SSD 10371

Trinity Grammar School Summer Hill Campus - The Renewal Project
Noise Impact Assessment

Prepared for:

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BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Bloompark Consulting (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

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SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
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1 Introduction

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Bloompark Consulting to prepare a Noise Impact Assessment (NIA) which will be submitted to the Department of Planning, Industry and Environment (DPIE) as part of the State Significant Development Application (SSD 10371) for the proposed Renewal Project at Trinity Grammar School (SSD 10371).

This NIA addresses relevant considerations contained in SSDA 10371 Secretary's Environmental Assessment Requirements (SEARs) dated 26 September 2019. The Project is seeking full SSDA approval for the proposed upgrade works, and built form approval for the Trinity Grammar School. As a result, this report predominantly addresses the potential noise impacts associated with the proposed works to the Campus in detail. High level, qualitative commentary is provided in relation to the proposed.

A glossary of acoustic terminology used throughout this report is included as **Appendix A**.

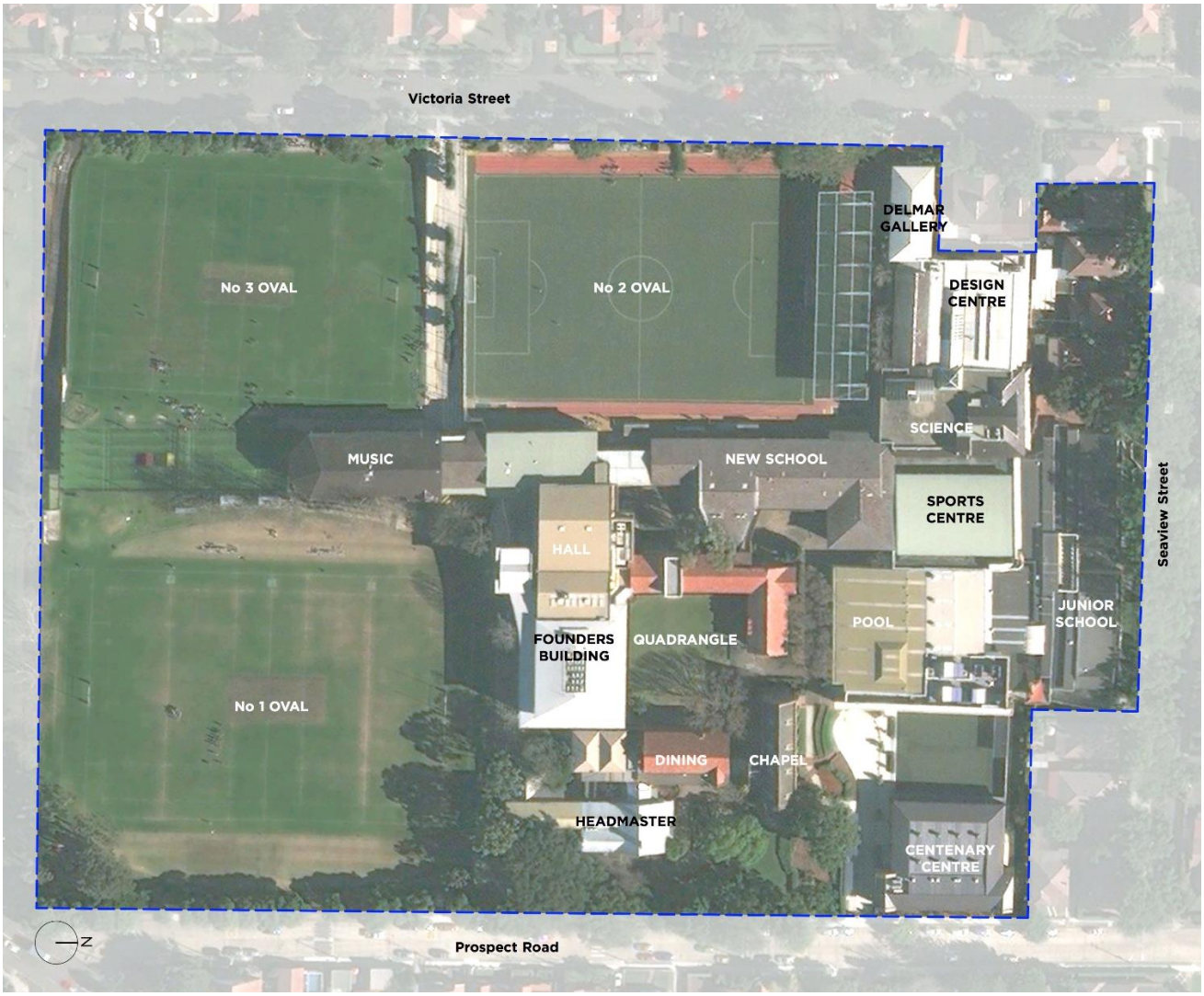
2 Project Description

2.1 Site Overview and Layout

Trinity Grammar School is located in the suburb of Summer Hill in the inner west Sydney region. The school is located between Victoria Street and Prospect Road to the west and east respectively. It is bounded to the south by Yeo Park, and to the north partially bounded by Seaview Street, and partially by a few small residential dwellings.

Figure 1 Site Overview

Figure 2 Site Plan showing proposed development zones



2.2 Description of the Proposal

The project involves the renewal of Trinity Grammar School, shown in **Figure 1**. The relevant works are shown in **Figure 2.** The proposed development seeks detailed built form approval of new teaching and educational facilities, as detailed below:

- New five (5) storey building at the heart of the Campus to accommodate modern, flexible teaching and learning spaces;
- Improve movement and flow for students, with better east-west and north-south links across the school grounds and between levels, including more accessible connections between the Junior School, ovals and car park, and providing strong visual and physical connections;
- Renewal and Refurbishment of existing teaching and learning facilities;
- Reconfiguration and connection of underground car park improve traffic flow for the school drop-off and pick-up zone and improve the safety of boys and visitors who enter the school grounds as pedestrians from Victoria Street;

- New multipurpose pavilion between Ovals 1 and 3 containing a multipurpose space and basketball court;
- Demolition of school-owned residences at 46, 48, 50 and 52 Seaview Street, improving the existing service, maintenance and delivery facilities;
- Improvement and extension to Junior School outdoor teaching area and outdoor assembly area.

Overall, the proposed built form approval seeks to provide a framework for the future physical development of the Campus to ensure the best teaching and learning outcomes, and ongoing evolution of the School.

2.3 Surrounding Environment

The site is located in the suburban area adjacent to Yeo Park in Summer Hill. The site is bounded to the west by Victoria Street which is a residential street; to the east by Prospect Road which is a residential street; to the south by Yeo Park; and to the north by Seaview Street, with a number of residential properties directly bordering the school.

2.4 Potential Noise Impacts

The primary aim of this noise impact assessment is to identify and assess the operational noise impacts that may affect the surrounding environment and noise-sensitive receivers as a result of the proposed works outlined in Section 2.2. The potential noise and vibration impacts which may arise as a result of the proposed works include:

- Operational noise emissions from regular student activities
- Operational noise emissions from out-of-school-hours events and public functions
- Operational noise emissions from onsite mechanical plant and deliveries
- Potential noise and vibration emissions during the construction stage

3 Ambient Noise Environment

3.1 Background Noise Survey

In order to characterise the existing acoustical environment at the nearest sensitive receivers, unattended noise monitoring was conducted between Thursday 14th February and Thursday 21st February 2019 at the locations shown in **Figure 1.** Following collection of this data, it was deemed by SLR that further monitoring was required, and unattended measurements were conducted again at the same locations between Wednesday 30th October and Friday 8th November 2019.

Three 7-day ambient noise measurements were conducted between 30/10/2019 and 08/11/2019 as well as 15-minute attended noise measurements at the locations indicated in **Figure 1** to determine the character of the existing acoustic environment of the local area. Instrumentation for the noise survey included the following:

Table 1 Noise monitoring equipment list

Equipment	Location
Brüel & Kjær 2250L (S/N 3003389) Noise Logger	Location 1 unattended
Brüel & Kjær 2250 (S/N 3004635) Noise Logger	Location 2 unattended
Brüel & Kjær 2250 (S/N 3005904) Sound Level Meter	Location 3 unattended
Brüel & Kjær Calibrator (S/N 3008204)	-

Calibration of the logging devices was checked prior and after the measurements. There was no detectable drift in calibration. All equipment carried appropriate and current manufacturer calibration certificates.

The logging positions were selected to capture a representative sample of the ambient noise character of the site to establish the noise emission criteria.

The measured data has been filtered to remove data affected by adverse weather conditions following reference to the weather reports recorded at the Bureau of Meteorology (BOM) Canterbury weather station.

Daily graphs representing the measured noise data are attached in **Appendix B**. The graphs represent each 24 hour period by incorporating the L_{A10}, L_{A90}, L_{Aeq} and L_{Amax} noise levels for the corresponding 15 minute periods.

3.1.1 Unattended Noise Monitoring

To assess the acoustical implications of the development on the levels of noise received at nearby potentially sensitive receivers, the measured data at the noise logging position was processed in accordance with the Environmental Protection Authority's (EPA) NSW *Noise Policy for Industry* (NPfI).

Table 2 details the Rating Background Level (RBL) and L_{Aeq} noise levels recorded during the daytime, evening and night-time periods. Data affected by adverse meteorological conditions and by spurious and uncharacteristic events has been excluded from the results and were also excluded from the data used to determine the noise emission criteria.

Table 2 Measured Ambient Noise Levels Corresponding to EPA NPfI Assessment Time Periods

Noise Monitoring Location	Period[1]	Measurement Parameter (dBA)	
		L_{A90} (RBL)[2]	L_{Aeq} [3]
Location 1	Daytime	44	64
	Evening	41	58
	Night-time	35	53
Location 2	Daytime	42	59
	Evening	40	57
	Night-time	35	53
Location 3	Daytime	43	60
	Evening	42	57
	Night-time	34	52

Note 1: For Monday to Saturday, Daytime 7:00 am - 6:00 pm; Evening 6:00 pm - 10:00 pm; Night-time 10:00 pm - 7:00 am.

On Sundays and Public Holidays, Daytime 8:00 am - 6:00 pm; Evening 6:00 pm -10:00 pm; Night-time 10:00 pm - 8:00 am.

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

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

3.1.2 Attended Noise Monitoring

Operator attended noise monitoring measurements provide a context and noise level characteristics for the unattended noise measurements. A summary of the attended measurements is tabulated in **Table 3**

Table 3 Operator Attended 15-minute Ambient Noise Survey

Location/ Description	Date/ Start time/ Weather	Primary Noise Descriptor (dB re 20 µPa)			Description of Noise Emission, Typical Maximum Levels L_{Amax} (dB)
		L_{AFmax}	L_{AFmin}	L_{Aeq}	
Location 1	21/02/2019 10:35am	90	61	73	Recess. Junior + senior school playing basketball.
Location 2	21/02/2019 10:25am	84	59	68	Recess. Junior + senior school playing basketball.
Location 3	21/02/2019 10:15am	73	54	61	Steady state mechanical.
Location 4	21/02/2019 10:20am	74	52	61	Students playing. Truck reverse beeping.

4 Noise Assessment Criteria

4.1 Secretary's Environmental Assessment Requirements (SEARs)

This NIA addresses relevant considerations contained in the SSDA 10371 SEARs dated 26 September 2019 as shown in **Table 4.**

Table 4 Project Related Noise and Vibration SEARs – SSDA 10371

Condition		Location Addressed in this Report
12.	**Noise and vibration**	-
-	Identify and assess operational noise, including consideration of any public-address system, school bell, mechanical services (e.g. air conditioning plant), use of any school hall for concerts etc. (both during and outside school hours) and any out of hours community use of school facilities, and outline measures to minimise and mitigate the potential noise impacts on surrounding occupiers of land.	**Section 5**
-	Identify and provide a quantitative assessment of the main noise and vibration generating sources during demolition, site preparation, bulk excavation, construction. Outline measures to minimise and mitigate the potential noise impacts on surrounding occupiers of land.	**Section 7**

4.2 Operational Noise – Noise Policy for Industry

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

4.2.1 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'.

4.2.1.1 Project Noise Trigger Levels

The noise emission trigger levels for industrial noise generated by the proposal are provided in **Table 5**. The Project 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 5 Project Noise Trigger Levels for Surrounding Receivers

Receiver Type	Time of Day	Recommended Amenity Noise Level (dBA)	Measured Noise Level (dBA)		Project Noise Trigger Levels L_{Aeq}(15minute) (dBA)	
			RBL[1]	**L_{Aeq}(period)**	**Intrusiveness**	**Amenity[2,3]**
Residential 1 (Victoria Street)	Day	55	44	64	**49**	50
	Evening	45	41	58	46	**40**
	Night	40	35	53	40	**35**
Residential 2 (Seaview Street)	Day	55	42	59	**47**	50
	Evening	45	40	57	45	**40**
	Night	40	35	53	40	**35**

Note 1: RBL = Rating Background Level.

Note 2: The recommended amenity noise levels have been used as the project amenity noise levels as there are no other industries present or likely to be introduced.

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

Two sets of project specific criteria (Residential 1 and Residential 2) were derived individually from noise loggers L01 and L02 (shown in **Table 5**) to ensure that each affected residential receiver's existing ambient noise level was represented accurately.

The "Residential 1" group refers to the houses opposite the two ovals on Victoria Street, whereas residential receivers on Seaview Street are to be assessed to the "Residential 2" category.

4.3 Operational Noise Criteria

At the current time there is no standard process or guideline in NSW to derive noise criteria for the assessment of potential noise impacts from proposed educational facilities (excluding the NPfI for the industrial noise source component). As such, different criteria have been nominated to assess potential operational noise impacts from the proposed Project accompanied by a discussion of their suitability.

4.3.1 Operational Noise – Outdoor Play Areas

Given the similarities between educational facilities and Child Care Centres in terms of land use, business hours and general operations (ie playtime hours etc), the duration of exposure to potential noise impacts at nearby noise-sensitive receivers is predicted to be similar. For this reason, the AAAC's *"Guideline for Child Care Centre Acoustic Assessment"* has been adopted to assess potential noise impacts from the Project's proposed outdoor play areas. The following points shall be considered:

- For most Child Care Centres, as the duration of time that children are allowed to play outside is reduced, the overall noise impact reduces. Therefore, it is reasonable to allow a higher level of noise impact for a shorter duration of outdoor play.
- A total time limit of approximately 2 hours outdoor play per day is regarded as reasonable grounds for the allowance of an additional 5 dB emergence above the background level.

The criteria is summarised in **Table 6**

Table 6 Operational Noise Criteria – Outdoor Play Areas

Assessment Location	Duration	Time of Day	Measured RBL L_{A90}	Criteria ($L_{Aeq(15minute)}$)	Comments
Nearest noise-sensitive receiver[1]	Up to 2 hours (total) per day	Daytime	42	52	The LAeq noise level emitted from the outdoor play area shall not exceed the background noise level by more than 10 dB.
	More than 2 hours per day	Daytime	42	47	The LAeq noise level emitted from the outdoor play area shall not exceed the background noise level by more than 5 dB.

Note 1: The assessment location is defined as the most affected point on or within any residential receiver property boundary.

4.3.2 Operational Noise – Noise Impacts from OOSH Events

After a comprehensive review of criteria historically used to characterise and assess potential noise impacts from events outside of business hours, in conjunction with past experience in State Significant educational facility acoustic assessments, SLR recommends the following criteria be used:

Table 7 Operational Noise Criteria – OOSH Events

Day	Time Period	Recommended Criteria	Residential Criteria (dBA)
Monday to Sunday	07:00 – 23:00	$L_{Aeq(15min)}$ must not exceed RBL + 5 dB	45
	23:00 – 07:00	$L_{Aeq(15min)}$ must not exceed RBL	39

This is based upon noise goals outlined in the EPA "*Noise Guide for Local Government*" and other known similar assessments that have been approved within the Sydney Metropolitan area.

4.4 Construction Noise Criteria – NSW Environment Protection Authority

4.4.1 NSW Interim Construction Noise Guideline

The NSW *Interim Construction Noise Guideline* (ICNG) sets out ways to assess and manage the impacts of construction noise on residences and other sensitive land uses. It does this by presenting assessment approaches that are tailored to the scale of the construction works.

The ICNG requires project specific Noise Management Levels (NMLs) to be established for noise affected receivers. The NMLs are not mandatory limits, however in the event construction noise levels are predicted to be above the NMLs, feasible and reasonable work practices are to be investigated to minimise noise emissions.

4.4.1.1 Residential Receivers

The ICNG provides an approach for determining NMLs at sensitive receivers based on RBL for the area, as described in **Table 8**.

Table 8 Determination of NMLs for Residential Receivers

Time of Day	NML [1] $L_{Aeq(15minute)}$	How to Apply
Standard hours [2] Monday to Saturday 7:00 am to 5:00 pm No work on Sundays or public holidays	RBL + 10 dBA	• 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 dBA	• 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 dBA above the noise affected level, the proponent should negotiate with the community.

Note 1 The RBL is the overall single-figure background noise level measured in each relevant assessment period (during or outside the recommended standard hours). The term RBL is described in detail in the NSW *Noise Policy for Industry*.

Note 2 These are not the standard hours as defined by the ICNG, however have been provided to SLR as the standard hours for Bayside Council, which the project is seeking to comply with.

4.4.1.2 Sleep Disturbance

Where construction is expected to occur during the night-time, it is necessary to consider the potential for sleep disturbance. In addition to the ICNG NMLs, guidance in relation to sleep disturbance is contained in the EPA's *Noise Policy for Industry* (NPfI). Although the sleep disturbance criteria in the NPfI is with respect to industrial sources of noise, it is also considered appropriate for assessing potential sleep disturbance impacts from construction noise.

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 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 may happen during the night-time.

The NPfI also refers to the NSW EPA *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.

4.4.2 Noise Management Level Summary

The NMLs and sleep disturbance criterion applicable to construction noise from the project are detailed in **Table 9**.

Table 9 NMLs and Sleep Disturbance Criterion for Construction Noise

Location	Standard Construction Hours (dBA) $L_{Aeq(15minute)}$	Out of Hours (dBA) $L_{Aeq(15minute)}$			Sleep Disturbance Screening, dBA L_{Amax}
	Daytime	**Evening** [1]	**Night-time**	**Highly Noise Affected**	
Location 1	54	51	45	75	50
Location 2	52	50	45	75	50

Note 1: This refers to the period on Monday – Saturday 5:00 pm - 10:00 pm.

4.5 Construction Vibration

The construction of the project would involve intermittent sources of vibration which may result in two main types of vibration impact: disturbance at receivers and cosmetic/structural damage to buildings.

As a guide, safe working distances for items of vibration intensive plant likely to be used at the project are provided in the RMS CNVG and are reproduced below in **Table 10**.

Table 10 Recommended Safe Working Distances for Vibration Intensive Plant

Plant Item	Rating/Description	Safe Working Distance	
		Cosmetic Damage (BS 7385)	**Human Response (NSW EPA Vibration Guideline)**
Vibratory Roller	< 50 kN (Typically 1-2t)	5 m	15 m to 20 m
	< 100 kN (Typically 2-4t)	6 m	20 m
	< 200 kN (Typically 4-6t)	12 m	40 m
	< 300 kN (Typically 7-13t)	15 m	100 m
	> 300 kN (Typically 13-18t)	20 m	100 m
	> 300 kN (Typically > 18t)	25 m	100 m
Small Hydraulic Hammer	300 kg - 5 to 12t excavator	2 m	7 m
Medium Hydraulic Hammer	900 kg - 12 to 18t excavator	7 m	23 m
Large Hydraulic Hammer	1600 kg - 18 to 34t excavator	22 m	73 m
Vibratory Pile Driver	Sheet piles	2 m to 20 m	20m to 100 m
Pile Boring	≤ 800 mm	2 m (nominal)	4 m
Jackhammer	Hand held	1 m (nominal)	2 m

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

The safe working distances presented above are quoted for both cosmetic damage (refer to BS7385:2 *Evaluation and Measurement for Vibration in Buildings Part 2: Guide to Damage Levels from Ground-borne Vibration*, 1993) and human comfort (refer to NSW EPA *Assessing Vibration: a technical guideline*, 2006).

The distances are noted as being indicative and would vary depending on the particular item of plant and local geotechnical conditions. It is noted that the distances apply to addressing the risk of cosmetic damage (ie minor – easily reparable) to typical buildings under typical geotechnical conditions

5 Operational Noise Impacts

Potential noise impacts from the following operational scenarios have been assessed at the surrounding noise-sensitive receivers. Trinity Grammar School have provided detailed information regarding the facility usages in the document titled 'Trinity Grammar School Indicative Usage' dated 25th October 2019. Potential noise impacts include:

- Noise impacts from standard operations (ie noise from outdoor play areas during school hours).
- Noise impacts from OOSH indoor operations (ie noise from out-of-school-hours events located within the hall or sporting buildings such as the new Multi-Purpose Pavilion).
- Noise impacts from the new delivery area along Seaview Street.
- Noise impacts from mechanical plant and school related equipment (ie school bells and public address (PA) systems).

5.1 Noise Impact Assessment – Outdoor Play

SLR has undertaken an assessment in accordance with the methodology in the AAAC's *"Guideline for Child Care Centre Acoustic Assessment"* for the outdoor areas, based on the expected future occupancy of the outdoor areas adjacent to Victoria Street and Seaview Street.

As the occupancy levels of the outdoor areas along Victoria Street are not expected to significantly change, an assessment is not required as the existing noise levels at nearby receivers will not be impacted by the redevelopment.

Similarly, while the Junior School play area is expanding along Seaview Street, occupancy of the play area is not expected to change significantly, and noise from outdoor play will be simply spread out over a larger area.

For the above reasons, SLR has not deemed it necessary to conduct a specific assessment of outdoor play area noise. Existing treatments, orientation and measures are expected to suffice.

5.2 Noise Impact Assessment – Hall Operations

There are not expected to be any significant changes to operation or use of the school hall, for typical operations or out-of-school-hours operations. Therefore, SLR does not believe an assessment of hall operations is relevant for the purposes of this report.

5.3 Noise Impact Assessment – Multi-purpose Pavilion and other indoor sporting facilities

A primary potential noise generating space associated with the new development is from use of the Pavilion building which contains two new basketball courts. The northern façade contains doors that are able to be stacked to one side, which would allow noise breakout to surrounding receivers.

Since Oval 3 is positioned closer to neighbouring residents along Victoria Street, and Oval 1 is located closer to residents across Prospect Road, the addition of the new Pavilion is not likely to increase noise levels at the nearest receiver locations. It is expected that existing noise levels from the two adjacent ovals will be greater or equal to that of the Pavilion basketball courts, and at similar operating hours (Weekday and Saturday daytime periods).

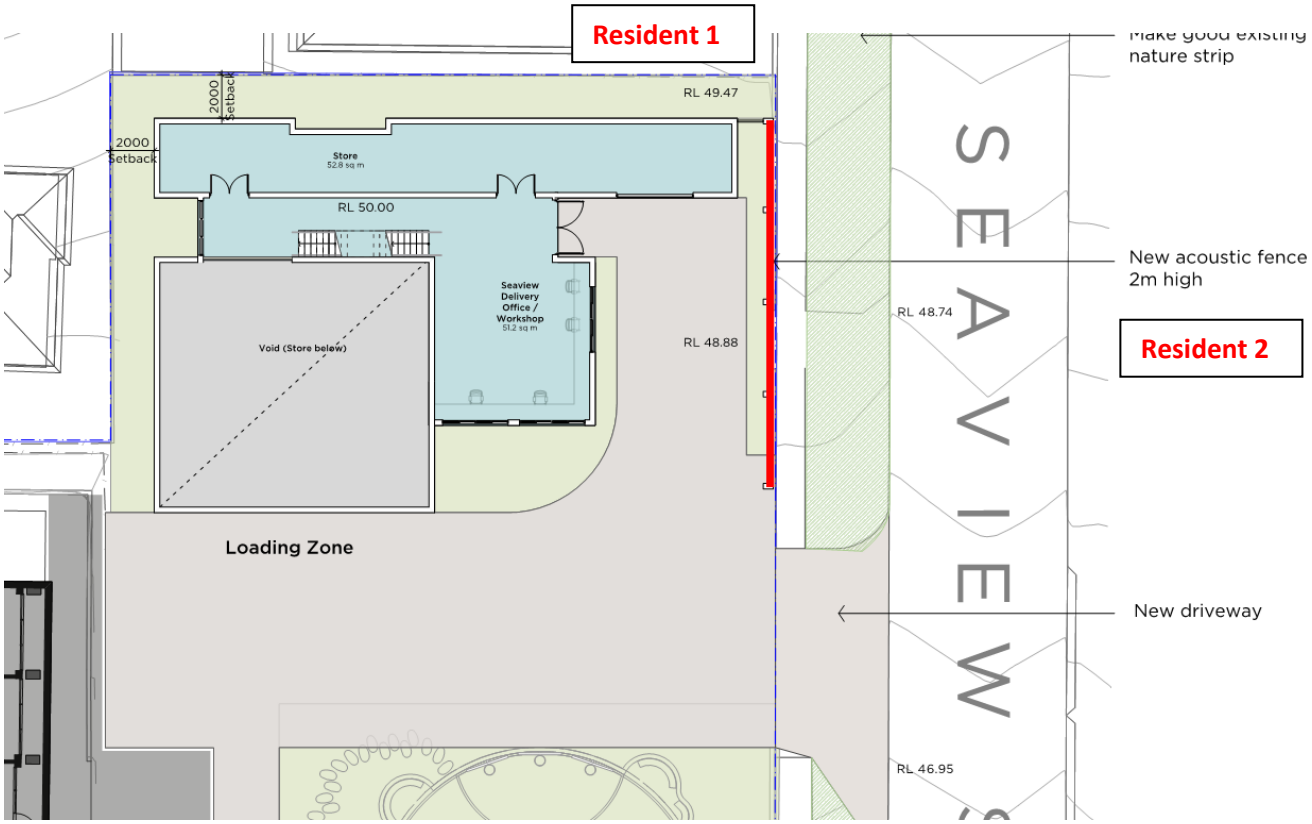
As a result, SLR expects noise increases at neighbouring residents from the new indoor basketball courts to be negligible, and therefore has not conducted a further assessment of noise levels.

5.4 Noise Impact Assessment – Deliveries along Seaview Street

The intended use of the Seaview Delivery Office is to support deliveries during school operating hours only, including couriers, suppliers and materials. It should also be noted that currently rubbish and waste is facilitated at this location. Under the proposed design changes, this will be moved to Yeo Park service area, thus reducing the impact of noise from these larger vehicles compared to existing.

Vans and small Pantech trucks are proposed to utilise the delivery area shown in **Figure 3.**

Figure 3 Seaview Delivery Office Layout



The following typical delivery noise sources, as detailed in **Table 11**, have been used in the noise model as part of the industrial noise assessment. The 'NPFI Modifying Factor' column shows that a 5dB penalty (increase) in level has been applied to reverse beepers due to the tonal nature of the reverse beeper. Similarly, a 5dB modifying factor has been used for the air brakes as the noise is impulsive in nature.

Table 11 Delivery Source Noise Levels

Noise Source	SWL (dBA)	Expected Duration (s)	NPfI Modifying Factor (dBA)
Small van/truck entering and leaving	102	120	0
Larger heavy rigid vehicle entering and leaving (Scenario 2 only)	106	120	0
Air brakes (Scenario 2 only)	115	2	5 (impulsive)
Truck Reversing	97	30	0
Reverse Beeper	107	30	5 (tonality)

Noise predictions have been based on the following delivery vehicle movement numbers:

- Day: four per hour (equivalent to one per 15min assessment period)
- Evening: nil
- Night: nil

The predictions within this report are based on the number of movements above and appropriate operational management measures should be put in place to ensure these are correct to prevent actual noise emissions being higher than predicted. It is expected that deliveries would be less than the above numbers, but SLR have assumed one delivery in a 15-minute daytime period to be a valid assessment parameter.

The operational noise level due to use of the loading area has been predicted to the nearest receivers. The noise levels are summarised in **Table 12**.

Table 12 Operational noise levels of loading scenarios without mitigation

Nearest Receiver Locations	Period		$L_{Aeq(15minute)}$ Noise Level (dBA)			Compliance?
		Project Noise Trigger Level	Predicted at Resident 1 [1]	Predicted at Resident 2 [2]	Worst Case Exceedance	
Scenario 1: Small/Medium truck using Seaview Delivery	Day	47	40	55	8	No
Scenario 2: Large truck using Seaview Delivery	Day	47	49	61	14	No

Note 1: Resident 1 identified as adjacent receiver at 54 Seaview Street.

Note 2: Resident 2 identified as receiver across the road at 138 Victoria Street.

As exceedances are anticipated at some of the nearest receivers during daytime assessment periods, noise mitigation is required to be investigated to minimise noise emissions from the operation of the Seaview delivery area. **Table 13** summarises the potential mitigation measures that could be used to reduce noise emissions. The Seaview Delivery Office building provides shielding from 54 Seaview Street, but a barrier or other mitigation measure will be required to mitigate noise impact to 138 Victoria Street.

Table 13 Seaview Delivery Mitigation Review

Location	Mitigation Measure	Potential Reduction	Discussion
Source	Remove the need for reversing alarms within the Loading Dock	-2 dBA	Not Recommended. Not considered feasible on the grounds of safety in the Loading Dock.
Source	Management measure to permit only vehicles with broadband reversing alarms to use the Loading Dock	-2 dBA	Recommended. Considered feasible and reasonable.
Source	Remove the 'airbrake' noise source contribution	-1 dBA	Not Recommended. Not considered feasible. It is not believed HRVs can operate without this gas release.
Source	Relocate heavy rigid vehicle deliveries to an alternate location	-5 to -10 dBA	Recommended. Standard mitigation measures would not reduce levels sufficiently to allow Scenario 2 operations to comply. SLR recommends an alternate location for HRV vehicle deliveries, and only small to medium delivery vehicles utilise the Seaview Delivery Office.
Path	Break line-of-sight from Loading area to 138 Victoria Street. Note that 54 Seaview St is shielded by the Seaview Delivery Office building	-5 to -8 dBA	Recommended. Needs to be investigated further to see if line-of-sight can be broken to either/both properties
Receiver	Provide "at-property" treatments to both 54 Seaview Street and 138 Victoria Street to reduce internal noise impacts	TBA	Not Recommended. Does not protect external residential amenity. Typically considered as a last resort.

With the adoption of a solid 2m high barrier as shown in **Figure 3,** the revised noise levels shown in **Table 14** are predicted from all sources of operational noise during a delivery scenario (small to medium truck).

Table 14 Operational noise levels of Seaview Delivery Office following mitigation with a 2m barrier

Loading Dock Scenario	Period	$L_{Aeq(15minute)}$ Noise Level (dBA)				Compliance?
		Project Noise Trigger Level	Predicted at Resident 1 [1]	Predicted at Resident 2 [2]	Worst Case Exceedance	
Scenario 1: Small/Medium truck using Seaview Delivery	Day	47	40	47	-	Yes

Note 1: Resident 1 identified as adjacent receiver at 54 Seaview Street.

Note 2: Resident 2 identified as receiver across the road at 138 Victoria Street.

5.5 Mechanical Plant/ Equipment

A review of the current architectural drawings provided by ACOR indicates that typical sources of industrial noise associated with the project may include:

- Noise from mechanical equipment including HVAC, chillers, corridor ventilation systems and fire pump and fire control equipment, school bells and PA systems.

At this stage, the technical specifications of the proposed mechanical plant and other equipment that may result in potential noise impacts from the project are largely unavailable and should be assessed in greater depth (in accordance with the noise criteria outlined in **Section 4.2.1.1** during the detailed design stage of the Project.

5.5.1 In-Principle Acoustic Treatment Recommendations

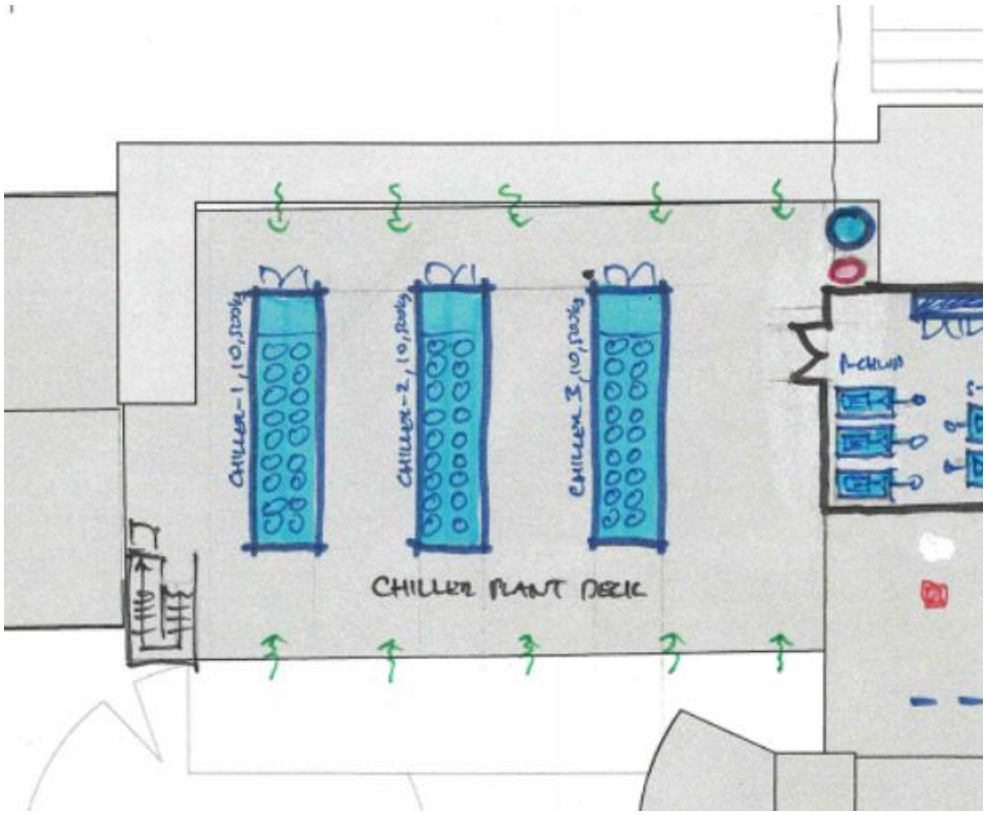
Operational noise emissions from mechanical plant and other equipment associated with the project should be designed and located to reduce potential noise impacts from the project at nearby noise-sensitive receivers. Noise trigger levels established to assess noise emissions from mechanical plant and equipment are documented in **Table 5.** Detailed assessment and verification of mechanical noise emissions should be carried out during the detailed design stage of the project ensuring that the nominated criteria for mechanical plant and other equipment are met.

It is envisaged that the industrial noise sources outlined in this Section will achieve compliance with the nominated criteria through common engineering methods that may consist of:

- Selection of low-noise mechanical plant and other noise generating equipment.
- Judicious location of mechanical plant and equipment with respect to nearby noise-sensitive receivers.
- Barriers/enclosures (eg plant rooms).
- Silencers and acoustically lined ductwork.

1.1.1 Chiller Plant Deck on Level 4 rooftop of Arrow Building

Figure 4 Chiller plant deck preliminary sketch



A preliminary assessment has been conducted on the chillers in terms of noise emissions affecting nearby residential receivers. Preliminary chiller selections and layouts have been provided by ACOR. SLR has conducted an acoustic assessment and review of the chiller plant deck design intent.

Table 15 Proposed Chiller sound power level from single unit on rooftop deck

Equipment	Overall Sound Power Level of each chiller, SWL
Daikin EWYD-4ZA Chiller	103

The chiller sound power levels have been used to predict noise breakout from the rooftop deck to the Residential receivers to the west along Victoria Street. A summary of the calculated results and compliances are presented in **Table 16** below.

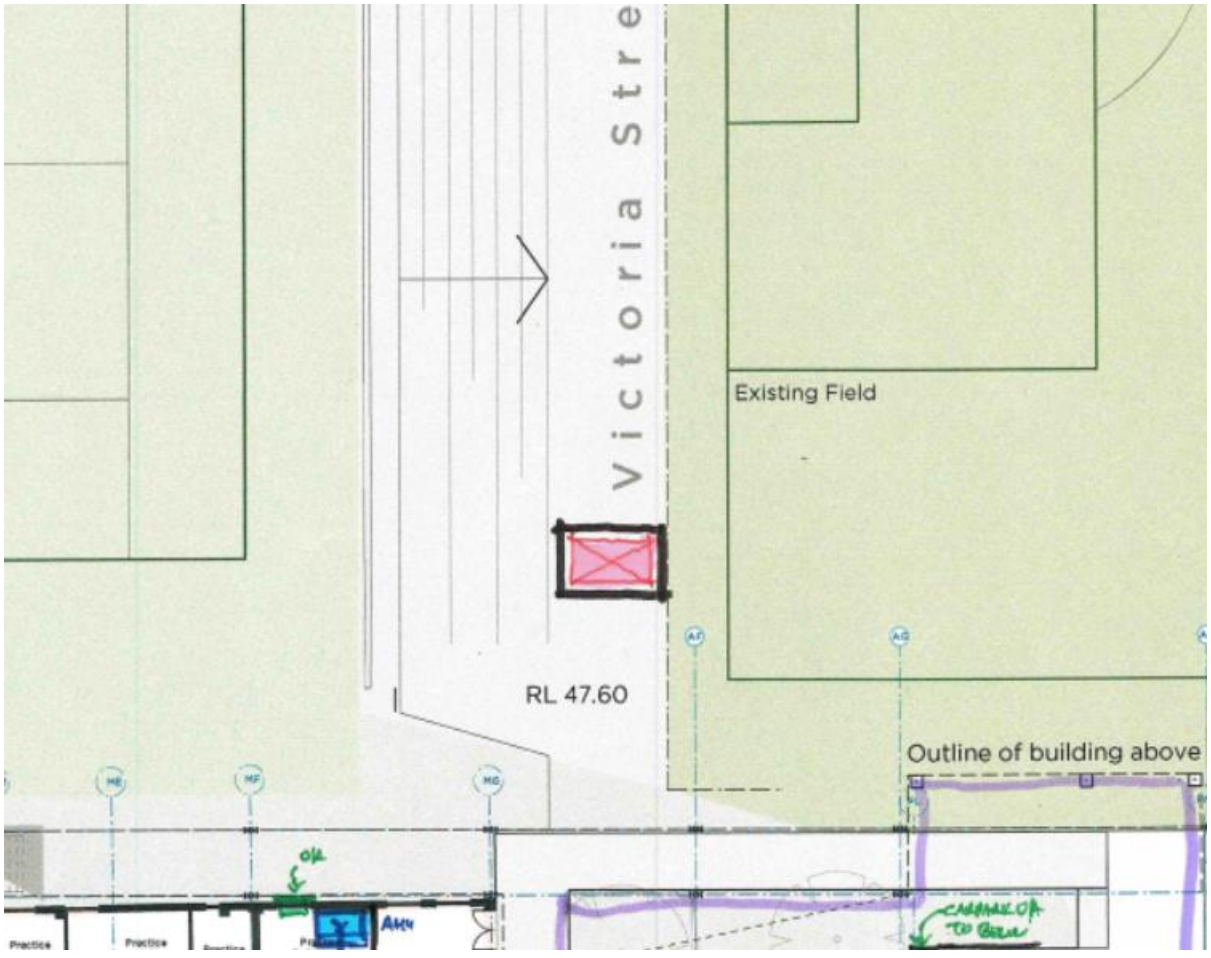
Table 16 Preliminary Chiller noise emission

Receiver	Noise Sources	Criteria $L_{Aeq(15min)}$	Predicted Contribution $L_{Aeq(15min)}$	Compliance
Residential Location 155-173 Victoria Street (110m to the west)	3 rooftop deck chillers open to atmosphere with no visual screening	35[1]	38	NO
	3 rooftop deck chillers open to atmosphere with acoustic louvres or screening to 500mm above chiller height on the eastern and western sides	35[1]	~30	YES

Note 1: Criteria has been based on operation during the most stringent night period as per the Noise Policy for Industry.

1.1.2 Carpark Exhaust Stack beside Victoria Street driveway

Figure 5 Carpark exhaust stack preliminary sketch



The criteria at the nearest residential receiver (155-173 Victoria Street) has been correlated to the allowable noise levels at the Carpark exhaust stack location. This will provide a maximum permissible noise level, and details on the noise mitigation requirements to meet the criteria. During the detailed design phase, the carpark exhaust fan selection and mitigation are required to be reviewed to ensure compliance will be achieved.

Table 17 Proposed allowable sound power level from Carpark exhaust stack

	Maximum Allowable Sound Power Level of each unit, SWL							
Equipment	63	125	250	500	1k	2k	4k	8k
Single carpark exhaust fan	83	83	80	77	73	70	67	59

The maximum allowable noise levels have been used to predict noise breakout from the exhaust stack to the residential receivers to the west. A summary of the calculated results and compliances are presented in **Table 18** below.

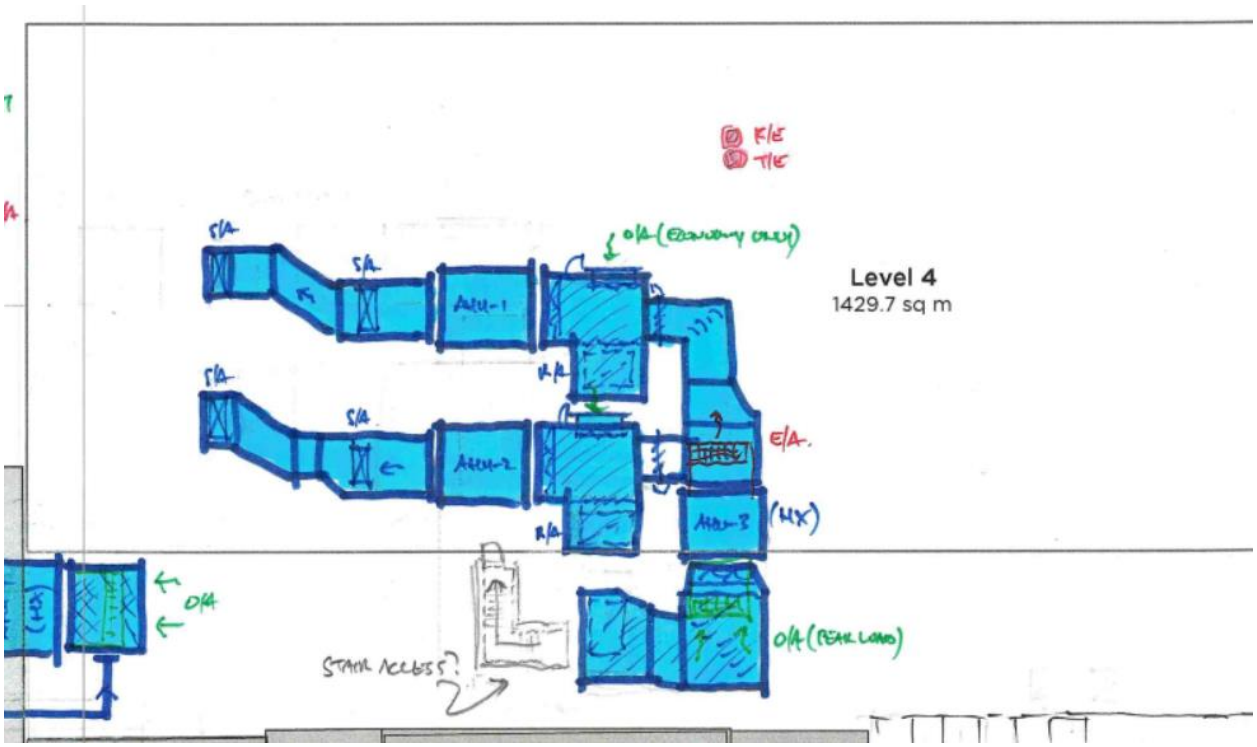
Table 18 Preliminary carpark exhaust stack noise emission

Receiver	Noise Sources	Criteria $L_{Aeq(15min)}$	Predicted Contribution $L_{Aeq(15min)}$	Compliance
Residential Location 155-173 Victoria Street (80m to the west)	Carpark exhaust stack rising approximately 9m from ground level	35[1]	33	YES

Note 1: Criteria has been based on operation during the most stringent night period as per the Noise Policy for Industry.

1.1.3 AHU's on Level 4 rooftop of T/L Building

Figure 6 Teaching/Learning building Level 4 rooftop AHU's preliminary sketch



The criteria at the nearest residential receiver (155-173 Victoria Street) has been correlated to the allowable noise levels on the rooftop where exposed AHUs are located. This will provide a maximum permissible noise level, and details on the screening/mitigation requirements to meet the criteria. During the detailed design phase, the AHU selection and mitigation are required to be reviewed to ensure compliance will be achieved.

Table 19 Proposed allowable sound power level from single outdoor AHU

	Maximum Allowable Sound Power Level of each unit, SWL							
Equipment	63	125	250	500	1k	2k	4k	8k
Single outdoor AHU	86	86	83	80	76	73	70	62

The maximum allowable noise levels have been used to predict noise breakout from the space to the residential receivers to the west. A summary of the calculated results and compliances are presented in **Table 20** below.

Table 20 Preliminary rooftop AHU noise emission

Receiver	Noise Sources	Criteria $L_{Aeq(15min)}$	Predicted Contribution $L_{Aeq(15min)}$	Compliance
Residential Location 155-173 Victoria Street (110m to the west)	-Four exposed AHUs on the T/L rooftop	35[1]	33	YES

Note 1: Criteria has been based on operation during the most stringent night period as per the Noise Policy for Industry.

6 Construction Noise and Vibration Impacts

6.1 Recommended Construction Hours

Where possible, the construction works would be undertaken in accordance with the Inner West Council standard daytime working hours of:

- 7.00 am to 5.00 pm Monday to Saturday

On this basis, the potential noise impacts from construction works have been predicted for the daytime period only.

6.2 Source Location

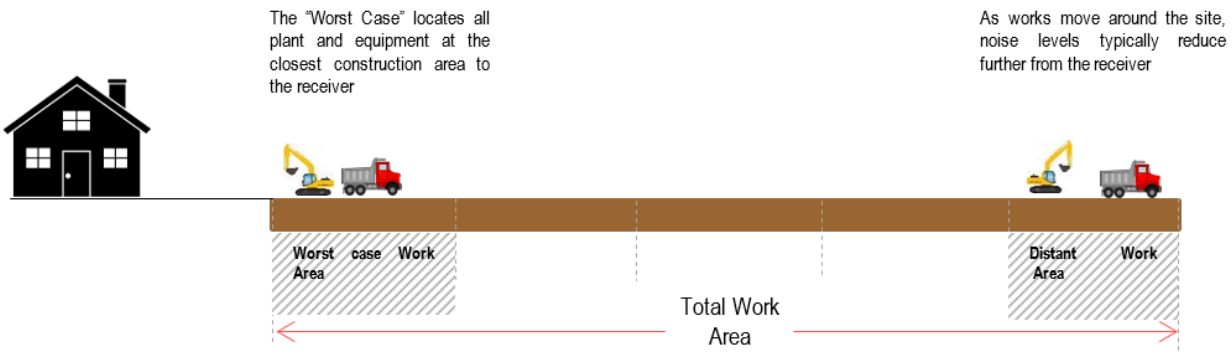
Consistent with the requirements of the ICNG, this construction noise assessment provides a 'realistic worst-case' assessment based on the required construction works within a 15-minute period. This is typically associated with works located nearest to a particular receiver.

In reality, the potential construction noise impacts at any particular location can vary greatly depending on the following factors:

- The location of construction works within the site relative to the nearest sensitive receiver
- The overall duration of the construction works
- The intensity of the noise levels
- The time at which the construction works are undertaken
- The character of the noise

Noise levels at sensitive receivers can also be significantly lower than the worst-case scenario when the construction works are moved further from receivers within a works area. This concept is shown in **Figure 7**.

Figure 7 Illustration of Work Areas



The above figure illustrates that when the works move away from a receiver the noise levels from the operation of the construction equipment would reduce accordingly.

6.3 Construction Noise Model

A construction noise model was developed in SoundPLAN to predict the potential noise impacts at the surrounding residential receivers shown in **Figure 1**.

The computer model allows for factors such as source sound power levels, attenuation due to distance, ground and air absorption and shielding attenuation, as well as meteorological conditions.

Heights of buildings, and other structures were estimated based on aerial photography. All noise predictions within the model were calculated using ISO 9613 algorithms.

6.3.1 Sound Power Levels

Noise sources likely to be associated with the project construction works are based on information provided by Bloompark Consulting. Sound power levels for typical items of plant expected to be used during the project are listed in **Table 21**. These noise levels are representative of modern plant operating with noise control measures in good condition.

Table 21 Construction Noise Sources – Sound Power Levels

Equipment	Sound Power Level L_{Amax} (dBA)
Truck (10 Tonne)	107
Hand Tools	94
Chainsaw	114
Excavator (22 Tonne)	99
Excavator (14 Tonne)	97
Piling Rigs (Bored)	111
Mobile Crane	100
Rockbreaker (Silenced with SOONAN)	116
Concrete Pump	106
Concrete Truck	103

6.4 Construction Noise Scenarios

Seven construction scenarios were modelled based on information provided from Bloompark Consulting. Each of the scenarios were based on typical stages of construction and included the associated construction plant and equipment outlined in **Table 21**.

Table 22 Construction Works Scenarios

Scenario	Total Sound Power Level dBA	Associated Construction Plant and Equipment
Demolition of Seaview buildings	113	Rock breaker (Silenced SOONAN SB40)
		Chainsaw

Scenario	Total Sound Power Level dBA	Associated Construction Plant and Equipment
		Excavator (22 tonne)
		Truck (10 Tonne)
Construction of new Junior School outdoor play area and Maintenance/ Delivery areas	106	Concrete Truck
		Truck
		Mobile Crane (100 tonne)
		Hand Tools
		Excavator (14 tonne)
Construction of both carparks (phased)	113	Rock breaker (Silenced SOONAN SB40)
		Pilling Rig (Bored)
		Chainsaw
		Excavator (22 tonne)
		Concrete Truck
		Truck
Construction of Sports and Pavilion building	105	Excavator (22 tonne)
		Truck
		Concrete Mixer Truck
		Hand Tools (5mins)
Demolition of existing buildings within new Teacher and Learning space	110	Rock breaker (Silenced SOONAN SB40)
		Excavator (22 tonne)
		Truck (10 Tonne)
Excavation of new Teacher and Learning site	112	Rock breaker (Silenced SOONAN SB40)
		Pilling Rig (Bored)
		Excavator (22 tonne)
		Truck (10 Tonne)
Construction of new Teacher and Learning building	111	Pilling Rig (Bored)
		Excavator (22 tonne)
		Truck (10 Tonne)
		Mobile Crane (100 tonne)
		Concrete Pump
		Hand Tools

Note 1: A single figure sound power level was calculated accounting for the combined plant and equipment operating concurrently in each construction scenario.

To determine the potential worst-case impacts, the construction noise sources were modelled throughout the construction area for each of the seven construction stages.

6.5 Construction Noise Predictions

For each of the seven scenarios shown in **Table 22**, construction noise levels were predicted at the surrounding residential receivers and assessed against the project Noise Management Levels presented in **Section 4.7**.

A summary of the predicted worst-case levels is presented in **Table 23**.

Table 23 Construction Noise Impact Prediction Summary

Scenario	Noise Level ($L_{Aeq(15minute)}$ dBA)			Number of Highly Noise Affected Receivers
	Daytime NML (RBL + 10 dB)	**Predicted (Upper to Lower)[1]**	**NML Exceedance (Upper to Lower)[1]**	
Demolition of Seaview buildings	52	88 - 22	36 to 0	2
Construction of Junior School outdoor play area and Maintenance/ Delivery areas	52	81 - 16	29 to 0	2
Construction of both carparks (phased)	52	70 – 20	18 to 0	-
Construction of Sports and Pavilion building	52	55 - 18	3 to 0	-
Demolition of existing buildings within site	52	63 – 22	11 to 0	-
Excavation of Teaching and Learning site	52	66 – 25	14 to 0	-
Construction of Teaching and Learning building	52	65 – 24	13 to 0	-

Note 1: The range represents the predicted worst-case noise levels for the nearest and furthest receivers.

The construction noise predictions indicate that:

- Exceedances of NML's are predicted in all construction scenarios, with the exception of the construction of the Sports and Pavilion building. The greatest noise level exceedances are predicted at the residences located on Seaview Street, which are in close proximity to demolition works occurring early in the project timeline. Demolition, excavation and construction activities occurring at the Teaching and Learning site are likely to result in minor exceedances of NML's at residential receivers. Acoustic impacts on school operations have not been assessed at this time.
- For most construction activities, it is expected that the construction noise levels would frequently be lower than predicted at the most exposed receivers, as the noise levels presented in this report are based on a realistic worst-case assessment.

6.6 Mitigation Measures

6.6.1 Airborne Noise

The expected exceedances may be concerning for surrounding residents at times and particular effort should be directed towards the implementation of all feasible and reasonable noise mitigation and management strategies.

The following best practice noise mitigation and control measures should be investigated:

- Judicious selection of mechanical plant and equipment (eg quieter machinery and power tools).
- Maximising the offset distance between noisy plant items and nearby noise sensitive receivers.
- The use of appropriate respite periods where receivers are likely to be highly noise affected.
  - For example, the RMS *Construction Noise and Vibration Guideline* states that (noise intensive) work may be carried out in continuous blocks not exceeding three hours each with a minimum respite from those activities and works of not less than one hour between each block.
- Avoiding the coincidence of noisy plant working simultaneously close together and adjacent to sensitive receivers.
- Orienting equipment away from noise sensitive areas.
- Carrying out loading and unloading away from noise sensitive areas.
- Localised shielding of noisy equipment.
- Minimising consecutive works in the same locality.
- Considering periods of respite.

Once further details surrounding the proposed construction methodology, equipment and phasing is known, it is recommended that the construction contractor produces a comprehensive Construction Noise and Vibration Management Plan.

6.6.2 Vibration Mitigation Measures

At this early stage in the project the details regarding the exact construction methodology and equipment needed to complete the works are not finalised.

The potential vibration impacts should be assessed at a later stage of the project and it is recommended that the recommended safe working distances for vibration intensive plant, as shown in **Table 10**, are applied.

6.6.3 Noise Monitoring Procedures

Procedures and requirements for construction noise monitoring would be determined as the project progresses, with an appropriate monitoring protocol being defined in the Construction Noise and Vibration Management Plan.

7 Conclusion

SLR Consulting Australia Pty Ltd has conducted a noise impact assessment associated with regards to the Renewal Project at Trinity Grammar School Summer Hill. This assessment has been carried out in accordance with NSW regulatory requirements and will form part of the SSD 10371 submission to the NSW Department of Planning Industry and Environment in support of the development.

The scope of the assessment involved a survey of the existing noise environment; derivation and establishment of project specific noise criteria through consultation with various NSW and Australian guidelines; a noise impact assessment with respect to the appropriate criteria; and, where required, recommendations for noise control measures.

As a result of the operational noise impact assessment, compliance with the established criteria is expected from the proposal, subject to the control measures identified throughout **Section 5** of this report.

The construction noise assessment indicates that relatively high impacts are likely at the certain stages of the works at the nearest receivers and particular effort should be directed towards the implementation of all feasible and reasonable noise mitigation and management strategies, as outlined in **Section 6** of this report.

APPENDIX A

Acoustic Terminology

1 Sound Level or Noise Level

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

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

The symbols SPL, L or L_P are commonly used to represent Sound Pressure Level. The symbol L_A represents A-weighted Sound Pressure Level. The standard reference unit for Sound Pressure Levels expressed in decibels is 2×10^{-5} Pa.

2 'A' Weighted Sound Pressure Level

The overall level of a sound is usually expressed in terms of dBA, which is measured using a sound level meter with an 'A-weighting' filter. This is an electronic filter having a frequency response corresponding approximately to that of human hearing.

People's hearing is most sensitive to sounds at mid frequencies (500 Hz to 4000 Hz), and less sensitive at lower and higher frequencies. Thus, the level of a sound in dBA is a good measure of the loudness of that sound. Different sources having the same dBA level generally sound about equally loud.

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

Sound Pressure Level (dBA)	Typical Source	Subjective Evaluation
130	Threshold of pain	Intolerable
120	Heavy rock concert	Extremely noisy
110	Grinding on steel	
100	Loud car horn at 3 m	Very noisy
90	Construction site with pneumatic hammering	
80	Kerbside of busy street	Loud
70	Loud radio or television	
60	Department store	Moderate to quiet
50	General Office	
40	Inside private office	Quiet to very quiet
30	Inside bedroom	
20	Recording studio	Almost silent

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

3 Sound Power Level

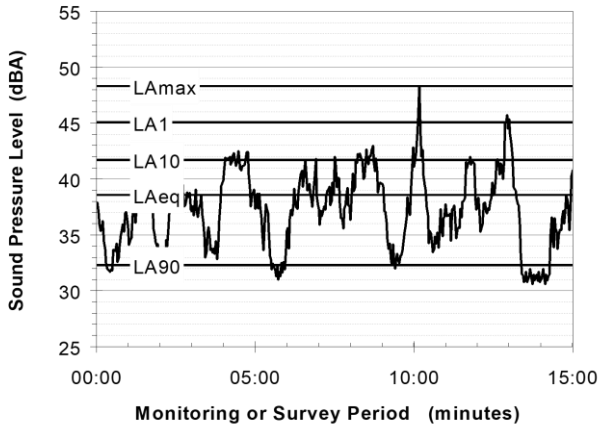
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or L_W, or by the reference unit 10^{-12} W.

The relationship between Sound Power and Sound Pressure may be likened to an electric radiator, which is characterised by a power rating, but has an effect on the surrounding environment that can be measured in terms of a different parameter, temperature.

4 Statistical Noise Levels

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

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



Of particular relevance, are:

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

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

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

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

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

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

5 Tonality

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

6 Impulsiveness

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

7 Frequency Analysis

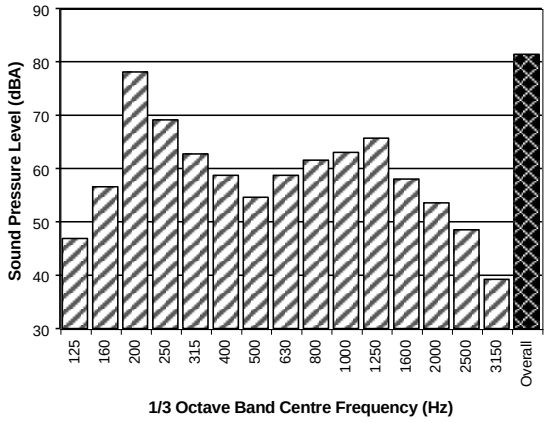
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal. This analysis was traditionally carried out using analogue electronic filters, but is now normally carried out using Fast Fourier Transform (FFT) analysers.

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

Frequency analysis can be in:

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

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



8 Vibration

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

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

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

The common units for velocity are millimetres per second (mm/s). As with noise, decibel units can also be used, in which case the reference level should always be stated. A vibration level V, expressed in mm/s can be converted to decibels by the formula 20 log (V/V_o), where V_o is the reference level (10^{-9} m/s). Care is required in this regard, as other reference levels may be used by some organizations.

9 Human Perception of Vibration

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

10 Over-Pressure

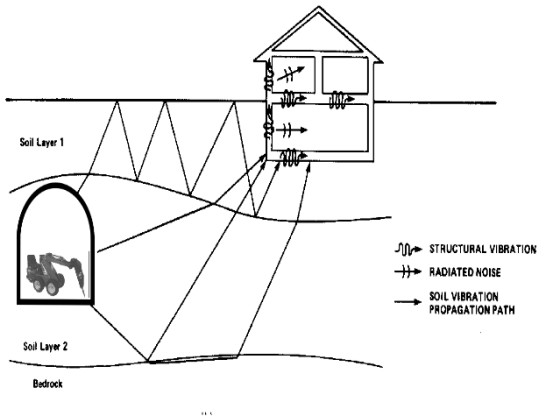
The term 'over-pressure' is used to describe the air pressure pulse emitted during blasting or similar events. The peak level of an event is normally measured using a microphone in the same manner as linear noise (ie unweighted), at frequencies both in and below the audible range.

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

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

Typical sources of ground-borne or structure-borne noise include tunnelling works, underground railways, excavation plant (eg rockbreakers), and building services plant (eg fans, compressors and generators).

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



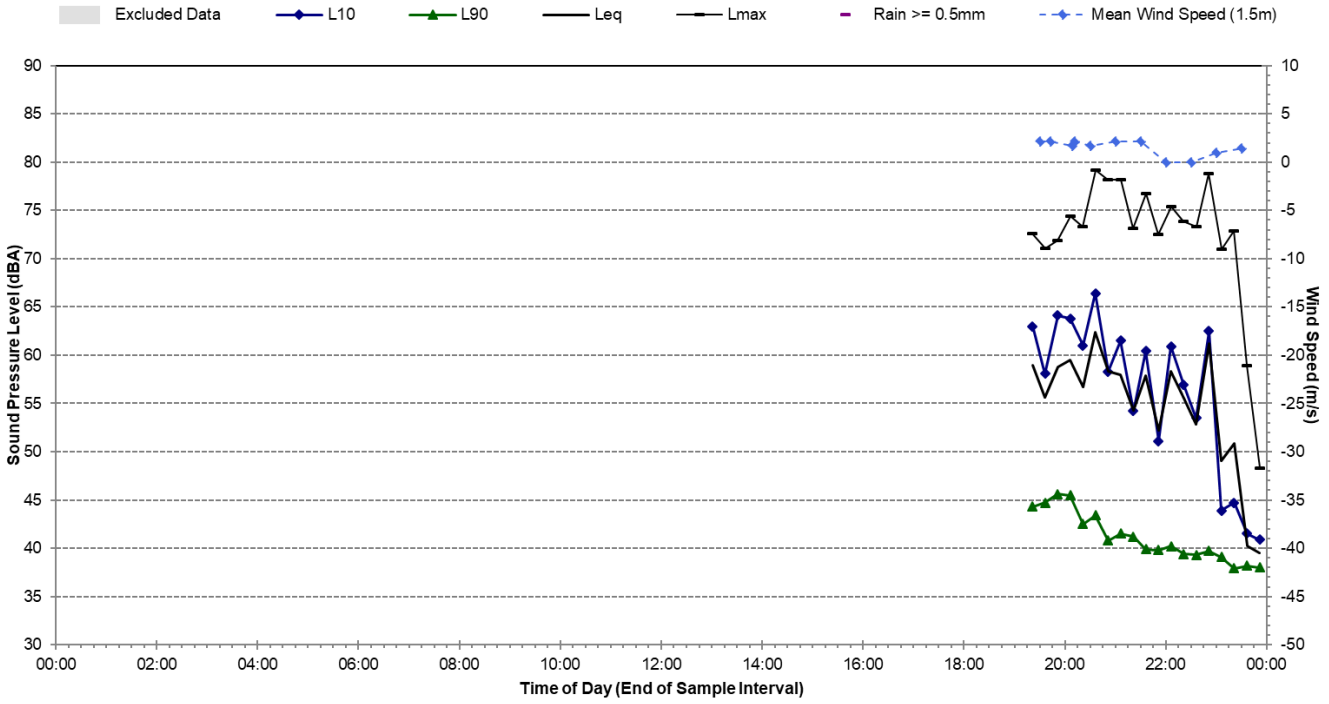
The term 'regenerated noise' is also used in other instances where energy is converted to noise away from the primary source. One example would be a fan blowing air through a discharge grill. The fan is the energy source and primary noise source. Additional noise may be created by the aerodynamic effect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

APPENDIX B

Statistical Ambient Noise Data

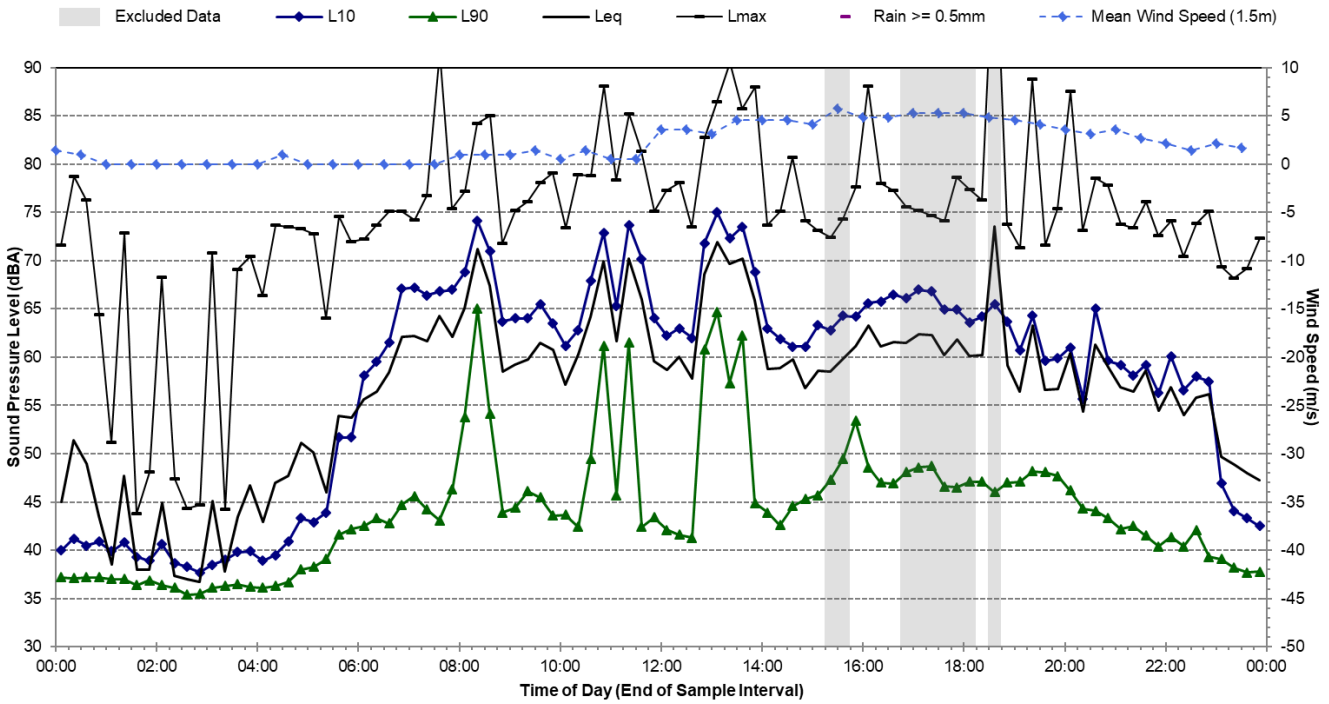
Statistical Ambient Noise Levels

Location 1 - Wednesday, 30 October 2019



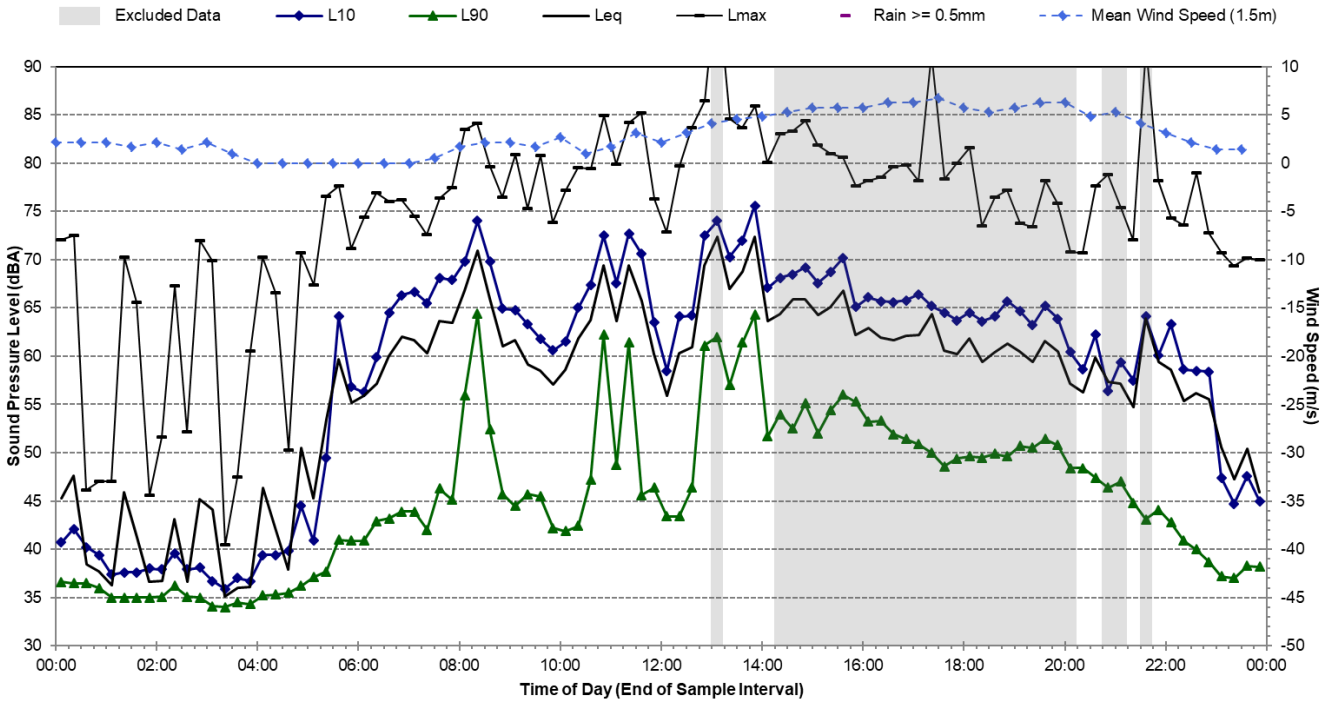
Statistical Ambient Noise Levels

Location 1 - Thursday, 31 October 2019



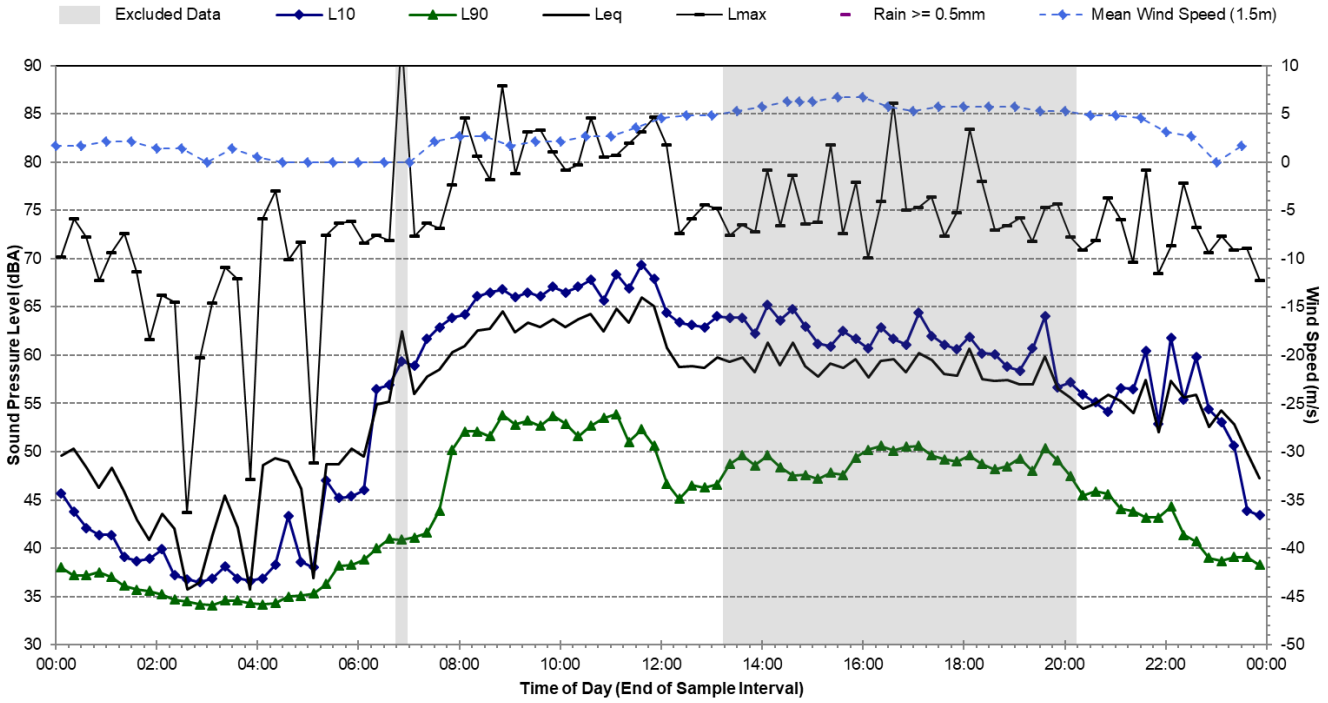
Statistical Ambient Noise Levels

Location 1 - Friday, 1 November 2019



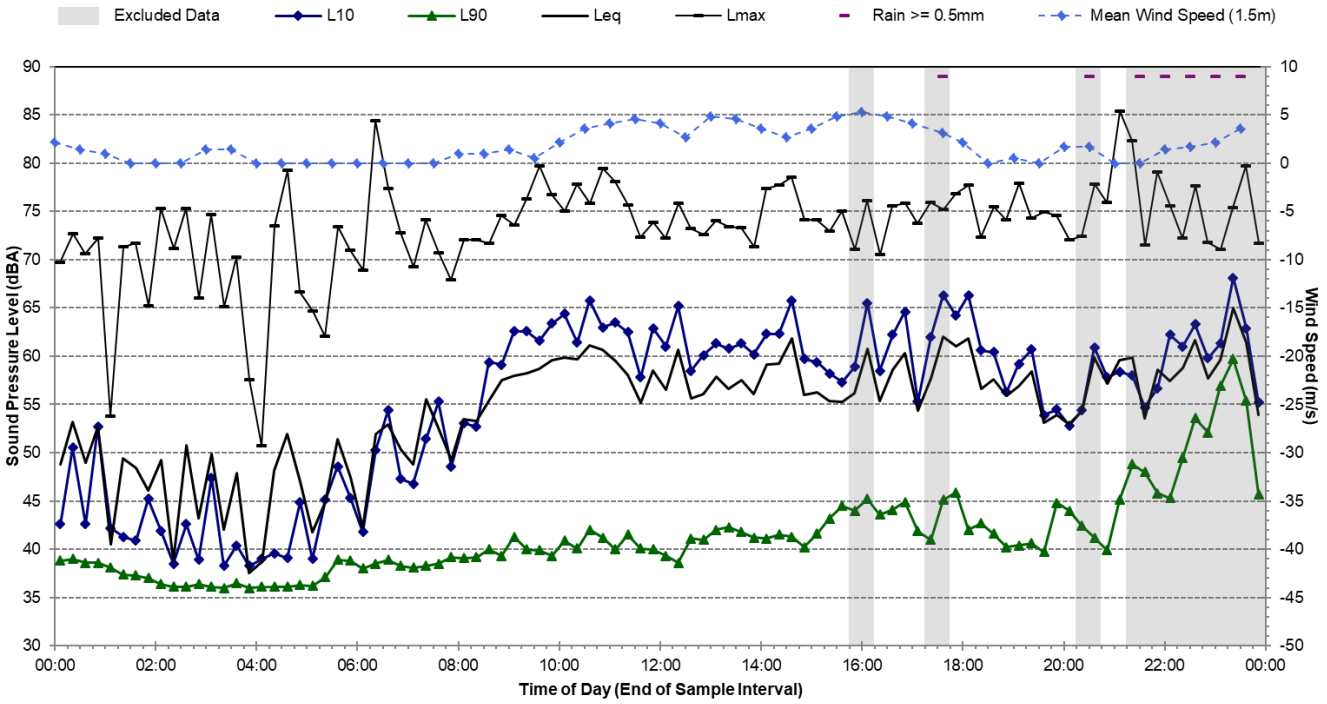
Statistical Ambient Noise Levels

Location 1 - Saturday, 2 November 2019



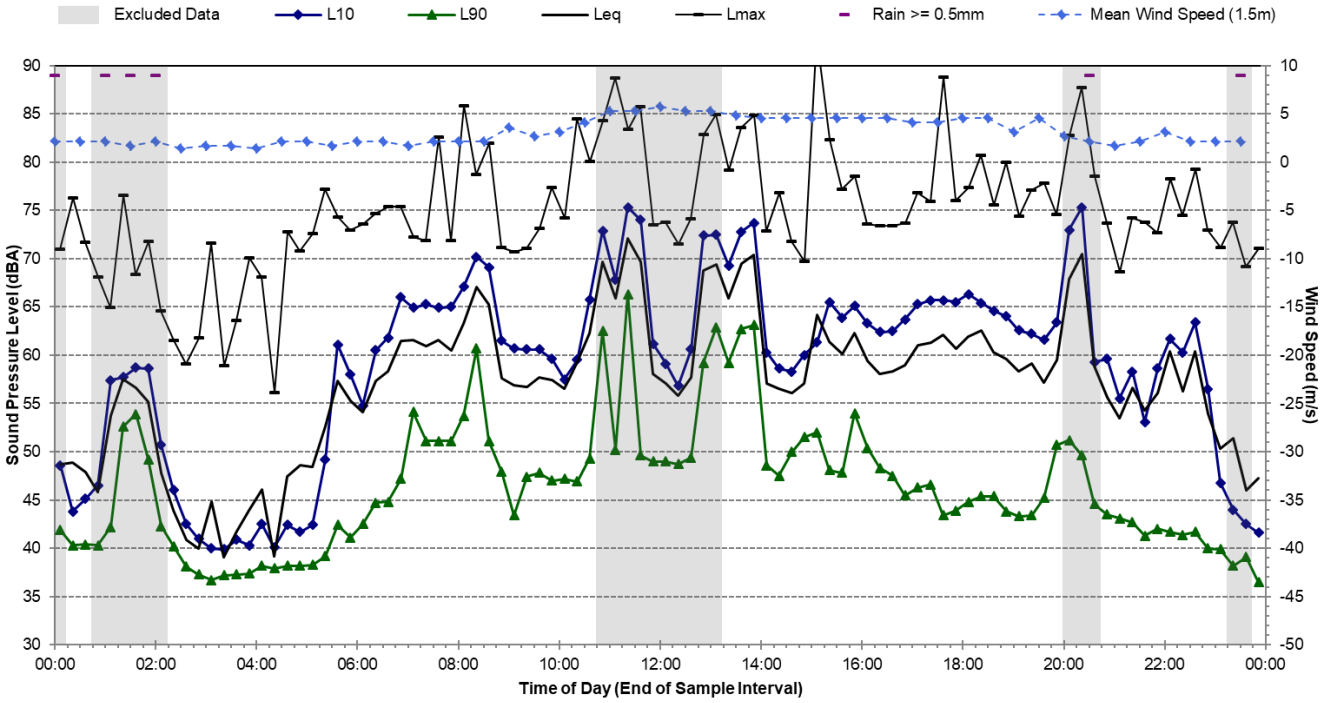
Statistical Ambient Noise Levels

Location 1 - Sunday, 3 November 2019



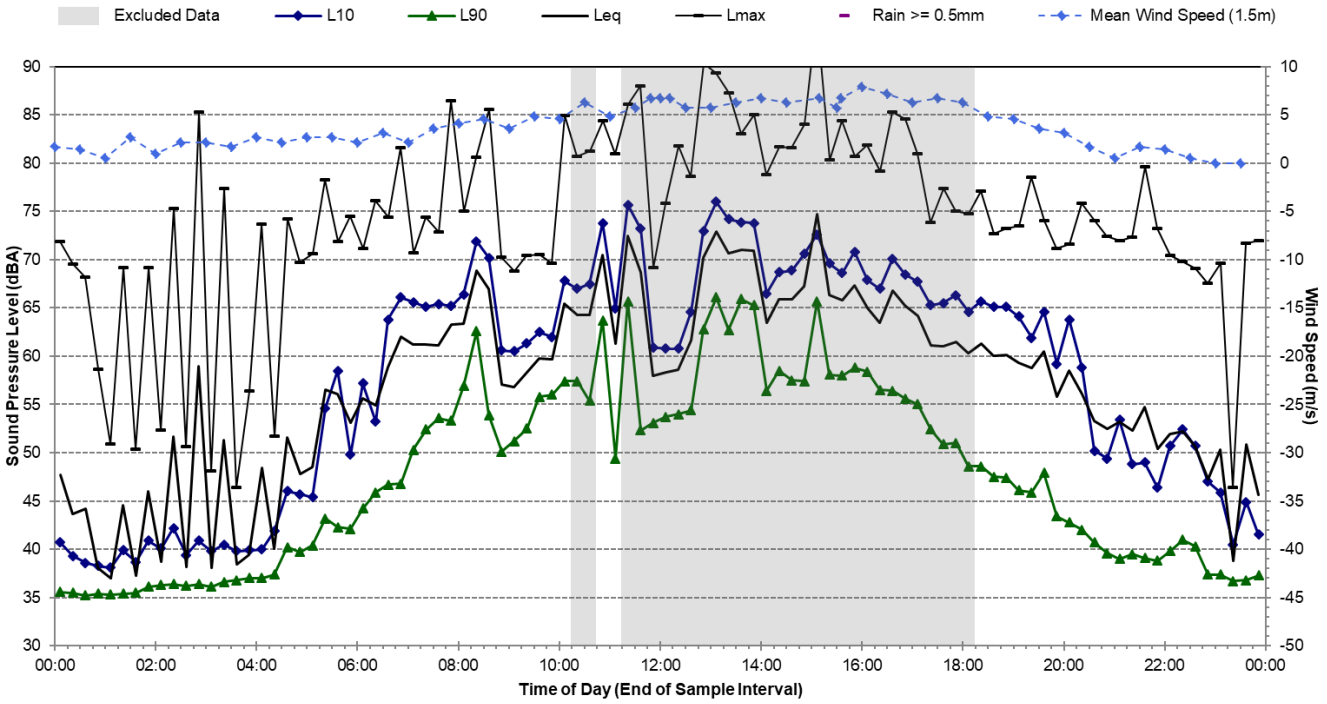
Statistical Ambient Noise Levels

Location 1 - Monday, 4 November 2019



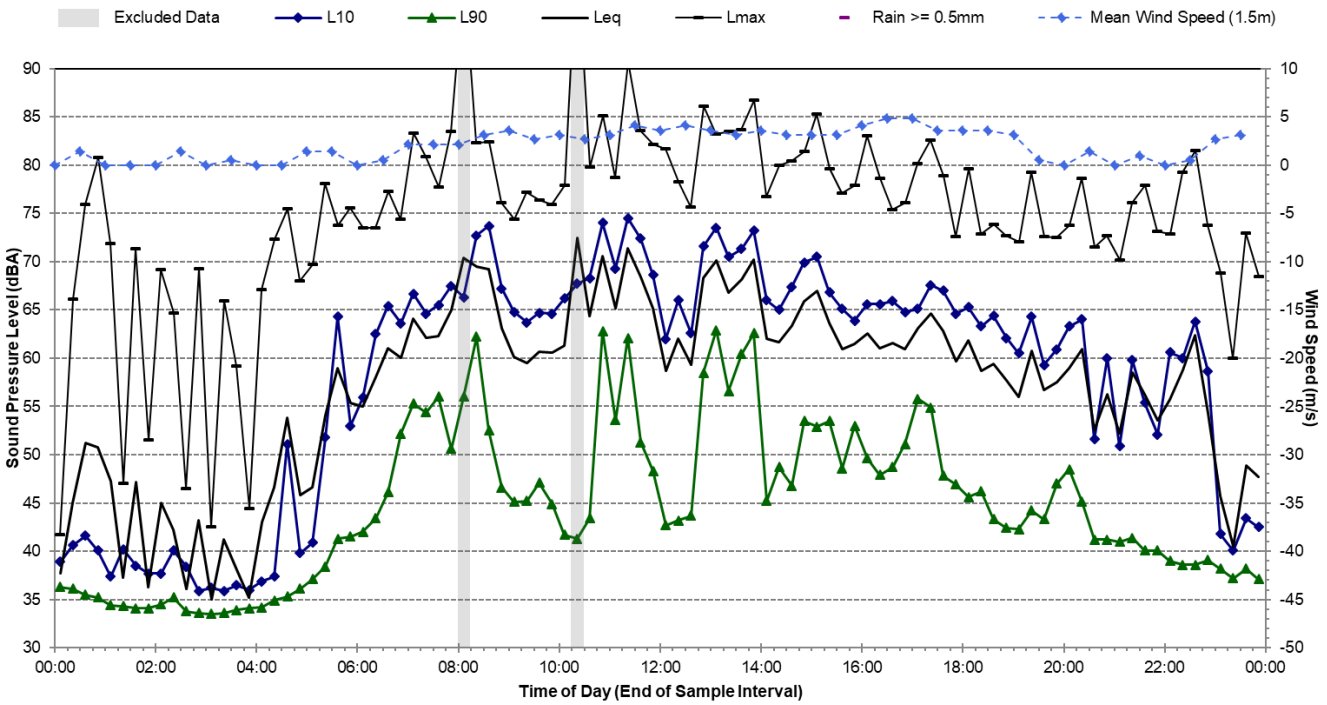
Statistical Ambient Noise Levels

Location 1 - Tuesday, 5 November 2019



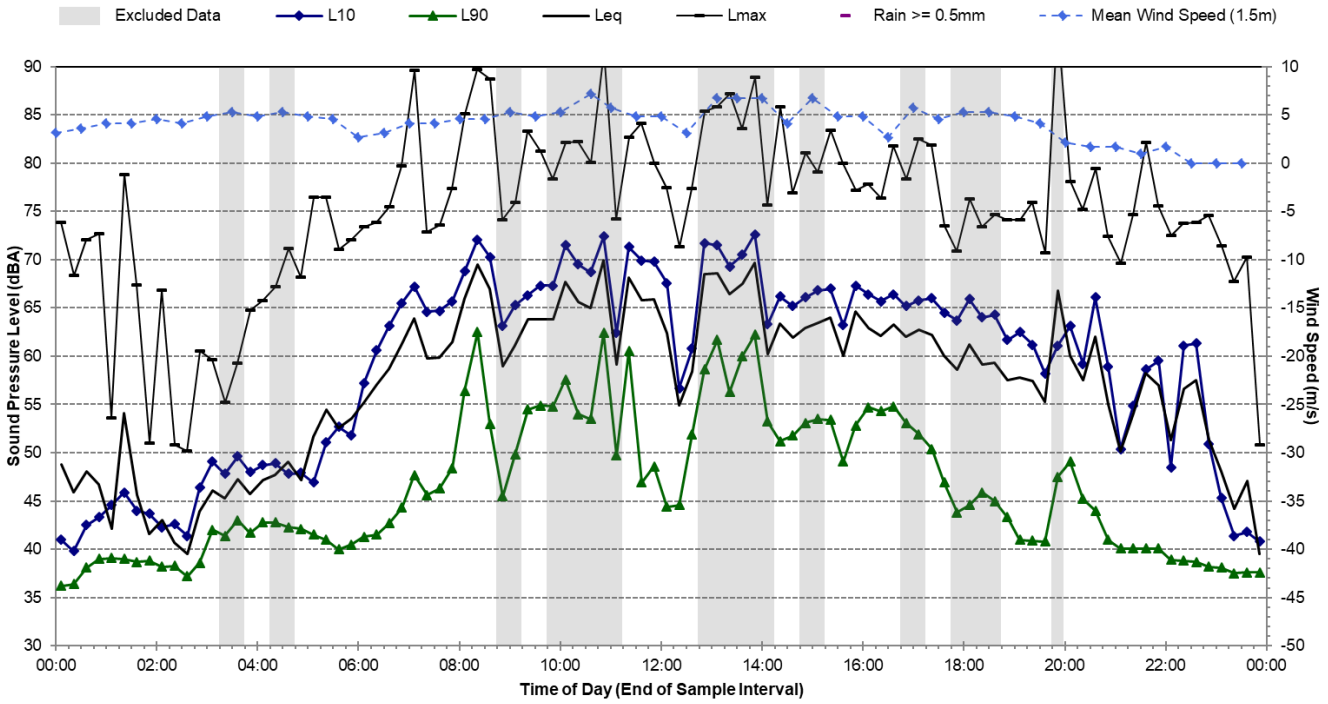
Statistical Ambient Noise Levels

Location 1 - Wednesday, 6 November 2019



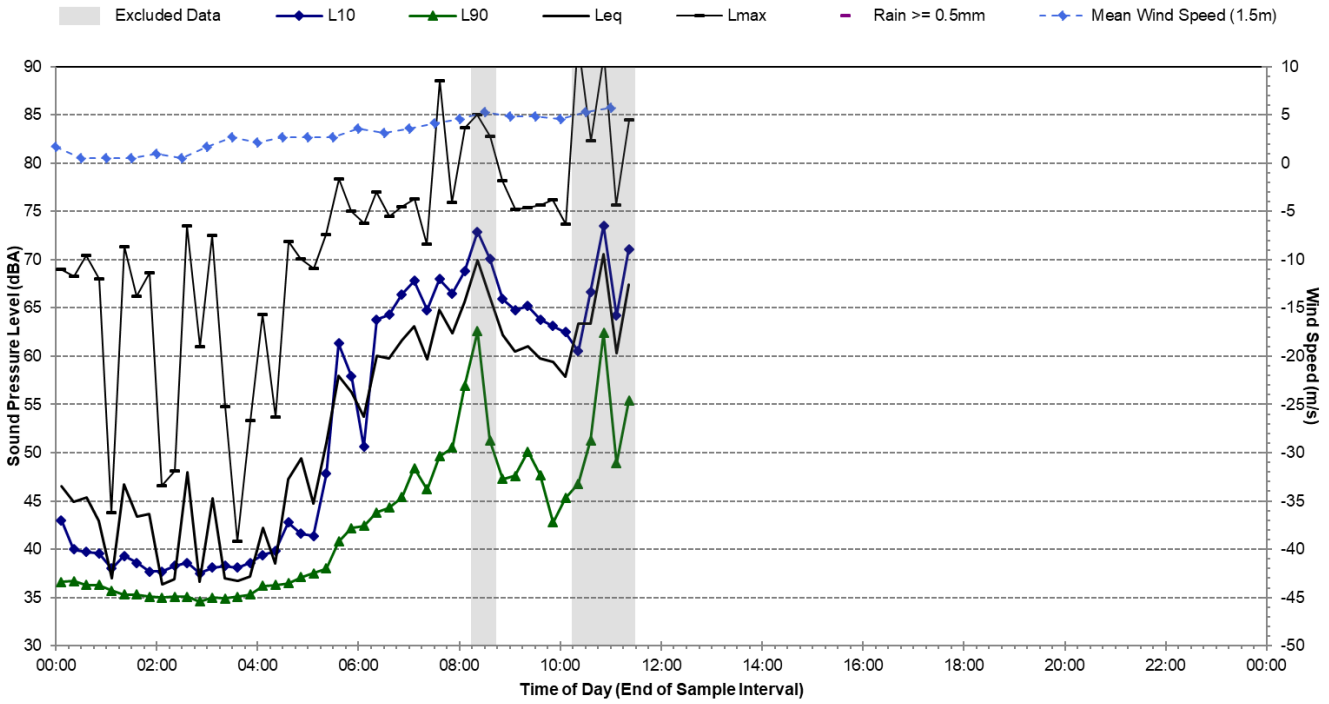
Statistical Ambient Noise Levels

Location 1 - Thursday, 7 November 2019



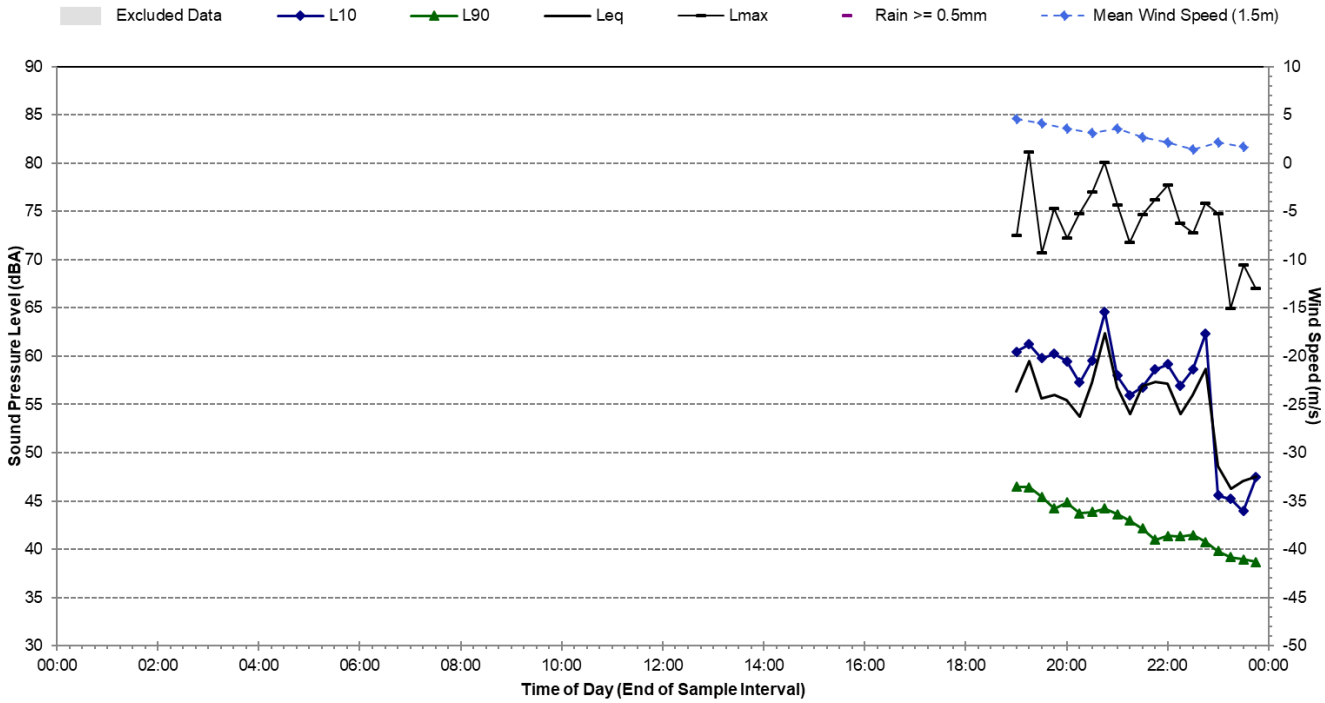
Statistical Ambient Noise Levels

Location 1 - Friday, 8 November 2019



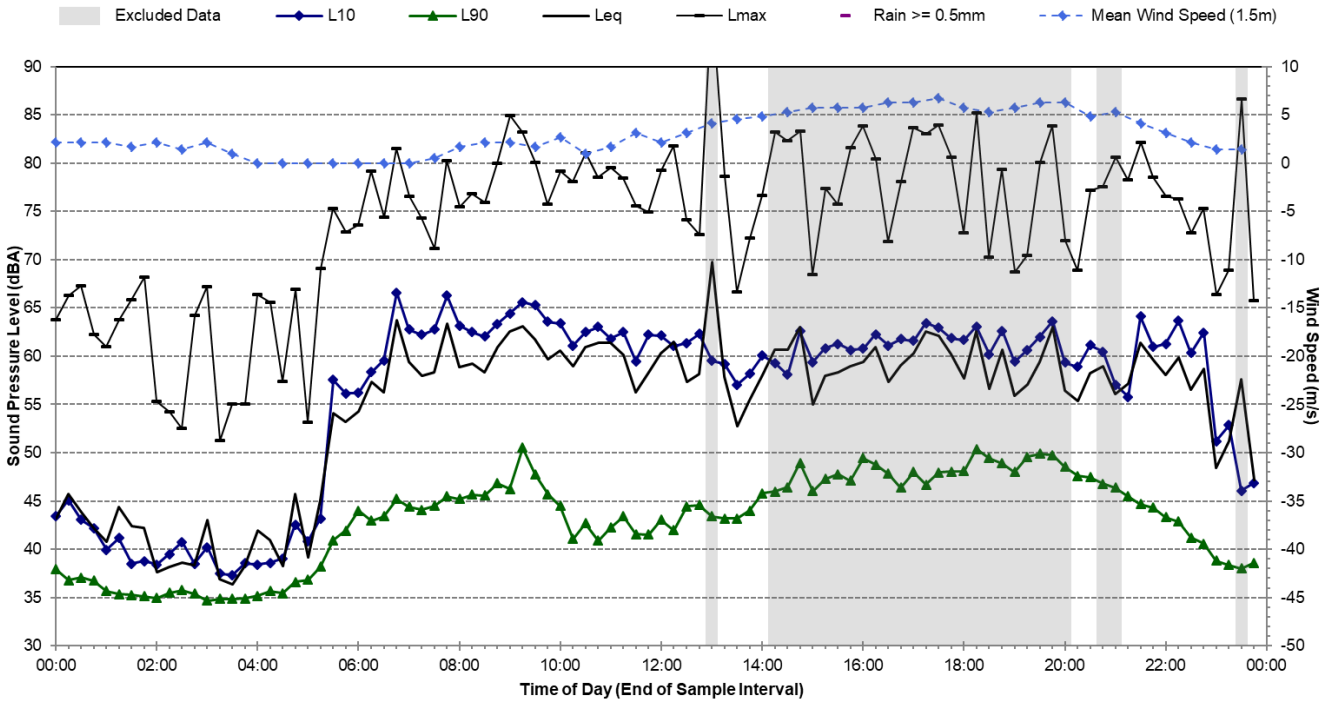
Statistical Ambient Noise Levels

Location 2 - Thursday, 31 October 2019



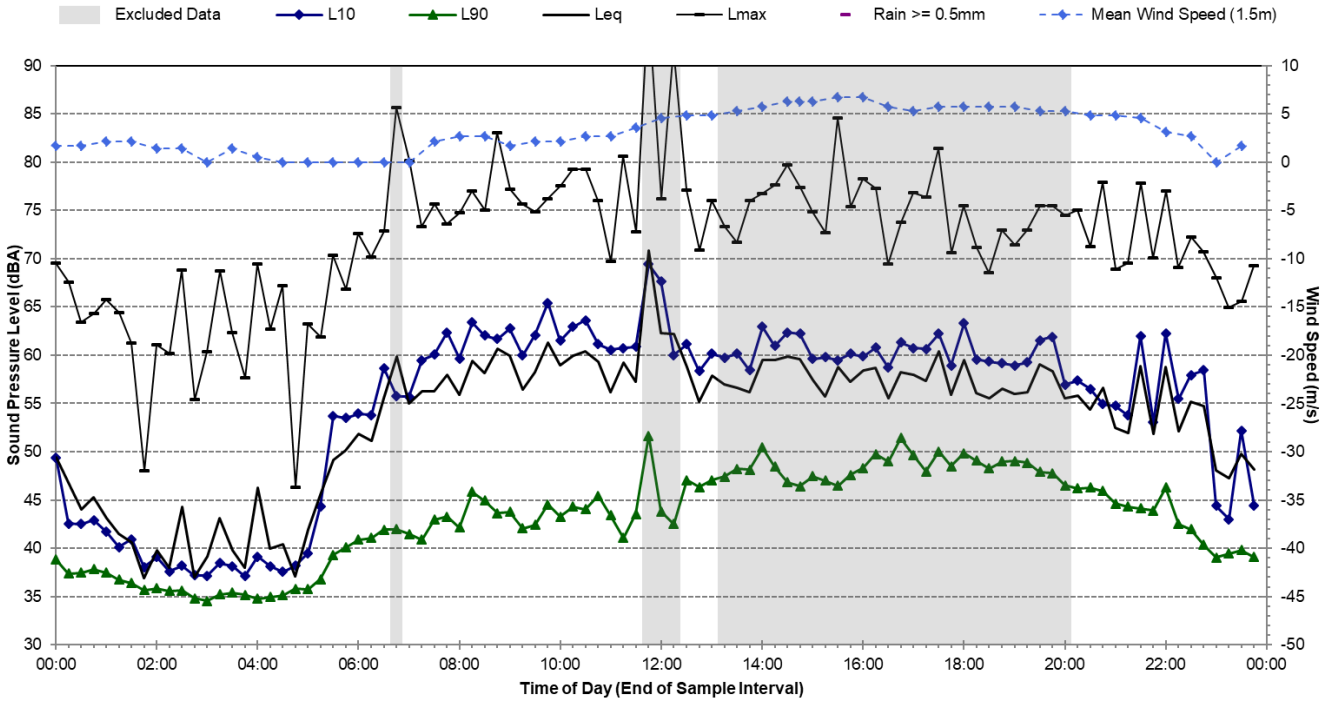
Statistical Ambient Noise Levels

Location 2 - Friday, 1 November 2019



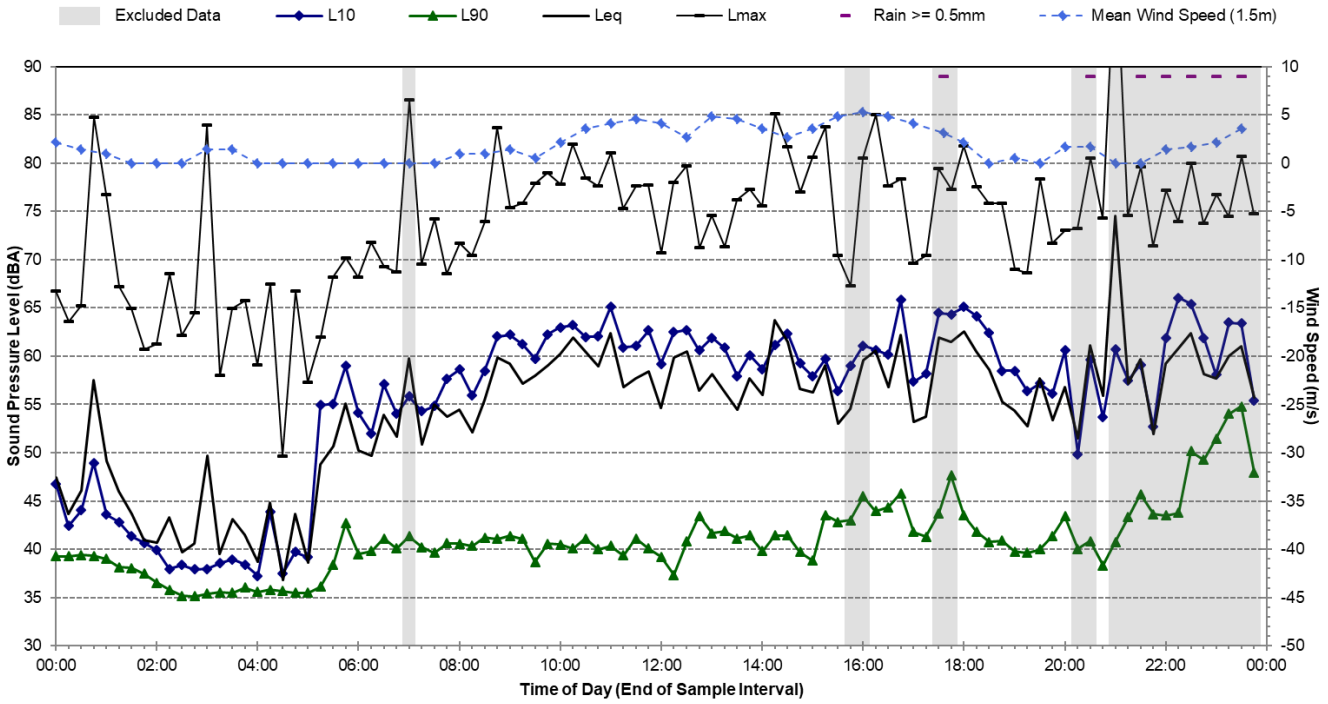
Statistical Ambient Noise Levels

Location 2 - Saturday, 2 November 2019



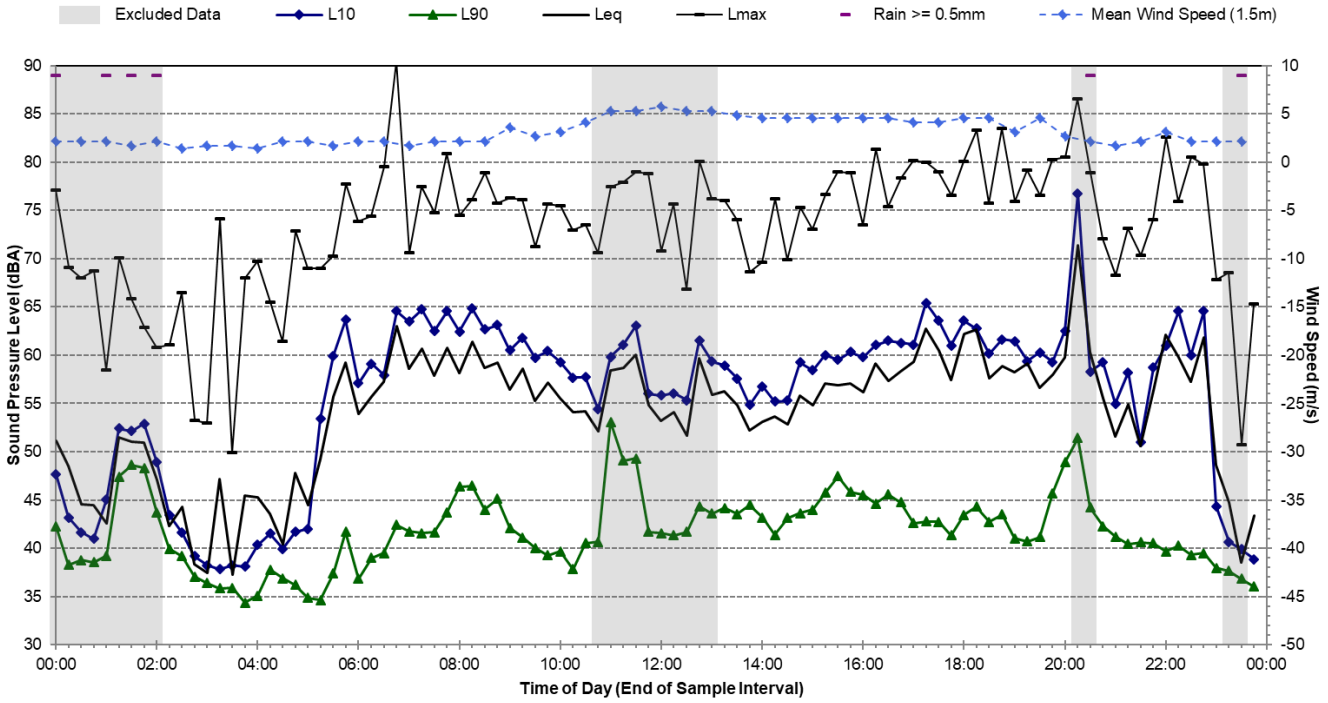
Statistical Ambient Noise Levels

Location 2 - Sunday, 3 November 2019



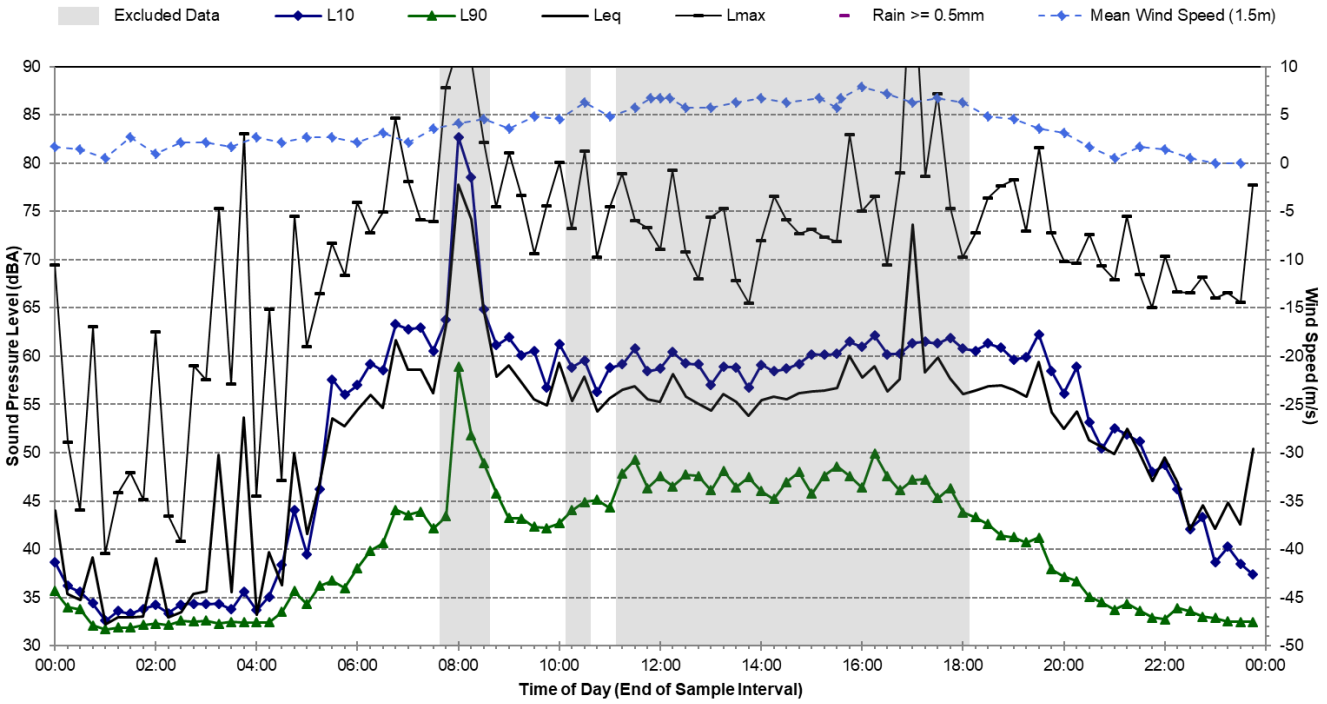
Statistical Ambient Noise Levels

Location 2 - Monday, 4 November 2019



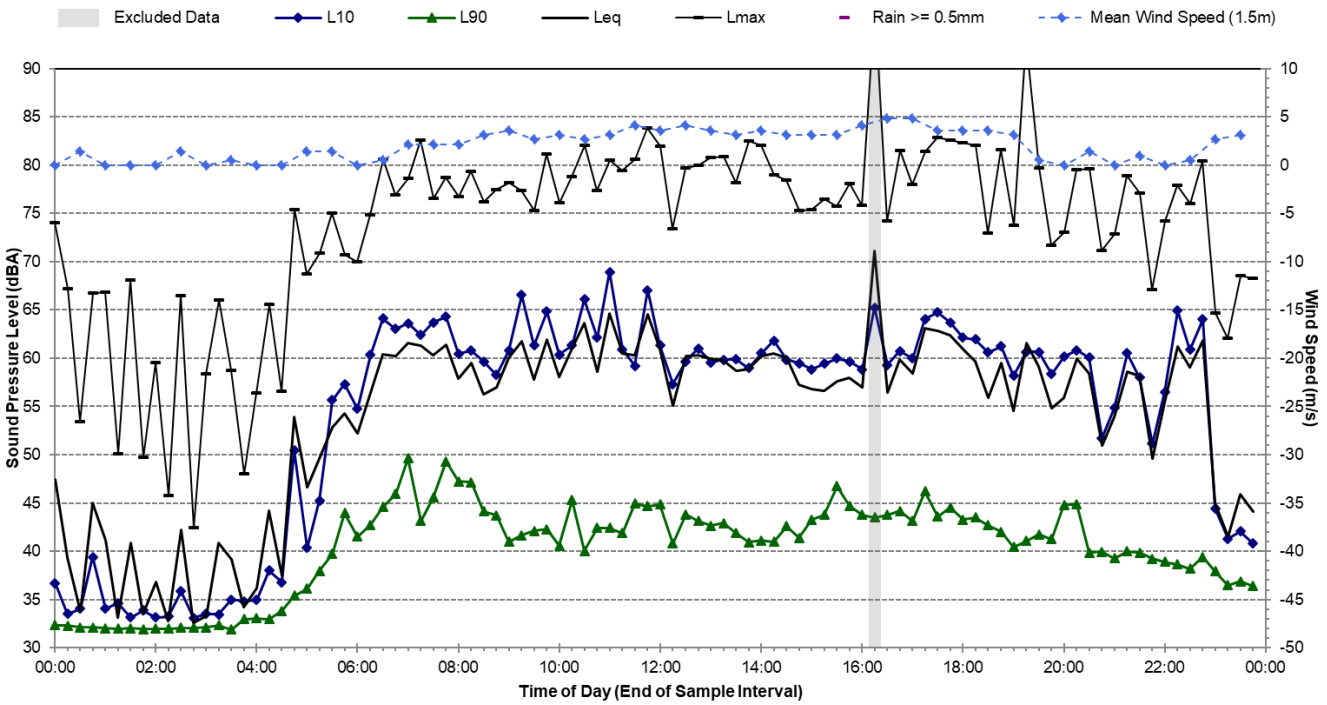
Statistical Ambient Noise Levels

Location 2 - Tuesday, 5 November 2019



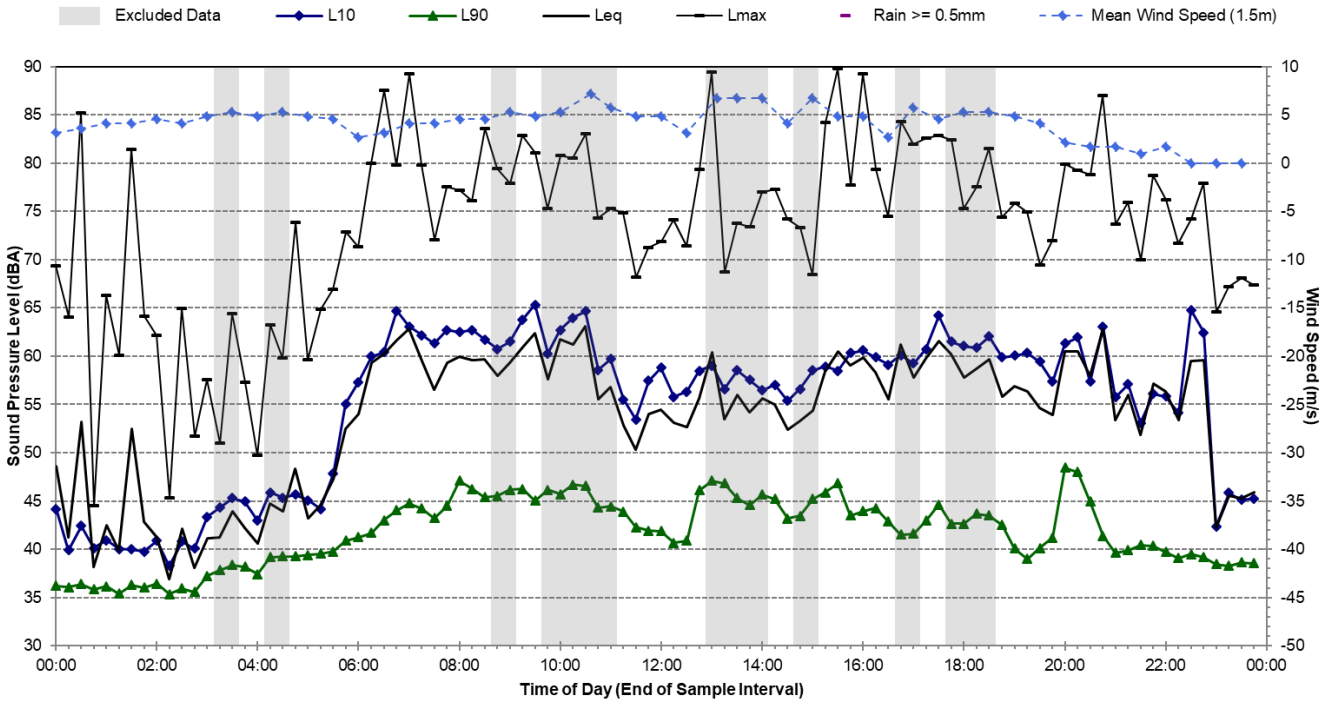
Statistical Ambient Noise Levels

Location 2 - Wednesday, 6 November 2019



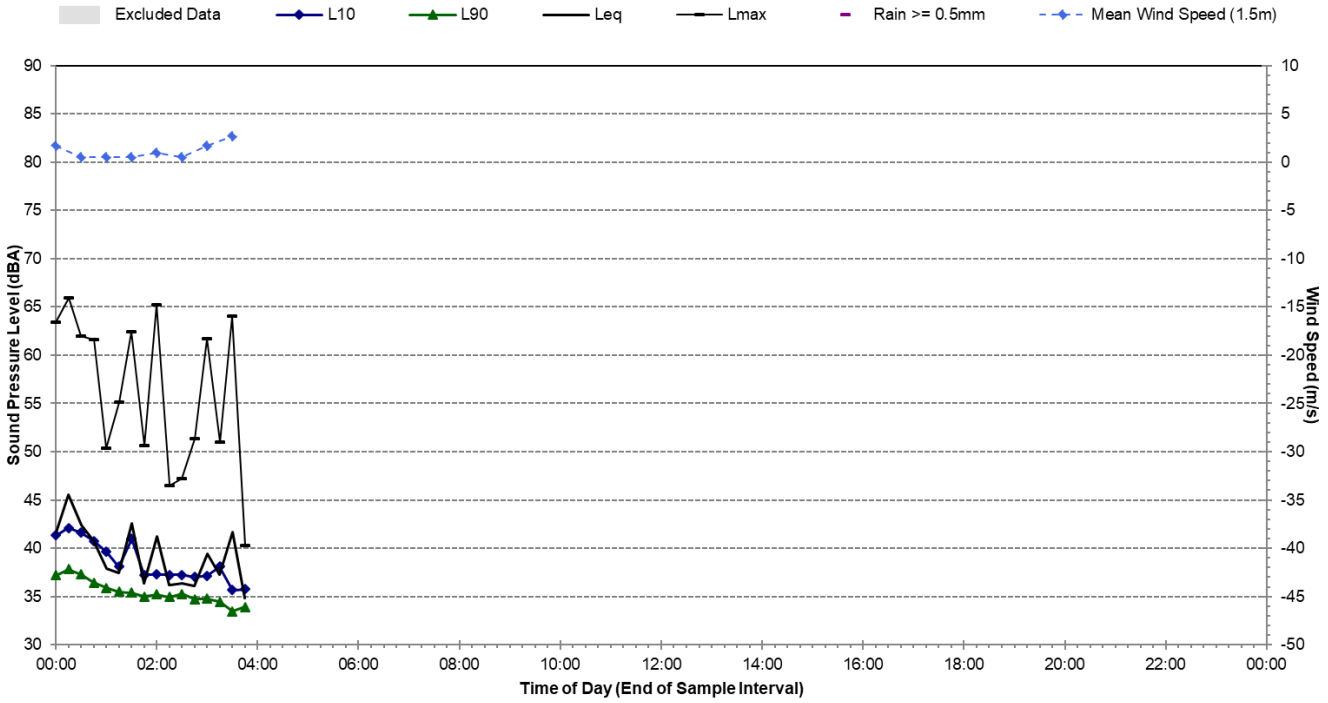
Statistical Ambient Noise Levels

Location 2 - Thursday, 7 November 2019



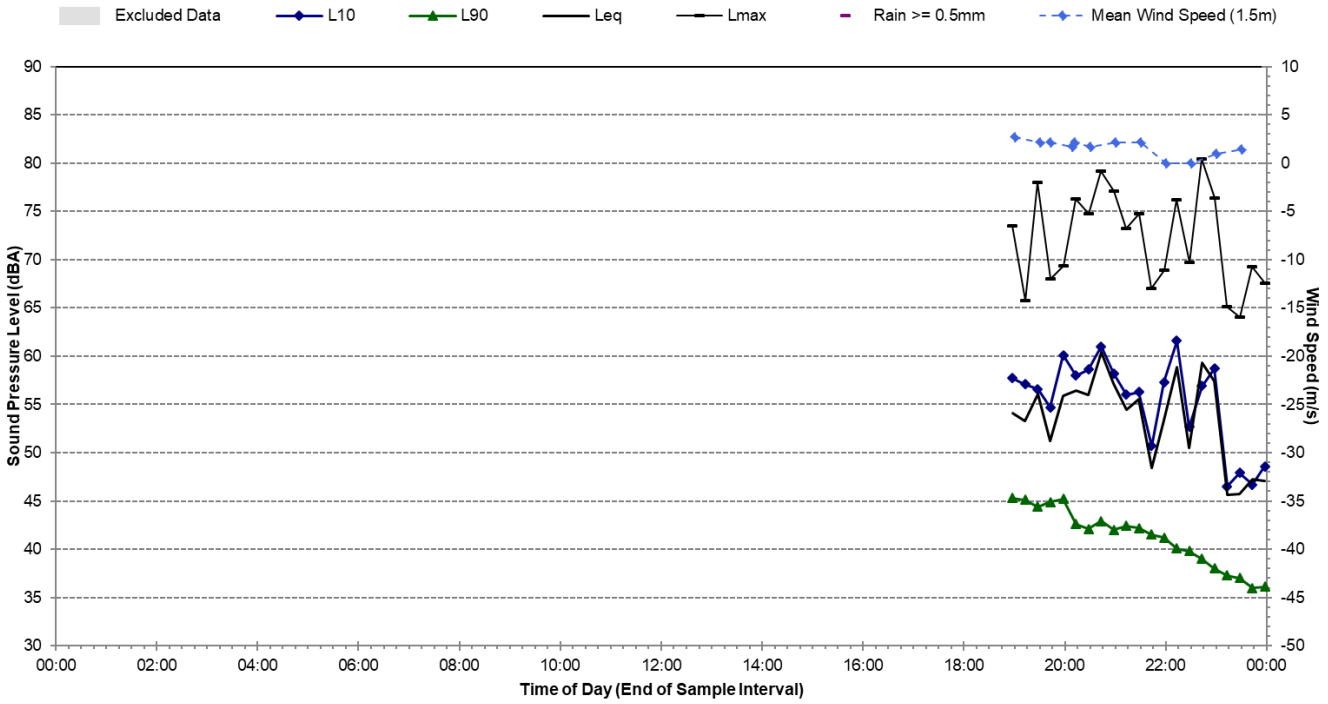
Statistical Ambient Noise Levels

Location 2 - Friday, 8 November 2019



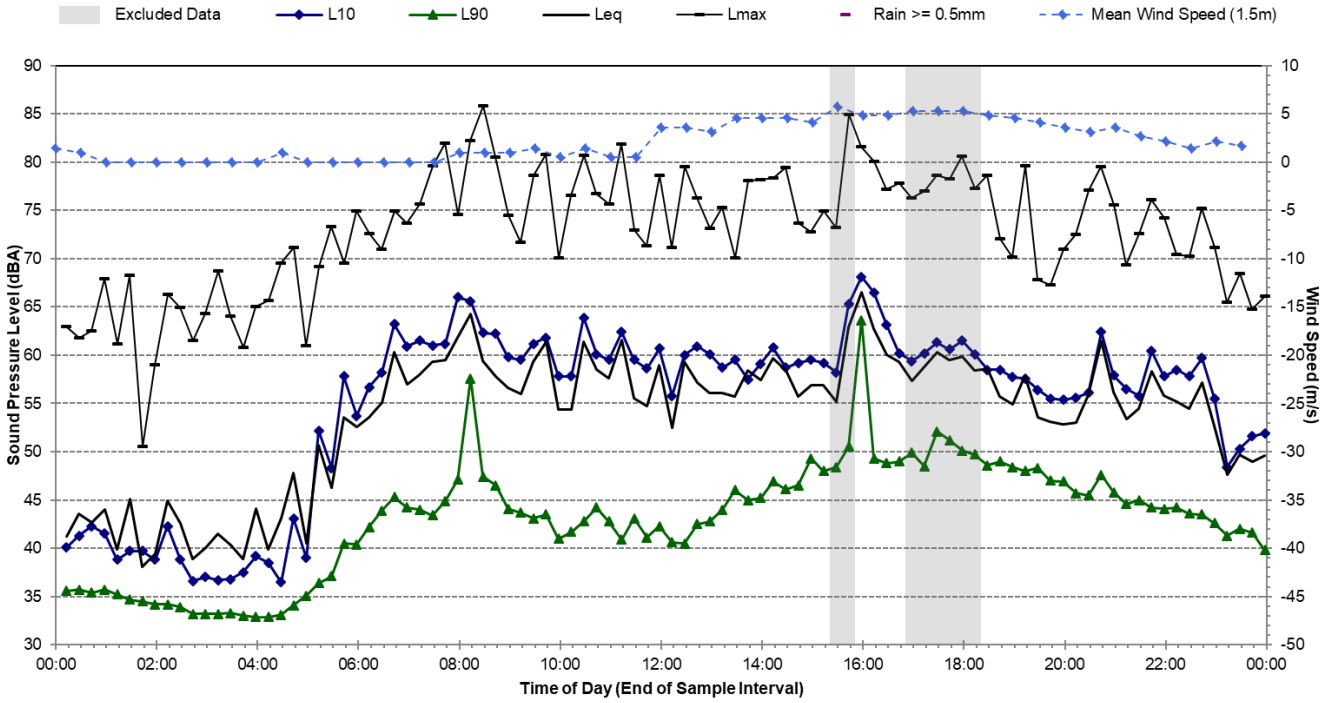
Statistical Ambient Noise Levels

Location 3 - Wednesday, 30 October 2019



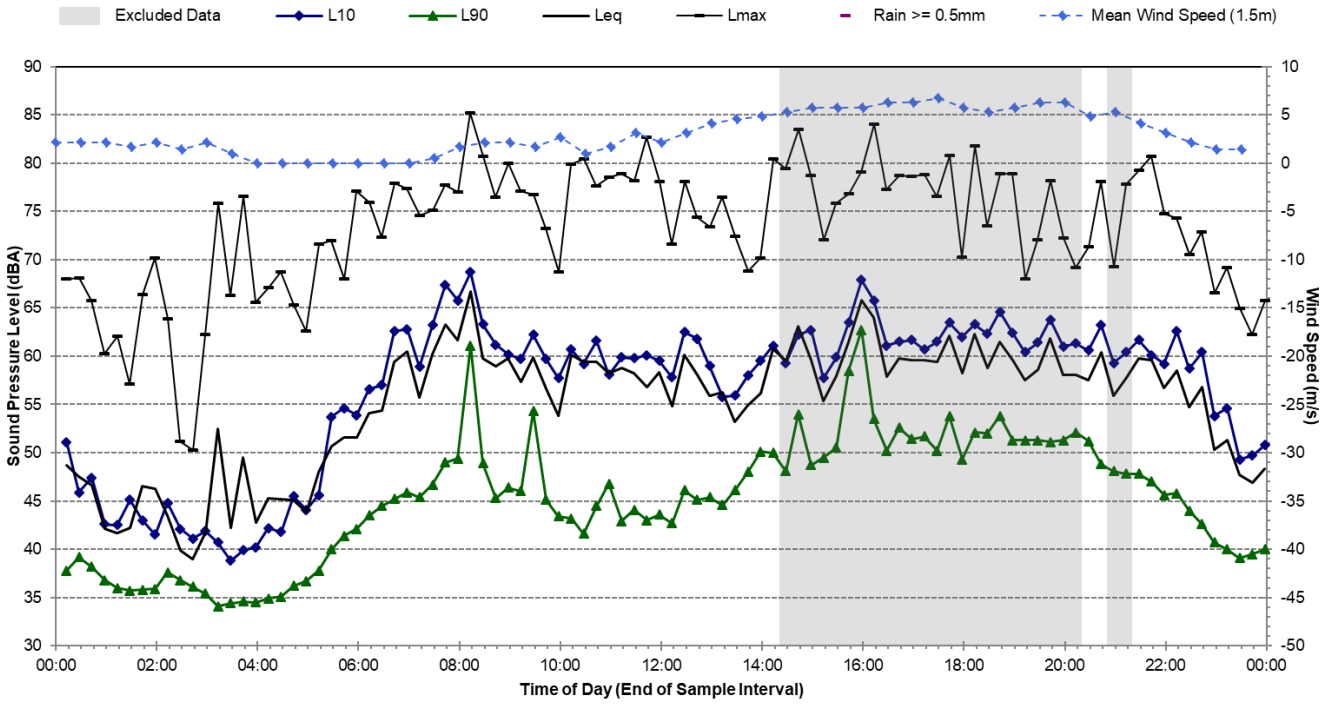
Statistical Ambient Noise Levels

Location 3 - Thursday, 31 October 2019



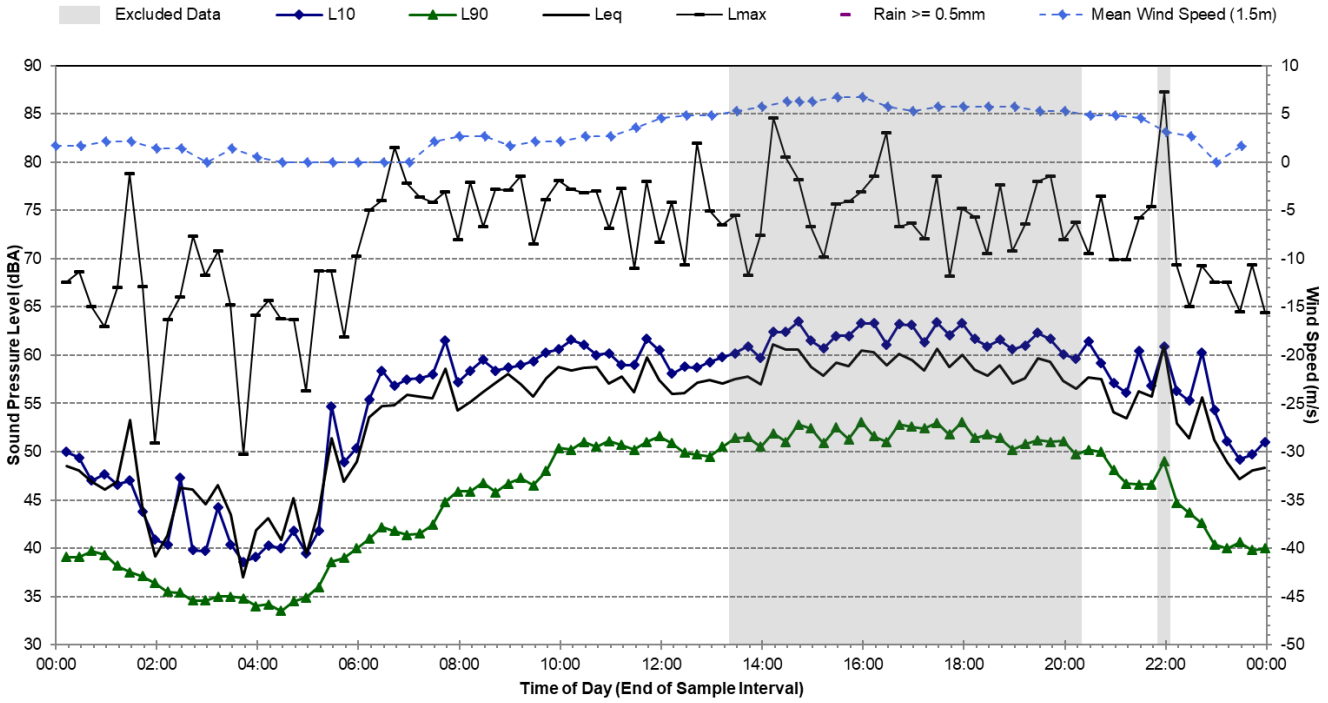
Statistical Ambient Noise Levels

Location 3 - Friday, 1 November 2019



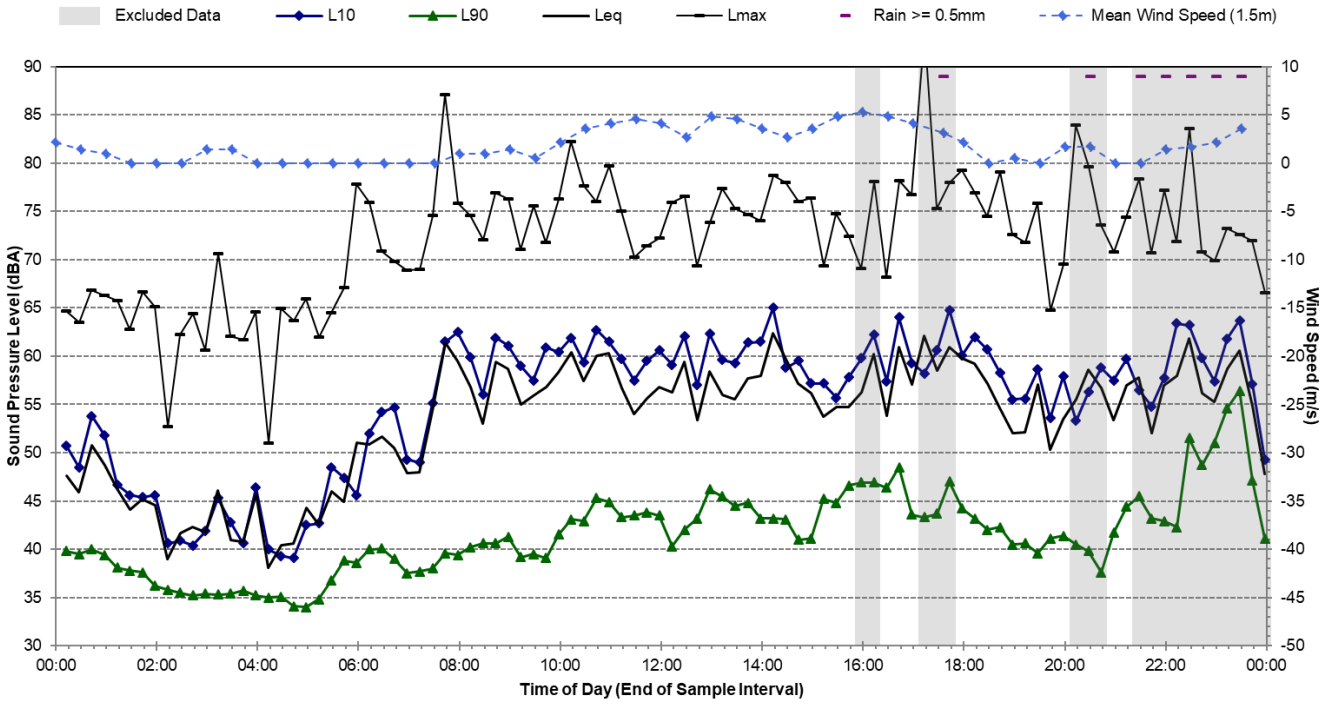
Statistical Ambient Noise Levels

Location 3 - Saturday, 2 November 2019



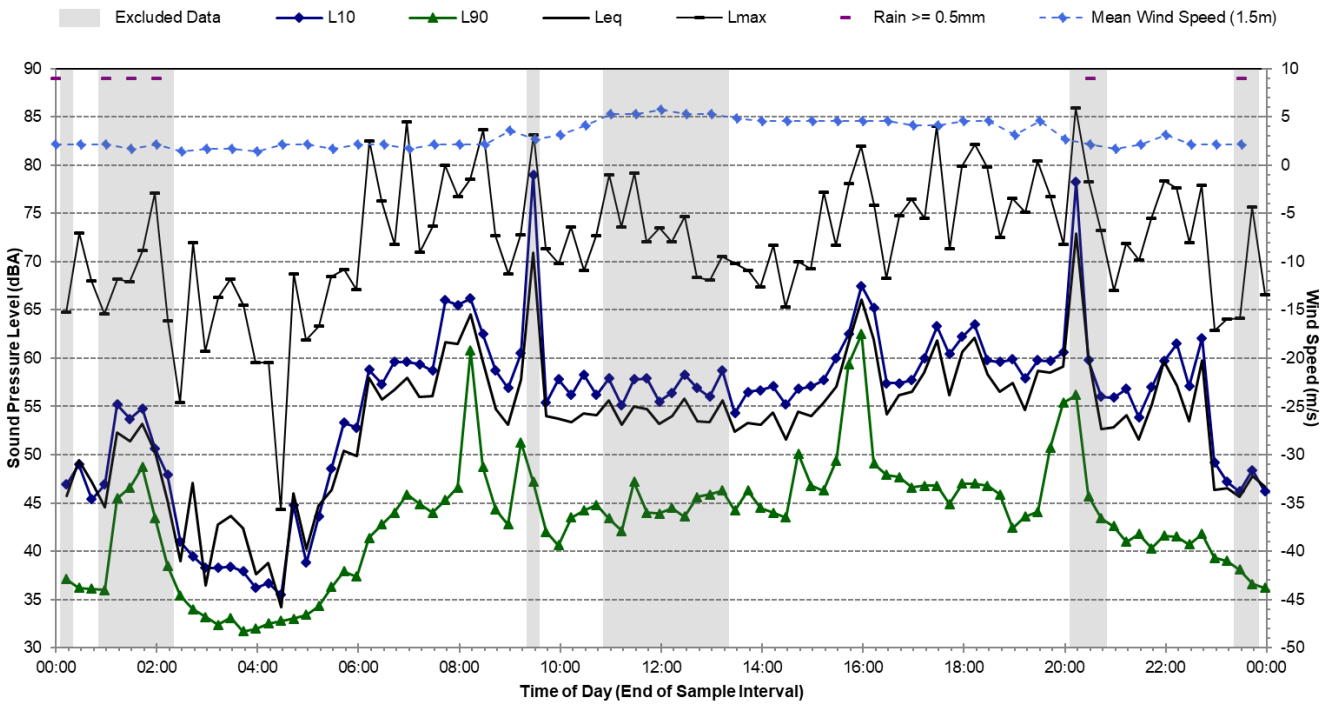
Statistical Ambient Noise Levels

Location 3 - Sunday, 3 November 2019



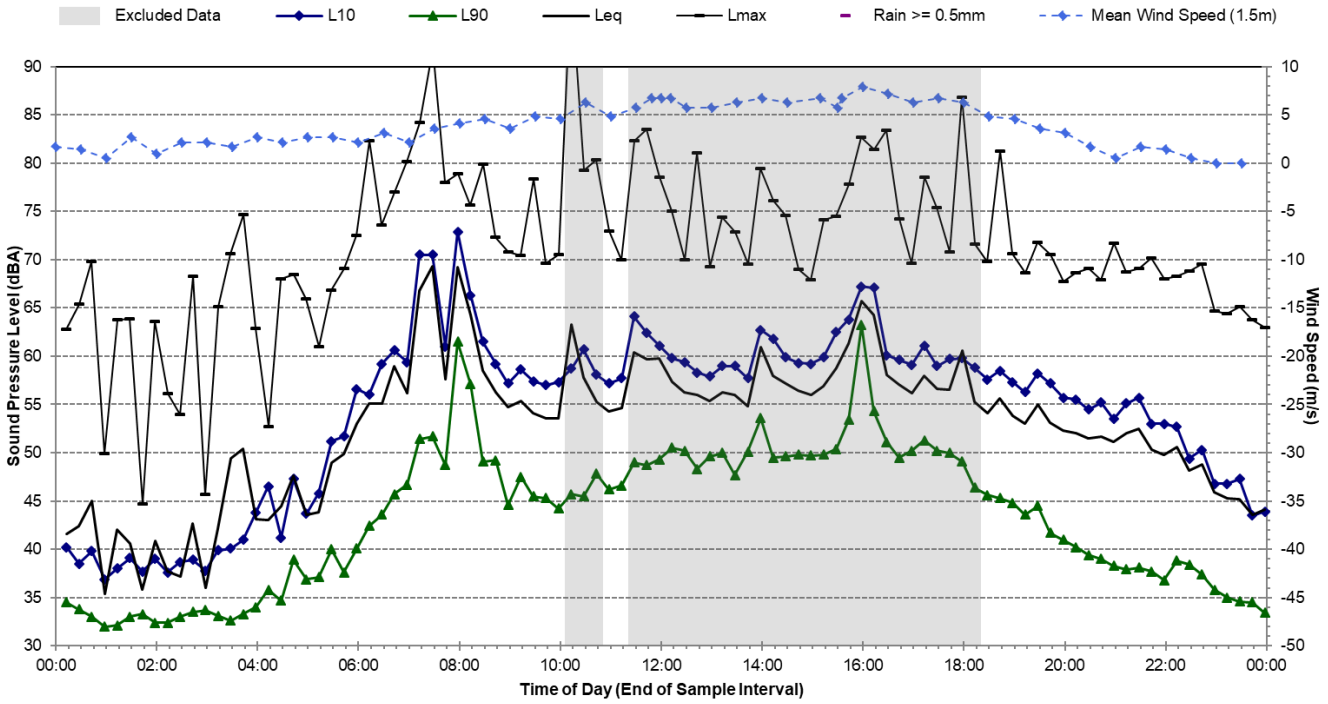
Statistical Ambient Noise Levels

Location 3 - Monday, 4 November 2019



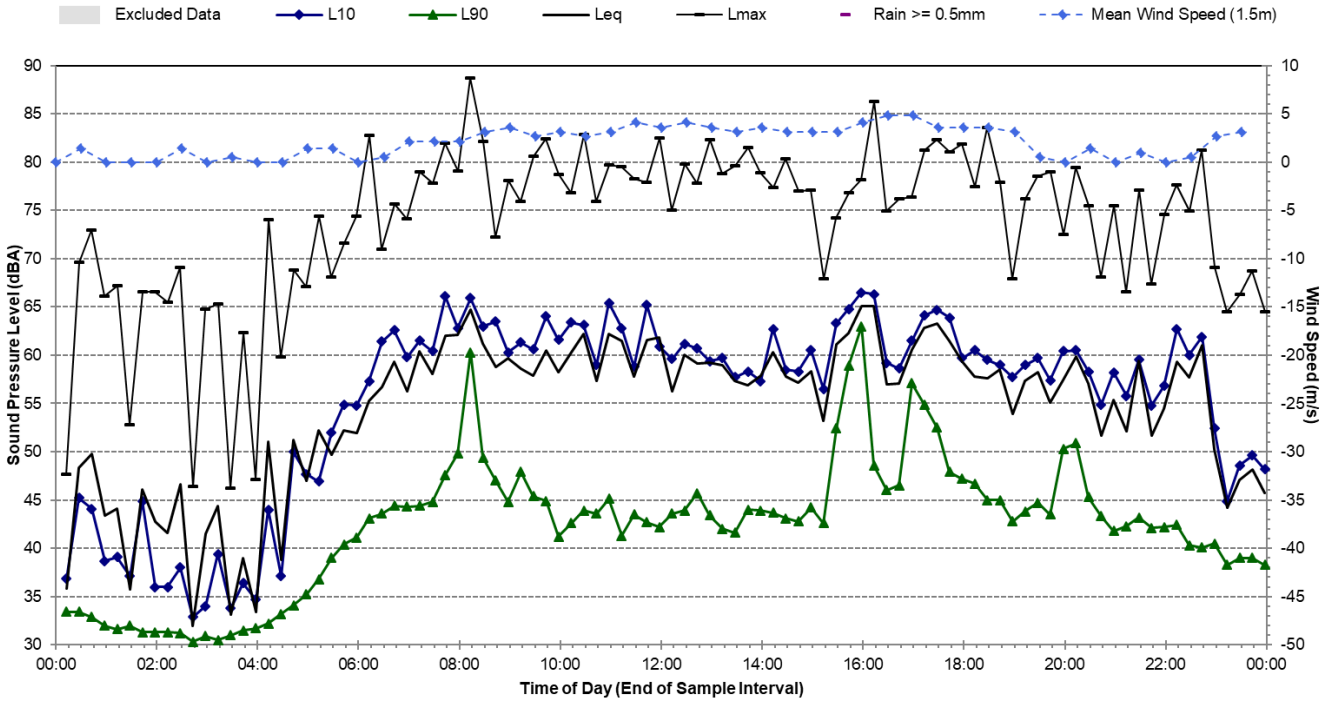
Statistical Ambient Noise Levels

Location 3 - Tuesday, 5 November 2019



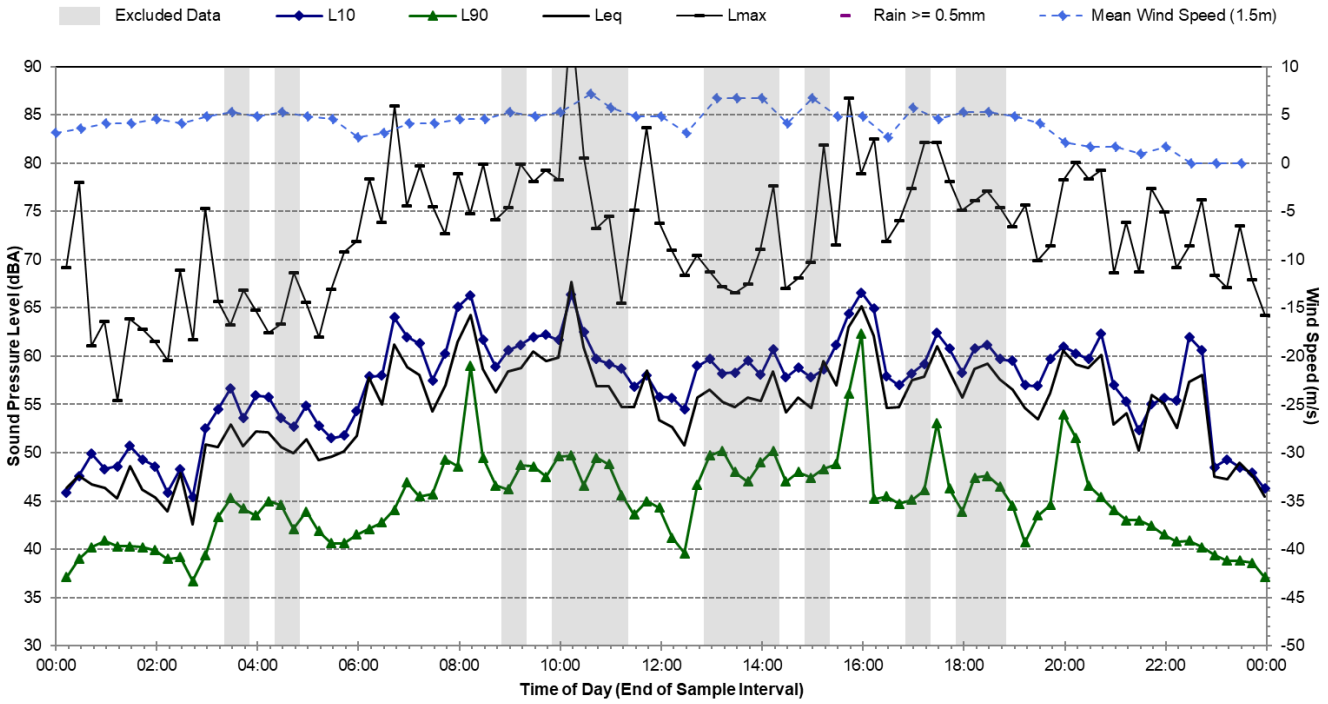
Statistical Ambient Noise Levels

Location 3 - Wednesday, 6 November 2019



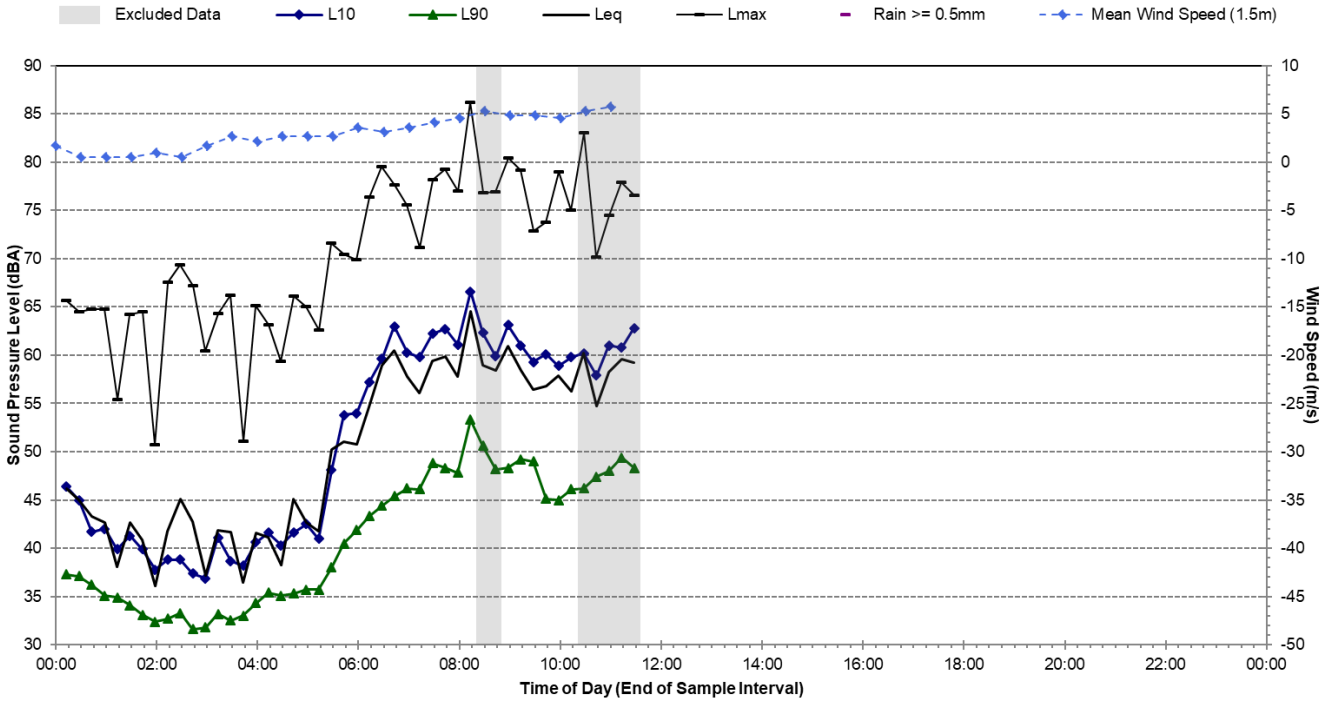
Statistical Ambient Noise Levels

Location 3 - Thursday, 7 November 2019



Statistical Ambient Noise Levels

Location 3 - Friday, 8 November 2019



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