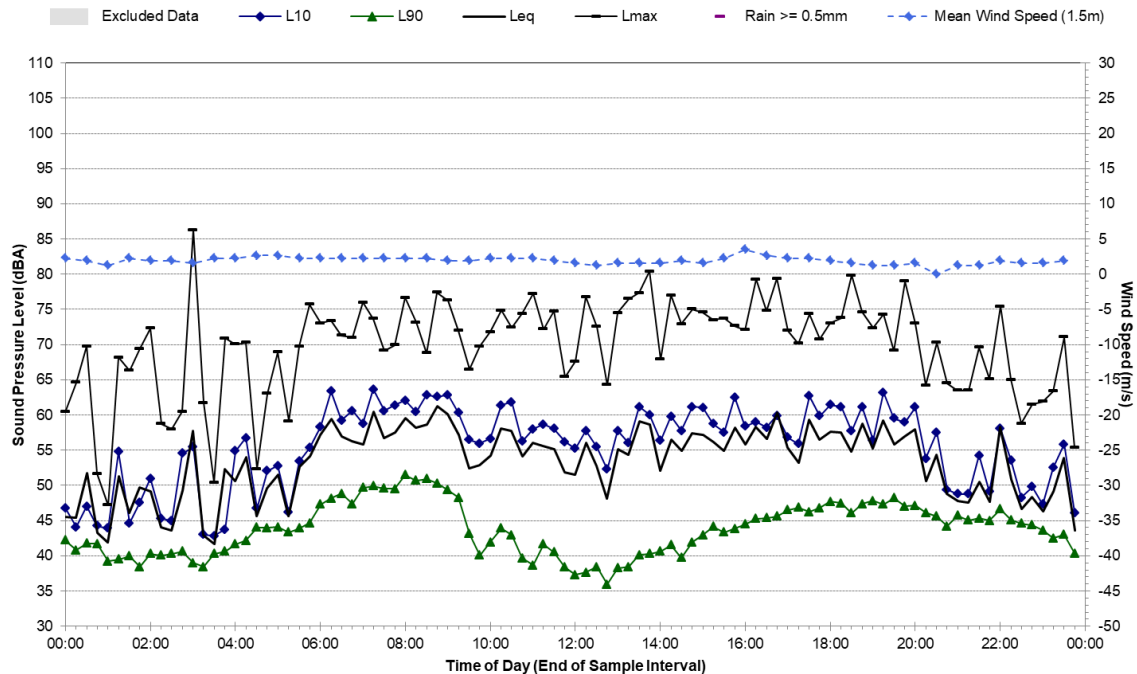
Statistical Ambient Noise Levels

13 Morgan Street, Botany - Thursday, 21 June 2018



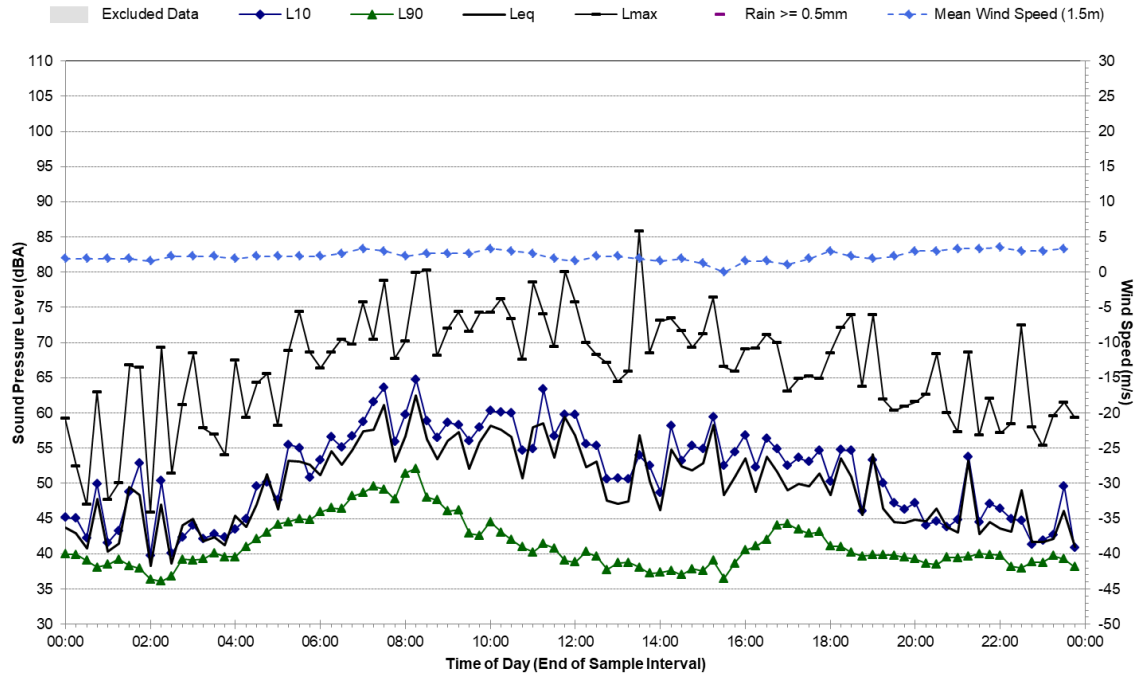
Statistical Ambient Noise Levels

13 Morgan Street, Botany - Friday, 22 June 2018



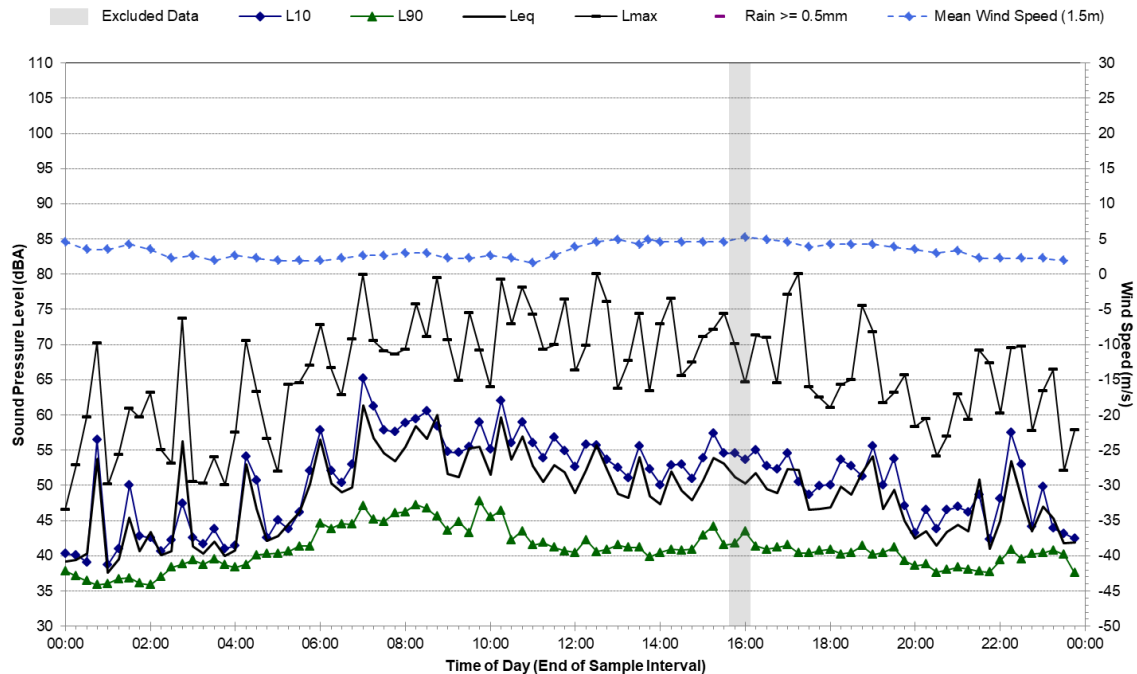
Statistical Ambient Noise Levels

13 Morgan Street, Botany - Saturday, 23 June 2018



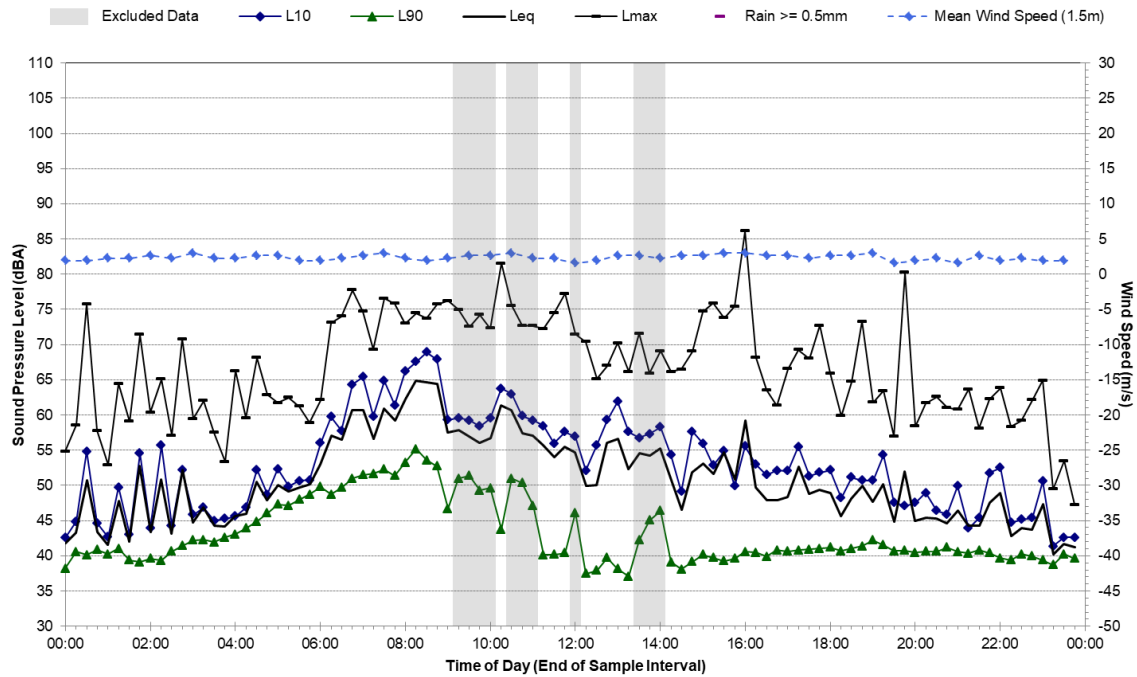
Statistical Ambient Noise Levels

13 Morgan Street, Botany - Sunday, 24 June 2018



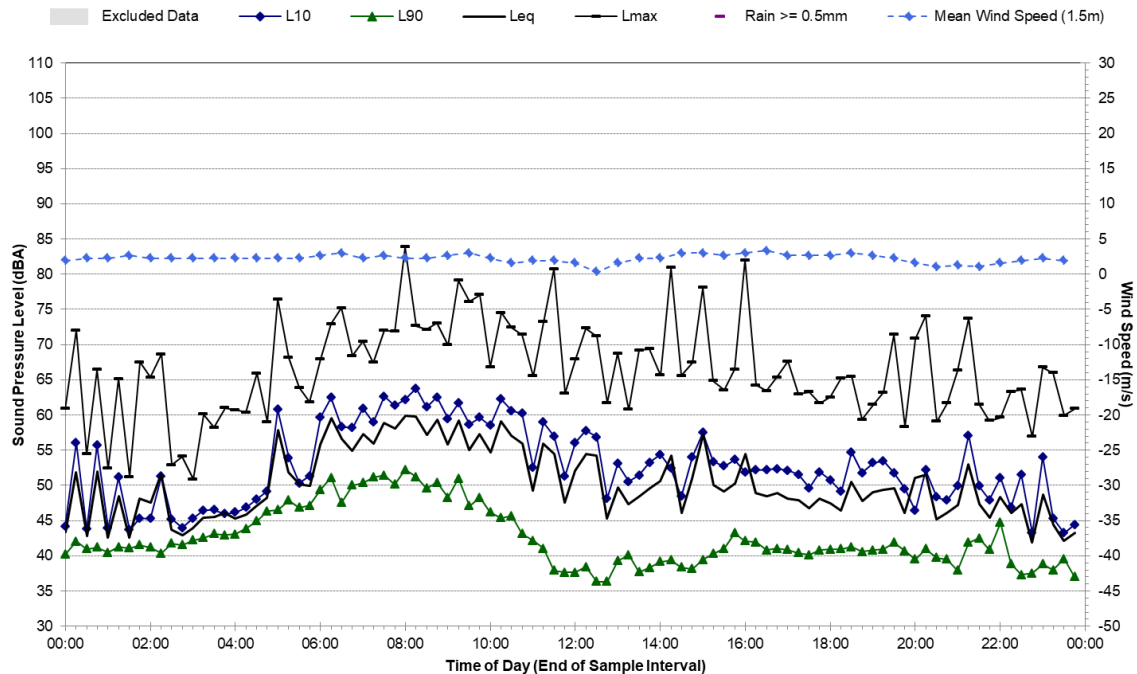
Statistical Ambient Noise Levels

13 Morgan Street, Botany - Monday, 25 June 2018



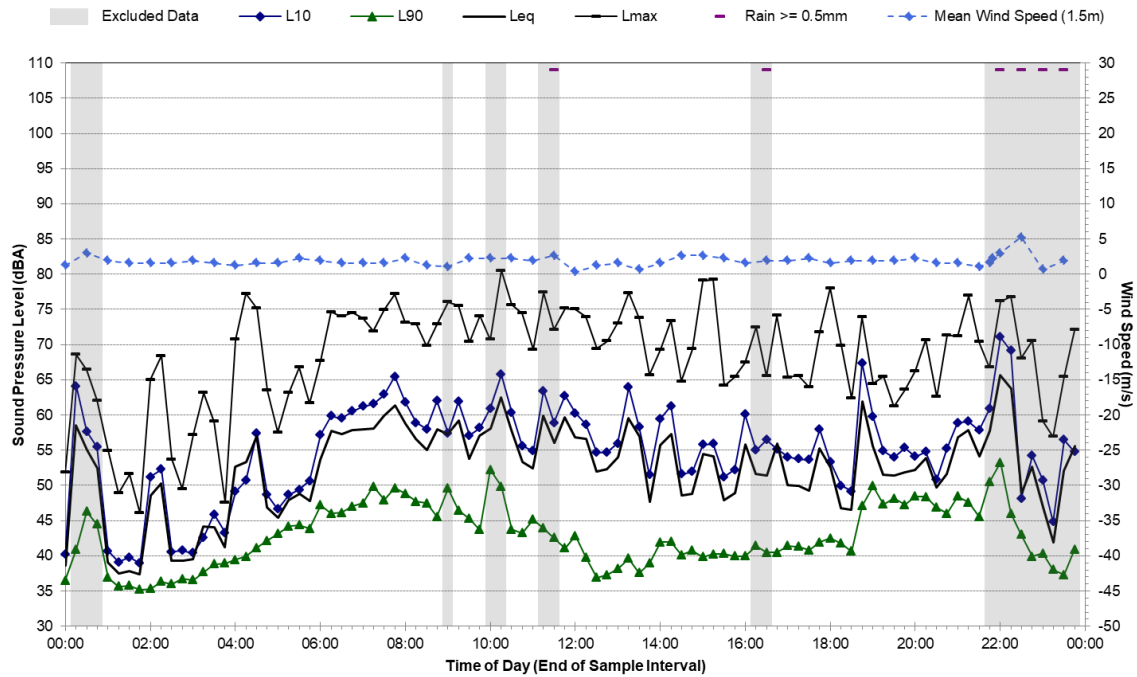
Statistical Ambient Noise Levels

13 Morgan Street, Botany - Tuesday, 26 June 2018



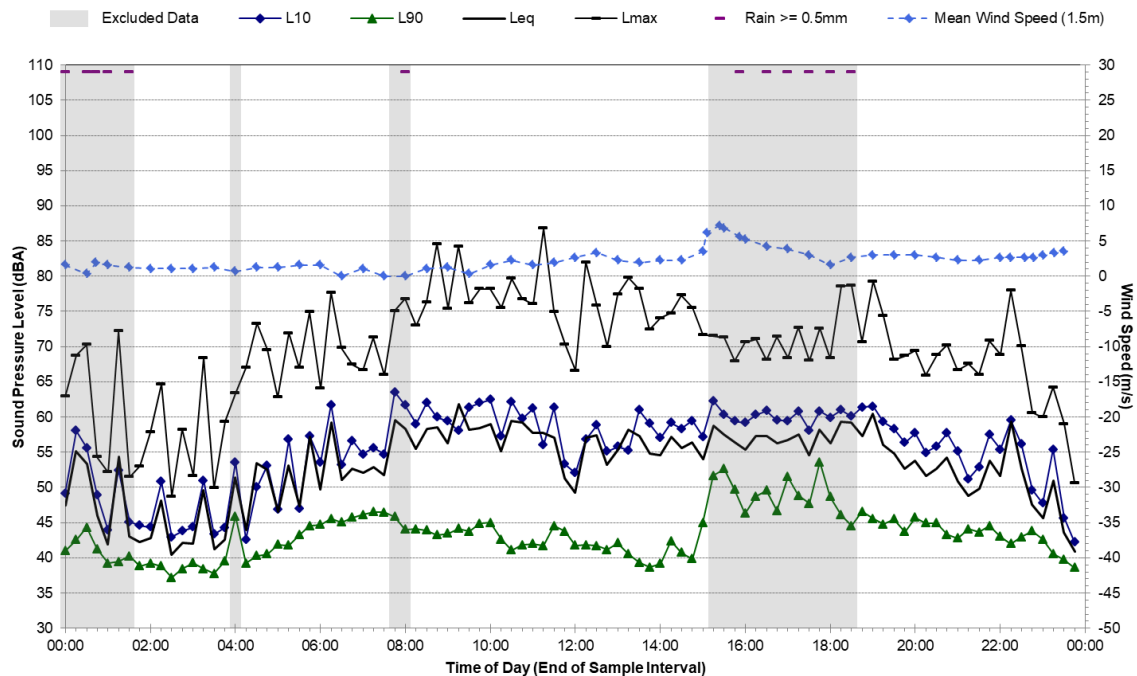
Statistical Ambient Noise Levels

13 Morgan Street, Botany - Wednesday, 27 June 2018



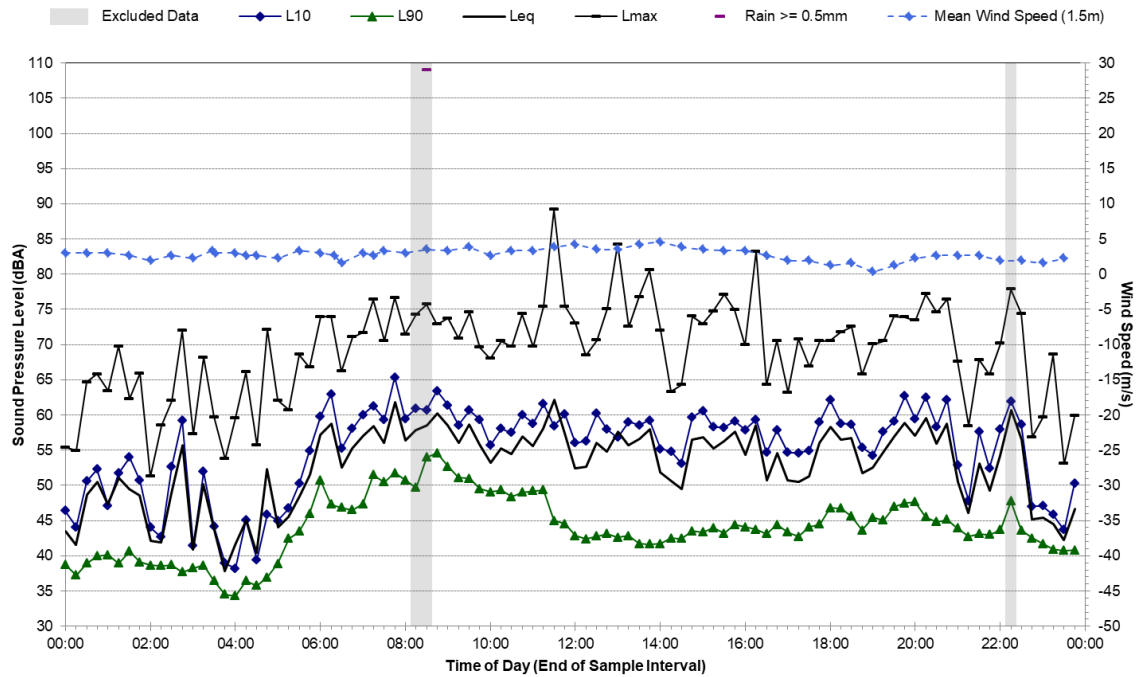
Statistical Ambient Noise Levels

13 Morgan Street, Botany - Thursday, 28 June 2018



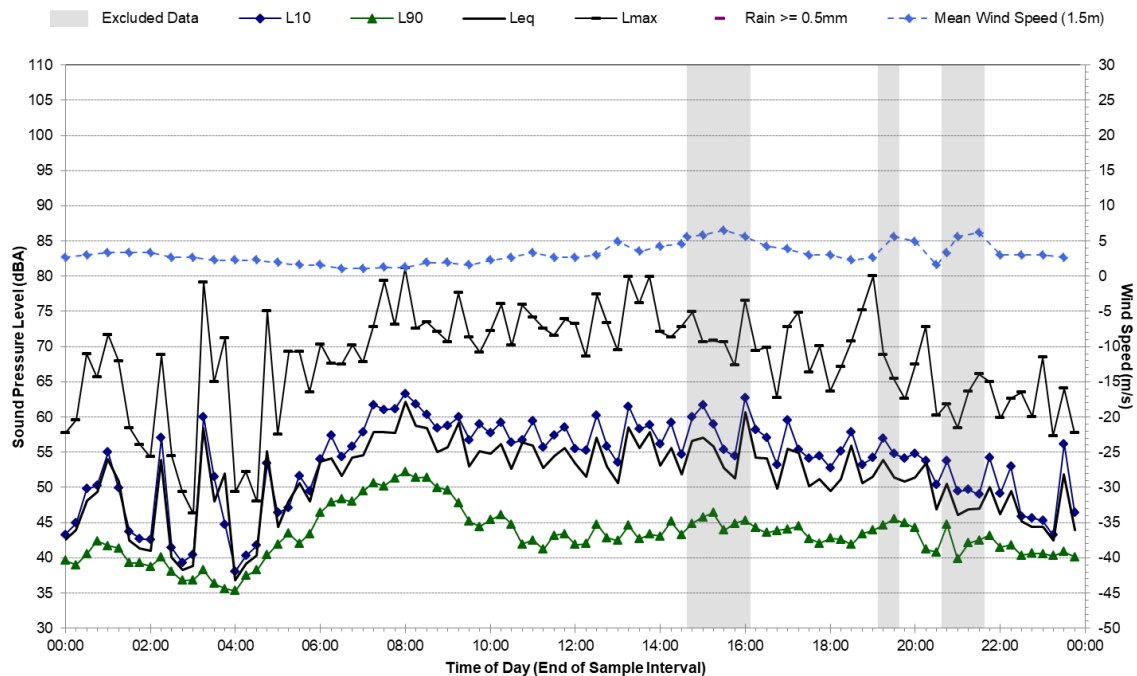
Statistical Ambient Noise Levels

13 Morgan Street, Botany - Friday, 29 June 2018



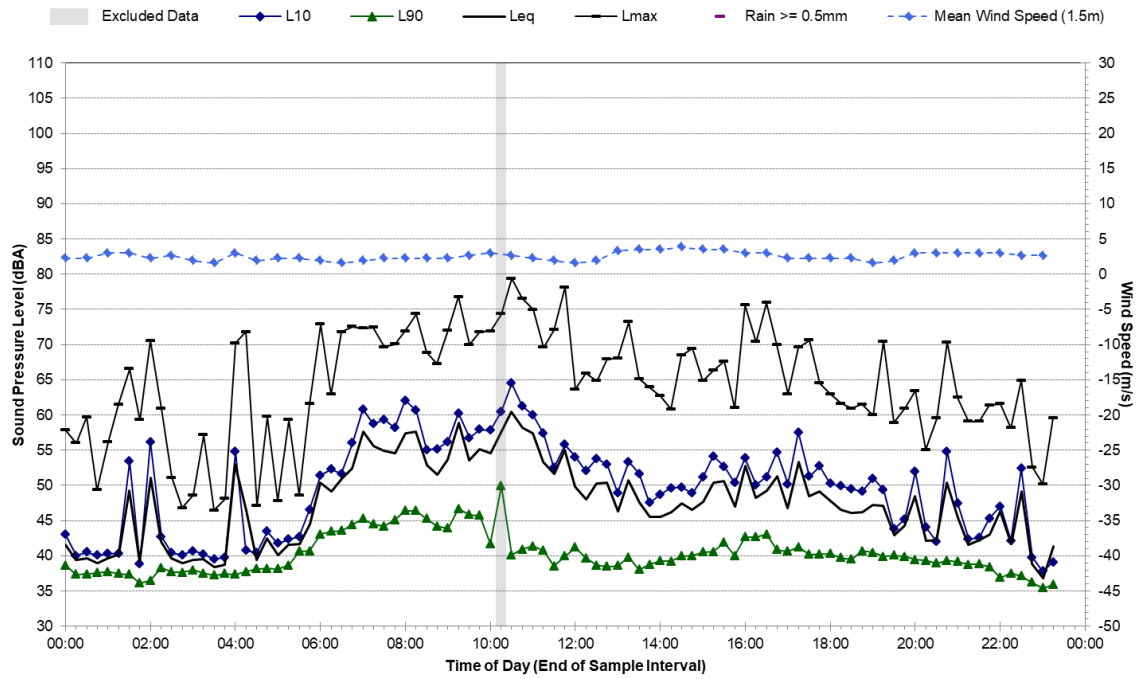
Statistical Ambient Noise Levels



13 Morgan Street, Botany - Saturday, 30 June 2018



Statistical Ambient Noise Levels

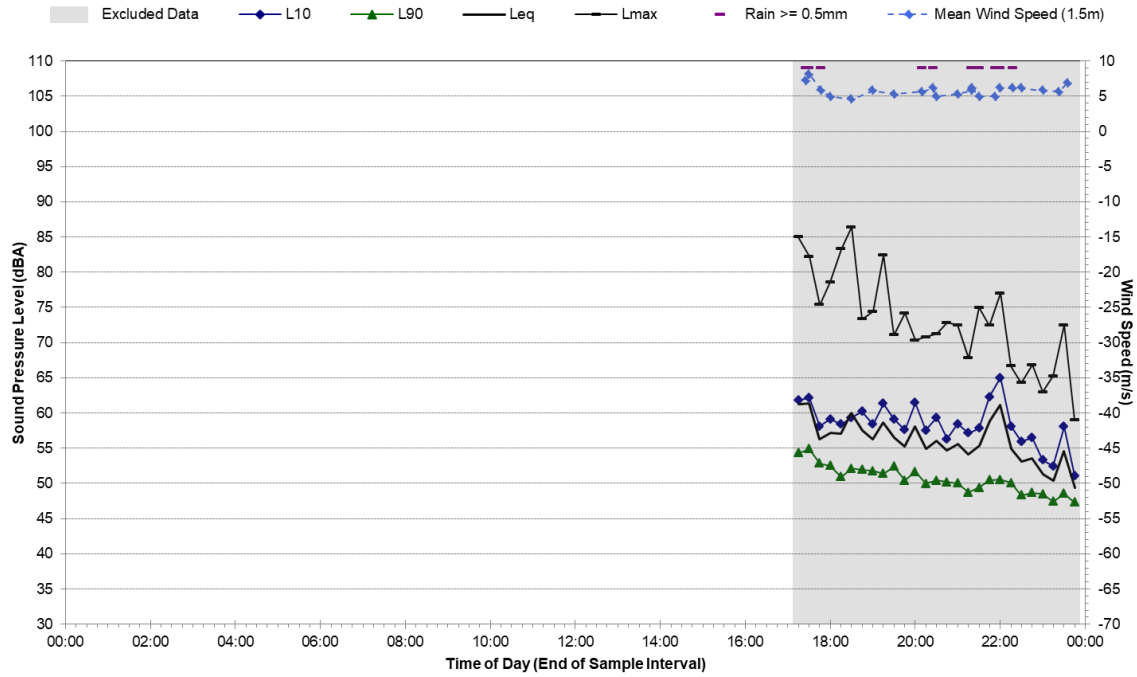
13 Morgan Street, Botany - Sunday, 1 July 2018



SNoise Monitoring Location		L.07			Map of Noise Monitoring Location	
Noise Monitoring Address		38 Ocean Street, Pagewood				
<div>Logger Device Type: Svantek 957, Logger Serial No: 3003389</div> <div>Sound Level Meter: Brüel and Kjær 2250L, Sound Level Meter Serial No: 2487418</div> <div>Ambient noise logger deployed at residential address 38 Ocean Street, Pagewood.</div> <div>Attended noise measurements indicate the ambient noise environment at this location is influenced by local road traffic noise from Ocean Street. Train pass bys and aircraft flyovers also contribute to the ambient noise levels at this location.</div> <div>Attended Measurements Noise Levels (LAm_{ax}): 09/10/2018: Light-vehicle traffic on Ocean Street: 58 dBA. Helicopter flyby: 73 dBA. Train pass by: 61 dBA. Birds and insects intermittently audible.</div>						
Ambient Noise Logging Results – NPfI Defined Time Periods					Photo of Noise Monitoring Location	
Monitoring Period	Noise Level (dBA)					
	RBL	LAeq	L10	L1		
Daytime	46	58	59	65		
Evening	46	54	55	61		
Night-time	43	54	52	59		
Ambient Noise Logging Results – RNP Defined Time Periods						
Monitoring Period	Noise Level (dBA)					
	LAeq(period)		LAeq(1hour)			
Daytime (7am-10pm)	-		-			
Night-time (10pm-7am)	-		-			
Attended Noise Measurement Results						
Date	Start Time	Measured Noise Level (dBA)				
		LA90	LAeq	LAm _{ax}		
09/10/2018	13:20	48	57	77		

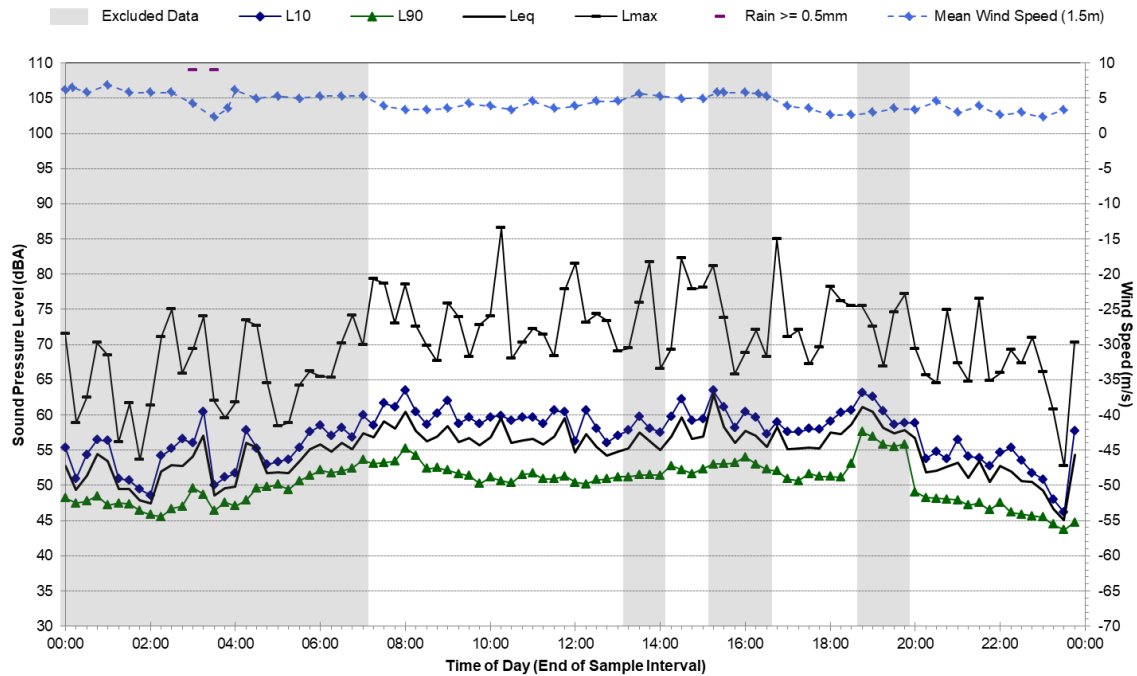
Statistical Ambient Noise Levels

38 Ocean Street, Pagewood - Tuesday, 19 June 2018



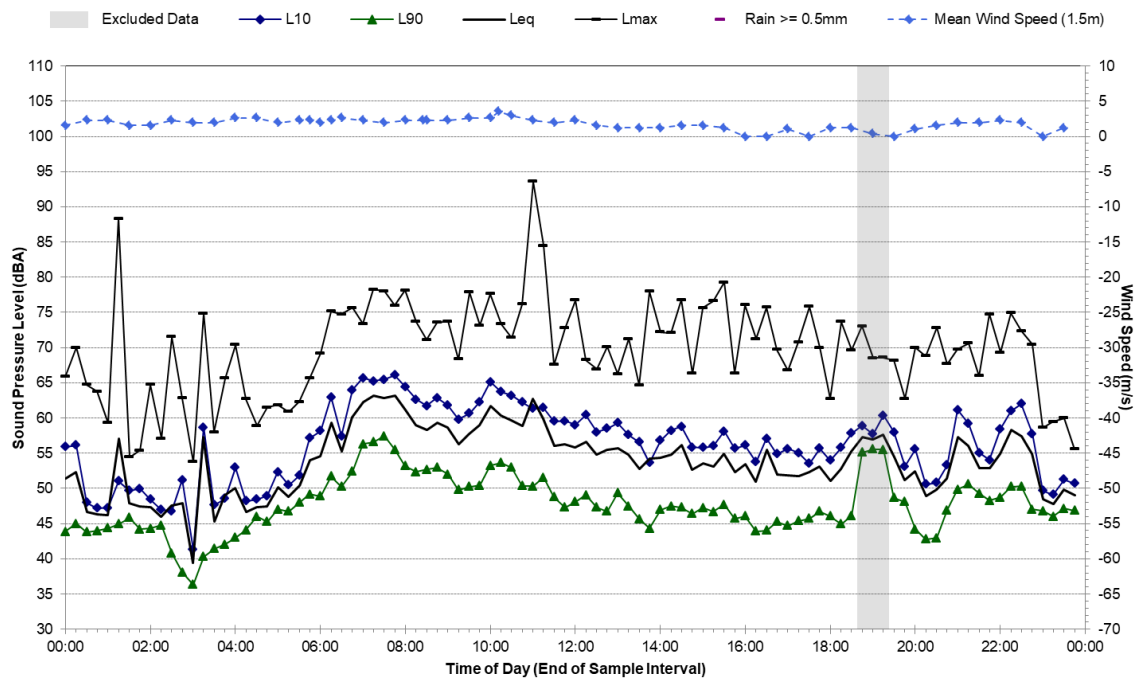
Statistical Ambient Noise Levels

38 Ocean Street, Pagewood - Wednesday, 20 June 2018



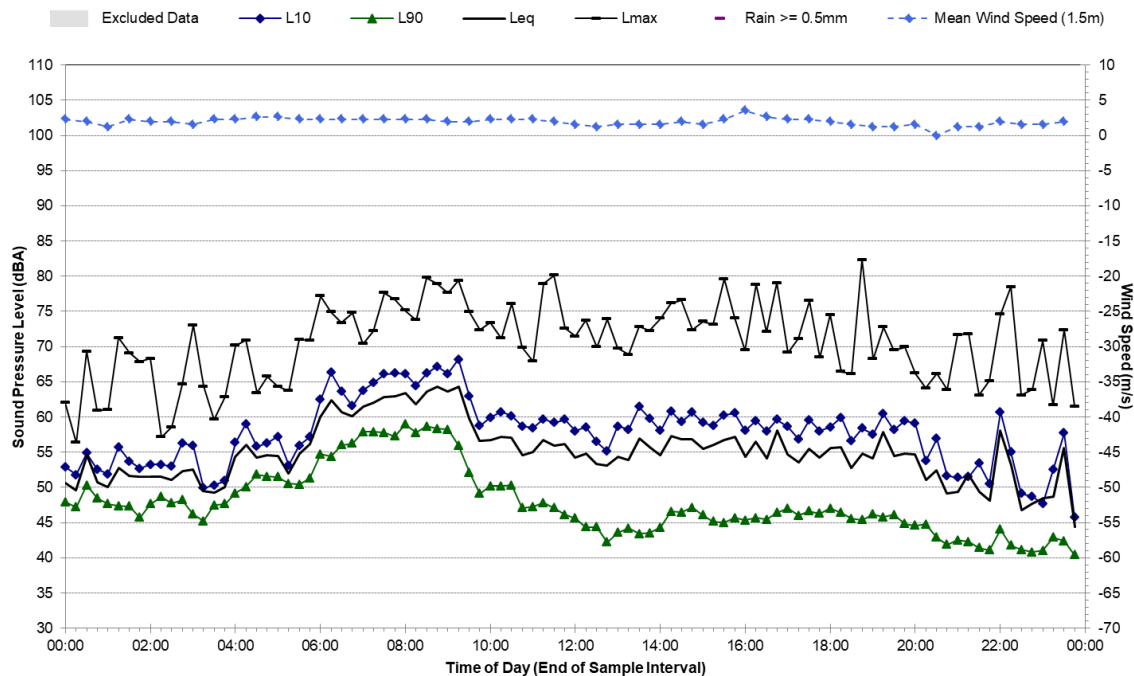
Statistical Ambient Noise Levels

38 Ocean Street, Pagewood - Thursday, 21 June 2018



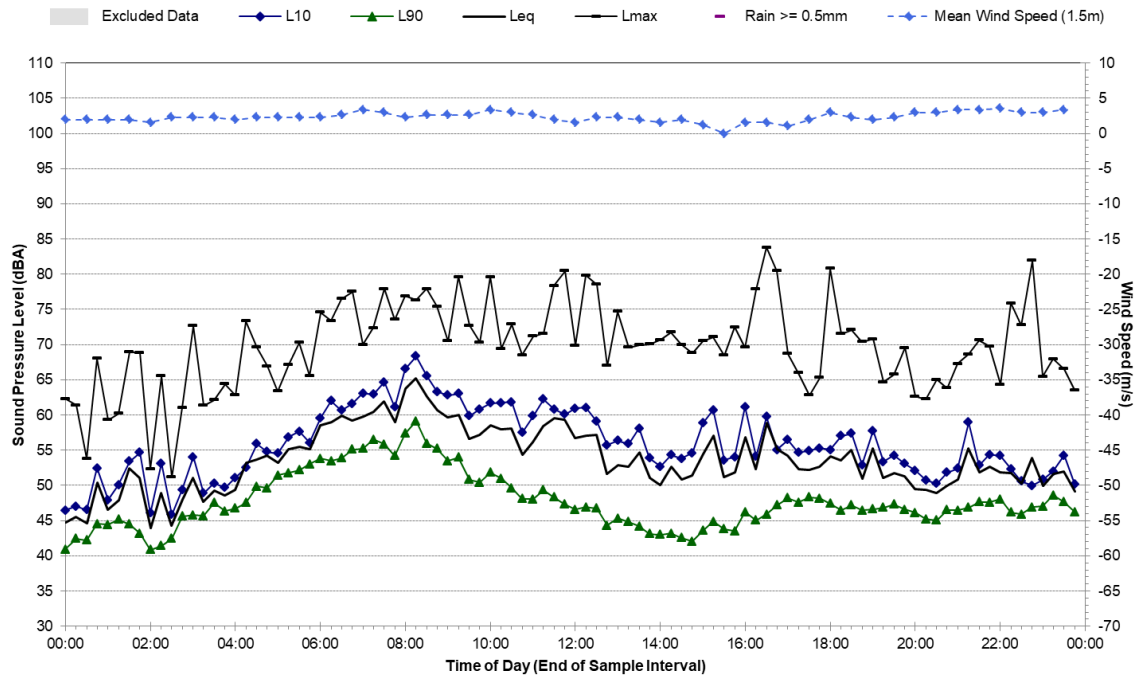
Statistical Ambient Noise Levels

38 Ocean Street, Pagewood - Friday, 22 June 2018



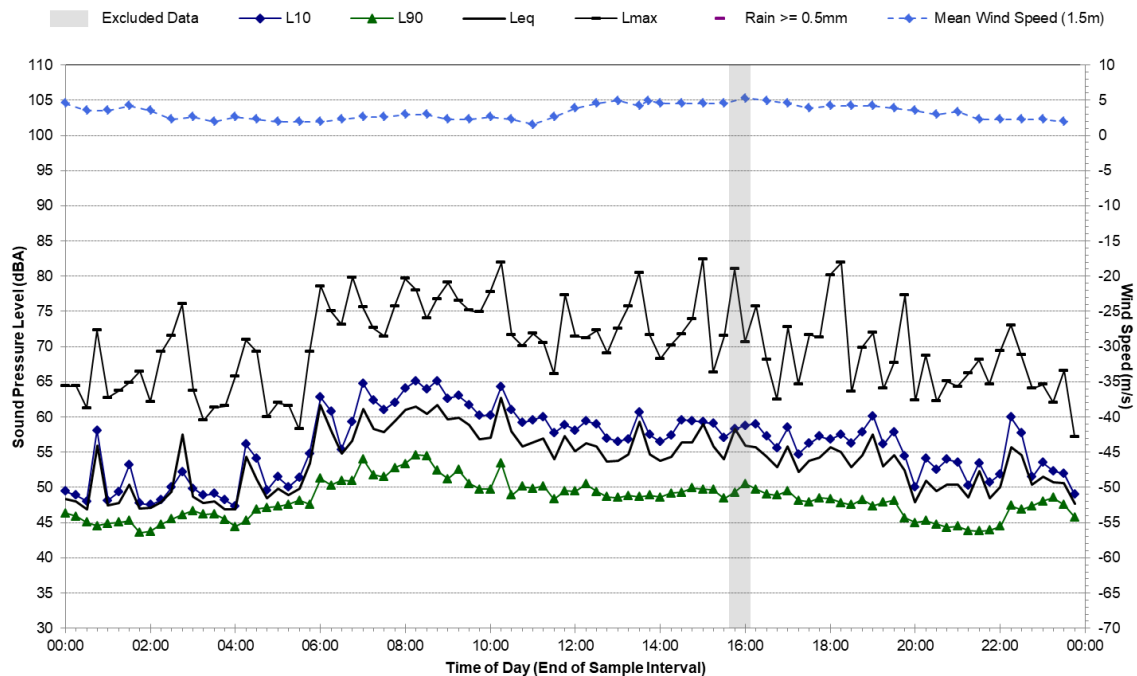
Statistical Ambient Noise Levels

38 Ocean Street, Pagewood - Saturday, 23 June 2018



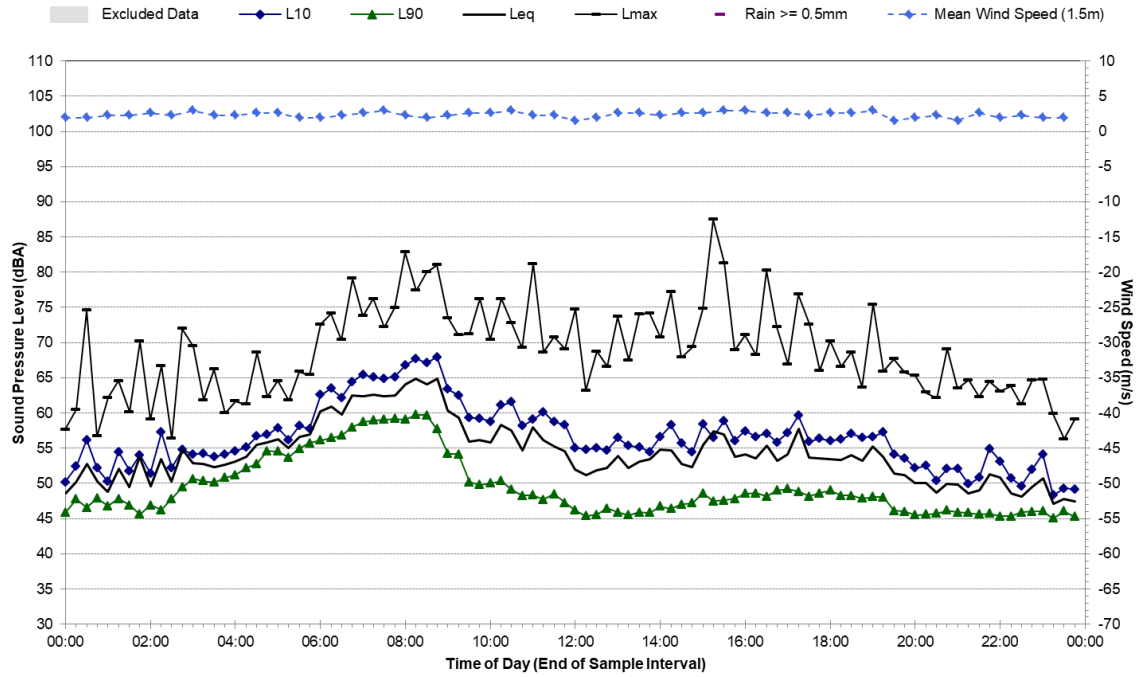
Statistical Ambient Noise Levels

38 Ocean Street, Pagewood - Sunday, 24 June 2018



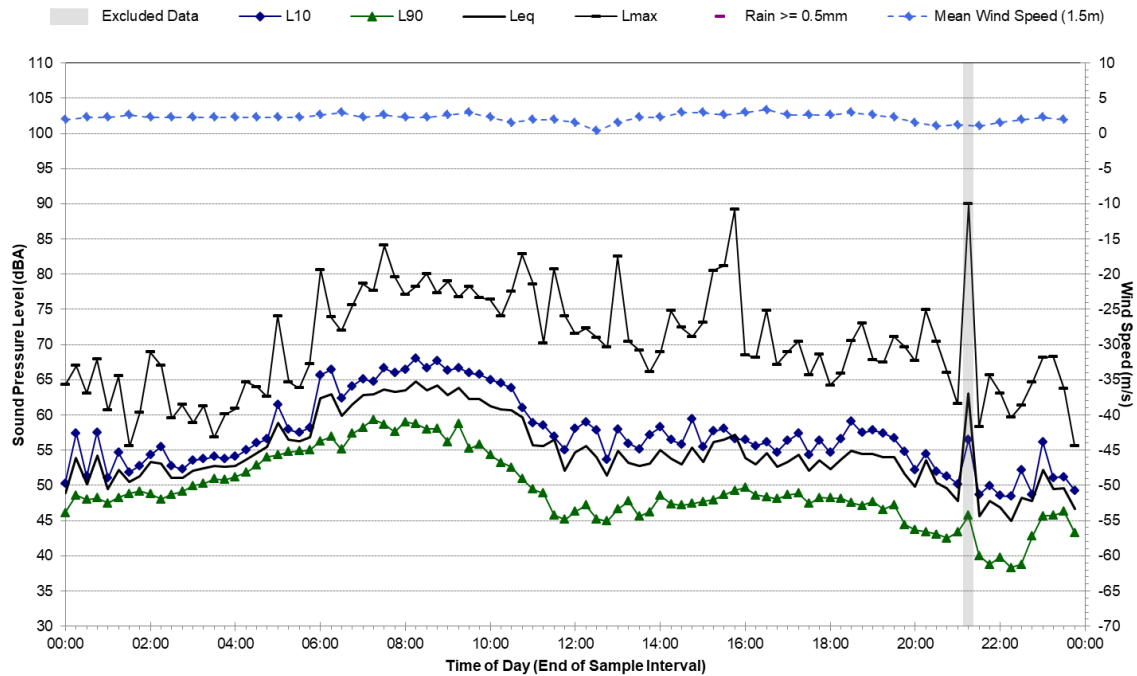
Statistical Ambient Noise Levels

38 Ocean Street, Pagewood - Monday, 25 June 2018



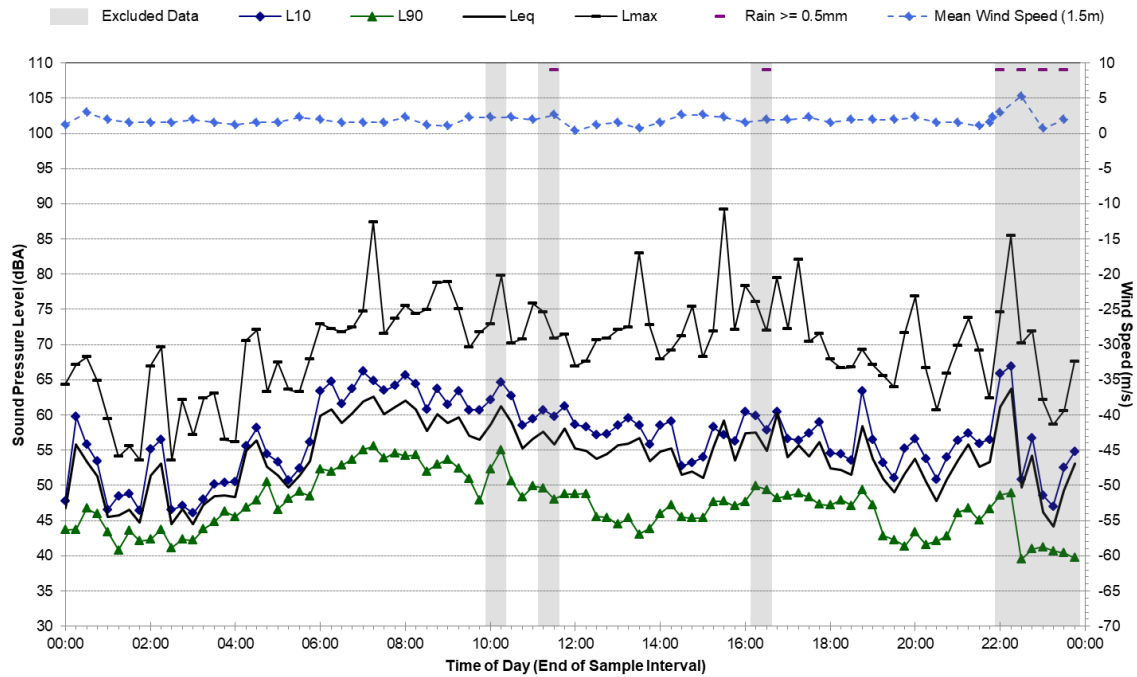
Statistical Ambient Noise Levels

38 Ocean Street, Pagewood - Tuesday, 26 June 2018



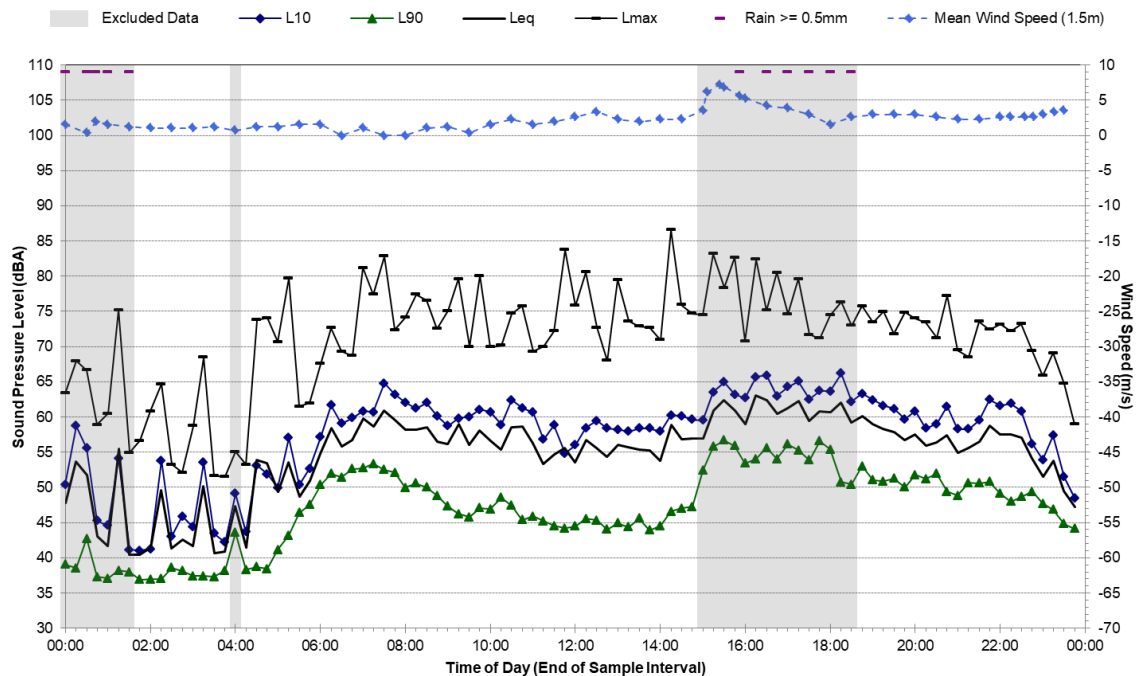
Statistical Ambient Noise Levels

38 Ocean Street, Pagewood - Wednesday, 27 June 2018



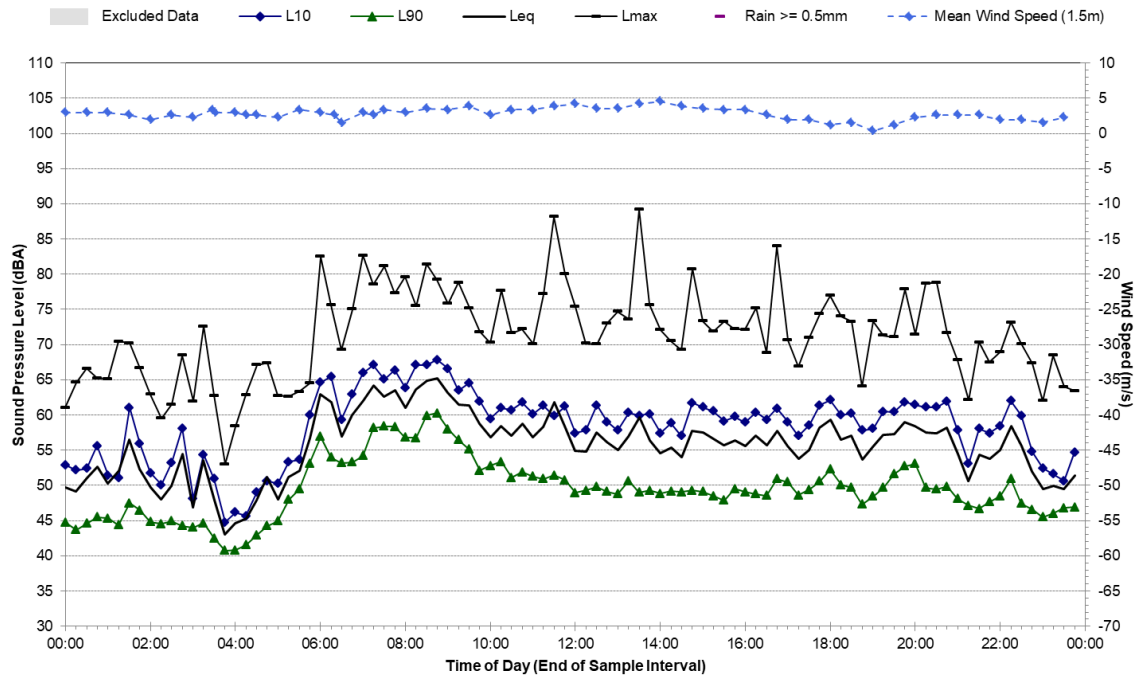
Statistical Ambient Noise Levels

38 Ocean Street, Pagewood - Thursday, 28 June 2018



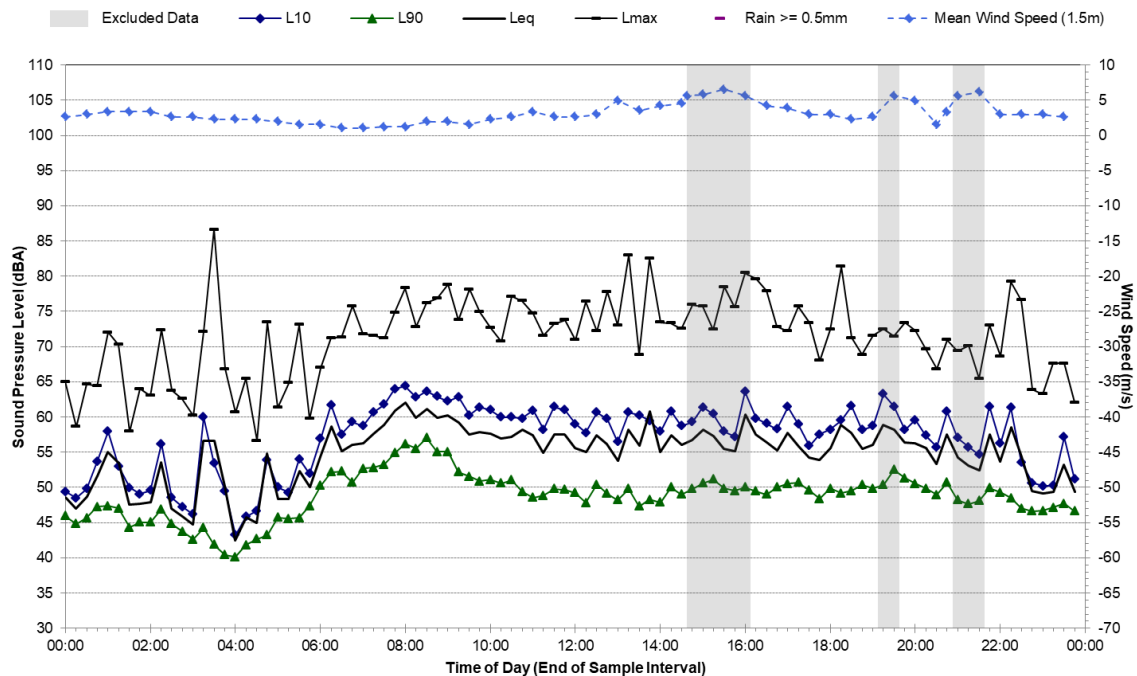
Statistical Ambient Noise Levels

38 Ocean Street, Pagewood - Friday, 29 June 2018



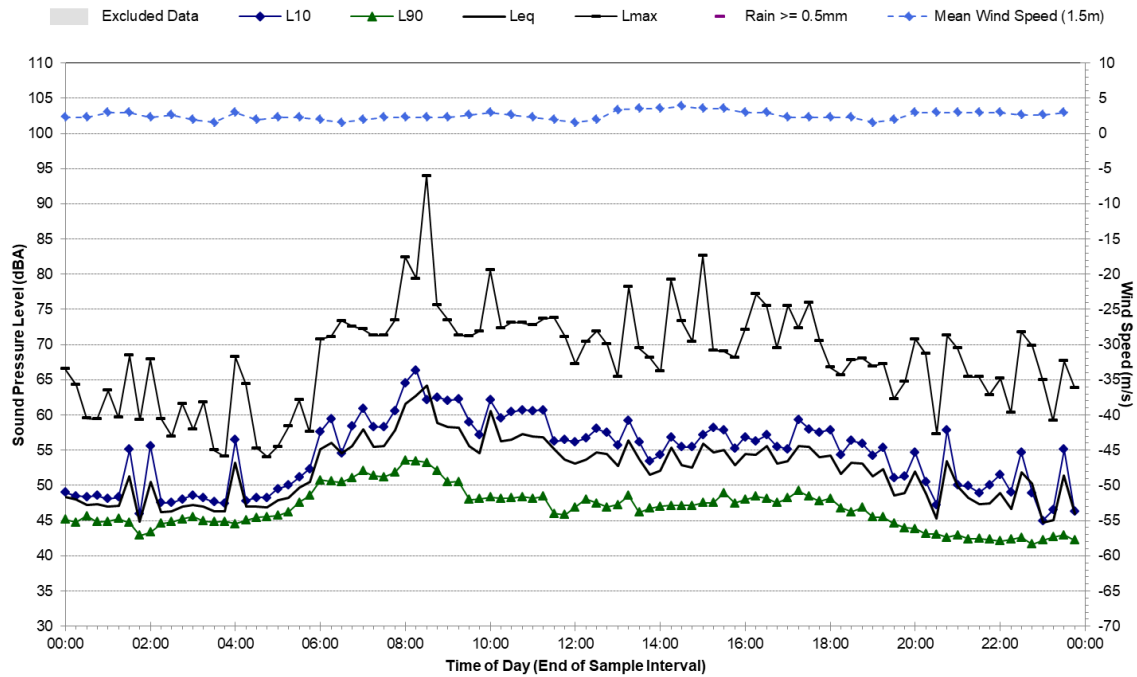
Statistical Ambient Noise Levels

38 Ocean Street, Pagewood - Saturday, 30 June 2018



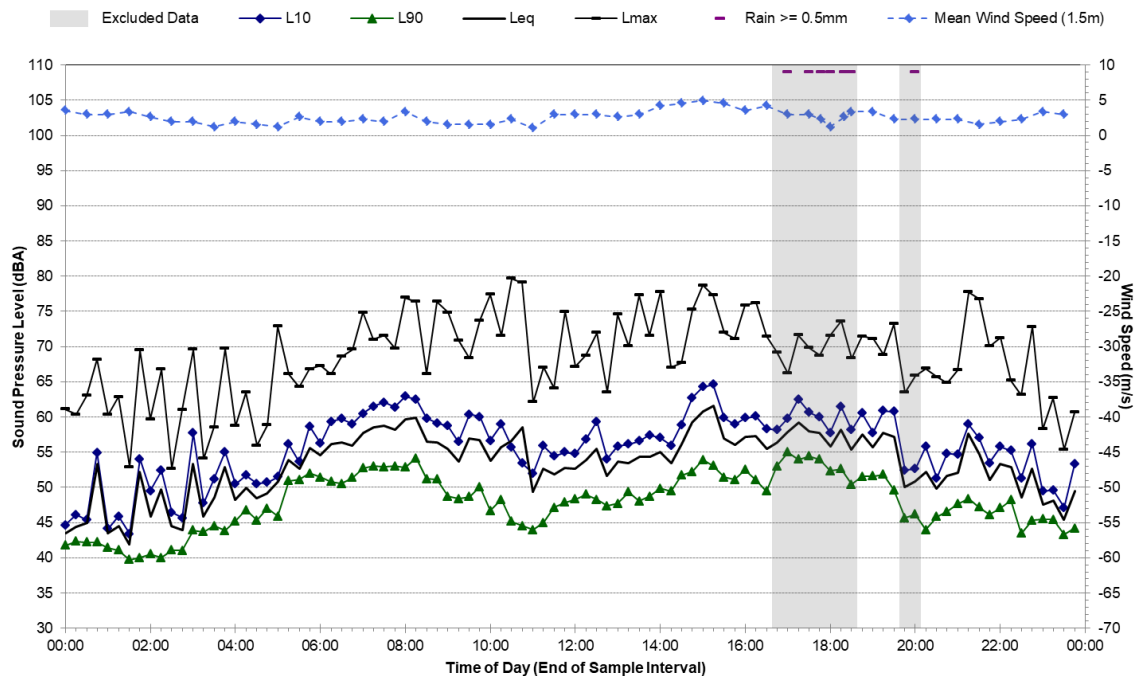
Statistical Ambient Noise Levels

38 Ocean Street, Pagewood - Sunday, 1 July 2018



Statistical Ambient Noise Levels

38 Ocean Street, Pagewood - Monday, 2 July 2018



APPENDIX C

Construction Information

Table 1 Equipment Lists and Sound Power Levels

Equipment		Ballast Tamper	Bobcat	Chainsaw ¹	Chipper	Concrete Mixer Truck	Concrete Pump	Concrete Saw ¹	Dozer	Excavator - Breaker ¹	Excavator (14 tonne)	Excavator (22 tonne)	Front End Loader	Generator (small)	Grader	Hand Tools	Lighting - Diesel Generator	Mobile Crane - Franna	Mobile Crane (400 tonne)	Piling - Bored	Roller - Smooth Drum	Roller - Vibratory (12 tonne) ¹	Semi Trailer	Test Train	Truck
SWL LAeq(15min) ²		118	104	114	120	103	106	119	110	121	97	99	104	93	108	94	98	98	106	111	107	109	106	105	107
Ref	Scenario																								
1a	Enabling Works - Billboard Demolition							X				X				X									X
1b	Enabling Works - Utilities		X			X	X	X				X				X					X				X
1c	Enabling Works – Veg. Clearance & Prop. Adjusts.		X	X	X				X		X				X										
2a	Compounds - Establishment											X				X					X				X
2b	Compounds - Operations											X				X									
3a	Bridge Works - Demolition (inc. breaker)							X		X			X			X	X		X				X		X
3b	Bridge Works - Construction					X	X						X			X	X		X	X			X		
4a	Retaining Walls - Construction					X	X						X			X	X		X	X			X		
5a	Track Works - High Impact	X						X	X		X		X		X	X						X	X	X	
5b	Track Works - Typical Impact											X				X									
6a	Signalling (inc. CSR)		X			X					X							X							
6a	Testing, Commissioning & Finishing										X			X		X		X						X	X

Note 1: Equipment classified as 'annoying' in the ICNG and requires an additional 5 dB correction.

Note 2: Sound power level data is taken from the DEFRA Noise Database, TfNSW *Construction Noise and Vibration Strategy*, RMS *Construction and Vibration Guideline*.

Table 2 Predicted Worst-case Construction Noise Levels (dBA) – Residential Receivers

Period	ID	Scenario	Activity	Predicted Worst-case Noise Level (dBA)							
				NCA01	NCA02	NCA03	NCA04	NCA05	NCA06	NCA07	NCA08
Daytime	1a	Enabling Works	Billboard Demolition	55	-	65	45	-	-	<30	<30
	1b		Utilities	65	-	78	79	-	-	84	82
	1c		Veg. Clearing & Property Adjust.	70	-	83	84	-	-	89	87
	2a	Compounds	Establishment	46	-	51	58	-	-	61	74
	2b		Operations	35	-	40	47	-	-	50	63
	3a	Bridge Works	Demolition (inc. breaker)	59	-	70	82	-	-	50	51
	3b		Construction	52	-	63	75	-	-	43	44
	4a	Retaining Walls	Construction	61	-	64	70	-	-	42	44
	5a	Track Works	Peak	68	-	81	82	-	-	87	85
	5b		Typical	46	-	59	60	-	-	65	63
	6a	Signalling (inc. CSR)		55	-	68	69	-	-	74	72
	6b	Testing, Commissioning & Finishing		56	-	69	70	-	-	75	73
Evening	1a	Enabling Works	Billboard Demolition	55	-	65	45	-	-	<30	<30
	1b		Utilities	65	-	78	79	-	-	84	82
	1c		Veg. Clearing & Property Adjust.	70	-	83	84	-	-	89	87
	2a	Compounds	Establishment	46	-	51	58	-	-	61	74
	2b		Operations	35	-	40	47	-	-	50	63
	3a	Bridge Works	Demolition (inc. breaker)	59	-	70	82	-	-	50	51
	3b		Construction	52	-	63	75	-	-	43	44
	4a	Retaining Walls	Construction	61	-	64	70	-	-	42	44
	5a	Track Works	Peak	68	-	81	82	-	-	87	85
	5b		Typical	46	-	59	60	-	-	65	63
	6a	Signalling (inc. CSR)		55	-	68	69	-	-	74	72
	6b	Testing, Commissioning & Finishing		56	-	69	70	-	-	75	73
Night-time	1a	Enabling Works	Billboard Demolition	55	-	65	45	-	-	<30	<30
	1b		Utilities	65	-	78	79	-	-	84	82
	1c		Veg. Clearing & Property Adjust.	70	-	83	84	-	-	89	87
	2a	Compounds	Establishment	46	-	51	58	-	-	61	74
	2b		Operations	35	-	40	47	-	-	50	63
	3a	Bridge Works	Demolition (inc. breaker)	59	-	70	82	-	-	50	51
	3b		Construction	52	-	63	75	-	-	43	44
	4a	Retaining Walls	Construction	61	-	64	70	-	-	42	44
	5a	Track Works	Peak	68	-	81	82	-	-	87	85
	5b		Typical	46	-	59	60	-	-	65	63
	6a	Signalling (inc. CSR)		55	-	68	69	-	-	74	72
	6b	Testing, Commissioning & Finishing		56	-	69	70	-	-	75	73

Table 3 Predicted Worst-case NML Exceedances (dB) – Residential Receivers

Period	ID	Scenario	Activity	Predicted Worst-case Noise Level (dBA)							
				NCA01	NCA02	NCA03	NCA04	NCA05	NCA06	NCA07	NCA08
Daytime	1a	Enabling Works	Billboard Demolition	-	-	1	-	-	-	-	-
	1b		Utilities	-	-	14	12	-	-	28	33
	1c		Veg. Clearing & Property Adjust.	-	-	19	17	-	-	33	38
	2a	Compounds	Establishment	-	-	-	-	-	-	5	25
	2b		Operations	-	-	-	-	-	-	-	14
	3a	Bridge Works	Demolition (inc. breaker)	-	-	6	15	-	-	-	2
	3b		Construction	-	-	-	8	-	-	-	-
	4a	Retaining Walls	Construction	-	-	-	3	-	-	-	-
	5a	Track Works	Peak	-	-	17	15	-	-	31	36
	5b		Typical	-	-	-	-	-	-	9	14
	6a	Signalling (inc. CSR)		-	-	4	2	-	-	18	23
	6b	Testing, Commissioning & Finishing		-	-	5	3	-	-	19	24
Evening	1a	Enabling Works	Billboard Demolition	-	-	9	-	-	-	-	-
	1b		Utilities	2	-	22	20	-	-	33	38
	1c		Veg. Clearing & Property Adjust.	7	-	27	25	-	-	38	43
	2a	Compounds	Establishment	-	-	-	-	-	-	10	30
	2b		Operations	-	-	-	-	-	-	-	19
	3a	Bridge Works	Demolition (inc. breaker)	-	-	14	23	-	-	-	7
	3b		Construction	-	-	7	16	-	-	-	-
	4a	Retaining Walls	Construction	-	-	8	11	-	-	-	-
	5a	Track Works	Peak	5	-	25	23	-	-	36	41
	5b		Typical	-	-	3	1	-	-	14	19
	6a	Signalling (inc. CSR)		-	-	12	10	-	-	23	28
	6b	Testing, Commissioning & Finishing		-	-	13	11	-	-	24	29
Night-time	1a	Enabling Works	Billboard Demolition	-	-	15	-	-	-	-	-
	1b		Utilities	7	-	28	26	-	-	36	40
	1c		Veg. Clearing & Property Adjust.	12	-	33	31	-	-	41	45
	2a	Compounds	Establishment	-	-	1	5	-	-	13	32
	2b		Operations	-	-	-	-	-	-	2	21
	3a	Bridge Works	Demolition (inc. breaker)	1	-	20	29	-	-	2	9
	3b		Construction	-	-	13	22	-	-	-	2
	4a	Retaining Walls	Construction	3	-	14	17	-	-	-	2
	5a	Track Works	Peak	10	-	31	29	-	-	39	43
	5b		Typical	-	-	9	7	-	-	17	21
	6a	Signalling (inc. CSR)		-	-	18	16	-	-	26	30
	6b	Testing, Commissioning & Finishing		-	-	19	17	-	-	27	31

Table 4 Predicted Worst-case Construction Noise Levels – Commercial Receivers

Period	ID	Scenario	Activity	Predicted Worst-case Noise Level (dBA)							
				NCA01	NCA02	NCA03	NCA04	NCA05	NCA06	NCA07	NCA08
When in use	1a	Enabling Works	Billboard Demolition	76	70	64	44	-	<30	<30	<30
	1b		Utilities	80	78	83	84	-	79	53	83
	1c		Veg. Clearing & Property Adjust.	85	83	88	89	-	84	58	88
	2a	Compounds	Establishment	57	58	60	65	-	75	45	50
	2b		Operations	46	47	49	54	-	64	34	39
	3a	Bridge Works	Demolition (inc. breaker)	73	70	69	77	-	81	<30	48
	3b		Construction	66	63	62	70	-	74	<30	41
	4a	Retaining Walls	Construction	76	73	65	66	-	68	<30	41
	5a	Track Works	Peak	83	81	86	87	-	82	52	86
	5b		Typical	61	59	64	65	-	60	30	64
	6a	Signalling (inc. CSR)		70	68	73	74	-	69	39	73
	6b	Testing, Commissioning & Finishing		71	69	74	75	-	70	40	74

Table 5 Predicted NML Exceedances, All Receiver Types – NCA01

ID	Scenario	Activity	Number of Receivers																
			Total	HNA ¹	With NML Exceedance ²														
					Standard Daytime			Out of Hours Works ³											
								Daytime OOH			Evening			Night-time			Sleep Disturbance		
					1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB
1a	Enabling Works	Billboard Demolition	109	-	3	1	-	3	1	-	1	1	-	2	-	1	-	-	-
1b		Utilities	109	-	12	1	1	12	1	1	2	1	1	5	1	1	1	-	-
1c		Veg. Clearing & Property Adjust.	109	-	17	10	2	18	10	2	3	1	2	4	3	2	1	-	-
2a	Compounds	Establishment	109	-	1	-	-	1	-	-	1	-	-	-	1	-	-	-	-
2b		Operations	109	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
3a	Bridge Works	Demolition (inc. breaker)	109	-	4	2	-	4	2	-	-	2	-	5	-	1	-	-	-
3b		Construction	109	-	2	-	-	2	-	-	2	-	-	-	1	-	-	-	-
4a	Retaining Walls	Construction	109	-	4	1	-	4	1	-	1	1	-	4	-	1	-	-	-
5a	Track Works	Peak	109	-	11	3	1	12	3	1	2	1	1	5	1	1	1	-	-
5b		Typical	109	-	1	-	-	1	-	-	1	-	-	-	1	-	-	-	-
6a	Signalling (inc.		109	-	2	-	-	2	-	-	2	-	-	1	1	-	-	-	-
6b	Testing,		109	-	3	1	-	3	1	-	1	1	-	1	-	1	-	-	-

Note 1: Highly Noise Affected, based on ICNG definition (ie predicted noise at residential receiver is 75 dBA or greater).

Note 2: Based on worst-case predicted noise levels.

Note 3: OOH = Out of hours.

Table 6 Predicted NML Exceedances, All Receiver Types – NCA02

ID	Scenario	Activity	Number of Receivers																
			Total	HNA ¹	With NML Exceedance ²														
					Standard Daytime			Out of Hours Works ³											
					1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB
1a	Enabling Works	Billboard Demolition	55	-	1	-	-	1	-	-	1	-	-	1	1	-	-	-	-
1b		Utilities	55	-	10	3	-	10	3	-	-	2	-	-	-	2	-	-	-
1c		Veg. Clearing & Property Adjust.	55	-	17	7	1	17	7	1	-	2	-	-	-	2	-	-	-
2a	Compounds	Establishment	55	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2b		Operations	55	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3a	Bridge Works	Demolition (inc. breaker)	55	-	2	-	-	2	-	-	2	-	-	-	2	-	-	-	-
3b		Construction	55	-	1	-	-	1	-	-	1	-	-	1	1	-	-	-	-
4a	Retaining Walls	Construction	55	-	4	-	-	4	-	-	2	-	-	-	2	-	-	-	-
5a	Track Works	Peak	55	-	13	3	1	13	3	1	-	2	-	-	-	2	-	-	-
5b		Typical	55	-	1	-	-	1	-	-	-	-	-	2	-	-	-	-	-
6a	Signalling (inc.		55	-	3	-	-	3	-	-	2	-	-	-	2	-	-	-	-
6b	Testing,		55	-	2	1	-	2	1	-	2	-	-	-	2	-	-	-	-

Note 1: Highly Noise Affected, based on ICNG definition (ie predicted noise at residential receiver is 75 dBA or greater).

Note 2: Based on worst-case predicted noise levels.

Note 3: OOH = Out of hours.

Table 7 Predicted NML Exceedances, All Receiver Types – NCA03

ID	Scenario	Activity	Number of Receivers																
			Total	HNA ¹	With NML Exceedance ²														
					Standard Daytime			Out of Hours Works ³											
					1-10 dB	11-20 dB	>20 dB	Daytime OOH			Evening			Night-time			Sleep Disturbance		
								1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB
1a	Enabling Works	Billboard Demolition	370	-	3	-	-	4	-	-	7	-	-	23	4	-	45	3	-
1b		Utilities	370	3	22	6	-	54	14	-	67	17	3	148	39	10	164	50	11
1c		Veg. Clearing & Property Adjust.	370	11	61	14	-	118	21	3	127	38	7	200	89	22	178	55	14
2a	Compounds	Establishment	370	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-
2b		Operations	370	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3a	Bridge Works	Demolition (inc. breaker)	370	-	2	2	-	12	3	-	18	4	-	76	9	2	45	3	-
3b		Construction	370	-	2	-	-	4	-	-	4	-	-	14	4	-	5	-	-
4a	Retaining Walls	Construction	370	-	2	-	-	8	-	-	12	-	-	25	6	-	11	-	-
5a	Track Works	Peak	370	7	39	10	-	63	18	3	111	24	4	190	51	19	167	40	10
5b		Typical	370	-	-	-	-	-	-	-	3	-	-	12	-	-	7	-	-
6a	Signalling (inc.		370	-	5	-	-	12	-	-	16	3	-	33	8	-	18	3	-
6b	Testing,		370	-	7	-	-	16	-	-	19	3	-	40	12	-	22	4	-

Note 1: Highly Noise Affected, based on ICNG definition (ie predicted noise at residential receiver is 75 dBA or greater).

Note 2: Based on worst-case predicted noise levels.

Note 3: OOH = Out of hours.

Table 8 Predicted NML Exceedances, All Receiver Types – NCA04

ID	Scenario	Activity	Number of Receivers																
			Total	HNA ¹	With NML Exceedance ²														
					Standard Daytime			Out of Hours Works ³											
					1-10 dB	11-20 dB	>20 dB	Daytime OOH			Evening			Night-time			Sleep Disturbance		
								1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB
1a	Enabling Works	Billboard Demolition	506	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1b		Utilities	506	3	15	2	-	20	5	-	24	8	-	101	15	4	123	17	4
1c		Veg. Clearing & Property Adjust.	506	8	23	5	-	54	13	1	86	14	3	252	29	10	147	21	4
2a	Compounds	Establishment	506	-	-	-	-	-	-	-	-	-	-	6	-	-	1	-	-
2b		Operations	506	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3a	Bridge Works	Demolition (inc. breaker)	506	2	11	2	-	16	3	-	37	6	1	124	12	2	80	9	2
3b		Construction	506	1	2	-	-	6	1	-	8	2	-	26	5	1	10	2	-
4a	Retaining Walls	Construction	506	-	2	-	-	6	-	-	10	1	-	23	5	-	12	2	-
5a	Track Works	Peak	506	4	20	4	-	30	9	-	60	14	1	175	23	5	123	17	4
5b		Typical	506	-	-	-	-	-	-	-	1	-	-	4	-	-	3	-	-
6a	Signalling (inc.		506	-	2	-	-	5	-	-	8	-	-	15	4	-	12	1	-
6b	Testing,		506	-	2	-	-	5	-	-	9	1	-	17	4	-	14	1	-

Note 1: Highly Noise Affected, based on ICNG definition (ie predicted noise at residential receiver is 75 dBA or greater).

Note 2: Based on worst-case predicted noise levels.

Note 3: OOH = Out of hours.

Table 9 Predicted NML Exceedances, All Receiver Types – NCA05

ID	Scenario	Activity	Number of Receivers																
			Total	HNA ¹	With NML Exceedance ²														
					Standard Daytime			Out of Hours Works ³											
					1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	Evening			Night-time			Sleep Disturbance		
											1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB
1a	Enabling Works	Billboard Demolition	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1b		Utilities	1	-	1	-	-	1	-	-	1	-	-	-	-	-	-	-	-
1c		Veg. Clearing & Property Adjust.	1	-	1	-	-	1	-	-	1	-	-	-	-	-	-	-	-
2a	Compounds	Establishment	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2b		Operations	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3a	Bridge Works	Demolition (inc. breaker)	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3b		Construction	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4a	Retaining Walls	Construction	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5a	Track Works	Peak	1	-	1	-	-	1	-	-	1	-	-	-	-	-	-	-	-
5b		Typical	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6a	Signalling (inc.		1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6b	Testing,		1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note 1: Highly Noise Affected, based on ICNG definition (ie predicted noise at residential receiver is 75 dBA or greater).

Note 2: Based on worst-case predicted noise levels.

Note 3: OOH = Out of hours.

Table 10 Predicted NML Exceedances, All Receiver Types – NCA06

ID	Scenario	Activity	Number of Receivers																
			Total	HNA ¹	With NML Exceedance ²														
					Standard Daytime			Out of Hours Works ³											
					1-10 dB	11-20 dB	>20 dB	Daytime OOH			Evening			Night-time			Sleep Disturbance		
								1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB
1a	Enabling Works	Billboard Demolition	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1b		Utilities	14	-	5	-	-	5	-	-	1	-	-	-	-	-	-	-	-
1c		Veg. Clearing & Property Adjust.	14	-	3	3	-	3	3	-	1	-	-	-	-	-	-	-	-
2a	Compounds	Establishment	14	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-
2b		Operations	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3a	Bridge Works	Demolition (inc. breaker)	14	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-
3b		Construction	14	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-
4a	Retaining Walls	Construction	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5a	Track Works	Peak	14	-	2	3	-	2	3	-	1	-	-	-	-	-	-	-	-
5b		Typical	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6a	Signalling (inc.		14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6b	Testing,		14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note 1: Highly Noise Affected, based on ICNG definition (ie predicted noise at residential receiver is 75 dBA or greater).

Note 2: Based on worst-case predicted noise levels.

Note 3: OOH = Out of hours.

Table 11 Predicted NML Exceedances, All Receiver Types – NCA07

ID	Scenario	Activity	Number of Receivers																
			Total	HNA ¹	With NML Exceedance ²														
					Standard Daytime			Out of Hours Works ³											
					1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB
1a	Enabling Works	Billboard Demolition	325	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1b		Utilities	325	13	121	40	12	181	76	21	180	76	21	159	101	36	144	115	42
1c		Veg. Clearing & Property Adjust.	325	32	180	77	21	134	120	52	133	120	52	77	163	76	133	119	52
2a	Compounds	Establishment	325	-	22	-	-	59	-	-	59	-	-	86	11	-	59	-	-
2b		Operations	325	-	-	-	-	-	-	-	-	-	-	7	-	-	-	-	-
3a	Bridge Works	Demolition (inc. breaker)	325	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-
3b		Construction	325	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4a	Retaining Walls	Construction	325	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5a	Track Works	Peak	325	21	143	57	15	152	95	34	151	95	34	123	119	56	145	104	37
5b		Typical	325	-	13	-	-	19	4	-	19	4	-	26	11	-	24	7	-
6a	Signalling (inc.		325	-	35	12	-	68	18	3	68	18	3	94	24	10	61	17	2
6b	Testing,		325	1	44	13	-	80	19	4	80	19	4	104	26	11	68	18	3

Note 1: Highly Noise Affected, based on ICNG definition (ie predicted noise at residential receiver is 75 dBA or greater).

Note 2: Based on worst-case predicted noise levels.

Note 3: OOH = Out of hours.

Table 12 Predicted NML Exceedances, All Receiver Types – NCA08

ID	Scenario	Activity	Number of Receivers																
			Total	HNA ¹	With NML Exceedance ²														
					Standard Daytime			Out of Hours Works ³											
					1-10 dB	11-20 dB	>20 dB	Daytime OOH			Evening			Night-time			Sleep Disturbance		
								1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB
1a	Enabling Works	Billboard Demolition	484	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1b		Utilities	484	39	201	94	72	207	161	95	207	160	95	183	175	114	158	181	133
1c		Veg. Clearing & Property Adjust.	484	72	207	161	95	108	202	165	108	201	165	61	213	200	145	181	148
2a	Compounds	Establishment	484	-	37	37	19	69	27	40	69	27	40	90	23	50	66	29	34
2b		Operations	484	-	41	13	-	29	34	-	29	34	-	27	41	2	29	34	-
3a	Bridge Works	Demolition (inc. breaker)	484	-	9	-	-	103	-	-	103	-	-	121	-	-	103	-	-
3b		Construction	484	-	-	-	-	-	-	-	-	-	-	9	-	-	-	-	-
4a	Retaining Walls	Construction	484	-	-	-	-	-	-	-	-	-	-	17	-	-	-	-	-
5a	Track Works	Peak	484	40	222	142	69	163	183	127	163	182	127	116	198	160	163	182	127
5b		Typical	484	-	48	3	-	70	27	-	70	27	-	87	39	1	70	27	-
6a	Signalling (inc.		484	-	115	44	2	165	68	15	164	68	15	178	74	35	141	62	7
6b	Testing,		484	-	122	48	3	171	70	27	170	70	27	182	87	40	155	67	10

Note 1: Highly Noise Affected, based on ICNG definition (ie predicted noise at residential receiver is 75 dBA or greater).

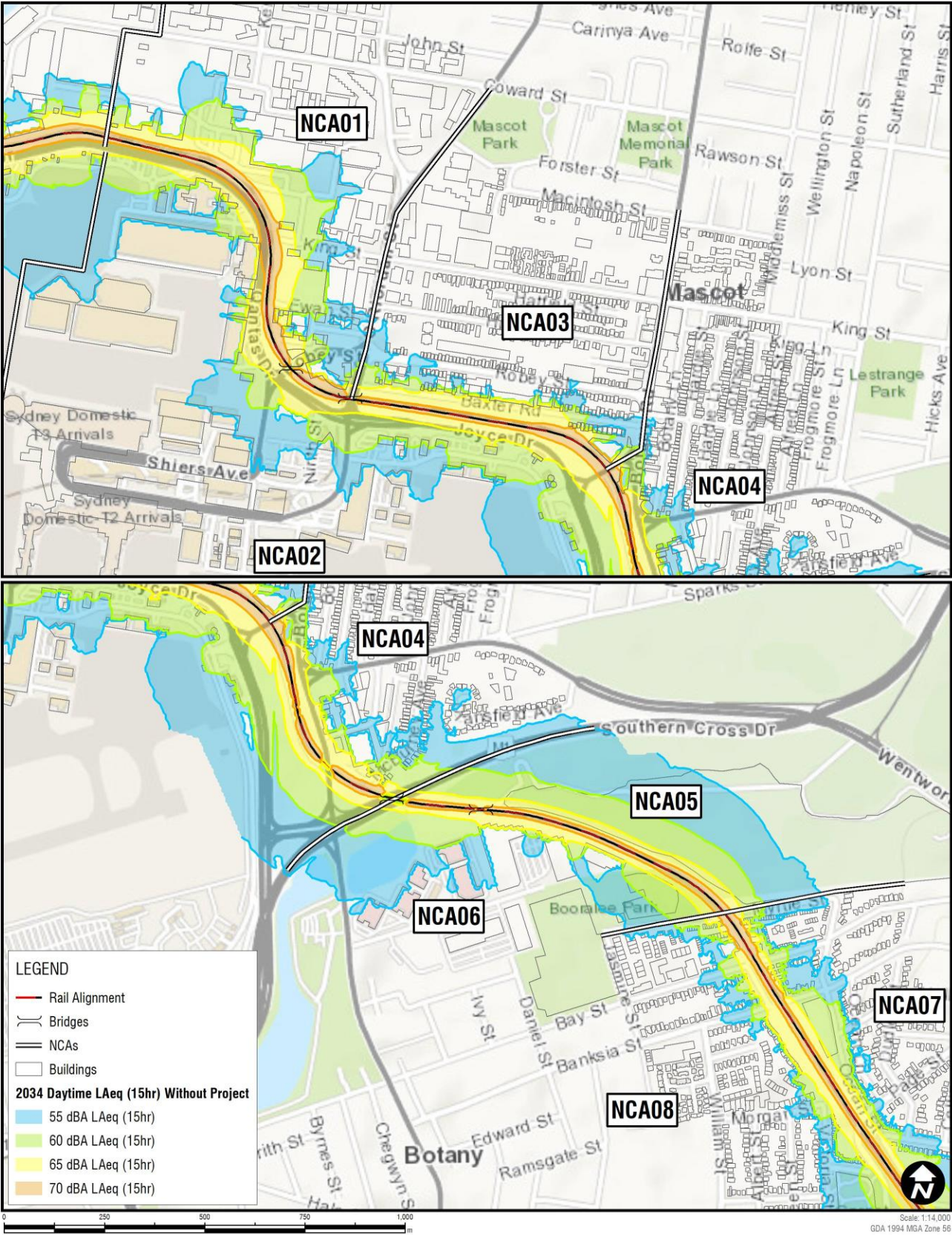
Note 2: Based on worst-case predicted noise levels.

Note 3: OOH = Out of hours.

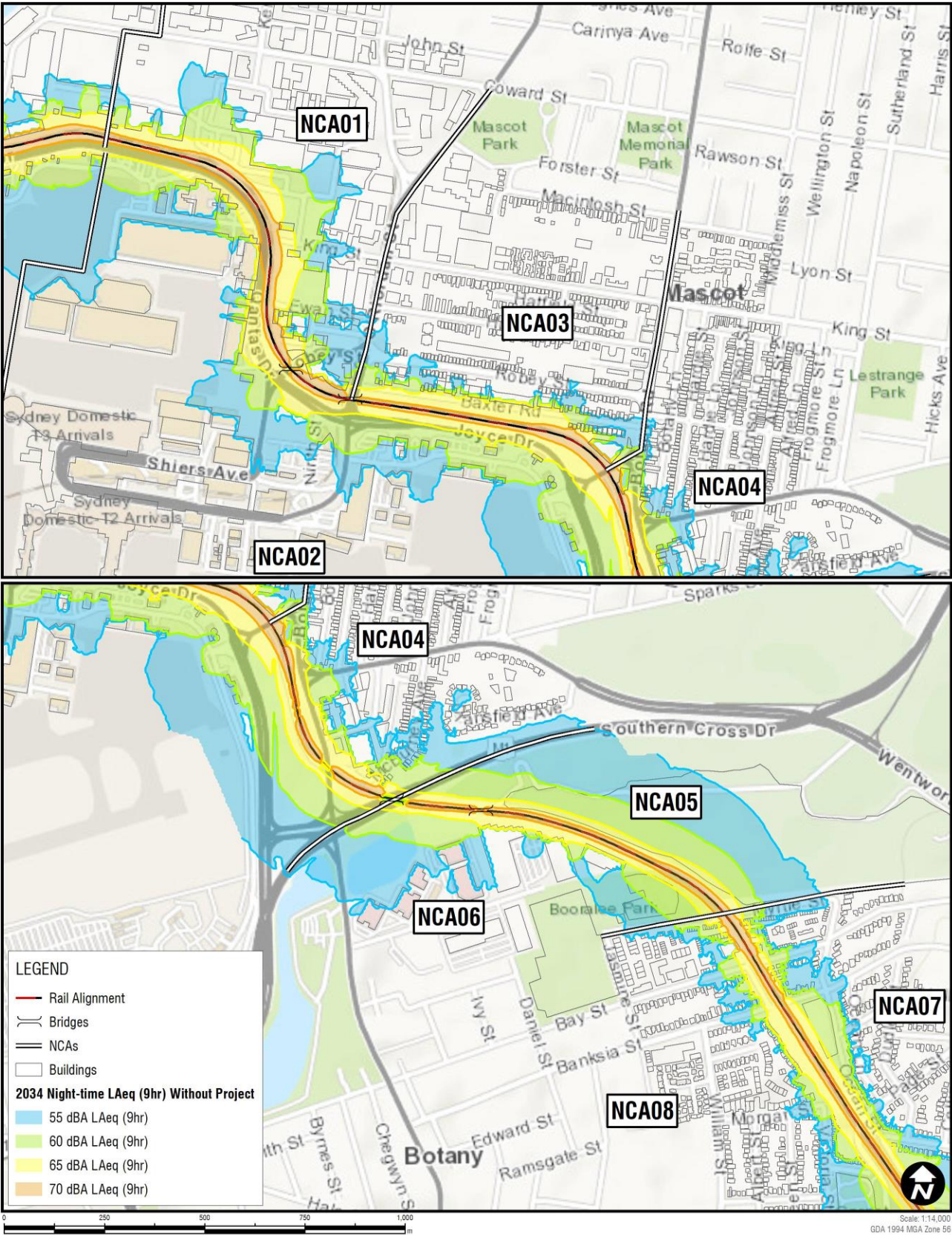
APPENDIX D

Operational Rail Noise Contours

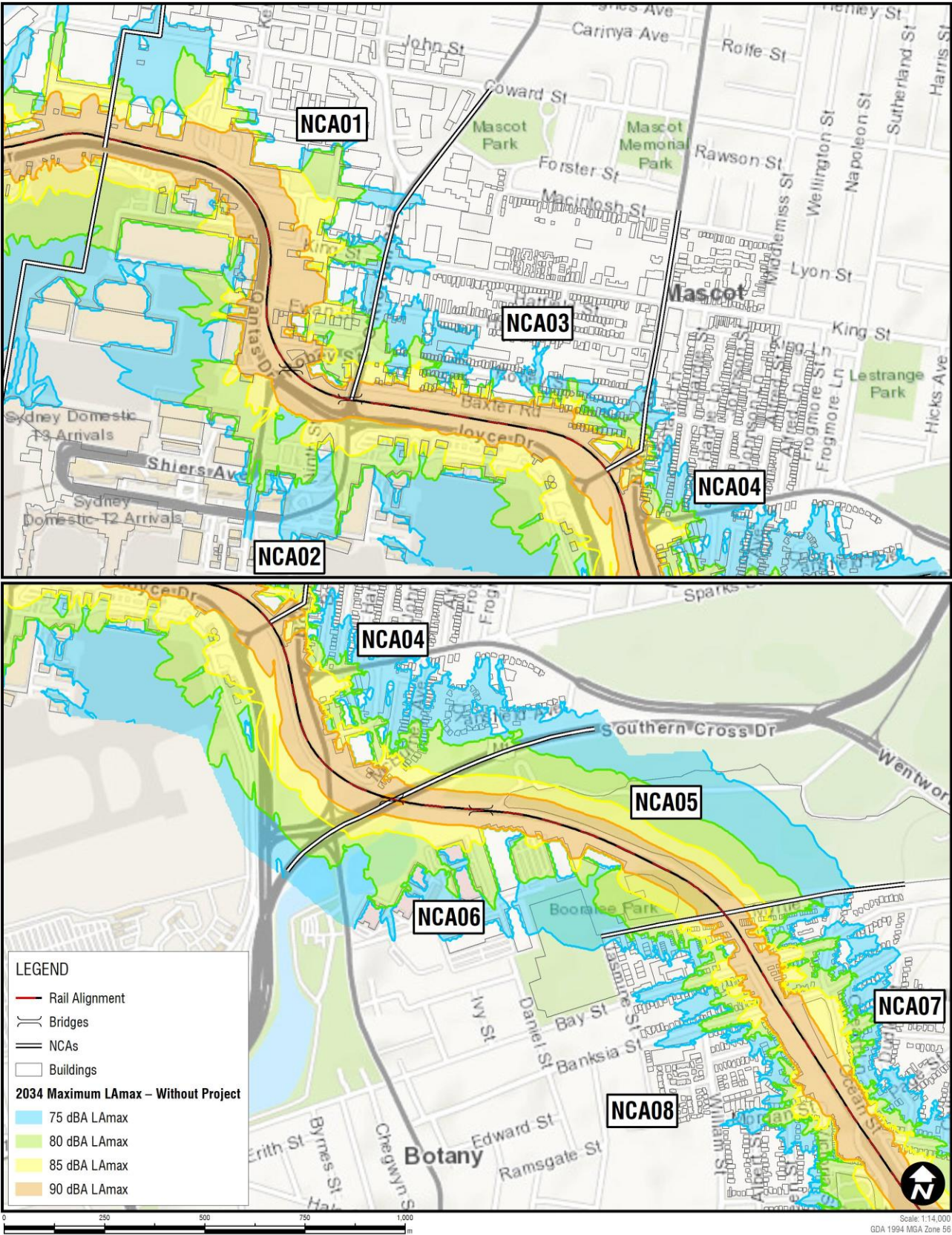
Without Project – 2034, Daytime



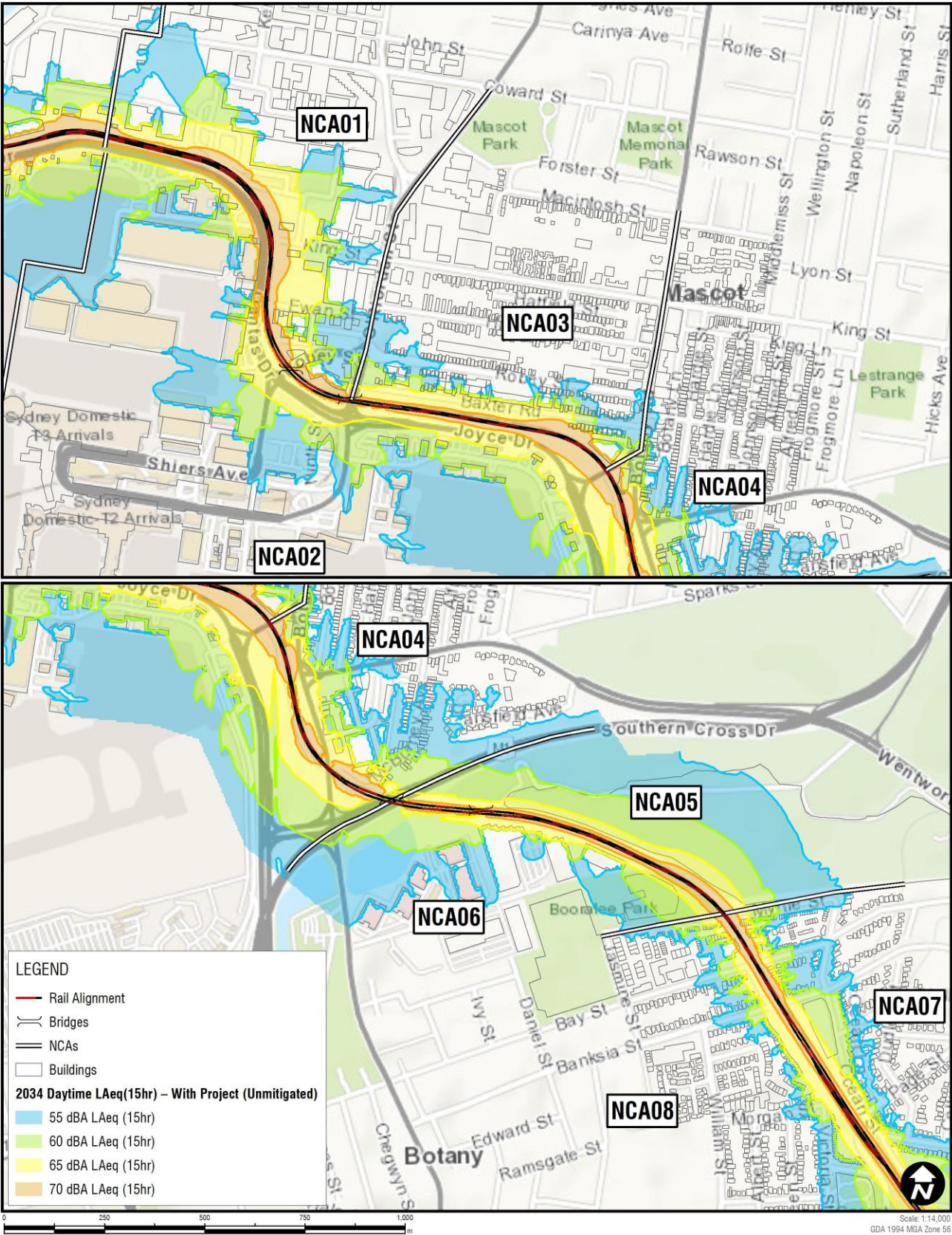
Without Project – 2034, Night-time



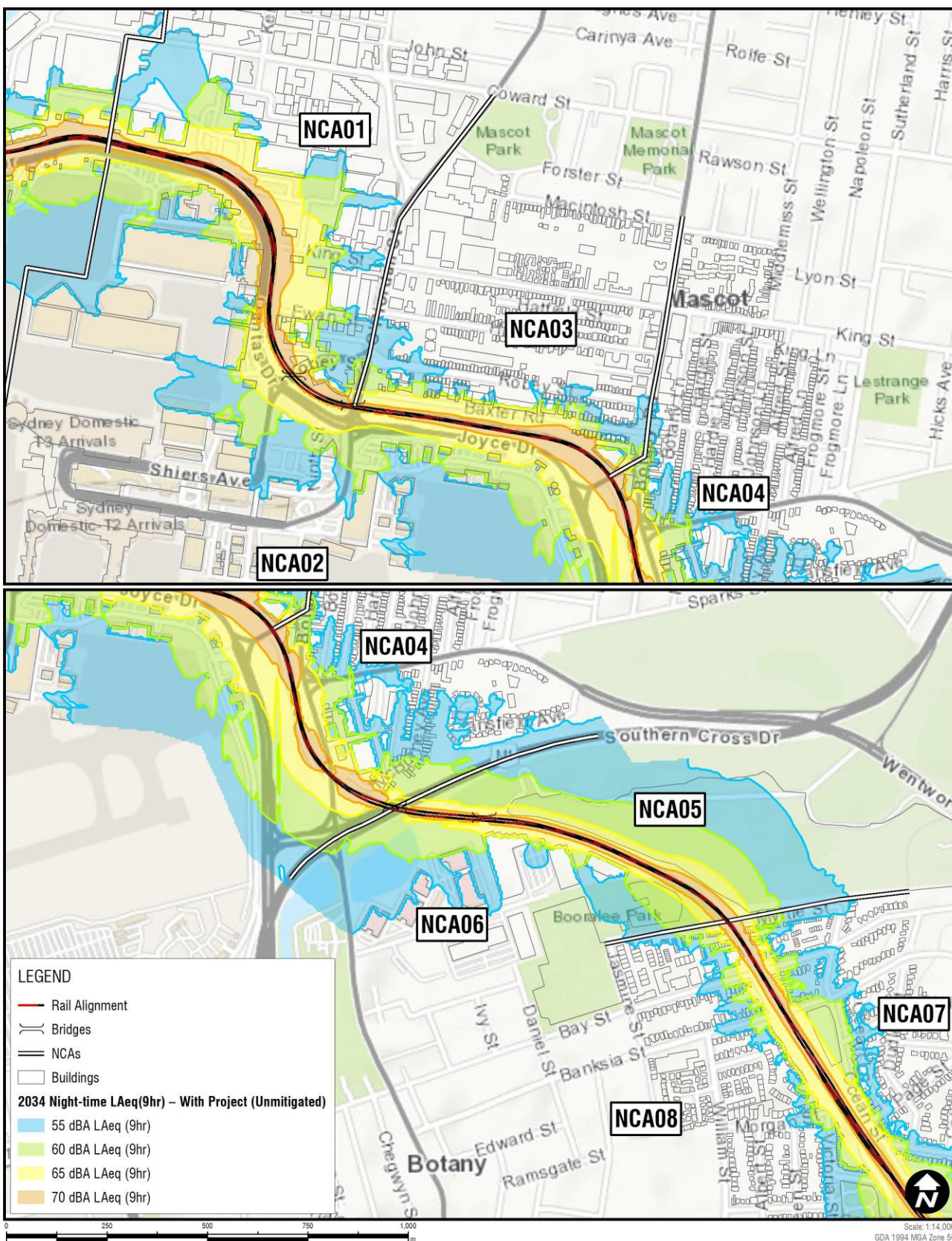
Without Project – 2034, Maximum Noise Level



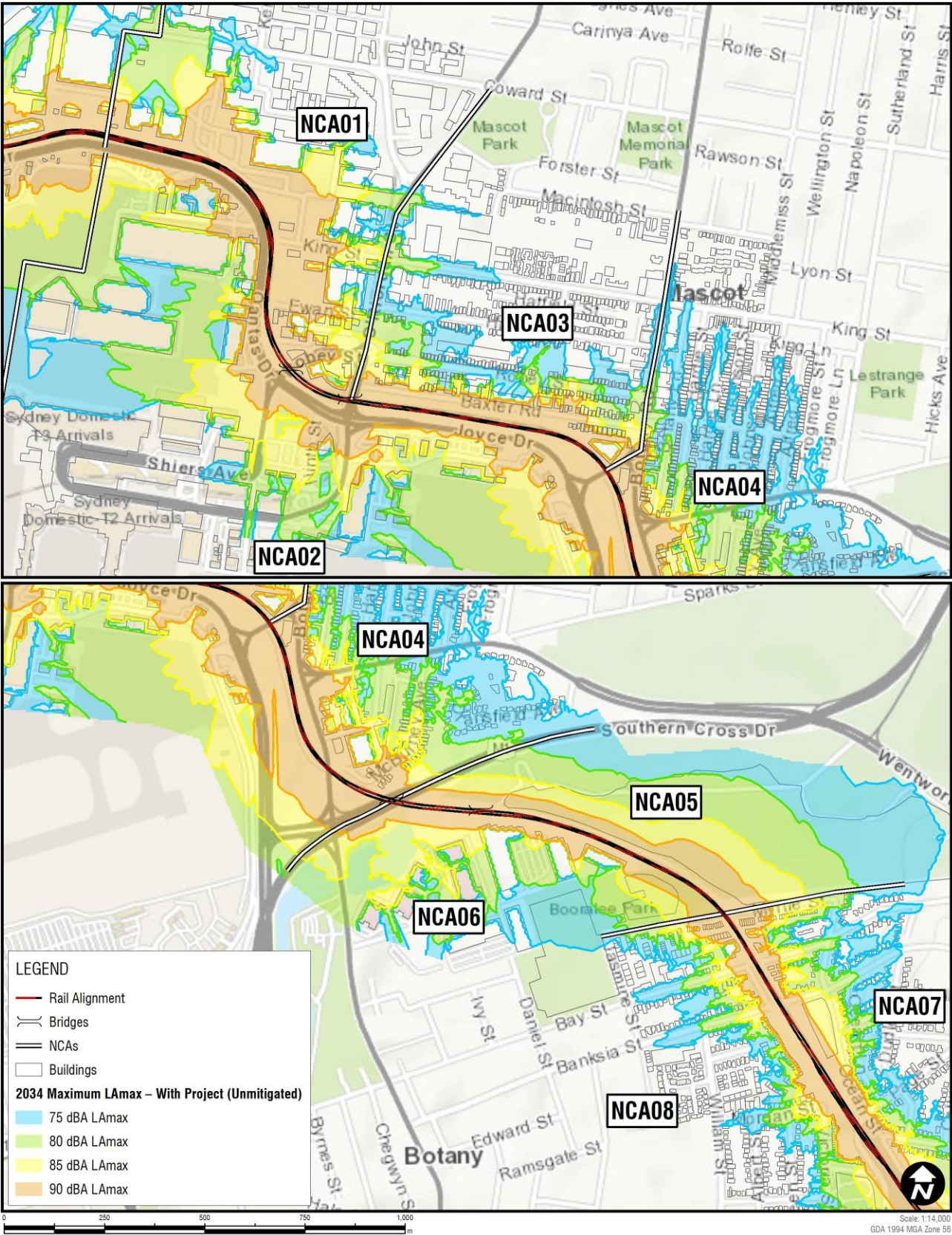
With Project – 2034, Daytime (No Mitigation)



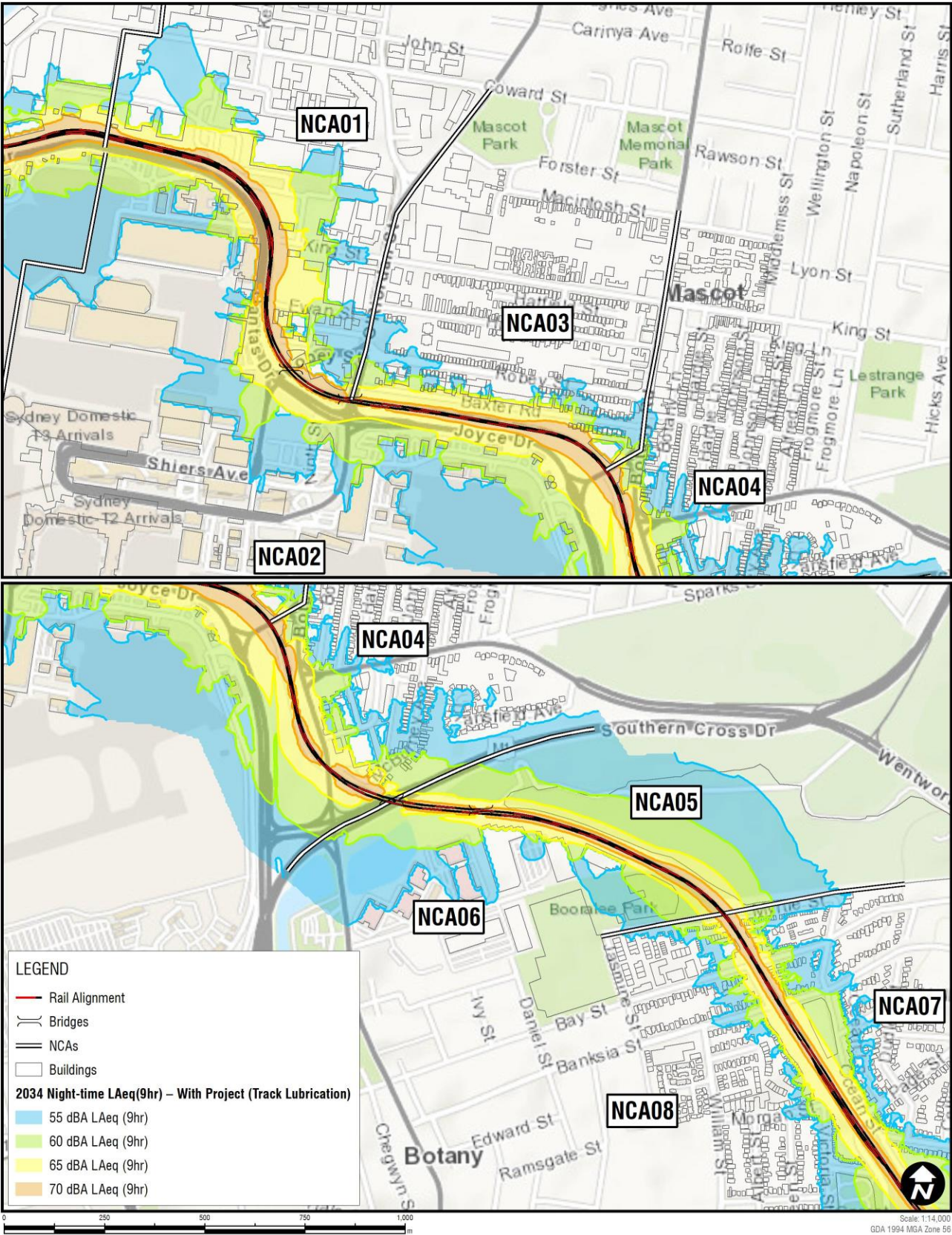
With Project – 2034, Night-time (No Mitigation)



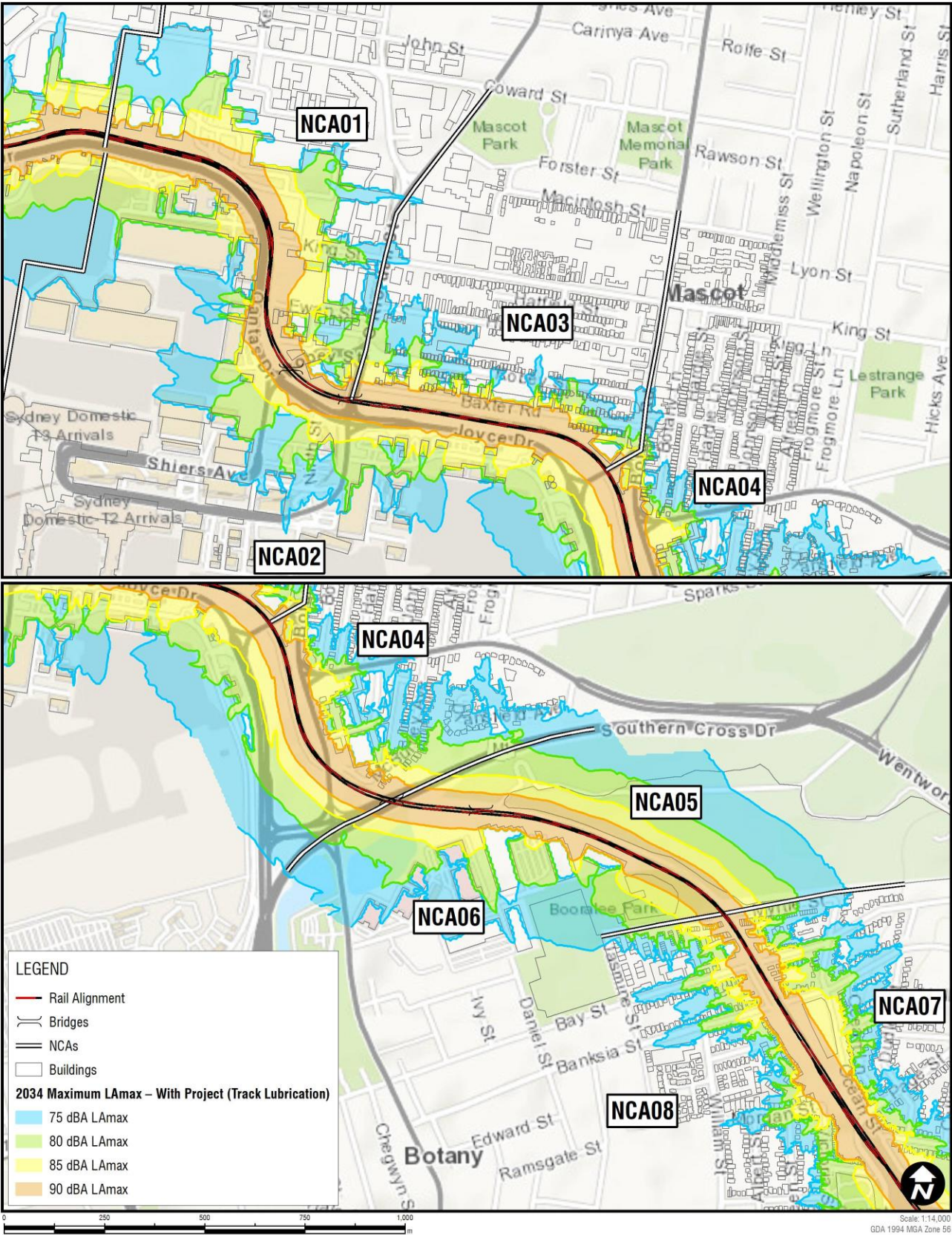
With Project – 2034, Maximum Noise Level (No Mitigation)



With Project – 2034, Night-time (With Lubrication Mitigation)



With Project – 2034, Maximum Noise Level (With Lubrication Mitigation)



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