Augusta Street Warehouse and Distribution Centre

Noise and Vibration Impact Assessment

The Trustee for Huntingwood Property Trust

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Basis of Report

This report has been prepared by SLR Consulting Australia (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with The Trustee for Huntingwood Property Trust (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.

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1.0 Introduction

SLR Consulting Australia Pty Ltd (SLR) has been commissioned by The Trustee for Huntingwood Property Trust to prepare this report to address the technical requirements of the Secretary's Environmental Assessment Requirements (SEARs), and to accompany the State Significant Development Application (SSD- 36138263) for the proposed Augusta Street warehouse and distribution centre at Augusta Street, Blacktown.

This report summarises the assessment of the potential construction and operational noise impacts associated with the proposal

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

1.1 Secretary's Environmental Assessment Requirements – SSD 36138263

The Secretary's Environmental Assessment Requirements (SEARs) for SSD 36138263 were issued by the Department of Planning, Industry and Environment (DPIE) on 2 August 2022. The requirements relevant to noise and vibration are shown in **Table 1**.

Table 1 Secretary's Environmental Assessment Requirements, SSD 36138263, 2 August 2022

Noise and Vibration	Where Addressed
Provide a noise and vibration assessment prepared in accordance with the relevant EPA guidelines. The assessment must detail construction and operational noise and vibration impacts on nearby sensitive receivers and structures and outline the proposed management and mitigation measures that would be implemented.	**Construction:** **Section 4.1, 5.1** and **5.2** **Operation:** **Section 4.2** and **6.0** **Mitigation:** **Section 6.0**

1.2 Project Location

The site is located at Augusta Street, Blacktown, within the Blacktown local government area (LGA). The site comprises multiple parcels of land and is legally described as:

- Lot 1 DP835264
- Lots 218-219 DP457024
- Lot 2151 DP135859
- Lot 2 DP516449
- Lot 163-164, 168-188 and 216 DP8716
- Lot 1 DP119616
- Lots 4-6 DP226294
- Lots 50-52 DP1144623
- Lot 7 DP803359

- Lots 6-10 DP801210
- Lot 4 DP585492
- Lot 4 DP583442
- Lot 2 DP1263824.

The site location and surrounding area is shown in **Figure 1** and the layout of the warehouses are shown in **Figure 2** to **Figure 4**. Key features of the site are as follows:

- The site has frontage to the Great Western Highway and the Western Motorway of 940 metres and frontage to Flushcombe Road of approximately 250 metres. Augusta Street dissects part of the western portion of the site and is vested to Blacktown Council.
- Access to the site is currently available from Augusta Street which connects to Flushcombe Road to the west. Flushcombe Road intersects with the Great Western Highway, providing east-west access to the metropolitan road network, with right-in and right-out movements available via the existing signalised intersection.
- The eastern part of the site slopes to the west, while the western part of the site slopes to the east, with the central low point at Blacktown Creek adjacent to the easement for water supply

The site is affected by multiple easements and restrictions including:

  - Multiple easements up to 30 metres wide for transmission lines along the southern part of the site. The site features high voltage power lines along the southern side.
  - A 10m wide easement for water supply which runs north-south within the central part of the site, with associated 9 metre wide and 3 metre wide easements for construction purposes.

- Lot 164 in DP8716 is identified as being owned by Amplitel as the land accommodates a Telstra mobile telecommunications facility which is proposed to be relocated.
- The site has been cleared but is undeveloped with scattered trees across the western boundary and southern boundaries and in the north-eastern corner. Blacktown Creek runs north-south through the central part of the site with riparian vegetation along the corridor.

Key features of the locality:

- The site is approximately 34km west of the Sydney CBD and approximately 3.3km south of the Blacktown commercial centre.
- The region features a mix of land uses, including residential and employment-generating activities. The Huntingwood and Pemulwuy industrial estates are located to the west and south-east.
- The Prospect Reservoir is approximately 1km south of the site adjacent to the Western Sydney Parklands.

The surrounding locality is described as follows:

- North: The site adjoins the Great Western Highway. The land further to the north primarily comprises residential development including detached single and double storey dwellings. A small natural reserve known as Timbertop Reserve separates the residential development and associated landscaping.

- East: The land immediately to the east of the site is vacant. The Prospect Highway is located further east, providing access to the M4 Motorway and Great Western Highway. St Bartholomew's Church and Cemetery is located on the eastern side of the Prospect Highway.
- South: The M4 Motorway runs along the southern boundary of the site, with boundary landscaping providing visual screening of the site. The land on the opposite side of the Motorway comprises recreational and entertainment facilities in the form of a water park and a drive in movie theatre. West: The land to the west comprises an animal holding facility and industrial development, characterised by large warehouse buildings.

1.3 Project Description

The proposed SSDA seeks approval to redevelop the site to accommodate a warehouse and distribution centre use inclusive of the following:

- Site establishment works, including tree removal, minor excavation / bulk earthworks.
- Construction and operation of four (4) new warehouse buildings comprising a multi-level warehouse building on the eastern portion of the site and three single storey warehouse buildings on the western portion of the site. The warehouse buildings will include ancillary office space and indicative warehouse fit out works including warehouse racking.
- The warehouse and distribution tenancies are proposed to be operated 24 hours per day, 7 days per week.
- Other associated works including landscaping, at-grade car parking and general site improvements.
- Business and building identification signage including wayfinding signage.
- Vehicle access provided via Augusta Street and a new proposed access from the Great Western Highway
- Lot consolidation of properties.

The identified sources of noise from the proposed development include:

- Mechanical plant
- Operation of the ground, first-floor and second -floor hardstands
- Truck movements on internal access roads, ramps and within hardstands
- Light vehicle movements on internal access roads and parking areas.

Figure 1 Site Location, Surrounding Receivers and Noise Monitoring Locations

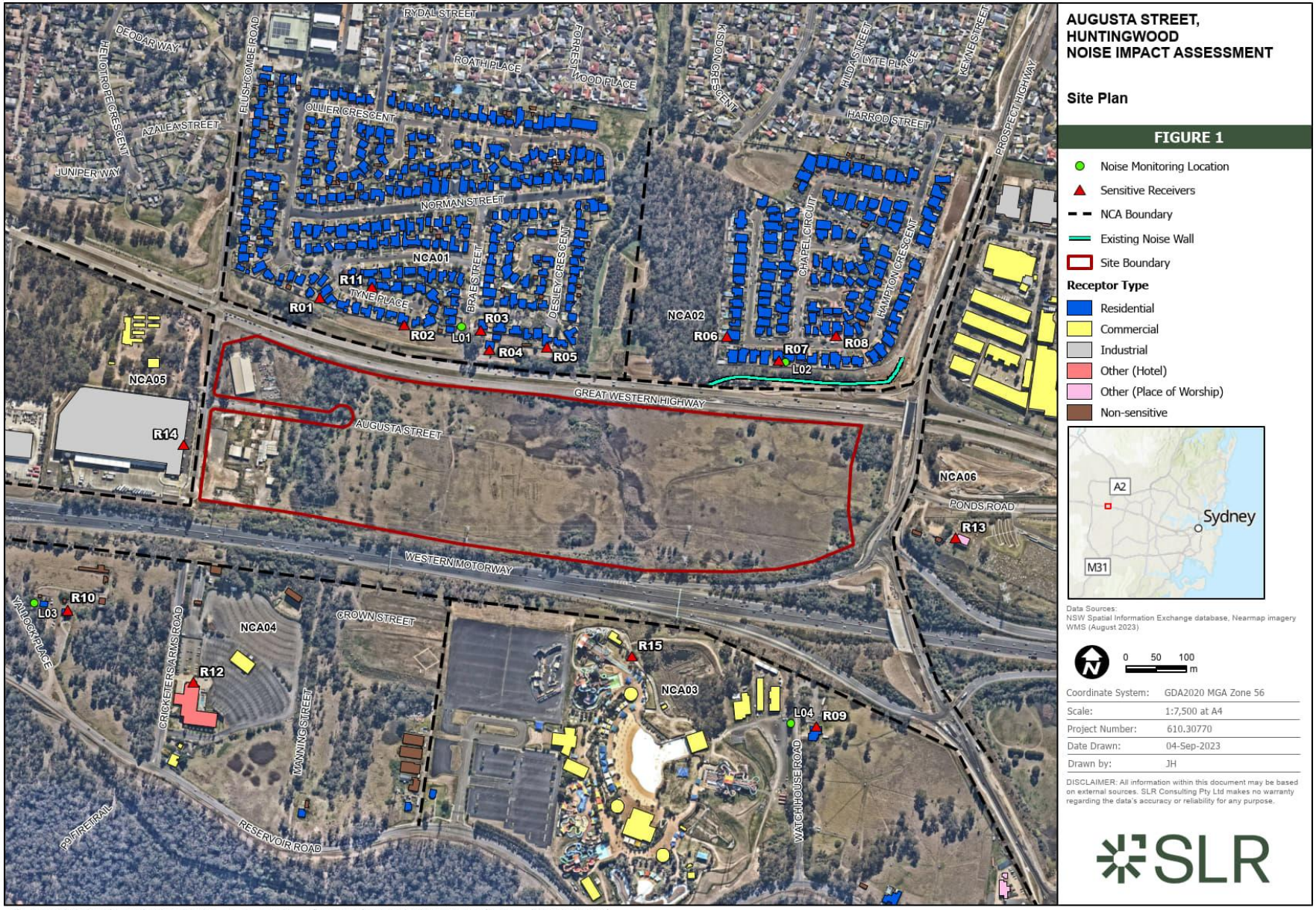


Figure 2 Proposed Development – Ground Floor

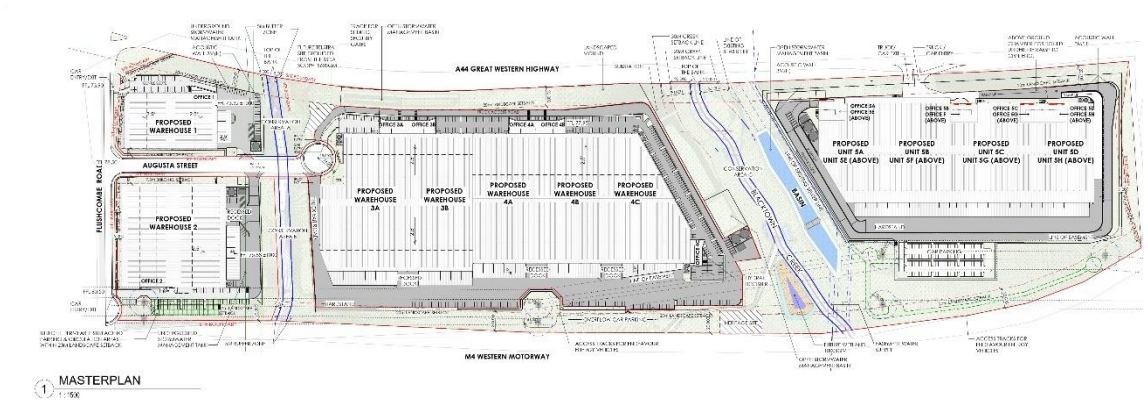


Figure 3 Proposed Development – First Floor

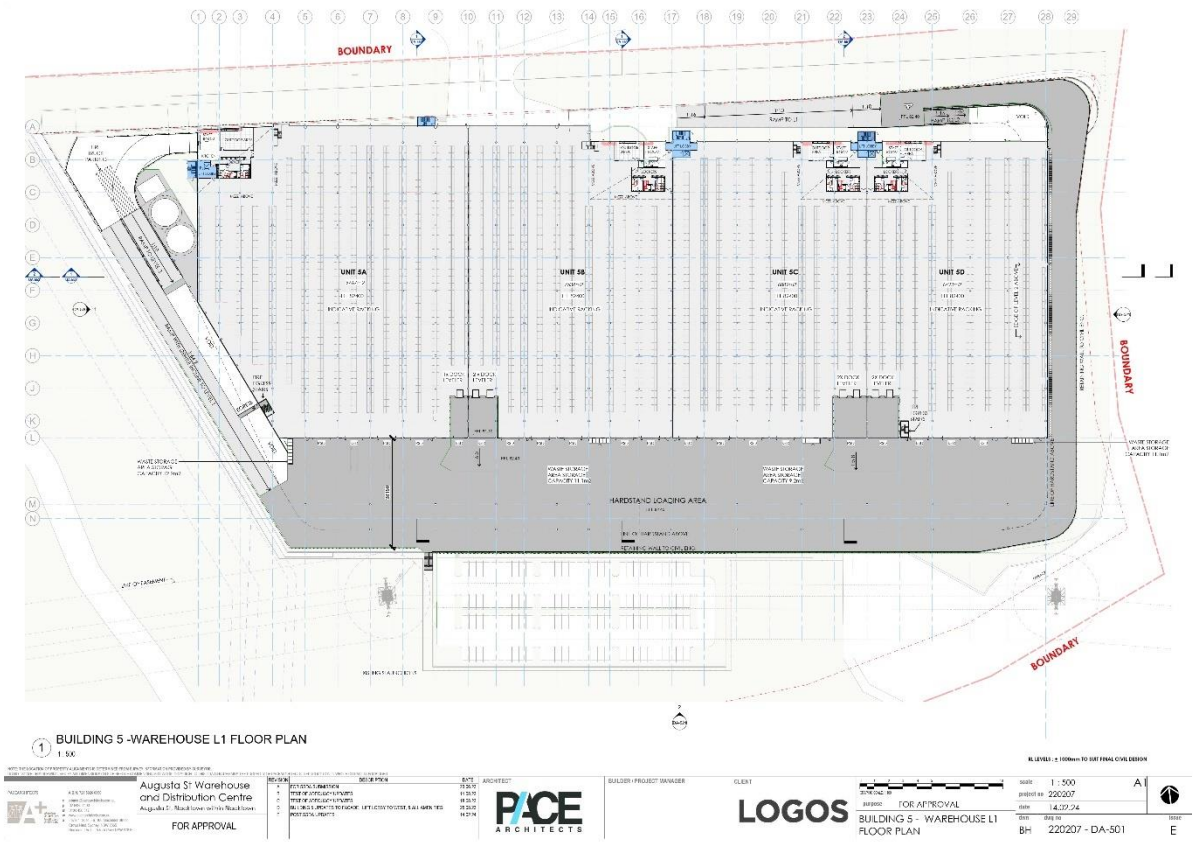
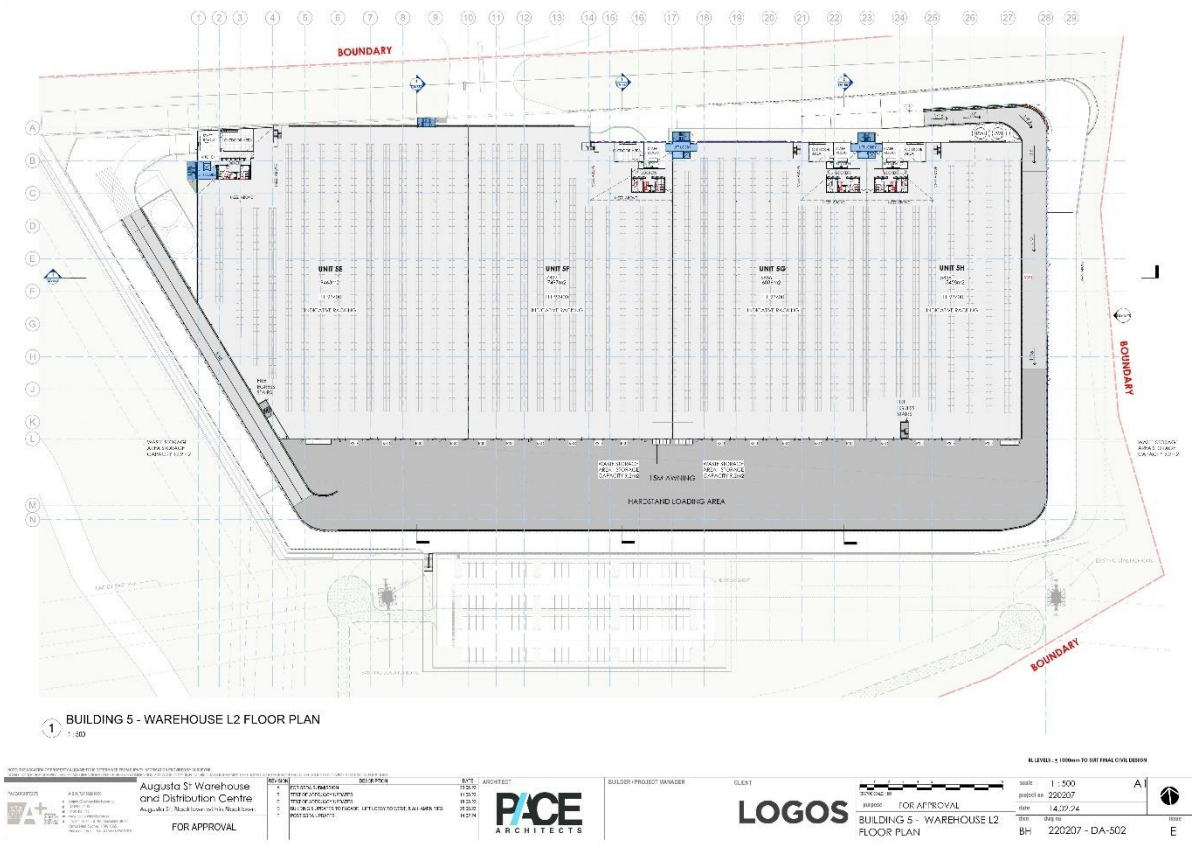


Figure 4 Proposed Development – Second Floor



1.4 Nearest Receivers

The nearest receivers are commercial developments located 30 m to the west of the site. The nearest residential receivers are located around 65 m to north of the site with the nearest residential receivers to the south 260 m from the site. The area surrounding the site has been divided into six Noise Catchment Areas (NCAs). The NCAs group together sensitive receivers with similar existing noise environments. The assessment has considered noise impacts at all the sensitive receivers within each NCA. The sensitive receivers identified with the highest potential impacts within each NCA are shown in **Figure 1** and detailed in **Table 2**.

Table 2 Surrounding Sensitive Receivers

Receiver	NCA	Receiver Type	Distance (m)	Direction	Address
R01	NCA01	Residential	95	North	4 Tyne Place, Prospect
R02	NCA01	Residential	90	North	18 Tyne Place, Prospect
R03	NCA01	Residential	95	North	39 Desley Crescent, Prospect
R04	NCA01	Residential	65	North	21 Brae Street, Prospect
R05	NCA01	Residential	80	North	31 Desley Crescent, Prospect
R06	NCA02	Residential	130	North	61 Hampton Crescent, Prospect
R07	NCA02	Residential	100	North	49 Hampton Crescent, Prospect
R08	NCA02	Residential	140	North	30 Hampton Crescent, Prospect
R09	NCA03	Residential	260	South	24 Watch House Road, Prospect
R10	NCA04	Residential	290	Southwest	2 Yallock Place, Prospect
R11	NCA01	Residential	140	North	5 Tyne Place, Prospect
R12	NCA04	Hotel	300	Southwest	32 Cricketers Arms Road, Prospect
R13	NCA06	Place of Worship	170	East	St Bartholomew's Church, Ponds Road, Prospect
R14	NCA05	Industrial	35	West	421-427 Flushcombe Road, Blacktown
R15	NCA03	Commercial	150	South	Raging Waters Sydney, 427 Reservoir Road, Prospect

2.0 Existing Noise Environment

Unattended noise monitoring was completed in the study area in May 2022. The measured noise levels have been used to determine the existing noise environment and to set the criteria used to assess the potential impacts from the proposal.

The monitoring equipment was positioned to measure existing noise levels that are representative of receivers potentially most affected by the proposal, within constraints such as accessibility, security and landowner permission.

The noise monitoring equipment continuously measured existing noise levels in 15-minute periods during the daytime, evening and night-time. All equipment carried current National Association of Testing Authorities (NATA) or manufacturer calibration certificates and equipment calibration was confirmed before and after each measurement.

The measured data has been processed to exclude noise from extraneous events and periods affected by adverse weather conditions, such as strong wind or rain (measured at the BOM weather station at Horsley park Equestrian Centre), to establish representative existing noise levels in the study area.

The noise monitoring locations are shown in **Figure 1** and the results are summarised in **Table 3**. Details of the unattended monitoring together with graphs of the measured daily noise levels are provided in **Appendix B**.

Table 3 Summary of Unattended Noise Monitoring Results

ID	Address	Measured Noise Levels (dBA)[1]					
		Background Noise (RBL)			Average Noise (L_{Aeq})		
		Day	Evening	Night	Day	Evening	Night
L01	18 Brae Street, Prospect	48	50	44	55	55	53
L02	47 Hampton Crescent, Prospect	47	46	39	55	53	51
L03	10 Yallock Place, Prospect	55	55	48	59	59	57
L04	Watch House Road, Prospect	49	49	45	55	54	52

Note 1: The assessment periods are the daytime which is 7 am to 6 pm Monday to Saturday and 8 am to 6 pm on Sundays and public holidays, the evening which is 6 pm to 10 pm, and the night-time which is 10 pm to 7 am on Monday to Saturday and 10 pm to 8 am on Sunday and public holidays. See the NSW EPA *Noise Policy for Industry*.

Short-term attended noise monitoring was also completed. The attended measurements allow the contributions of the various noise sources at each location to be determined. Detailed observations from the attended measurements are provided in **Appendix B.**

The attended measurements were generally found to be consistent with the results of the unattended noise monitoring and show that existing ambient noise levels are typically dominated by road traffic noise from the surrounding road network, including the M4 Motorway to the south and the Great Western Highway to the north of the proposed site, and industrial noise from existing industrial developments for receivers south of the M4 Motorway.

3.0 Assessment Criteria

3.1 Construction Noise Criteria

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 contains procedures for determining project specific Noise Management Levels (NMLs) for sensitive receivers based on the existing background noise in the area. The 'worst-case' noise levels from construction of a proposal are predicted and then compared to the NMLs in a 15-minute assessment period to determine the likely impact of the proposal.

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 4**.

Table 4 ICNG NMLs for Residential Receivers

Time of Day	NML $L_{Aeq(15minute)}$	How to Apply
Standard Construction 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	Noise affected RBL[1] + 10 dB	• The noise affected level represents the point above which there may be some community reaction to noise • Where the predicted or measured $L_{Aeq(15minute)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices 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 Standard Construction Hours	Noise affected 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 ICNG refers to the calculation procedures in the NSW *Industrial Noise Policy* (INP). The INP has been superseded by the NSW EPA *Noise Policy for Industry* (NPfI).Select style "List Number"

3.1.1.1 'Other Sensitive' Land Uses and Commercial Receivers

The ICNG NMLs for 'other sensitive' non-residential land uses are shown in **Table 5**.

Table 5 Construction NMLs at 'Other Sensitive' Land Uses

Land Use	Noise Management Level $L_{Aeq(15minute)}$ (dBA) (applied when the property is in use)	
	Internal	External
ICNG 'Other Sensitive' Receivers		
Classrooms at schools and other educational institutions	45	55[1]
Hospital wards and operating theatres	45	65[2]
Places of worship	45	55[1]
Active recreation areas (characterised by sporting activities and activities which generate noise)	-	65

Land Use	Noise Management Level $L_{Aeq(15minute)}$ (dBA) (applied when the property is in use)	
	Internal	External
Passive recreation areas (characterised by contemplative activities that generate little noise)	-	60
Commercial	-	70
Industrial	-	75
Non-ICNG 'Other Sensitive' Receivers		
Hotel – daytime & evening[3]	50	70[2]
Hotel – night-time[3]	40	60[2]

Note 1: It is assumed that these receivers have windows partially open for ventilation which results in internal noise levels being around 10 dB lower than the external noise level.

Note 2: It is assumed that these receivers have fixed windows which conservatively results in internal noise levels being around 20 dB lower than the external noise level.

Note 3: Taken from AS2107.

3.1.1.2 NML Summary

The construction NMLs for the proposal have been determined using the results from the unattended noise monitoring and are shown in **Table 6**.

Table 6 Project Specific Noise Management Levels (dBA)

NCA	Receiver Type	Monitoring Location	Noise Management Level ($L_{Aeq(15minute)}$ – dBA)				Sleep Disturbance Screening Level (RBL+15 dB) (L_{Amax} dBA)
			Standard Construction (RBL +10 dB)[1]	Out of Hours (RBL +5 dB)			
			Daytime	Daytime[2]	Evening	Night-time	Night-time
NCA01	Residential	L01	58	53	53	49	59
NCA02	Residential	L02	57	52	51	44	54
NCA03	Residential	L04	59	54	54	50	60
NCA04	Residential	L03	65	60	60	53	63
-	Hotel	-	70	70	70	60	60
-	Place of Worship	-	55	55	55	55	-
-	Commercial	-	70	70	-	-	-
-	Industrial	-	75	75	-	-	-

Note 1: RBL = Rating Background Level.

Note 2: Daytime out of hours is 7 am to 8 am and 1 pm to 6 pm on Saturday, and 8 am to 6 pm on Sunday and public holidays.

3.2 Construction Vibration Criteria

The effects of vibration from construction works can be divided into three categories:

- Those in which the occupants of buildings are disturbed (human comfort)

- Those where building contents may be affected (building contents)
- Those where the integrity of the building may be compromised (structural or cosmetic damage).

3.2.1 Human Comfort Vibration

People can sometimes perceive vibration impacts when vibration generating construction works are located close to occupied buildings.

Vibration from construction works tends to be intermittent in nature and the EPA's *Assessing Vibration: a technical guideline* (2006) provides criteria for intermittent vibration based on the Vibration Dose Value (VDV). The 'preferred' and 'maximum' VDVs for human comfort impacts are shown in **Table 7**

Table 7 Vibration Dose Values for Intermittent Vibration

Building Type	Assessment Period	Vibration Dose Value[1] ($m/s^{1.75}$)	
		Preferred	Maximum
Critical Working Areas (eg operating theatres or laboratories)	Day or night-time	0.10	0.20
Residential	Daytime	0.20	0.40
	Night-time	0.13	0.26
Offices, schools, educational institutions and places of worship	Day or night-time	0.40	0.80
Workshops	Day or night-time	0.80	1.60

Note 1: The VDV accumulates vibration energy over the daytime and night-time assessment periods, and is dependent on the level of vibration as well as the duration.

3.2.2 Effects on Building Contents

People perceive vibration at levels well below those likely to cause damage to building contents. For most receivers, the human comfort vibration criteria are the most stringent and it is generally not necessary to set separate criteria for vibration effects on typical building contents.

Exceptions to this can occur when vibration sensitive equipment, such as electron microscopes, are located in buildings near to construction works. No such items of equipment have been identified in the proposal area.

3.2.3 Structural and Cosmetic Damage Vibration

If vibration from construction works is sufficiently high it can cause damage to structural elements of affected buildings. The levels of vibration required to cause cosmetic damage tend to be at least an order of magnitude (10 times) higher than those at which people can perceive vibration.

Examples of damage that can occur includes cracks or loosening of drywall surfaces, cracks in supporting columns and loosening of joints. Structural damage vibration limits are contained in British Standard BS 7385 and German Standard DIN 4150.

BS 7385

British Standard BS 7385 recommends vibration limits for transient vibration judged to give a minimal risk of vibration induced damage to affected buildings. The limits for residential and industrial buildings are shown in **Table 8**.

Table 8 BS 7385 Transient Vibration Values for Minimal Risk of Damage

Group	Type of Building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
		4 Hz to 15 Hz	15 Hz and Above
1	Reinforced or framed structures. Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
2	Unreinforced or light framed structures. Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

Note 1: Where the dynamic loading caused by continuous vibration may give rise to dynamic magnification due to resonance, especially at the lower frequencies where lower guide values apply, then the guide values may need to be reduced by up to 50%.

For heritage buildings, the standard states that "a building of historical value should not (unless it is structurally unsound) be assumed to be more sensitive".

DIN 4150

German Standard DIN 4150 also provides guideline vibration limits for different buildings. Damage is not expected to occur where the values are complied with and the values are generally recognised to be conservative. The DIN 4150 values for buildings and structures are shown in **Table 9**.

Table 9 DIN 4150 Guideline Values for Short-term Vibration on Structures

Group	Type of Structure	Guideline Values Vibration Velocity (mm/s)				
		Foundation, All Directions at a Frequency of			Topmost Floor, Horizontal	Floor Slabs, Vertical
		1 to 10 Hz	10 to 50 Hz	50 to 100 Hz	All frequencies	All frequencies
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40	20
2	Residential buildings and buildings of similar design and/or occupancy	5	5 to 15	15 to 20	15	20
3	Structures that, because of their particular sensitivity to vibration, cannot be classified as Group 1 or 2 **and** are of great intrinsic value (eg heritage listed buildings)	3	3 to 8	8 to 10	8	20[1]

Note 1: It may be necessary to lower the relevant guideline value markedly to prevent minor damage.

3.2.4 Heritage Buildings or Structures

Heritage listed buildings and structures should be considered on a case-by-case basis but as noted in BS 7385 should not be assumed to be more sensitive to vibration, unless structurally unsound. Where a heritage building is deemed to be sensitive, the more stringent DIN 4150 Group 3 guideline values in **Table 9** can be applied.

One heritage building, St Bartholomew's Church located at Ponds Road, Prospect, has been identified 180m east of the site.

3.2.5 Minimum Working Distances for Vibration Intensive Works

Minimum working distances for typical vibration intensive construction equipment are provided in the Roads and Maritime (now Transport for NSW) *Construction Noise and Vibration Guideline* (CNVG) and are shown in **Table 10**. The minimum working distances are for both cosmetic damage (from BS 7385 and DIN 4150) and human comfort (from the NSW EPA Vibration Guideline). They 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 10 Recommended Minimum Working Distances from Vibration Intensive Equipment

Plant Item	Rating/Description	Minimum Distance		
		Cosmetic Damage		Human Response (NSW EPA Guideline)
		Residential and Light Commercial (BS 7385)	Heritage Items (DIN 4150, Group 3)	
Vibratory Roller	<50 kN (1–2 tonne)	5 m	11 m	15 m to 20 m
	<100 kN (2–4 tonne)	6 m	13 m	20 m
	<200 kN (4–6 tonne)	12 m	25 m	40 m
	<300 kN (7–13 tonne)	15 m	31 m	100 m
	>300 kN (13–18 tonne)	20 m	40 m	100 m
	>300 kN (>18 tonne)	25 m	50 m	100 m
Small Hydraulic Hammer	300 kg (5 to 12 t excavator)	2 m	5 m	7 m
Medium Hydraulic Hammer	900 kg (12 to 18 t excavator)	7 m	15 m	23 m
Large Hydraulic Hammer	1,600 kg (18 to 34 t excavator)	22 m	44 m	73 m
Vibratory Pile Driver	Sheet piles	2 m to 20 m	5 m to 40 m	20 m
Piling Rig – Bored	≤ 800 mm	2 m (nominal)	5 m	4 m
Jackhammer	Hand held	1 m (nominal)	3 m	2 m

The minimum working distances are indicative and will 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 Operational Noise Criteria

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

The NPfI defines how to determine 'trigger levels' for noise emissions from industrial developments. Where a development is likely to exceed the trigger levels at existing noise sensitive receivers, feasible and reasonable noise management measures are required to be considered to reduce the impacts.

There are two types of trigger levels – 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 LAeq noise level of the source, measured over a period of 15-minutes, does not exceed the representative 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.

Intrusive and amenity noise levels are not used directly as regulatory limits. They are used to assess the potential impact of noise, assess feasible and reasonable mitigation options, and subsequently determine achievable noise requirements.

The NPfI provides guidance on assigning residential receiver amenity noise categories based on the site-specific features shown in **Table 11**.

Table 11 Residential Receiver Amenity

Receiver Category	Typical Planning Land Use Zoning	Typical Existing Background Noise Levels (RBL)	Description
Rural	RU1 – primary production RU2 – rural landscape RU4 – primary production small lots R5 – large lot residential E4 – environmental living	Daytime <40 dBA Evening <35 dBA Night <30 dBA	Rural – an area with an acoustical environment that is dominated by natural sounds, having little or no road traffic noise and generally characterised by low background noise levels. Settlement patterns would be typically sparse. Note: Where background noise levels are higher than those presented due to existing industry or intensive agricultural activities, the selection of a higher noise amenity area should be considered.

Receiver Category	Typical Planning Land Use Zoning	Typical Existing Background Noise Levels (RBL)	Description
Suburban residential	RU5 – village RU6 – transition R2 – low density residential R3 – medium density residential E2 – environmental conservation E3 – environmental management	Daytime <45 dBA Evening <40 dBA Night <35dBA	Suburban – an area that has local traffic with characteristically intermittent traffic flows or with some limited commerce or industry. This area often has the following characteristic: evening ambient noise levels defined by the natural environment and human activity.
Urban residential	R1 – general residential R4 – high density residential B1 – neighbourhood centre (boarding houses and shop-top housing) B2 – local centre (boarding houses) B4 – mixed use	Daytime >45 dBA Evening >40 dBA Night >35 dBA	Urban – an area with an acoustical environment that: • Is dominated by 'urban hum' or industrial source noise, where urban hum means the aggregate sound of many unidentifiable, mostly traffic and/or industrial related sound sources • Has through-traffic with characteristically heavy and continuous traffic flows during peak periods • Is near commercial districts or industrial districts • Has any combination of the above.

Amenity noise categories have been determined with reference to the NPFI. The assessment is shown in **Table 12**.

Table 12 Residential Receiver Amenity Category Assessment

Area	Land Use Zoning	Existing Background Noise Levels RBL (dBA)			Resulting Amenity Classification	Discussion
		Day	Eve	Night		
NCA01	R2 – low density residential	48	48	44	Suburban	The residential receivers in these NCAs are zoned as R2 – low density residential. Although existing noise levels are high and are generally dominated by traffic noise from the Great Western Highway (and M4 Motorway), which has heavy and continuous traffic flows. The receivers closer to the highway and the proposal have an acoustic environment consistent with the description of an urban environment. At the northern extent of these NCAs further from the highway, the background acoustic environment may be quieter. SLR understands that DPE would prefer to classify these NCAs as suburban in the absence of noise data for the northern extent of the NCA.
NCA02		47	46	39		
NCA03	Unzoned R2 – low density residential	49	49	45	Urban	Unzoned land which is dominated by heavy and continuous traffic noise from the M4 Motorway, therefore residences have been classified as urban.
NCA04		48	48	44		

3.3.1 Project Noise Trigger Levels

The trigger levels for industrial noise from the proposal are summarised in **Table 13**. The Project Noise Trigger Levels (PNTL) are the most stringent of the intrusiveness and amenity trigger level for each period and are highlighted below.

Table 13 Project Noise Trigger Levels

NCA	Receiver Type	Period	Amenity Noise Level L_{Aeq} (dBA)	Measured Noise Level (dBA)		Project Noise Trigger Levels $L_{Aeq(15minute)}$ (dBA)	
				RBL[1]	L_{Aeq}	Intrusiveness	Amenity[2,3]
NCA01	Residential	Day	55	48	55	**53**	53
		Evening	45	48[4] (50 actual)	55	53	**43**[5]
		Night	40	44	53	49	**41**[5]
NCA02	Residential	Day	55	47	55	**52**	53
		Evening	45	46	53	51	**43**
		Night	40	39	51	44	**39**[5]
NCA03	Residential	Day	60	49	55	**54**	58
		Evening	50	49	54	54	**48**
		Night	45	45	52	50	**43**
NCA04	Residential	Day	60	55	59	60	**58**
		Evening	50	55	59	60	**48**
		Night	45	48	57	53	**45**[5]
	Hotel	Day	65	-	-	-	**63**
		Evening	55	-	-	-	**53**
		Night	50	-	-	-	**48**
-	Place of Worship[6]	When in use	50	-	-	-	**48**
-	Commercial		65	-	-	-	**63**
-	Industrial		70	-	-	-	**68**

Note 1: RBL = Rating Background Level.

Note 2: The project amenity noise levels have been converted to a 15-minute level by adding 3 dB, as outlined in the NPfI.

Note 3: The recommended amenity noise levels have been reduced by 5 dB, where appropriate, to give the project amenity noise levels.

Note 4: RBL reduced to be no higher than the daytime RBL.

Note 5: Project amenity level was set at 15 dB below the existing road traffic noise level, as outlined in the NPfI.

Note 6: The criterion is specified as an internal noise level for this receiver category. As the noise model predicts external noise levels, it has been conservatively assumed that all windows are openable and external noise levels are therefore 10 dB higher than the corresponding internal level, which is generally considered representative of windows being partially open for ventilation.

3.3.2 Sleep Disturbance

The potential for sleep disturbance from maximum noise level events during the night-time period from the development is required to be considered.

The NPfI defines the sleep disturbance screening level as 52 dBA L_{AFmax} or the prevailing background level plus 15 dB, whichever is greater.

The sleep disturbance screening levels for the development are shown in **Table 14**.

Table 14 Sleep Disturbance Screening Levels

Location	Noise Level (dBA)	
	Measured Prevailing Night-time Background Level	Sleep Disturbance Screening Level[1]
NCA01	44	59
NCA02	39	54
NCA03	45	60
NCA04	48	63

Note 1: The sleep disturbance screening level as 52 dBA L_{AFmax} or the prevailing background level plus 15 dB, whichever is greater

A detailed maximum noise level event assessment should be completed where the sleep disturbance screening level is exceeded. 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 period.

The NPfI refers to the *Road Noise Policy* (RNP) for additional information regarding sleep disturbance. enHealth Council studies are referenced which indicate that for short-term or transient noise events, for good sleep over eight hours the indoor L_{AFmax} sound pressure level should ideally not exceed around 45 dBA more than 10 or 15 times per night.

The RNP goes on to conclude that from the research on sleep disturbance to date:

- 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 65-70 dBA are not likely to affect health and wellbeing significantly.

3.3.3 Corrections for Annoying Noise Characteristics

Sources of industrial noise can cause greater annoyance where they contain certain characteristics, such as tonality, intermittency or dominant low-frequency content. The NPfI specifies the following modifying factor corrections, shown in **Table 15**, which are to be applied where annoying characteristics are present. The corrections are to be added to the noise level at the receiver before comparison with the Project Noise Trigger Levels.

Table 15 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 the 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 the 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[3]
Maximum adjustment	Refer to individual modifying factors	Where two or more modifying factors are indicated.	Maximum correction of 10 dB[2] (excluding duration correction)

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.

Note 3: Adjustment to be applied to night-time only.

Details of the modifying factors applied in the assessment are provided in **Section 4.2.3**.

3.3.4 Traffic on Surrounding Roads

The potential impacts from proposal related traffic on the surrounding public roads are assessed using the NSW EPA *Road Noise Policy* (RNP).

An initial screening test is first applied to evaluate if existing road traffic noise levels are expected to increase by more than 2.0 dB. Where this is considered likely, further assessment is required using the RNP criteria shown in **Table 16**.

Table 16 RNP/NCG Criteria for Assessing 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)

4.0 Methodology

A noise model of the study area has been used to predict noise levels from the proposed construction and operation of the proposal to all surrounding receivers. The ISO 9613-2 calculation method implemented in accordance with ISO 17534-3 was used in the SoundPLAN noise modelling software package.

Local terrain, receiver buildings and structures were digitised in the noise model to develop a three-dimensional representation of the construction sites and surrounding areas.

A new noise barrier on the Great Western Highway off ramp adjacent to NCA02 has been constructed as part of the Prospect Highway Upgrade project and has been included in the construction noise and operational noise assessments. The noise barrier has been modelled at the location and height (3.5 m) specified in Section 8.2 of the *Prospect Highway Upgrade – Detailed Design Acoustic Assessment*. The location of the noise barrier is shown in **Figure 1**.

4.1 Construction Noise and Vibration Assessment

4.1.1 Construction Activities

Representative scenarios have been developed to assess the likely impacts from the various construction phases of the proposal. These scenarios are shown in **Table 17**.

The assessment uses 'realistic worst-case' scenarios to determine the impacts from the noisiest 15-minute period that are likely to occur for each work scenario, as required by the ICNG. The impacts represent construction noise levels without mitigation applied.

The sound power levels for the construction equipment used in each scenario is presented in **Appendix C.**

Table 17 Construction Equipment

Scenario	Works Activity	Equipment
W.01	Vegetation clearing	Chainsaw, chipper, dozer, dump truck, excavator, front end loader, water truck
W.02	Earthworks	Dozer, dump truck, excavators, front end loader, grader, vibratory roller, water truck
W.03	Demolition (Building 1 and 2 only)	Rockbreaker, dozer, front end loader, truck
W.04	Foundation works	Piling- Bored, excavator, concrete truck, concrete pump, franna crane, truck
W.05	Warehouse construction and fitout	Mobile crane, elevated work platform, flatbed truck, hand tools, franna crane
W.06	Construction of roads and hardstands	Bitumen spray truck, line marking plant, paving machine, vibratory roller, concrete pump, concrete truck/agitator, concrete vibrator, mobile crane

4.1.2 Hours of Construction

Construction activities for the proposal are expected to be undertaken during the following hours:

- 7:00 am to 6:00 pm, Mondays to Fridays
- 8:00 am to 1:00 pm on Saturdays

- At no time on Sundays or Public Holidays.

4.2 Operational Noise Assessment

The project is in the early design stages and the future tenants are currently unknown. Several assumptions have been made regarding the future tenants and sources of noise, based on the likely warehouse and distribution uses. These assumptions have been used to develop reasonable worst-case noise modelling scenarios that reflect the expected highest noise emissions that the development would likely emit.

The model includes existing and design ground topography, ground type (ground absorption modelled 0.5 for residential areas, 0.75 for grassland reserves and 0.0 for industrial areas), buildings and representative worst-case noise sources from the proposal.

The ISO 9613-2 algorithm predicts the continuous A-weighted sound pressure levels under noise-enhancing meteorological conditions favourable to propagation from sources of known sound emission, including downwind propagation, or equivalently, propagation under a well-developed, moderate, ground-based temperature inversion, such as commonly occurs on clear calm nights.

Downwind propagation conditions include a wind direction within an angle of ±45° of the direction from the centre of the dominant sound source to the centre of the specified receiver region, with the wind blowing from source to receiver and wind speeds between approximately 1 metre a second (m/s) and 5 m/s, measured at a height of 3 m to 11 m above the ground. These propagation conditions are consistent with the range of conditions presented within the NPfI for “noise-enhancing” conditions, as shown in **Table 18**.

The potential impacts have been determined by comparing the predicted reasonable worst-case noise levels to the NPfI PNTLs in a 15-minute assessment period.

Table 18 Standard and Noise-enhancing Weather Conditions

Weather Conditions	Meteorological Parameters
Standard	Daytime/evening/night-time: stability categories A–D with wind speed up to 0.5 m/s
Noise-enhancing	Daytime/evening: stability categories A–D with light winds up to 3 m/s Night-time: stability categories A–D with light winds up to 3 m/s and/or stability category F with winds up to 2 m/s

4.2.1 Operational Noise Sources

1-3 August Street, Huntingwood is a speculative development with no tenants committed. The facility has been designed to accommodate typical warehouse and distribution centre uses.

The development comprises of three single story warehouse buildings and one two storey warehouse building with associated ancillary offices, roads, heavy vehicle access, hardstands, light vehicle access and carparking. Vehicles accessing Buildings 1 to 4 would access the site from Augusta Street, with vehicle access to Building 5 via the Great Western Highway. Heavy vehicles would park in the hardstand loading areas while they are loaded/unloaded, before exiting the site. Light vehicle carparking is provided for each warehouse and would generally be used by staff.

Internal noise sources would generally be minimal and associated with typical logistical, distribution, warehousing and office space activities. There would be no use of manufacturing equipment within any warehouses.

Roof mounted mechanical plant would be provided for each office. The development would operate 24 hours a day.

The main sources of operational noise at the development are expected to include:

- On-site light and heavy vehicle movements
- Loading dock activities in hardstands
- Mechanical plant
- Off-site vehicle movements.

A summary of the expected noise sources and reasonable worst-case assessment scenarios associated with the operation of the development is provided below.

4.2.1.1 On-Site Traffic

On-site vehicles have been modelled using the data provided by the Project's traffic consultant (CBRK) in **Table 19**. The volumes are representative of the expected worst-case 15-minute period for the daytime, evening and night-time. The volumes conservatively assume that light and heavy vehicles concurrently access the various warehouse tenancies during the reasonable worst-case 15-minute assessment period. In reality, vehicle access to each warehouse would be unlikely to occur concurrently, particularly during the night-time.

Heavy vehicle deliveries to the warehouses would be via a range of freight vehicles including medium trucks (ie rigid trucks) and heavy trucks (ie semi-trailers and b-doubles). Increased sound power levels have been applied to trucks on the ramps to allow for acceleration/deceleration noise when on inclines.

The following operational assumptions have been developed in consultation with CBRK, based on information provided as part of the Traffic Impact Assessment.

- Daytime (AM Peak volumes) – 290 Vehicle movements, 42% heavy vehicles, 80% arrivals, 20% departures.
- Evening – 50% of AM Peak volumes, 21% heavy vehicles, 50% arrivals, 50% departures.
- Night-time – 25% of AM Peak volumes, 23% heavy vehicles, 50% arrivals, 50% departures.
- Heavy vehicles comprise 30% articulated vehicles (Heavy trucks) and 70% rigid trucks (Medium trucks). These heavy vehicle categories have been considered as separate noise sources and are representative of the following vehicle classes of the AUSTROADS Vehicle Classification System.
    - Medium trucks include vehicles from Class 3 to Class 4,
    - Heavy trucks include vehicles from Class 5 to Class 12.

The peak 1-hour volumes outlined above were further broken down to peak 15-minute volumes in order to assess the noise emissions against the NPfI criteria. The peak 1-hour volumes have been assumed to be spread evenly across each 15 minute period.

Table 19 Vehicle Traffic Data – Worst-case 15-Minute Period

Vehicle Type	Location	Sound Power Level (dBA)	Vehicle Speed (km/h)	Number of Vehicles in Worst-case 15-minute Period[1]		
				Daytime (7am to 6pm)	Evening (6pm to 10pm)	Night-time (10pm to 7am)
Warehouse 1						
Heavy trucks	Loading docks	108[2]	10	1	0	0
Medium trucks	Loading docks	97[3]	10	1	1	1
Light vehicles	Car park	90[4]	20	2	3	1
Warehouse 2						
Heavy trucks	Loading docks	108[2]	10	1	0	0
Medium trucks	Loading docks	97[3]	10	2	2	1
Light vehicles	Car park	90[4]	20	4	6	3
Warehouse 3-4						
Heavy trucks	Access routes	108[2]	25	4	1	1
	Loading docks		10			
Medium trucks	Access routes	97[3]	25	9	3	1
	Loading docks		10			
Light vehicles	Car park	90[4]	20	17	12	6
Warehouse 5						
Heavy trucks	Access routes	108[2]	20	5	2	1
	Loading docks and Entry/Exit		10			
	Ramps	111[2]	10			
Medium trucks	Access routes	97[3]	20	11	3	1
	Loading docks and Entry/Exit		10			
	Ramps	100[3]	10			
Light vehicles	Car park	90[4]	20	21	14	7

Note 1: Total vehicles, includes both inbound and outbound vehicles. Volumes are rounded up to whole numbers for display purposes.

Note 2: Sound power level for 'heavy trucks' based on 106 dBA for trucks at slow speed for 80% of the time and 111 dBA for trucks accelerating for 20% of the time and is representative of trucks with three or more axles. Sound power level for 'medium trucks' based on 100 dBA for trucks at slow speed for 80% of the time and 106 dBA for trucks accelerating for 20% of the time and is representative of trucks with two axles and six tires. Trucks on ramps are assumed to be accelerating 100% of the time. Sound power levels taken from the Federal Highway Administration's Traffic Noise Model.

Note 3: Sound power level for medium trucks based on measurement data, 95 dBA for trucks at slow speed for 80% of the time and 100 dBA for trucks accelerating for 20% of the time. Trucks on ramps are assumed to be accelerating 100% of the time.

Note 4: Sound power level based on measured data.

The sound power level for medium trucks is based on measurement data from SLR's noise measurement database taken over multiple years at multiple locations and includes various medium truck types and models in the approximate 5 to 15 tonne range. SWL data is based on passby measurement at a known distance with the passby L_{Amax} measurement used to

develop the source SWL. SLRs database for vehicles in this size range indicates a SWL range of 91-100 dBA for low speed (5-20km/hr) manoeuvring and accelerating conditions.

4.2.1.2 Hardstands and Loading Docks

Details of the hardstand and loading dock noise sources are shown in **Table 20**. The various sources have been modelled in the hardstand areas (see **Figure 5**) based on the corresponding number of heavy vehicle movements in the reasonable worst-case 15-minute periods (see **Table 19**). Noise sources associated with the operations proposed at the Level 1 and Level 2 hardstand areas of Warehouse 5 have been modelled based on the elevations shown in the architectural plans.

Table 20 Typical Hardstand and Loading Dock Noise Sources

Noise Source	Sound Power Level (dBA)[1]	Typical Duration of Use in Worst-case 15-minute Period[2]
All Warehouses		
Truck reversing including alarm[3]	107[3,4]	30 seconds[2]
Forklift reversing alarm	102[3,4]	90 seconds[2]
Air brakes	118	1 second[2]
Roller door	94	15 seconds
Electric forklift	84	900 seconds[2]

Note 1: SWLs based on measurement data, where appropriate.

Note 2: Duration is applied per vehicle, based on the number of sources considered in the modelled scenarios, as shown in **Table 22**.

Note 3: SWL based on recommendation to use broadband reversing alarms, see **Section 6.2**.

Note 4: SWL includes a -3 dB reduction due to alarms being discrete events.

4.2.1.3 Internal Activities

The future usage of the warehouses would likely be associated with typical warehousing and distribution uses. Internal noise-generating activities at all warehouses are expected to generally be minimal. Potential break-out noise from general internal activities (internal forklift operations) has been assumed at roller doors when open during loading dock activities.

4.2.1.4 Mechanical Plant

At this early stage of the development the specific mechanical plant requirements for each warehouse have not been determined. Reasonable assumptions have been made that air-conditioning equipment would serve each office buildings and extraction fans would be required on each warehouse roof.

External mechanical plant has been modelled with indicative SWL data for equipment typical to a development of this size, as shown in **Table 21**. The locations of the sources are shown in **Figure 5**.

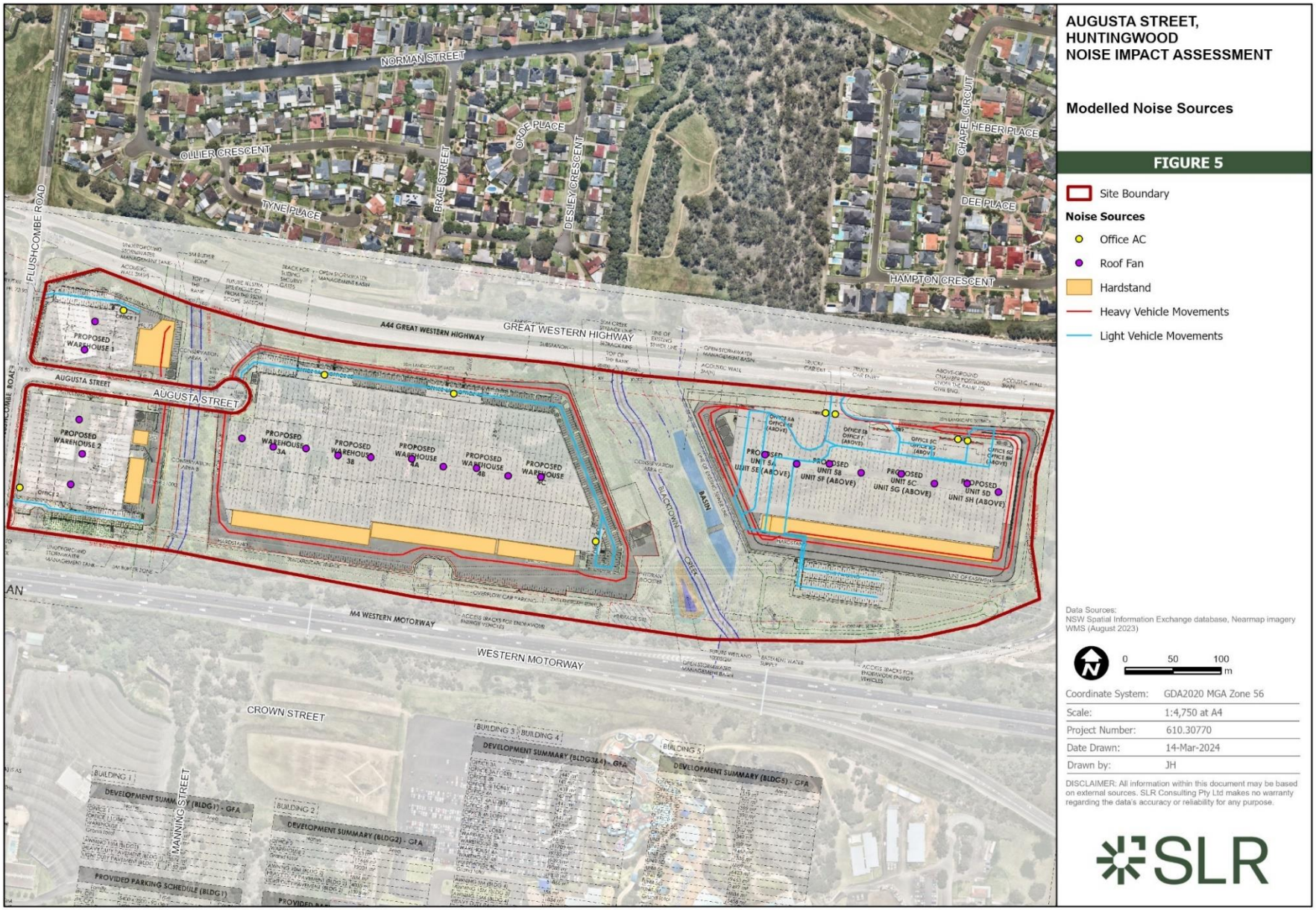
Table 21 Mechanical Plant

Noise Source	Sound Power Level (dBA)	Location
All Warehouses		
Air-conditioning equipment	78	Office roofs (one unit per office) (**Figure 5**). Expected operational hours are 8 am to 6 pm.
Extraction fans	90 (cumulative per warehouse)	Warehouse Roof. Assumed to operate 24/7.

4.2.2 Summary of Modelled Operational Scenarios

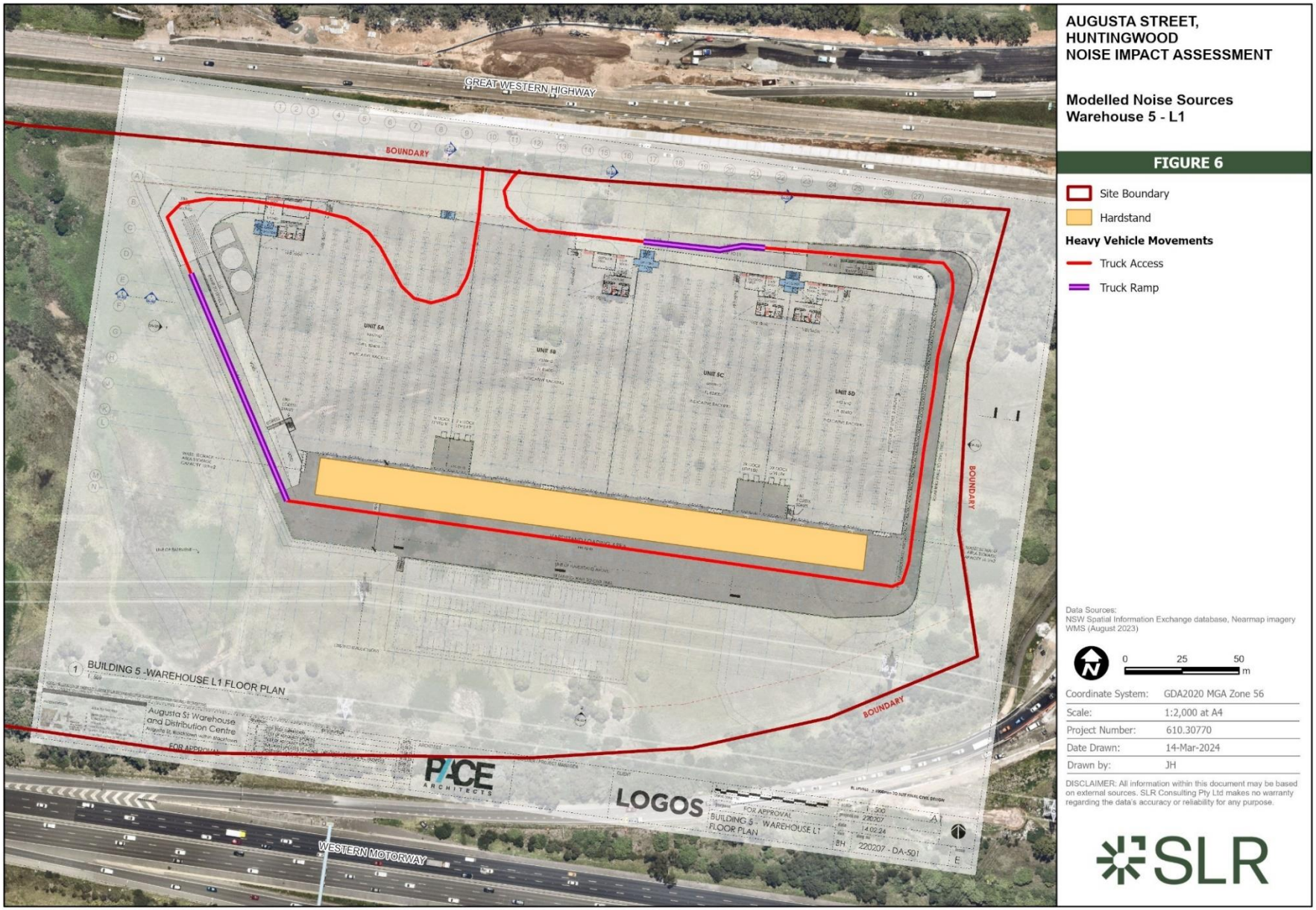
The modelled realistic worst-case 15-minute operational scenarios based on the activities, noise sources and sound power levels detailed above is summarised in **Table 22**. The modelled source locations are shown in **Figure 5** to **Figure 7**.

Figure 5 Modelled Noise Sources – Ground Floor and Overview



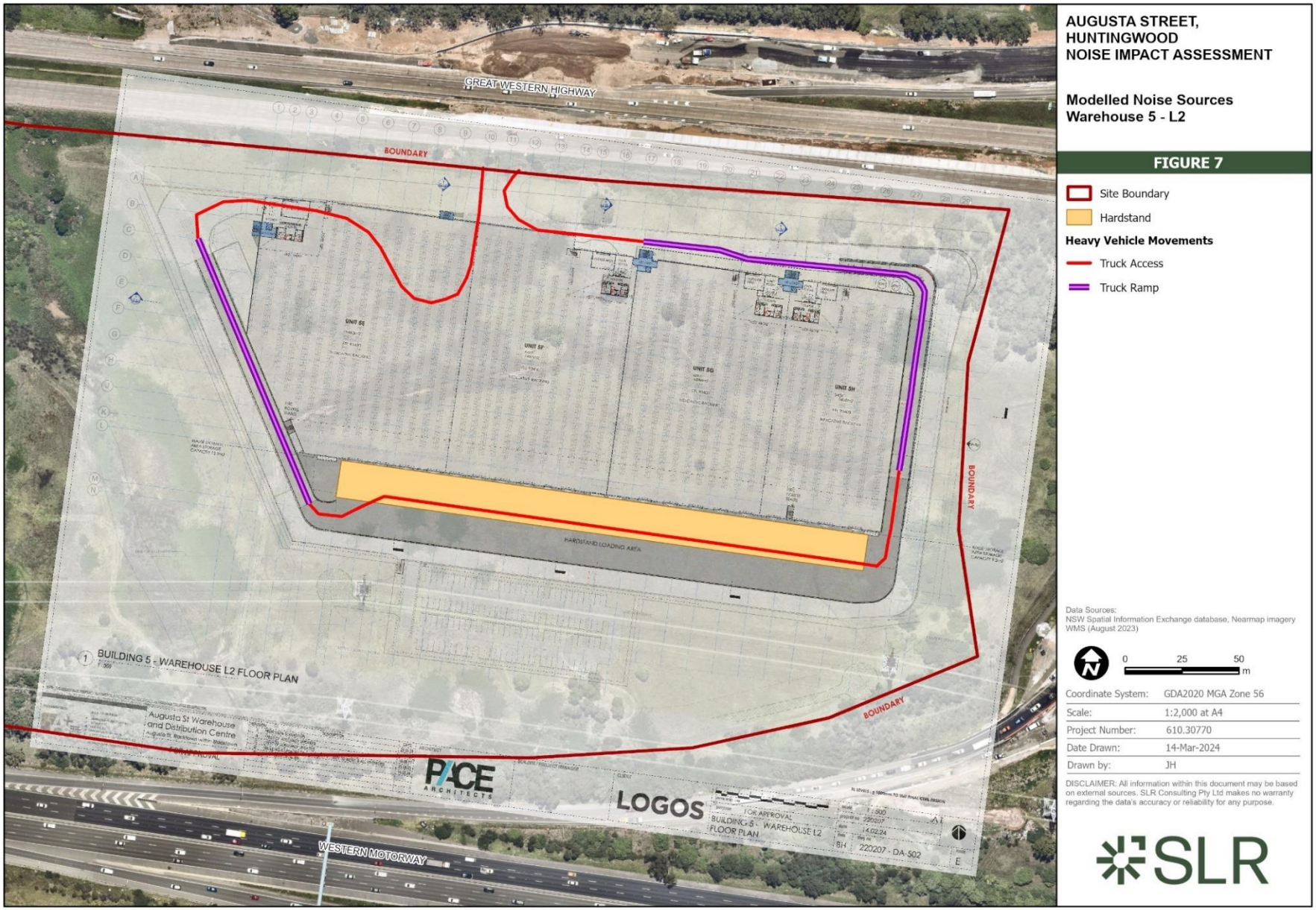
H:\Projects-SLR\610-SrvSYD\610-SYD\610.30770.00000 Augusta Street, Huntingwood\06 SLR Data\01 CADGIS\GIS\61030770_ArcPro\Project.aprx\6103770_G05 Modelled Noise Sources

Figure 6 Modelled Noise Sources – Warehouse 5 Level 1 (Hardstand RL 82.4m)



H:\Projects-SLR\610-SrvSYD\610-SYD\610.30770.00000 Augusta Street, Huntingwood\06 SLR Data\01 CADGIS\GIS\61030770_ArcPro\Project.aprx\6103770_G06 Modelled Noise Sources - Warehouse 5 L1

Figure 7 Modelled Noise Sources – Warehouse 5 Level 2 (Hardstand RL 93.4m)



H:\Projects-SLR\610-SrvSYD\610-SYD\610.30770.00000 Augusta Street, Huntingwood\06 SLR Data\01 CADGIS\GIS\61030770_ArcPro\Project.aprx\6103770_G07 Modelled Noise Sources - Warehouse 5 L2

Table 22 Summary of Modelled Realistic Worst-Case 15-minute Operational Scenarios

Warehouse	Noise Source/Location	Modelled Scenario		
		Daytime	Evening	Night-time
Warehouse 1	Heavy Vehicles - Truck access road and hardstand	• 1 heavy truck. • 1 medium truck	• 1 medium truck.	• 1 medium truck.
	Loading dock activities - Hardstand Area	• 2 trucks reversing in hardstand area including 1 airbrake release at end. • 2 electric forklift loading/unloading truck, including reversing alarms.	• 1 truck reversing in hardstand area. • 1 electric forklift loading/unloading truck, including reversing alarms.	• 1 truck reversing in hardstand area. • 1 electric forklift loading/unloading truck, including reversing alarms.
	Light Vehicles - Car park	• 2 light vehicles.	• 3 light vehicles.	• 1 light vehicle.
	Mechanical Plant - Office and Warehouse Roof	• 1 office air conditioning unit. • 2 warehouse extraction fans.	• 2 warehouse extraction fans.	• 2 warehouse extraction fans.
	Internal Activities	• Internal forklift operations modelled at roller doors when open during loading dock activities as per **Section 4.2.1.3**.		
Warehouse 2	Heavy Vehicles - Truck access road and hardstand	• 1 heavy truck. • 2 medium trucks.	• 2 medium trucks.	• 1 medium truck.
	Loading dock activities - Hardstand Area	• 3 trucks reversing in hardstand area including 1 airbrake release at end. • 3 electric forklift loading/unloading truck, including reversing alarms.	• 2 truck reversing in hardstand area. • 2 electric forklift loading/unloading truck, including reversing alarms.	• 1 truck reversing in hardstand area. • 1 electric forklift loading/unloading truck, including reversing alarms.
	Light Vehicles - Car park	• 4 light vehicles.	• 6 light vehicles.	• 3 light vehicles.
	Mechanical Plant - Office and Warehouse Roof	• 1 office air conditioning unit. • 3 warehouse extraction fans.	• 3 warehouse extraction fans.	• 3 warehouse extraction fans.
	Internal Activities	• Internal forklift operations modelled at roller doors when open during loading dock activities as per **Section 4.2.1.3**.		

Warehouse	Noise Source/Location	Modelled Scenario		
		Daytime	Evening	Night-time
Warehouse 3-4	Heavy Vehicles - Truck access roads and hardstands	• 4 heavy trucks • 9 medium trucks.	• 1 heavy truck. • 2 medium trucks.	• 1 heavy truck. • 1 medium truck.
	Loading dock activities - Hardstand Areas	• 12 trucks reversing in hardstand areas including 4 airbrake releases at end. • 12 electric forklifts loading/unloading trucks, including reversing alarms.	• 3 trucks reversing in hardstand areas including 1 airbrake release at end. • 3 electric forklifts loading/unloading trucks, including reversing alarms.	• 2 trucks reversing in hardstand areas including 1 airbrake release at end. • 2 electric forklifts loading/unloading trucks, including reversing alarms.
	Light Vehicles – Car park	• 17 light vehicles.	• 12 light vehicles.	• 6 light vehicles.
	Mechanical Plant – Office and Warehouse Roof	• 4 office air conditioning units (1 per office). • 10 warehouse extraction fans.	• 10 warehouse extraction fans.	• 10 warehouse extraction fans.
	Internal Activities	• Internal forklift operations modelled at roller doors when open during loading dock activities as per **Section 4.2.1.3**.		
Warehouse 5	Heavy Vehicles – Truck access roads and hardstands[1]	• 5 heavy trucks. • 11 medium trucks.	• 2 heavy trucks. • 3 medium trucks.	• 1 heavy truck. • 1 medium truck.
	Loading dock activities – Hardstand Areas[1]	• 15 trucks reversing in hardstand areas including 5 airbrake releases at end. • 15 electric forklifts loading/unloading trucks, including reversing alarms.	• 4 trucks reversing in hardstand areas including 1 airbrake release at end. • 4 electric forklifts loading/unloading trucks, including reversing alarms.	• 2 trucks reversing in hardstand areas including 1 airbrake release at end. • 2 electric forklifts loading/unloading trucks, including reversing alarms.
	Light Vehicles – Car park	• 21 light vehicles.	• 14 light vehicles.	• 7 light vehicles.
	Mechanical Plant – Office and Warehouse Roof	• 4 office air conditioning units (1 per office). • 8 warehouse extraction fans.	• 8 warehouse extraction fans.	• 8 warehouse extraction fans.
	Internal Activities[1]	• Internal forklift operations modelled at roller doors when open during loading dock activities as per **Section 4.2.1.3**.		

Note 1: Elevated noise sources have been modelled in accordance with the proposed elevations detailed in the architectural plans and shown in **Figure 6** and **Figure 7**.

4.2.3 Corrections for Annoying Noise Characteristics

The potential annoying noise characteristics and modifying factor corrections relevant to the proposal are:

- Tonality – the only source identified with potential tonal characteristics is reversing alarms. Broadband reversing alarms have been recommended as a noise mitigation measure (see **Section 6.2**). If tonal reversing alarms were to be used it is not predicted to result in a tonal penalty when assessed at the receiver.
- Low frequency noise – previous measurements of sources similar to those operating at the development indicate that no sources are expected to result in significant low frequency noise emissions.
- Intermittent noise – the NPfI defines intermittent noise as noise heard at the receiver where the level suddenly drops or increases several times during the assessment period, with a noticeable change of at least 5 dB. The intermittent correction does not apply to short-term events that emerge above the general industrial noise level and is therefore not applicable to industrial or commercial sites that have vehicle or plant movements at night, including audible reversing alarms.

No sources have been identified with potential intermittent characteristics.

4.2.4 Noise Sources with Potential for Sleep Disturbance

As the development is proposed to operate 24-hours a day, noise emissions during the night-time require assessment for potential sleep disturbance at the nearest residential receivers. The details of typical activities with the potential to cause sleep disturbance are shown in **Table 23**.

Table 23 Sleep Disturbance Noise Events – L_{Amax} Sound Power Levels

Noise Source	Sound Power Level L_{Amax} (dBA)
Heavy truck movement	111
Heavy truck airbrake	118
Truck reversing alarm	110
Forklift reversing alarm	105
Roller door	94

4.2.5 Off-site Road Traffic

Transport Noise Model (TNM) has been used in SoundPLAN to model traffic on the surrounding roads. The following has been included in the assessment:

- Heavy vehicle volumes have been modelled as ‘heavy trucks’ in TNM, noting that the majority of development related deliveries during all periods are expected to be via ‘medium trucks’ (ie rigid trucks). This results in a conservative assessment of the potential impacts.
- This assessment has considered altered traffic flow on both directions of the Great Western Highway, from the operation of the new signalised intersection, constructed as part of the Prospect Highway Upgrade project.
- Heavy vehicle acceleration and deceleration associated with Warehouse 5 access via the additional lanes of the new signalised intersection on the Great Western Highway has been considered as part of this assessment.

Traffic associated with the development is planned to enter and exit the development via the Great Western Highway. Access to Warehouses 1 to 4 would be from Augusta Street via Flushcombe Road. Access to Warehouse 5 would be via a new signalised intersection from the Great Western Highway.

The potential noise impacts from additional traffic have been assessed based on traffic data shown in **Table 24**. Development related traffic volumes include vehicles entering/exiting Warehouse 5 via the new signalised intersection, including additional lanes where applicable.

Table 24 Traffic Volumes – Existing and Development Related

Road	Existing Traffic Volumes[1]				Development Related Traffic Volumes			
	Daytime (7am to 10pm)		Night-time (10pm to 7am)		Daytime (7am to 10pm)		Night-time (10pm to 7am)	
	Light	Heavy	Light	Heavy	Light	Heavy[2]	Light	Heavy[2]
GWH EB West of Flushcombe Rd	15,581	820	3,679	198	697	258	82	31
GWH EB between Flushcombe Rd and WH5 intersection					490[3]	182[3]	58[3]	21[3]
GWH EB East of WH5 Intersection					220[3]	81[3]	26[3]	10[3]
GWH WB West of Flushcombe Rd	18,866	993	2,618	138	168	62	20	7
GWH EB between Flushcombe Rd and WH5 intersection					375[3]	139[3]	44[3]	16[3]
GWH EB East of WH5 Intersection					629[3]	233[3]	74[3]	28[3]
GWH Off ramp	3,229	371	624	76	13[3]	5[3]	2[3]	1[3]
GWH On ramp	1,977	68	1,839	63	13[3]	5[3]	2[3]	0[3]

Note 1: Data obtained from 'Build 2018' traffic volumes presented in the Prospect Highway Upgrade Detailed Design Acoustic Assessment.

Note 2: The majority of deliveries are expected to be via medium trucks (ie rigid trucks).

Note 3: Include vehicles entering/exiting Warehouse 5 via the new signalised intersection and additional lanes.

4.2.6 Weather Conditions

Fact Sheet D of the NPfI requires noise assessments to consider the potential effects of noise-enhancing weather conditions, such as wind from the source to the receiver and/or temperature inversions.

The NPfI contains guidance for determining noise enhancing weather. Data measured between January 2017 and December 2021 at the Horsley Park BOM weather station has been used to determine the occurrence of noise-enhancing weather conditions at the site and a summary is shown in **Table 25**.

Table 25 Occurrence of Noise-enhancing Weather Conditions

Period	Wind Speed from 0.5 to 3 m/s (Frequency of Occurrence > 30%)								Atmospheric Stability Class F or G[1]
	N	NE	E	SE	S	SW	W	NW	
Daytime	-	-	-	-	-	-	-	-	n/a
Evening	-	-	-	-	-	-	-	-	n/a
Night-time	-	-	-	-	-	Yes	Yes	-	Yes

Note 1: Noise-enhancing conditions for temperature inversions based on atmospheric stability class are only applied to the night-time assessment.

The weather analysis identified noise-enhancing weather conditions are expected to be a feature of the site, with westerly and south-westerly winds up to 3 m/s as well as temperature inversions of Class F or Class G occurring for more than 30% of the night-time periods in winter. The nearest sensitive residential receivers are within 250 m of the proposal site and the effects of weather on noise levels are expected to be minimal. Notwithstanding, the noise prediction modelling uses ISO 9613-2 algorithms which include noise-enhancing weather conditions including downwind propagation, or equivalently, propagation under a well-developed moderate ground-based temperature inversion.

4.2.7 Noise Model Variables

A summary of user adjusted noise model variables is detailed in **Table 26**.

Table 26 Noise Model User Adjusted Variables

Noise Model Parameter	Where Address in Report
NPfI Section 3.3.1 – Identifying Noise Parameters	
All noise sources related to the proposed development, including vehicles that operate on site	**Section 4.2.1**, **Table 22** and **Figure 5** to **Figure 7**
Source noise levels, site location and effective height of the noise source – references should be provided for all source noise levels used in the assessment (for example, direct measurement, previous Environmental Impact Statement, and manufacturers' specifications)	**Section 4.2.1** (**Table 19**, **Table 20**, **Table 21, Table 22** and **Figure 5** to **Figure 7**)
Annoying characteristics of the noise sources that may be experienced at receiver locations (for example, tonality, low frequency, and intermittency; see Fact Sheet C)	**Section 4.2.3**
All stages of project development, including whether noise emissions may vary depending on site operations, for example, during delivery/despatch activities	**Section 1.3** describes project stages. **Section 4.2.2** describes the assessed operational scenarios of the project operating during a worst-case 15 minute period
All receivers potentially affected by the development	**Figure 1** and **Section 1.4**. Receivers modelled at 1.5 m above ground level.
Meteorological conditions applicable to the site (from Fact Sheet D) to determine the meteorological conditions that should be adopted for the noise impact assessment	**Section 4.2.6**.
Site features (including natural and constructed, development and surrounding land uses) that affect noise propagation	**Figure 1** shows the surrounding buildings included in the noise model.

Noise Model Parameter	Where Address in Report
	Section 4.0 describes that the model includes ground topography, existing noise barriers and buildings.
Operating times of the development.	**Section 4.2.1** describes that the development would operate 24 hours a day and details the noise sources in each period
NPfI Section 3.3.2 – Noise Prediction	
The noise levels from the source at all potentially affected receivers should be predicted. The noise levels predicted should be on the basis of $L_{Aeq,15min}$ values (as project noise trigger levels are expressed using this descriptor) and the L_{Amax} level for assessing the potential for sleep disturbance.	**Section 5.3** (**Table 30** and **Table 31**) details the predicted $L_{Aeq(15minute)}$ and L_{Amax} noise levels)
For large or difficult projects, noise is generally predicted through the use of computer noise models. Such models generally take account of noise attenuation due to distance, atmospheric absorption, barriers, and effects of intervening ground types and weather conditions. The model selected should be capable of considering the standard and noise-enhancing meteorological conditions identified in Fact Sheet D.	**Section 4.0** details that the model uses ISO 9613-2 algorithm, implemented in accordance with ISO 17534-3. ISO 9613 includes noise-enhancing weather conditions including downwind propagation, or equivalently, propagation under a well-developed moderate ground-based temperature inversion.
All user-adjusted variables in a noise model should be identified and justified at the project level. Noise predictions should be presented in both point-to-point outputs and noise contours for larger projects in 5-dB increments.	**Section 4.2.1** details the noise model variables. Additional calculation not described in the NIA include: • Reflection order of 3 • Calculation search radius of 5 km (greater than study area) • Noise contours were calculated with a grid spacing of 10 m **Section 5.3** details the 'point-to-point' noise predictions **Appendix D** shows the predicted noise contours
Where the proposed development is expected to produce annoying noise characteristics, adjustments are to be applied to the predicted noise levels, as outlined in Fact Sheet C, to arrive at a final predicted level that will be compared with the project noise trigger levels.	**Section 4.2.3**

5.0 Assessment of Impacts

5.1 Construction Noise

The predicted noise levels at the most-affected sensitive receivers in each NCA surrounding the site are shown in **Table 28** and exceedances of the NMLs are shown in **Table 29**.

The assessment shows the predicted impacts based on the exceedance of the management levels, as per the categories in **Table 27**.

Table 27 Exceedance Bands and Impact Colouring

Exceedance of Management Level	Subjective Classification	Impact Colouring
No exceedance	Negligible	
1 to 10 dB	Minor impact	
11 dB to 20 dB	Moderate impact	
>20 dB	High impact	

The predictions represent a realistic worst-case scenario where the equipment in each scenario is working concurrently and the nearest location to each receiver. It is expected that noise levels would frequently be lower than the worst-case levels presented.

Table 28 Predicted Construction Noise Levels at Nearest Receivers

Receiver	NCA	Receiver Type	NML	Predicted Noise Level - $L_{Aeq(15\ minutes)}$ (dBA)														
				All Lots		Building 1				Building 2				Building 3-4			Building 5		
				W.01	W.02	W.03	W.04	W.05	W.06	W.03	W.04	W.05	W.06	W.04	W.05	W.06	W.04	W.05	W.06
R01	NCA01	Residential	58	67	65	68	60	59	64	62	54	53	58	56	54	60	32	30	36
R02		Residential	58	68	66	63	57	54	61	61	54	52	58	61	58	65	50	49	54
R03		Residential	58	69	67	61	55	52	59	60	52	51	56	62	60	66	48	46	52
R04		Residential	58	71	69	59	52	50	56	59	51	50	55	64	62	68	54	52	58
R05		Residential	58	70	68	54	46	45	50	55	47	46	51	63	61	67	60	56	64
R11		Residential	58	64	62	65	57	56	61	63	55	54	59	57	55	61	46	45	50
R06	NCA02	Residential	57	67	65	52	44	43	48	51	44	42	48	52	50	56	60	59	64
R07		Residential	57	68	66	50	42	41	46	50	41	41	45	50	49	54	61	58	65
R08		Residential	57	66	64	49	42	40	46	49	41	40	45	48	46	52	59	58	63
R09	NCA03	Residential	59	60	58	47	39	38	43	49	41	40	45	45	43	49	53	50	57
R10	NCA04	Residential	65	60	58	56	48	47	52	60	53	51	57	49	47	53	43	42	47
R12		Hotel	70	62	60	58	51	49	55	62	55	53	59	53	51	57	45	44	49
R13	NCA06	Place of Worship	55	63	61	47	39	38	43	47	39	38	43	45	44	49	56	55	60
R14	-	Industrial	75	77	75	69	63	60	67	77	70	68	74	54	53	58	44	42	48
R15	-	Commercial	70	68	66	53	46	44	50	55	47	46	51	60	57	64	61	56	65

Table 29 Predicted Exceedance at Nearest Receivers

Receiver	NCA	Receiver Type	NML	Predicted Exceedance - (dBA)															
				All Lots		Building 1				Building 2				Building 3-4			Building 5		
				W.01	W.02	W.03	W.04	W.05	W.06	W.03	W.04	W.05	W.06	W.04	W.05	W.06	W.04	W.05	W.06
R01	NCA01	Residential	58	9	7	10	2	1	6	4	-	-	-	-	-	2	-	-	-
R02		Residential	58	10	8	5	-	-	3	3	-	-	-	3	-	7	-	-	-
R03		Residential	58	11	9	3	-	-	1	2	-	-	-	4	2	8	-	-	-
R04		Residential	58	13	11	1	-	-	-	1	-	-	-	6	4	10	-	-	-
R05		Residential	58	12	10	-	-	-	-	-	-	-	-	5	3	9	2	-	6
R11		Residential	58	6	4	7	-	-	3	5	-	-	1	-	-	3	-	-	-
R06	NCA02	Residential	57	10	8	-	-	-	-	-	-	-	-	-	-	-	3	2	7
R07		Residential	57	11	9	-	-	-	-	-	-	-	-	-	-	-	4	1	8
R08		Residential	57	9	7	-	-	-	-	-	-	-	-	-	-	-	2	1	6
R09	NCA03	Residential	59	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
R10	NCA04	Residential	65	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
R12		Hotel	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
R13	NCA06	Place of Worship	55	8	6	-	-	-	-	-	-	-	-	-	-	-	1	-	5
R14	-	Industrial	75	2	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-
R15	-	Commercial	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

The above assessment of the predicted worst-case noise levels shows:

- Noise levels are expected to exceed the NMLs at the nearest receivers during certain noisy works.
- The highest impacts are expected during work that uses noise intensive equipment such as chippers and chainsaws during clearing works (W.01 – Vegetation Clearing), where exceedances of up to 13 dB in NCA01 (R04) and 11 dB in NCA02 (R07), are predicted, and are shown in in **Appendix C**. These items of equipment are, however, expected to only be required infrequently, with noise levels and corresponding impacts being much lower when they are not in use.
- Residential receivers in NCA01 are predicted to be most affected during construction of Warehouse 1 and Warehouse 3-4. Minor exceedances of the NML are predicted during most construction works. Noise levels during construction of the other warehouses are predicted to be lower due to increased separation distance.
- Residential receivers in NCA02 are predicted to be most affected during construction of Warehouse 5 where minor exceedances of the NMLs are predicted during most construction works. Noise levels during construction of the other warehouses are predicted to be lower due to increased separation distance.
- No residential receivers are predicted to be highly noise affected (≥75 dBA) during any of the construction work.
- Construction noise levels are predicted to exceed the NMLs by up to 8 dB at St Bartholomew's Church, (R13) however this is only predicted to occur when construction works associated with Warehouse 5 to the east are undertaken.
- Construction noise levels are predicted to comply with the commercial NML at the nearest existing commercial receivers.
- Construction noise levels are predicted to exceed the industrial NML by up to 2 dB at the nearest existing industrial receivers (R14) during some of the noisy work scenarios.

The presented impacts would only be expected to occur when noisy work is being completed close to the site boundaries, relative to each receiver. When work is in central areas of the site, or when less noise intensive equipment is being used, the noise levels would be lower.

Feasible and reasonable construction noise mitigation measures should be applied where exceedances of the NMLs are predicted. Construction noise mitigation and management measures are discussed in **Section 6.1**.

5.2 Construction Vibration

Vibration intensive items of equipment that would be required during the construction include rock breakers and vibratory rollers. These items of equipment are required during *W.01 – Demolition* and *W.02 – Earthworks*.

Offset distances for the vibration intensive equipment have been determined from the CNVG minimum working distances for cosmetic damage and human response (see **Table 10**). Buildings within the minimum working distances are shown in **Figure 8** to **Figure 11**.

Figure 8 Construction Vibration Assessment – Building 1

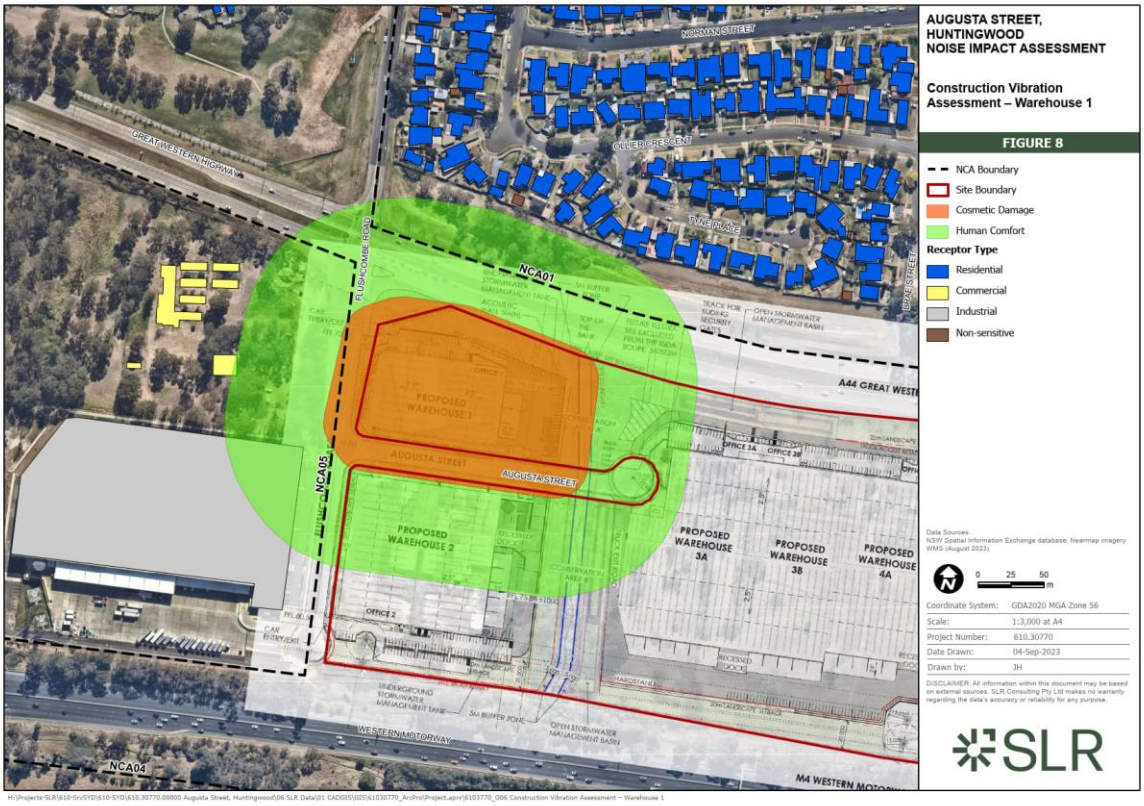


Figure 9 Construction Vibration Assessment – Building 2

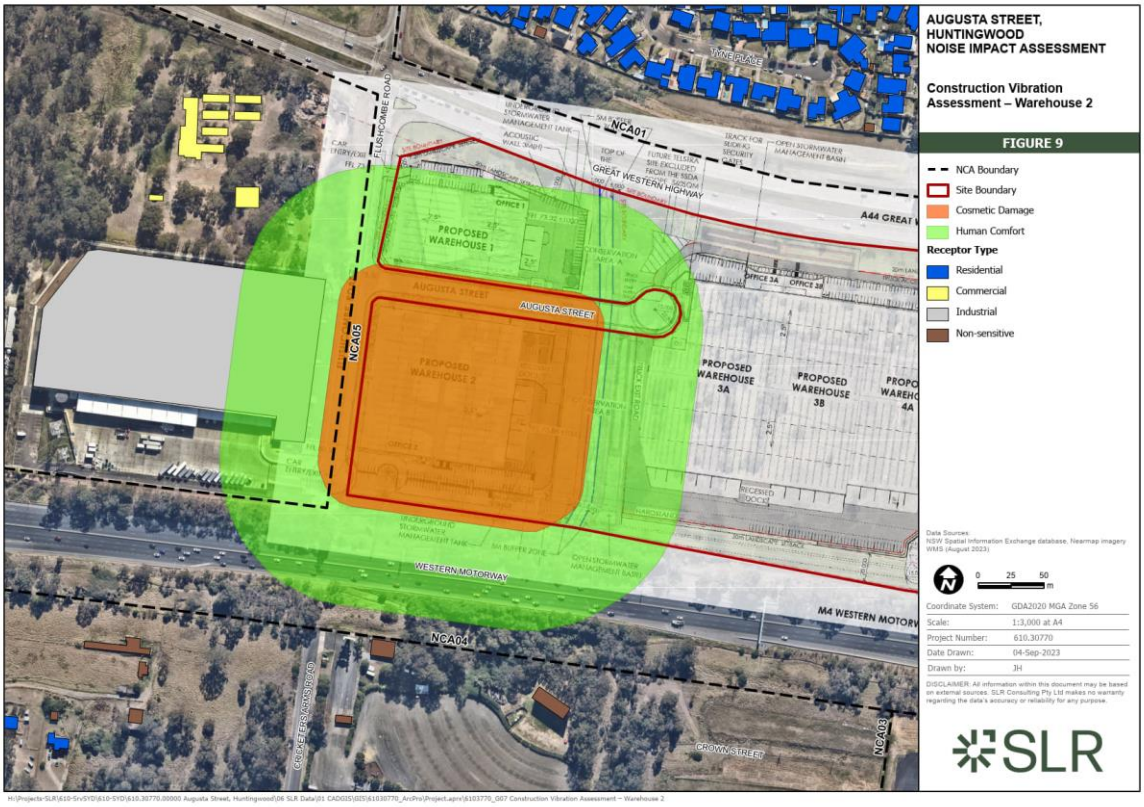


Figure 10 Construction Vibration Assessment – Building 3-4

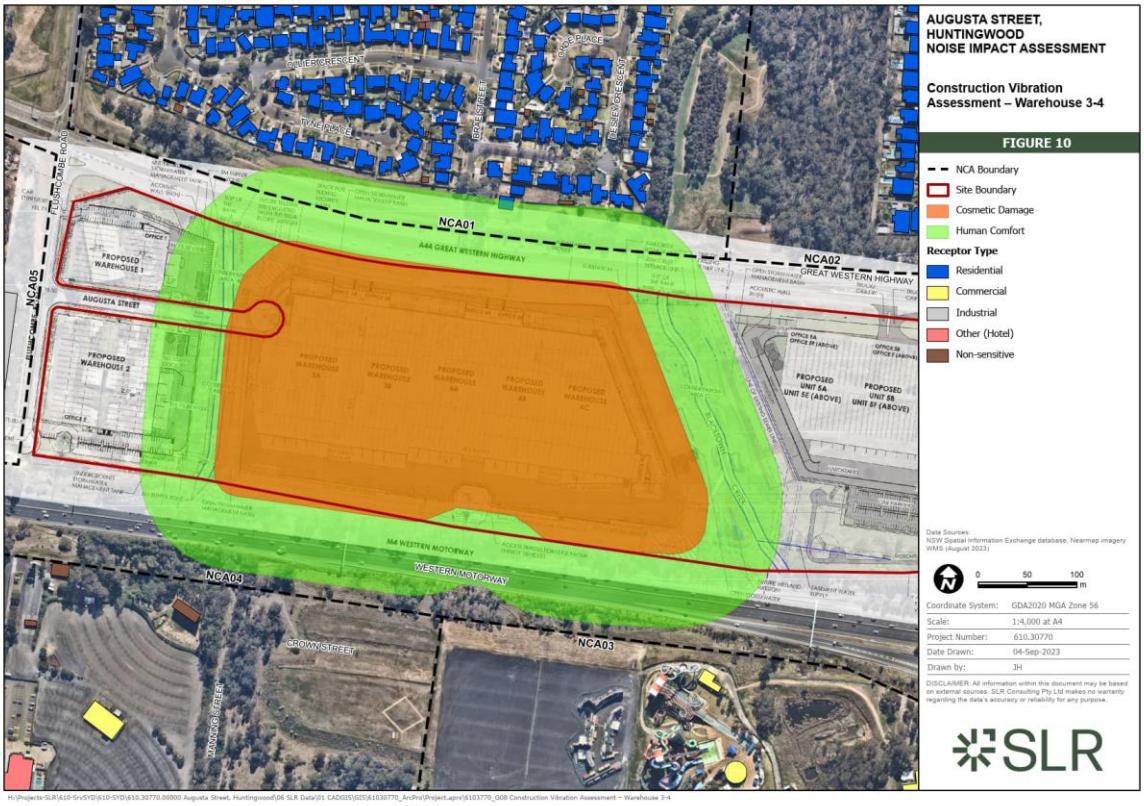
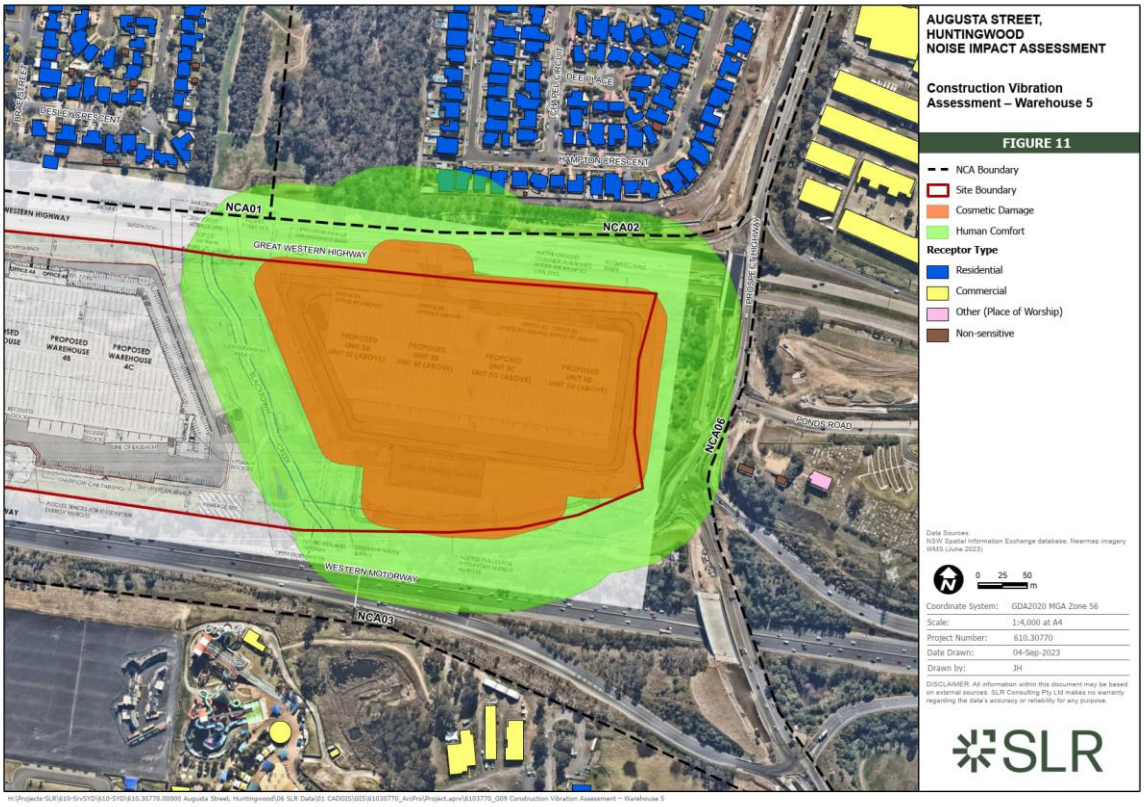


Figure 11 Construction Vibration Assessment – Building 5



Cosmetic Damage Assessment

The above figures show that all sensitive receiver buildings are sufficiently distant to be outside of the cosmetic damage minimum working distance for vibration intensive equipment and therefore, cosmetic damage impacts are not considered likely.

Human Comfort Vibration Assessment

The above figures indicate that commercial receivers to the west and residential receivers along the great Western Highway in NCA01 and NCA02 are within the human comfort minimum working distance and occupants of these buildings may be able to perceive vibration impacts at times when large hydraulic hammers are in use nearby. Where impacts are perceptible, they would likely only be apparent for relatively short durations when vibration intensive equipment is in use.

Feasible and reasonable construction vibration mitigation measures should be applied where vibration intensive works are required within the minimum working distances. Construction mitigation and management measures are discussed further in **Section 6.1**.

Heritage Structures

The heritage item, St Bartholomew's Church, is expected to be sufficiently distant from the site to be outside the minimum working distance for heritage items (ie 50 m for a large vibratory roller) and impacts are not considered likely.

5.3 Operational Noise

5.3.1 Operational Noise Assessment – Mitigated

Feasible and reasonable mitigation measures have been investigated for the development with the aim of reducing noise levels to the PNTLs. A detailed investigation of feasible and reasonable mitigation is provided in **Section 6.2**.

In summary, the following key measures have been applied to reduce noise emissions:

- Use of broadband and/or ambient noise sensing reversing alarms to minimise potentially annoyance.
- Roller doors will be kept closed when un/loading is not occurring.
- Installation of a 3m noise mound along the perimeter of the Warehouse 3 and 4 truck access road.
- Installation of a 3m noise barrier along the northern and eastern perimeter of the Warehouse 1 hardstand area.

A summary of the predicted impacts in the mitigated scenario is shown in **Table 30**.

Table 30 Operational Noise Assessment – Mitigated

Location	NCA	Receiver Type	Period	Noise Level $L_{Aeq(15minute)}$ (dBA)			Compliance
				Noise Criteria	Predicted	Exceedance	
R01	NCA01	Residential	Day	53	41	-	Yes
			Evening	43	37	-	Yes
			Night	41	35	-	Yes
R02	NCA01	Residential	Day	53	45	-	Yes
			Evening	43	41	-	Yes
			Night	41	39	-	Yes
R03	NCA01	Residential	Day	53	46	-	Yes
			Evening	43	41	-	Yes
			Night	41	39	-	Yes
R04	NCA01	Residential	Day	53	47	-	Yes
			Evening	43	42	-	Yes
			Night	41	41	-	Yes
R05	NCA01	Residential	Day	53	46	-	Yes
			Evening	43	41	-	Yes
			Night	41	41	-	Yes
R06	NCA02	Residential	Day	52	44	-	Yes
			Evening	43	38	-	Yes
			Night	39	39	-	Yes
R07	NCA02	Residential	Day	52	44	-	Yes
			Evening	43	38	-	Yes
			Night	39	38	-	Yes

Location	NCA	Receiver Type	Period	Noise Level $L_{Aeq(15minute)}$ (dBA)			Compliance
				Noise Criteria	Predicted	Exceedance	
R08	NCA02	Residential	Day	52	39	-	Yes
			Evening	43	32	-	Yes
			Night	39	33	-	Yes
R09	NCA03	Residential	Day	54	46	-	Yes
			Evening	48	40	-	Yes
			Night	43	38	-	Yes
R10	NCA04	Residential	Day	58	44	-	Yes
			Evening	48	37	-	Yes
			Night	45	36	-	Yes
R11	NCA01	Residential	Day	53	43	-	Yes
			Evening	43	39	-	Yes
			Night	41	37	-	Yes
R12	NCA04	Hotel	Day	63	46	-	Yes
			Evening	53	40	-	Yes
			Night	48	38	-	Yes
R13	NCA06	Place of Worship	When in Use	48	44	-	Yes
R14	NCA05	Industrial	When in Use	68	45	-	Yes
R15	NCA03	Commercial	When in Use	63	45	-	Yes

With feasible and reasonable mitigation, the predicted operational noise levels comply with the PNTLs at all receivers..

5.3.2 Sleep Disturbance

The predicted night-time maximum noise levels at the nearest residential receivers are shown in **Table 31**. These include the mitigation measures specified in **Section 6.2**.

Table 31 Sleep Disturbance Assessment

Location	Receiver Type	Source	Maximum Noise Level L_{Amax} (dBA)			Below Screening Level
			Sleep Dist. Screening Level	Predicted	Exceedance	
R01 (NCA01)	Residential	Heavy vehicle movements	59	51	-	Yes
		Heavy truck airbrake		55	-	Yes
		Truck reversing alarm		47	-	Yes
		Forklift reversing alarm		42	-	Yes
		Roller door		40	-	Yes
R02 (NCA01)	Residential	Heavy vehicle movements	59	56	-	Yes
		Heavy truck airbrake		59	-	Yes
		Truck reversing alarm		51	-	Yes
		Forklift reversing alarm		46	-	Yes
		Roller door		37	-	Yes
R04 (NCA01)	Residential	Heavy vehicle movements	59	58	-	Yes
		Heavy truck airbrake		55	-	Yes
		Truck reversing alarm		47	-	Yes
		Forklift reversing alarm		42	-	Yes
		Roller door		33	-	Yes
R06 (NCA02)	Residential	Heavy vehicle movements	54	55	1	**No**
		Heavy truck airbrake		49	-	Yes
		Truck reversing alarm		41	-	Yes
		Forklift reversing alarm		36	-	Yes
		Roller door		25	-	Yes
R09 (NCA03)	Residential	Heavy vehicle movements	60	47	-	Yes
		Heavy truck airbrake		55	-	Yes
		Truck reversing alarm		47	-	Yes
		Forklift reversing alarm		42	-	Yes
		Roller door		35	-	Yes
R10 (NCA04)	Residential	Heavy vehicle movements	63	47	-	Yes
		Heavy truck airbrake		55	-	Yes
		Truck reversing alarm		47	-	Yes
		Forklift reversing alarm		42	-	Yes
		Roller door		29	-	Yes

The above shows that maximum noise levels are generally expected to comply with the sleep disturbance screening level except for nearest receivers in NCA02 (R06) from heavy truck movements when exiting Warehouse 5 via the Level 2 down ramp. It is noted that the majority of heavy vehicles that are expected to access Warehouse 5 during the night-time are expected to be medium rigid trucks.

The NPfI requires a detailed maximum noise level assessment to be completed where night-time noise levels exceed the screening level.

5.3.2.1 Detailed Maximum Noise Level Assessment

The detailed maximum noise level assessment is summarised in **Table 32**. Residential receiver R06 is predicted to have an exceedance of the sleep disturbance screening level from heavy truck movements when exiting Warehouse 5 via the Level 2 down ramp.

Table 32 Detailed Maximum Noise Level Assessment

Receiver	Maximum Noise Level L_{Amax} (dBA)					Comments
	Sleep Disturbance Goals (dBA)		Development Related Maximum Noise Events		Existing Maximum Noise Levels	
	Awakening Response[1]	Good Sleep[2]	Predicted	Frequency of Occurrence		
R06 (NCA02)	65	Around 55 (10 to 15 times per night)	55	<10 to 15 events	60-70 (30 to 40 times per night)	**Awakening Response:** Maximum noise levels from heavy truck movements on the Warehouse 5 exit ramp are predicted to be below the 'awakening response' at all residential receivers. **Good Sleep:** Less than 15 heavy trucks are expected to access Warehouse 5 during the night-time, with the majority of heavy vehicles accessing the site expected to be medium rigid trucks. Maximum noise events from heavy truck movements are therefore not expected adversely affect 'good sleep' (ie they are not expected to occur more than 10-15 times per night). **Existing maximum noise levels:** The unattended noise monitoring showed that existing night-time maximum noise levels were measured to frequently be in the order of 60 to 70 dBA in NCA02 with an average of 30 to 40 maximum events above 60 dBA during the night-time period. The attended noise monitoring indicated existing noise levels in this area are dominated by existing road traffic noise from the Great Western Highway. Development related maximum noise levels predicted to be lower than existing maximum noise levels.

Note 1: Based on RNP guidance that maximum internal noise levels below 50 dBA to 55 dBA are unlikely to awaken people from sleep. This equates to an external noise level of 65 dBA when assuming a 10 dB loss for partially open windows for ventilation.

Note 2: Based on RNP guidance that for a good sleep over eight hours the indoor L_{Amax} sound pressure level should not exceed around 45 dBA more than 10 or 15 times per night. This equates to an external noise level of around 55 dBA when assuming a 10 dB loss for partially open windows for ventilation.

The predicted maximum noise levels from infrequent heavy truck movements airbrakes are expected to be below the levels outlined in the RNP that would be considered to have the potential to result in an 'awakening response' at the nearest receivers in NCA02.

The predicted maximum noise levels from infrequent heavy truck movements are predicted to be in line with the levels outlined in the RNP that would not affect 'good sleep. It is also noted that the predicted maximum noise levels assumed heavy trucks whereas the majority of night-time deliveries are expected to be via medium rigid trucks which are quieter, as noted in **Section 4.2.1.1**. As a result, heavy trucks exiting Warehouse 5 via the down ramp are expected to be an infrequent event. Therefore, the predicted maximum noise levels are not expected to affect 'good sleep' (ie they are not expected to occur more than 10-15 times per night).

Additionally, the Great Western Highway is located between the development site and nearest residential receivers in NCA02. The background noise monitoring survey measured existing night-time maximum noise levels from vehicles on the highway to frequently be in the range of 60 to 70 dB at the receivers with an average of 30 to 40 maximum events above 60 dBA during the night-time period. Maximum noise events from infrequent truck movements at the development would not result in Lmax noise events louder than those currently occurring during the night-time period from vehicles on the Great Western Highway.

Specific mitigation measures (S7 – Operational Noise Management Plan, see **Table 34**) have been recommended to be applied to the site which would assist in minimise potential sleep disturbance impacts.

Maximum noise events from truck movements during the night-time period would be unlikely to result in an adverse acoustic impact on the existing residences in NCA02. Based on the above, the predicted infrequent sleep disturbance exceedances are considered of low significance and do not warrant any further mitigation measures.

5.4 Off-site Traffic Assessment

The results of the off-site traffic assessment are shown in **Table 33**.

Table 33 Traffic Noise Assessment

NCA	Road	RNP Increase Criterion (dB)	Predicted Increase (dB)	
			Day	Night
NCA01	Residential receivers on Brae Street and Ollier Crescent, north of the Great Western Highway	2.0	1.1	1.3
NCA02	Residential Receivers on Hampton Close, north of the Great Western Highway		1.0	1.1

The above assessment shows that the predicted increase in traffic noise levels at the nearest residences north of the Great Western Highway from development related vehicles is expected to be below 2.0 dB. Increases of less than 2.0 dB represent a minor impact that is considered barely perceptible to the average person.

The potential impacts from development related traffic on the surrounding roads are expected to be negligible and no consideration of mitigation is required.

6.0 Mitigation and Management Measures

6.1 Construction Impacts

The impacts during construction of the project are predicted to be moderate and consistent with major construction work near to sensitive receivers.

The use of standard mitigation measures to minimise the impacts is considered sufficient to control the majority of the impacts. Examples of measures which could be applied to the work are provided in the Roads and Maritime (now Transport for NSW) *Construction Noise and Vibration Guideline* (see **Appendix E**).

A Construction Noise and Vibration Management Plan (CNVMP) would be prepared before any work begins. This would identify all potentially impacted receivers, assess the potential noise and vibration impacts from the project and provide details regarding how the impacts would be minimised through the use of all feasible and reasonable mitigation measures. The CNVMP would also contain procedures for handling complaints, should they occur, and detail any compliance monitoring requirements.

6.2 Operational Noise Impacts

Where operational noise impacts from the site are predicted to exceed the relevant noise criteria, feasible and reasonable operational noise mitigation and management measures should be considered, with the aim of reducing noise emissions to the relevant criteria.

The typical hierarchy for mitigation and management of industrial noise sources is as follows:

- Reducing noise emissions at the source (ie noise source control)
- Reducing noise in transmission to the receiver (ie noise path control)
- Reducing noise at the receiver (ie at-receiver control).

Analysis and assessment have been conducted to ensure that all reasonable and feasible mitigation measures have been thoroughly considered to adequately reduce noise emissions. The measures employed below have developed to achieve a balance between effectively reducing noise for nearby acoustic receivers while also maintaining the visual amenity for both nearby residents to the north across the Great Western Highway and future tenants of the industrial estate. Detailed discussion of the consideration of reasonable and feasible mitigation is provided in **Section 6.2.1**

A detailed assessment of potential feasible and reasonable mitigation measures that can be applied to the development to minimise the operational noise impacts is summarised in **Table 34**.

The measures should be regarded as indicative and would be further refined during detailed design when more details regarding specific tenants are known.

Table 34 Operational Noise Mitigation Options

Ref.	Mitigation Option	Noise Impact/Benefit	Reasonable and Feasible to Apply
Source Control			
S1	Use broadband and/or ambient sensing alarms on trucks and forklifts where they are required to reverse during the night-time.	Reduce potential for annoying noise emissions during the night-time.	Yes

Ref.	Mitigation Option	Noise Impact/Benefit	Reasonable and Feasible to Apply
S2	Roller doors kept closed when loading/unloading is not occurring.	Reduce potential for noise breakout from internal warehouse activity.	Yes
S3	Appropriate specification and location of mechanical plant during detailed design.	If noise impacts from mechanical plant are identified during detailed design, quieter plant could be selected, or the plant could be relocated to a location screened from view of the nearest receivers, where appropriate.	Yes
S4	Appropriate design of warehouses during detailed design.	Appropriate warehouse materials to minimise noise break-out from internal activities would be selected during detailed design.	Yes
S5	Limit truck volumes during the night-time.	Noise from trucks on site roads and in loading docks contributes to the predicted exceedances	No – the truck volumes used in this assessment are likely needed to meet tenant's requirements. Changes to internal truck routes and/or numbers not considered feasible.
S6	Appropriate design of site layout to minimise the need for trucks to stop or brake outside of loading docks with line of sight to residential receivers.	Minimise noise emissions, particularly from truck airbrakes.	Yes
S7	Production of an Operational Noise Management Plan.	This would detail the measures that could be used by the various tenants to minimise general noise emissions from the site. Reference can be made to the Best Management Practice (BMP) and Best Available Technology Economically Available (BATEA) measures listed in the NPfI (see **Appendix F**).	Yes
Path Control			
P3	Install a 3m noise barrier along the north and eastern boundary of Warehouse 1 hardstand area.	Reduce noise propagation from on-site heavy vehicle movements and loading/unloading activity expected to provide a benefit of up to 6 dB from operations within the hardstand area, at the nearest residential receivers.	Yes
P4	Install a 3m noise barrier/berm along the northern boundary of the Warehouse 3-4 Truck access road.	Reduce noise propagation from on-site heavy vehicle movements on internal access roads expected to provide a benefit of up to 5 dB from vehicle movements at the nearest receiver.	Yes

Ref.	Mitigation Option	Noise Impact/Benefit	Reasonable and Feasible to Apply
Receiver Control			
R1	Not required	n/a	n/a
Verification Monitoring			
V1	Noise Monitoring	Verify post-construction operational noise levels are in-line with predictions and the mitigation is working as intended.	Yes

6.2.1 Consideration of Feasible and Reasonable Mitigation Measures

Various noise reduction strategies have been explored and implemented, including the introduction of noise walls, reorientation of building design to position loading areas away from residential receivers and creation of landscape mounding on the northern setback.

The indicative modelled locations of the proposed noise barrier is shown in purple and the location of the proposed noise berm is shown in green in **Figure 12**.

A summary of key design considerations that have guided the overall acoustic mitigation proposed is detailed below.

6.2.1.1 Preservation of visual amenity:

Visual Impact within the Huntingwood Precinct DCP states the subject site is located in Zone 1 and is considered to have high visual sensitivity to nearby receptors. Visual impact of the appearance of the development as viewed from the Great Western Highway is of key concern to Council and DPE and requires design and articulation with effective onsite landscaping and treatments. The development is proposed to be heavily landscaped in proposed setbacks surrounding the site and in road reserves and vegetation buffers helping to soften and screen views for these nearby receptors, providing greening to the street scape and built form.

To ensure visual amenity is maintained, the development has proposed to replace traditional acoustic walls with landscaped mounding within the 20m landscaped setback along a prominent section of the northern boundary. While landscape mounding in the proposed area is limited to a maximum height of 3m due to engineering limitations, it does create substantial visual amenity benefits to residents that are located to north across the GWH.

It is worth noting that combined with substantial landscape planting to offset the visual impact, extensive consideration has been given to the scale of the buildings to create visual interest in the façade using different layers of materials and patterns resulting in varied built form that minimises the industrial look. The design which was favourably received by Blacktown City Council Architect during consultation will be lost with the introduction of acoustics walls along the northern frontage.

6.2.1.2 Integration of Outdoor space

The integration and provision of outdoor space within an industrial development plays a crucial role in enhancing the overall well-being of future occupants. A conscious decision was made by the proposed development to utilise acoustic landscaped mounding along the northern boundary as a substitute to an acoustic wall. The key intention is to maintain integration of outdoor space with the offices of Warehouse 3A, 3B, 4A, 4B, creating a linear park that guides occupants along the northern frontage of the development east towards Blacktown Creek Conservation area. The vision is to allow future occupants to integrate with

the outdoor areas and not shield these areas off from the development with installation of acoustic walls that envelope the site's boundaries.

6.2.1.3 Civil Design Limitations

There are civil design limitations within the 20m landscape setback zone which prevents creation an acoustic mound taller than 3m. The issue arises from the fact that most of the existing levels at the boundary are too low to allow for a maximum slope of 1V:2.5H from the top of this acoustic embankment within 20 metres. As result of these limitations an acoustic mound to the maximum height of 3m is proposed from the level of the Truck Access Road.

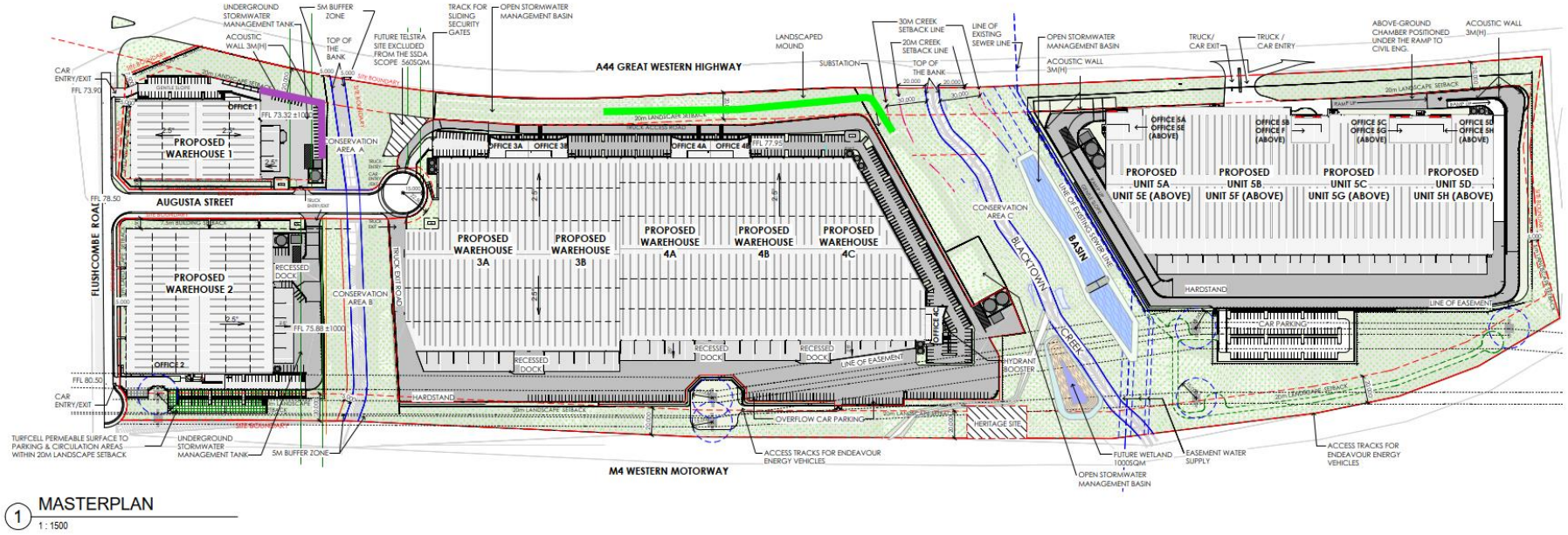
6.2.1.4 Preservation of existing canopy coverage

To ensure preservation of existing limited tree canopy cover across the proposed development, the placement of On-Site Detention (OSD) basins has been carefully considered. As shown on the Civil Drawings prepared by Costin Roe, an OSD Basin is proposed within the 20m landscaped setback to the GWH. Originally the location of this basin was positioned within the conservation area further west of its current location and subsequently repositioned to the east to ensure existing mature native trees within the original proposed location would be retained. The limitation this creates is it prevents the extension of landscaped acoustic mounding further west.

6.3 Future project stages

The project is a speculative development without any tenants committed and the exact operational procedures of the site are not known at this time. Several assumptions have been made regarding the likely future uses and sources of noise. The noise predictions in this report should be regarded as indicative for planning purposes and should be confirmed at a later stage when detailed information is available.

Figure 12 3 m Wall and Noise Berm Locations



7.0 Conclusions

SLR has been engaged to assess the potential construction and operational noise emissions from the proposed development at Augusta Street, Huntingwood. The proposal includes the operation of four warehouses, including a multi-level warehouse building on the eastern part of the site, which would be in use 24/7.

The potential impacts from the proposal have been assessed against the noise and vibration specific Secretary's Environmental Assessment Requirements.

Construction noise levels are predicted to exceed the management levels at the nearest sensitive receivers. Exceedances are predicted at residential receivers to the north of the proposal and commercial receivers surrounding the proposal, however, this would only be expected to occur when noisy work is being completed close to the site boundary. Standard mitigation measures have been recommended to address the potential construction impacts.

A range of feasible and reasonable mitigation measures have been recommended to control the impacts which have been incorporated into the architectural and landscape plans. Operational noise levels are expected to comply the trigger levels at all surrounding receivers. .

Based on the predicted levels and recommended mitigation measures, the proposal is considered appropriate from an acoustic standpoint.

Appendix A Acoustic Terminology

Augusta Street Warehouse and Distribution Centre

Noise and Vibration Impact Assessment

The Trustee for Huntingwood Property Trust

SLR Project No.: 610.30770.00000

9 May 2024

Sound Level or Noise Level

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

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

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

'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.

Sound Power Level

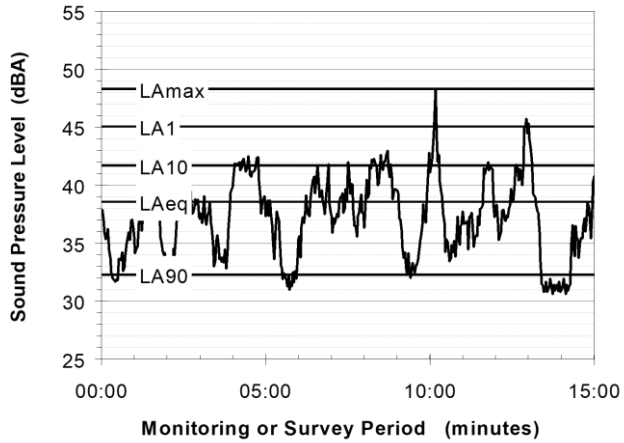
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or LW, or by the reference unit 10^{-12} W.

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.

Statistical Noise Levels

Sounds that vary in level over time, such as road traffic noise and most community noise, are commonly described in terms of the statistical exceedance levels LAN, where LAN is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the LA1 is the noise level exceeded for 1% of the time, LA10 the noise exceeded for 10% of the time, and so on.

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



Of particular relevance, are:

LA1 The noise level exceeded for 1% of the 15 minute interval.

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

LA90 The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.

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

Frequency Analysis

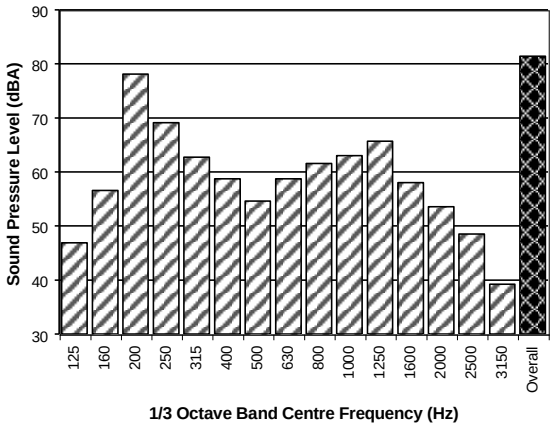
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal.

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.



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.

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.

Human Perception of Vibration

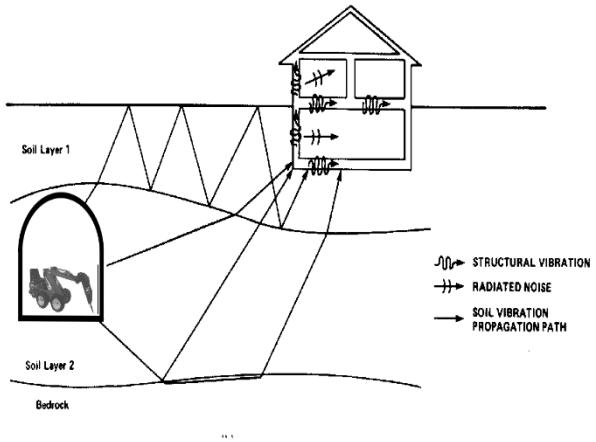
People are able to 'feel' vibration at levels lower than those required to cause even superficial damage to the most susceptible classes of building (even though they may not be disturbed by the motion). An individual's perception of motion or response to vibration depends very strongly on previous experience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

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 Summary

Augusta Street Warehouse and Distribution Centre

Noise and Vibration Impact Assessment

The Trustee for Huntingwood Property Trust

SLR Project No.: 610.30770.00000

9 May 2024

Noise Monitoring Location	L01
Noise Monitoring Address	**18 Brae Street, Prospect**

Logger Device Type: Svantek 957, Logger Serial No: 20667
Sound Level Meter Device Type: Brüel and Kjær 2250L, Sound Level Meter Serial No: 3005904

Ambient noise logger deployed at residential address 18 Brae St, Prospect. Logger located with view of Great Western Highway to the south.

Attended noise measurements indicate the ambient noise environment at this location is dominated by road traffic noise from the Great Western Highway to the south.

Recorded Noise Levels (L_{Amax}):
04/05/2022: Light-vehicle traffic Great Western Hwy: 50-53 dBA, Heavy-vehicle traffic Great Western Hwy: 52-56 dBA, Birds: 59-78 dBA, Animals: 63 dBA, Emergency Siren: 57-66 dBA, Helicopter: 55-56 dBA, Light-vehicle traffic Brae St: 52-54 dBA

Map of Noise Monitoring Location

Ambient Noise Logging Results – ICNG Defined Time Periods

Monitoring Period	Noise Level (dBA)			
	RBL	LAeq	L10	L1
Daytime	48	55	56	61
Evening	50	55	56	60
Night-time	44	53	54	57

Ambient Noise Logging Results – RNP Defined Time Periods

Monitoring Period	Noise Level (dBA)	
	LAeq(period)	LAeq(1hour)
Daytime (7am-10pm)	55	57
Night-time (10pm-7am)	53	55

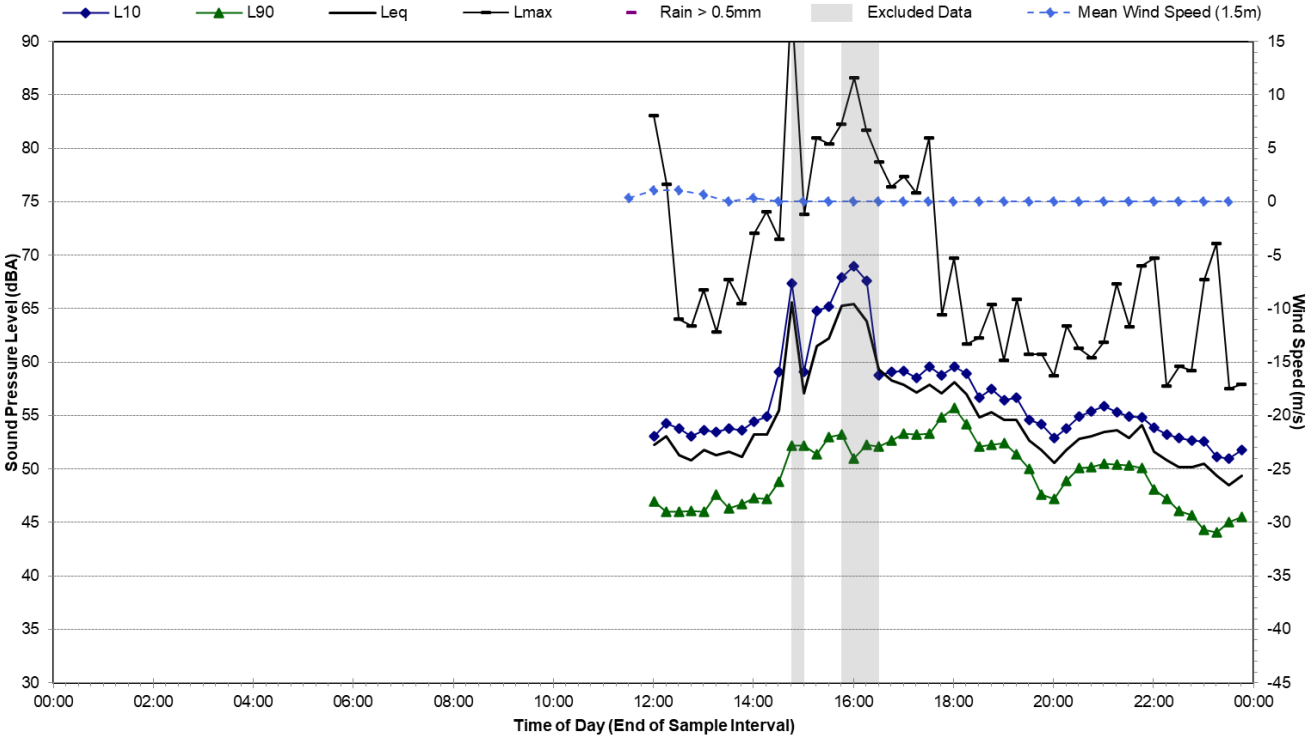
Attended Noise Measurement Results

Date	Start Time	Measured Noise Level (dBA)		
		LA90	LAeq	LAmax
04/05/2022	11:29	47	52	78

Photo of Noise Monitoring Location

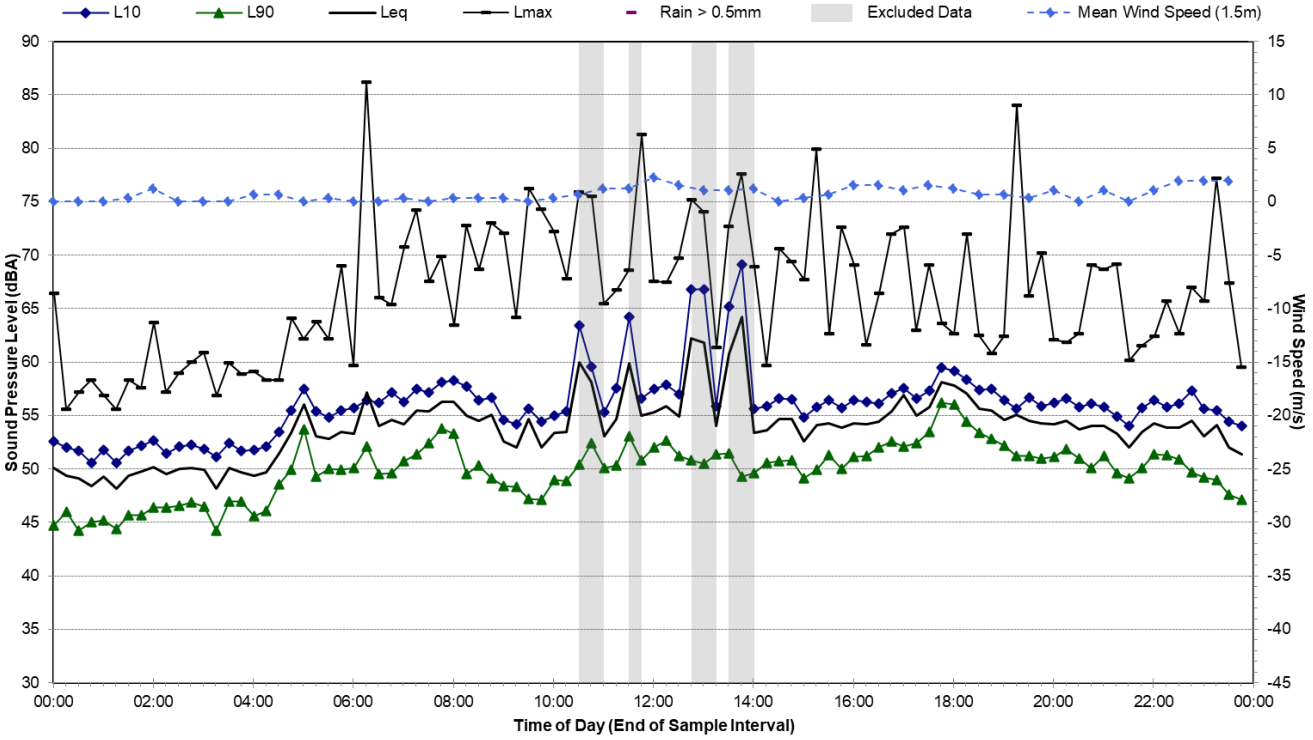
Statistical Ambient Noise Levels

L01 - 18 Brae Street - Wednesday, 4 May 2022



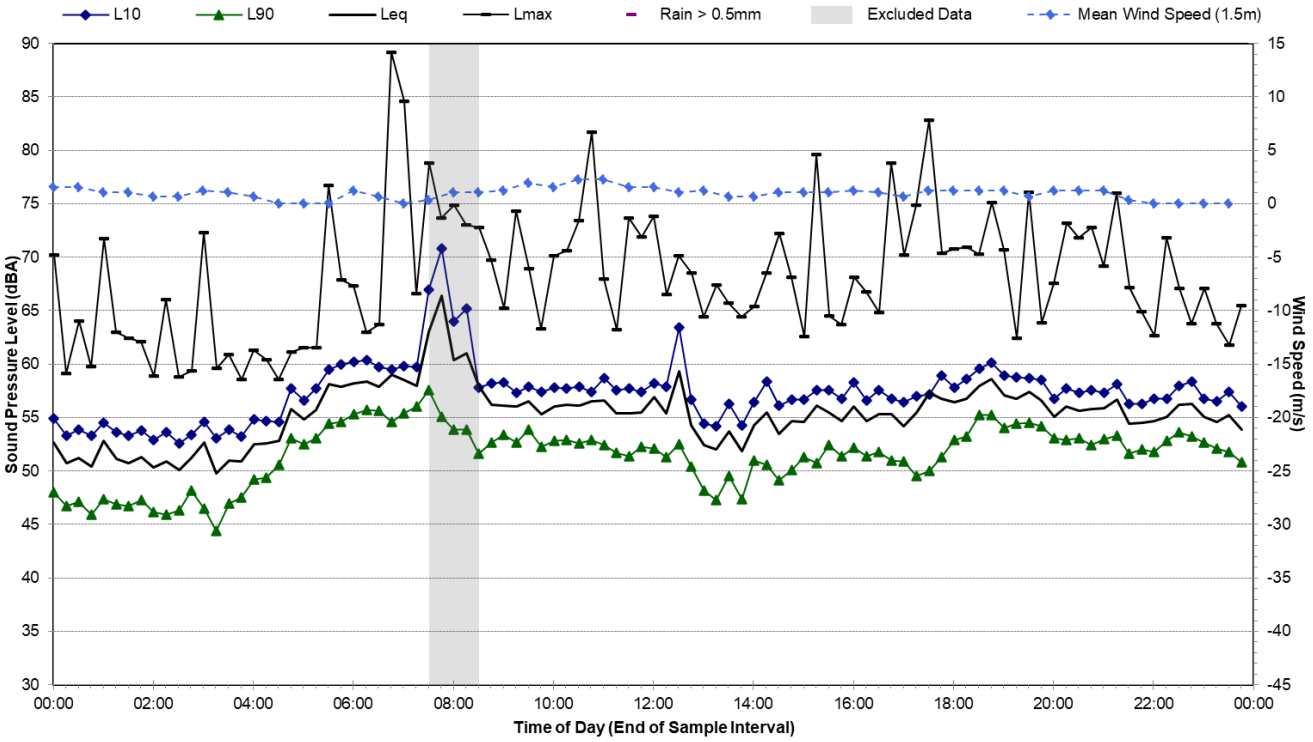
Statistical Ambient Noise Levels

L01 - 18 Brae Street - Thursday, 5 May 2022



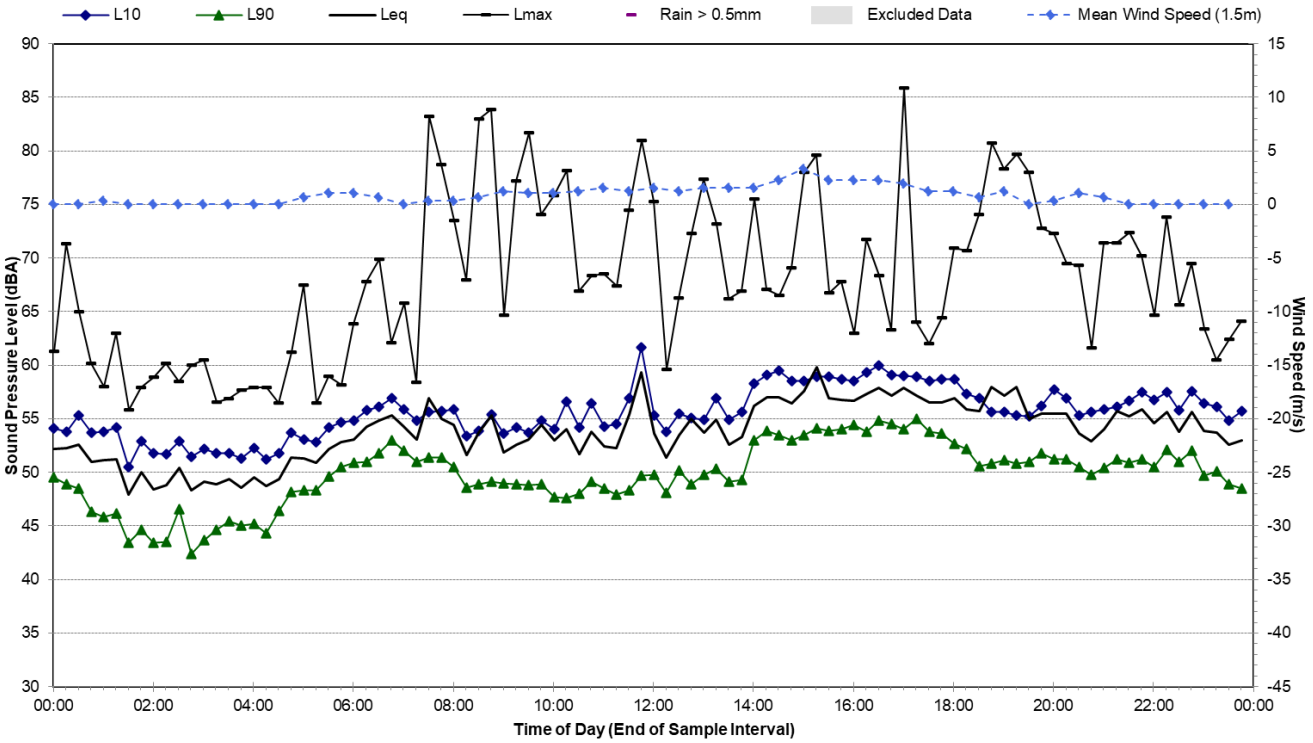
Statistical Ambient Noise Levels

L01 - 18 Brae Street - Friday, 6 May 2022



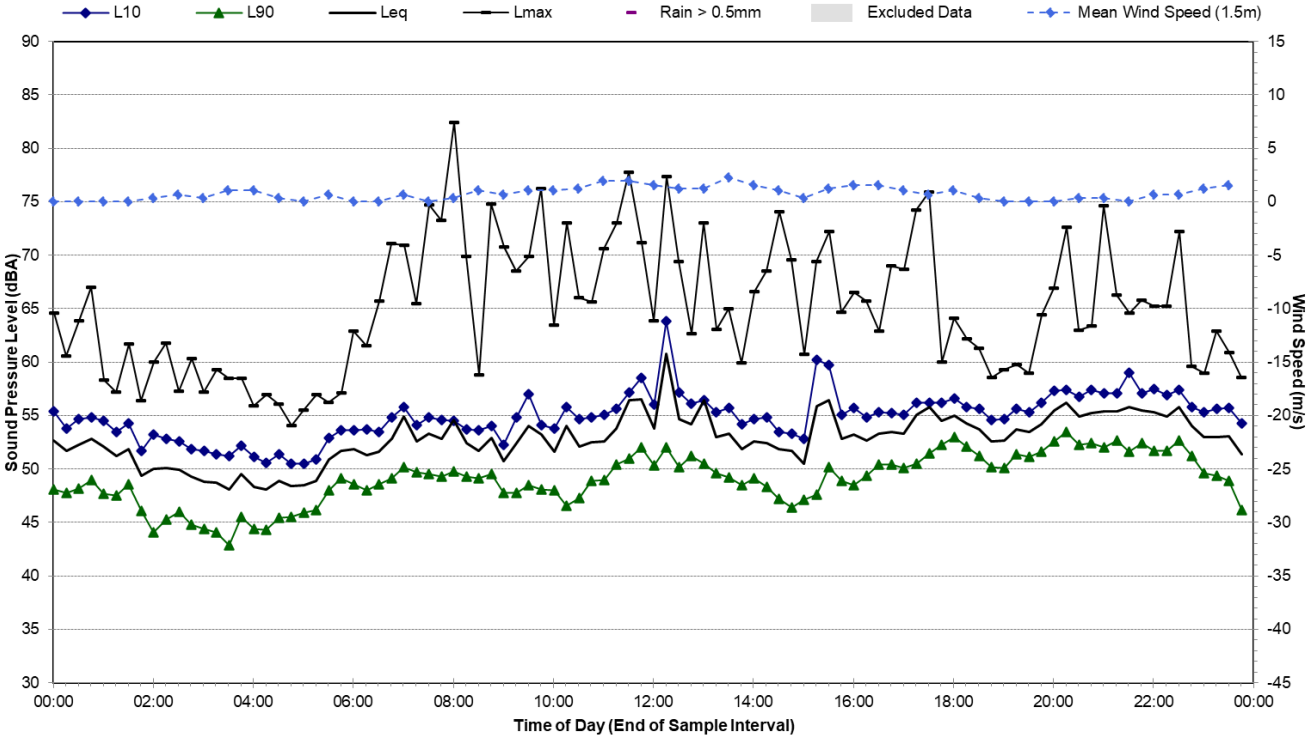
Statistical Ambient Noise Levels

L01 - 18 Brae Street - Saturday, 7 May 2022



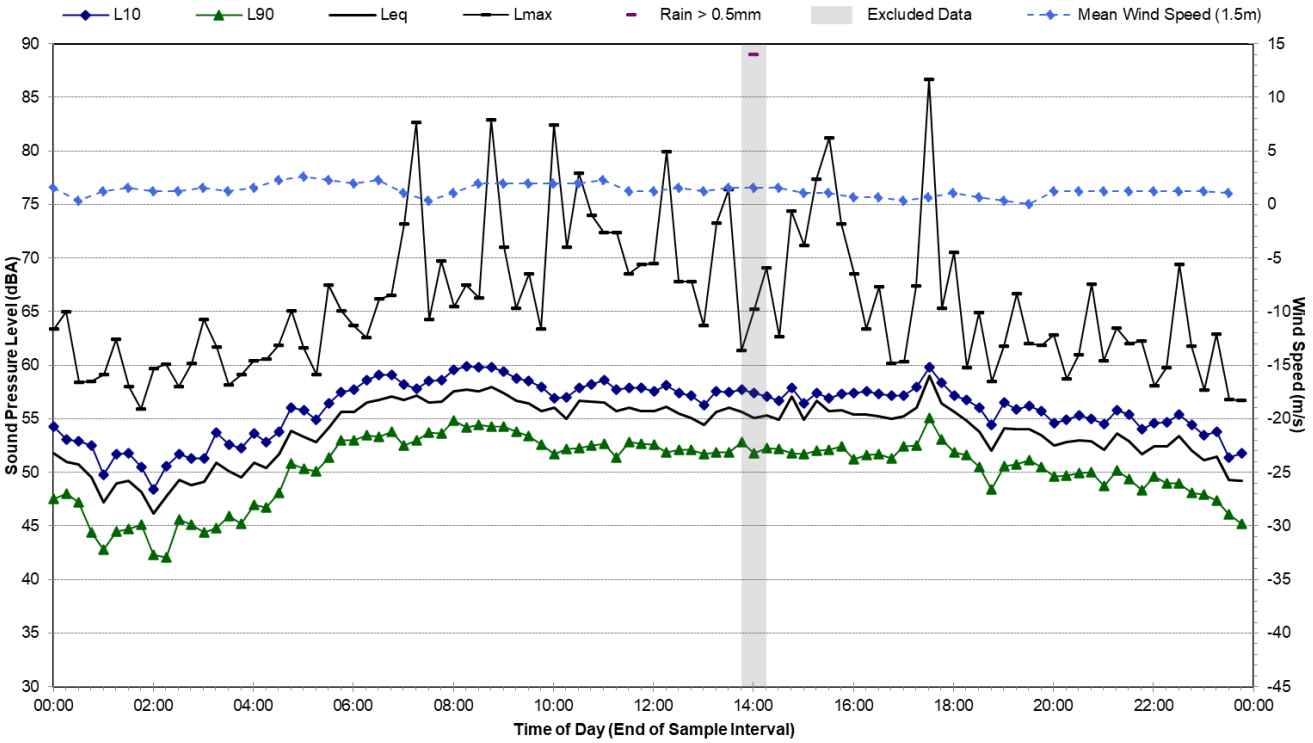
Statistical Ambient Noise Levels

L01 - 18 Brae Street - Sunday, 8 May 2022



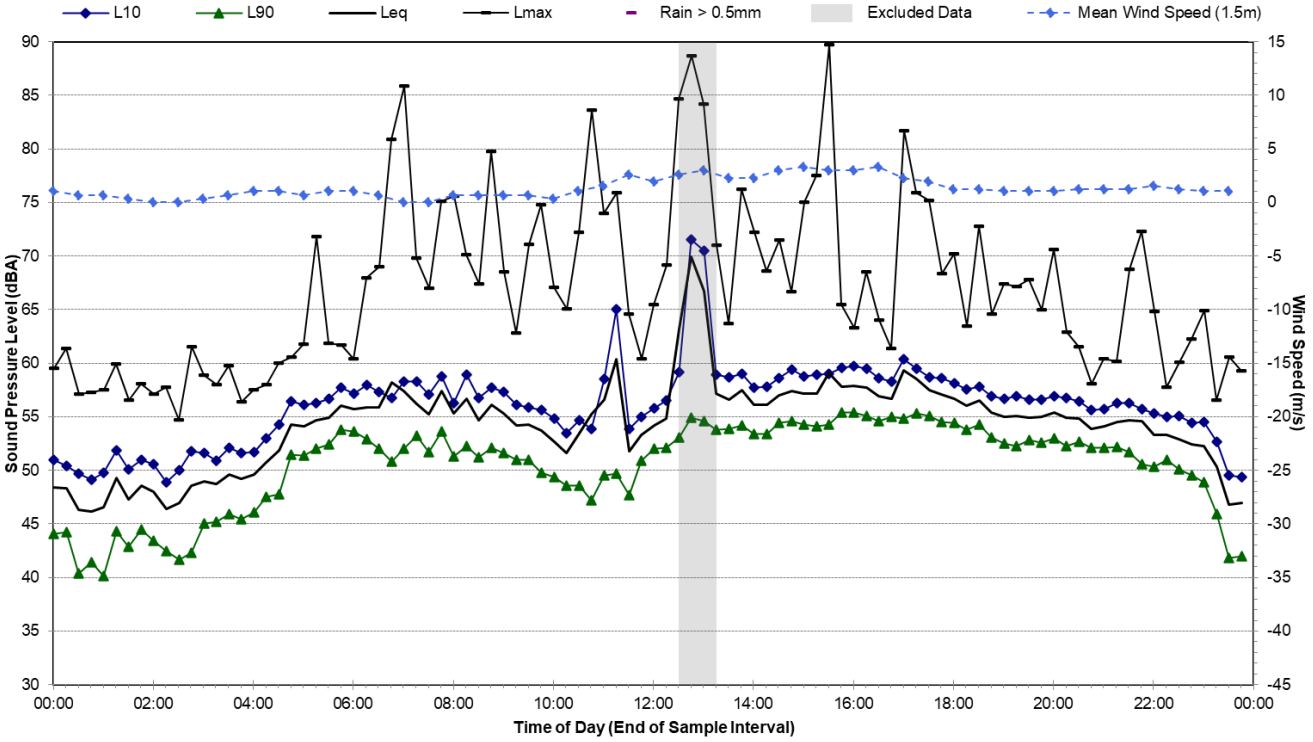
Statistical Ambient Noise Levels

L01 - 18 Brae Street - Monday, 9 May 2022



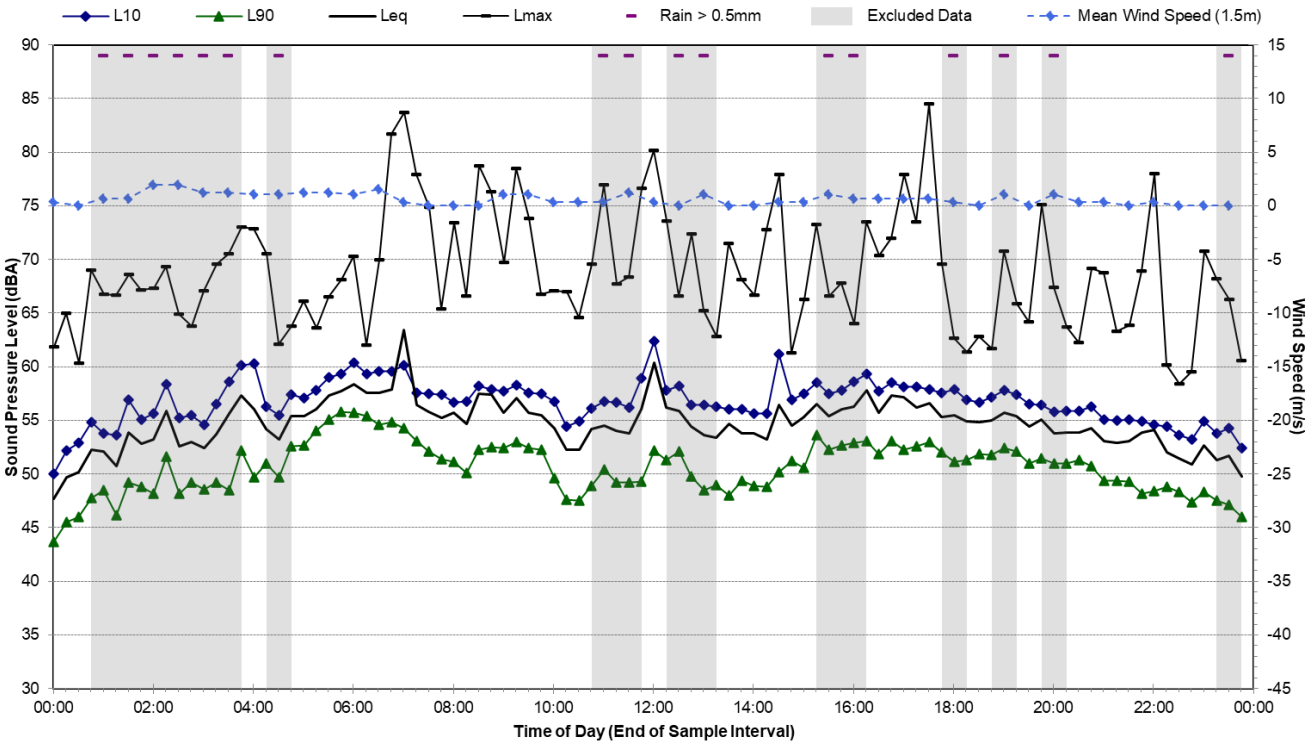
Statistical Ambient Noise Levels

L01 - 18 Brae Street - Tuesday, 10 May 2022



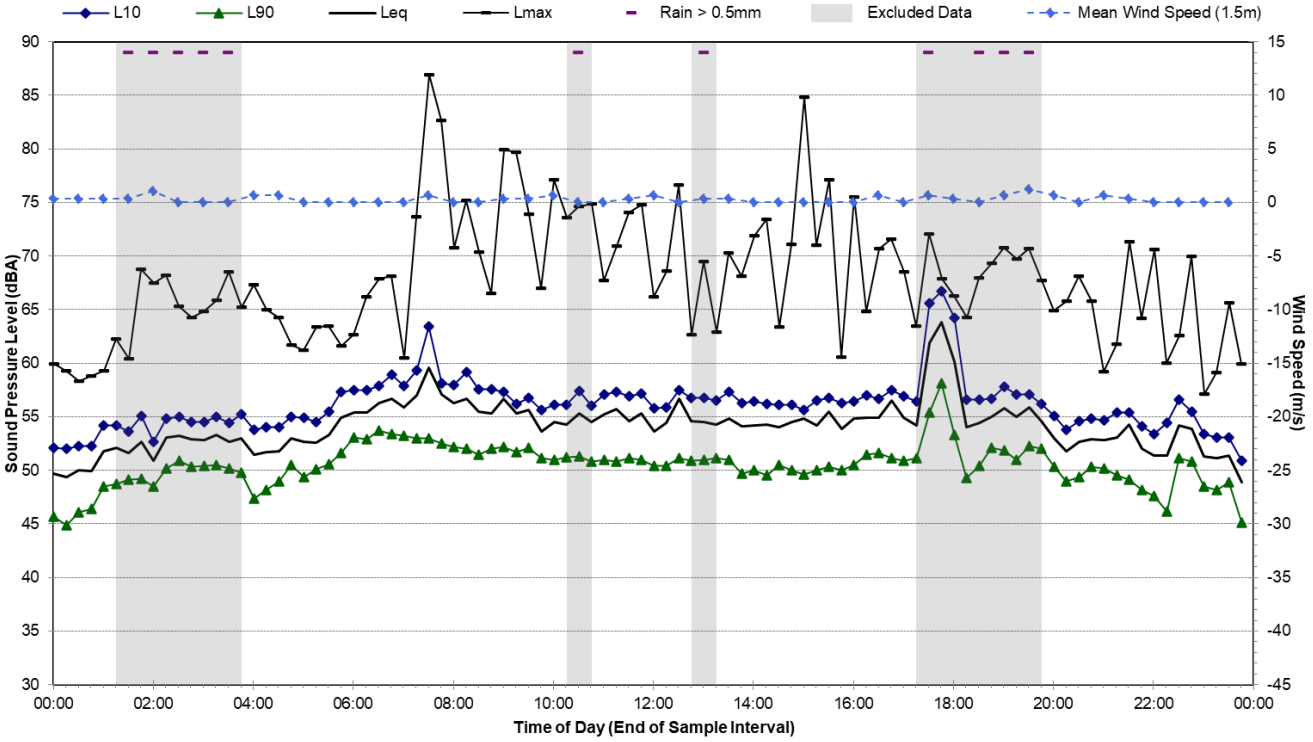
Statistical Ambient Noise Levels

L01 - 18 Brae Street - Wednesday, 11 May 2022



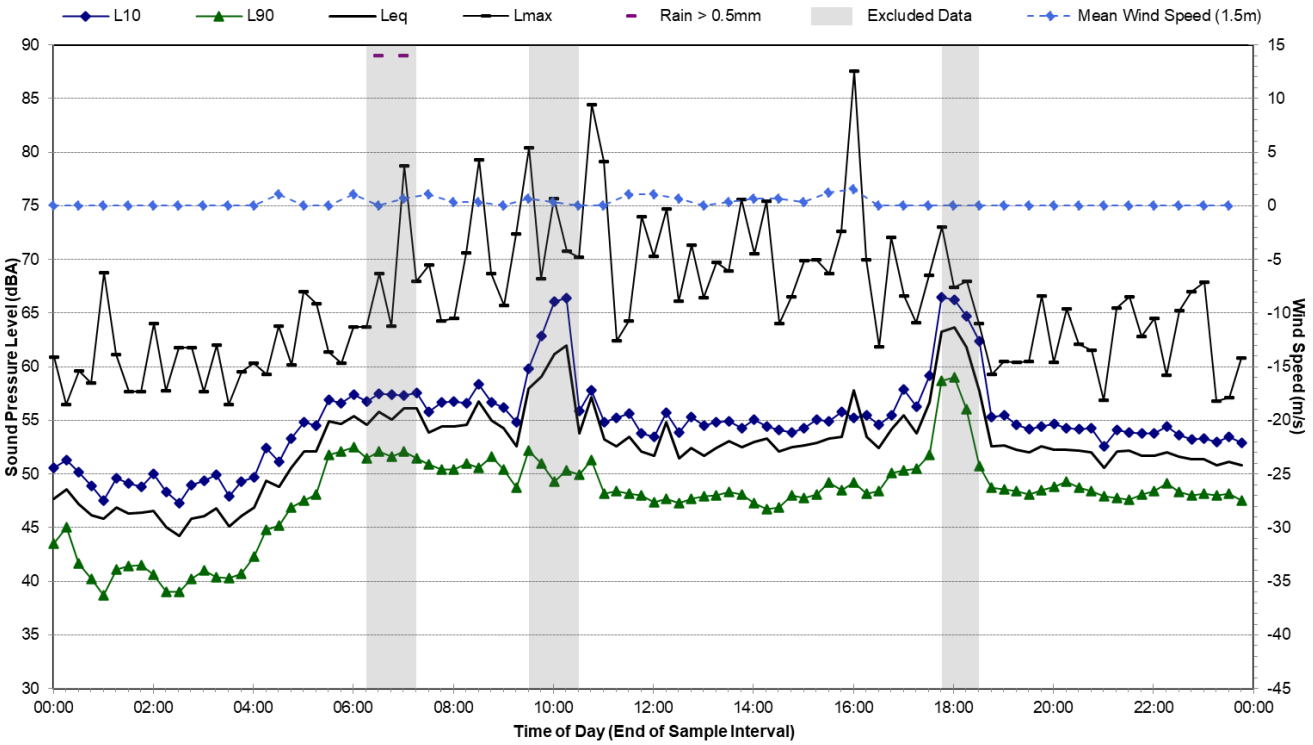
Statistical Ambient Noise Levels

L01 - 18 Brae Street - Thursday, 12 May 2022



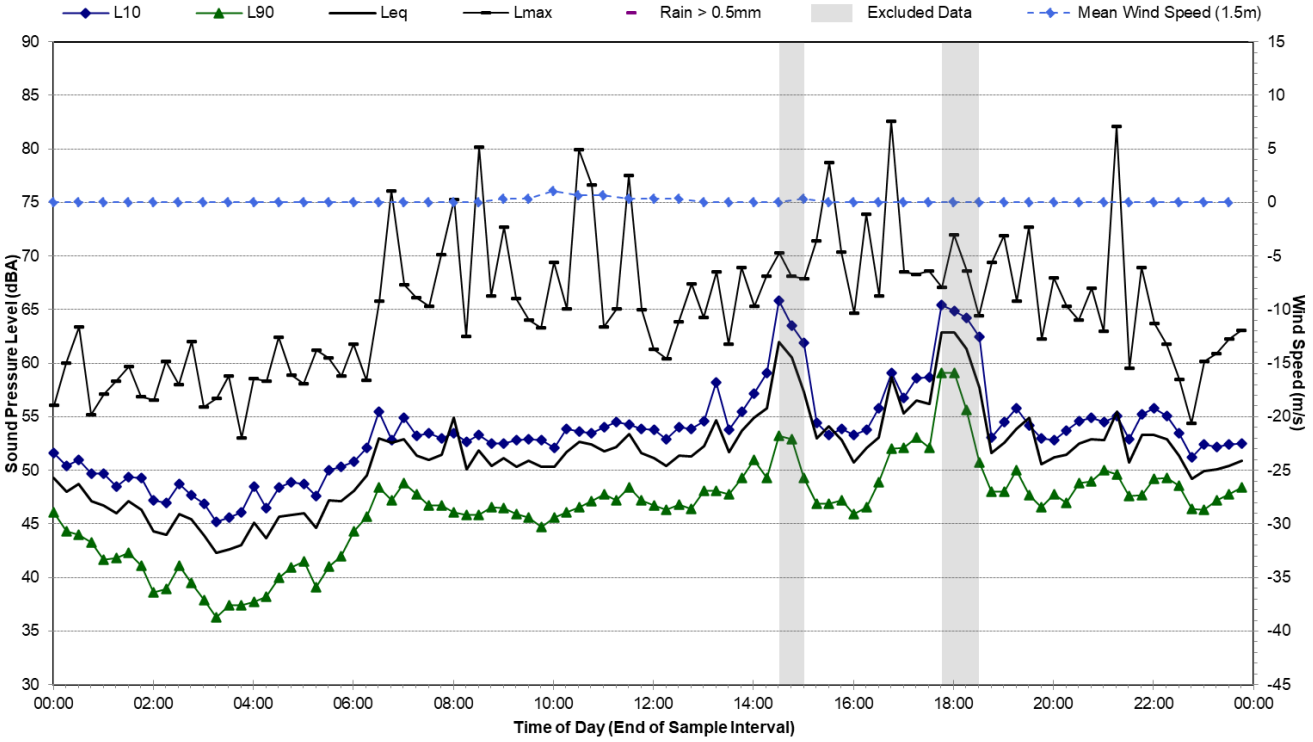
Statistical Ambient Noise Levels

L01 - 18 Brae Street - Friday, 13 May 2022



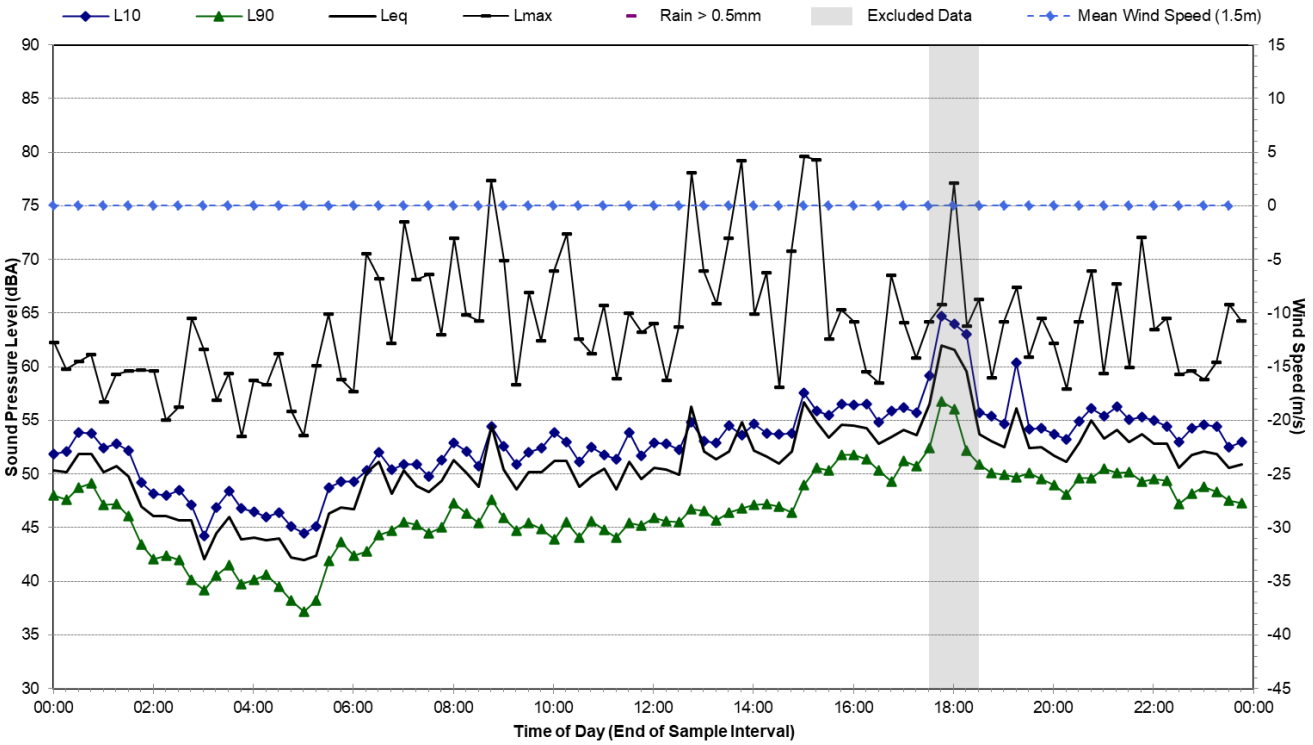
Statistical Ambient Noise Levels

L01 - 18 Brae Street - Saturday, 14 May 2022



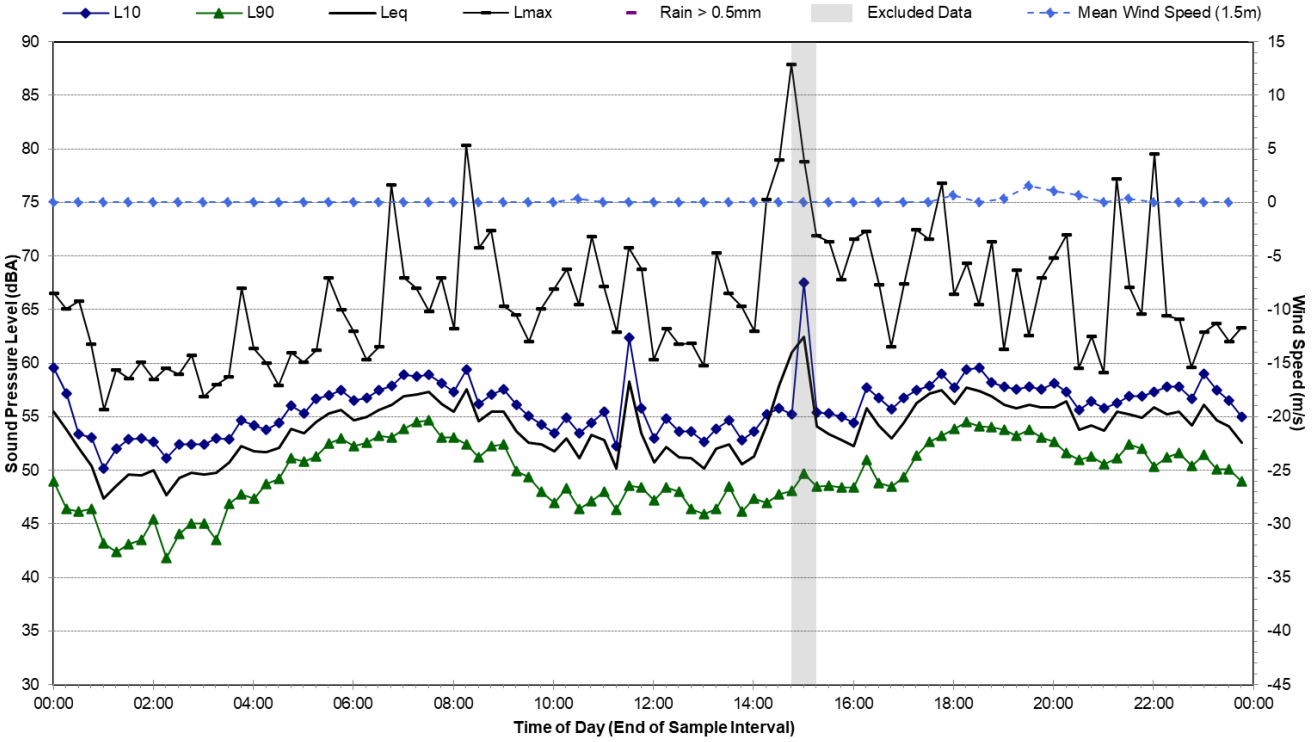
Statistical Ambient Noise Levels

L01 - 18 Brae Street - Sunday, 15 May 2022



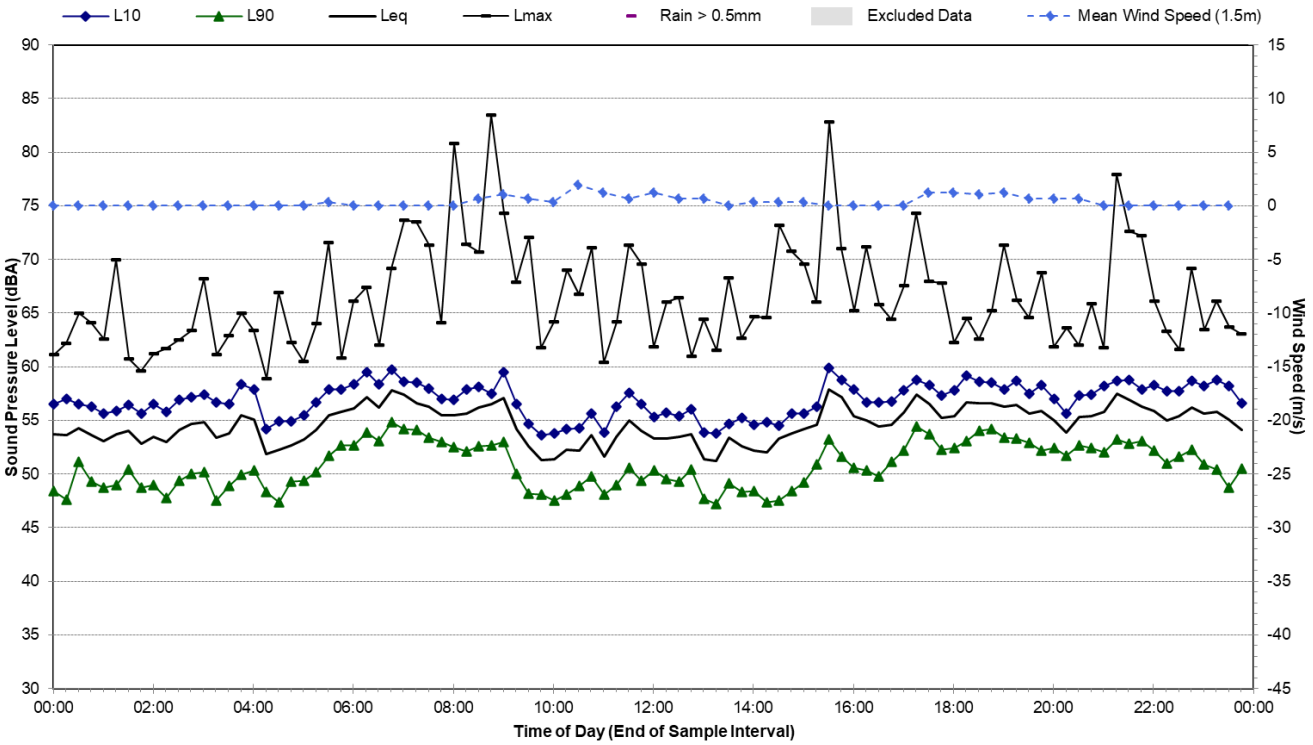
Statistical Ambient Noise Levels

L01 - 18 Brae Street - Monday, 16 May 2022



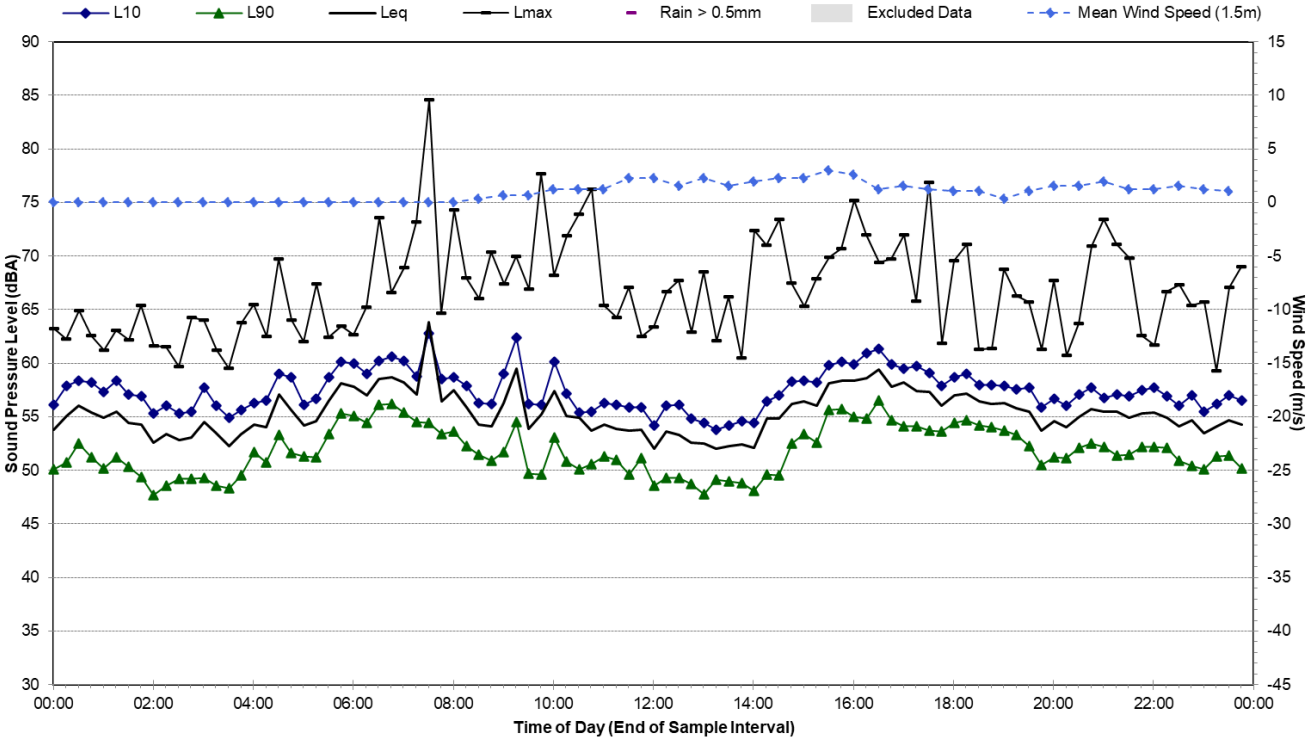
Statistical Ambient Noise Levels

L01 - 18 Brae Street - Tuesday, 17 May 2022



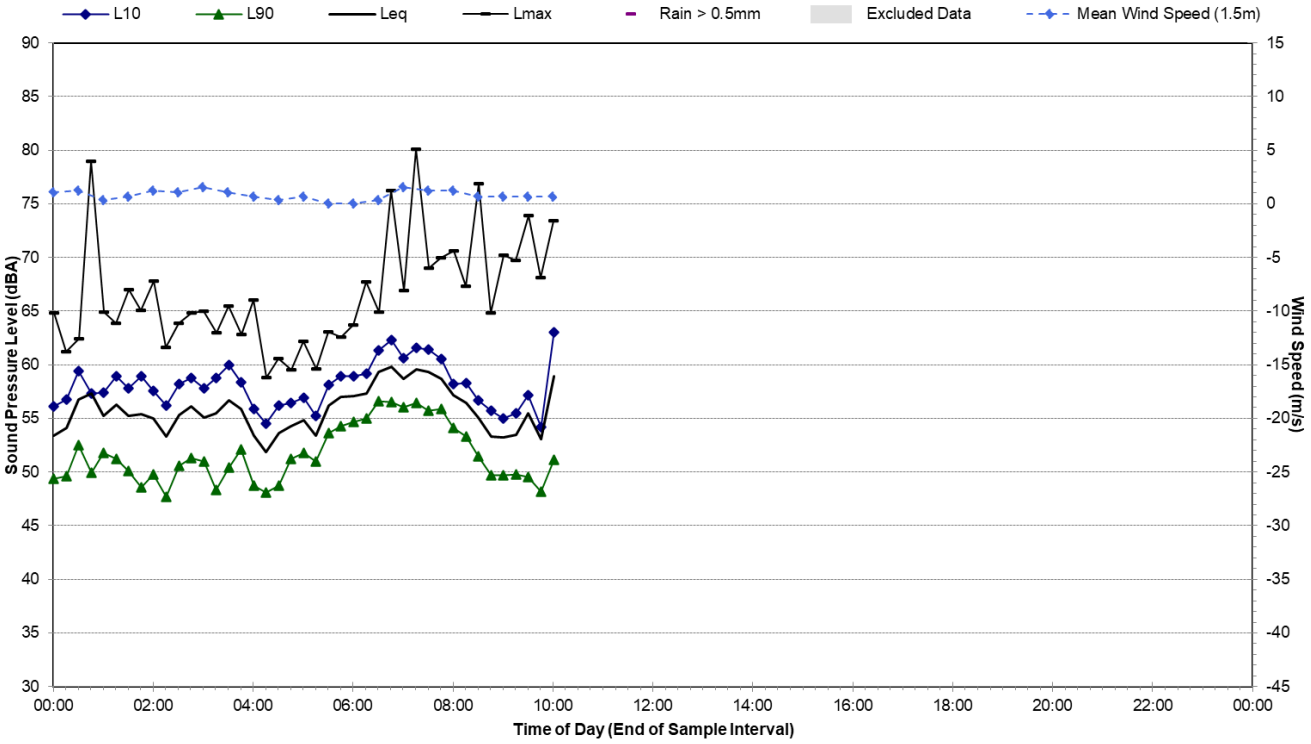
Statistical Ambient Noise Levels

L01 - 18 Brae Street - Wednesday, 18 May 2022



Statistical Ambient Noise Levels

L01 - 18 Brae Street - Thursday, 19 May 2022



Noise Monitoring Location	L02
Noise Monitoring Address	**47 Hampton Crescent, Prospect**

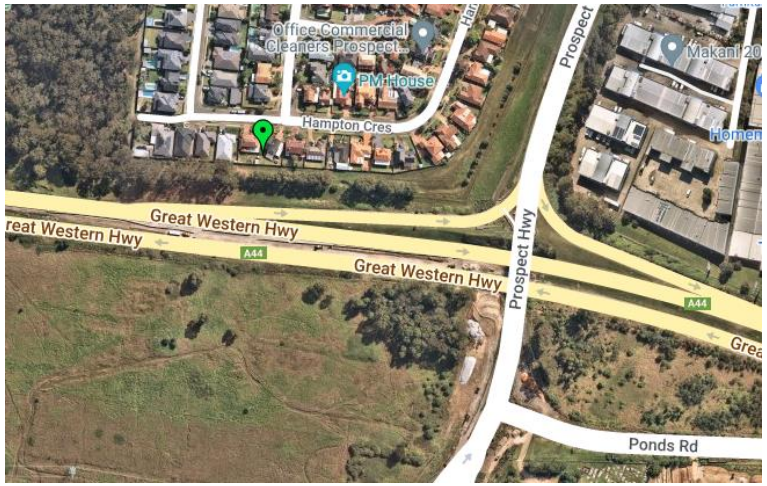
Logger Device Type: Svantek 957, Logger Serial No: 20644
Sound Level Meter Device Type: Brüel and Kjær 2250L, Sound Level Meter Serial No: 3005904

Ambient noise logger deployed at residential address 47 Hampton Cres, Prospect. Logger located with view of Great Western Highway to the south and Prospect Highway to the east.

Attended noise measurements indicate the ambient noise environment at this location is dominated by road traffic noise from the Great Western Highway to the south.

Recorded Noise Levels (LAmax):
19/05/2022: Light-vehicle traffic Great Western Hwy: 50-56 dBA, Heavy-vehicle traffic Great Western Hwy: 54-65 dBA, Traffic Prospect Highway: 45-49 dBA, Birds: 56-58 dBA, Animals: 66 dBA, Emergency Siren: 57-66 dBA, Aircraft: 56-63 dBA, Roadworks: 52-56 dBA

Map of Noise Monitoring Location



Ambient Noise Logging Results – ICNG Defined Time Periods

Monitoring Period	Noise Level (dBA)			
	RBL	LAeq	L10	L1
Daytime	47	55	57	61
Evening	46	53	55	60
Night-time	39	51	51	57

Ambient Noise Logging Results – RNP Defined Time Periods

Monitoring Period	Noise Level (dBA)	
	LAeq(period)	LAeq(1hour)
Daytime (7am-10pm)	54	56
Night-time (10pm-7am)	51	54

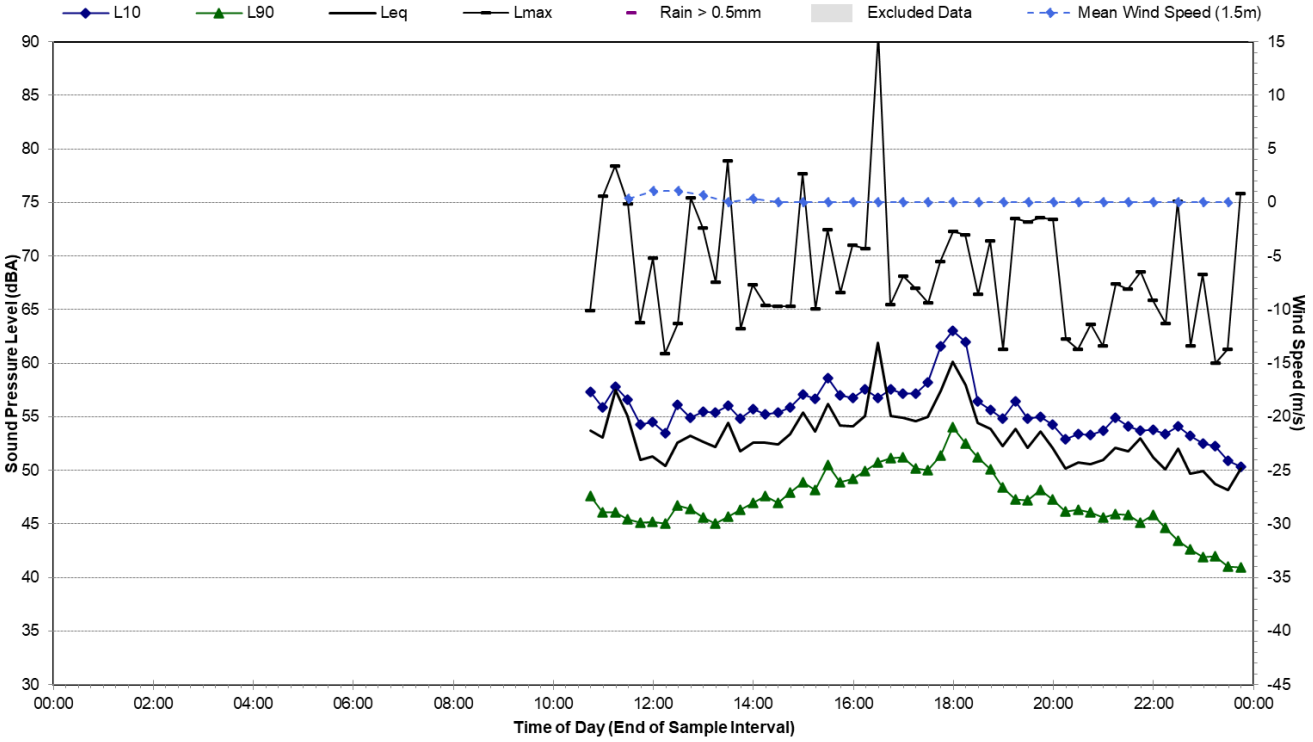
Attended Noise Measurement Results

Date	Start Time	Measured Noise Level (dBA)		
		LA90	LAeq	LAmax
19/05/2022	09:30	47	53	66

Photo of Noise Monitoring Location

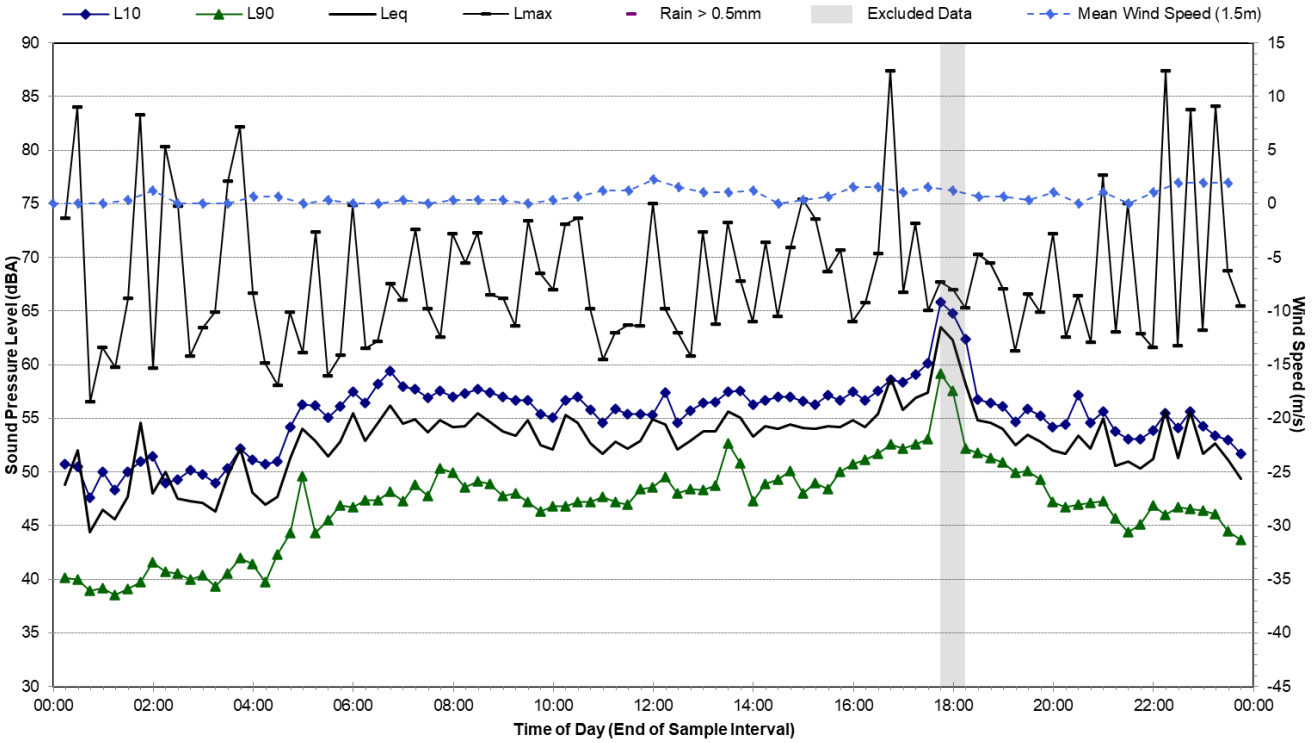
Statistical Ambient Noise Levels

L02 - 47 Hampton Crescent - Wednesday, 4 May 2022



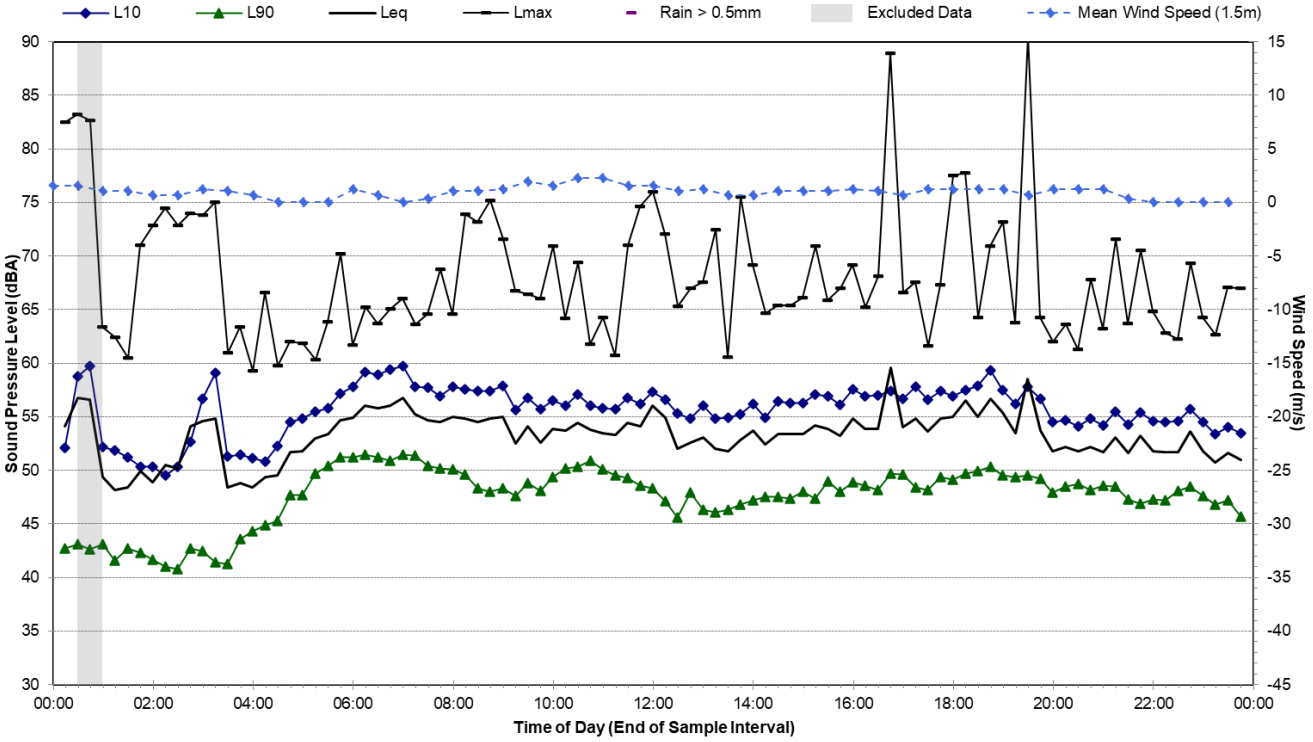
Statistical Ambient Noise Levels

L02 - 47 Hampton Crescent - Thursday, 5 May 2022



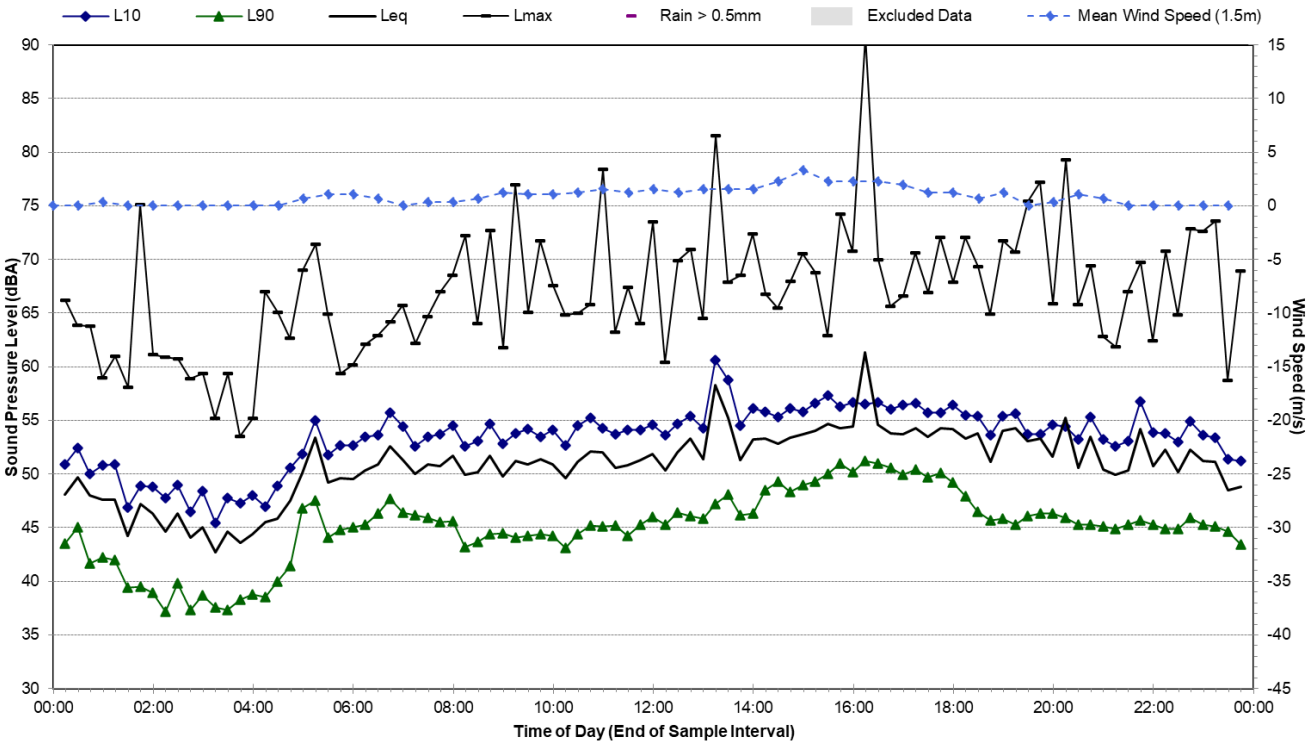
Statistical Ambient Noise Levels

L02 - 47 Hampton Crescent - Friday, 6 May 2022



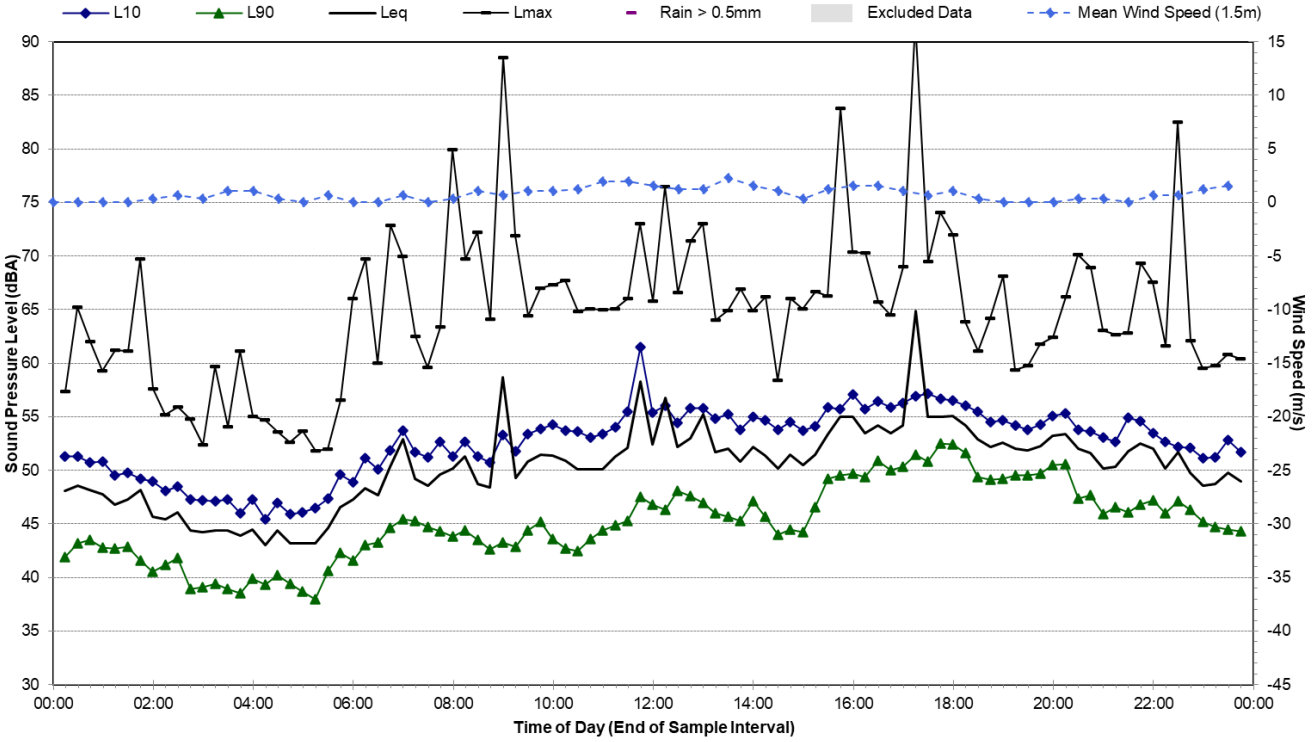
Statistical Ambient Noise Levels

L02 - 47 Hampton Crescent - Saturday, 7 May 2022



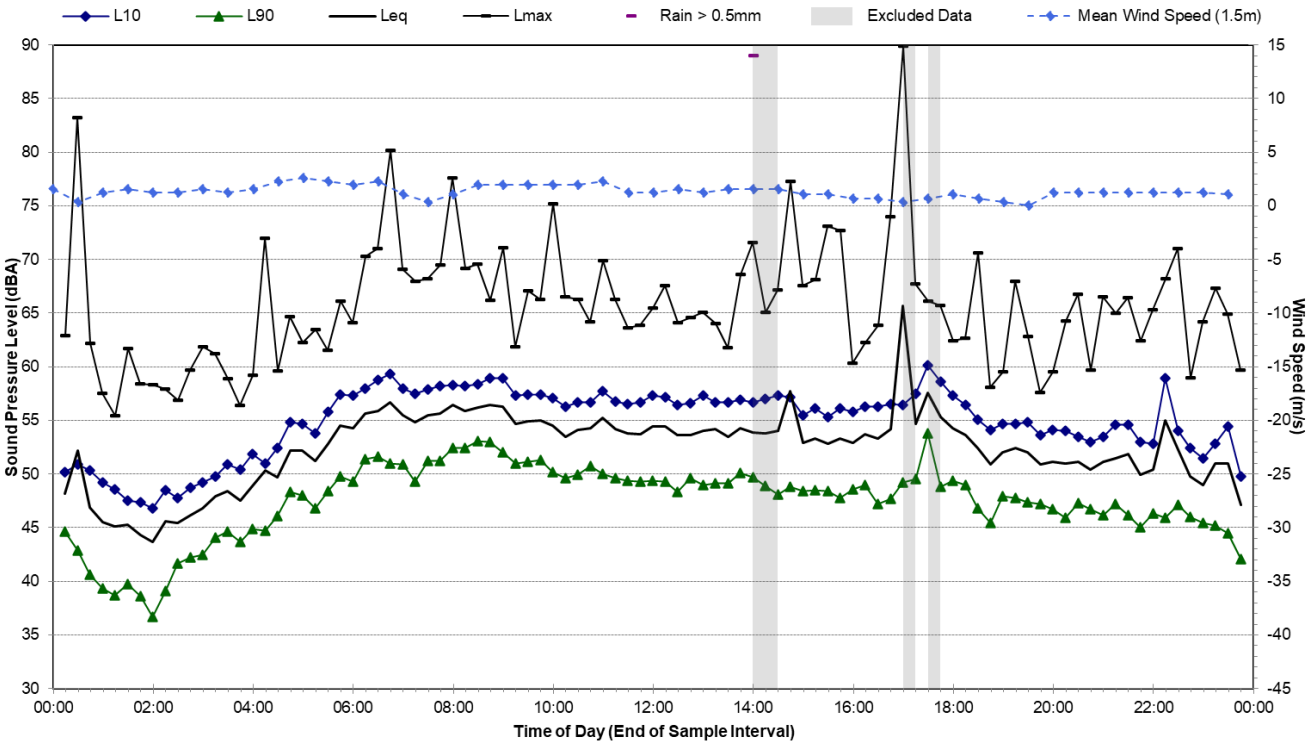
Statistical Ambient Noise Levels

L02 - 47 Hampton Crescent - Sunday, 8 May 2022



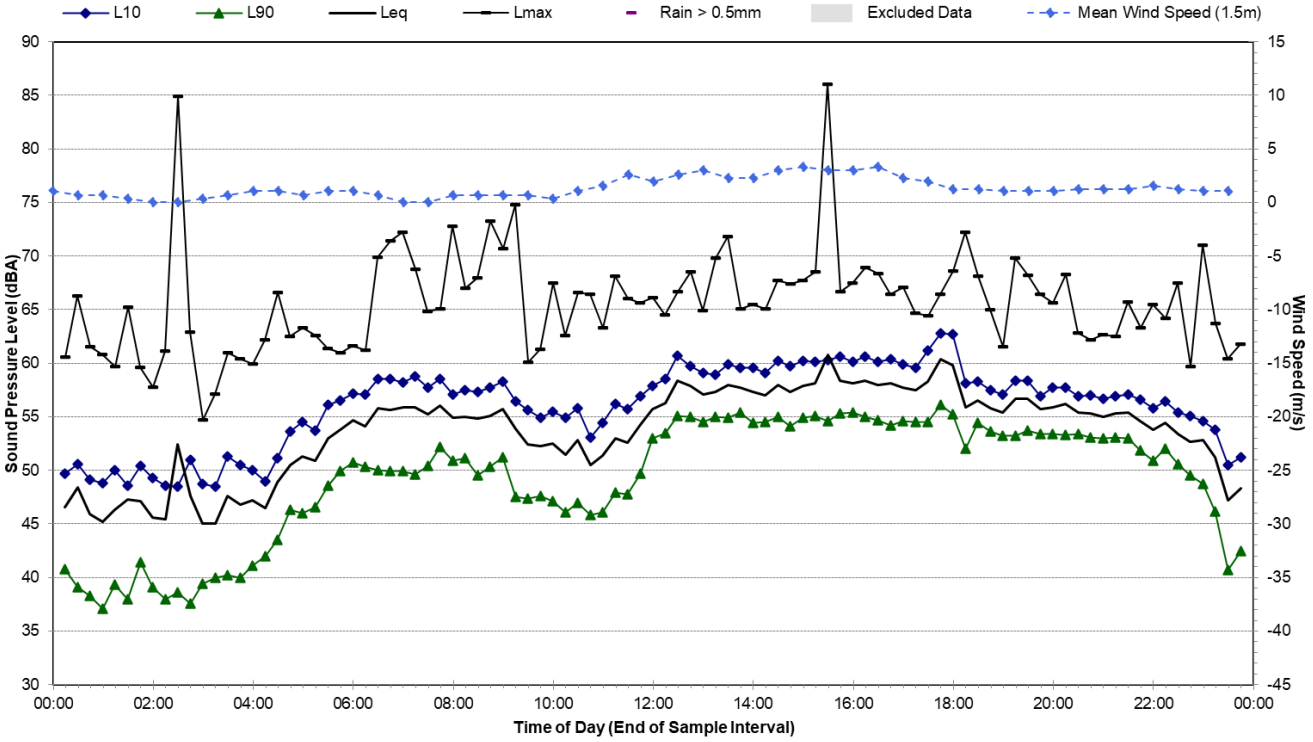
Statistical Ambient Noise Levels

L02 - 47 Hampton Crescent - Monday, 9 May 2022



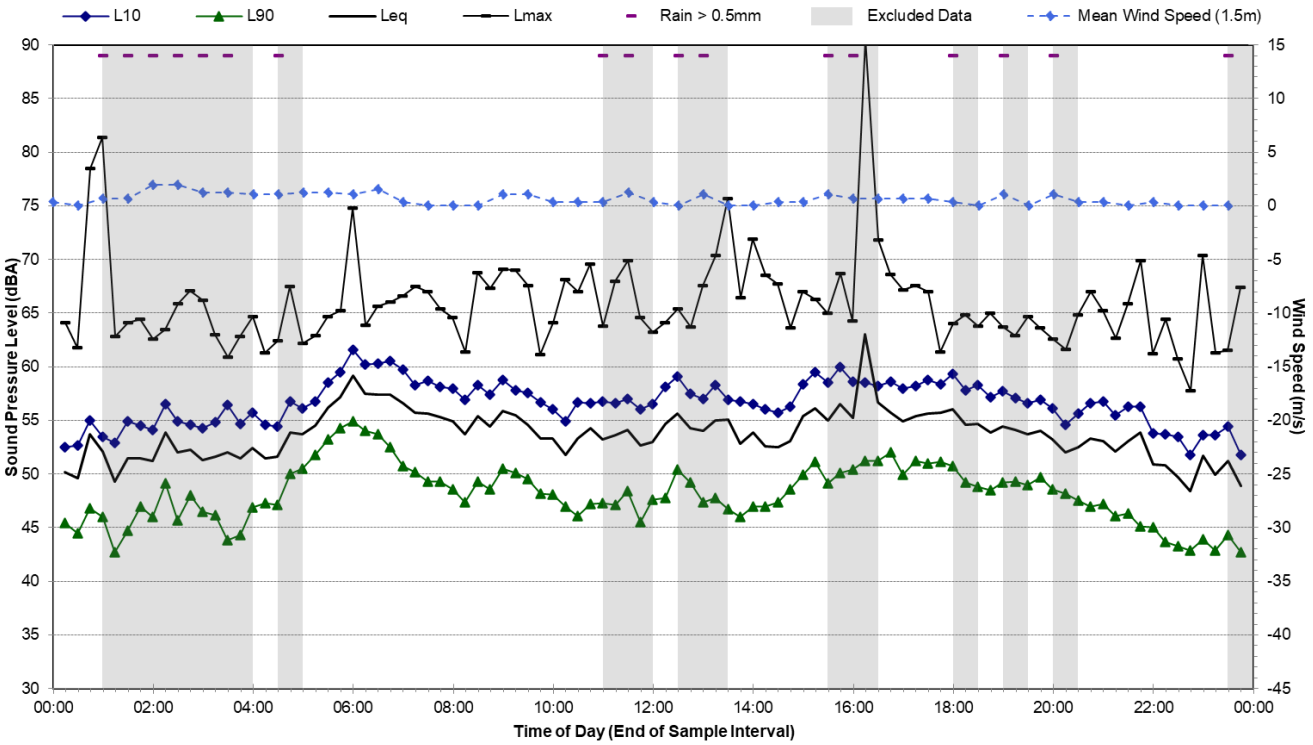
Statistical Ambient Noise Levels

L02 - 47 Hampton Crescent - Tuesday, 10 May 2022



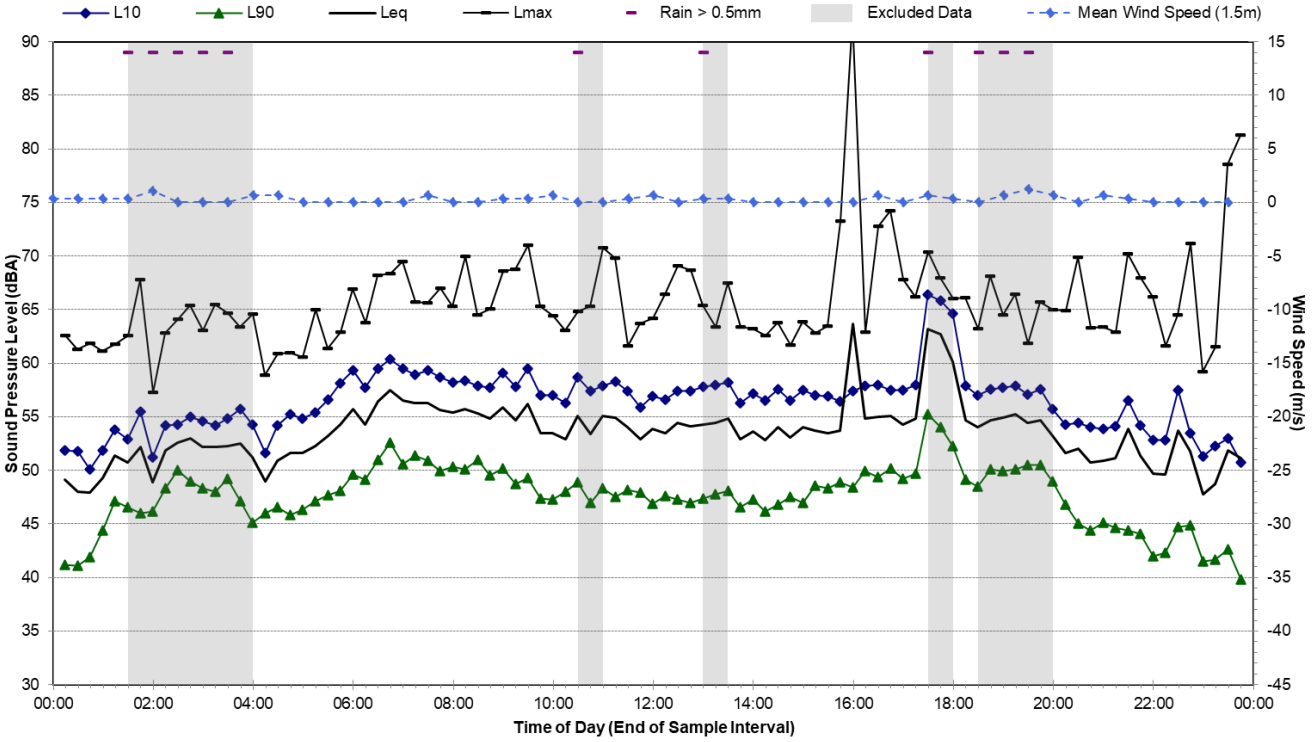
Statistical Ambient Noise Levels

L02 - 47 Hampton Crescent - Wednesday, 11 May 2022



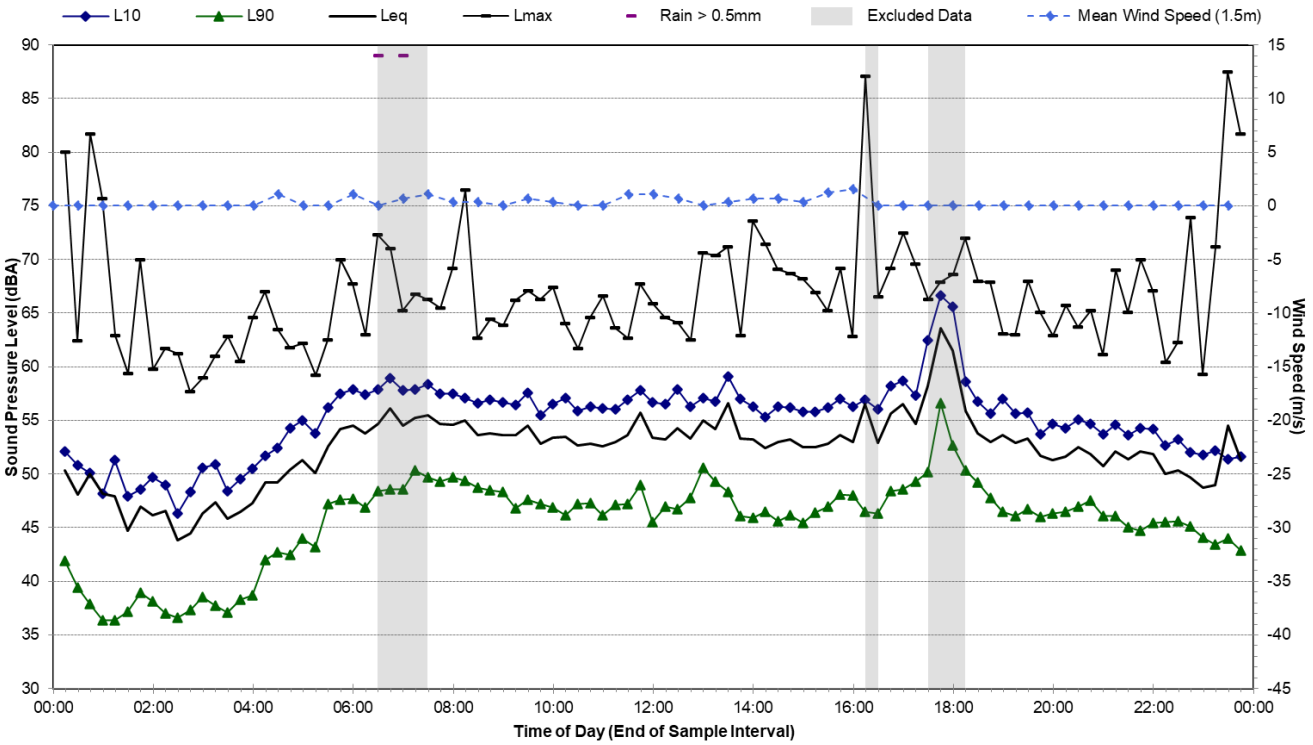
Statistical Ambient Noise Levels

L02 - 47 Hampton Crescent - Thursday, 12 May 2022



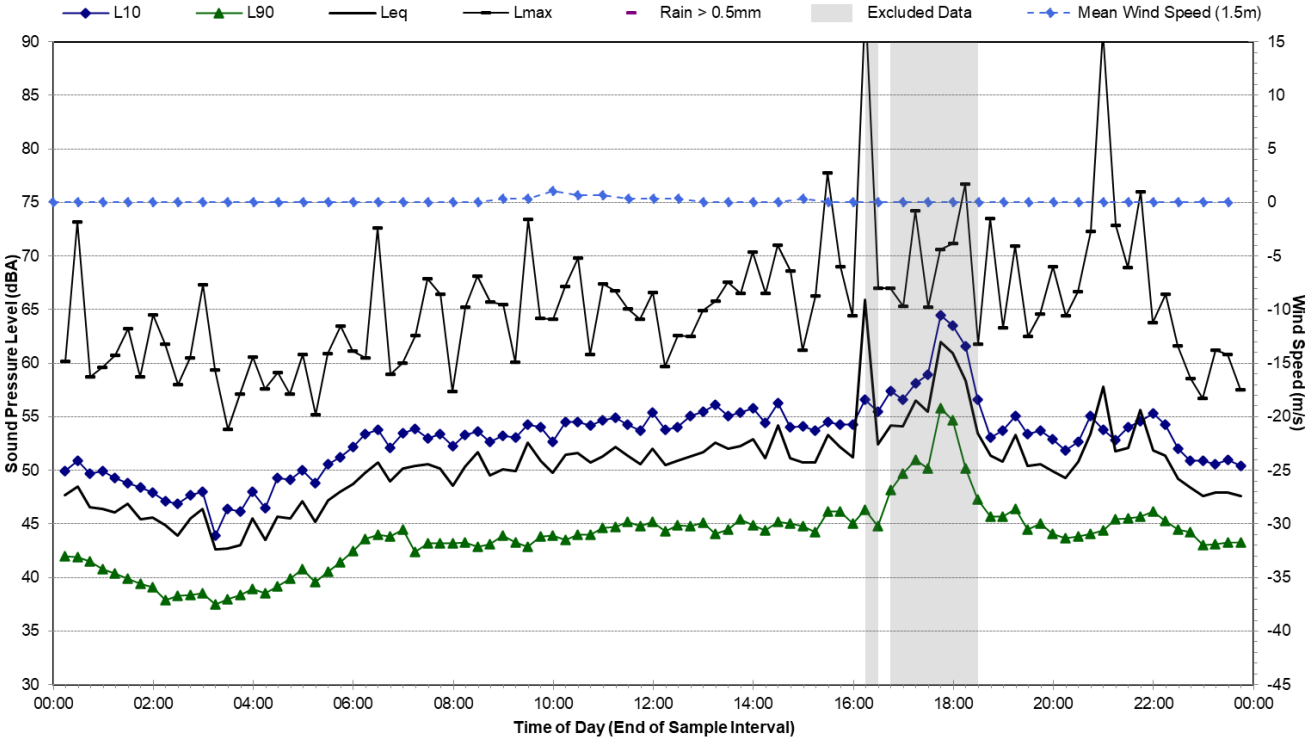
Statistical Ambient Noise Levels

L02 - 47 Hampton Crescent - Friday, 13 May 2022



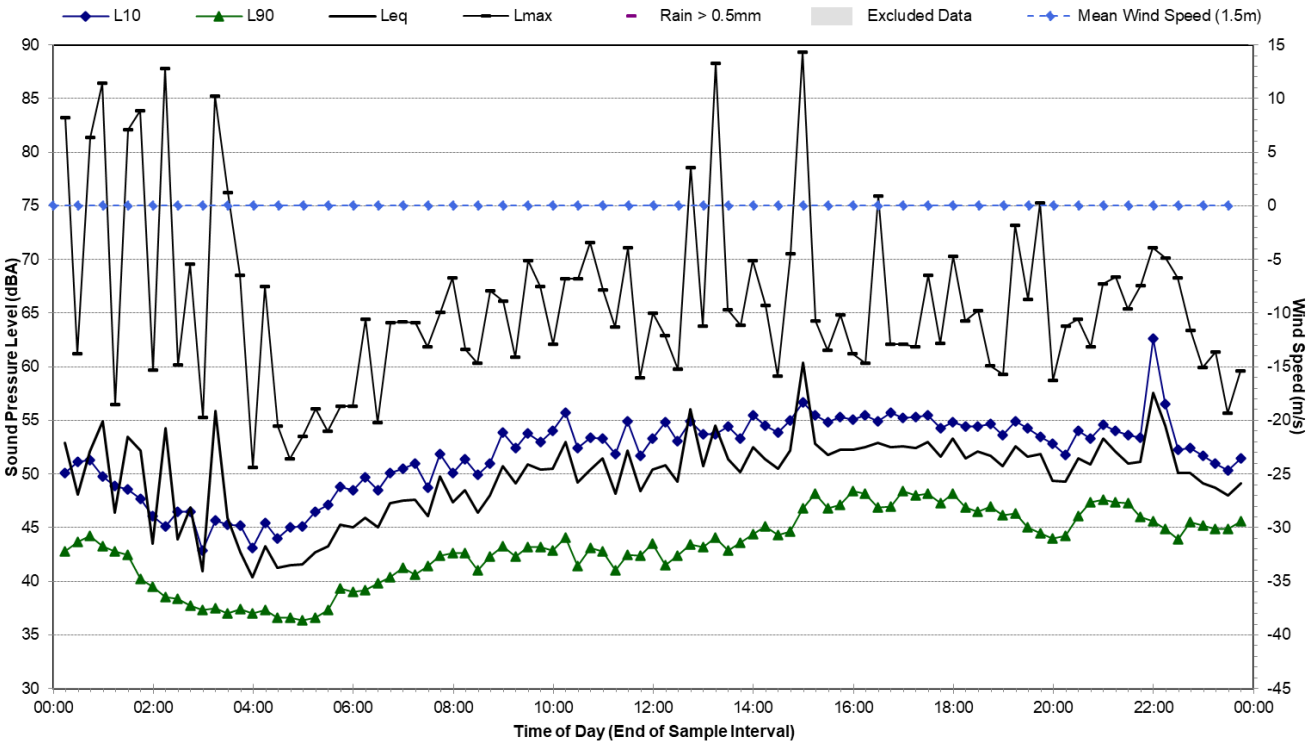
Statistical Ambient Noise Levels

L02 - 47 Hampton Crescent - Saturday, 14 May 2022



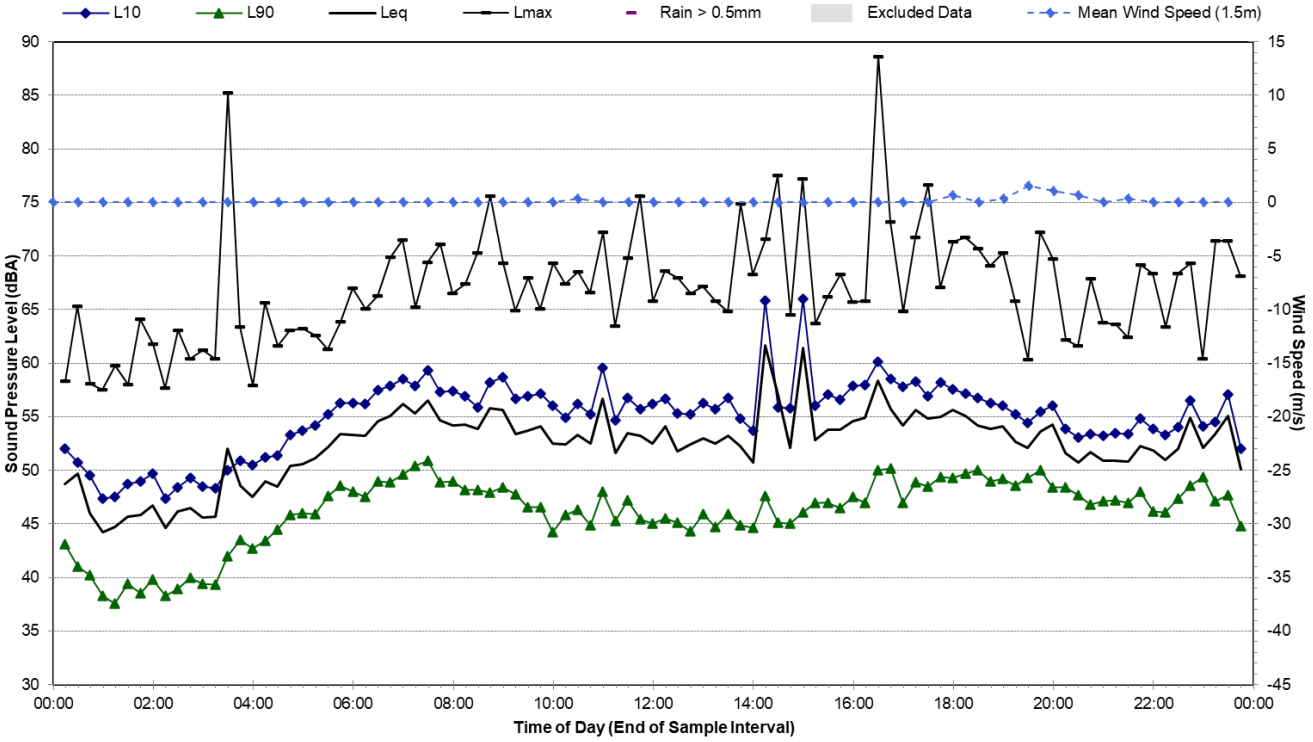
Statistical Ambient Noise Levels

L02 - 47 Hampton Crescent - Sunday, 15 May 2022



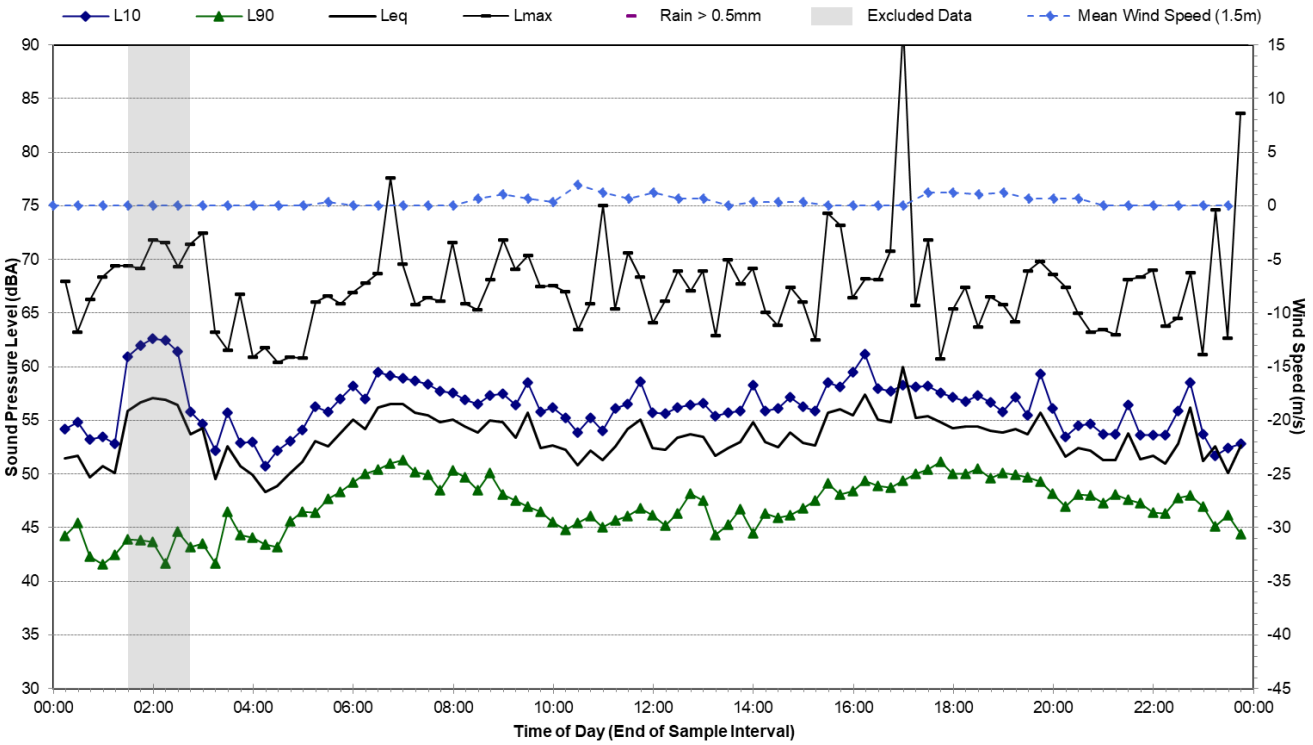
Statistical Ambient Noise Levels

L02 - 47 Hampton Crescent - Monday, 16 May 2022



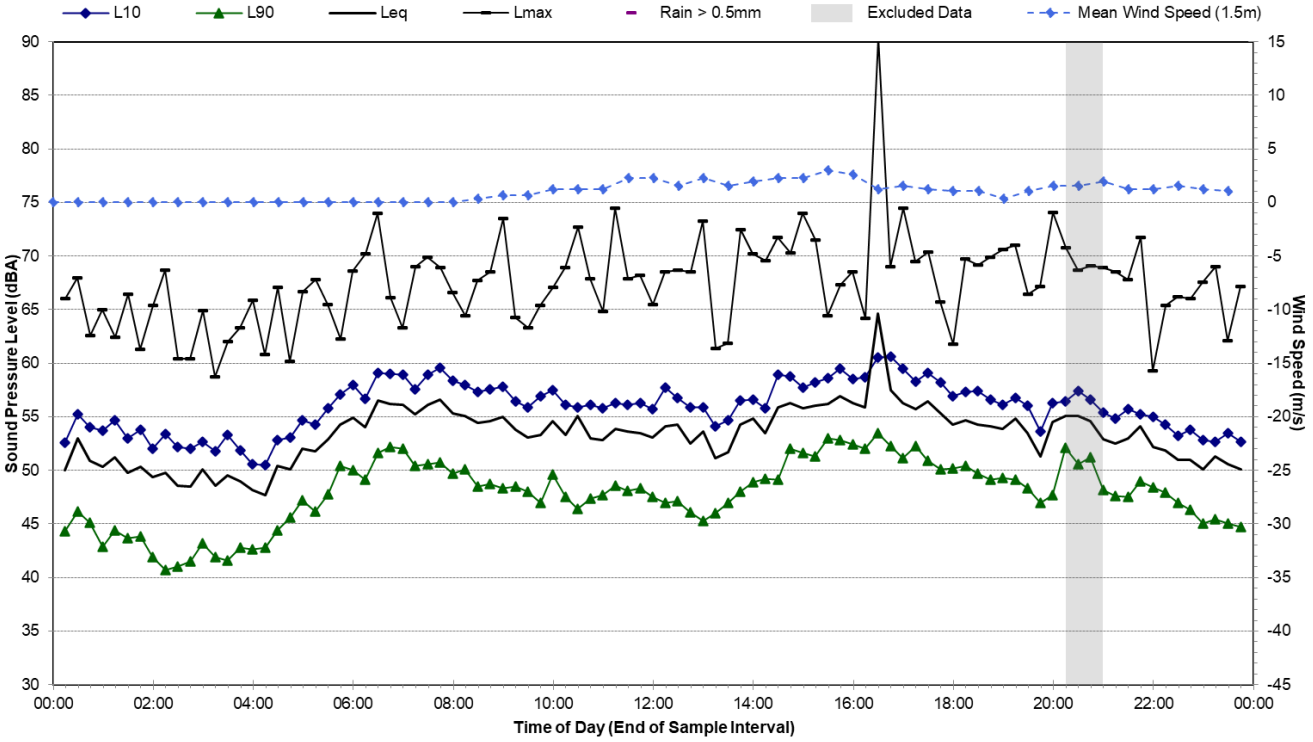
Statistical Ambient Noise Levels

L02 - 47 Hampton Crescent - Tuesday, 17 May 2022



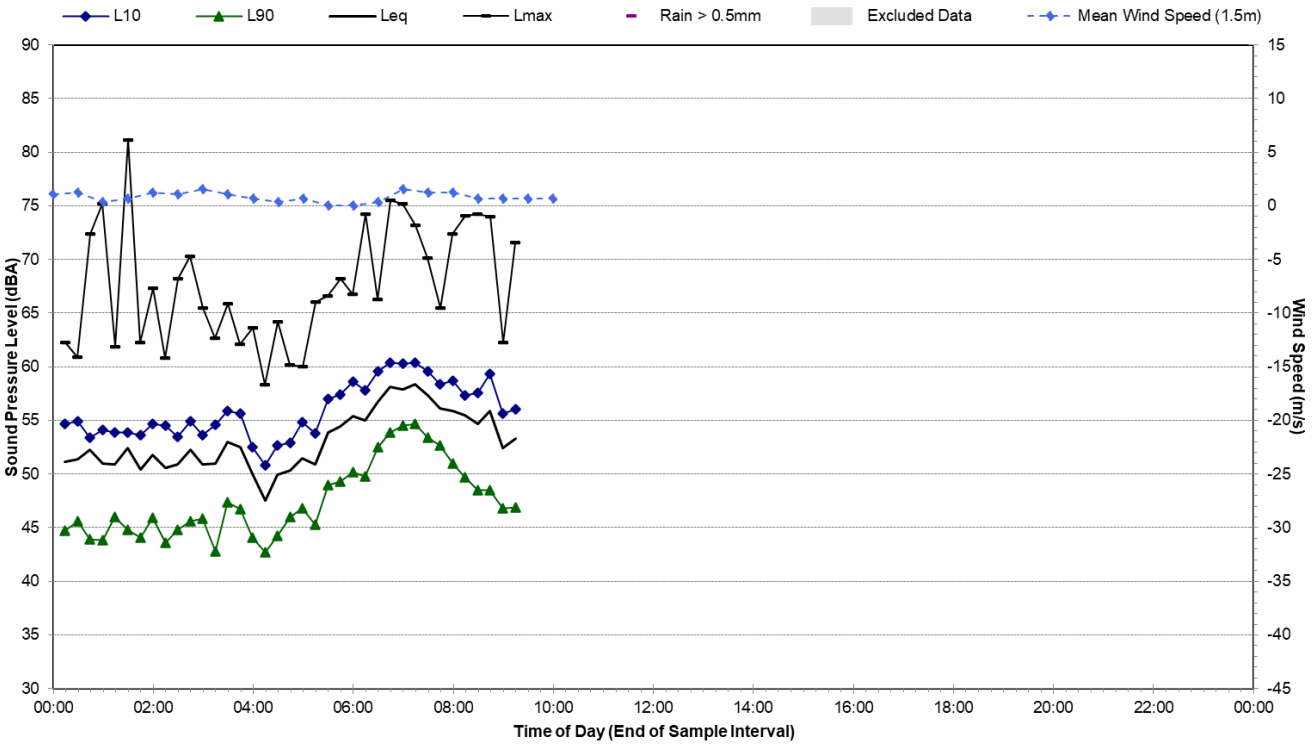
Statistical Ambient Noise Levels

L02 - 47 Hampton Crescent - Wednesday, 18 May 2022



Statistical Ambient Noise Levels

L02 - 47 Hampton Crescent - Thursday, 19 May 2022



Noise Monitoring Location	L03
Noise Monitoring Address	**10 Yallock Place, Prospect**

Logger Device Type: Brüel and Kjær 2250L, Logger Serial No: 3004636

Sound Level Meter Device Type: Brüel and Kjær 2250L, Sound Level Meter Serial No: 3005904

Ambient noise logger deployed at residential address 10 Yallock Pl, Prospect. Logger located with view of the M4 Western Motorway to the north and Reservoir Road to the south.

Attended noise measurements indicate the ambient noise environment at this location is dominated by road traffic noise from the M4 Western Motorway to the north. Road traffic noise from Reservoir Rd to the south and industrial operations to the north also contributes to the LAeq at this location.

Recorded Noise Levels (LAmax):
04/05/2022: Light-vehicle traffic M4 Motorway: 55-61 dBA, Heavy-vehicle traffic M4 Motorway: 60-67 dBA, Traffic Reservoir Rd: 58-62 dBA, Industry: 58-65 dBA

Map of Noise Monitoring Location

Ambient Noise Logging Results – ICNG Defined Time Periods

Monitoring Period	Noise Level (dBA)			
	RBL	LAeq	L10	L1
Daytime	55	59	60	63
Evening	55	59	60	62
Night-time	48	57	58	60

Ambient Noise Logging Results – RNP Defined Time Periods

Monitoring Period	Noise Level (dBA)	
	LAeq(period)	LAeq(1hour)
Daytime (7am-10pm)	59	60
Night-time (10pm-7am)	57	60

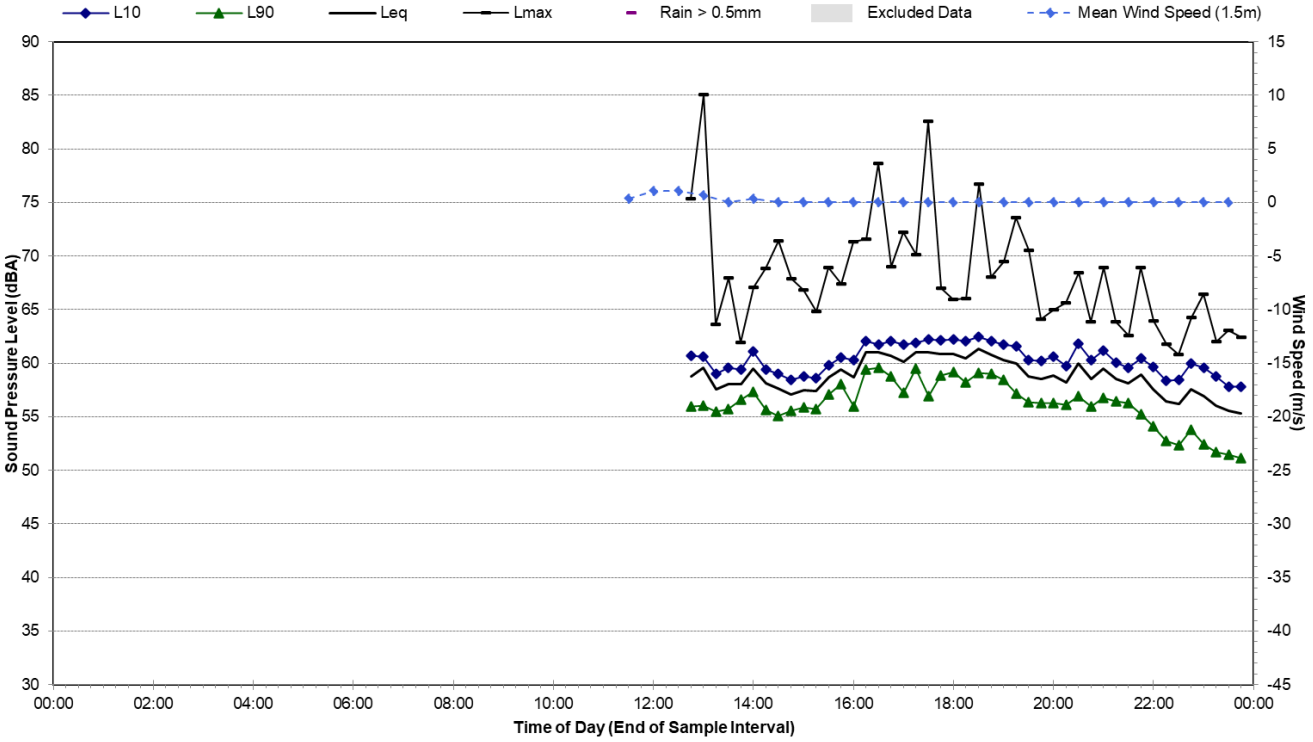
Attended Noise Measurement Results

Date	Start Time	Measured Noise Level (dBA)		
		LA90	LAeq	LAmax
19/05/2022	12:31	57	60	66

Photo of Noise Monitoring Location

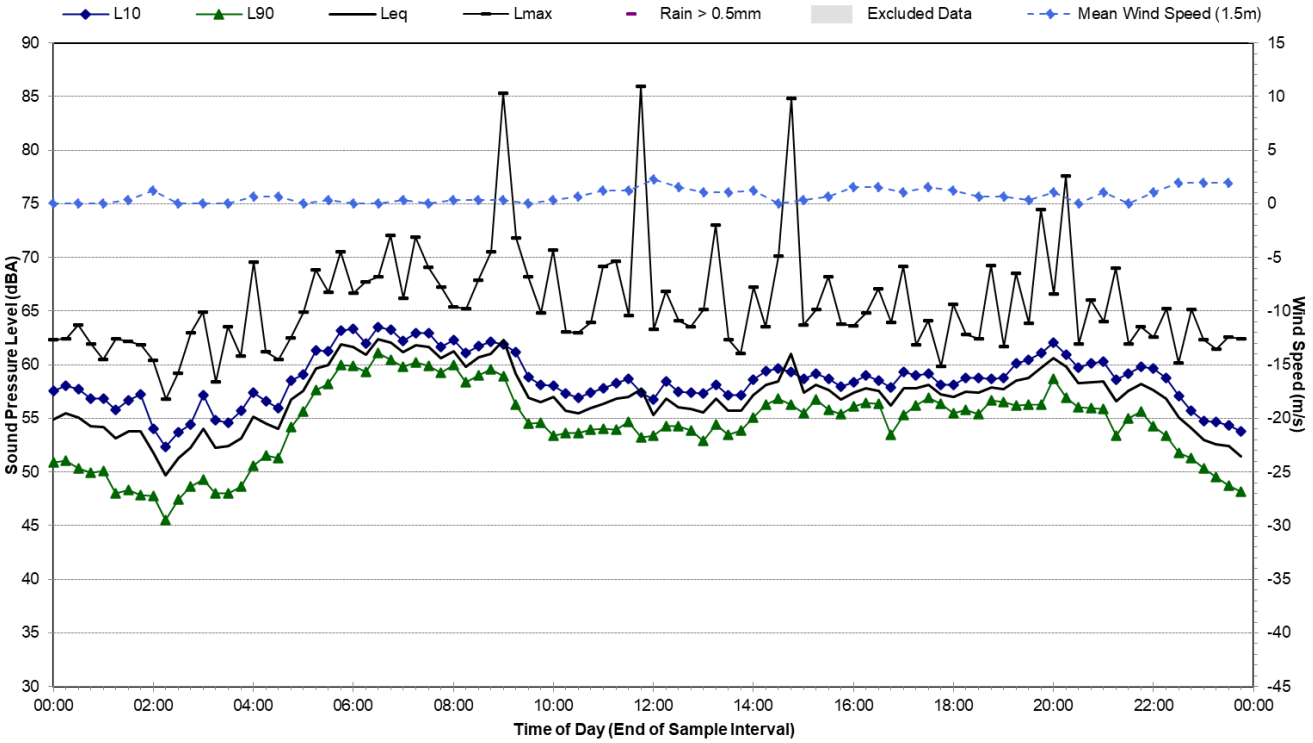
Statistical Ambient Noise Levels

L03 - 10 Yallock Place - Wednesday, 4 May 2022



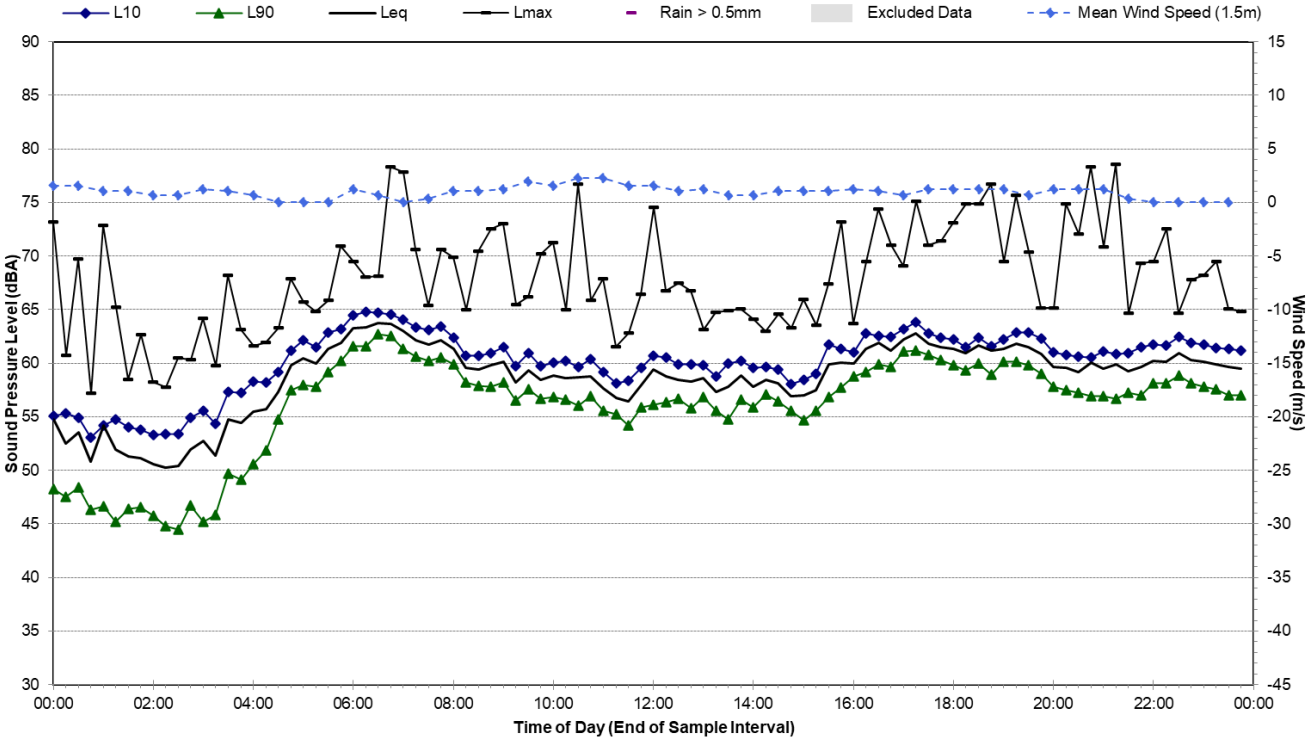
Statistical Ambient Noise Levels

L03 - 10 Yallock Place - Thursday, 5 May 2022



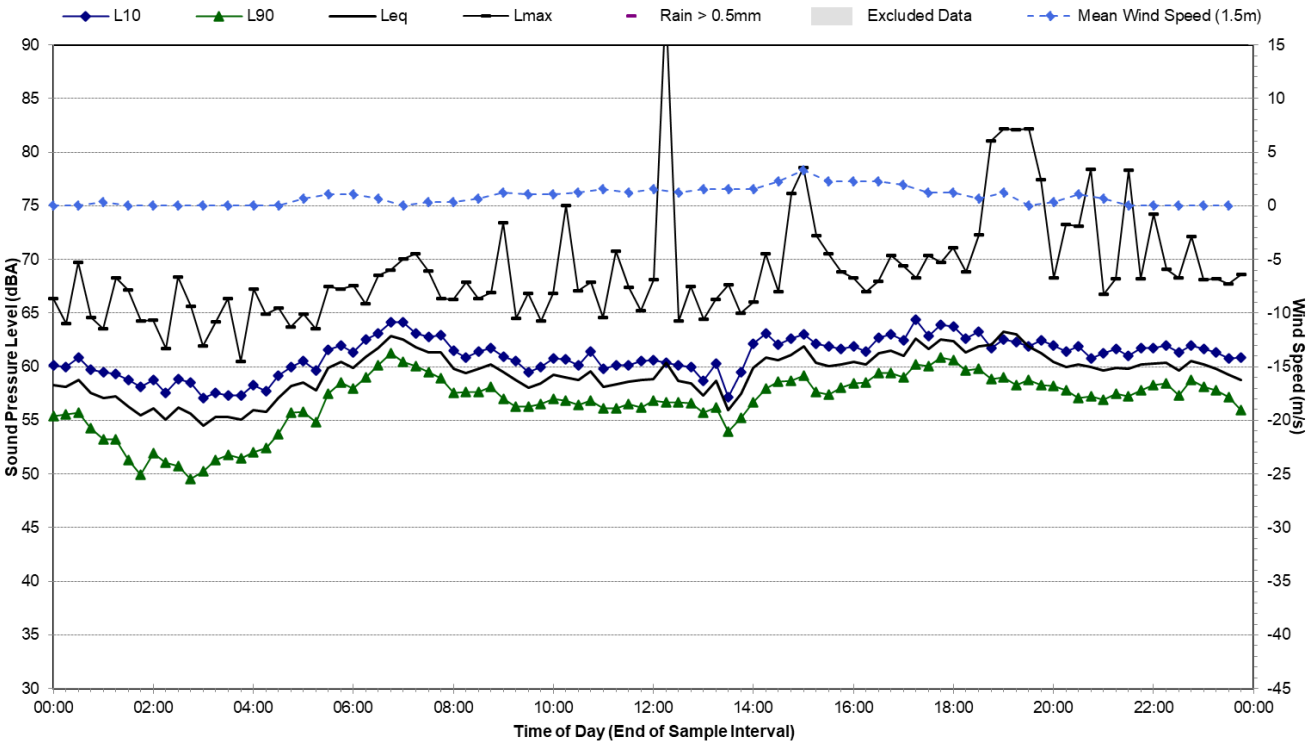
Statistical Ambient Noise Levels

L03 - 10 Yallock Place - Friday, 6 May 2022



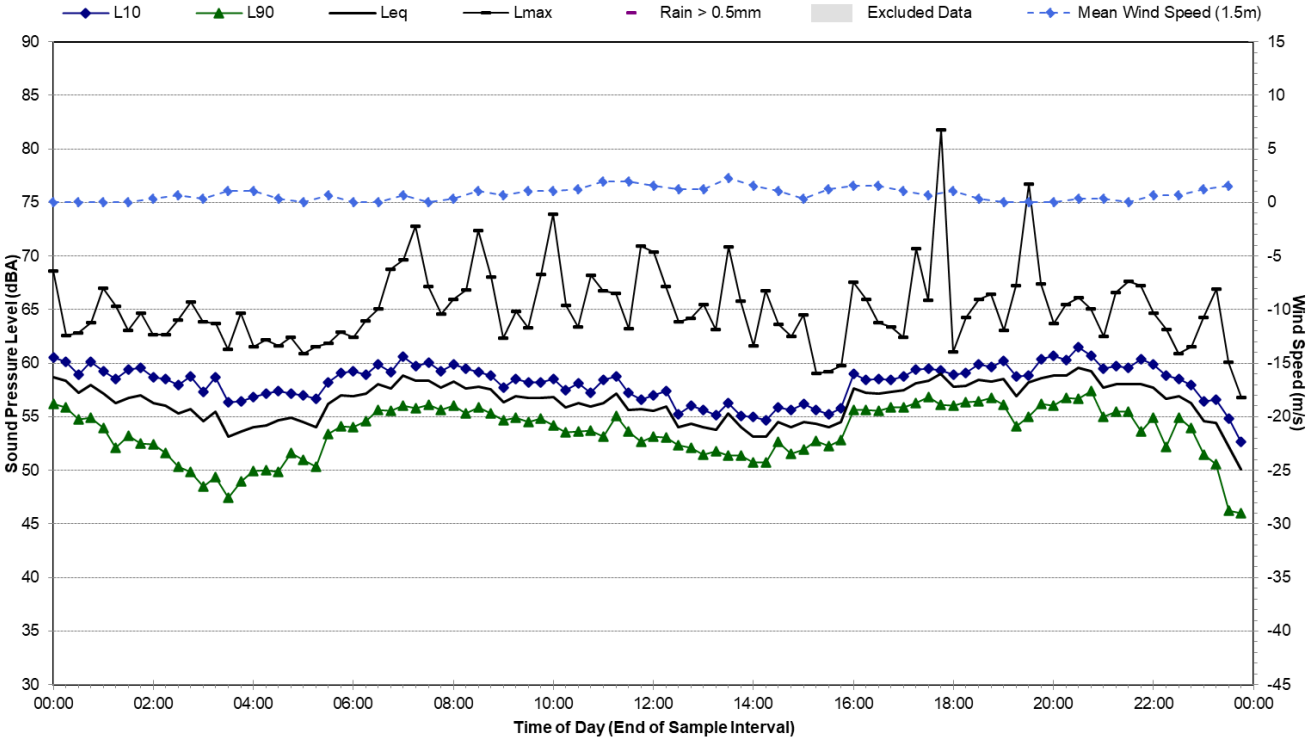
Statistical Ambient Noise Levels

L03 - 10 Yallock Place - Saturday, 7 May 2022



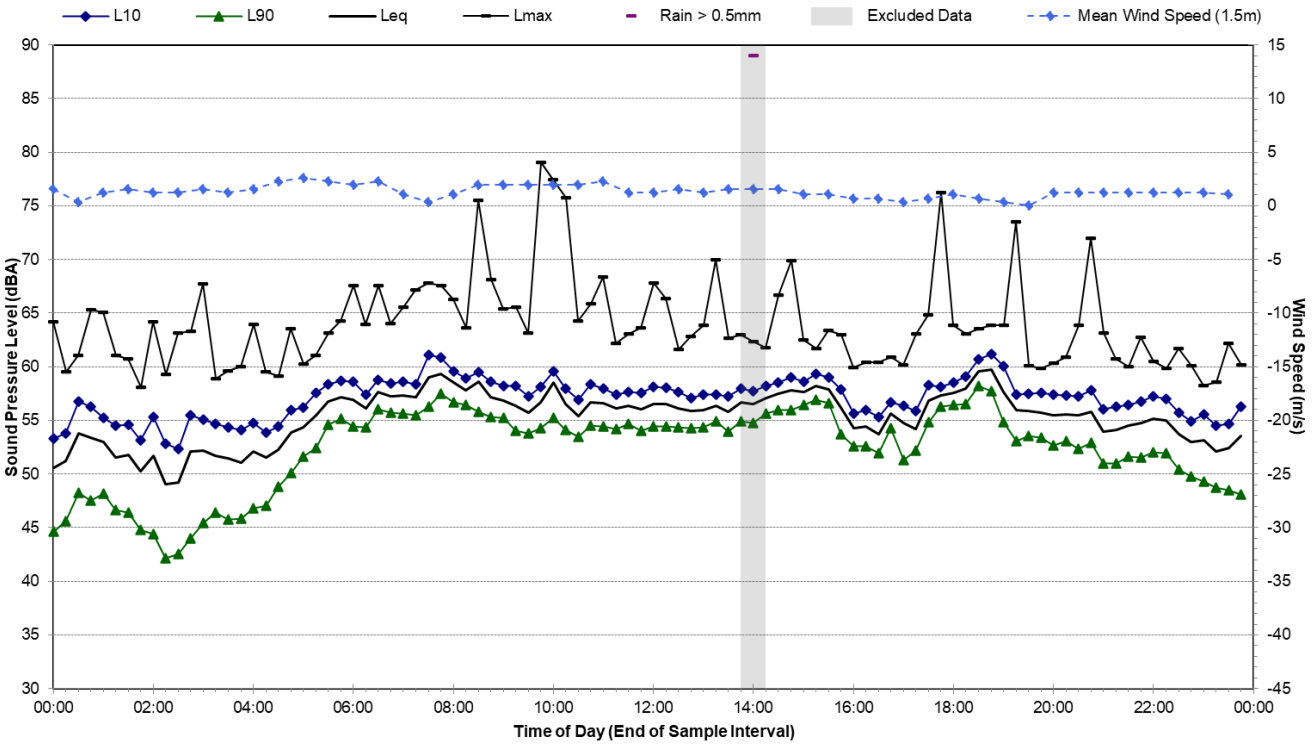
Statistical Ambient Noise Levels

L03 - 10 Yallock Place - Sunday, 8 May 2022



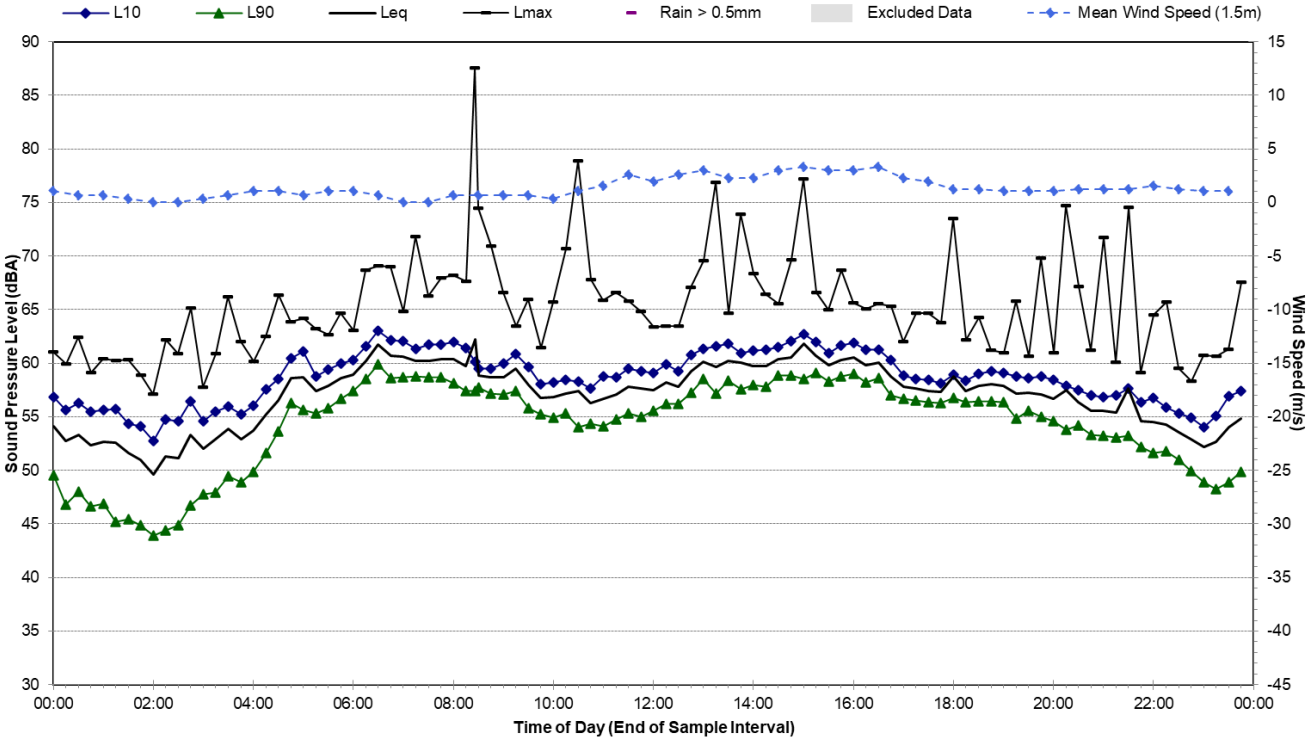
Statistical Ambient Noise Levels

L03 - 10 Yallock Place - Monday, 9 May 2022



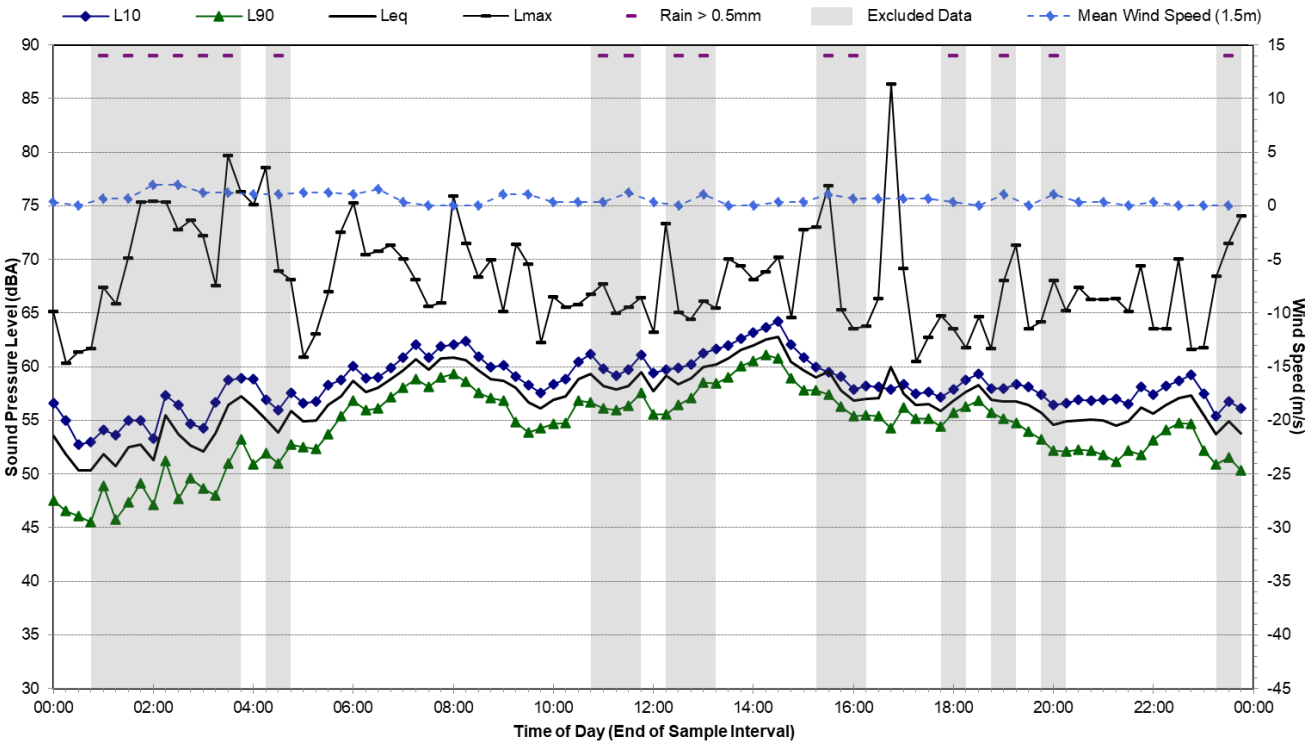
Statistical Ambient Noise Levels

L03 - 10 Yallock Place - Tuesday, 10 May 2022



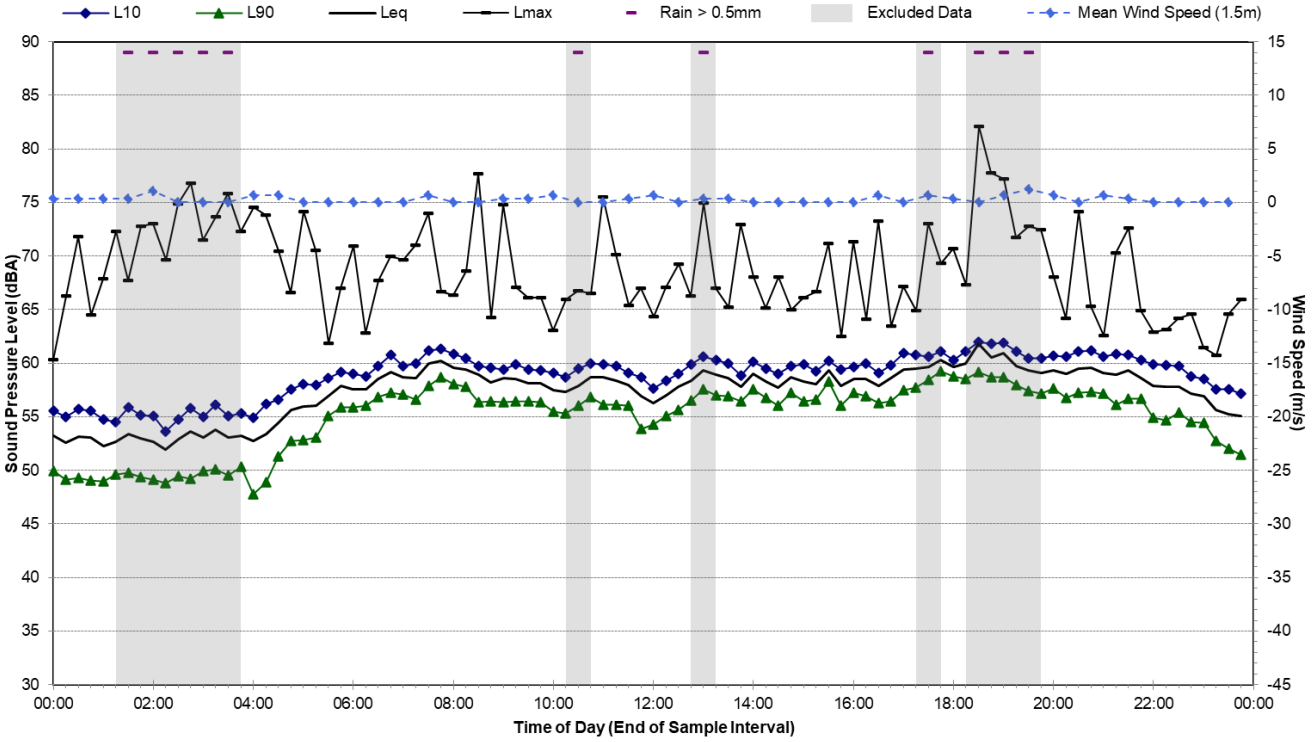
Statistical Ambient Noise Levels

L03 - 10 Yallock Place - Wednesday, 11 May 2022



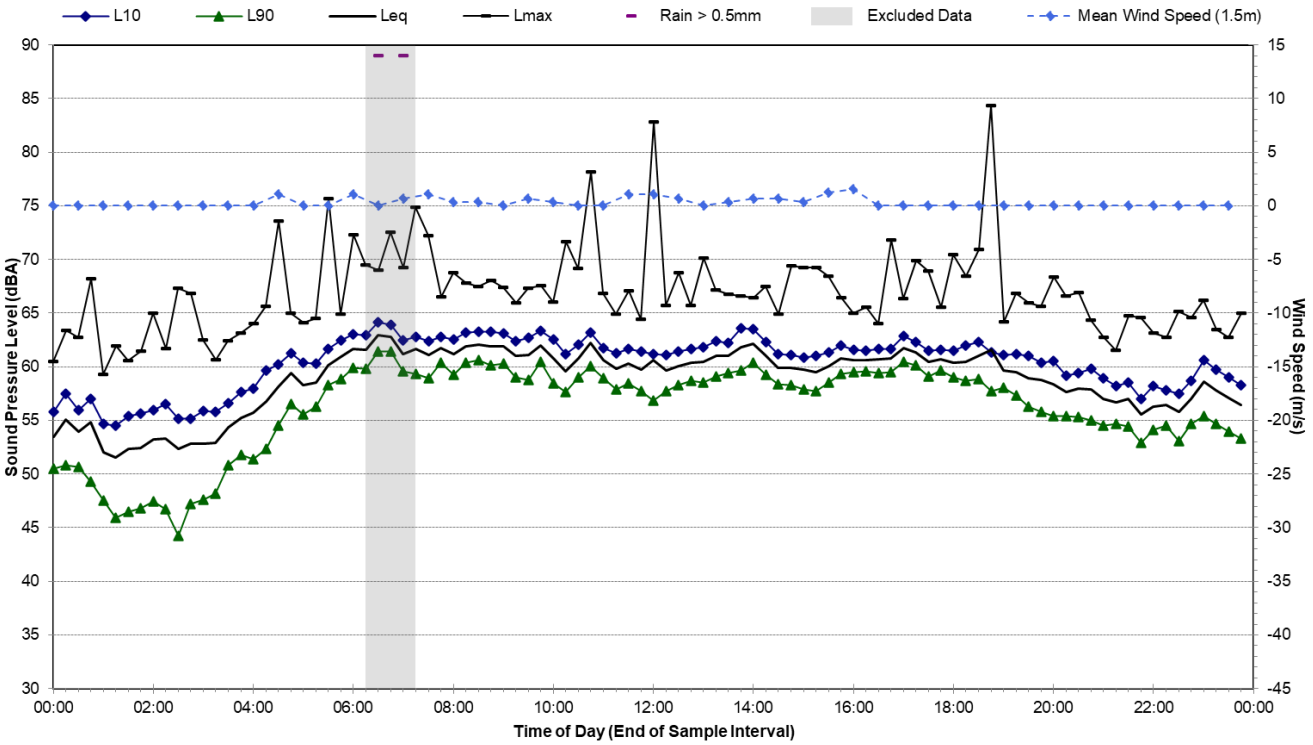
Statistical Ambient Noise Levels

L03 - 10 Yallock Place - Thursday, 12 May 2022



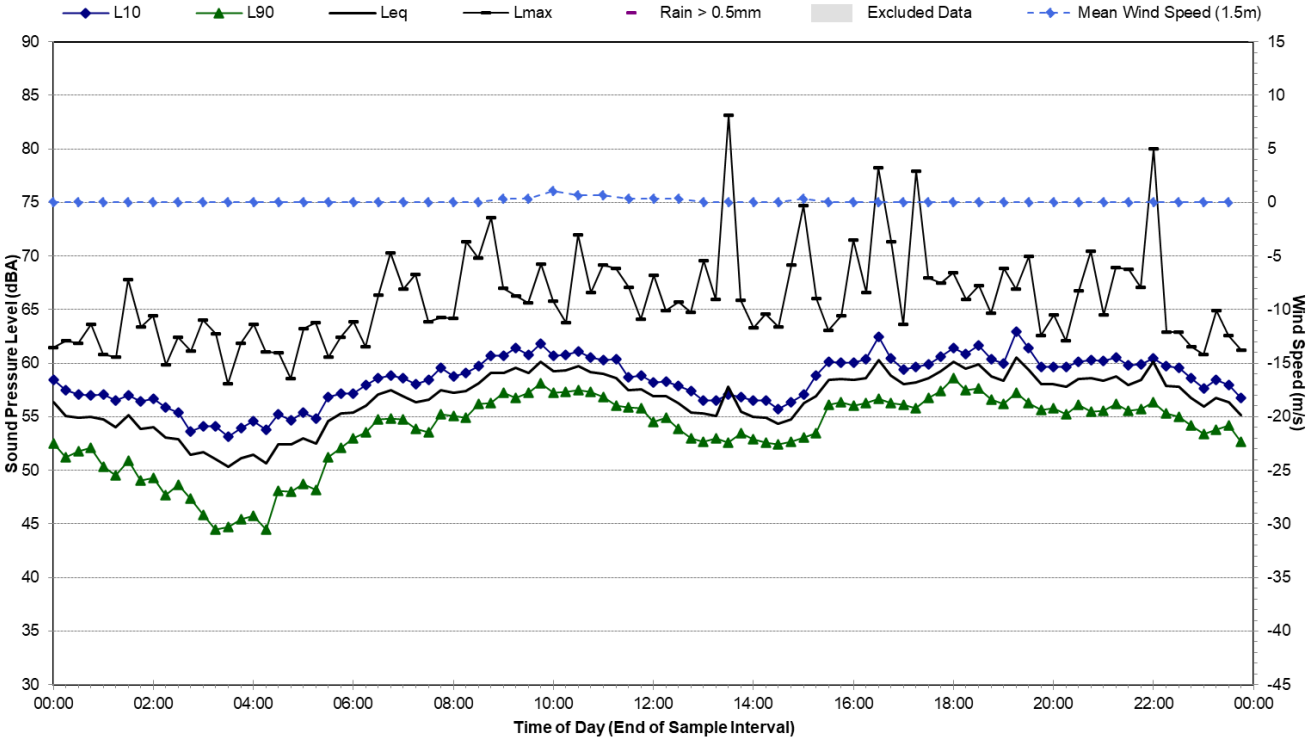
Statistical Ambient Noise Levels

L03 - 10 Yallock Place - Friday, 13 May 2022



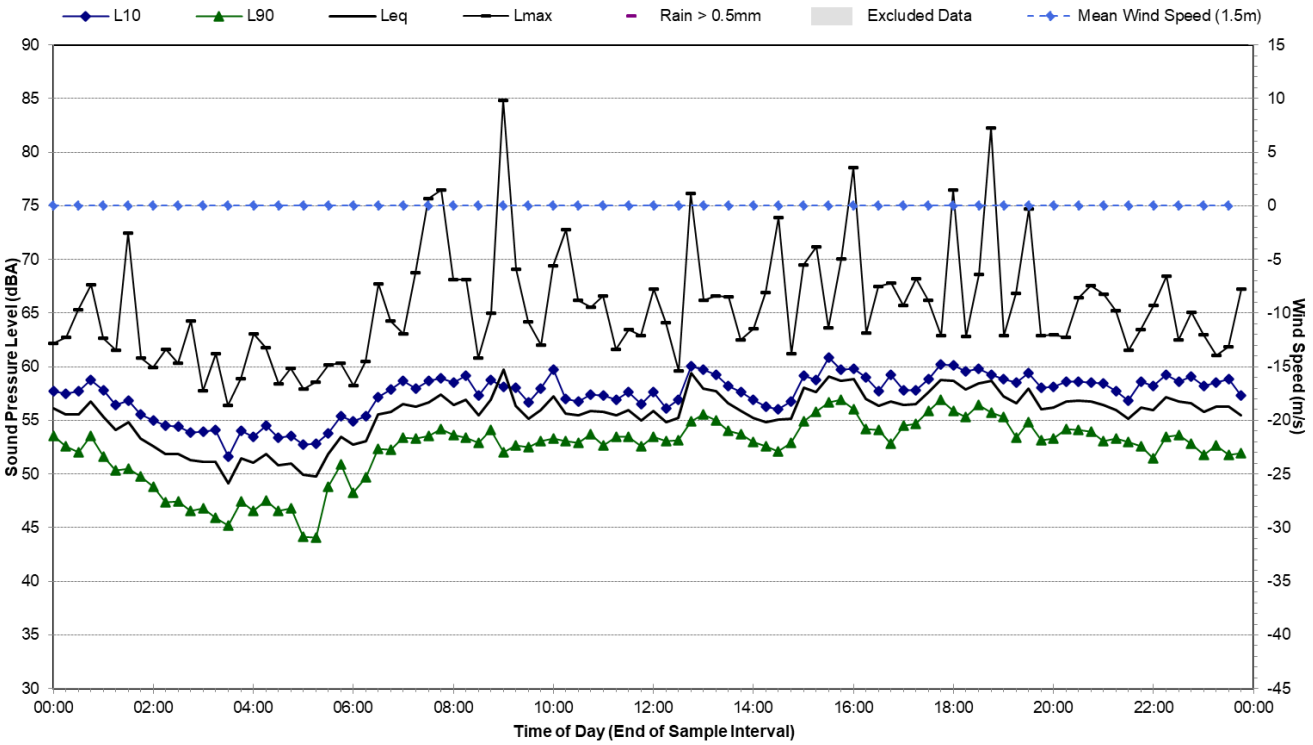
Statistical Ambient Noise Levels

L03 - 10 Yallock Place - Saturday, 14 May 2022



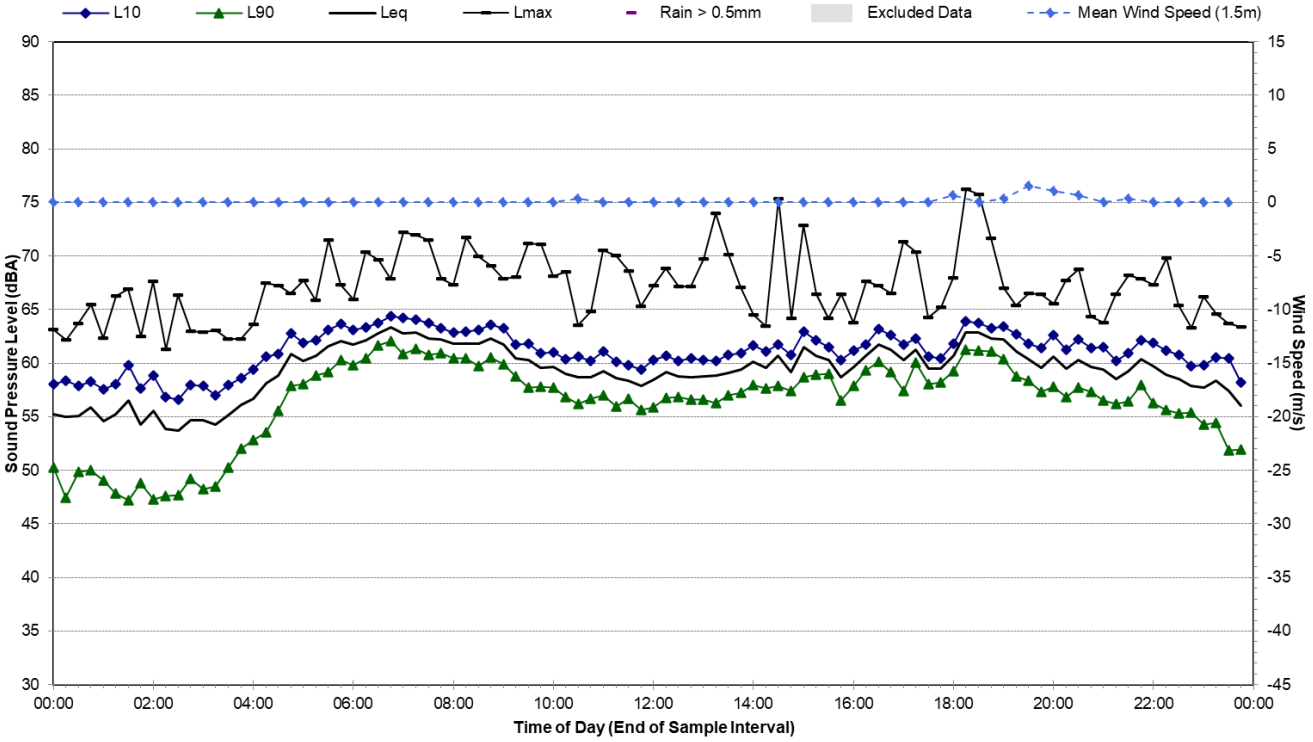
Statistical Ambient Noise Levels

L03 - 10 Yallock Place - Sunday, 15 May 2022



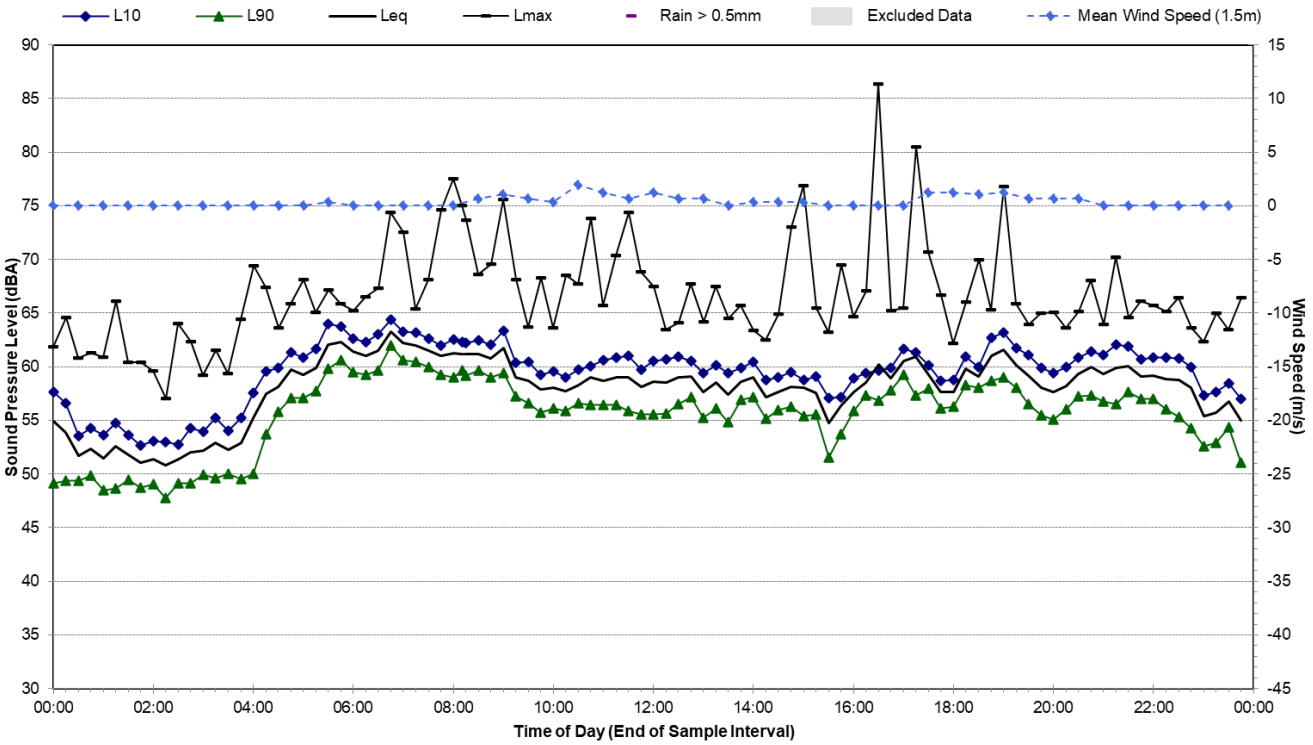
Statistical Ambient Noise Levels

L03 - 10 Yallock Place - Monday, 16 May 2022



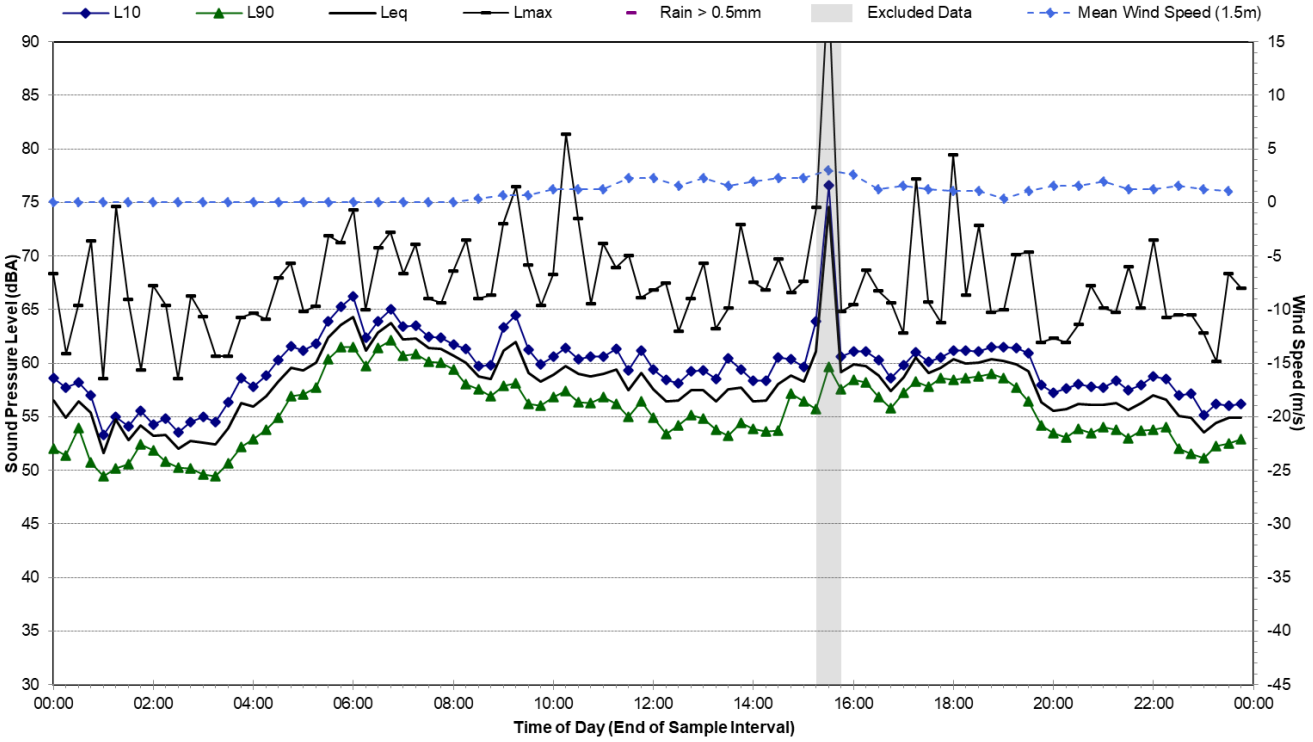
Statistical Ambient Noise Levels

L03 - 10 Yallock Place - Tuesday, 17 May 2022



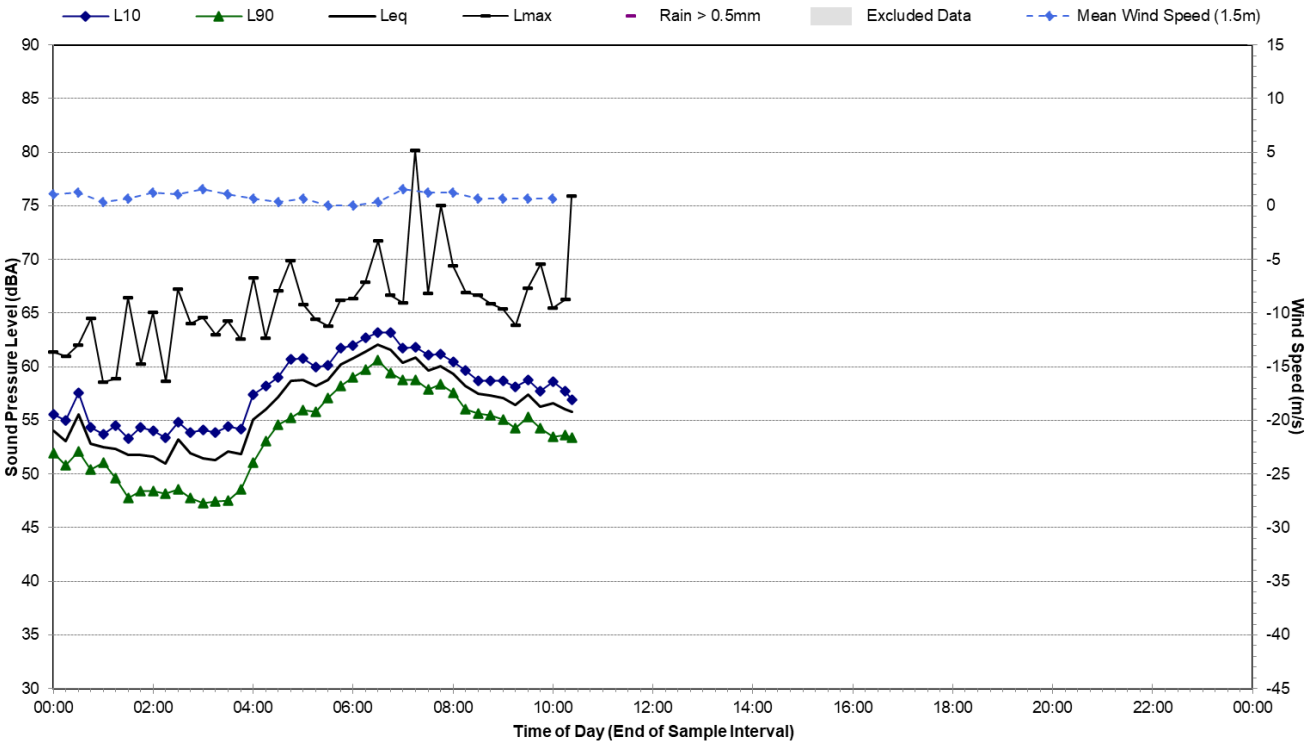
Statistical Ambient Noise Levels

L03 - 10 Yallock Place - Wednesday, 18 May 2022



Statistical Ambient Noise Levels

L03 - 10 Yallock Place - Thursday, 19 May 2022



Noise Monitoring Location	L04
Noise Monitoring Address	**Watch House Road, Prospect**

Logger Device Type: Svantek 957, Logger Serial No: 23244

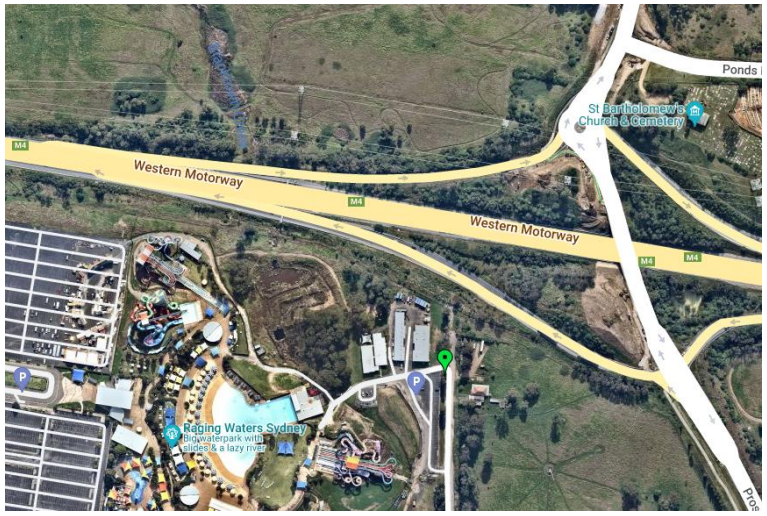
Sound Level Meter Device Type: Brüel and Kjær 2250L, Sound Level Meter Serial No: 3005904

Ambient noise logger deployed opposite residential address 24 Watch House Road, Prospect. Logger located with view of the M4 Western Motorway to the north, Watch House Road to the east and Reservoir Road to the south.

Attended noise measurements indicate the ambient noise environment at this location is dominated by road traffic noise from the M4 Western Motorway to the north. Road traffic noise from Reservoir Rd to the south and industrial operations from Raging Waters to the west also contributes to the LAeq at this location.

Recorded Noise Levels (LAmax):
19/05/2022: Light-vehicle traffic M4 Motorway: 51-52 dBA, Heavy-vehicle traffic M4 Motorway: 52-68 dBA, Traffic Watch House Rd: 54-59 dBA, Raging Waters Industry: 52-58 dBA, Aircraft 55-58 dBA

Map of Noise Monitoring Location



Ambient Noise Logging Results – ICNG Defined Time Periods

Monitoring Period	Noise Level (dBA)			
	RBL	LAeq	L10	L1
Daytime	49	55	55	61
Evening	49	54	54	58
Night-time	45	52	52	54

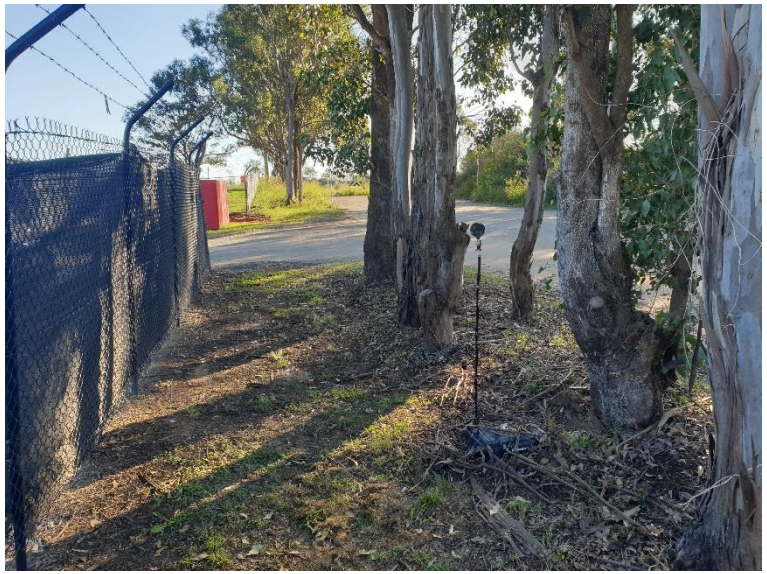
Ambient Noise Logging Results – RNP Defined Time Periods

Monitoring Period	Noise Level (dBA)	
	LAeq(period)	LAeq(1hour)
Daytime (7am-10pm)	56	58
Night-time (10pm-7am)	53	55

Attended Noise Measurement Results

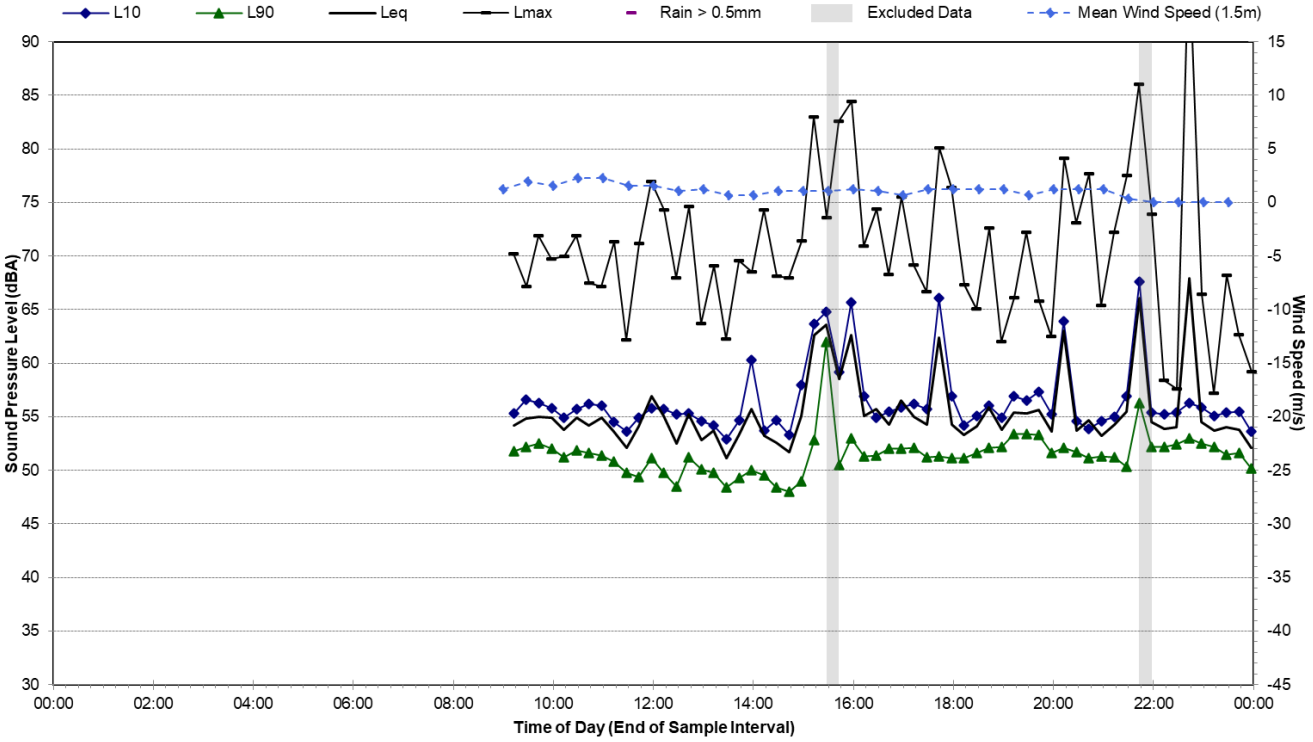
Date	Start Time	Measured Noise Level (dBA)		
		LA90	LAeq	LAmax
19/05/2022	10:40	50	53	68

Photo of Noise Monitoring Location



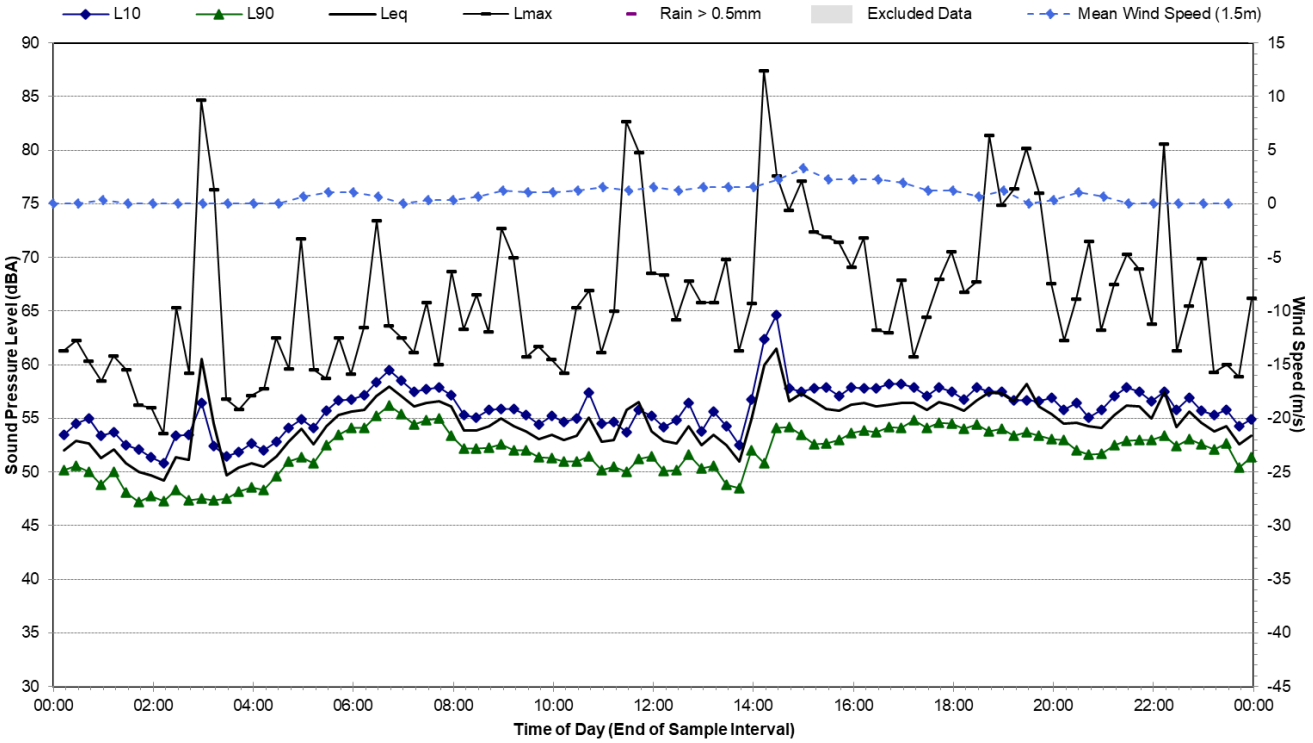
Statistical Ambient Noise Levels

L04 - Watch House Road - Friday, 6 May 2022



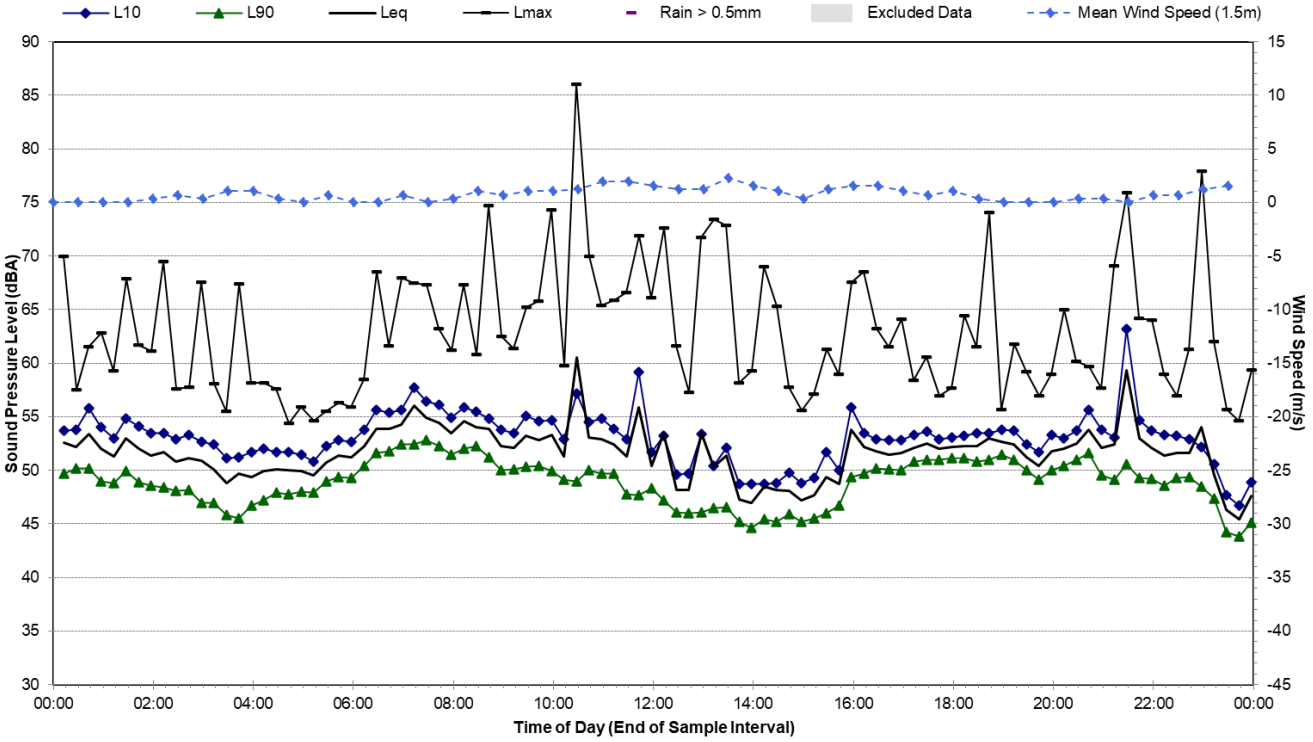
Statistical Ambient Noise Levels

L04 - Watch House Road - Saturday, 7 May 2022



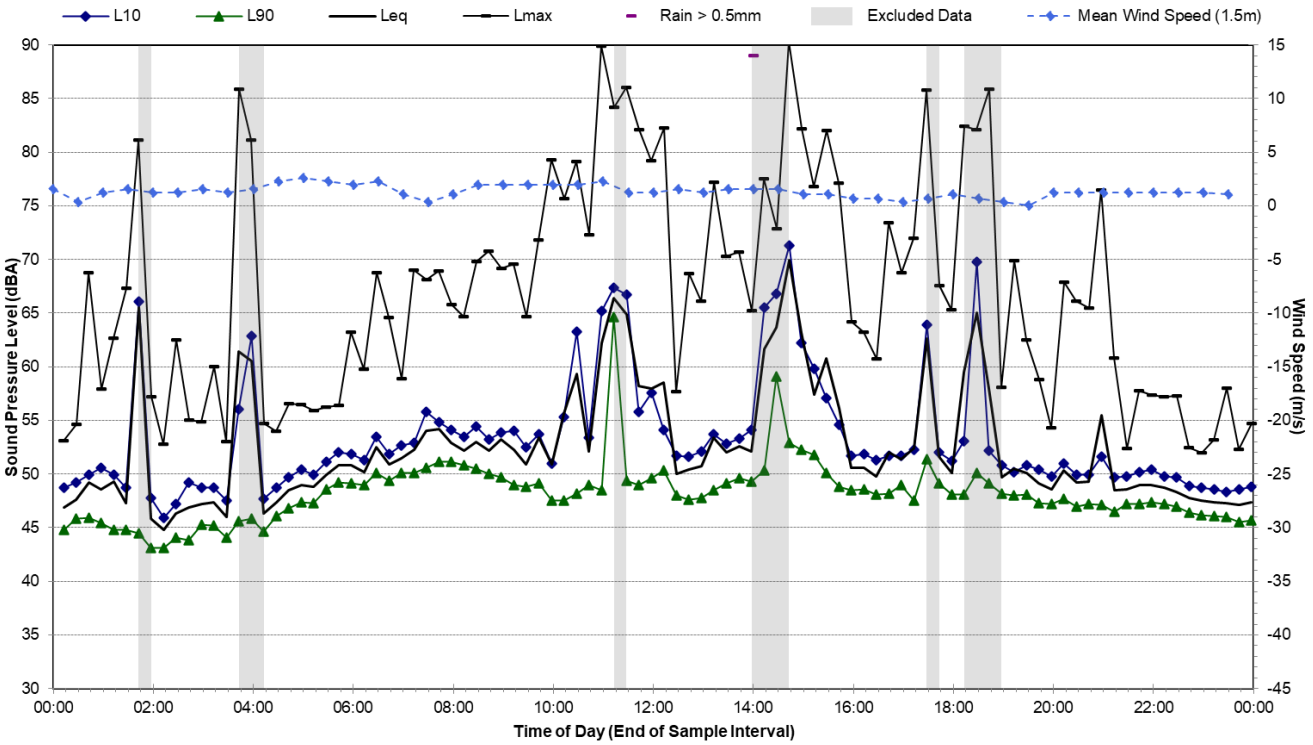
Statistical Ambient Noise Levels

L04 - Watch House Road - Sunday, 8 May 2022



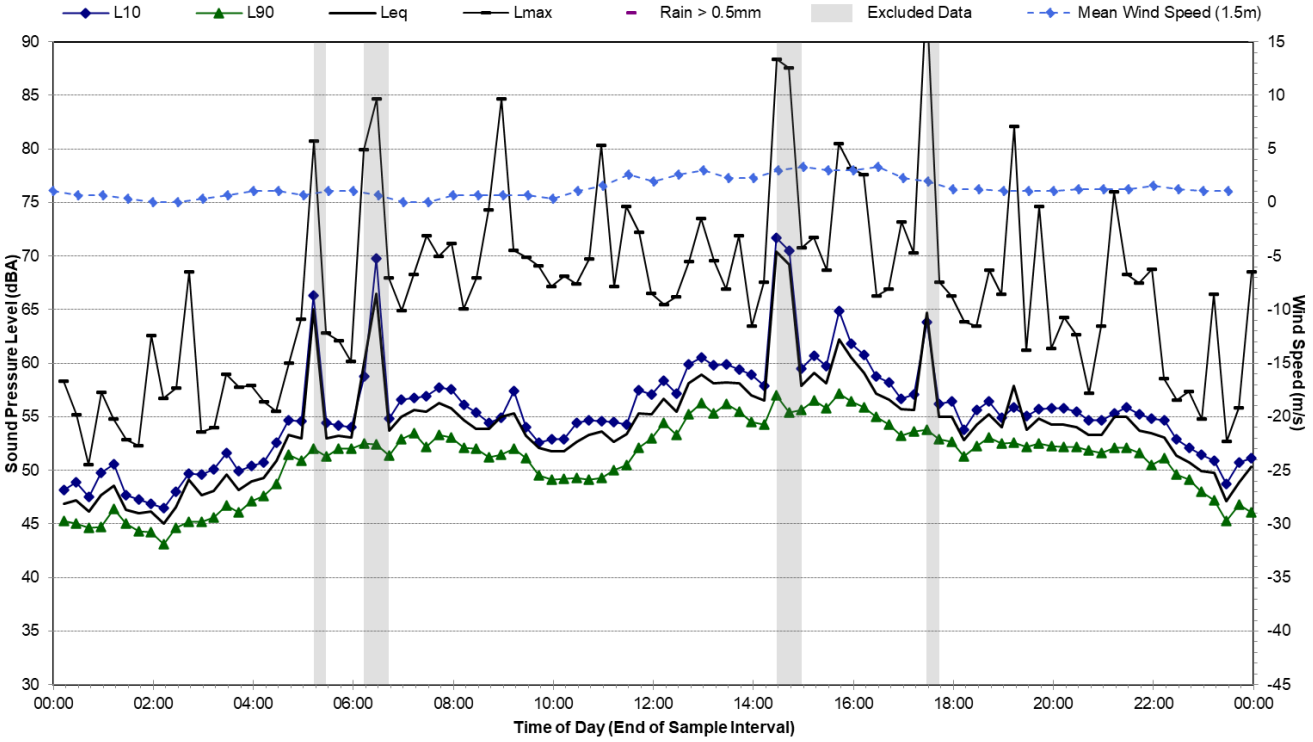
Statistical Ambient Noise Levels

L04 - Watch House Road - Monday, 9 May 2022



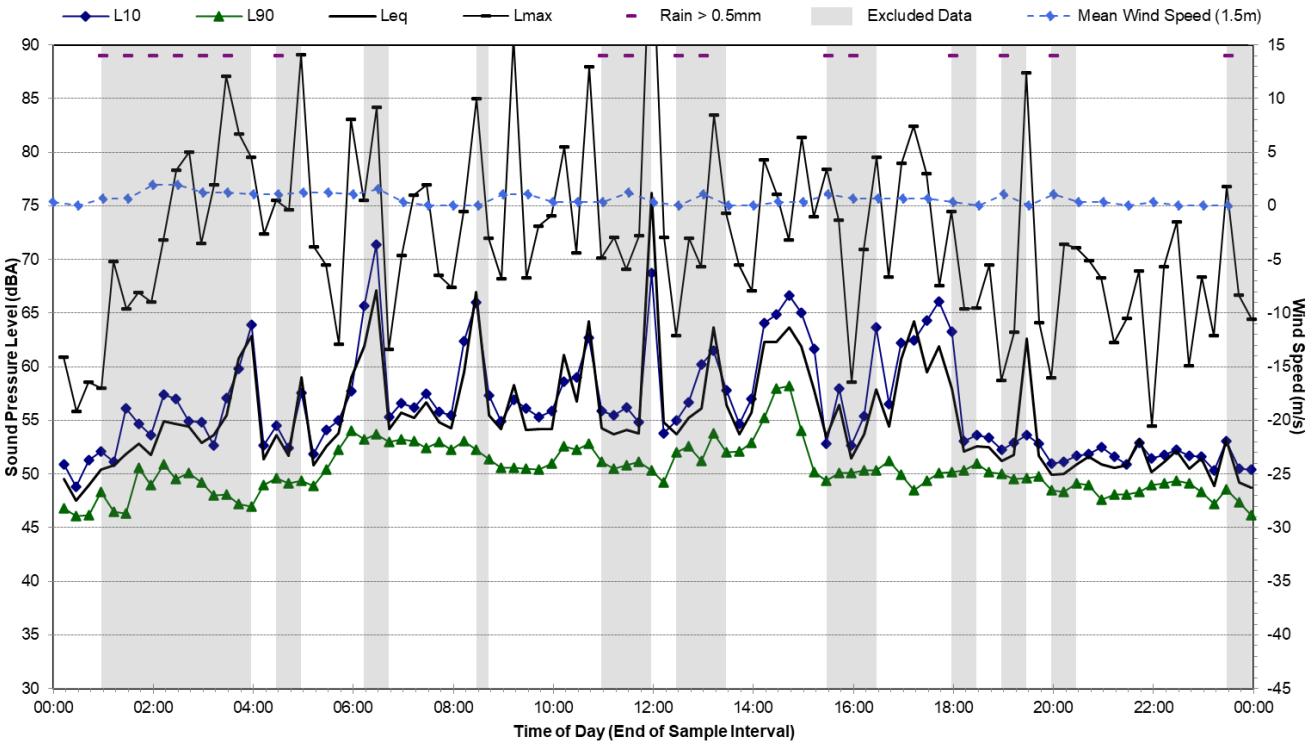
Statistical Ambient Noise Levels

L04 - Watch House Road - Tuesday, 10 May 2022



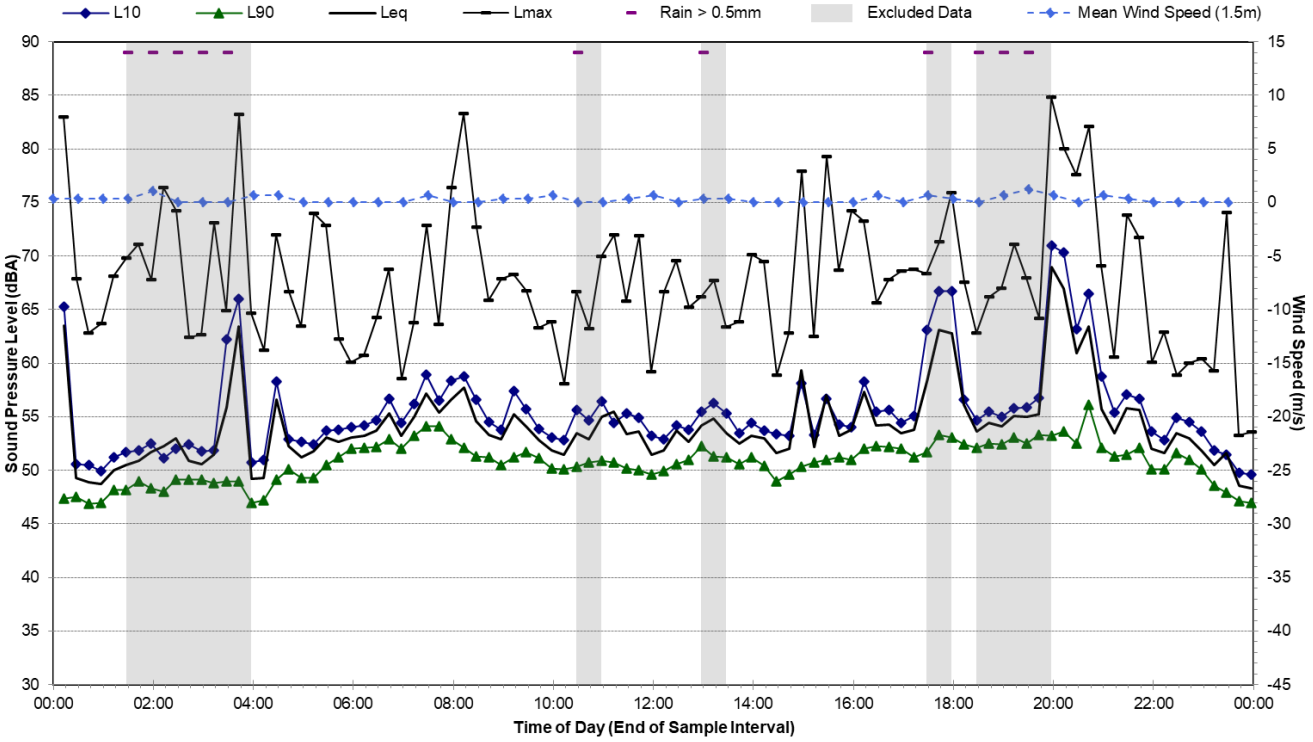
Statistical Ambient Noise Levels

L04 - Watch House Road - Wednesday, 11 May 2022



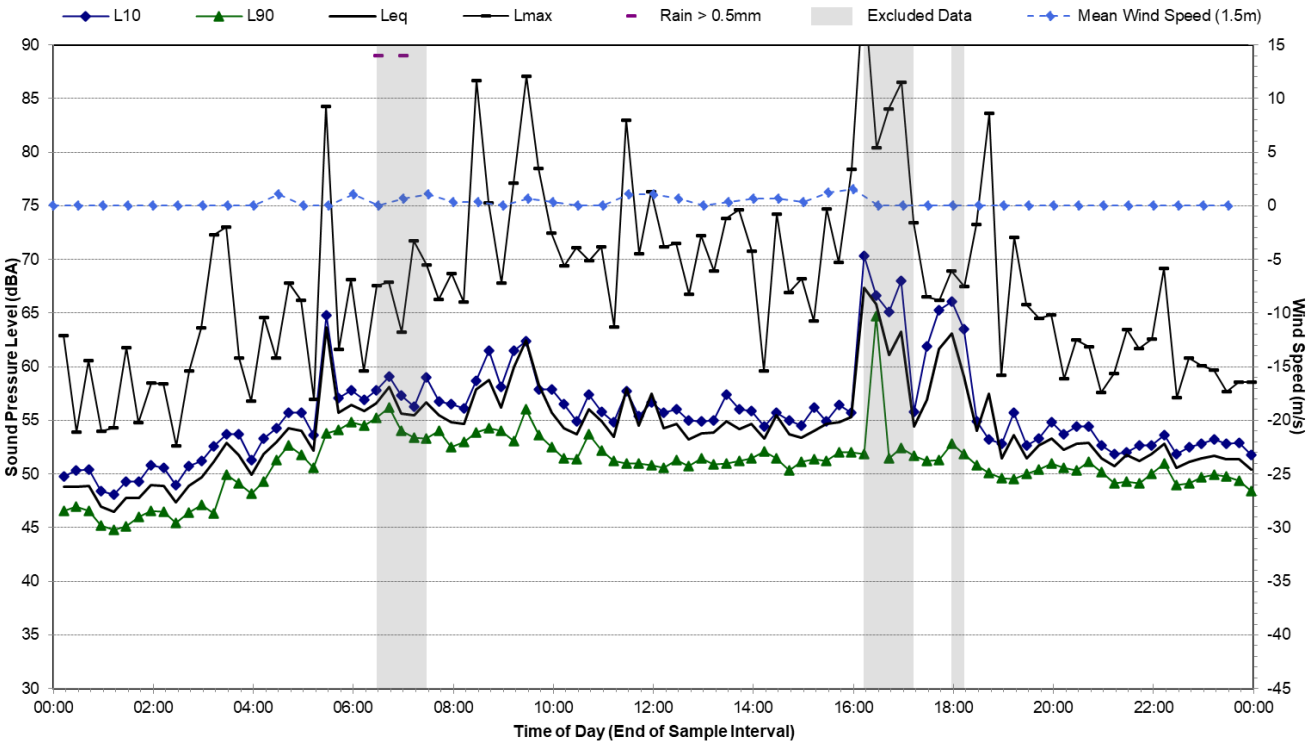
Statistical Ambient Noise Levels

L04 - Watch House Road - Thursday, 12 May 2022



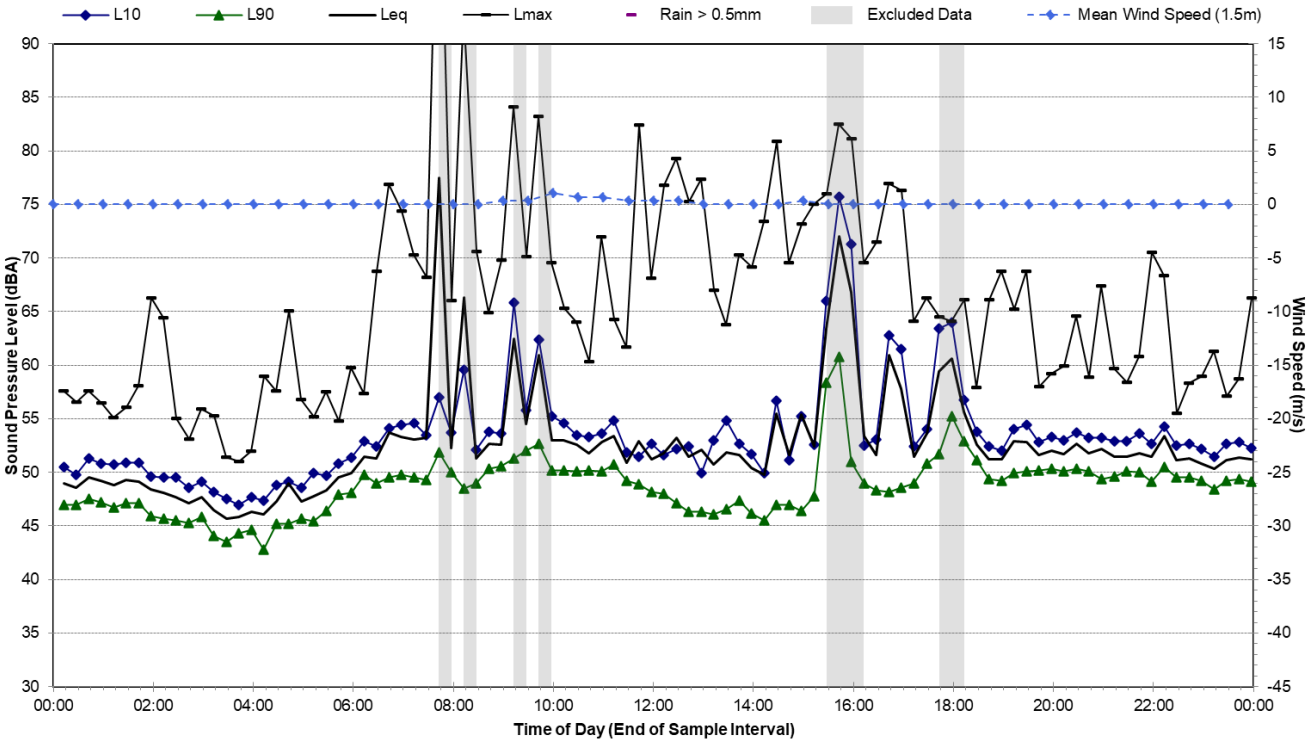
Statistical Ambient Noise Levels

L04 - Watch House Road - Friday, 13 May 2022



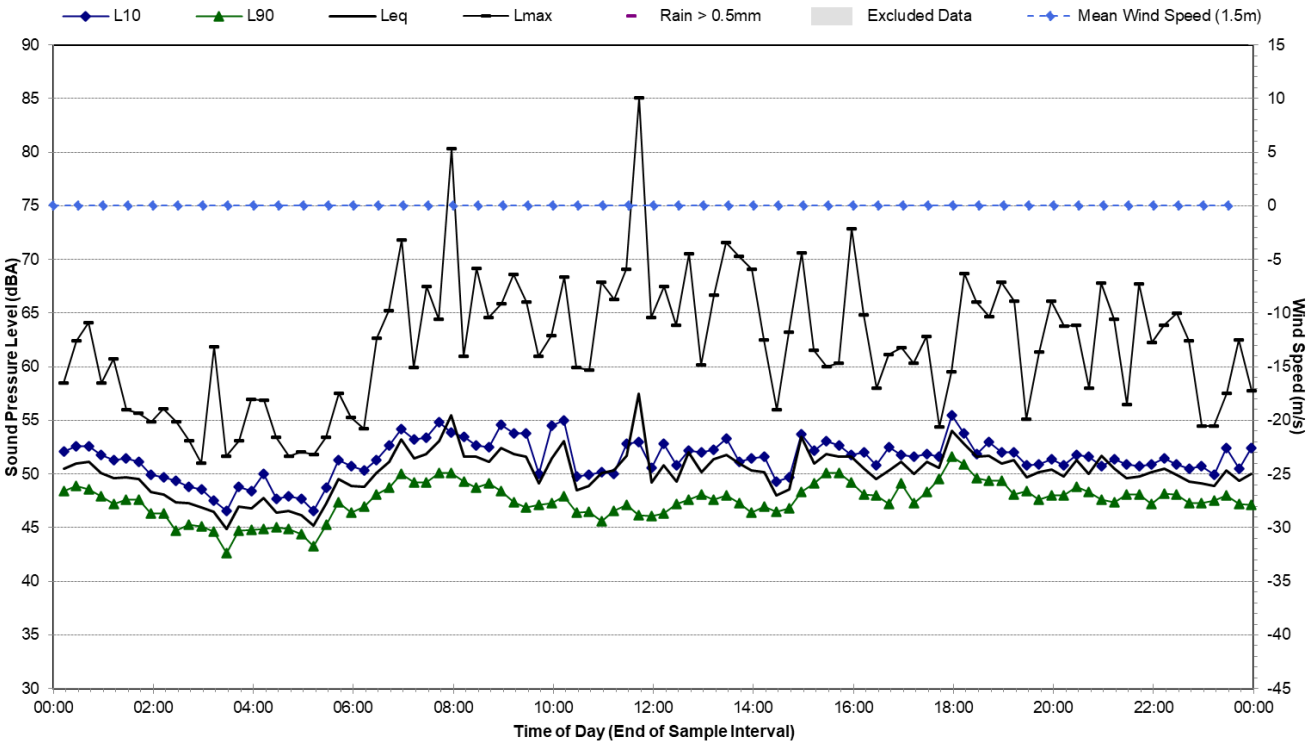
Statistical Ambient Noise Levels

L04 - Watch House Road - Saturday, 14 May 2022



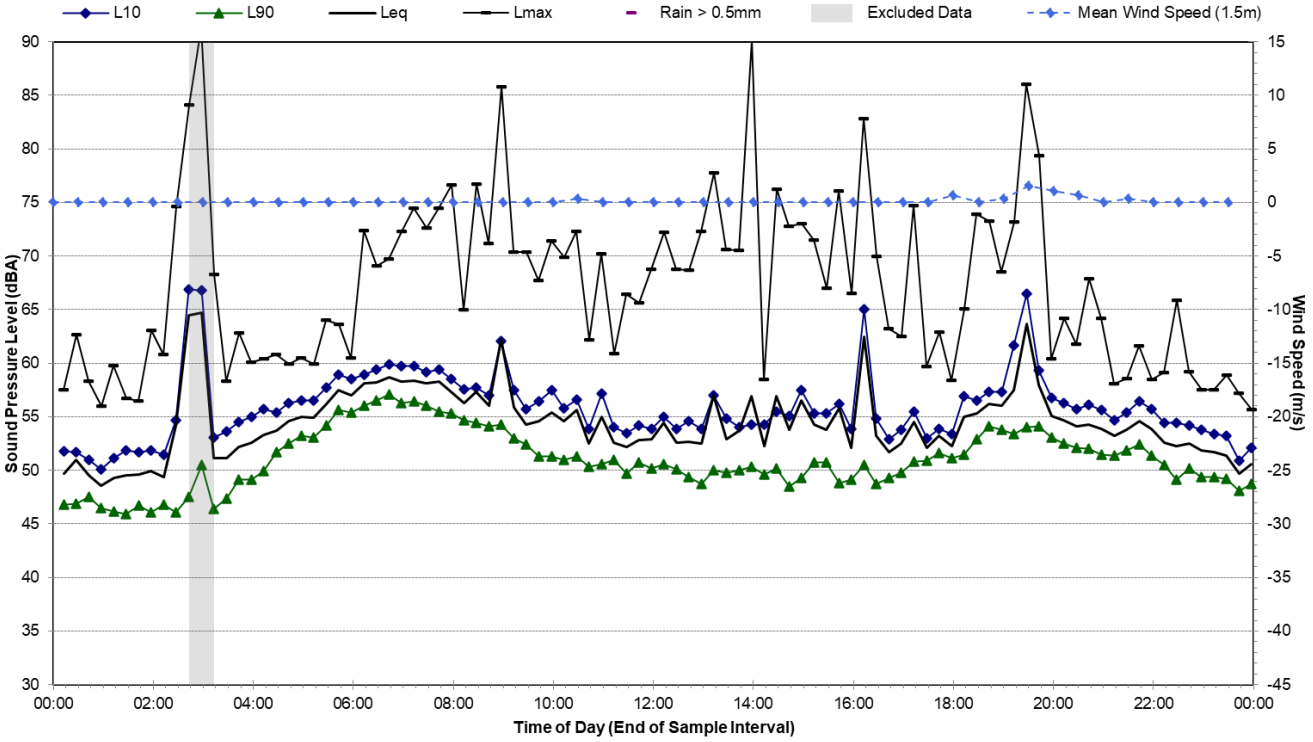
Statistical Ambient Noise Levels

L04 - Watch House Road - Sunday, 15 May 2022



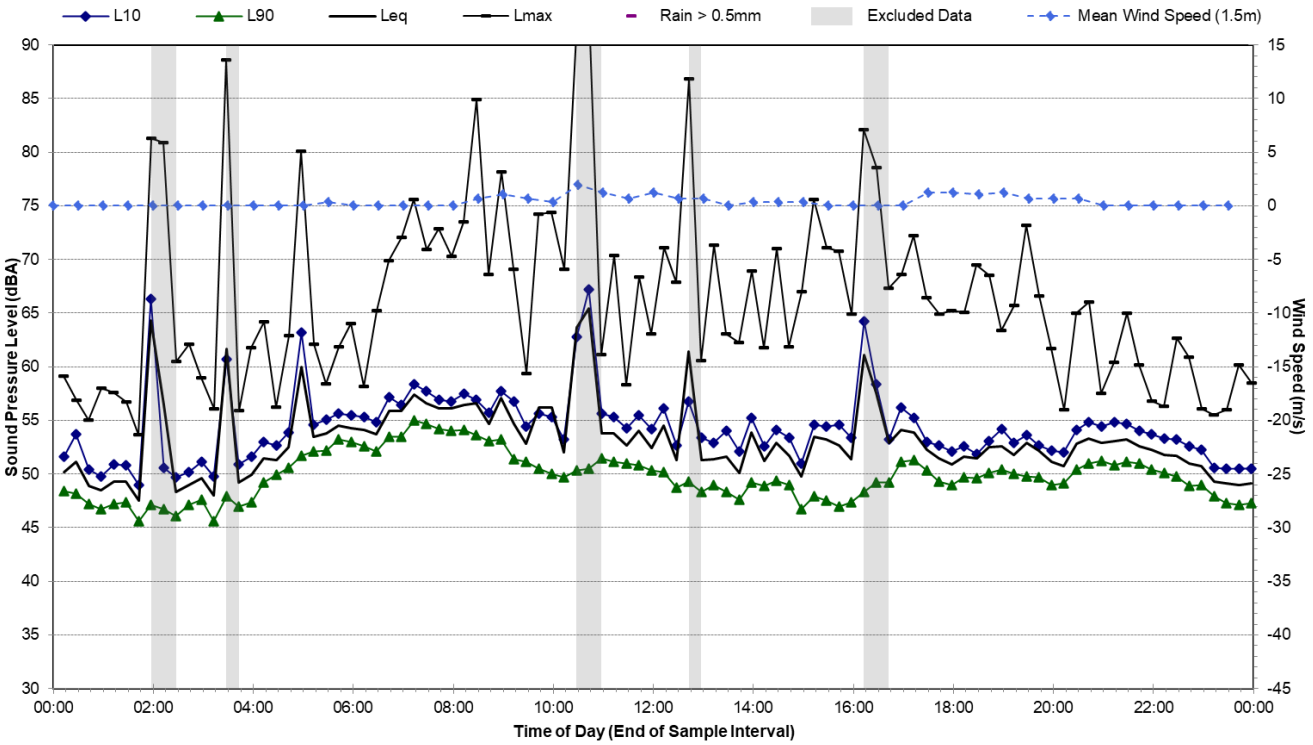
Statistical Ambient Noise Levels

L04 - Watch House Road - Monday, 16 May 2022



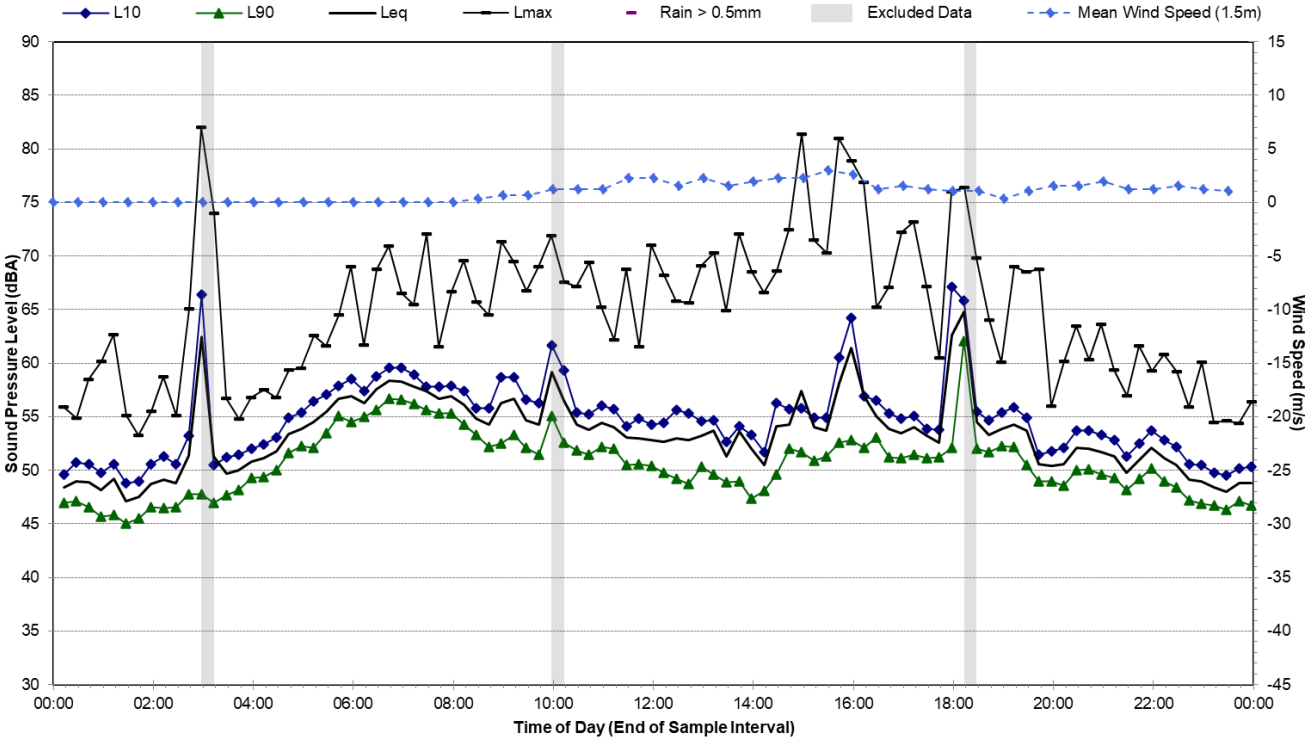
Statistical Ambient Noise Levels

L04 - Watch House Road - Tuesday, 17 May 2022



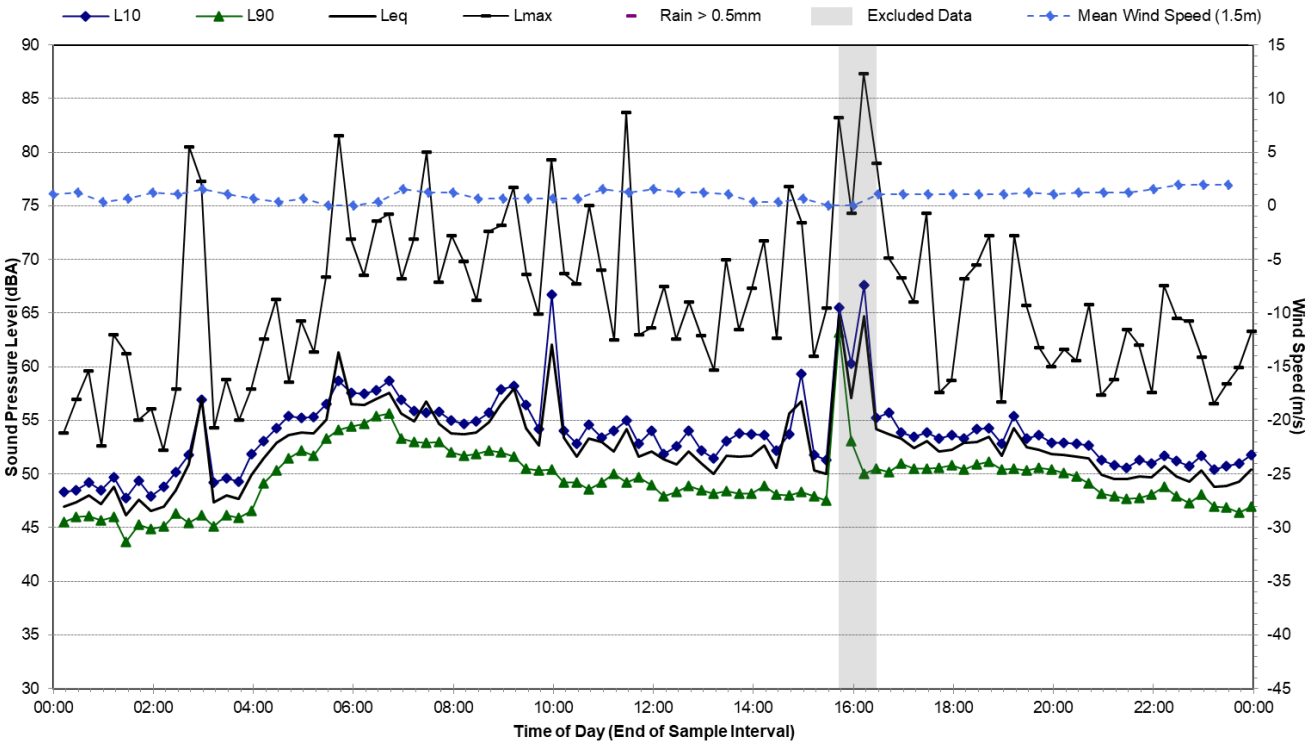
Statistical Ambient Noise Levels

L04 - Watch House Road - Wednesday, 18 May 2022



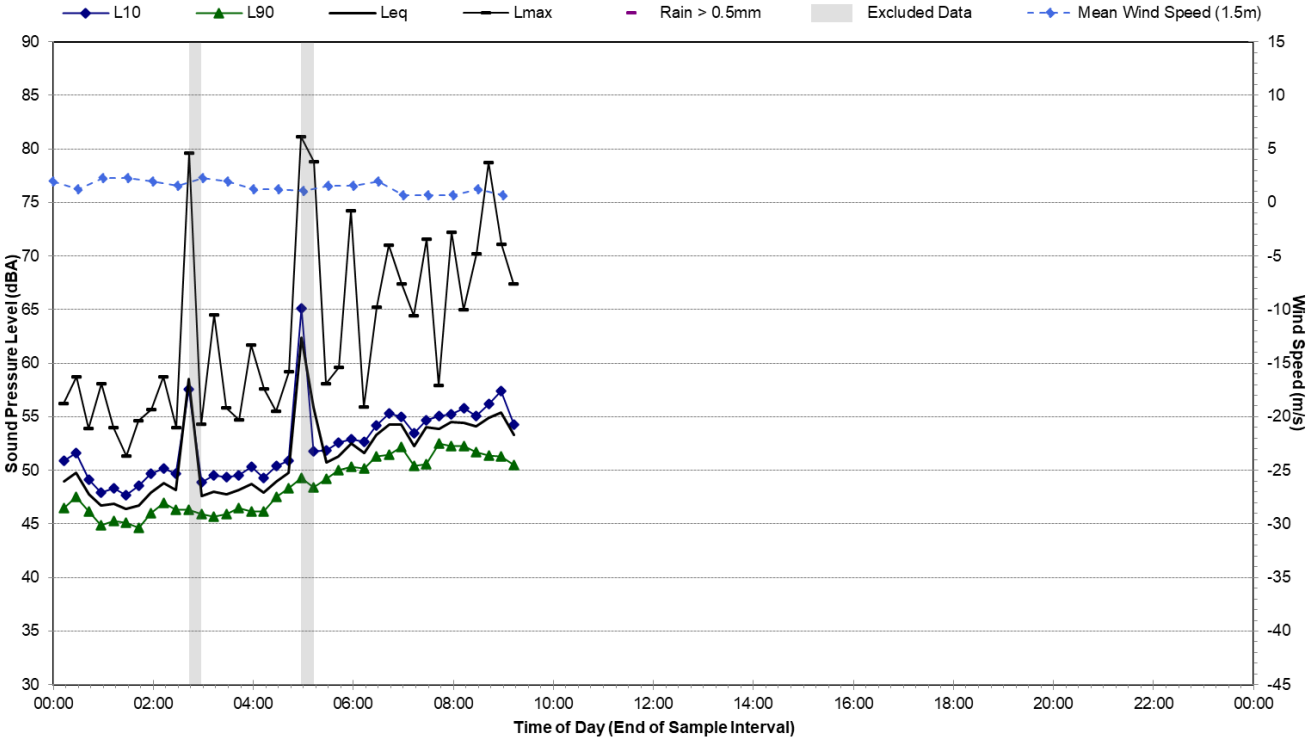
Statistical Ambient Noise Levels

L04 - Watch House Road - Thursday, 19 May 2022



Statistical Ambient Noise Levels

L04 - Watch House Road - Friday, 20 May 2022



Appendix C Construction Noise Sources and Wost-Case Airborne Noise Impacts

Augusta Street Warehouse and Distribution Centre

Noise and Vibration Impact Assessment

The Trustee for Huntingwood Property Trust

SLR Project No.: 610.30770.00000

9 May 2024

Equipment	Total SWL	Asphalt Truck & Sprayer	Chainsaw[1]	Chipper	Concrete Pump	Concrete Truck	Concrete Vibrator[1]	Crane - Mobile (100t)	Dozer	Elevated Working Platform	Excavator (20t)	Excavator (30t) + Hydraulic Hammer[1]	Front End Loader	Grader	Hand Tools	Line Marking Truck	Paving Machine	Piling - Bored	Roller - Vibratory[1]	Truck - Dump	Truck - Flatbed	Water Cart
Sound Power Level[2]		106	119	120	106	103	107	113	116	97	105	127	112	108	94	108	108	112	114	108	103	107
Estimated on-time in any 15 minutes		15	5	15	7.5	10	15	15	10	15	10	5	10	10	15	15	15	10	15	10	10	10
Scenario																						
Vegetation Clearing	122		X	X					X		X		X							X		X
Earthwork	120								X		X		X	X					X	X		X
Demolition	123								X			X	X							X		X
Foundation Works	115				X	X		X			X							X		X		
Warehouse construction and fitout	114							X		X					X						X	
Construction of Roads and hardstands	119	X			X	X	X	X						X		X	X		X			

Note 1: Equipment classed as 'annoying' in the ICNG and includes a 5 dB correction.

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

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Appendix D Operational Noise Contours

Augusta Street Warehouse and Distribution Centre

Noise and Vibration Impact Assessment

The Trustee for Huntingwood Property Trust

SLR Project No.: 610.30770.00000

9 May 2024

Site Operation – Day (Mitigated)

Site Operation – Evening (Mitigated)

Site Operation – Night (Mitigated)

Appendix E CNVG Mitigation Measures

Augusta Street Warehouse and Distribution Centre

Noise and Vibration Impact Assessment

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CNVG Standard Mitigation and Management Measures

Action Required	Applies To	Details
Management measures		
Implementation of any project specific mitigation measures required.	Airborne noise	Implementation of any project specific mitigation measures required.
Implement community consultation or notification measures.	Airborne noise Ground-borne noise & vibration	Notification detailing work activities, dates and hours, impacts and mitigation measures, indication of work schedule over the night-time period, any operational noise benefits from the works (where applicable) and contact telephone number. Notification should be a minimum of 7 calendar days prior to the start of works. For projects other than maintenance works more advanced consultation or notification may be required. Please contact Roads and Maritime Communication and Stakeholder Engagement for guidance. Website (If required) Contact telephone number for community Email distribution list (if required) Community drop-in session (if required by approval conditions).
Site inductions	Airborne noise Ground-borne noise & vibration	All employees, contractors and subcontractors are to receive an environmental induction. The induction must at least include: • all project specific and relevant standard noise and vibration mitigation measures • relevant licence and approval conditions • permissible hours of work • any limitations on high noise generating activities • location of nearest sensitive receivers • construction employee parking areas • designated loading/unloading areas and procedures • site opening/closing times (including deliveries) • environmental incident procedures.
Behavioural practices	Airborne noise	No swearing or unnecessary shouting or loud stereos/radios on site. No dropping of materials from height, throwing of metal items and slamming of doors.
Verification	Airborne noise Ground-borne noise & vibration	Where specified under Appendix C of the CNVG a noise verification program is to be carried out for the duration of the works in accordance with the Construction Noise and Vibration Management Plan and any approval and licence conditions.
Attended vibration measurements	Ground-borne vibration	Where required attended vibration measurements should be undertaken at the commencement of vibration generating activities to confirm that vibration levels are within the acceptable range to prevent cosmetic building damage.
Update Construction Environmental Management Plans	Airborne noise Ground-borne noise & vibration	The CEMP must be regularly updated to account for changes in noise and vibration management issues and strategies.
Building condition surveys	Vibration Blasting	Undertake building dilapidation surveys on all buildings located within the buffer zone prior to commencement of activities with the potential to cause property damage

Action Required	Applies To	Details
Source controls		
Construction hours and scheduling	Airborne noise Ground-borne noise & vibration	Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods.
Construction respite period during normal hours and out-of-hours work	Ground-borne noise & vibration Airborne noise	See Appendix C of the CNVG for more details on the following respite measures: • Respite Offers (RO) • Respite Period 1 (R1) • Respite Period 2 (R2) • Duration Respite (DR)
Equipment selection.	Airborne noise Ground-borne noise & vibration	Use quieter and less vibration emitting construction methods where feasible and reasonable. For example, when piling is required, bored piles rather than impact-driven piles will minimise noise and vibration impacts. Similarly, diaphragm wall construction techniques, in lieu of sheet piling, will have significant noise and vibration benefits. Ensure plant including the silencer is well maintained.
Plant noise levels.	Airborne-noise	The noise levels of plant and equipment must have operating Sound Power or Sound Pressure Levels compliant with the criteria in Appendix H of the CNVG. Implement a noise monitoring audit program to ensure equipment remains within the more stringent of the manufacturers specifications or Appendix H of the CNVG.
Rental plant and equipment.	Airborne-noise	The noise levels of plant and equipment items are to be considered in rental decisions and in any case cannot be used on site unless compliant with the criteria in Table 2 of the CNVG.
Use and siting of plant.	Airborne-noise	The offset distance between noisy plant and adjacent sensitive receivers is to be maximised. Plant used intermittently to be throttled down or shut down. Noise-emitting plant to be directed away from sensitive receivers. Only have necessary equipment on site.
Plan worksites and activities to minimise noise and vibration.	Airborne noise Ground-borne vibration	Locate compounds away from sensitive receivers and discourage access from local roads. Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site. Where additional activities or plant may only result in a marginal noise increase and speed up works, consider limiting duration of impact by concentrating noisy activities at one location and move to another as quickly as possible. Very noise activities should be scheduled for normal working hours. If the work can not be undertaken during the day, it should be completed before 11:00pm. Where practicable, work should be scheduled to avoid major student examination periods when students are studying for examinations such as before or during Higher School Certificate and at the end of higher education semesters. If programmed night work is postponed the work should be re-programmed and the approaches in this guideline apply again.
Reduced equipment power	Airborne noise Ground-borne vibration	Use only the necessary size and power.

Action Required	Applies To	Details
Non-tonal and ambient sensitive reversing alarms	Airborne noise	Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work. Consider the use of ambient sensitive alarms that adjust output relative to the ambient noise level.
Minimise disturbance arising from delivery of goods to construction sites.	Airborne noise	Loading and unloading of materials/deliveries is to occur as far as possible from sensitive receivers. Select site access points and roads as far as possible away from sensitive receivers. Dedicated loading/unloading areas to be shielded if close to sensitive receivers. Delivery vehicles to be fitted with straps rather than chains for unloading, wherever possible. Avoid or minimise these out of hours movements where possible.
Engine compression brakes	Construction vehicles	Limit the use of engine compression brakes at night and in residential areas. Ensure vehicles are fitted with a maintained Original Equipment Manufacturer exhaust silencer or a silencer that complies with the National Transport Commission's 'In-service test procedure' and standard.
Path controls		
Shield stationary noise sources such as pumps, compressors, fans etc.	Airborne noise	Stationary noise sources should be enclosed or shielded where feasible and reasonable whilst ensuring that the occupational health and safety of workers is maintained. Appendix D of AS 2436:2010 lists materials suitable for shielding.
Shield sensitive receivers from noisy activities.	Airborne noise	Use structures to shield residential receivers from noise such as site shed placement; earth bunds; fencing; erection of operational stage noise barriers (where practicable) and consideration of site topography when situating plant.
Receptor control		
Structural surveys and vibration monitoring	Ground-borne vibration	Pre-construction surveys of the structural integrity of vibration sensitive buildings may be warranted. At locations where there are high-risk receptors, vibration monitoring should be conducted during the activities causing vibration.
See Appendix C of the CNVG for additional measures	Airborne noise Ground-borne vibration	In some instances, additional mitigation measures may be required.

Appendix F NPfI Mitigation Measures

Augusta Street Warehouse and Distribution Centre

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Best Management Practice (BMP)

Best management practice (BMP) is the application of particular operational procedures that minimise noise while retaining productive efficiency.

Where applied, these measures and practices are often documented in a noise management plan so that operational practices and undertakings are clearly understood and applied at all levels of an industrial operation. Application of BMP can include the following types of practice:

- Using the quietest plant that can do the job
- Scheduling the use of noisy equipment at the least-sensitive time of day
- Not operating, or reducing operations at night
- Siting noisy equipment behind structures that act as barriers, or at the greatest distance from the noise-sensitive area or orienting the equipment so that noise emissions are directed away from any sensitive areas, to achieve the maximum attenuation of noise
- Where there are several noisy pieces of equipment, scheduling operations so they are used separately rather than concurrently
- Keeping equipment well-maintained and operating it in a proper and efficient manner
- Using 'quiet' practices when operating equipment, for example, positioning idling trucks in appropriate areas
- Running staff-education programs and regular tool box talks on the effects of noise and the use of quiet work practices.

Best Available Technology Economically Achievable (BATEA)

With 'Best available technology economically achievable' (BATEA), equipment, plant and machinery that produce noise incorporate the most advanced and affordable technology to minimise noise output. Affordability is not necessarily determined by the price of the technology alone. Increased productivity may also result from using more advanced equipment, offsetting the initial outlay, for example, using 'quieter' equipment that can be operated over extended hours. Old or badly-designed equipment can often be a major source of noise.

Where BMP fails to achieve the required noise reduction by itself, the BATEA approach should then be considered. Examples of uses of BATEA include:

- Considering alternatives to tonal reversing alarms (where work health and safety is appropriately considered)
- Using equipment with efficient muffler design
- Using quieter engines, such as electric instead of internal combustion
- Fitting and maintaining noise reduction packages on plant and equipment
- Using efficient enclosures for noise sources
- Damping or lining metal trays or bins
- Active noise control.

For many industries there are a wide range of factors that can restrict the feasibility and reasonableness of applying BMP or BATEA measures on a particular site. Work health and safety considerations must also be taken into account as well as any other regulatory and process requirements.