LOT 4 - BRINGELLY ROAD BUSINESS HUB

Noise Impact Assessment

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PREPARED BY

SLR Consulting Australia Pty Ltd
ABN 29 001 584 612
Tenancy 202 Submarine School, Sub Base Platypus, 120 High Street
North Sydney NSW 2060 Australia

T: +61 2 9427 8100
E: sydney@slrconsulting.com www.slrconsulting.com

BASIS OF REPORT

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DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
610.17734-R10-v0.1	12 August 2020	Jason Rasquinha	Antony Williams	Antony Williams

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1 Introduction

SLR Consulting Australia Pty Ltd (SLR) has been engaged by ESR Australia to undertake a noise impact assessment of a proposed warehouse facility at Lot 4 of Bringelly Business Hub. This assessment has been completed to accompany the Development Application for the proposal.

This report summarises the results of ambient noise measurements undertaken at the site and assesses the potential noise impacts on the surrounding receivers from predicted noise emissions from the proposal.

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

1.1 Proposal Description

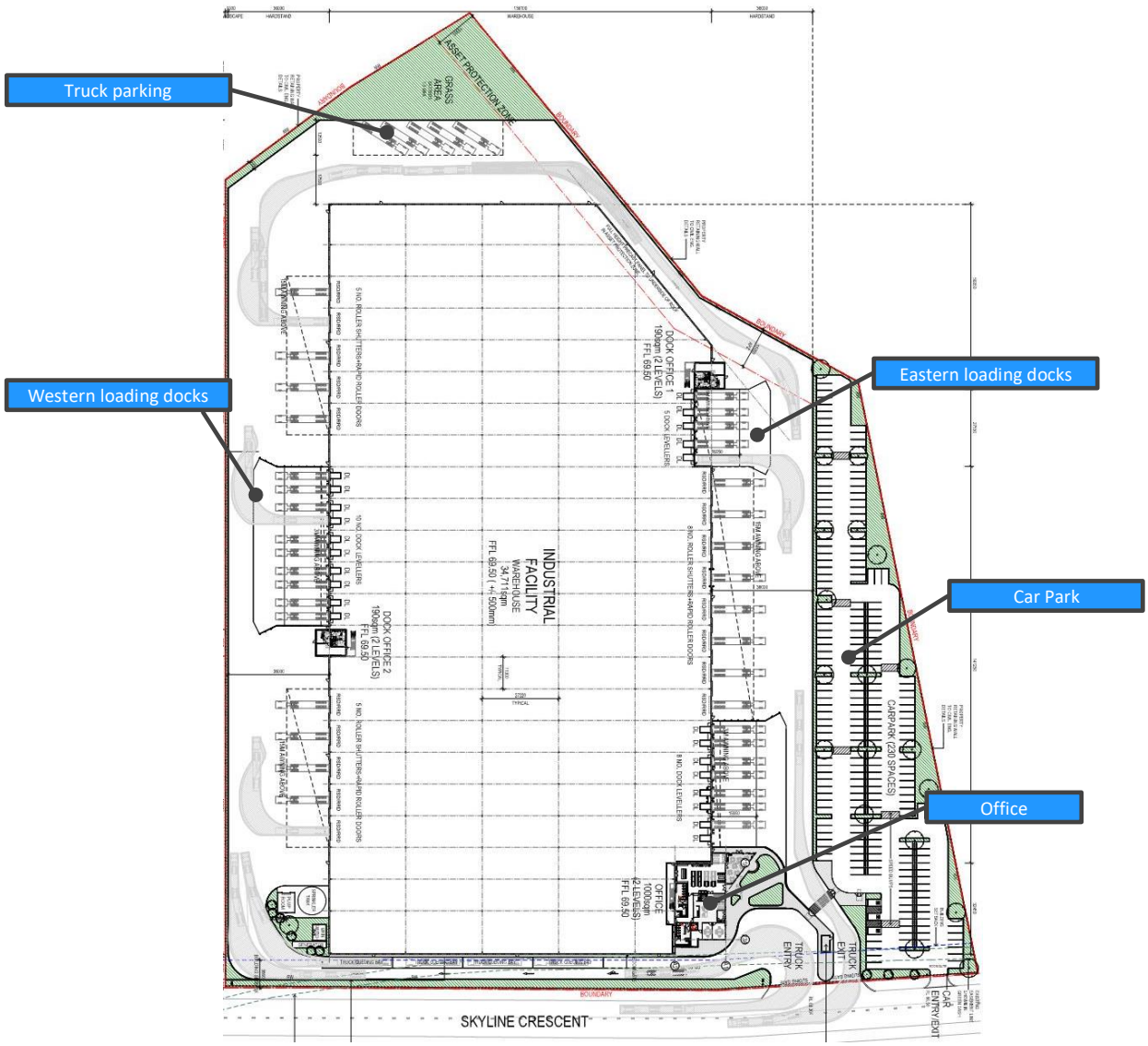
The proposed facility would generally involve the delivery and storage of products along with office and support facilities.

The proposal forms part of the 19 hectare Bringelly Business Hub which was granted development consent in January 2016 and allows for predominantly light industrial and retail development. The two lots to the east of Lot 4 are approved and operational, with the adjacent lot to the west being recently approved for Bunnings.

The site location is shown in **Figure 1** and proposed layout of the facility is shown in **Figure 2**.

Figure 1 Site Location, Surrounding Receivers and Noise Monitoring Locations

Figure 2 Proposed Layout



Warehouse operating hours would be 24 hours per day, seven days a week. The identified sources of noise from the facility include:

- Truck and light vehicle movements on internal access roads and in parking areas
- Loading of trucks in the various loading docks
- Truck parking
- Roof mounted mechanical plant.

A 230 space car park is situated to the east of the facility and a truck access route runs along the boundary of the site.

1.2 Nearest Receivers

The nearest sensitive receivers are residential dwellings to the north-east on Stuart Road. The closest of these is around 200 m away. Additional residential receivers are also located to the west and east, although these a more distant and are generally shielded by the buildings on the adjoining lots.

The nearest receivers are shown in **Figure 1**, with details of the nearest potentially affected sensitive receivers in **Table 1**.

Table 1 Surrounding Sensitive Receivers

ID	Address	Type	Distance (m)	Direction
R01	12 Bringelly Road, Horningsea Park (abandoned condition)	Residential	80 m	East
R02	12 Bringelly Road, Horningsea Park	Residential	85 m	East
R03	Properties across Cowpasture Road	Residential	420 m	East
R04	Residential properties on Stuart Road	Residential	200 m	North-east
R05	Properties on Stuart Road	Residential	250 m	West
R06	MindChamps Early Learning Centre	Childcare Centre	250 m	North-east
R07	CEA Office Building	Commercial	70 m	East
R08[1]	Proposed Bunnings Warehouse Building	Commercial	35 m	West

Note 1: The Bunnings warehouse is not constructed yet and only operational noise impacts have been assessed to it.

1.3 Secretary's Environmental Assessment Requirements

This report has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) for the development. The SEARs relevant to this assessment are outlined in **Table 2**.

Table 2 SEARs Relevant to Noise and Vibration

Requirement	Comments
6. Noise and Vibration – including:	
- a description of all potential noise and vibration sources during the construction and operational phases of the development, including on and off-site traffic noise	**Section 4** and **5**
- a cumulative noise impact assessment of all potential noise sources in accordance with relevant Environment Protection Authority guidelines	**Section 5.2.2**
- details of noise mitigation, management and monitoring measures	**Section 6**

2 Existing Noise Environment

The acoustical environment surrounding the site is generally controlled by road traffic noise from the surrounding road network, with the nearest major roads being Cowpasture Road to the east and Bringelly Road and Camden Valley Way to the south. The South West Rail Link is also located around 250 m to the south of the site.

2.1 Unattended Ambient Noise Monitoring

Unattended noise monitoring was completed at the site in August 2018 to measure the existing ambient noise environment of the area.

The noise monitoring locations were selected with consideration of other noise sources which may influence the measurements, security of noise monitoring equipment and gaining permission for access from residents and landowners.

Calibration of the equipment was checked prior to and following measurements, and drift in calibration did not exceed acceptable tolerances. All equipment carried appropriate and current NATA (or manufacturer) calibration certificates.

The measured data was processed with reference to the NSW EPA's *Noise Policy for Industry* (NPfI) and the data was filtered to remove periods affected by adverse weather conditions, based on Bureau of Meteorology weather station data. A summary of the background noise monitoring locations and results are provided in **Table 3** and **Table 4**, and are shown in **Appendix B**.

Table 3 Ambient Noise Monitoring Locations

ID	Location Address	Location Details	Representative Receiver Area
L01	18 Stuart Road, West Hoxton	Noise logger deployed in adjacent vacant land	Residences to the north in West Hoxton
L02	12 Bringelly Road, Horningsea Park	Noise logger deployed in adjacent vacant land	Residences to the east in Horningsea Park
L03	Intersection of Stuart Road and Twenty Sixth Avenue, Horningsea Park	Noise logger deployed in adjacent vacant land	Residences to the west in Horningsea Park

Table 4 Summary of Ambient Noise Levels

ID	Location	Measured Noise Levels (dBA)					
		RBL[1]			$L_{Aeq(period)}$[2]		
		Daytime	Evening	Night-time	Daytime	Evening	Night-time
L01	18 Stuart Road, West Hoxton	39	36	31	53	51	48
L02	12 Bringelly Road, Horningsea Park	46	45	37	55	53	52
L03	Intersection of Stuart Road and Twenty Sixth Avenue, Horningsea Park	44	43	39	51	54	49

Note 1: The Rating Background Levels (RBLs) and LAeq noise levels have been obtained from the measured data using the calculation procedures outlined in the NPfI.

Note 2: NPfI time periods – Day: 7:00 am to 6:00 pm Monday to Saturday, 8:00 am to 6:00 pm Sundays and public holidays; Evening: 6:00 pm to 10:00 pm; Night: the remaining periods.

Daily graphs representing the measured noise levels are contained in **Appendix B**. The graphs represent each 24 hour period during the survey and show the L_{A1}, L_{A10}, L_{Aeq} and L_{A90} noise levels in 15 minute periods.

3 Assessment Criteria

3.1 Interim Construction Noise Guideline

The NSW *Interim Construction Noise Guideline* (ICNG) is used to assess and manage impacts from construction noise on residences and other sensitive land uses in NSW.

The ICNG requires project specific Noise Management Levels (NMLs) to be established for sensitive receivers based on the existing background noise in the area.

The NMLs are not mandatory limits, however where construction noise levels are predicted or measured to be above the NMLs, feasible and reasonable work practices to minimise noise emissions are to be investigated.

3.1.1 Residential Receivers

The ICNG approach for determining NMLs at residential receivers is shown in **Table 5**.

Table 5 Determination of NMLs for Residential Receivers

Time of Day	NML LAeq(15minute)	How to Apply
Standard hours Monday to Friday 7:00 am to 6:00 pm Saturday 8:00 am to 1:00 pm No work on Sundays or public holidays	RBL + 10 dB	• The noise affected level represents the point above which there may be some community reaction to noise. • Where the predicted or measured LAeq(15minute) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practises to meet the noise affected level. • The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.

	Highly Noise Affected
	75 dBA
		• The Highly Noise Affected (HNA) level represents the point above which there may be strong community reaction to noise.
		• Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restructuring the hours that the very noisy activities can occur, taking into account:
		  ◦ Times identified by the community when they are less sensitive to noise (such as before and after school for works near schools or mid-morning or mid-afternoon for works near residences.
		  ◦ If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.

Outside recommended standard hours	RBL + 5 dB	• A strong justification would typically be required for works outside the recommended standard hours. • The proponent should apply all feasible and reasonable work practices to meet the noise affected level. • Where all feasible and reasonable practises have been applied and noise is more than 5 dB above the noise affected level, the proponent should negotiate with the community.

Note 1: The RBL is the Rating Background Level and the methodology for calculating it is described in the NSW *Noise Policy for Industry*.

Sleep Disturbance

Where construction works are planned to extend over more than two consecutive nights, the ICNG recommends that an assessment of sleep disturbance impacts should be completed.

A method for assessing sleep disturbance is contained in the EPA's *Noise Policy for Industry* (NPfI). Although the NPfI sleep disturbance criteria relates to industrial noise, it is also considered relevant for reviewing potential impacts from construction noise as a screening criteria to identify the need for further assessment.

The NPfI notes that a detailed maximum noise level assessment should be undertaken where a project results in night-time noise levels which exceed:

- 52 dBA L_{AFmax} or the prevailing background level plus 15 dB, whichever is the greater.

3.1.2 Other Sensitive Land Uses

The ICNG provides criteria for a number of non-residential 'other sensitive' land uses, such as educational institutes, hospitals, medical facilities and outdoor recreational areas. The ICNG references AS 2107 for criteria for other sensitive receivers which are not listed in the guideline.

The AS2107 NMLs for other sensitive receivers are shown in **Table 6**.

Table 6 NMLs for Project Specific Other Sensitive Receivers

Land Use	NML LAeq(15minute)		NML Derived From
	Internal	External	
Childcare Centre	60 dBA play areas	70 dBA[1] play areas	ICNG outdoor passive recreation
	40 dBA sleeping area	50 dBA[1] sleeping area	AS2107 for residential sleeping areas near to major roads

Note 1: A conservative 10 dB outside-to-inside facade performance is assumed at this receiver for an open window.

3.1.3 Summary of NMLs

The NMLs for the project are determined using the background noise monitoring and are shown in **Table 7**.

Table 7 Construction Noise Management Levels

Receiver ID	Representative Background Monitoring Location	Noise Management Level ($L_{Aeq(15minute)}$ – dBA)				Sleep Disturbance Screening Criteria (RBL +15 dB)
		Standard Construction (RBL +10 dB)	Out of Hours (RBL +5 dB)			
		Daytime	Daytime[1]	Evening	Night-time	
R01	L.02	56	n/a	n/a	n/a	n/a
R02	L.02	56	n/a	n/a	n/a	n/a
R03	L.02	56	n/a	n/a	n/a	n/a
R04	L.01	49	n/a	n/a	n/a	n/a
R05	L.03	54	n/a	n/a	n/a	n/a
R06	-	70 (play areas)	n/a	n/a	n/a	n/a
		50 (sleeping areas)	n/a	n/a	n/a	n/a
R07	-	70	n/a	n/a	n/a	n/a

Note 1: This refers to the period on Saturday between 7am – 8am and 1pm – 6pm, on Sunday and public holidays between 8am – 6pm.

3.1.4 Construction Road Traffic Noise

The potential impacts from construction traffic on public roads are assessed under the NSW EPA *Road Noise Policy* (RNP)).

An initial screening test is first applied to evaluate if noise levels due to construction traffic are expected to increase by more than 2 dB. Where this is considered likely further assessment is required using the RNP base criteria shown in **Table 8**.

Table 8 RNP Criteria for Assessing Construction Traffic on Public Roads

Road Category	Type of Project/Land Use	Assessment Criteria (dBA)	
		Daytime (7 am - 10 pm)	Night-time (10 pm - 7 am)
Freeway/ arterial/ sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq(15hour)}$ 60 (external)	$L_{Aeq(9hour)}$ 55 (external)
Local roads	Existing residences affected by additional traffic on existing local roads generated by land use developments	$L_{Aeq(1hour)}$ 55 (external)	$L_{Aeq(1hour)}$ 50 (external)

3.2 Construction Vibration

Minimum working distances for typical vibration intensive construction equipment are provided in **Table 9**.

The minimum working distances are quoted for both cosmetic damage (see *BS 7385 Part 2-1993 Evaluation and measurement for vibration in buildings Part 2*, BSI, 1993) and human comfort (see the NSW DEC *Assessing Vibration: A Technical Guideline*, 2006) and are based on empirical data which suggests that where works are further from receivers than the quoted minimum distances then impacts are not considered likely.

Table 9 CNVG Recommended Minimum Working Distances from Vibration Intensive Equipment

Plant Item	Rating/Description	Minimum Distance	
		Cosmetic Damage (BS 7385)	Human Response (NSW EPA Guideline)
Vibratory Roller	1-2 tonne	5 m	15 m to 20 m
	2-4 tonne	6 m	20 m
	4-6 tonne	12 m	40 m
	7-13 tonne	15 m	100 m
	13-18 tonne	20 m	100 m
	>18 tonne	25 m	100 m
Small Hydraulic Hammer	300 kg (5 to 12 t excavator)	2 m	7 m
Medium Hydraulic Hammer	900 kg (12 to 18 t excavator)	7 m	23 m
Large Hydraulic Hammer	1,600 kg (18 to 34 t excavator)	22 m	73 m
Piling Rig – Bored	≤ 800 mm	2 m (nominal)	4 m
Jackhammer	Hand held	1 m (nominal)	2 m

Note 1: Taken from the Roads and Maritime *Construction Noise and Vibration Guideline*.

Note 2: More stringent conditions may apply to heritage or other sensitive structures.

The minimum working distances are indicative and would vary depending on the particular item of equipment and local geotechnical conditions. The distances apply to cosmetic damage of typical buildings under typical geotechnical conditions.

3.3 Noise Policy for Industry

The *Noise Policy for Industry* (NPfI) was released in 2017 and sets out the NSW EPA's requirements for the assessment and management of noise from industry in NSW.

3.3.1 Trigger Levels

The NPfI describes 'trigger levels' which indicate the noise level at which feasible and reasonable noise management measures should be considered. Two forms of noise criteria are provided – one to account for 'intrusive' noise impacts and one to protect the 'amenity' of particular land uses.

- The **intrusiveness** of an industrial noise source is generally considered acceptable if the L_{Aeq} noise level of the source, measured over a period of 15 minutes, does not exceed the background noise level by more than 5 dB. Intrusive noise levels are only applied to residential receivers. For other receiver types, only the amenity levels apply.
- To limit continual increases in noise levels from the use of the intrusiveness level alone, the ambient noise level within an area from all industrial sources should remain below the recommended **amenity** levels specified in the NPfI for that particular land use.

For this assessment, the area surrounding the proposal is considered to be 'suburban'.

3.3.2 Project Specific Criteria

The noise emission trigger levels for industrial noise generated by the facility are provided in **Table 10**. The Project Specific Noise Trigger Level is the lowest value of the intrusiveness or amenity noise level for each period and these are shown in the table in bold.

Table 10 Project Specific Noise Trigger Levels

Receivers	Period	Recommended Amenity Noise Level L_{Aeq} (dBA)	Measured Noise Level (dBA)		Project Noise Trigger Levels $L_{Aeq(15minute)}$ (dBA)	
			RBL[1]	$L_{Aeq(period)}$	Intrusiveness	Amenity[2,3]
Residential to the north (R04)	Daytime	55	39	53	**44**	53
	Evening	45	36	51	**41**	43
	Night-time	40	31	48	**36**	38
Residential to the east (R01 – R03)	Daytime	55	46	55	**51**	53
	Evening	45	45	53	50	**43**
	Night-time	40	37	52	42	**40**[4]
Residential to the west (R05)	Daytime	55	44	51	**49**	53
	Evening	45	43	54	48	**43**
	Night-time	40	39	49	44	**38**
Childcare centres[5] (R06)	When in use	50	n/a	n/a	n/a	**48**
Commercial receivers (R07 & R08)	When in use	65	n/a	n/a	n/a	**63**

Note 1: RBL = Rating Background Level.

Note 2: The recommended amenity noise levels have been reduced by 5 dB, where appropriate, to give the project amenity noise levels due to other sources of industrial noise being in the area. It is noted that the NPfI defines a process in Section 2.4.2 for determining amenity noise levels where receivers are potentially affected by proposed 'clusters of industry'. However, given receivers surrounding the site would not be impacted by more than four individual sources of industrial noise, the recommended amenity noise level minus 5 dB approach is appropriate and adequately covers cumulative noise impacts from the Bringelly Road Business Hub.

Note 3: The project amenity noise levels have been converted to a 15-minute level by adding 3 dB.

Note 4: The measured L_{Aeq} noise level was dominated by road traffic noise and exceeds the recommended amenity noise level by 10 dB or more, therefore the 'high traffic project amenity noise level' is the existing $L_{Aeq(traffic)}$ noise level minus 15 dB.

Note 5: The NPfI and AS2107 do not provide specific guideline noise levels for childcare centres, as such an internal criterion of 40 dBA has been used with a 10 dB external to internal, which is generally considered representative of windows being partially open for ventilation

3.3.3 Modifying Factors

Sources of industrial noise can cause greater annoyance where they contain certain characteristics, such as tonality, impulsiveness, intermittency, irregularity or dominant low-frequency content. The NPfI provides the following modifying factors, shown in **Table 11**, which are to be applied to the predicted receiver noise levels.

Table 11 NPfI Modifying Factors

Factor	Assessment/Measurement	When to Apply	Correction[1]
Tonal noise	One-third octave or narrow band analysis	Level of one-third octave band exceeds the level of the adjacent bands on both sides by levels defined in the NPfI.	5 dB[2]
Low-frequency noise	Measurement of source contribution C-weighted and A-weighted level and one-third octave measurements	Measure/assess source contribution C and A weighted $L_{eq,t}$ levels over same time period. Correction to be applied where the C minus A level is 15 dB or more and the level to which thresholds defined in the NPfI are exceeded.	2 or 5 dB[2]
Intermittent noise	Subjectively assessed but should be assisted with measurement to gauge the extent of change in noise level	The source noise heard at the receiver varies by more than 5 dB and the intermittent nature of the noise is clearly audible.	5 dB

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

Note 2: Where a source emits tonal and low-frequency noise, only one 5 dB correction should be applied if the tone is in the low-frequency range, that is, at or below 160 Hz.

Sleep Disturbance

In accordance with the NPfI, a detailed maximum noise level assessment should be undertaken where a development results in night-time noise levels which exceed:

- $L_{Aeq(15minute)}$ 40 dBA or the prevailing RBL plus 5 dB, whichever is the greater, and/or
- L_{AFmax} 52 dBA or the prevailing RBL plus 15 dB, whichever is the greater.

The detailed assessment should cover the maximum noise level, the extent to which the maximum noise level exceeds the RBL and the number of times this happens during the night-time.

The NPfI refers to the *Road Noise Policy* (RNP) for additional information regarding sleep disturbance. From the research to date, the RNP concludes that:

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

4 Construction Noise and Vibration Assessment

4.1 Construction Activities

The activities likely to be required to build the project involve conventional construction equipment such as ground excavation equipment, mobile cranes, delivery trucks and trade equipment.

The representative construction scenarios developed to assess potential impacts during construction are detailed in **Table 12.**

Table 12 Construction Activities

Works ID	Scenario	Working Hours			
		Standard Daytime	Day OOH[1]	Evening	Night-time
W.001	Site Establishment	✓	-	-	-
W.002	Ground Works	✓	-	-	-
W.003	Structural Works	✓	-	-	-
W.004	Service Installation	✓	-	-	-
W.005	Finishing Trades	✓	-	-	-

Note 1: OOH = Out of hours. During the daytime this refers to the period on Saturday between 7am – 8am and 1pm – 6pm, on Sunday and public holidays between 8am – 6pm.

4.1.1 Working Hours

The works would be undertaken during the standard construction hours of:

- 7.00 am to 6.00 pm Monday to Friday
- 8.00 am to 1.00 pm on Saturdays
- No work on Public Holidays or Sundays.

It is not expected that there would be any requirement for works during evening or night-time periods.

4.1.2 Construction Activity Source Noise Levels

The assessment uses 'realistic worst-case' scenarios to determine the impacts from the noisiest 15-minute period that is likely to occur for each work scenario, as required by the ICNG. Sound power levels for the construction equipment used in the modelling are listed in **Table 13**.

Table 13 Construction Works and Sound Power Levels for Construction Equipment

Works ID	Scenario	Sound Power Level (L_{eq} dBA)											
		Concrete Mixer Truck	Concrete Pump	22 T Excavator	Generator	Grader	4" Grinder	Hammer Drill	Hand Tools	Mobile Crane Franna	Mobile Crane 100 T	Roller – Vibratory	Truck
		103	106	99	102	108	98	100	94	98	100	107	107
W.001	Site Establishment				X								X
W.002	Ground Works			X	X	X						X	X
W.003	Structural Works	X	X	X	X			X	X		X		
W.004	Service Installation			X	X		X	X			X		
W.005	Finishing Trades			X	X		X		X	X			

Note 1: The ICNG requires that activities identified as particularly annoying (such as jackhammering, rock breaking and power saw operation) have a 5 dB 'penalty' added to predicted noise levels when using the quantitative method.

Note 2: Sound Power Levels have been taken from DEFRA, RMS *Construction Noise and Vibration Guideline* and TfNSW *Construction Noise and Vibration Strategy*.

4.2 Construction Noise Assessment

Noise predictions from the construction works have been predicted to the nearest receivers during the daytime and are summarised in **Table 14**.

The results represent the worst-case noise levels where all equipment in each scenario is working concurrently. For most construction activities, it is expected that the construction noise levels would frequently be lower than predicted.

Table 14 Predicted Daytime Construction Noise Levels

Construction Scenario	Receiver / NCA	Noise Level LAeq(15minute) (dBA)		
		Daytime NML	Predicted Level	Exceedance
W.001 Site Establishment	R01 (12 Bringelly Road – Abandoned Condition)[1]	56	36	-
	R02 (12 Bringelly Road)		52	-
	R03 (Properties along Cowpasture Road)		53	-
	R04 (Properties along Stuart Road)	49	57	8
	R05 (Properties to West of development)	54	54	-
	R06 (MindChamps Early Learning Centre)	70 (play areas)	59	
		50 (sleeping)	59	9
	R07 (CEA Office building)	70	70	-
W.002 Ground Works	R01 (12 Bringelly Road – Abandoned Condition)[1]	56	36	-
	R02 (12 Bringelly Road)		52	-
	R03 (Properties along Cowpasture Road)		53	-
	R04 (Properties along Stuart Road)	49	57	8
	R05 (West of development)	54	54	-
	R06 (MindChamps Early Learning Centre)	70 (play areas)	59	
		50 (sleeping)	59	9
	R07 (CEA Office building)	70	70	-
W.003 Structural Works	R01 (12 Bringelly Road – Abandoned Condition)[1]	56	32	-
	R02 (12 Bringelly Road)		46	-
	R03 (Properties along Cowpasture Road)		48	-
	R04 (Properties along Stuart Road)	49	54	5
	R05 (West of development)	54	50	-
	R06 (MindChamps Early Learning Centre)	70 (play areas)	55	-
		50 (sleeping)	55	5
	R07 (CEA Office building)	70	57	-
W.004 Service Installation	R01 (12 Bringelly Road – Abandoned Condition)[1]	56	30	-
	R02 (12 Bringelly Road)		44	-
	R03 (Properties along Cowpasture Road)		46	-
	R04 (Properties along Stuart Road)	49	52	3
	R05 (West of development)	54	48	-
	R06 (Clever Cookies Child Care)	70 (play areas)	53	-
		50 (sleeping)	53	3
	R07 (CEA Office building)	70	55	-

Construction Scenario	Receiver / NCA	Noise Level LAeq(15minute) (dBA)		
		Daytime NML	Predicted Level	Exceedance
W.005 Finishing Trades	R01 (12 Bringelly Road – Abandoned Condition)[1]	56	<30	-
	R02 (12 Bringelly Road)		40	-
	R03 (Properties along Cowpasture Road)		42	-
	R04 (Properties along Stuart Road)	49	48	-
	R05 (West of development)	54	44	-
	R06 (Clever Cookies Child Care)	70 (play areas)	49	-
		50 (sleeping)	49	-
	R07 (CEA Office building)	70	51	-

Note 1: Receiver not considered noise sensitive.

The above shows the following:

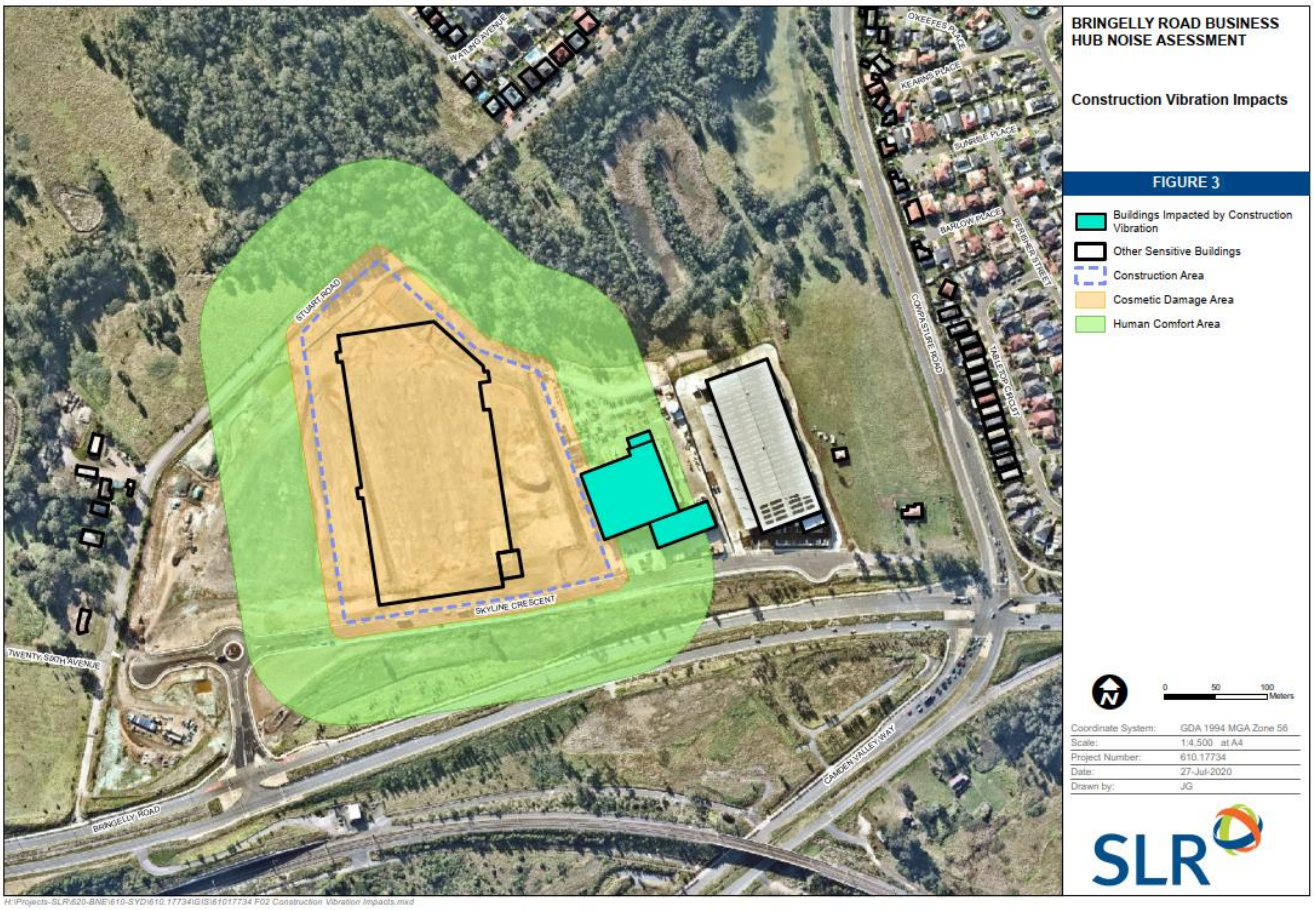
- The noise levels from construction of the project are generally predicted to comply with the criteria at most receivers. Moderate worst-case exceedances of up to 9 dB are however predicted at the nearest receivers to the north when noisier work activities are being completed. This is due to the proximity of the receivers to the northern boundary of the site and the relatively low existing background levels in this area.
- It is likely that exceedances would only occur when work is being carried out at the northern end of the site. Noise levels are expected to comply when works move to the southern end of the site.
- It is noted that works would only occur during Standard Daytime Construction Hours.

4.3 Construction Vibration Assessment

The major potential sources of vibration from the proposed construction activities would likely be during earthworks when vibratory rollers are being used.

Vibration offset distances have been determined from the CNVG minimum working distances for cosmetic damage and human response in **Table 9** and the assessment is summarised in **Figure 3**. Buildings within the minimum working distances are shown on the figure.

Figure 3 Construction Vibration – Vibratory Roller used as part of Earthworks



Cosmetic Damage Assessment

The above figure shows that the distance between the construction works and the nearest sensitive receivers is generally sufficient for most buildings to be outside of the cosmetic damage minimum working distances. The adjacent CFC warehouse is however marginally within the minimum working distance and impacts may occur when vibration intensive works are being completed nearby.

Human Comfort Vibration Assessment

The CFC warehouse and office building are also within the human comfort minimum working distance and occupants of these buildings may be able to perceive vibration impacts at times when vibration intensive equipment is in use. Where impacts are perceptible, they would likely only be apparent for relatively short durations when vibration intensive equipment is in use.

Construction mitigation and management measures are discussed further in **Section 6**.

4.4 Construction Traffic

The requirements for construction traffic accessing the site would be minimal and would not be expected to result in any additional noise impacts at the nearest receivers due to the roads in the area being major routes with high existing volumes of traffic.

5 Operational Noise Assessment

5.1 Operational Noise Sources

A summary of the potential noise sources associated with the operation of the facility is provided below.

5.1.1 On-Site Traffic

The modelling of on-site vehicles has been based on the provided traffic data presented in **Table 15**. The volumes are assumed to be representative of the worst-case 15-minute period for the daytime, evening and night-time.

Table 15 Vehicle Volumes – Worst-case 15 Minute Period

Vehicle Type	Number of Vehicles (per Worst-case 15 Minute)		
	Daytime	Evening	Night-time
Trucks	6	1	1
Light Vehicle Traffic	13	1	2

On-site vehicles have been modelled as line sources based on the sound power levels and assumed speeds presented in **Table 16**.

Table 16 Vehicle Speeds & Sound Power Levels

Noise Source	Sound Power Level (dBA)	Vehicle Speed	Location
Trucks	105	20 km/h	Site perimeter truck route
Light Vehicle Traffic	95	20 km/h	Car park

The following typical noise sources associated with trucks loading are presented in **Table 17**. Loading and unloading activities have been modelled in the northern most loading bays which represents a worst-case situation for the nearest receivers to the north. A truck has also been modelled in the northern truck parking area.

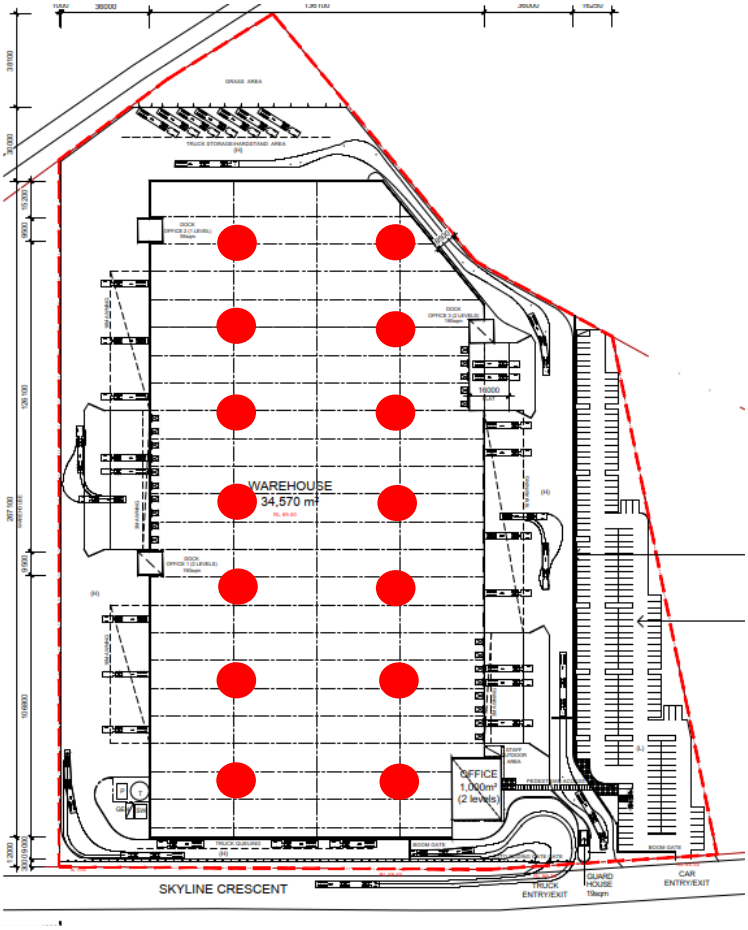
Table 17 Typical Truck Parking Noise Levels and Duration of Operation

Noise Source	Sound Power Level (dBA)	Typical Duration of Operation	Source Height
Reversing Alarm[1]	110	10 seconds	1.5 m
Air brakes	120	1 second	1.5 m
Roller door	94	60 seconds	4 m
Forklift	93	900 seconds	0.5 m

Note 1 It is noted that the operation of this plant is typically intermittent in nature. A +5 dB modifying correction factor is therefore applied to the noise level to account for its potential to cause annoyance, in accordance with the NPfI.

The mechanical plant at the site would likely be limited to rooftop air-conditioning equipment and supply/extraction fans. A total of 14 180 kW Fusion Modular (FPA180) units will be placed on the roof in two rows.

Figure 4 Indicative Rooftop Mechanical Plant Location



The assumed sound power level for mechanical plant is shown in **Table 18** based on equipment with a similar capacity.

Table 18 Assumed Mechanical Plant Details

Noise Source	Sound Power Level (dBA)	Typical Duration of Operation	Source Height[1]
180 kW Fusion Modular	90[2]	24 hours	0.5 m

Note 1: Height above roof.

Note 2: The mechanical plant would be shielded by a small parapet around each unit. The modelled sound power level has therefore been reduced by 5 dB to account for shielding that would be provided.

5.1.2 Warehouse Internal Activities

The internal noise generating activities are expected to be minimal and would not significantly contribute to external noise emissions.

5.1.3 Noise Sources with Potential for Sleep Disturbance

As the facility operates 24 hours per day, noise emissions during the night-time require an assessment for potential sleep disturbance at the nearest noise sensitive receivers. A summary of the L_{Amax} sound power levels of typical activities that may occur at the facility with the potential to cause sleep disturbance is presented in **Table 19**.

Table 19 Sleep Disturbance – L_{Amax} Sound Power Levels

Noise Source	L_{Amax} SWL (dBA)	Source height
Truck Movements	108	1 m
Airbrake	120	1 m
Reversing Alarm	110	1 m
Roller Door	94	4 m

These sources have been assumed to be in the north-eastern most loading dock, which is the location which would most affect the nearest receivers to the north-east.

5.2 Noise Level Predictions

5.2.1 Lot 4 Predicted Levels

SoundPLAN V8 has been used for modelling the noise emissions from the proposal using the ISO 9613-2 industrial noise algorithm. The model includes ground topography, buildings and representative noise sources as discussed in **Section 5.1**.

The predicted noise levels at the nearest receivers from industrial noise emissions are presented in **Table 20**.

Table 20 Industrial Noise Assessment

Scenario	Receiver Location	Period	$L_{Aeq(15\ minutes)}$ Noise Level (dBA)			Compliance?
			Project Noise Trigger Level	Predicted	Exceedance	
Lot 4 Industrial Noise Sources	R01 – 12 Bringelly Road, Horningsea Park (abandoned property)	Daytime	51	<30	-	Yes
		Evening	43	<30	-	Yes
		Night-time	40	<30	-	Yes
	R02 – 12 Bringelly Road, Horningsea Park	Daytime	51	36	-	Yes
		Evening	43	30	-	Yes
		Night-time	40	<30	-	Yes
	R03 – Cowpasture Road Receivers	Daytime	51	40	-	Yes
		Evening	43	35	-	Yes
		Night-time	40	33	-	Yes
	R04 – Receivers to the north	Daytime	44	46	2	**No**
		Evening	41	40	-	Yes
		Night-time	36	38	2	**No**
	R05 – Receivers to the west	Daytime	49	38	-	Yes
		Evening	43	33	-	Yes
		Night-time	38	33	-	Yes
	R06 - Clever Cookies Child Care	When in use	48	47	-	Yes
	R07 - CEA Office building	When in use	63	46	-	Yes
	R08 – Proposed Bunnings Warehouse building	When in use	63	63	-	Yes

The above assessment indicates that noise levels are generally predicted to comply with the Project Noise Trigger Level at most receivers. A relatively minor exceedance of 2 dB during the daytime and night-time is, however, predicted at the nearest residential receiver to the north-east (at receiver R04).

The predicted exceedances are caused by truck movements around the site boundary near the truck parking area. Noise from all other activities is predicted to comply with the goals during all periods.

With regard to the exceedances, it is noted that the existing noise environment of the area is controlled by existing road traffic noise from on surrounding road network. Reference to the noise monitoring data shows that existing L_{Aeq} noise levels near the Stuart Road receivers are higher than the predicted noise from the proposal. When considering this, together with the relatively low number of trucks that would access the site, particularly during the more sensitive night-time period, the predicted 2 dB exceedances are consider minor. Additionally, the NPfI notes that where exceedances of ≤2 dB are apparent the significance of the residual noise levels is generally considered negligible.

5.2.2 Cumulative Noise from all Developments

Cumulative operational noise levels from Lot 4, Steelforce (assessed in SLR report 610.17734-R03-v1.0), CFC (assessed in SLR report 610.17734-R02-v1.3) and Bunnings (assessed in Wilkinson Murray report 19268 Version A) have been assessed at the surrounding residential receivers and the results are shown in **Table 21**.

Table 21 Cumulative Noise Levels – Lot 4, Steelforce, CFC and Bunnings

Receiver Location	Period	$L_{Aeq(15\ minutes)}$ Noise Level (dBA)							Compliance?
		Noise Trigger Level[1]	Steelforce	CFC	Bunnings	Lot 4	Cumulative Level	Exceedance	
R01 – 12 Bringelly Road, Horningsea Park (abandoned property)	Daytime	58	51	34	-	<30	51	-	Yes
	Evening	48	51	33	-	<30	51	3	**No**
	Night-time	43	42	33	-	<30	43	-	Yes
R02 – 12 Bringelly Road, Horningsea Park	Daytime	58	42	45	-	36	47	-	Yes
	Evening	48	42	34	-	30	43	-	Yes
	Night-time	43	33	34	-	<30	37	-	Yes
R03 – Cowpasture Road Receivers	Daytime	58	35	34	-	40	42	-	Yes
	Evening	48	35	32	-	35	39	-	Yes
	Night-time	43	30	32	-	33	37	-	Yes
R04 – Receivers to the north	Daytime	58	36	43	35	46	48	-	Yes
	Evening	48	36	35	35	40	43	-	Yes
	Night-time	43	30	35	n/a	38	40	-	Yes
R05 – Receivers to the west	Daytime	58	-	38	44	38	46	-	Yes
	Evening	48	-	30	44	33	44	-	Yes
	Night-time	43	-	30	n/a	33	35	-	Yes

Note 1: The cumulative noise criteria is taken to be the amenity level plus 3 dB (to convert it to a 15-minute assessment level), as per the NPfI.

Note 2: Noise from Steelforce is not expected to significantly impact R05.

Note 3: Noise from Bunnings is not expected to significantly impact R01, R02 and R03.

The above shows that cumulative noise levels are expected to comply with the goals at all residential receivers except R01 during the evening. This receiver is to the immediate east of the approved and currently operational Steelforce site and noise levels at this receiver are controlled by emissions from Steelforce alone (ie the cumulative noise level is the same as the noise level from Steelforce alone).

Cumulative noise levels are therefore not expected to introduce any additional adverse effects at any receivers surrounding the site.

5.2.3 Sleep Disturbance

The predicted night-time L_{Amax} noise levels at the nearest habitable receivers to the development are presented in **Table 22**.

Table 22 Summary of Predicted Sleep Disturbance Noise Levels (dBA)

Receiver Location	Source	L_{AFmax} Noise Level (dBA)			Compliance?
		Criteria	Predicted	Exceedance	
R02 – 12 Bringelly Road, Horningsea Park	Airbrake	52	45	-	Yes
	Reversing Alarm		36	-	Yes
	Roller Door		<30	-	Yes
	Truck Movements		45	-	Yes
R03 – Cowpasture Road Receivers	Airbrake	52	56	4	**No**
	Reversing Alarm		46	-	Yes
	Roller Door		30	-	Yes
	Truck Movements		44	-	Yes
R04 – Receivers to the north	Airbrake	52	60	8	**No**
	Reversing Alarm		50	-	Yes
	Roller Door		<30	-	Yes
	Truck Movements		52	-	Yes
R05 – Receivers to the west	Airbrake	54	35	-	Yes
	Reversing Alarm		<30	-	Yes
	Roller Door		<30	-	Yes
	Truck Movements		47	-	**No**

The above shows that noise from truck air brakes is predicted to exceed the night-time sleep disturbance goal at the residences to the north and east. The use of truck airbrakes is however expected to be an infrequent event (during loading of trucks only) and the impacts from this are considered relatively minor given existing noise levels in the area are controlled by road traffic movements on the surrounding road network.

5.3 Traffic Increases on the Surrounding Road Network

Light and heavy vehicles associated with the facility would access the site directly from Bringelly Road. Given the high existing volumes on this route, the potential noise impacts from additional traffic generated by the development is considered negligible.

6 Mitigation

6.1 Construction Noise

Noise impacts may be apparent at the nearest receivers during construction of the project. The project should apply all feasible and reasonable mitigation measures to minimise the impacts, particularly during noise intensive works.

The following example measures shown in **Table 23** should be implemented to minimise the potential impacts from the works.

Table 23 Standard Recommended Mitigation Measures

Project stage	Measure
Scheduling	Wherever possible, highly noisy intensive works should only be undertaken during the following hours, unless otherwise assessed and justified: - 7 am to 6 pm Mondays to Fridays, inclusive; and - 8 am to 1 pm Saturdays; and - at no time on Sundays or public holidays.
	Provide respite periods when noisy works are undertaken outside standard hours of construction or during periods where high noise impacts are likely.
	Carry out community consultation to determine the need and frequency of respite periods, if necessary.
	Avoid loading and unloading of materials / deliveries outside of daytime hours.
Site Layout	Site entry and exit points should be located as far as possible from sensitive receivers.
	Compounds and work areas should be designed to as one-way to minimise the need for vehicles to reverse.
	Work compounds, parking areas, equipment and stockpiles should be positioned away from noise-sensitive locations and/or in shielded locations.
	Trucks should not idle near to residential receivers.
	Stationary sources of noise, such as generators, should be located away from sensitive receivers.
Contractor management	Training should be provided to project personnel, including relevant sub-contractors, on noise and vibration requirements and the location of sensitive receivers during inductions and toolbox talks.
	Delivery vehicles should be fitted with straps rather than chains for unloading, wherever possible.
	Truck drivers should avoid compression braking as far as practicable.
	Where night-time works are required, trucks should use broadband reversing alarms.

Project stage	Measure
Noise source mitigation	Use the minimum sized equipment necessary to complete the work and where possible, use alternative, low-impact construction techniques.
	Power tools should use mains power where possible rather than generators.
	Shut down machinery, including generators, when not in operation.
	Avoid dropping materials from a height and dampen or line metal trays, as necessary.
	Ensure equipment is operated in the correct manner.
	All equipment should be appropriately maintained and fitted with noise control devices, where practicable, including acoustic lining of engine bays and air intake / discharge silencers, etc.
	Where possible, use dampened 'city' bits on jackhammers and rockbreakers.
Community consultation	Provide appropriate notice on the Bringelly Road Business Hub website prior to starting works.
	Provide signage with a 24 hour contact number.
	Where there are complaints regarding noise, review and implement additional control measures, where feasible and reasonable.
Monitoring	Conduct noise and/or vibration monitoring in response to any valid complaints received.

6.2 Operational Noise

Operational noise emissions from the proposal are predicted to be compliant at most of the surrounding receivers with the exception of minor exceedances at the nearest receivers to the north-east, due to truck movements.

The significance of this exceedance is however considered low and does there not warrant any specific mitigation measures. Notwithstanding, it is recommended that operational procedure for the site should recognise that there is potential for impacts to receivers to the north-east, particularly during the night-time, and should aim to minimise noise emissions from trucks (and the site) as far as practicable.

7 Conclusion

Construction and operational noise emissions associated with the proposed facility at Lot 4 of the Bringelly Business Hub have been assessed against the appropriate *Noise Policy for Industry* trigger levels and *Interim Construction Noise Guideline* Noise Management Levels.

Construction noise levels are predicted to result in moderate worst-case impacts at the nearest receivers to the north-east, however, it is noted that works would only be completed during the daytime and not during evening or night-time periods. Noise levels at the other more distant receivers are expected to be below the management levels.

Operational noise level are generally expected to be comply with the trigger levels except for minor exceedances at the nearest residences to the north-east, which is due to truck movements on the site access road. The significance of this exceedance is however considered low and does there not warrant any specific mitigation measures.

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 x 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

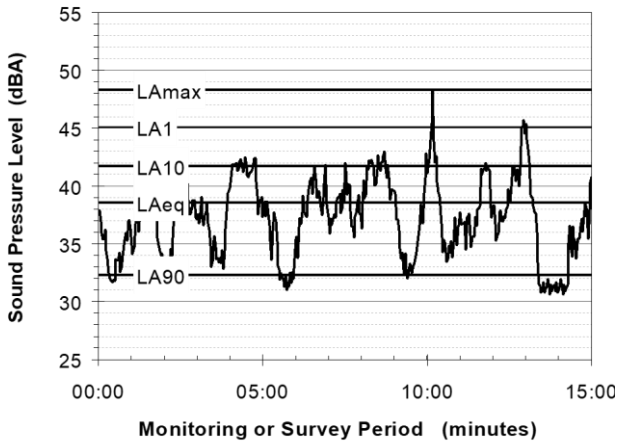
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or LW, or by the reference unit 10^{-12} W.

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 L_{AN}, where L_{AN} is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the L_{A1} is the noise level exceeded for 1% of the time, L_{A10} the noise exceeded for 10% of the time, and so on.

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



Of particular relevance, are:

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

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

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

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

5. Frequency Analysis

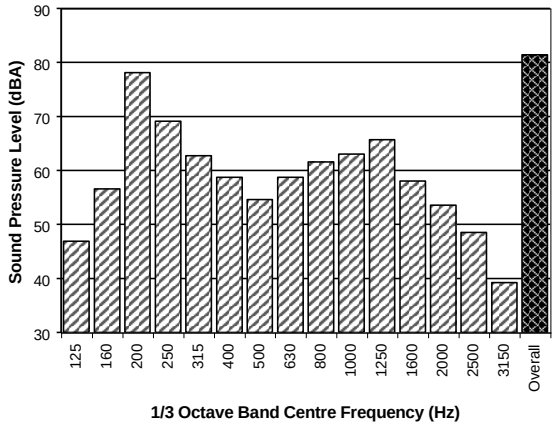
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal.

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/Vo), where Vo 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

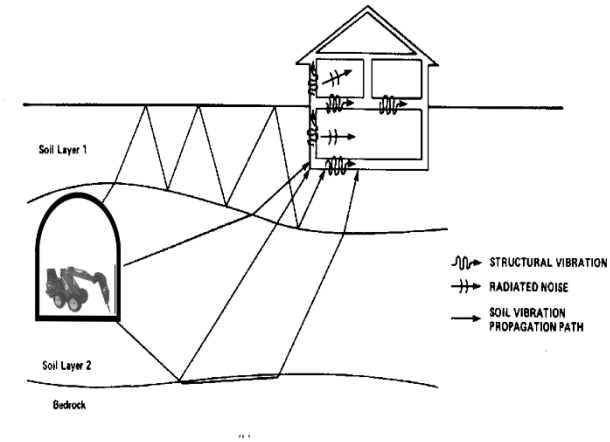
People are able to 'feel' vibration at levels lower than those required to cause even superficial damage to the most susceptible classes of building (even though they may not be disturbed by the motion). An individual's perception of motion or response to vibration depends very strongly on previous experience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



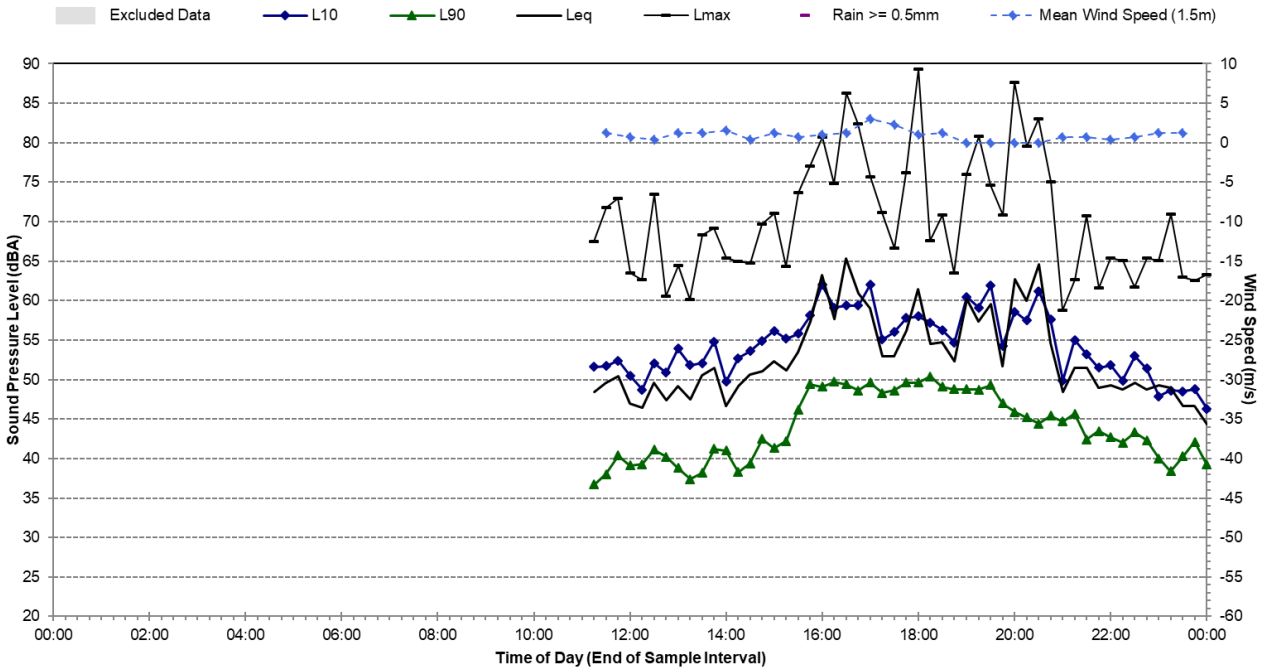
The term 'regenerated noise' is also used in other instances where energy is converted to noise away from the primary source. One example would be a fan blowing air through a discharge grill. The fan is the energy source and primary noise source. Additional noise may be created by the aerodynamic effect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

APPENDIX B

Noise Monitoring Graphs

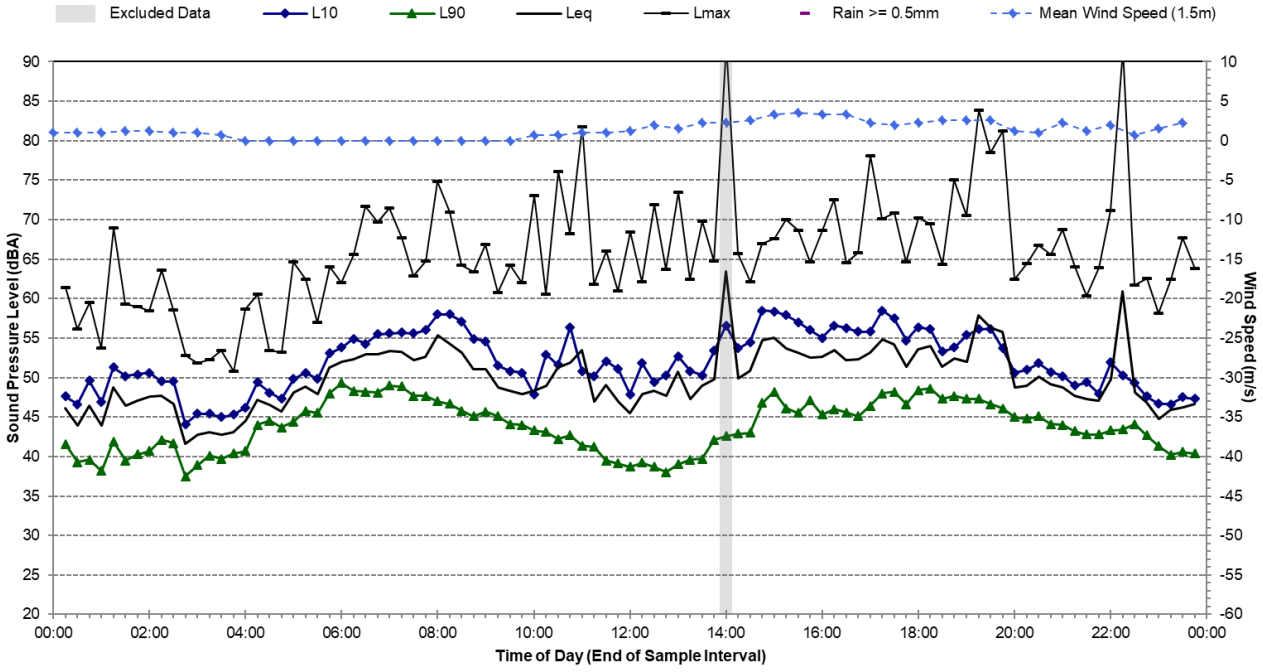
Statistical Ambient Noise Levels

L01 - 18 Stuart Road, West Hoxton Park Road - Thursday, 9 August 2018



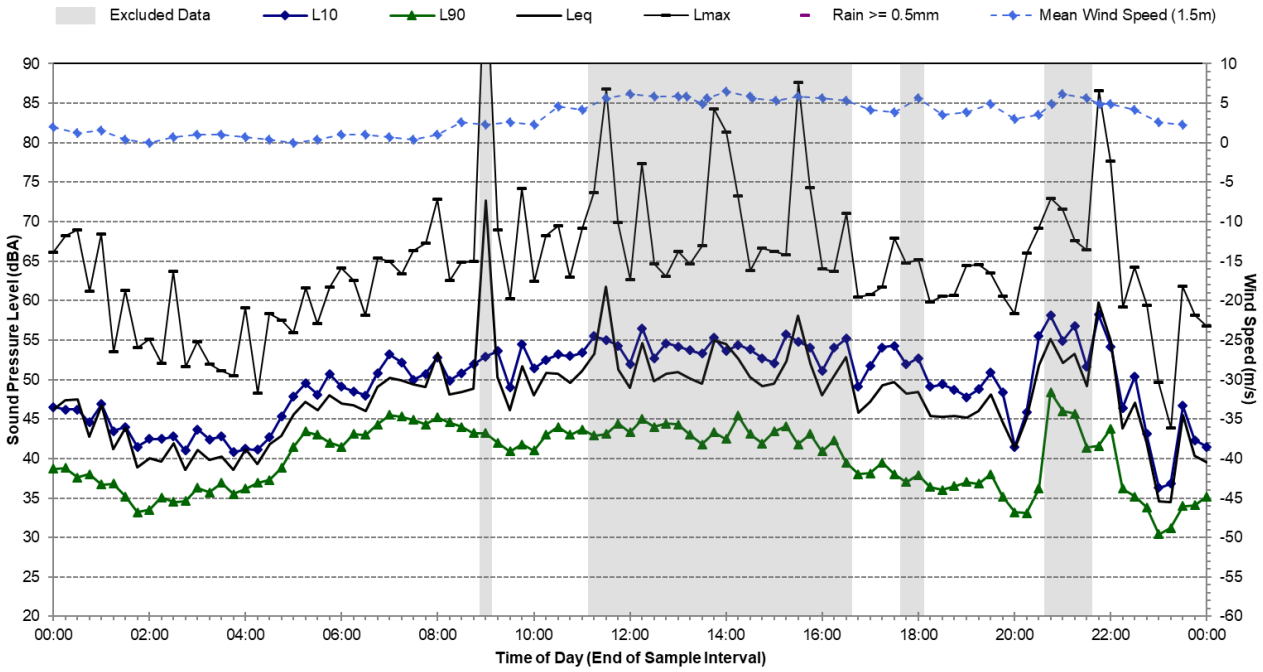
Statistical Ambient Noise Levels

L01 - 18 Stuart Road, West Hoxton Park Road - Friday, 10 August 2018



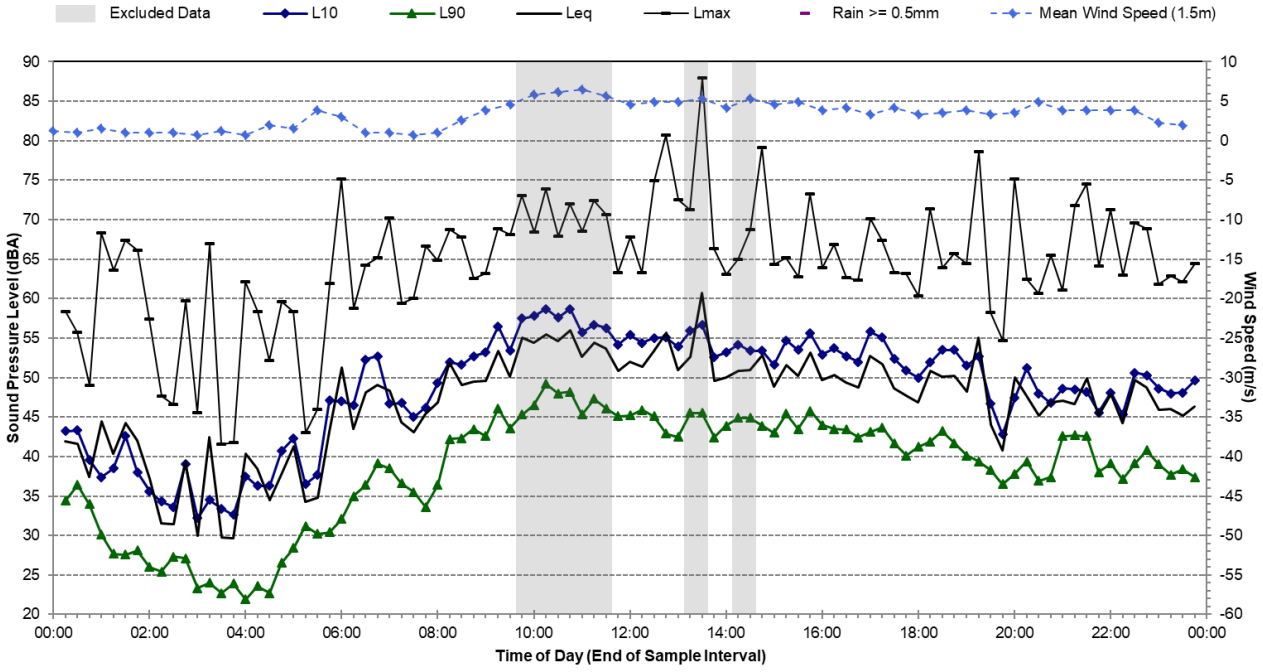
Statistical Ambient Noise Levels

L01 - 18 Stuart Road, West Hoxton Park Road - Saturday, 11 August 2018



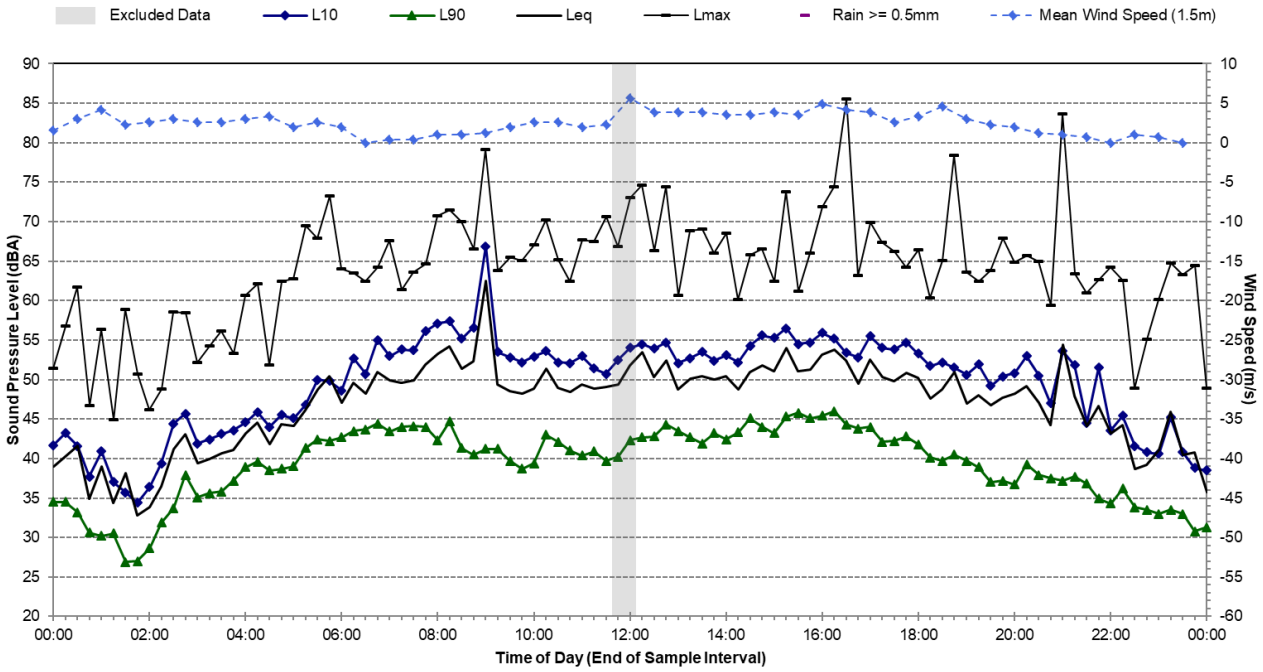
Statistical Ambient Noise Levels

L01 - 18 Stuart Road, West Hoxton Park Road - Sunday, 12 August 2018



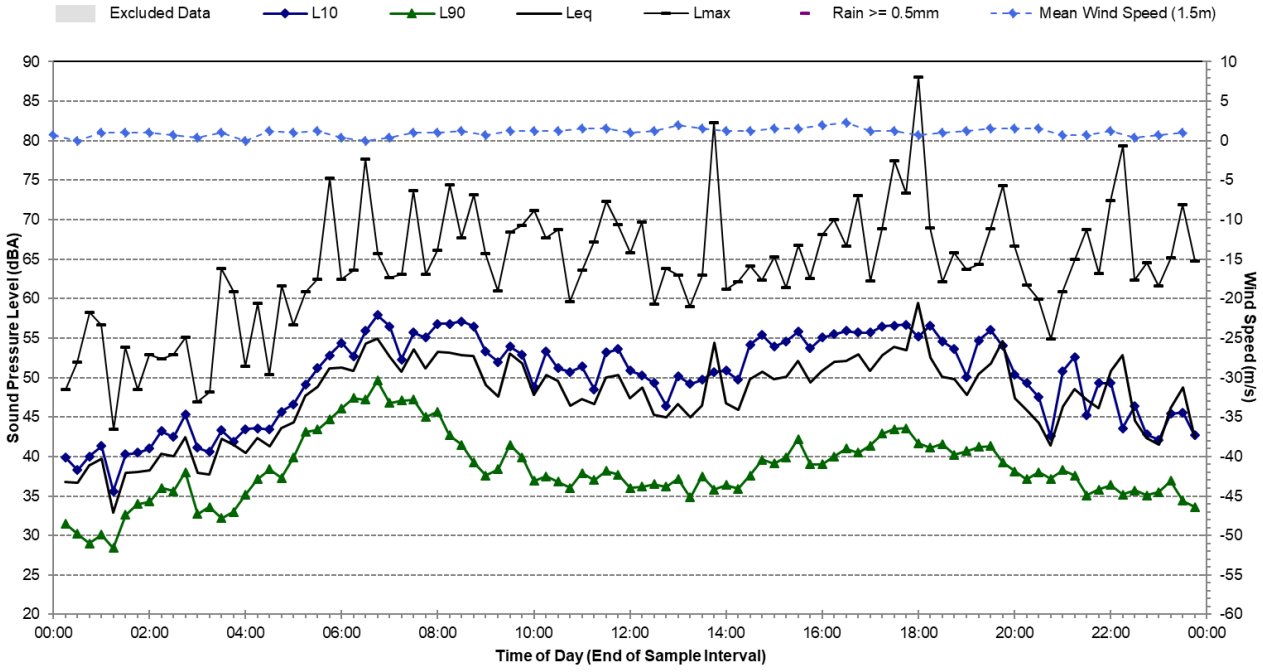
Statistical Ambient Noise Levels

L01 - 18 Stuart Road, West Hoxton Park Road - Monday, 13 August 2018



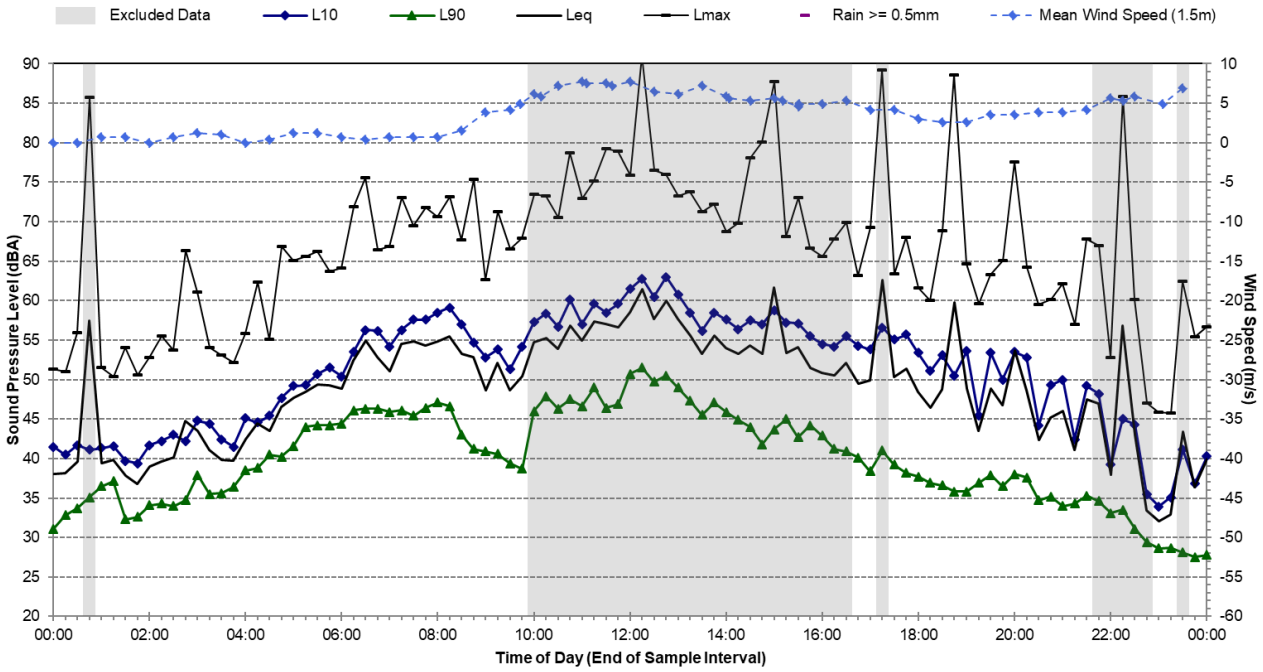
Statistical Ambient Noise Levels

L01 - 18 Stuart Road, West Hoxton Park Road - Tuesday, 14 August 2018



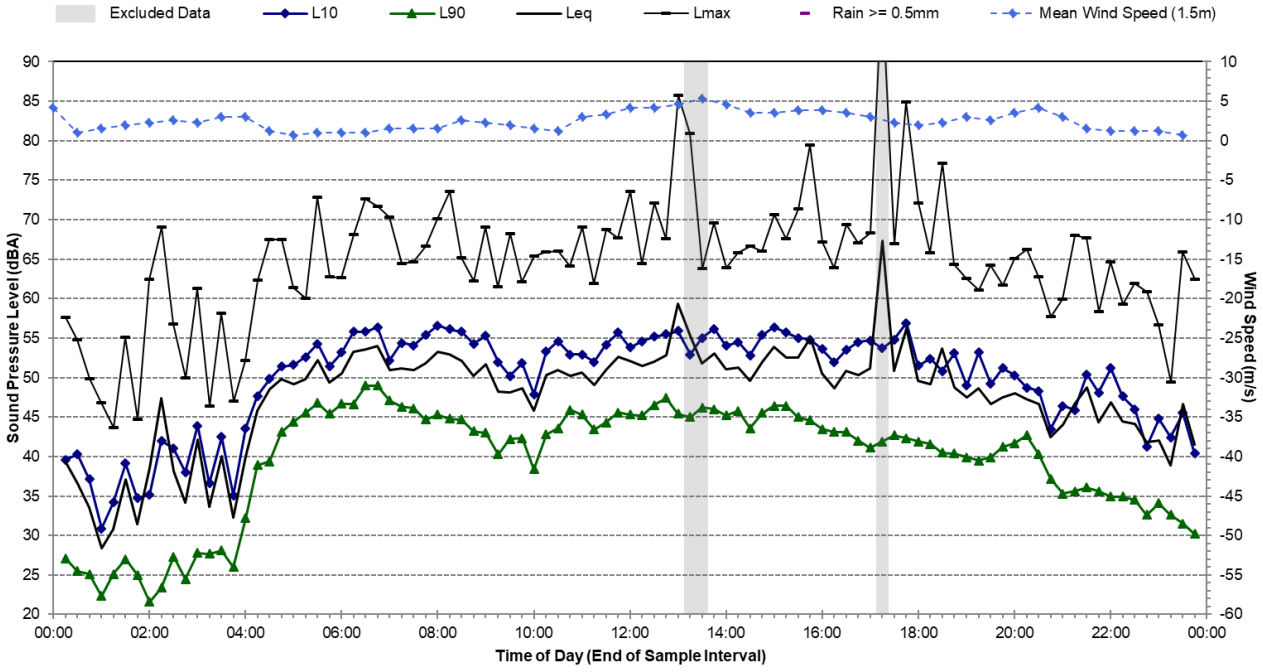
Statistical Ambient Noise Levels

L01 - 18 Stuart Road, West Hoxton Park Road - Wednesday, 15 August 2018



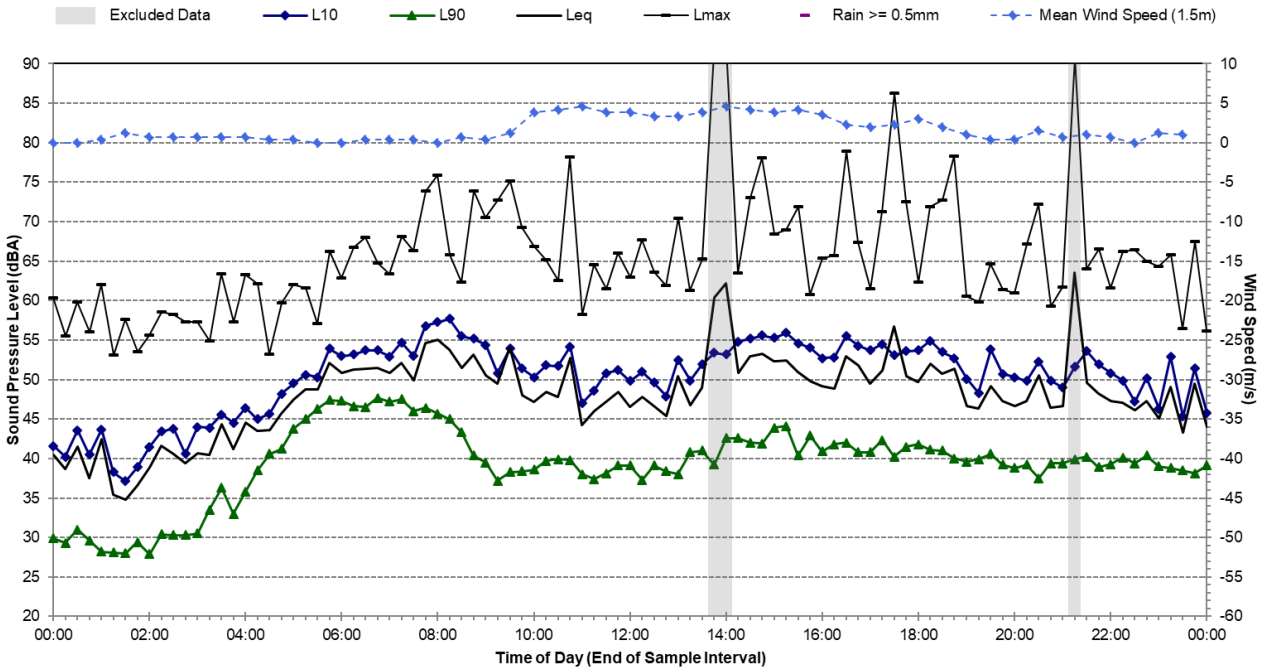
Statistical Ambient Noise Levels

L01 - 18 Stuart Road, West Hoxton Park Road - Thursday, 16 August 2018



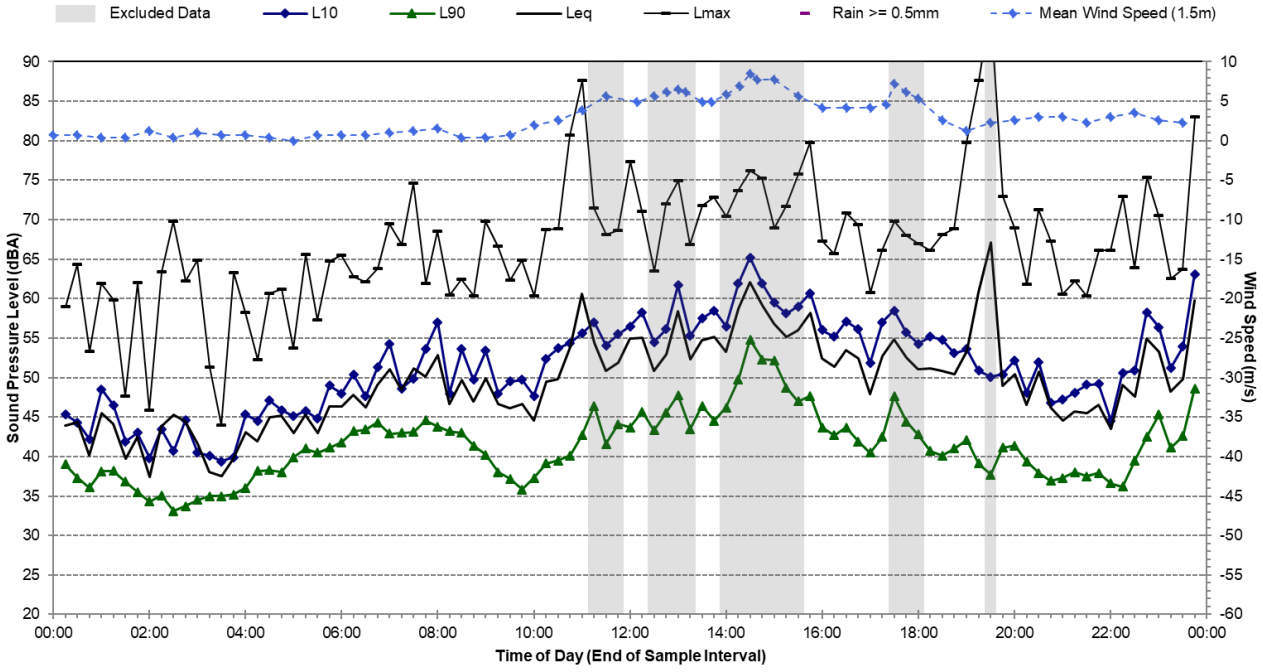
Statistical Ambient Noise Levels

L01 - 18 Stuart Road, West Hoxton Park Road - Friday, 17 August 2018



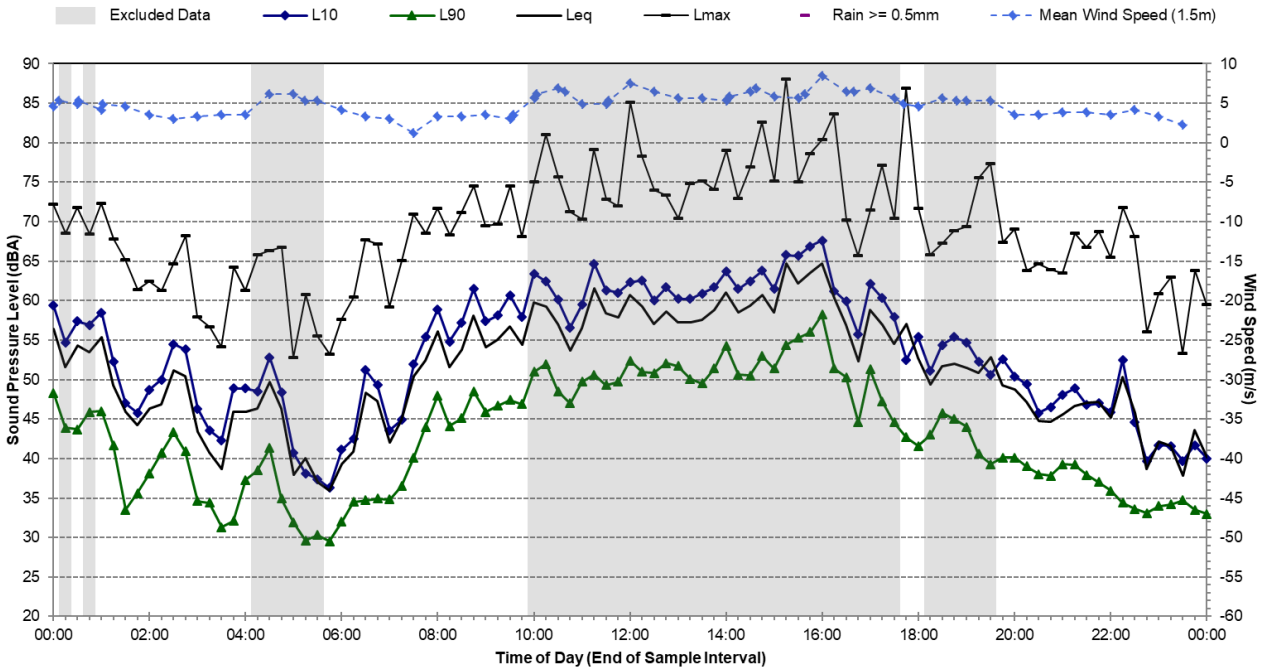
Statistical Ambient Noise Levels

L01 - 18 Stuart Road, West Hoxton Park Road - Saturday, 18 August 2018



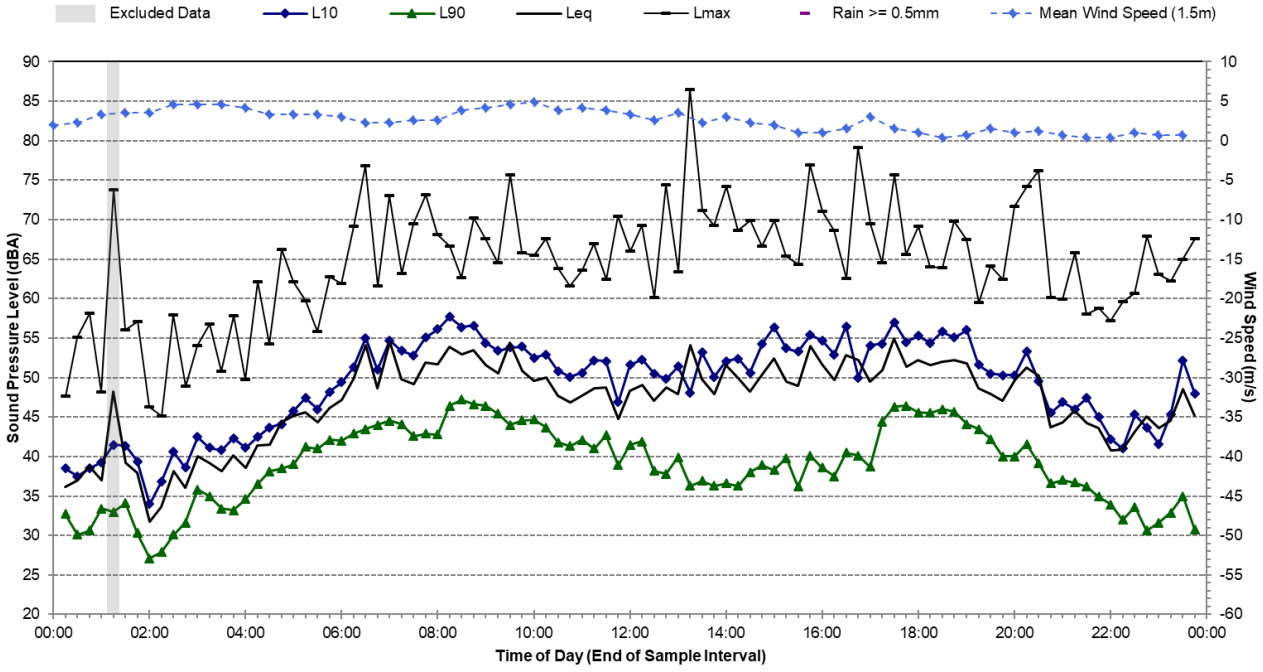
Statistical Ambient Noise Levels

L01 - 18 Stuart Road, West Hoxton Park Road - Sunday, 19 August 2018



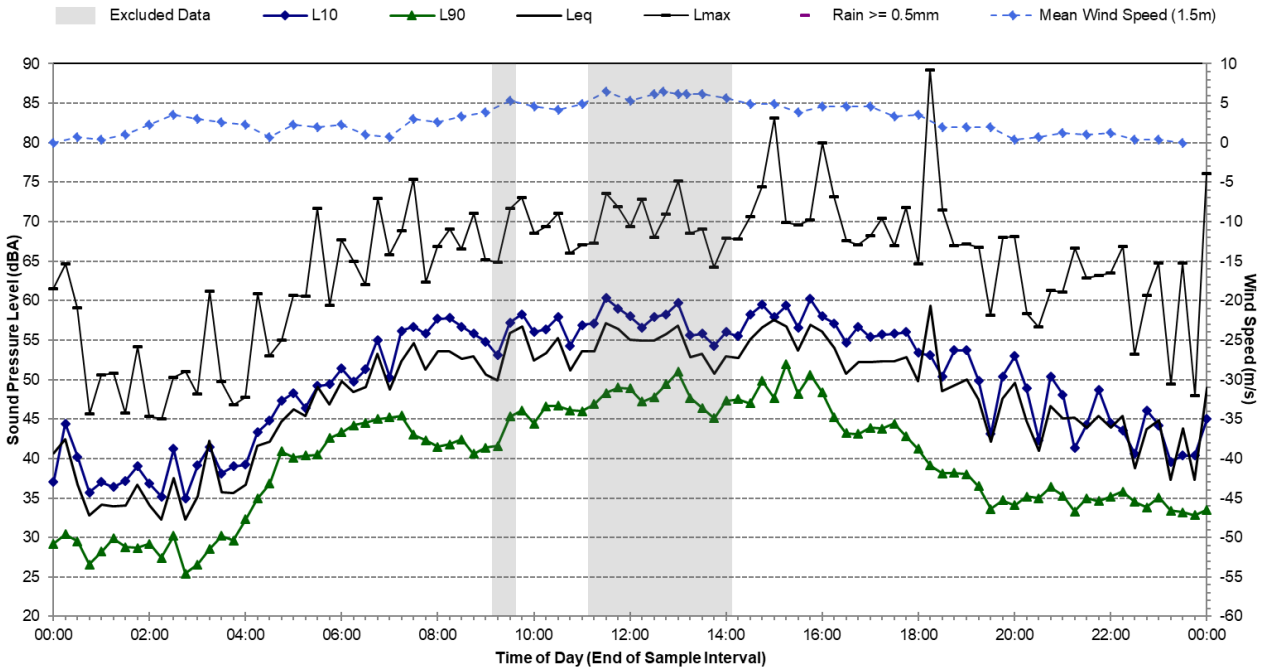
Statistical Ambient Noise Levels

L01 - 18 Stuart Road, West Hoxton Park Road - Monday, 20 August 2018



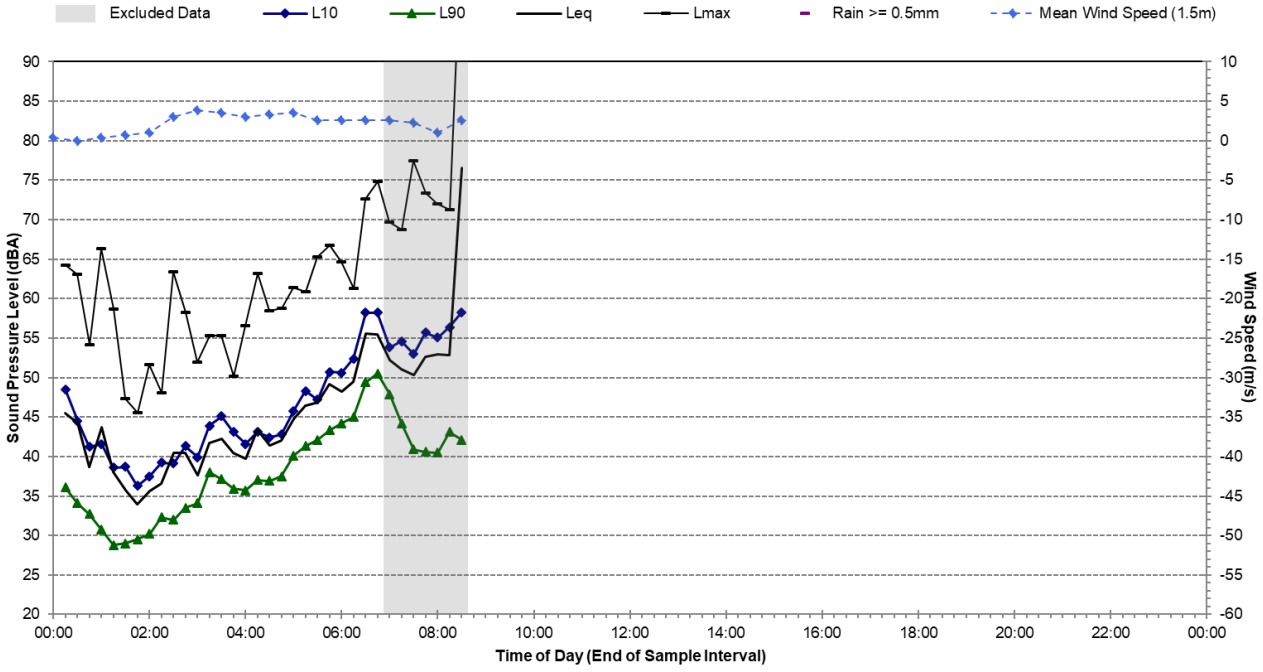
Statistical Ambient Noise Levels

L01 - 18 Stuart Road, West Hoxton Park Road - Tuesday, 21 August 2018



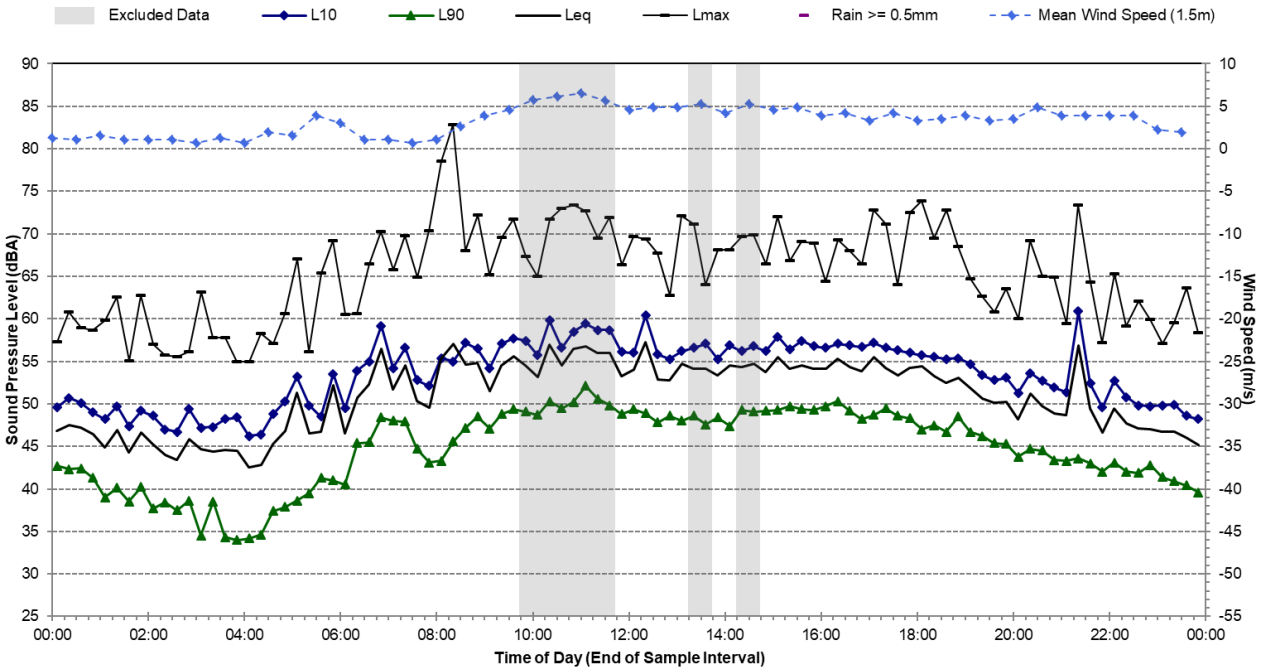
Statistical Ambient Noise Levels

L01 - 18 Stuart Road, West Hoxton Park Road - Wednesday, 22 August 2018



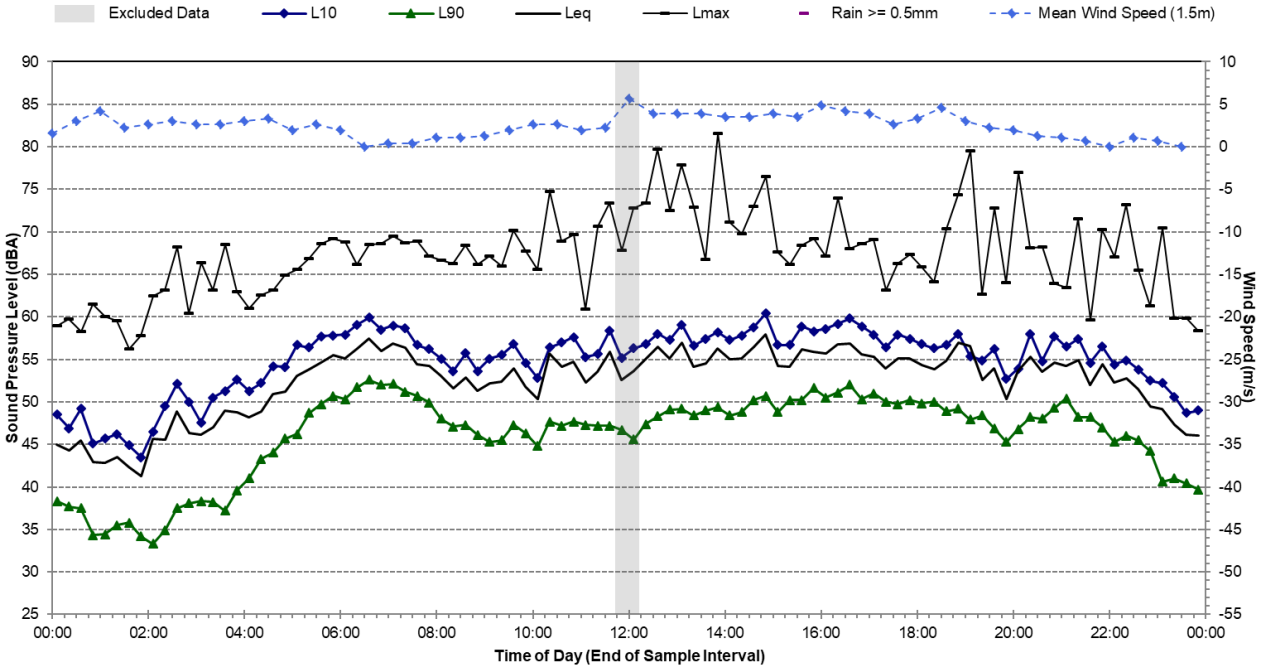
Statistical Ambient Noise Levels

L02 - 12 Bringelly Road, Horningsea Park - Sunday, 12 August 2018



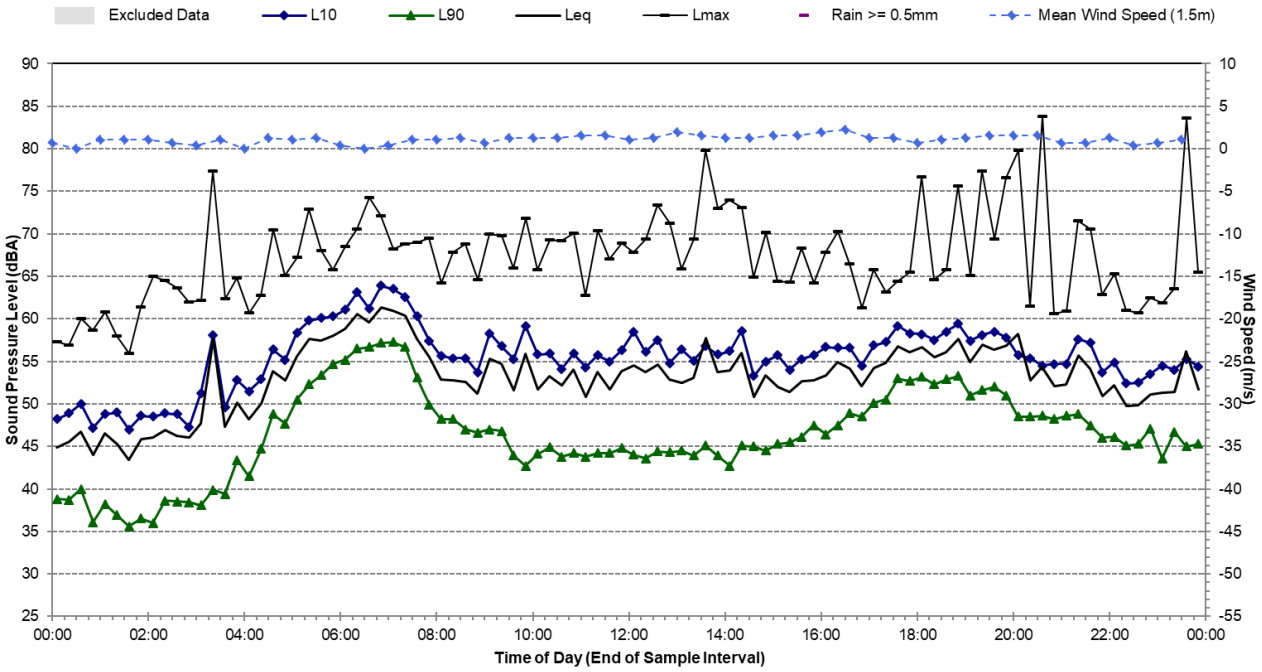
Statistical Ambient Noise Levels

L02 - 12 Bringelly Road, Horningsea Park - Monday, 13 August 2018



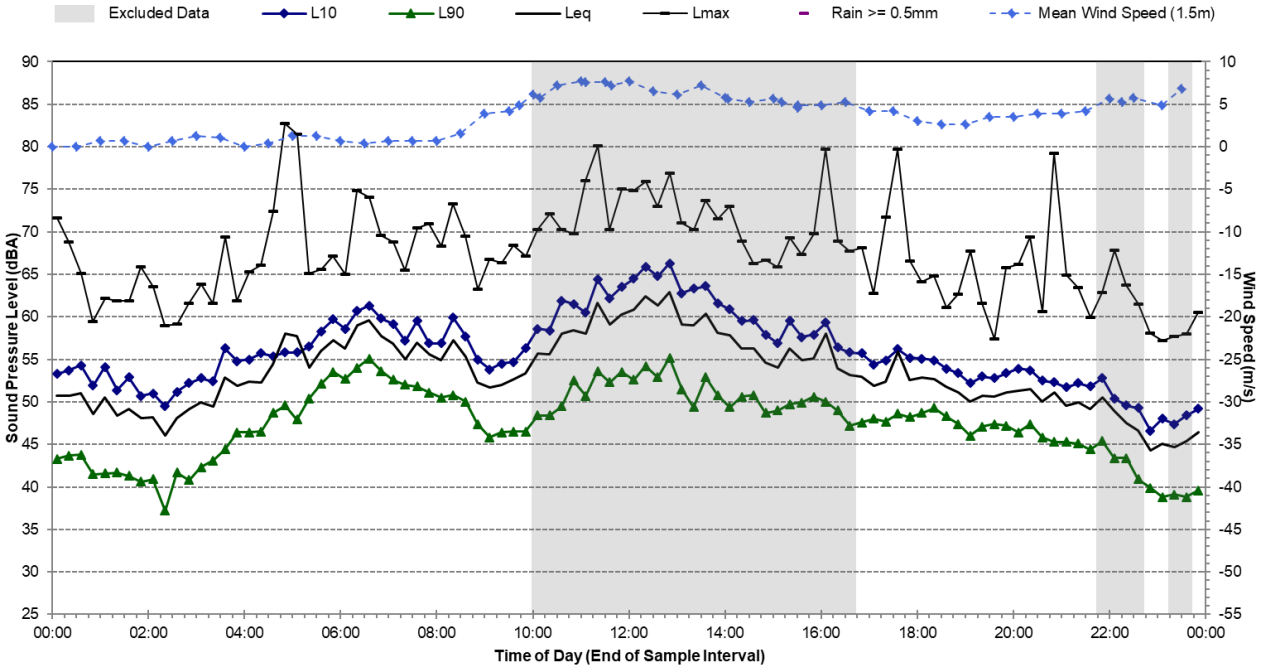
Statistical Ambient Noise Levels

L02 - 12 Bringelly Road, Horningsea Park - Tuesday, 14 August 2018



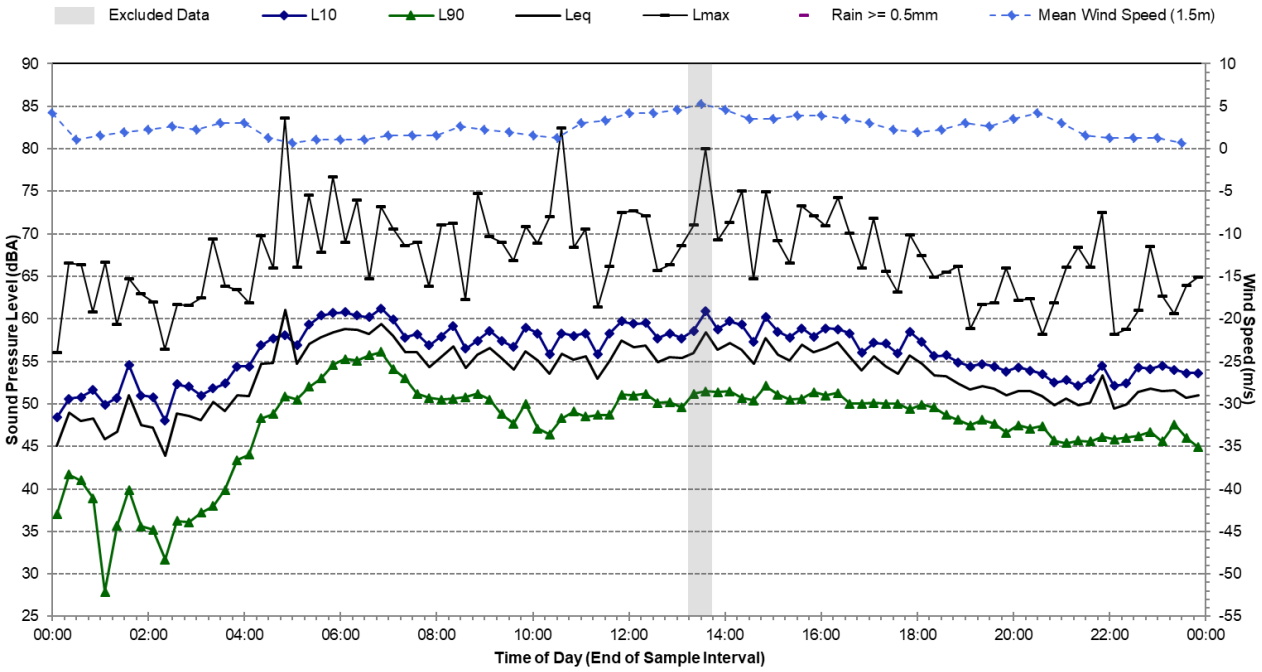
Statistical Ambient Noise Levels

L02 - 12 Bringelly Road, Horningsea Park - Wednesday, 15 August 2018



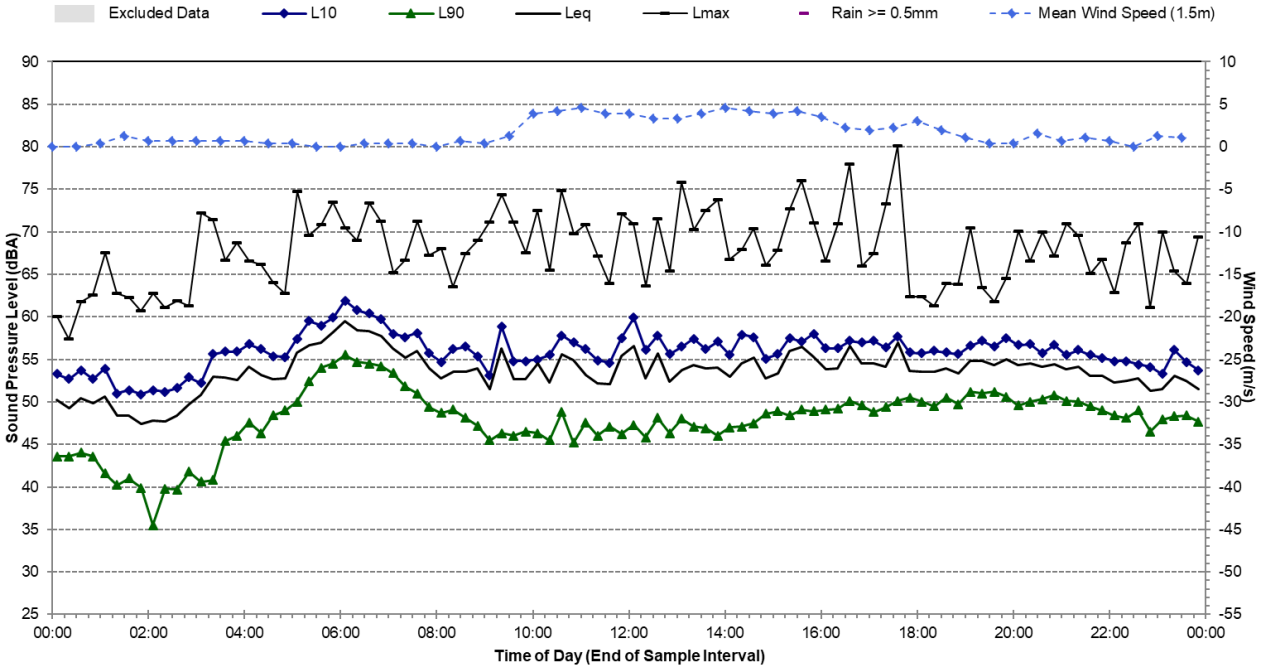
Statistical Ambient Noise Levels

L02 - 12 Bringelly Road, Horningsea Park - Thursday, 16 August 2018



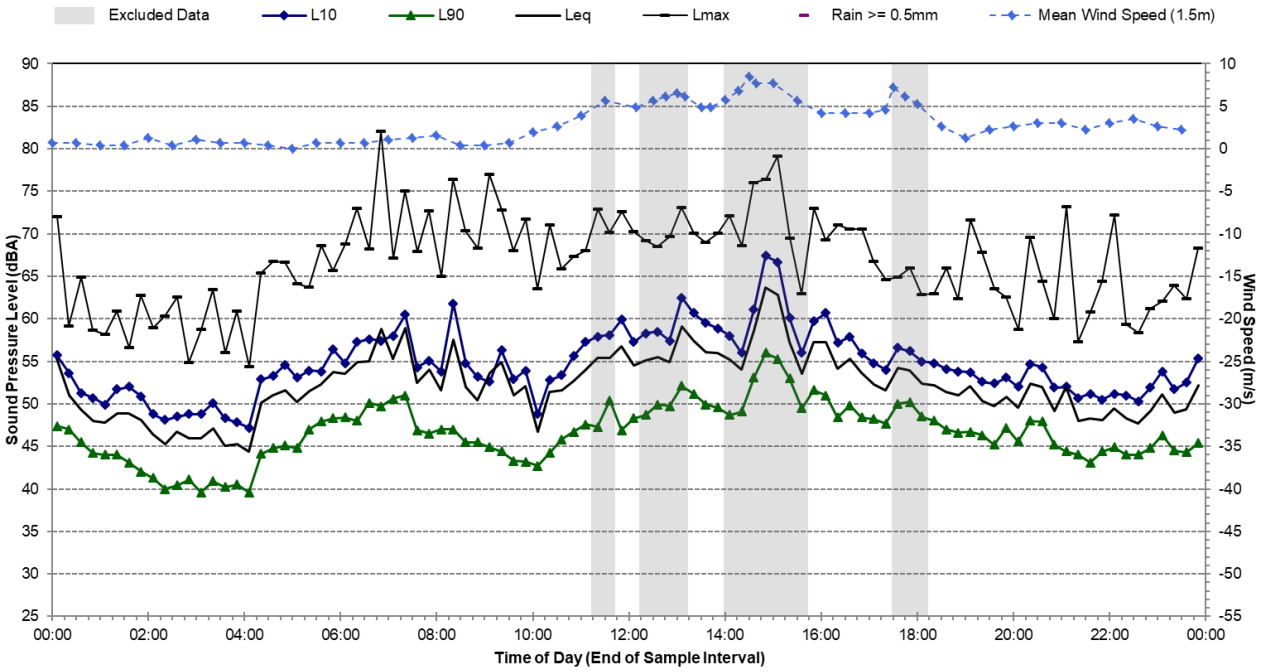
Statistical Ambient Noise Levels

L02 - 12 Bringelly Road, Horningsea Park - Friday, 17 August 2018



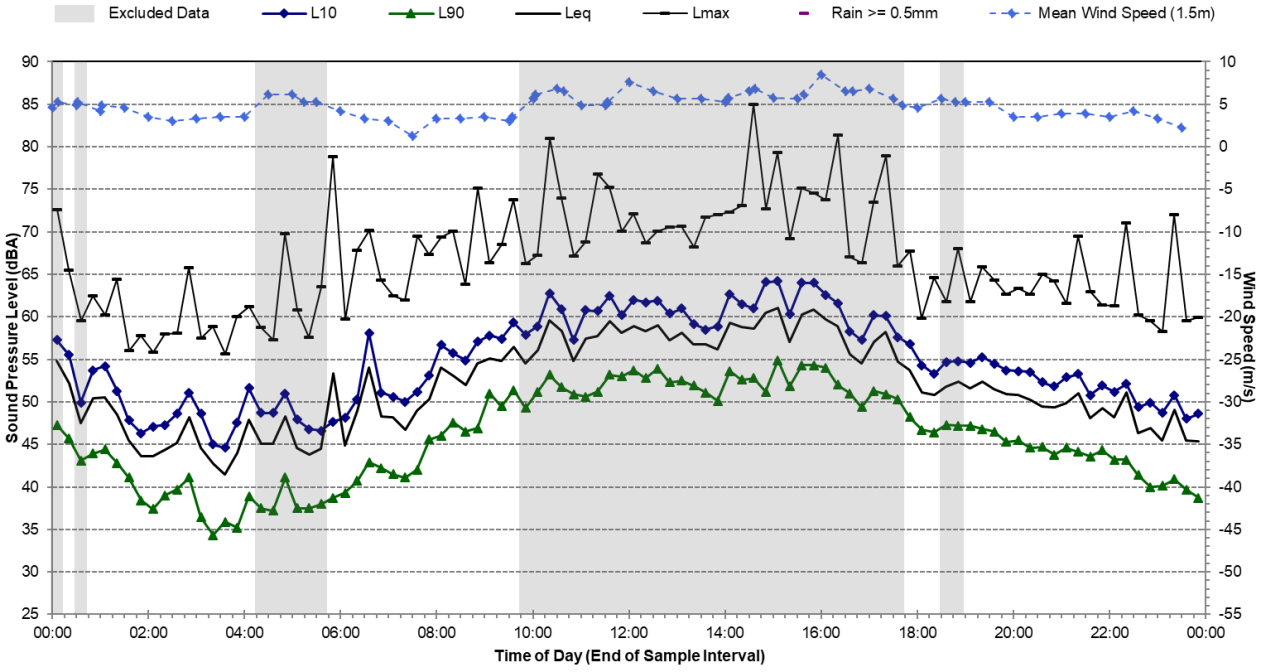
Statistical Ambient Noise Levels

L02 - 12 Bringelly Road, Horningsea Park - Saturday, 18 August 2018



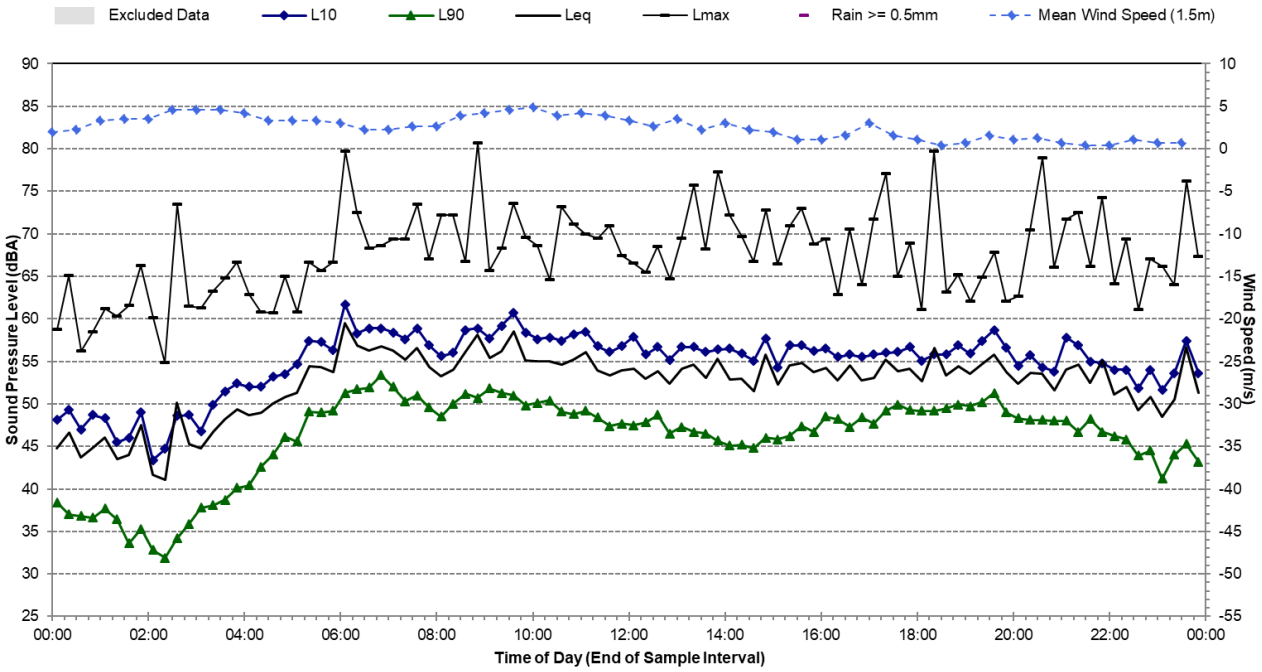
Statistical Ambient Noise Levels

L02 - 12 Bringelly Road, Horningsea Park - Sunday, 19 August 2018



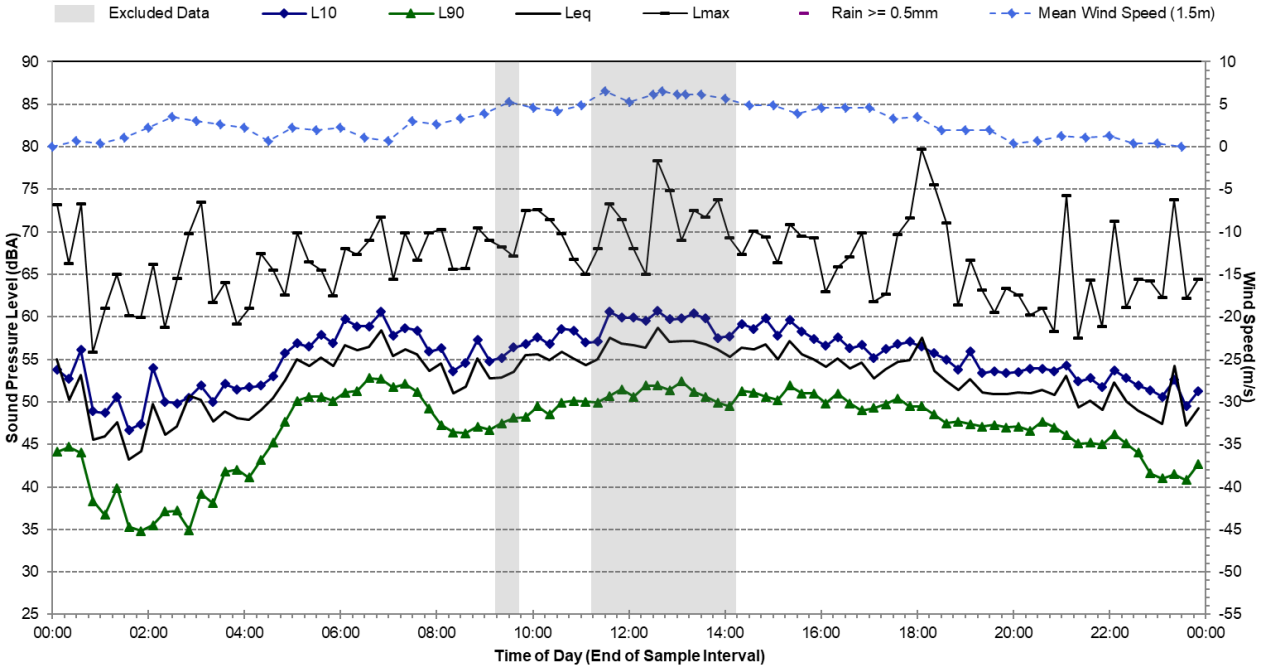
Statistical Ambient Noise Levels

L02 - 12 Bringelly Road, Horningsea Park - Monday, 20 August 2018



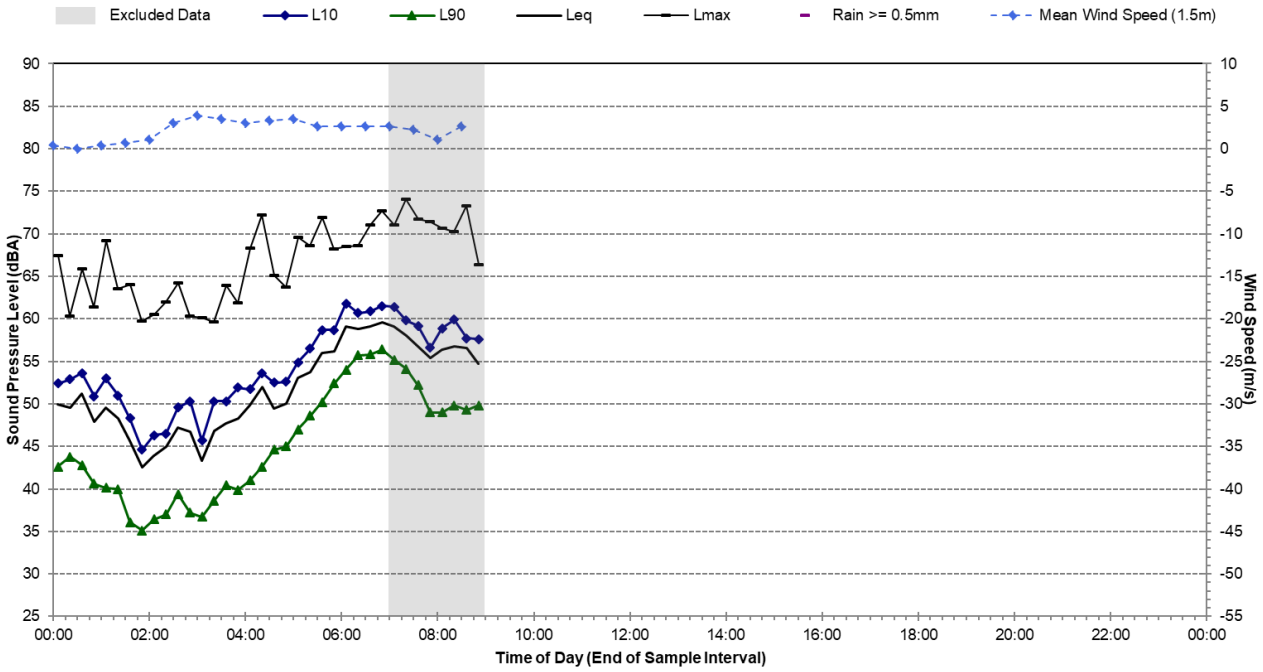
Statistical Ambient Noise Levels

L02 - 12 Bringelly Road, Horningsea Park - Tuesday, 21 August 2018



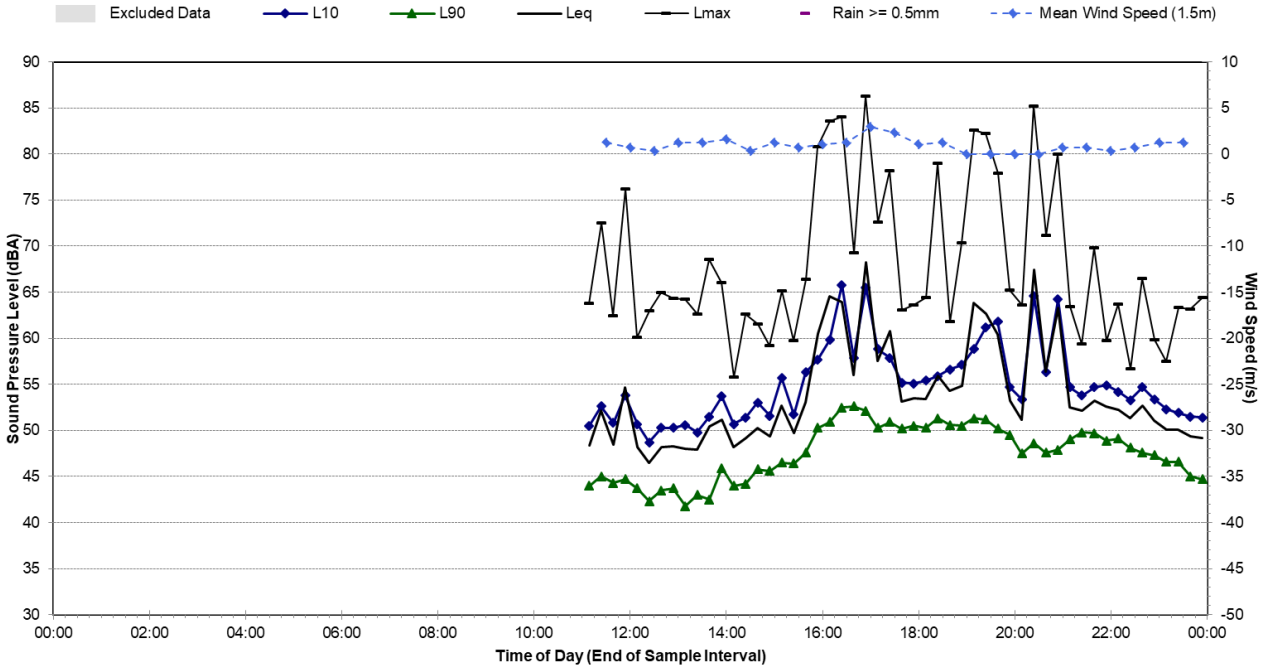
Statistical Ambient Noise Levels

L02 - 12 Bringelly Road, Horningsea Park - Wednesday, 22 August 2018



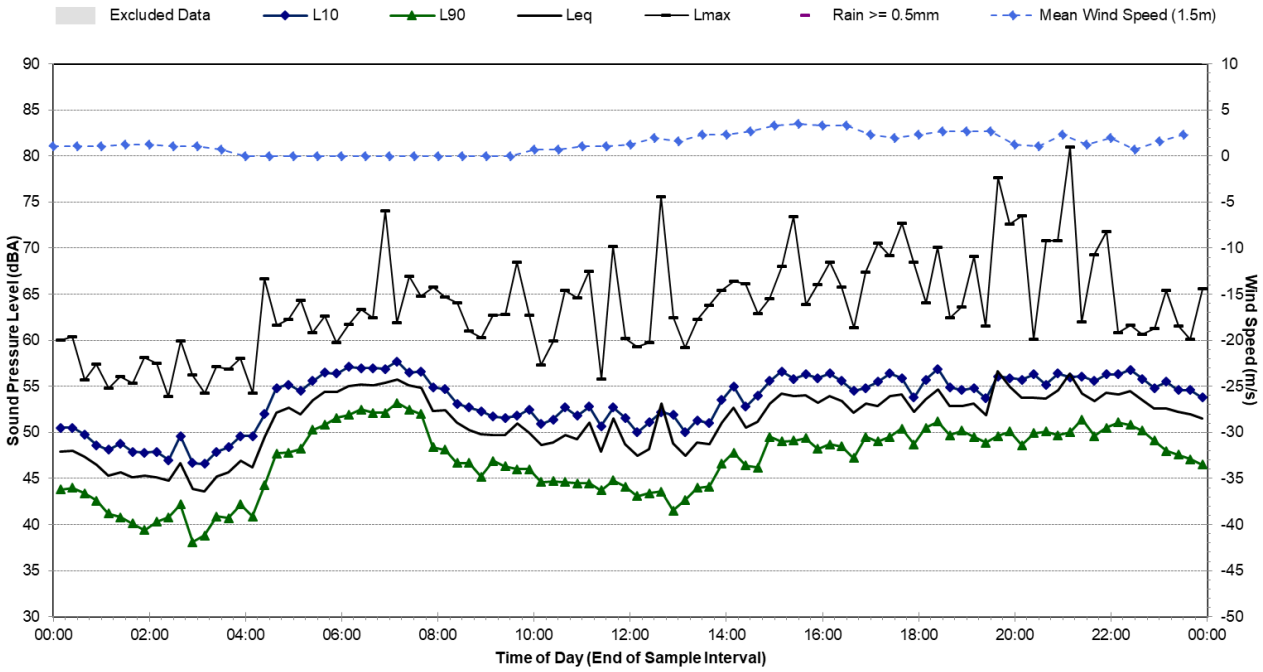
Statistical Ambient Noise Levels

L03 - Stuart Road, Horningsea Park - Thursday, 9 August 2018



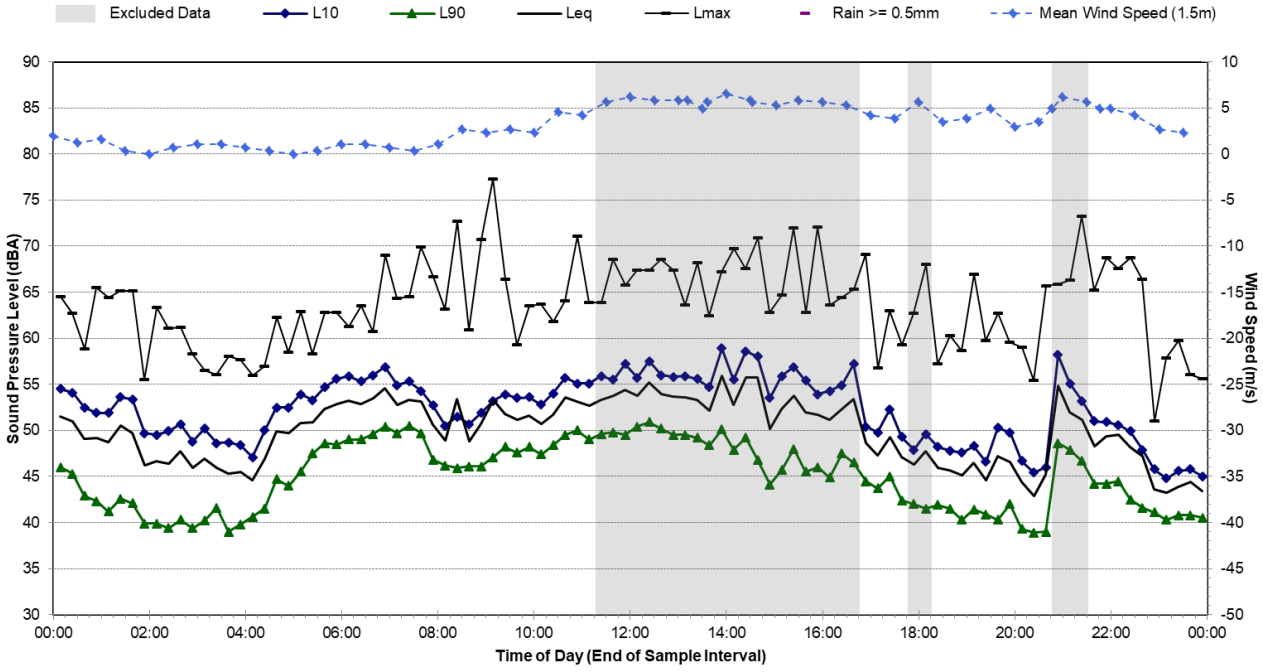
Statistical Ambient Noise Levels

L03 - Stuart Road, Horningsea Park - Friday, 10 August 2018



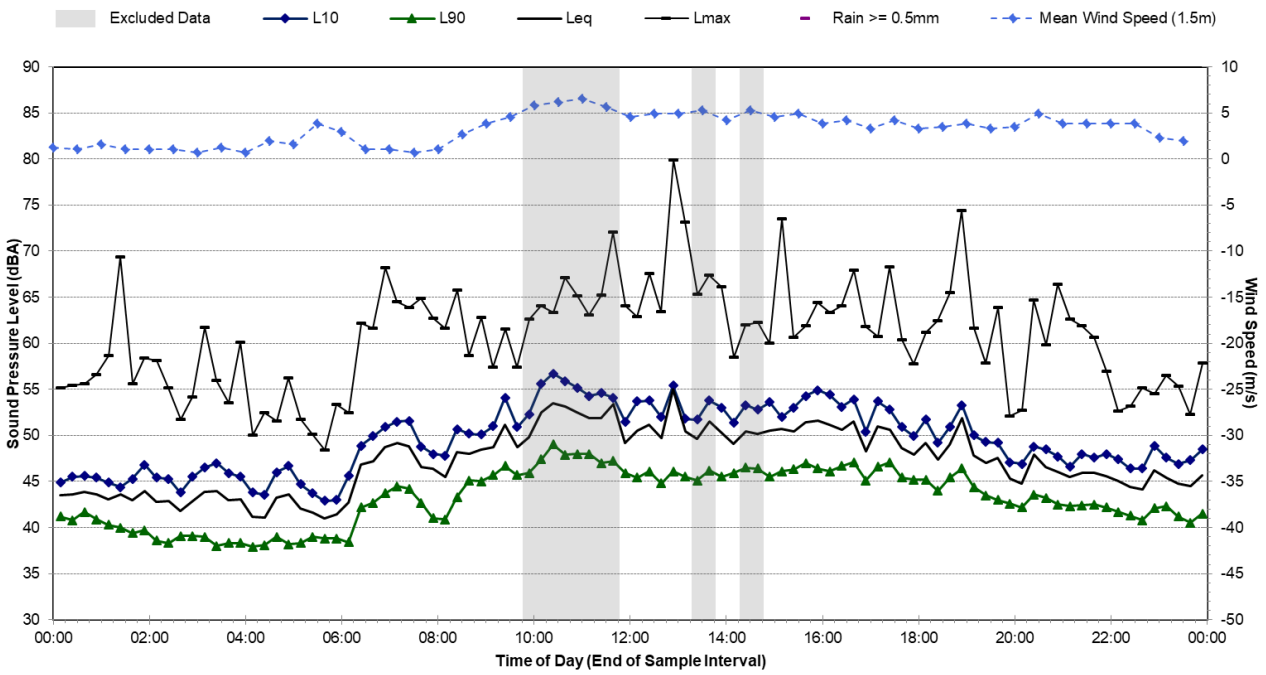
Statistical Ambient Noise Levels

L03 - Stuart Road, Horningsea Park - Saturday, 11 August 2018



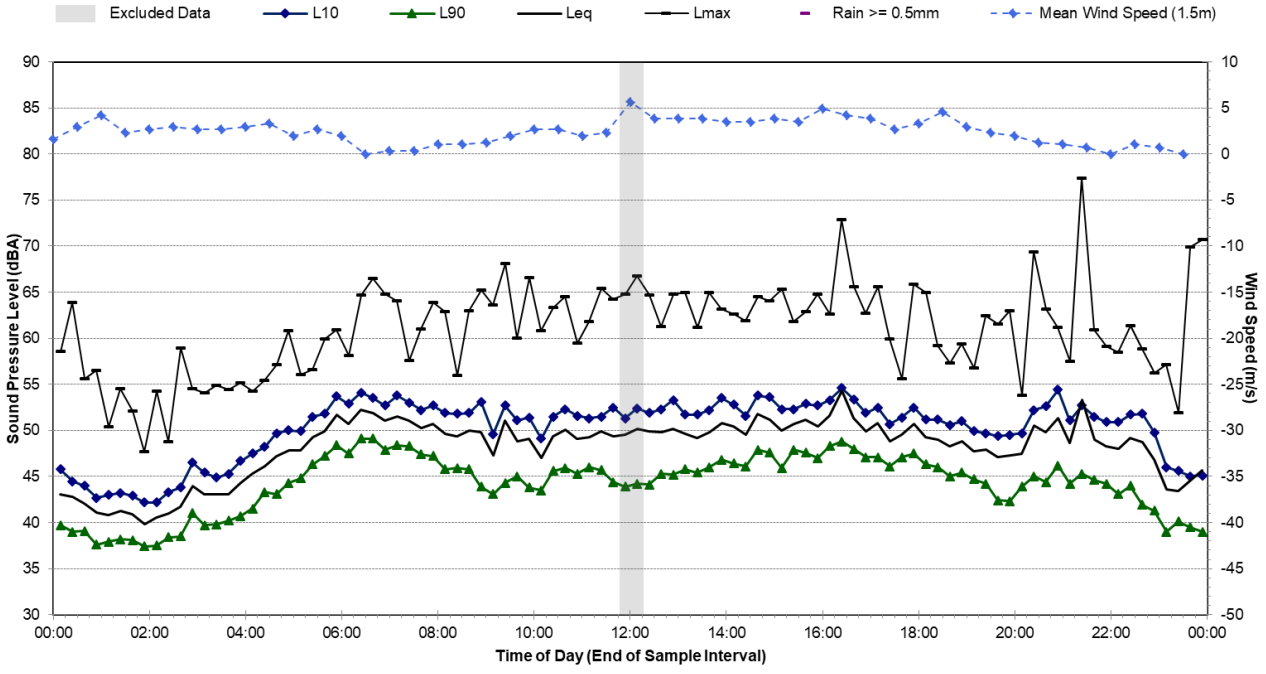
Statistical Ambient Noise Levels

L03 - Stuart Road, Horningsea Park - Sunday, 12 August 2018



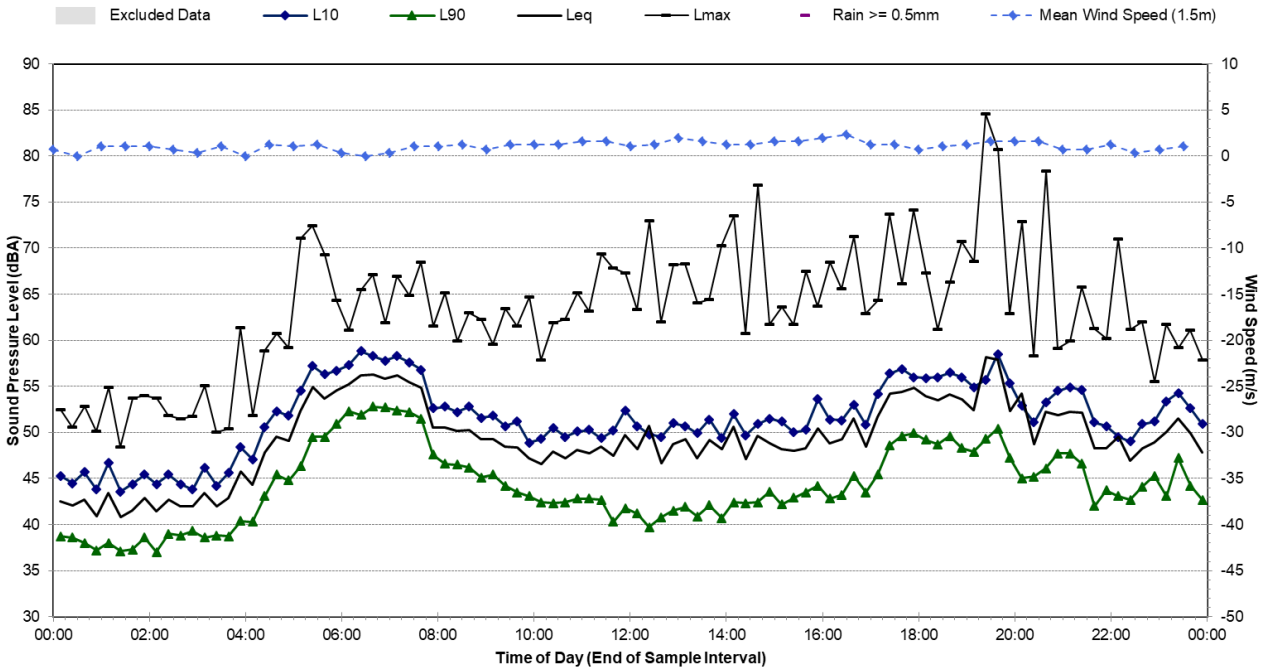
Statistical Ambient Noise Levels

L03 - Stuart Road, Horningsea Park - Monday, 13 August 2018



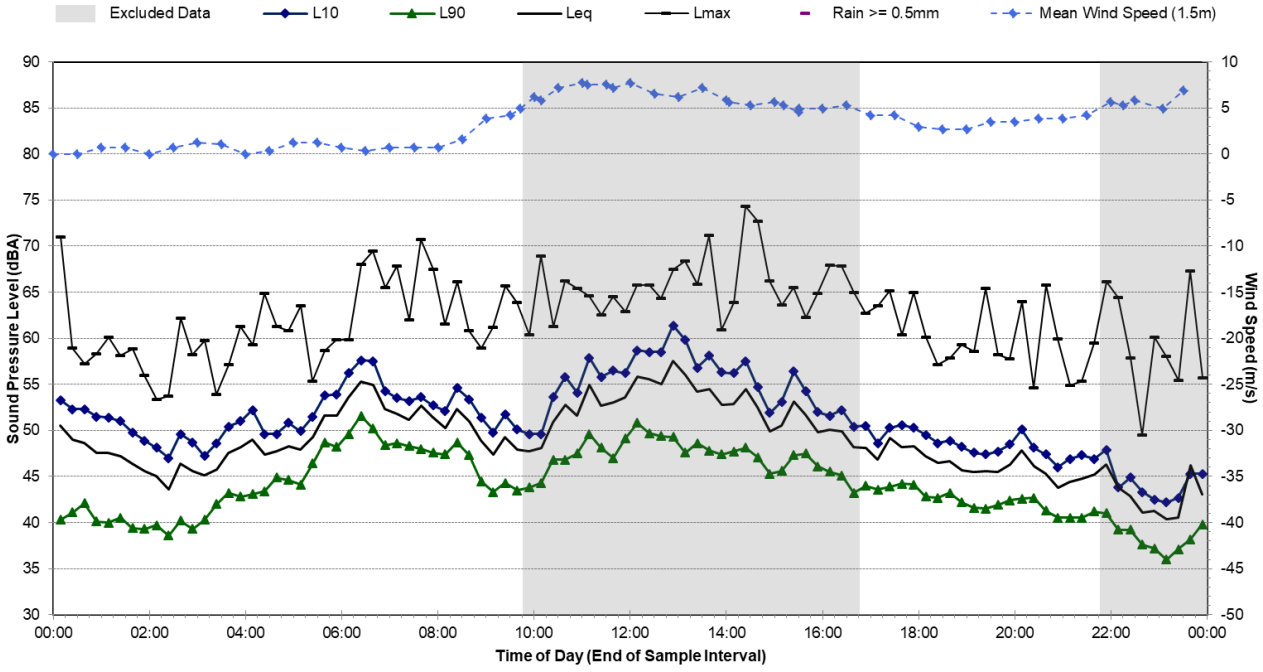
Statistical Ambient Noise Levels

L03 - Stuart Road, Horningsea Park - Tuesday, 14 August 2018



Statistical Ambient Noise Levels

L03 - Stuart Road, Horningsea Park - Wednesday, 15 August 2018



ASIA PACIFIC OFFICES

BRISBANE
Level 2, 15 Astor Terrace
Spring Hill QLD 4000
Australia
T: +61 7 3858 4800
F: +61 7 3858 4801

CANBERRA
GPO 410
Canberra ACT 2600
Australia
T: +61 2 6287 0800
F: +61 2 9427 8200

DARWIN
Unit 5, 21 Parap Road
Parap NT 0820
Australia
T: +61 8 8998 0100
F: +61 8 9370 0101

GOLD COAST
Level 2, 194 Varsity Parade
Varsity Lakes QLD 4227
Australia
M: +61 438 763 516

MACKAY
21 River Street
Mackay QLD 4740
Australia
T: +61 7 3181 3300

MELBOURNE
Level 11, 176 Wellington Parade
East Melbourne VIC 3002
Australia
T: +61 3 9249 9400
F: +61 3 9249 9499

NEWCASTLE
10 Kings Road
New Lambton NSW 2305
Australia
T: +61 2 4037 3200
F: +61 2 4037 3201

PERTH
Ground Floor, 503 Murray Street
Perth WA 6000
Australia
T: +61 8 9422 5900
F: +61 8 9422 5901

SYDNEY
Tenancy 202 Submarine School
Sub Base Platypus
120 High Street
North Sydney NSW 2060
Australia
T: +61 2 9427 8100
F: +61 2 9427 8200

TOWNSVILLE
12 Cannan Street
South Townsville QLD 4810
Australia
T: +61 7 4722 8000
F: +61 7 4722 8001

WOLLONGONG
Level 1, The Central Building
UoW Innovation Campus
North Wollongong NSW 2500
Australia
T: +61 2 4249 1000

AUCKLAND
68 Beach Road
Auckland 1010
New Zealand
T: 0800 757 695

NELSON
6/A Cambridge Street
Richmond, Nelson 7020
New Zealand
T: +64 274 898 628