Safe Accessible Transport program – Macquarie Fields Station Upgrade

Noise and Vibration Impact Assessment

Aurecon

Level 11, 73 Miller Street
North Sydney 2060

Prepared by:

SLR Consulting Australia

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v1.0	1 August 2024	Nicholas Vandenberg/ Adam Sirianni	Antony Williams	Antony Williams
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v1.2	13 August 2024	Nicholas Vandenberg/ Adam Sirianni	Antony Williams	Antony Williams

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 Aurecon (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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1.0 Introduction

Transport for NSW (Transport) is proposing to upgrade Macquarie Fields Station (the Proposal) to meet accessibility requirements outlined in the *Disability Discrimination Act 1992* (DD Act).

The Proposal is part of the Safe Accessible Transport program which is a NSW Government initiative to provide a better experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure. The Proposal would provide safe and equitable access to the surrounding pedestrian network at Macquarie Fields Station and would also improve customer facilities and amenity.

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Aurecon on behalf of Transport for NSW to prepare a construction and operational noise and vibration assessment for the proposed station upgrade at Macquarie Fields.

This report assesses the potential construction and operational noise and vibration impacts from the Proposal and identifies feasible and reasonable noise and vibration mitigation and management measures to control the impacts, where appropriate.

This assessment forms part of the Review of Environmental Factors (REF) for the Proposal.

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

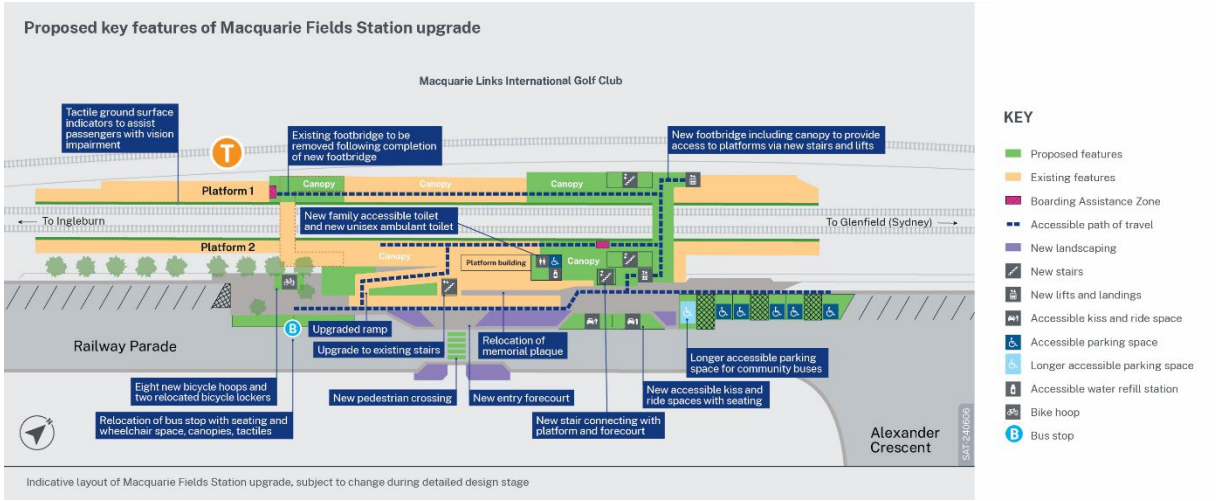
1.1 Proposal Description

Transport proposes to provide accessibility upgrades to Macquarie Fields Station. Key features of the Proposal are shown in **Figure 1** and include:

- construction of a new pedestrian footbridge with stairs and weather protection to provide access to the station platforms and subsequent removal of the existing footbridge (following completion of the new footbridge)
- installation of a three-stop lift connecting Railway Parade, Platform 2 and the new pedestrian footbridge, and installation of a two-stop lift connecting Platform 1 and the new pedestrian footbridge
- upgrade of the station access from Railway Parade, including a new compliant accessible ramp and stairs, and a new second set of stairs near the new footbridge to Platform 2
    - upgrade to the station forecourt to include:
    - six accessible parking spaces (including one longer accessible parking space to accommodate accessible community transport vehicles)
    - two accessible kiss and ride spaces
    - a new pedestrian crossing across Railway Parade to the station entrance
    - bus stop relocation on Railway Parade
    - additional bicycle parking
    - associated footpath and kerb ramp upgrades and new lighting
- modifications to the existing station building on Platform 2 to provide a new unisex ambulant toilet, a family accessible toilet, an electrical services enclosure and station storage facilities

- upgrade of the existing platform surfaces (through platform regrading and localised platform widening), new boarding assistance zone on Platform 1 and relocation of the boarding assistance zone on Platform 2, installation of tactile ground surface indicators (TGSIs) and provision of new canopies over the platforms near the new footbridge and boarding assistance zones
- provision of an accessible water refill station adjacent to the new family accessible toilet
- relocation of the memorial plaque adjacent to the main entrance stairs, subject to further stakeholder consultation during detailed design
- upgrades of other facilities and station services to make them accessible including wayfinding signage, hearing augmentation, Opal card readers, help points and public phone as well as improvement to landscaping, lighting and CCTV.

Figure 1 Key Features of the Proposal



1.2 Nearest Receivers

Macquarie Fields Station is generally surrounded by various commercial and residential receivers. The nearest receivers are residential receivers opposite the Proposal on Railway Parade and residential receivers north-west of the Proposal in the Macquarie Links Estate.

The study area used in the assessment of impacts from the Proposal, together with the nearest sensitive receivers and Noise Catchment Areas (NCAs), are shown in **Figure 2**.

The industrial zoned area to the south has been conservatively classified as commercial in lieu of knowing exact operations of each tenancy.

Scale: 1:12,750 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 04-Jul-2024
Project Number: 610.031874

SLR

Data Source:
Nearmap Imagery March 2024

SITE LOCATION AND NOISE MONITORING LOCATIONS

FIGURE 2

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2.0 Existing Acoustic Environment

Unattended noise monitoring was completed at two locations in the study area during June 2024. 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 project.

The monitoring equipment was positioned to measure existing noise levels that are representative of receivers potentially most affected by the project, 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 Holsworthy Aerodrome AWS), to establish representative existing noise levels in each NCA.

The noise monitoring locations are shown in **Figure 2** and the results are summarised in **Table 1**. Details of each monitoring location together with graphs of the measured daily noise levels are provided in **Appendix B**.

Table 1 Unattended Noise Monitoring Results

ID	Address	Measured Noise Level[1] (dBA)					
		Background Noise (RBL)			Average Noise (L_{Aeq})		
		Day	Evening	Night	Day	Evening	Night
L01	286 Railway Parade, Macquarie Fields	41	41[2] (44 actual)	40	57	57	56
L02	12 Macquarie Links Drive, Macquarie Fields	42	42[2] (43 actual)	39	51	50	49

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

Note 2: The evening Rating Background Level (RBL) has been reduced to match the daytime RBL due to the measured evening RBL being higher than the daytime, as outlined in the NPfI.

The existing noise environment at the site is generally dominated by road traffic from the surrounding road network and rail network.

Short-term attended noise monitoring was also completed at each monitoring location. 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 noise levels are typically dominated by road traffic noise from the surrounding road network and rail traffic.

3.0 Assessment Criteria

3.1 Construction Noise Criteria

3.1.1 Interim Construction Noise Guideline

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

The ICNG 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 project 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.

3.1.1.1 Residential Receivers

The ICNG approach for determining NMLs at residential receivers is shown in **Table 2**.

Table 2 ICNG NMLs for Residential Receivers

Time of Day	NML $L_{Aeq(15minute)}$	How to Apply
Standard Construction Hours Monday to Friday 7am to 6pm Saturday 8am to 1pm 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 *Noise Policy for Industry* (NPfI).

3.1.1.2 Sleep Disturbance

Infrastructure projects often require certain work to be completed during the night-time. Where night work is located close to residential receivers, there is potential for sleep disturbance impacts.

The ICNG lists five categories of work that might need to be undertaken outside of Standard Construction Hours:

- the **delivery of oversized equipment or structures** that require special arrangements to transport on public roads
- **emergency work** to avoid the loss of life or damage to property, or to prevent environmental harm
- **maintenance and repair of public infrastructure** where disruption to essential services or considerations of worker safety do not allow work within standard hours
- **public infrastructure work** that shortens the length of the project and is supported by the affected community
- work where a proponent demonstrates and justifies **a need to operate outside the recommended standard hours**.

Where construction work is planned to extend over more than two consecutive nights, the ICNG recommends that an assessment of sleep disturbance impacts should be completed. The ICNG refers to the *NSW Environmental Criteria for Road Traffic Noise* for assessing the potential impacts, which notes that to limit the level of sleep disturbance, the L_1 level (or L_{Amax}) should not exceed the existing L90 background noise level by more than 15 dB.

3.1.1.3 'Other Sensitive' Land Uses

Several non-residential land uses have been identified in the study area. The NMLs for 'other sensitive' receivers are shown in **Table 3**.

Table 3 Construction NMLs for '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 which generate noise)	-	65
Passive recreation areas (characterised by contemplative activities that generate little noise)	-	60
Commercial	-	70
Industrial	-	75

Land Use	Noise Management Level $L_{Aeq(15minute)}$ (dBA) (applied when the property is in use)	
	Internal	External
Non-ICNG 'Other Sensitive' Receivers		
Child care centres – sleeping areas[3]	40	50[1]
Aged Care	Considered as Residential	

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: Criteria taken from Association of Australian Acoustical Consultants *Guideline for Child Care Centre Acoustic Assessment*.

3.1.1.4 NML Summary

The construction NMLs are summarised in **Table 4**. Out of hours NMLs would be applicable to works undertaken outside the ICNG standard construction hours.

Table 4 Construction Noise Management Levels

NCA	Receiver Type	Background Monitoring Location	Noise Management Level ($L_{Aeq(15minute)}$ - dBA)				Sleep Disturbance Screening Criteria[2] (L_{Amax})
			Standard Daytime (RBL +10dB)	Out of Hours (RBL +5dB)			
				Daytime[1]	Evening	Night	
NCA01	Residential	L.01	51	46	46	45	55
NCA02	Residential	L.02	52	47	47	44	54
All	Commercial	n/a	70 (when in use)				n/a
All	Industrial	n/a	75 (when in use)				n/a
All	Educational	n/a	55 (external noise level, when in use)				n/a
All	Place of Worship	n/a	55 (external noise level, when in use)				
All	Child Care	n/a	50 (external noise level, when in use)				

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

Note 2: Sleep disturbance screening level is RBL+15 dB or 52 dBA, whichever is higher.

3.1.2 Construction Traffic Noise Guidelines

The potential impacts from construction traffic associated with the Proposal when travelling on public roads are assessed under 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 as a result of construction traffic. Where this is considered likely, further assessment is required using the RNP criteria shown in **Table 5**.

Table 5 RNP Criteria for Assessing Construction Traffic on Public Roads

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

3.2 Construction Vibration Criteria

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

- Those in which the occupants of buildings are disturbed (**human comfort**). People can sometimes perceive vibration impacts when vibration generating construction work is located close to occupied buildings. Vibration from construction work 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), as shown in **Table 6**. While the construction activities for the Proposal are generally not expected to result in continuous or impulsive vibration impacts, criteria are provided in **Table 7**.
- Those where building contents may be affected (**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 or medical imaging equipment, are in buildings near to construction work. No such equipment has been identified in the study area.
- Those where the integrity of the building may be compromised (**structural/cosmetic damage**). If vibration from construction work is sufficiently high it can cause cosmetic damage to elements of affected buildings. Industry standard cosmetic damage vibration limits are specified in British Standard *BS 7385: Part 2-1993 Evaluation and measurement for vibration in buildings Part 2, BSI (1993)* and German Standard *DIN 4150 Part 3-2016 Structural vibration – Effects of vibration on structures, Deutsches Institute fur Normung (1999)*. The limits are shown in **Table 8** and **Table 9**.

Table 6 Human Comfort Vibration – 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.

Table 7 Human Comfort Vibration – Preferred and Maximum Weighted Root Mean Square Values for Continuous and Impulsive Vibration Acceleration (m/s^2) 1–80 Hz

Location	Assessment period	Preferred values		Maximum values	
		z-axis	x- and y-axis	z-axis	x- and y-axis
Continuous vibration					
Residential	Daytime	0.010	0.0071	0.020	0.014
	Night-time	0.007	0.005	0.014	0.010
Offices, schools, educational institutions and places of worship	Day or night-time	0.020	0.014	0.040	0.028
Workshops	Day or night-time	0.04	0.029	0.080	0.058
Impulsive vibration					
Residential	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.10	0.071	0.20	0.14
Offices, schools, educational institutions and places of worship	Day or night-time	0.64	0.46	1.28	0.92
Workshops	Day or night-time	0.64	0.46	1.28	0.92

Table 8 Cosmetic Damage – 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%.

Table 9 Cosmetic Damage – 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.

3.2.1 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.

3.2.2 Minimum Working Distances for Vibration Intensive Works

Minimum working distances for typical vibration intensive construction equipment are provided in the Transport *Construction Noise and Vibration Guideline-Public Transport Infrastructure (CNVG-PTI)* 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 *Assessing Vibration: a technical guideline*). They are calculated from empirical data which suggests that where work is 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[1] (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	N/A
Piling rig-hammer	12t down force	15m		50 m
Jackhammer	Hand held	1 m (nominal)	3 m	Avoid contact with structure

Note 1: Minimum working distances for heritage items that have been identified as structurally unsound or otherwise particularly sensitive to vibration. These distances have been calculated based on the 2.5 mm/s PPV criteria from DIN 4150 and the cosmetic damage minimum working distances presented in the Transport CNVG-PTI with reference to BS 7385.

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

3.3 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 L_{Aeq} 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. The residences surrounding the development have been classified as 'Suburban'.

3.3.1 Project Noise Trigger Levels

The trigger levels for industrial noise from the project are summarised in **Table 11** for each NCA shown in **Figure 2**. The Project Noise Trigger Levels (PNTL) are the most stringent of the intrusiveness and amenity trigger level for each period and are highlighted in bold below.

Table 11 Project Noise Trigger Levels

Type of Receiver	NCA	Period	Amenity Noise Level LAeq (dBA)	Measured Noise Level (dBA)		Project Trigger Noise Level $L_{Aeq(15minute)}$ (dBA)		
				RBL[1]	L_{Aeq} (period)	Intrusive	Amenity[2,3]	Overall
Residential Receivers								
Residential	NCA01 (L01)	Day	55	41	57	46	53	**46**
		Evening	45	41	57	46	43	**43**
		Night	40	40	56	45	38	**38**
	NCA02 (L02)	Day	55	42	51	47	53	**47**
		Evening	45	42	50	47	43	**43**
		Night	40	39	49	44	38	**38**
'Other Sensitive' Receivers								
Commercial	All	When in use	65	n/a	n/a	n/a	63	**63**
Educational	All	When in use	35 $L_{Aeq(1hr)}$ (internal)	n/a	n/a	n/a	43 (external)	**43**
Place of worship	All	When in use	40 (internal)	n/a	n/a	n/a	48 (external)	**48**
Passive recreation	All	When in use	50	n/a	n/a	n/a	48	**48**
Active recreation	All	When in use	55	n/a	n/a	n/a	53	**53**

Note 1: RBL = Rating Background Level.

Note 2: The recommended amenity noise levels have been reduced by 5 dB, where appropriate, to give the project amenity noise levels due to other sources of industrial noise being present in the area.

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

4.0 Methodology

4.1 Construction Noise Assessment Methodology

A noise model of the study area has been used to predict noise levels from the proposed construction work to all surrounding receivers. The model uses ISO 9613 algorithms in SoundPLAN V8.2 software.

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.

4.1.1 Work Scenarios

Representative scenarios have been developed to assess the likely impacts from the various construction phases of the Proposal. These scenarios are shown in **Table 12** together with a high-level description of each work activity.

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. Equipment used for each scenario was selected from those presented in the REF and the most noise intensive plant required in each scenario were adopted to provide a realistic worst-case assessment. Information regarding the construction equipment used in the modelling, together with corresponding sound power level data are listed in **Appendix C**.

The scenarios represent one possible way that the Proposal could be constructed and may not necessarily be the same methodology with the exact same equipment list that the Contractor engaged to construct the Proposal would use. The final construction methodology (including the full plant and equipment list) and the expected construction noise levels would be confirmed by the Contractor.

The assessment is generally considered conservative as the calculations assume several items of construction equipment are in use at the same time within individual scenarios.

Table 12 Works Scenario Description

ID	Scenario	Description
W.001	Site establishment and enabling works and demobilising site compounds and work areas	The following activities would be carried out during site establishment and enabling works: • establishment of the site compound (including erection of fencing, hoardings, safety barriers, site office, lighting, amenities and plant and material storage areas) • vegetation removal • relocation or upgrade of services and utilities as required • demobilisation of the site compound including fencing, hoardings, plant, etc
W.002	Vegetation clearing	
W.003	Main works - excavation and piling works	This would include: • piling and excavation works to construct the new footbridge and lift foundations • installation of the foundations for the new footbridge and lift shaft (foundation would be fenced off and inaccessible to the public) • construction of concrete supports for the new footbridge and stairs
W.004	Main works - concrete works around footbridge	
W.005	Main works - installation of new footbridge lift and stairs	This would include: • installation of formwork and steel work for lift shafts and canopy roofing • installation of the new lift, stairs, connection to the new footbridge and protection elements along the new footbridge and stairs

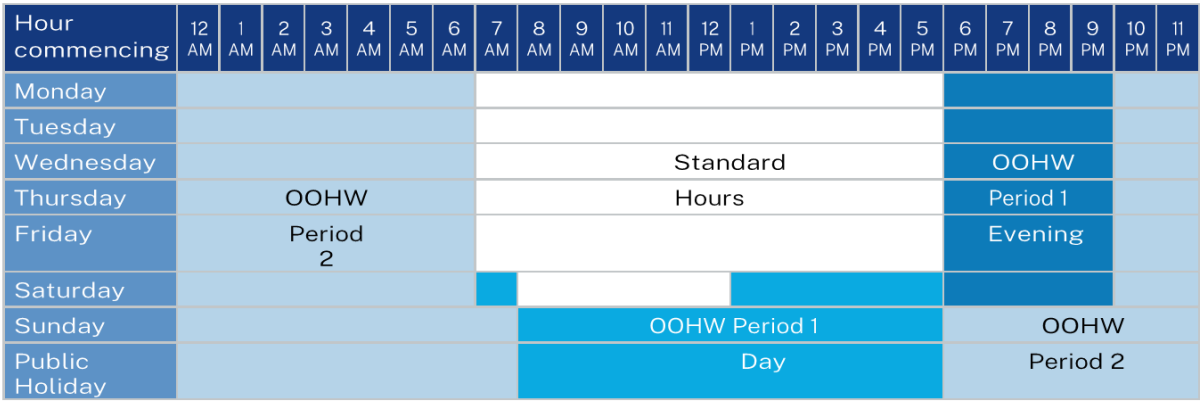
ID	Scenario	Description
W.006	Decommissioning-removal of stairs and footbridge	The following activities would be carried out during decommissioning works following the commissioning of the new footbridge: • removal of the existing stairs and existing footbridge in stages
W.007	Main works - platform works - resurfacing, etc	This would include: • regrading and resurfacing of the platform, including installation of tactile ground surface indicators (TGSIs) to provide compliant accessible paths throughout the station
W.008	Main works - installation of new platform canopies	• upgrade of existing canopies to provide longer canopies near the new footbridge and boarding assistance zones
W.009	Main works - station building modifications	This would include: • demolition of existing facilities and installation of new amenities and reconfiguration of existing spaces • extension of the existing station building and provide additional amenities including new family accessible toilet
W.010	Main works - station access works, footpaths etc	This would include: • construction of new station access connecting the station forecourt, Platform 2 and new footbridge on the north-eastern end of the forecourt, opposite the new lift • relocation of the existing Railway Parade bus stop and waiting area • installation of six new accessible parking spaces (including one long accessible parking space), and two kiss and ride spaces on Railway Parade • construction of new pedestrian crossing and upgrade of kerb ramps at both intersections of Railway Parade and Alexander Crescent
W.011	Main works – electrical upgrades	This would include: • isolating and removing existing transformer and installation of new transformer. • carry out trenching for new cable routes • removal of the footing of the overhead wiring structure and install new lighting in the Railway Parade commuter car park
W.012	Finishing works - landscaping and furniture, etc	This would include: • removal of the site office, temporary amenities and plant and equipment storage areas including remediation works if required. • removal of any temporary supports for the new footbridge • installation of new utilities, including new cable routes, drainage infrastructure and cables for hearing augmentation and CCTV cameras and reinstallation of platform furniture, including vending machines and Opal card readers • commissioning of new assets, including the new lift • landscaping along the platform and forecourt area • installation of signage and wayfinding • removal of temporary access stairs
W.013	Site compound – general operation	This would include: • bulk material storage and delivery laydown area • plant and equipment storage • light vehicles and heavy vehicle movements

Subject to approval, early construction activities are expected to commence in late 2024, with main construction commencing early 2025 and taking around 18 months to complete. Timeframes are subject to detailed design and confirmation of final construction methodology.

4.1.2 Construction Hours

Construction of the proposal would be carried out during Standard Construction Hours where possible. Standard Construction Hours are defined in the ICNG and the Transport CNVG-PTI and shown in **Table 13**.

Table 13 Standard Construction Hours[1,2,3]



Note 1: Taken from the Transport *CNVG-PTI*.

Note 2: Standard Construction Hours are Monday to Friday 7am to 6pm and Saturdays from 8am to 1pm, as defined in the ICNG.

Note 3: Work outside of Standard Construction Hours is defined as 'Out-of-Hours Work' (OOHW) and can be divided into two periods of sensitivity. OOHW Period 1 which relates to evening (and weekend daytime) work, and OOHW Period 2 which relates to night-time (and weekend evening) work.

Certain work may need to occur outside standard hours and would include night work and work during routine rail possessions which are scheduled closures that would occur regardless of the Proposal when part of the rail network is temporarily closed and trains are not operating.

Out of hours work is required in some cases to minimise disruptions to customers, pedestrians, motorists and nearby sensitive receivers; and to ensure the safety of railway workers and operational assets.

It is estimated that around four rail possessions would be required for the following:

- service validation and services relocation
- dilapidation surveys
- localised platform widening near the freight rail line
- installation of new footbridge (including stairs, lift shafts and lift cars), protection screens and canopies
- installation of new platform canopies
- platform regrading and resurfacing
- electrical power supply upgrades
- demolition of existing footbridge and stairs.

Out of hours work may also be scheduled outside rail possession periods which might reduce the impact of the Proposal on the wider community and road network, for example to allow oversized plant and material deliveries, minor road work, and other platform work which would otherwise impact train passengers. The Contractor engaged to do the work may have an alternative construction methodology and may request access to weeknight rail possessions (which would indicatively run for around four nights from Monday night to Thursday night with working hours of around 11pm to 3am) to allow for preparation works required prior to the weekend possessions.

Approval from Transport would be required for any out of hours work and the affected community would be notified as outlined in the Transport CNVG-PTI.

The expected periods in which the work would be completed are shown in **Table 14**. The expected durations of each scenario are also provided.

Table 14 Scenarios and Periods of Work

ID	Scenario	Hours of Work				Indicative Start Date	Likely Duration
		Standard Day	Out-of-Hours Work				
			Day OOH[1]	Eve[2]	Night[3]		
W.001	Site establishment and enabling works and demobilising site compounds and work areas	✓	-	-	-	Nov 2024	6 weeks
W.002	Vegetation clearing	✓	-	-	-	December 2024	2 weeks
W.003	Main works - excavation and piling works	✓	✓	✓	✓	March 2025	Main works during March and May possession and continued works during normal hours - 10 weeks
W.004	Main works - concrete works around footbridge	✓	✓	✓	✓	May 2025	12 weeks
W.005	Main works - installation of new footbridge, lift and stairs	✓	✓	✓	✓		Main works during May and September possession and fit out during normal hours - 16 weeks
W.006	Decommissioning-removal of stairs and footbridge	✓	✓	✓	✓	November 2025	Possession works across 2 days
W.007	Main works - platform works - resurfacing, etc	✓	✓	✓	✓		
W.008	Main works - installation of new platform canopies	✓	✓	✓	✓	May 2025	Main structure during possession and fit out during normal hours - 6 weeks
W.009	Main works - station building modifications	✓	-	-	-	June 2025	16 weeks
W.010	Main works - station access works, footpaths etc	✓	-	-	-	April 2025	6 weeks

ID	Scenario	Hours of Work				Indicative Start Date	Likely Duration
		Standard Day	Out-of-Hours Work				
			Day OOH[1]	Eve[2]	Night[3]		
W.011	Main works – electrical upgrades	✓	-	-	-	September 2025	6 weeks
W.012	Finishing works - landscaping and furniture, etc	✓	-	-	-	November 2025	4 weeks
W.013	Site compound – general operation	✓	✓	✓	✓	Throughout Project	Throughout Project

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

Note 2: Evening is 6pm to 10pm Mondays to Saturdays.

Note 3: Night is 10pm to 7am for Mondays to Saturdays and 6pm to 8am for Sundays and public holidays.

4.2 Construction Vibration Assessment Methodology

The potential impacts during vibration intensive work have been assessed using the Transport CNVG-PTI minimum working distances for cosmetic damage and human response shown in **Table 10**.

The assessment identifies structures which are within the minimum working distances based on the construction scenarios with vibration intensive equipment as shown in **Table 15** (see **Appendix C** for more information).

Table 15 Vibration Intensive Equipment

ID	Scenario	Vibration Intensive Equipment	Minimum Distance		
			Cosmetic Damage		Human Response (NSW EPA Guideline)
			Residential and Light Commercial (BS 7385)	Heritage Items (DIN 4150, Group 3)	
W.003	Main works - excavation and piling works	Vibratory Roller (>300 kN 13-18 tonne)	20 m	40 m	100 m
		Piling Rig – Bored (≤ 800 mm)	2 m (nominal)	5 m	N/A
		Jackhammer- Hand held	1 m (nominal)	3 m	Avoid contact with structure
W.006	Decommissioning- removal of stairs and footbridge	Jackhammer - Hand held	1 m (nominal)	3 m	Avoid contact with structure
W.007	Main works - platform works - resurfacing, etc	Vibratory Roller (>300 kN 13-18 tonne)	20 m	40 m	100 m
		Jackhammer - Hand held	1 m (nominal)	3 m	Avoid contact with structure
W.009	Main works - station building modifications	Jackhammer - Hand held	1 m (nominal)	3 m	Avoid contact with structure

ID	Scenario	Vibration Intensive Equipment	Minimum Distance		
			Cosmetic Damage		Human Response (NSW EPA Guideline)
			Residential and Light Commercial (BS 7385)	Heritage Items (DIN 4150, Group 3)	
W.010	Main works - station access works, footpaths etc	Vibratory Roller (>300 kN 13-18 tonne)	20 m	40 m	100 m
		Jackhammer - Hand held	1 m (nominal)	3 m	Avoid contact with structure

Note 1: Other items of vibration generating equipment may be required at times during the works, however, they are expected to be less vibration intensive.

4.3 Construction Mitigation

The ICNG acknowledges that due to the nature of construction work it is inevitable that there will be impacts where construction is near to sensitive receivers. Several approaches are used on major infrastructure projects to minimise the potential noise and vibration impacts as far as practicable.

Standard Mitigation Measures

The Transport CNVG-PTI contains a number of ‘standard mitigation measures’ for mitigating and managing noise and vibration impacts during construction of Transport infrastructure projects.

These standard measures include items such as requiring construction Contractors to complete site inductions to make workers aware of any noise and vibration specifics, completing regular monitoring to check noise and vibration levels are as expected, and checking noise emission levels from construction equipment to ensure they remain within manufacturers’ specifications. The ‘standard mitigation measures’ are shown in **Appendix D**.

Additional Mitigation Measures

Where noise impacts remain after the use of ‘standard mitigation measures’, the Transport CNVG-PTI requires ‘additional mitigation measures’ to be applied, where feasible and reasonable.

The ‘additional mitigation measures’ include items such as specific notifications of upcoming work, using respite where there are high impacts and verification of construction noise and vibration levels. The measures are determined based on the exceedance of the management levels and are shown in **Appendix D**.

5.0 Assessment of Construction Impacts

5.1 Predicted Noise Levels

The following overview is based on the predicted impacts at the most affected receivers and is representative of the worst-case situation where construction equipment is at the closest point to each receiver.

The assessment shows the predicted noise impacts based on the exceedance of the noise management levels, as per the categories in **Table 16** which are taken from the Transport CNVG-PTI.

Table 16 Exceedance Bands and Corresponding Transport CNVG-PTI Perception Categories

CNVG-PTI Perception Categories	Exceedance of Noise Management Level		Impact Colouring
	Daytime	Out of Hours	
Negligible	No exceedance	No exceedance	
Noticeable	-	1 to 5 dB	
Clearly Audible	1 to 10 dB	6 to 15 dB	
Moderately Intrusive	11 to 20 dB	16 to 25 dB	
Highly Intrusive	> 20 dB	> 25 dB	

A summary of the number of buildings where NML exceedances were predicted for the various work scenarios is shown in **Table 17**. For most construction activities, it is expected that the construction noise levels would frequently be lower than the worst-case levels predicted. Noise contour maps showing representative worst-case scenarios are in **Appendix E**.

The assessment is generally considered conservative as the calculations assume several items of construction equipment are in use at the same time within individual scenarios. In reality, there would frequently be periods when construction noise levels are much lower than the worst-case levels predicted as well as times when no equipment is in use and no noise impacts occur.

Recommendations for mitigation and management are discussed in **Section 7.0**.

Table 17 Overview of NML Exceedances

ID	Scenario	NCA	Number of Receivers																	
			HNA[1]	With NML Exceedance[2]																
				Standard Daytime			Out of Hours													
							Daytime OOH				Evening				Night-time				Sleep Disturbance	Sleep Awakening
				1-10 dB	11-20 dB	>20 dB	1-5 dB	6-15 dB	16-25 dB	>25 dB	1-5 dB	6-15 dB	16-25 dB	>25 dB	1-5 dB	6-15 dB	16-25 dB	>25 dB	>Screening Level	>65 dB
Residential Receivers																				
W.001	Site establishment and enabling works	NCA01	-	13	8	-	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		NCA02	-	-	-	-	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
W.002	Vegetation clearing	NCA01	5	133	14	7	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		NCA02	-	23	-	-	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
W.003	Main works - excavation and piling works	NCA01	-	34	11	-	100	34	11	-	121	38	13	-	158	48	11	2	179	24
		NCA02	-	-	-	-	11	-	-	-	9	-	-	-	37	1	-	-	20	-
W.004	Main works - concrete works around footbridge	NCA01	-	10	7	-	10	10	7	-	13	10	7	-	18	11	7	-	37	15
		NCA02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W.005	Main works - installation of new footbridge, lift and stairs	NCA01	-	24	4	-	56	24	4	-	62	24	5	-	79	26	6	-	61	13
		NCA02	-	-	-	-	-	-	-	-	-	-	-	-	7	-	-	-	-	-
W.006	Decommissioning - removal of stairs and footbridge	NCA01	-	30	8	-	90	30	8	-	105	34	8	-	126	41	9	-	241	35
		NCA02	-	-	-	-	9	-	-	-	6	-	-	-	25	-	-	-	37	-
W.007	Main works - platform works, resurfacing etc	NCA01	-	83	13	-	222	83	13	-	238	91	16	-	278	114	15	3	611	113
		NCA02	-	3	-	-	41	3	-	-	38	1	-	-	74	15	-	-	157	2
W.008	Main works - platform canopies	NCA01	-	15	7	-	28	15	7	-	34	15	8	-	47	18	8	-	55	16
		NCA02	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-

ID	Scenario	NCA	Number of Receivers																	
			HNA[1]	With NML Exceedance[2]																
				Standard Daytime			Out of Hours													
							Daytime OOH				Evening				Night-time				Sleep Disturbance	Sleep Awakening
				1-10 dB	11-20 dB	>20 dB	1-5 dB	6-15 dB	16-25 dB	>25 dB	1-5 dB	6-15 dB	16-25 dB	>25 dB	1-5 dB	6-15 dB	16-25 dB	>25 dB	>Screening Level	>65 dB
W.009	Main works - station building modifications	NCA01	-	23	8	-	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		NCA02	-	-	-	-	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
W.010	Main works - station access works, footpaths etc	NCA01	-	23	10	1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		NCA02	-	-	-	-	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
W.011	Main works – electrical upgrades	NCA01	-	23	9	-	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		NCA02	-	-	-	-	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
W.012	Finishing works – landscaping, etc	NCA01	-	11	-	-	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		NCA02	-	-	-	-	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
W.013	Site compound – general operation	NCA01	-	14	-	-	22	14	-	-	22	14	-	-	23	18	1	-	78	-
		NCA02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

ID	Scenario	NCA	Number of Receivers																	
			HNA[1]	With NML Exceedance[2]																
				Standard Daytime			Out of Hours													
							Daytime OOH				Evening				Night-time				Sleep Disturbance	Sleep Awakening
				1-10 dB	11-20 dB	>20 dB	1-5 dB	6-15 dB	16-25 dB	>25 dB	1-5 dB	6-15 dB	16-25 dB	>25 dB	1-5 dB	6-15 dB	16-25 dB	>25 dB	>Screening Level	>65 dB
Other Sensitive Receivers																				
W.001	Site establishment and enabling works	All	n/a	-	-	-	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
W.002	Vegetation clearing	All	n/a	-	-	-	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
W.003	Main works - excavation and piling works	All	n/a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	n/a	n/a
W.004	Main works - concrete works around footbridge	All	n/a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	n/a	n/a
W.005	Main works - installation of new footbridge, lift and stairs	All	n/a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	n/a	n/a
W.006	Decommissioning- removal of stairs and footbridge	All	n/a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	n/a	n/a
W.007	Main works - platform works, resurfacing etc	All	n/a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	n/a	n/a
W.008	Main works - platform canopies	All	n/a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	n/a	n/a
W.009	Main works - station building modifications	All	n/a	-	-	-	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
W.010	Main works - station access works, footpaths etc	All	n/a	-	-	-	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

ID	Scenario	NCA	Number of Receivers																	
			HNA[1]	With NML Exceedance[2]																
				Standard Daytime			Out of Hours													
							Daytime OOH				Evening				Night-time				Sleep Disturbance	Sleep Awakening
				1-10 dB	11-20 dB	>20 dB	1-5 dB	6-15 dB	16-25 dB	>25 dB	1-5 dB	6-15 dB	16-25 dB	>25 dB	1-5 dB	6-15 dB	16-25 dB	>25 dB	>Screening Level	>65 dB
W.011	Main works – electrical upgrades	All	n/a	-	-	-	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
W.012	Finishing works – landscaping, etc	All	n/a	-	-	-	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
W.013	Site compound – general operation	All	n/a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	n/a	n/a

Note 1: HNA – Highly Noise Affected (>75dBA)

Note 2: Based on worst-case predicted noise level

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

- Noise impacts from the work are predicted to exceed the management levels during certain construction activities. The impacts are predicted to be the highest where work is required near to adjacent sensitive receivers and/or when noise intensive equipment is required.
- During standard daytime hours, 'clearly audible' to 'moderately intrusive' impacts are predicted to occur at some of the nearest residential receivers during certain stages of all work scenarios. The highest impacts are predicted during 'W.002 – Vegetation clearing and 'W.010 – Main works', which require noise intensive equipment such as chainsaws, chippers, jackhammers or concrete saws. A small number of the nearest receivers are predicted to be subject to 'highly intrusive' noise impacts during these two scenarios. The highest impacts are predicted at the residential receivers to the south and east of the station in NCA01, with reduced impacts seen to the north-west in NCA02 due to receivers in this area being distant from the works.
- During standard daytime hours, 'moderately intrusive' impacts are predicted at receivers within around 150 metres of the worst-case work activities. 'Highly intrusive' impacts are only seen at receivers immediately adjacent the work. The extent of these impacts are shown in **Figure 4**, with the predicted noise levels from the worst-case scenarios being shown in **Appendix E**. Receivers which are further away from the work are subject to correspondingly lower noise levels and impacts.
- During the night-time, up to three residential receivers are predicted to have 'highly intrusive' impacts when noise intensive equipment is in use during 'W.003 – Main works' and 'W.007 – Main works'. These receivers are located to the south of the station in NCA01 and are immediately adjacent to work areas where noise intensive equipment would likely be used. 'Moderately intrusive' night-time impacts are predicted at residential receivers within around 150 metres of this work, with receivers which are more distant being subjected to lower noise levels and corresponding 'clearly audible' or 'noticeable' impacts, as the distance from the works increases. The extent of the night-time impacts are shown in **Figure 6**, with the predicted noise levels from the worst-case scenarios being shown in **Appendix E**.
- The night-time impacts from other less noisy activities and expected to be notably lower, with the worst-case noise level from these scenarios typically resulting in 'clearly audible' or 'noticeable' impacts at the nearest receivers. A relatively small number of the nearest receivers in NCA01 to the immediate south of the works are predicted to be subject to 'moderately intrusive' impacts during certain scenarios.
- The night-time impacts are expected to be limited to four rail possessions that would occur over four weekends across 2025 and 2026, as detailed in **Table 14**.
- Residential receivers are generally not expected to be Highly Noise Affected (ie ≥75 dBA) during the works, except during 'W.002 - Vegetation clearing' where up to five receivers are predicted to be Highly Noise Affected when chainsaws and chippers are being used. These receivers are located to the immediate south of the works as shown in **Figure 4**. It is noted that these works would only occur during standard daytime hours.
- All 'other sensitive' receivers are predicted to comply with the NMLs during all construction activities.
- It is noted that for most scenarios, the noisiest work would only be required for a relatively short period of the total duration. Noise levels and impacts at other times would be much lower than the worst-case levels predicted for each scenario, and there would often be times when noise levels are relatively low and no impacts occur.

- Review of the predictions shows that the sleep disturbance screening criterion is likely to be exceeded when night-time work occurs near to residential receivers. The receivers which would potentially be affected by sleep disturbance impacts are generally the same receivers where 'moderately intrusive' and 'highly intrusive' night-time impacts have been predicted (see **Figure 6**).

All appropriate feasible and reasonable construction noise mitigation measures should be applied to work where exceedances of the NMLs are predicted. The recommended construction noise mitigation measures are discussed in **Section 7.0** and **Appendix D**.

5.2 Cumulative Noise Impacts

Cumulative construction noise impacts can occur where multiple work activities are being completed near to a particular receiver at the same time. There is potential for cumulative construction impacts from multiple construction activities being completed in different areas of the proposal, and also from construction work on other nearby projects being completed at the same time.

Since the construction scenarios required for various stages of the proposal would generally require similar items of equipment, concurrent construction work being completed near to a particular area could theoretically increase the worst-case noise levels in this report by around 3 dB (ie a logarithmic adding of two sources of noise at the same level).

The likelihood of worst-case noise levels being generated by two different work activities at the same time is, however, considered low and rather than increase construction noise levels, the impact of concurrent work would generally be a limited to a potential increase in the duration, and annoyance, of noise impacts on the affected receivers.

In practice, construction noise levels in any one location would vary and would be frequently much lower than the worst-case scenario assessed due to construction staging moving work around within the proposal area and, in many cases, only a few items of equipment being used at any one time.

A review of development applications currently lodged through local council or the Department of Planning, Housing and Infrastructure (DPHI) identified no other significant construction works on other projects in the area.

5.3 Construction Road Traffic

The Proposal is expected to require up to 20 heavy vehicle deliveries per day during peak construction periods (during scheduled track work possessions) and less during non-track work periods.

The relatively small number of construction vehicles is not expected to have a significant effect on existing road traffic noise levels in the study area therefore is not anticipated to exceed the criteria.

The potential for construction traffic impacts would be reviewed in more detail during production of the Construction Noise and Vibration Management Plan for the Proposal, which would be produced by the Contractor at a later date.

5.4 Construction Vibration Assessment

Vibration offset distances for the vibration intensive equipment required to complete the work have been determined from the Transport CNVG-PTI minimum working distances for cosmetic damage and human response (see **Table 10**). Buildings within the minimum working distances have been determined and the assessment is summarised in **Figure 3**.

Figure 3 Vibration Assessment

Cosmetic Damage Assessment

The assessment shows that all buildings surrounding the study area are outside the minimum working distance for cosmetic damage (ie 20 metres for a vibratory roller) and therefore, cosmetic damage impacts are not considered likely.

All appropriate feasible and reasonable construction vibration mitigation measures should still be applied. Construction mitigation and management measures are discussed in **Section 7.0**.

Human Comfort Vibration Assessment

Certain receivers in the study area are, however, within the human comfort minimum working distance as shown in **Figure 3** (ie 100 metres for a large vibratory roller) and occupants of affected buildings may be able to perceive vibration impacts at times when vibration intensive equipment is in use. Where impacts are perceptible, they would likely only be apparent for relatively short durations when vibration intensive equipment is nearby.

Construction mitigation and management measures are discussed further in **Section 7.0**.

Heritage Structures

No heritage items have been identified with the proposal area surrounding Macquarie Fields station.

6.0 Assessment of Operational Impacts

The Proposal would relocate the main station entry and pedestrian footbridge, however this change is relatively minor and not expected to significantly alter operational noise impacts.

The Proposal would introduce new infrastructure and assets (eg lifts, stairs, etc), however, the introduction of these items is not anticipated to generate significant noise and/or vibration emissions.

The Proposal would increase accessibility and hence the potential mobility and scale of station usage but any noise emissions from these sources (eg passenger access and usage of the station) are considered insignificant when compared to the existing ambient environment.

If required, operational noise emissions would be re-assessed during the detailed design phase when the proposed equipment is known. Noise levels are expected to be able to comply with relevant criteria using standard noise control measures and/or appropriate selection of equipment.

Furthermore, the Proposal would not directly result in an increase in the number of trains (which is the dominant existing operational noise emission source) that occur daily on the existing rail network.

Accordingly, there is no anticipated change in operational noise and/or vibration impacts associated with the Proposal.

7.0 Mitigation

7.1 Construction Impacts

The construction noise and vibration predictions indicate that the proposed construction activities are likely to exceed the construction noise management levels at certain locations adjacent to the work areas, during certain activities.

The potential impacts from the Proposal would be managed in accordance with recommendations as detailed within this report, as per the procedures defined in the Transport CNVG-PTI.

The potential for construction impacts would be reviewed in more detail during production of the Construction Noise and Vibration Management Plan for the Proposal, which would be produced by the Contractor at a later date and used to manage the impacts.

7.1.1 Project Specific Mitigation Measures

The following project specific mitigation measures are recommended:

- A Construction Noise and Vibration Management Plan should be produced for the proposal. This should include:
  - identification of nearby sensitive receivers
  - description of works, construction equipment and hours of work
  - criteria for the project and relevant licence and approval conditions
  - requirements for noise and vibration monitoring
  - details of how community consultation would be completed
  - procedures for handling complaints
  - details on how respite would be applied where ongoing high impacts are seen at certain receivers.
- The assessment has identified that relatively high impacts are likely when noise intensive equipment such as jackhammers and concrete saws are in use, especially during the night-time period. Residential receivers near to the work are predicted to have ‘moderately intrusive’ to ‘highly intrusive’ worst-case impacts in NCA01 during the night-time when noise intensive equipment is in use nearby. Where noise intensive equipment is to be used near to sensitive receivers, it is recommended that the work is scheduled for daytime hours. Where this is not possible, then the work should be completed as early as possible in each work shift to minimise the potential for night-time impacts.

7.1.2 Standard Mitigation Measures

Particular effort should be directed towards the implementation of all feasible and reasonable noise mitigation and management strategies as per the standard mitigation measures detailed in the ICNG.

Reference should be made to the Transport CNVG-PTI which details a number of standard mitigation measures for construction activities likely to result in adverse noise or vibration impacts associated with infrastructure projects.

Where identified in the impact assessment, particular effort should be directed towards the implementation of all feasible and reasonable noise mitigation and management strategies, noting that additional site-specific measures may also be recommended.

Standard mitigation measures which may be considered appropriate for the Proposal, as taken from the Transport CNVG-PTI, are shown in **Appendix D**.

7.1.3 Additional Noise Mitigation Measures

The Transport CNVG-PTI requires additional noise mitigation measures to be considered where exceedances of the noise goals are predicted, particularly during Out of Hours Works (OOHWs).

The Transport CNVG-PTI additional mitigation measures are listed in **Table 18** and described in **Appendix D**. The additional mitigation measures matrix (AMMM) for construction noise is reproduced in **Table 19**.

The objective of these additional noise mitigation measures is to engage, inform and provide project-specific messages to the community, recognising that advanced warning of potential disruptions can assist in reducing the impact.

Table 18 Additional Mitigation Measures

Mitigation / Management Measure	Abbreviation
Periodic Notification	PN
Verification Monitoring	V
Specific Notification	SN
Respite Offer	RO
Alternative Accommodation	AA
Alternative Construction Methodology	AC
Respite Period	RP
Duration Respite	DR

Table 19 Transport CNVG-PTI Additional Mitigation Measures Matrix – Airborne Construction Noise

Construction Hours	Receiver Perception	dBA above RBL	dBA above NML	Additional Management Measures[3]
Standard Hours Mon-Fri (7am - 6pm) Sat (8am - 1pm) Sun/Pub Hol (Nil)	Noticeable	5 to 10	0	-
	Clearly Audible	>10 to 20	≤10	-
	Moderately Intrusive	>20 to 30	>10 to 20	PN, V
	Highly Intrusive	>30	>20	PN, V
	75 dBA or greater	N/A	N/A	PN, V, SN
OOHW Period 1 Mon-Fri (6pm - 10pm) Sat (7am - 8am & 1pm - 10pm) Sun/Pub Hol. (8am - 6pm)	Noticeable	5 to 10	≤5	-
	Clearly Audible	>10 to 20	5 to 15	PN, RP[1], DR[1]
	Moderately Intrusive	>20 to 30	>15 to 25	PN, V, SN, RO, RP[1], DR[1]
	Highly Intrusive	>30	>25	PN, V, SN, RO, RP[1], DR[1]
OOHW Period 2 Mon-Sat (12am - 7am & 10pm - 12am) Sun/Pub Hol. (12am - 8am & 6pm - 12am)	Noticeable	5 to 10	≤5	PN
	Clearly Audible	>10 to 20	5 to 15	PN, V, SN, RO[2], RP[1], DR[1]
	Moderately Intrusive	>20 to 30	>15 to 25	PN, V, SN, RO[2], RP[1], DR[1]
	Highly Intrusive	>30	>25	PN, V, SN, RO[2], RP[1], DR[1], AA

Note 1: Respite periods and duration reduction are not applicable when works are carried out during OOHW Period 1 Day only (ie Saturday 6am-7am and 1pm-6pm, Sunday / Public Holidays 8am-6pm).

Note 2: Respite offer during OOHW Period 2 are only applicable for evening periods (ie, Sundays / Public Holidays 6pm-10pm), and may not be required if a respite offer has already been made for the immediately preceding OOHW Period 1.

Note 3: PN = Project notification, SN = Specific notification, individual briefings, or phone call, V = Verification monitoring, DR = Duration Reduction, RP = Respite Period, RO = Project specific respite offer, AA = Alternative accommodation.

7.1.4 Additional Vibration Mitigation Measures

Where the vibration management levels for building damage may be exceeded, vibration monitoring should be conducted to determine site specific minimum working distances.

Alternative construction methodologies may need to be considered where it is not possible to complete the work within the building damage vibration management levels. The additional mitigation measures described in the Transport CNVG-PTI are summarised below in **Table 20**.

Table 20 Additional Mitigation Measures Matrix – Construction Vibration

Construction hours	Receiver Perception	Vibration Management Level	Additional Management Measures
Standard Hours Mon-Fri (7am - 6pm) Sat (8am - 1pm) Sun/Pub Hol (Nil)	Human disturbance	Exceeds HVML	PN, V, RO
	Building damage	Exceeds DVML	V, AC
OOHW Period 1 Mon-Fri (6pm - 10pm) Sat (7am - 8am) & (1pm - 10pm) Sun/Pub Hol. (8am - 6pm)	Human disturbance	Exceeds HVML	PN, V, SN, RO, RP, DR
	Building damage	Exceeds DVML	V, AC
OOHW Period 2 Mon-Fri (10pm - 7am) Sat (10pm - 8am) Sun/Pub Hol. (6pm - 7am)	Human disturbance	Exceeds HVML	PN, V, SN, RO, AA, RP, DR
	Building damage	Exceeds DVML	V, AC

Notes: PN = Project notification SN = Specific notification, individual briefings, or phone call, V = Verification monitoring, AA = Alternative accommodation, DR = Duration Reduction, RO = Project specific respite offer, RP = Respite Period, AC = Alternative construction methodology, HVML = vibration management level for human disturbance, DVML = vibration management level for cosmetic damage to buildings or structures.

7.1.5 Summary of Additional Mitigation

The predicted construction noise levels in **Section 5.1** have been used to determine the requirement for additional mitigation measures for the Proposal.

The recommended additional mitigation measures use the predicted impacts from the worst-case construction activities for the daytime, evening (OOHW period 1) and night-time (OOHW period 2), as shown in **Figure 4**, **Figure 5** and **Figure 6**, respectively.

Figure 4 Additional Mitigation Summary – Standard Daytime Construction Hours

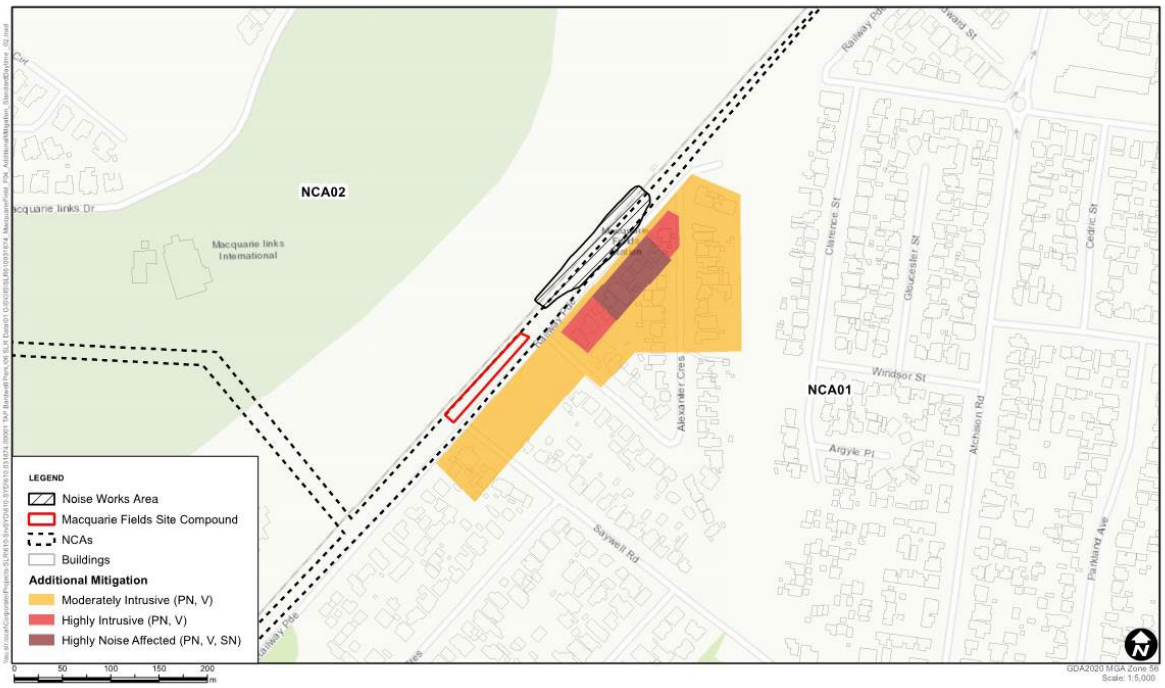


Figure 5 Additional Mitigation Summary – Out of Hours Period 1 Works

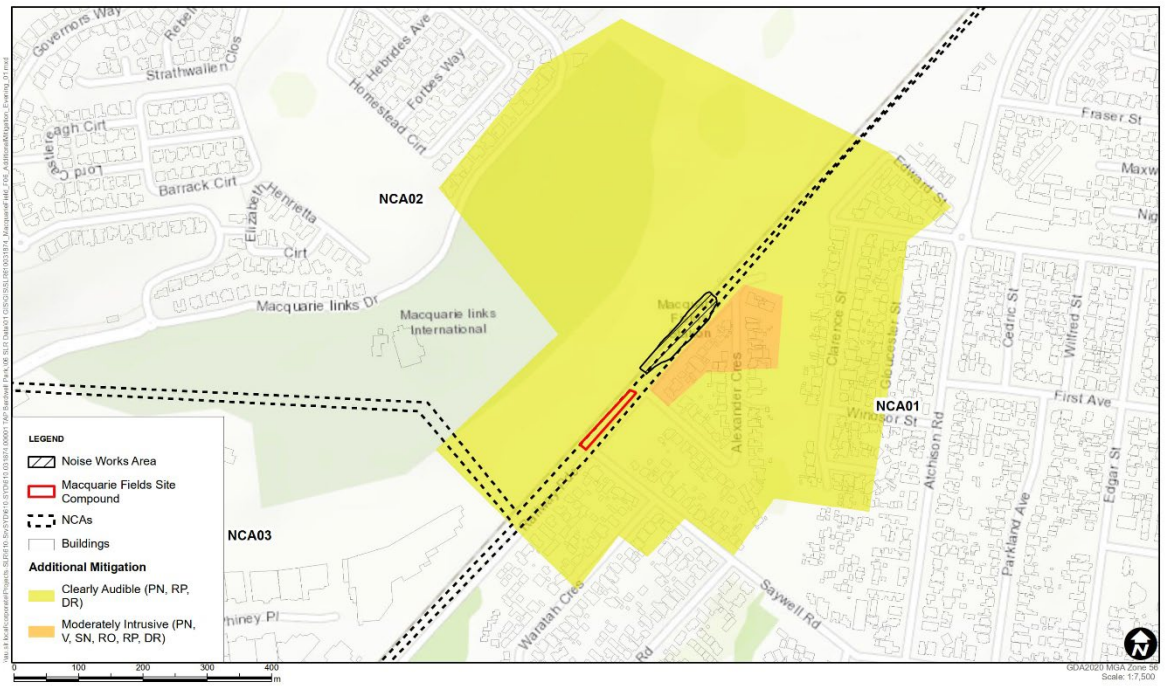


Figure 6 Additional Mitigation Summary – Out of Hours Period 2 Works

The required additional mitigation measures would be confirmed by the Contractor during production of the Construction Noise and Vibration Management Plan for the Proposal.

8.0 Conclusion

Transport proposes to upgrade Macquarie Fields Station as part of the program to meet accessibility requirements outlined in the *Disability Discrimination Act 1992* (DD Act).

This report describes the existing noise environment in the study area, outlines the method used in the assessment and identifies the likely impacts from construction of the proposal on the nearby sensitive receivers. Where impacts are predicted, appropriate measures have been recommended to mitigate and manage the impacts.

Construction Noise and Vibration

The nearest residential receivers to the Proposal are predicted to be subject to 'highly intrusive' or 'moderately intrusive' worst-case noise impacts at certain times during standard daytime hours, particularly when noise intensive equipment such as chainsaws, chippers, jackhammers or concrete saws are in use near to receivers. These worst-case impacts are, however, generally limited to a relatively small number of the nearest residential receivers in NCA01. Residential receivers which are further back are also predicted to be impacted by the Proposal during noisy construction work, but to a lesser degree.

The noise impacts during evening and night-time work are predicted to be increased compared to daytime work due to more stringent criteria, however, the requirement for night-time work is expected to be relatively infrequent (across four rail possessions).

The main potential source of vibration during construction of the Proposal would be from vibratory rollers. The nearest receivers to the proposal are likely to be outside of the minimum working distances for cosmetic damage, but potentially within the minimum working distances for human comfort.

The Proposal should apply all feasible and reasonable work practices to reduce the potential noise and vibration impacts and a number of strategies have been recommended. The exact strategies would be determined during development of a Construction Noise and Vibration Management Plan prior to construction work commencing.

Operational Noise

The Proposal would relocate the main station entry and pedestrian footbridge, however this change is relatively minor and not expected to significantly alter operational noise impacts.

The Proposal would introduce new infrastructure and assets (eg lifts, stairs, etc), however, introduction of these items is not anticipated to generate significant noise and/or vibration emissions.

If required, operational noise emissions would be re-assessed during the detailed design phase when the proposed equipment is known. Noise levels are expected to be able to comply with relevant criteria using standard noise control measures and/or appropriate selection of equipment.

Accordingly, there is no anticipated change in operational noise and/or vibration impacts associated with the Proposal.

Appendix A Acoustic Terminology

Safe Accessible Transport program – Macquarie Fields Station Upgrade

Noise and Vibration Impact Assessment

Aurecon

SLR Project No.: 610.031874

13 August 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

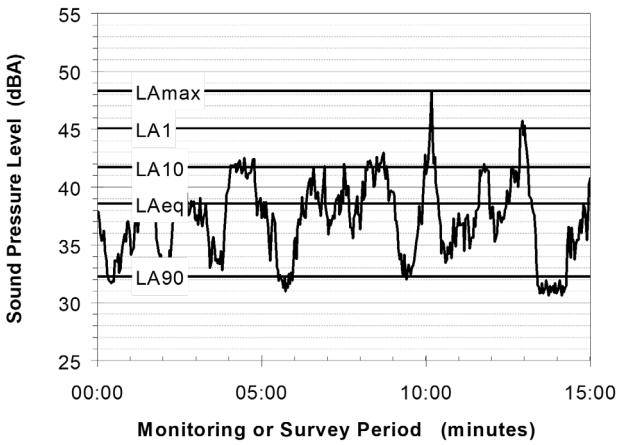
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or LW, or by the reference unit 10^{-12} W.

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

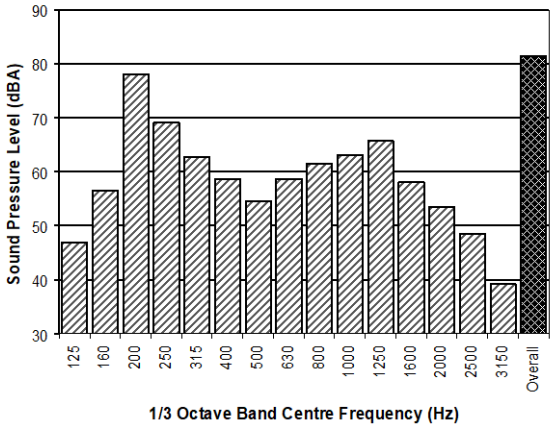
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal.

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

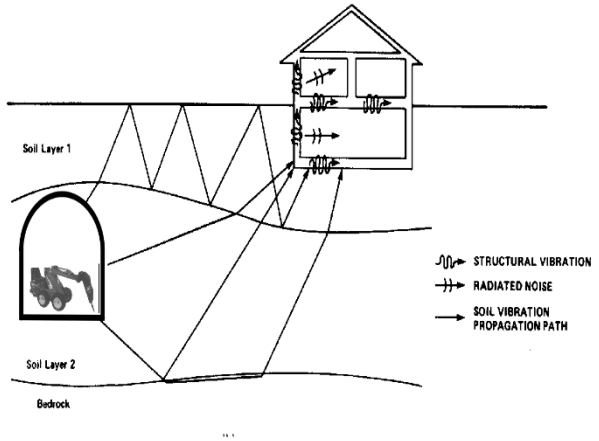
People are able to 'feel' vibration at levels lower than those required to cause even superficial damage to the most susceptible classes of building (even though they may not be disturbed by the motion). An individual's perception of motion or response to vibration depends very strongly on previous experience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

Safe Accessible Transport program – Macquarie Fields Station Upgrade

Noise and Vibration Impact Assessment

Aurecon

SLR Project No.: 610.031874

13 August 2024

Noise Monitoring Location	L.01
Noise Monitoring Address	**286 Railway Parade, Macquarie fields**

Logger Device Type: Svantek 957, Logger Serial No: 20665

Sound Level Meter Device Type: B&K 2250L, Sound Level Meter Serial No: 3004635

Ambient noise logger deployed at 286 Railway Parade, Macquarie Fields. Logger located in the front yard of the property towards the rail corridor.

Attended noise measurements indicate the ambient noise environment at this location is controlled by rail traffic including passenger and freight trains. Natural noise sources such as birds and wind also contribute to the L_{Aeq} at this location. Road traffic on Railway Pde also dominant when present.

Recorded Noise Levels (LAmax) 05/06/2024:

Road Traffic on Railway Pde – 44 to 70 dBA
Passenger Trains – 51 to 59 dBA
Freight Train – 73 dBA
Pedestrians – 47 to 55 dBA
Birds – 49 to 74 dBA

Map of Noise Monitoring Location

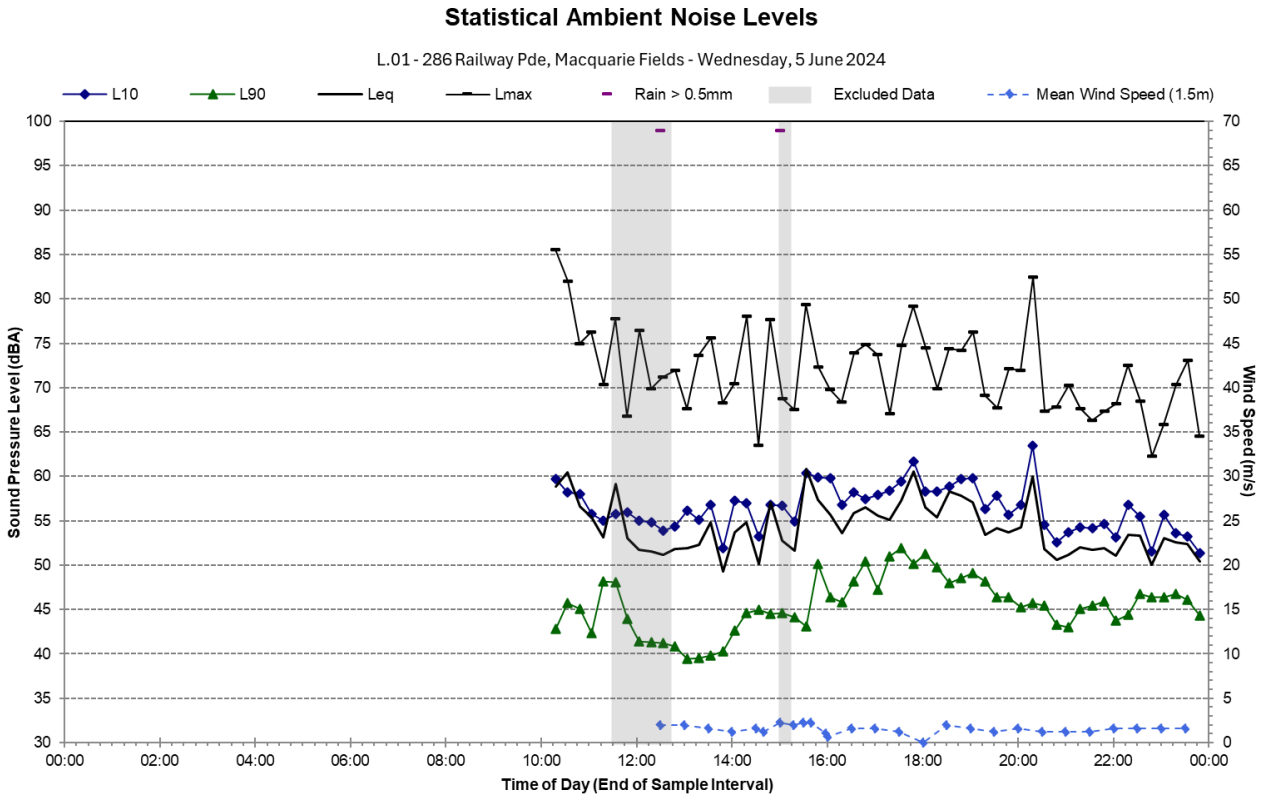
Ambient Noise Logging Results ICNG Defined Time Periods

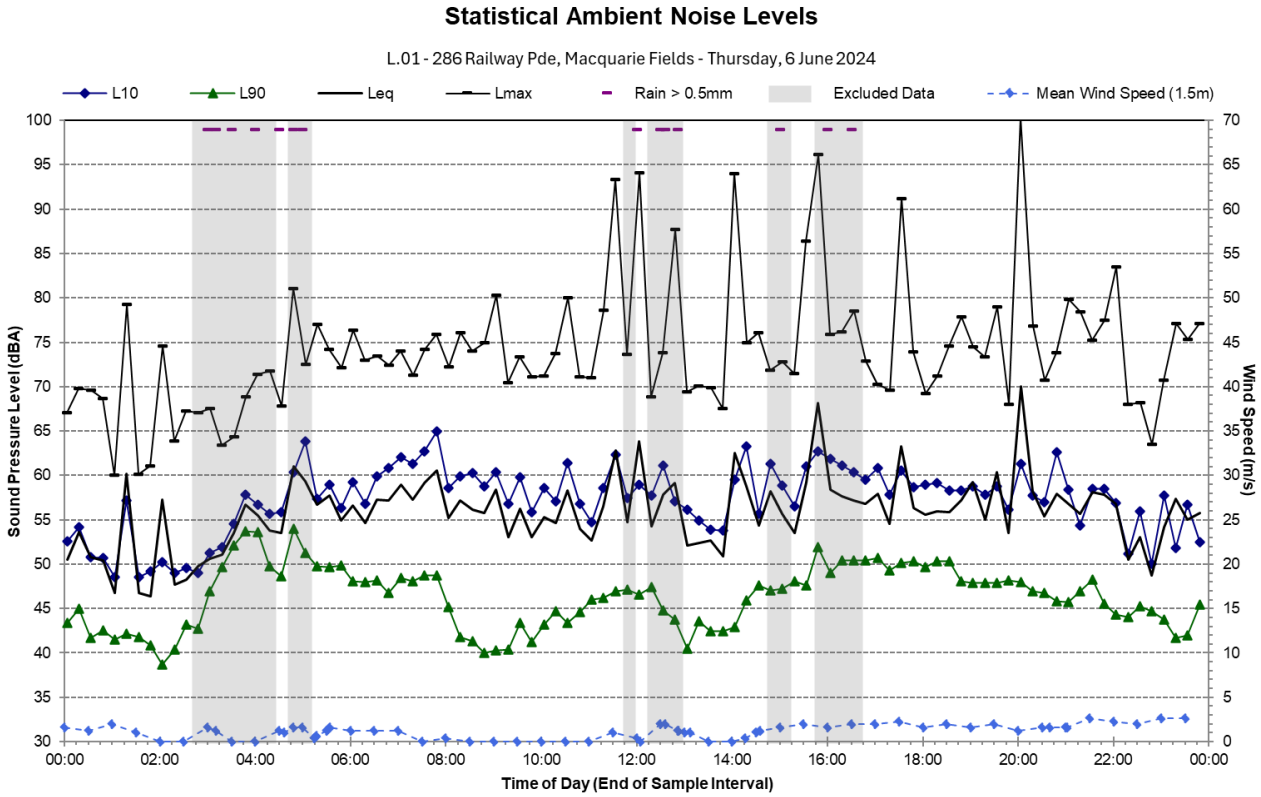
Monitoring Period	Noise Level (dBA)			
	RBL	L_{Aeq}	L10	L1
Daytime	41	57	56	66
Evening	44	57	57	66
Night-time	40	56	53	64

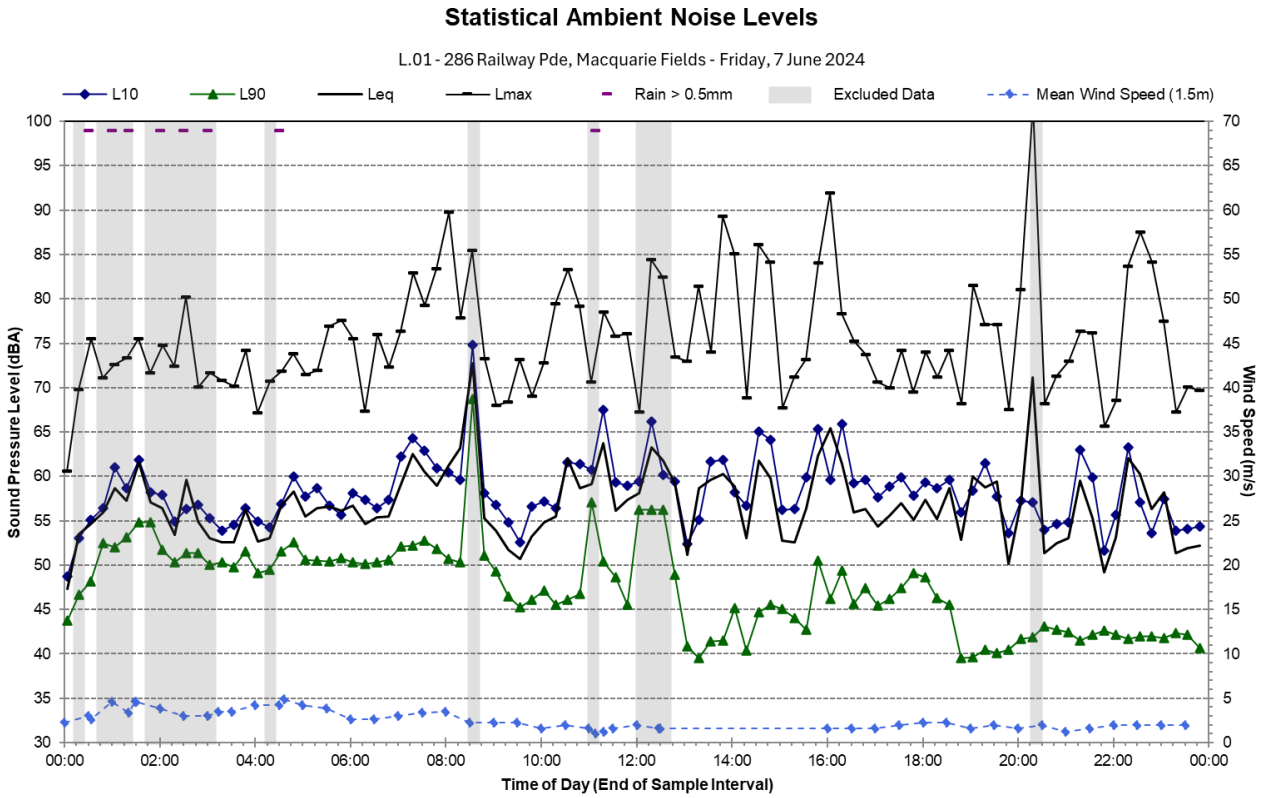
Attended Noise Measurement Results

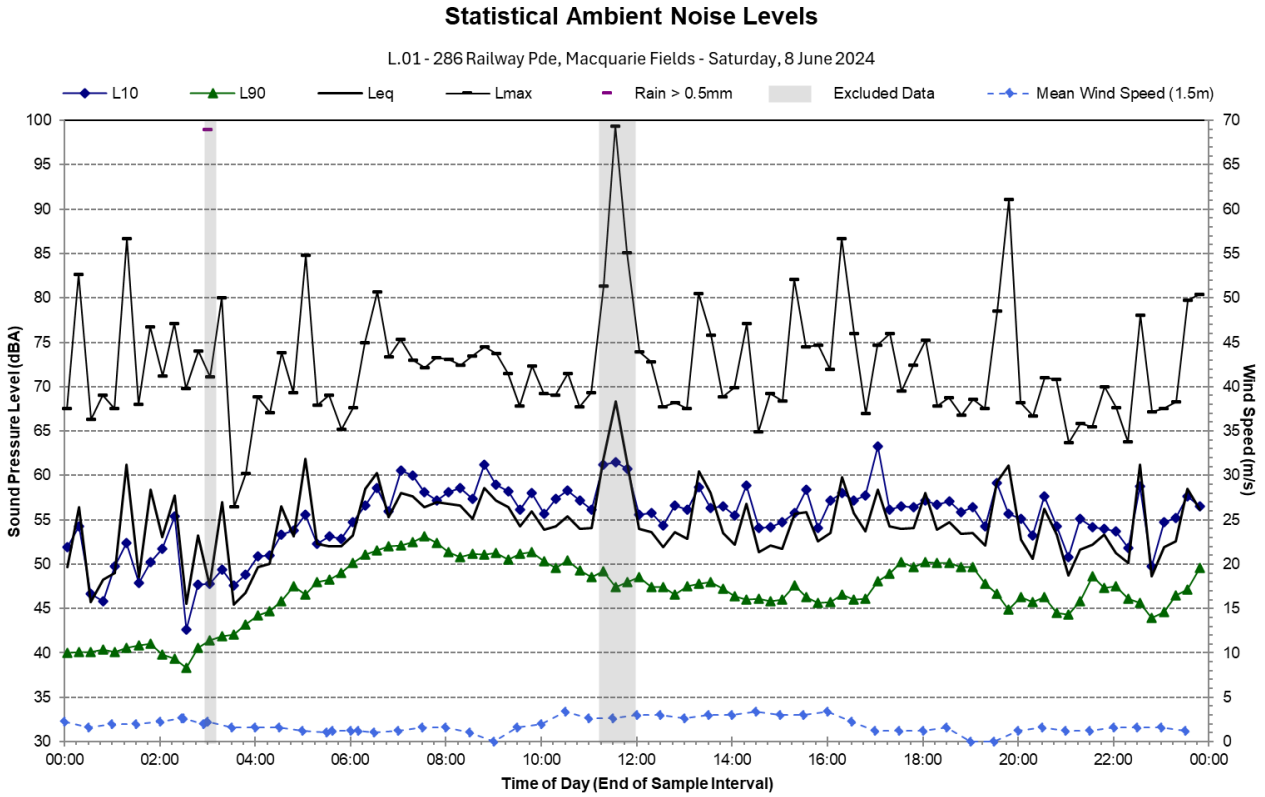
Date	Start Time	Measured Noise Level (dBA)		
		LA90	L_{Aeq}	L_{Amax}
05/06/2024	09:47	42	55	74

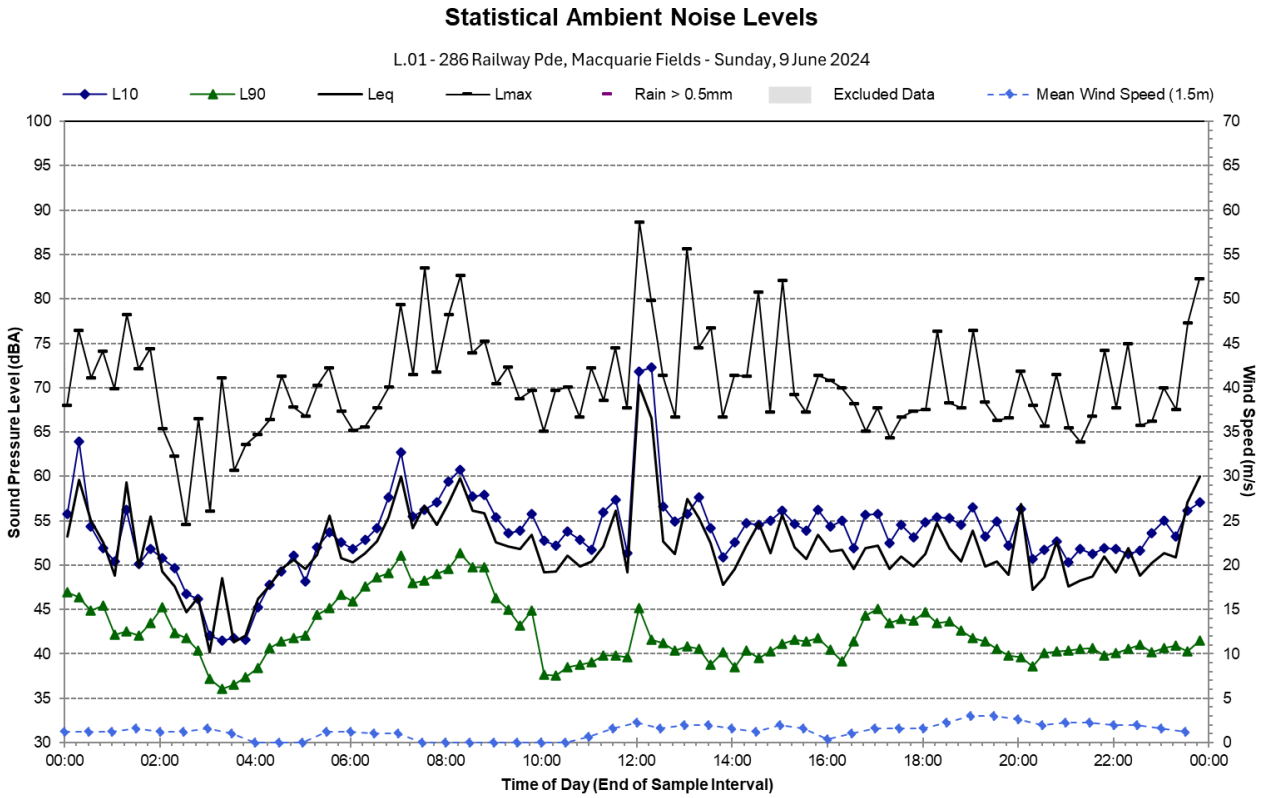
Photo of Noise Monitoring Location

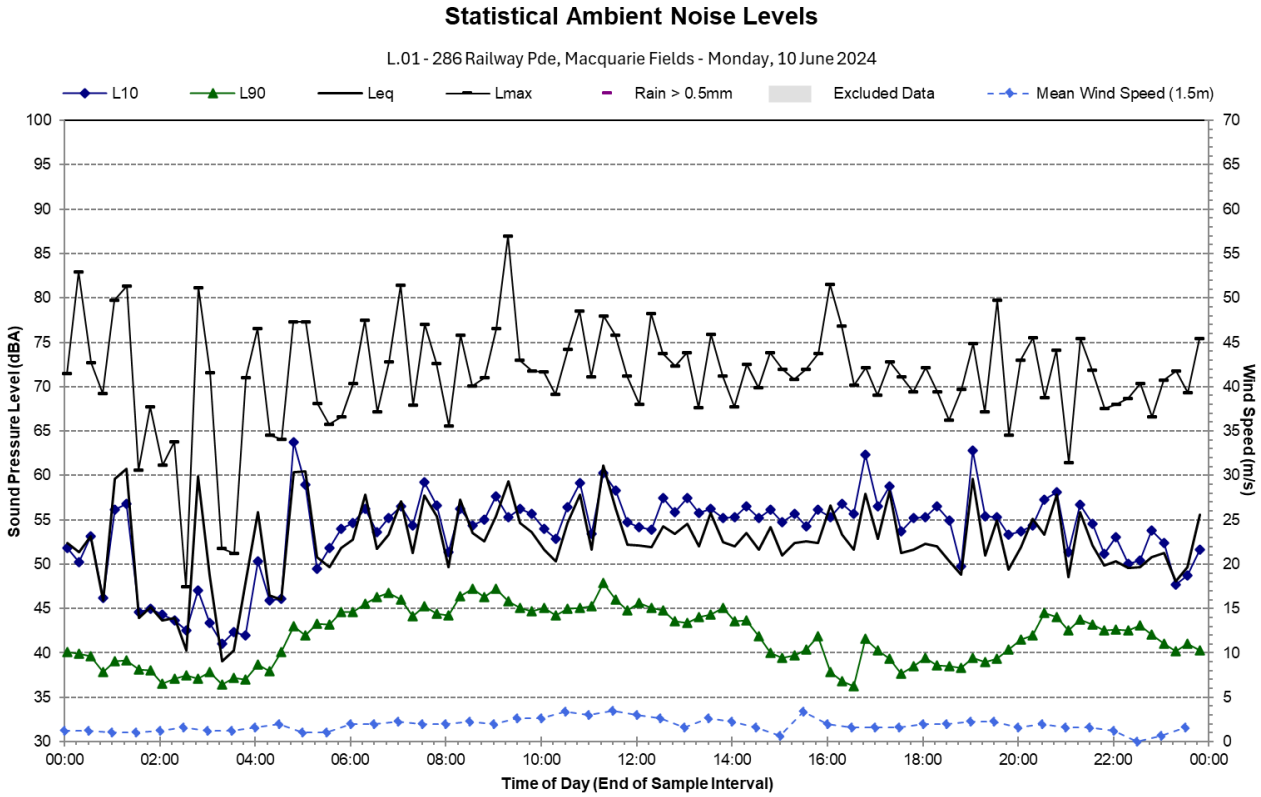

Statistical Ambient Noise Levels
L.01 - 286 Railway Pde, Macquarie Fields - Wednesday, 5 June 2024
L10
L90
Leq
Lmax
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

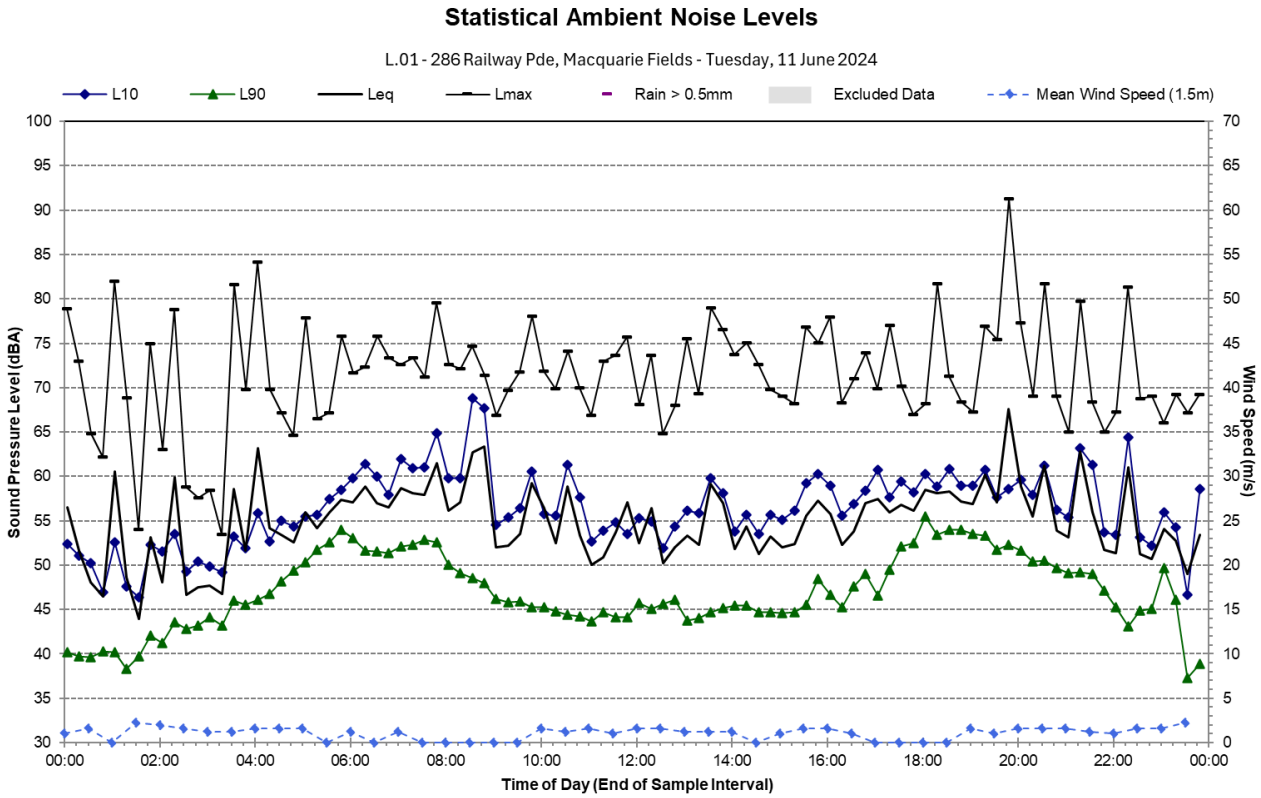

Statistical Ambient Noise Levels
L.01 - 286 Railway Pde, Macquarie Fields - Thursday, 6 June 2024
L10
L90
Leq
Lmax
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

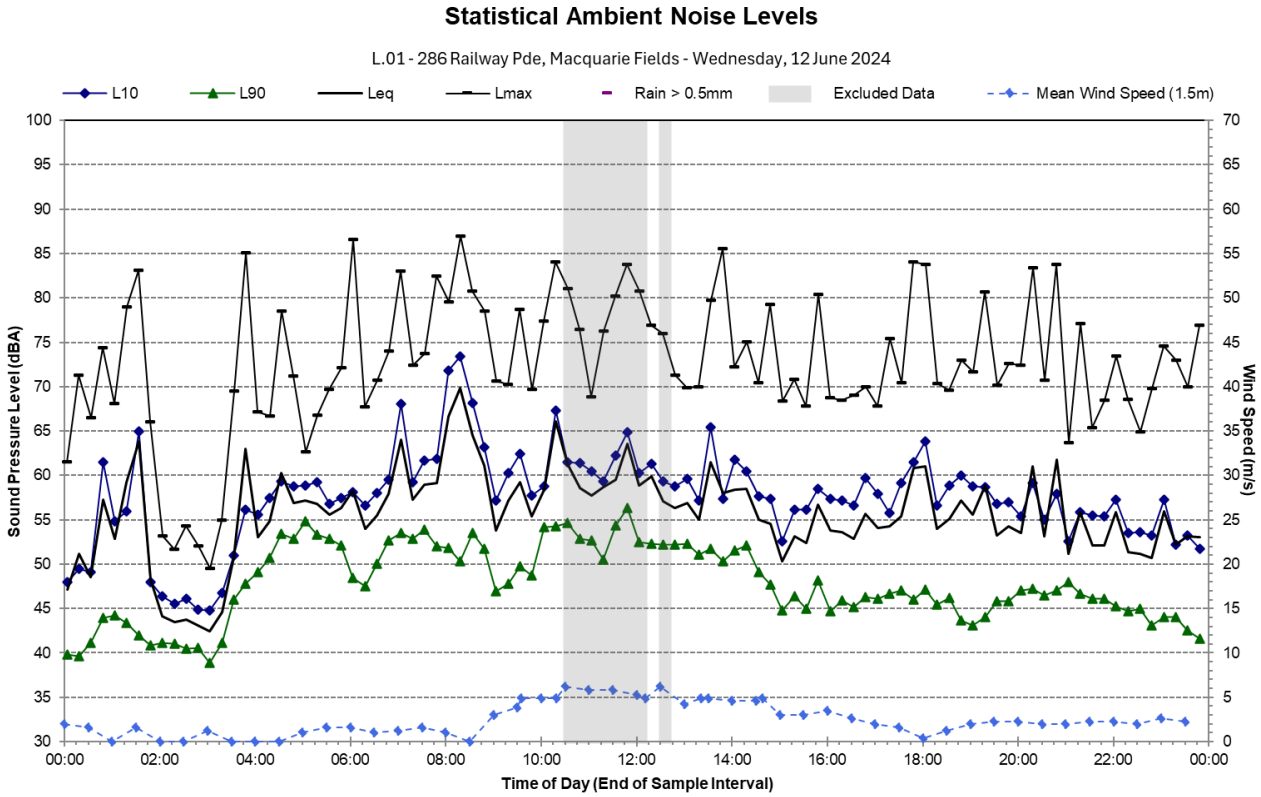

Statistical Ambient Noise Levels
L.01 - 286 Railway Pde, Macquarie Fields - Friday, 7 June 2024
L10
L90
Leq
Lmax
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

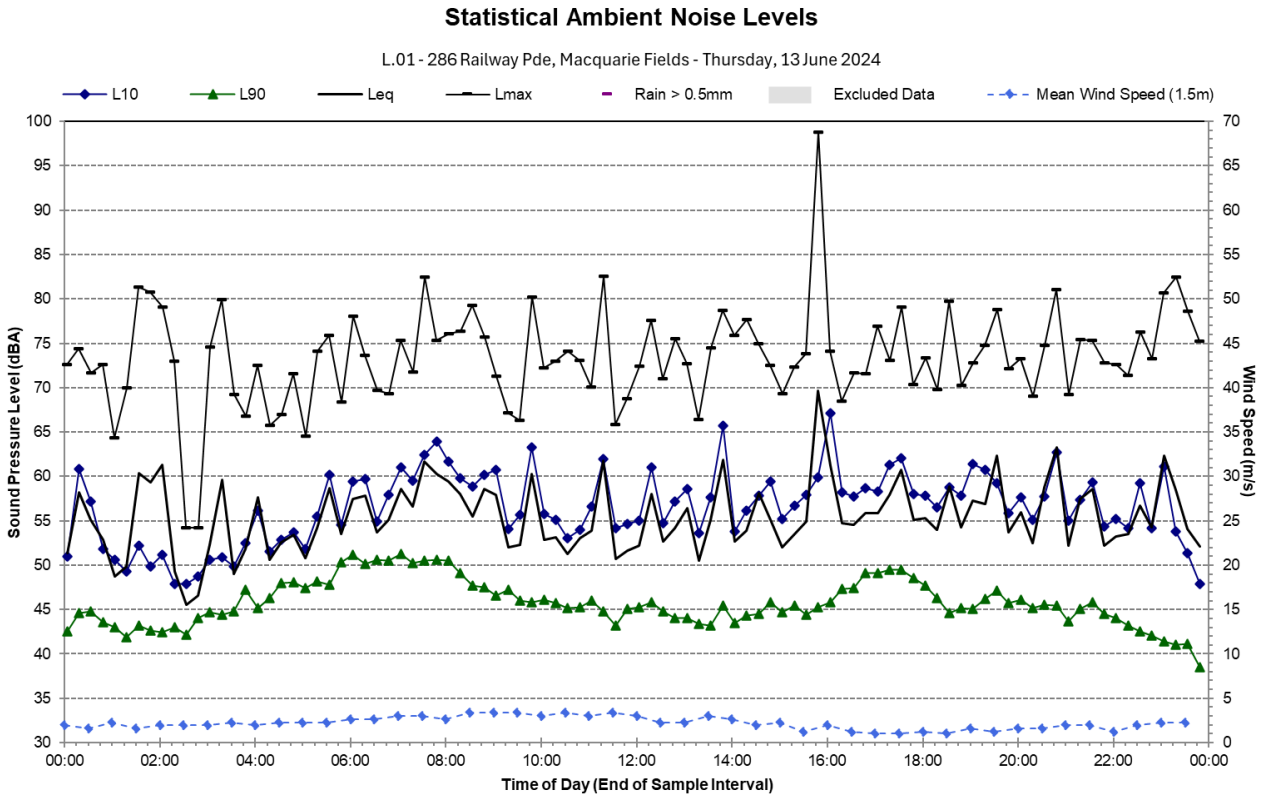

Statistical Ambient Noise Levels
L.01 - 286 Railway Pde, Macquarie Fields - Saturday, 8 June 2024
L10
L90
Leq
Lmax
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

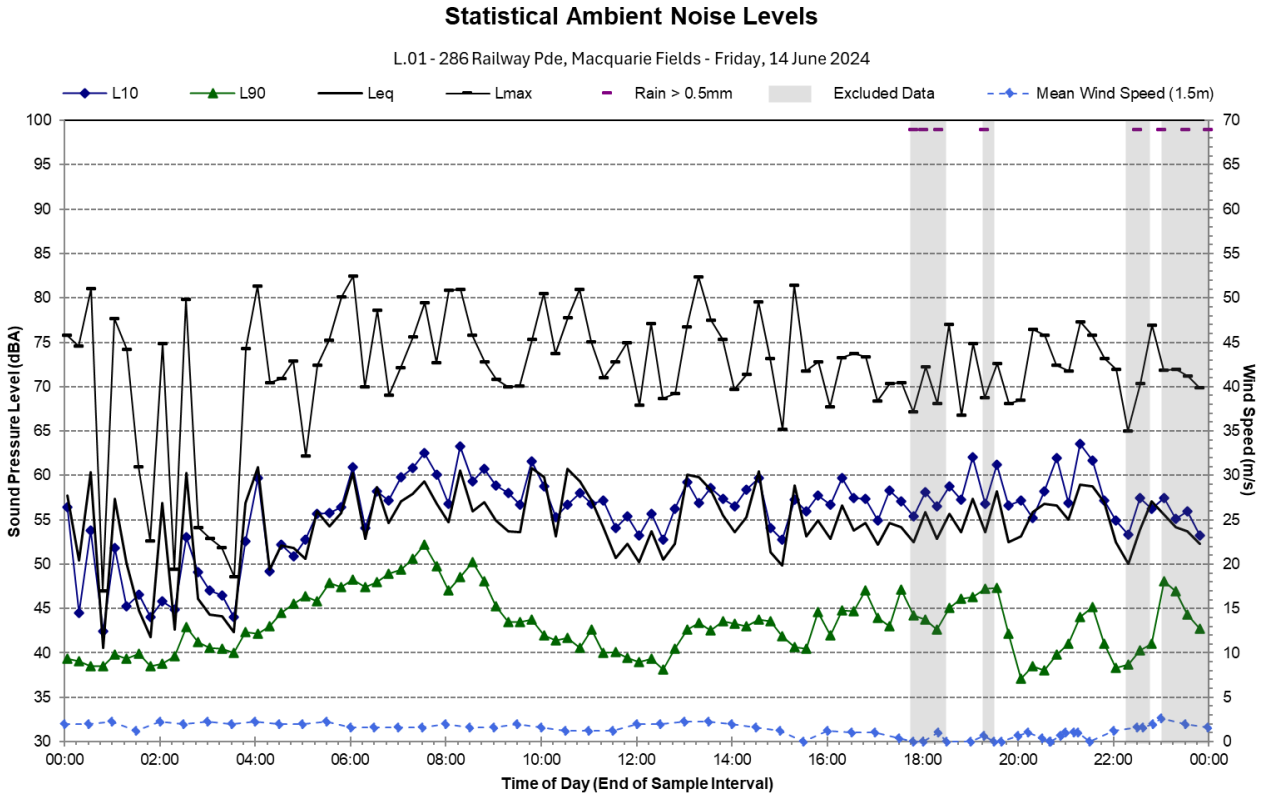

Statistical Ambient Noise Levels
L.01 - 286 Railway Pde, Macquarie Fields - Sunday, 9 June 2024
L10
L90
Leq
Lmax
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

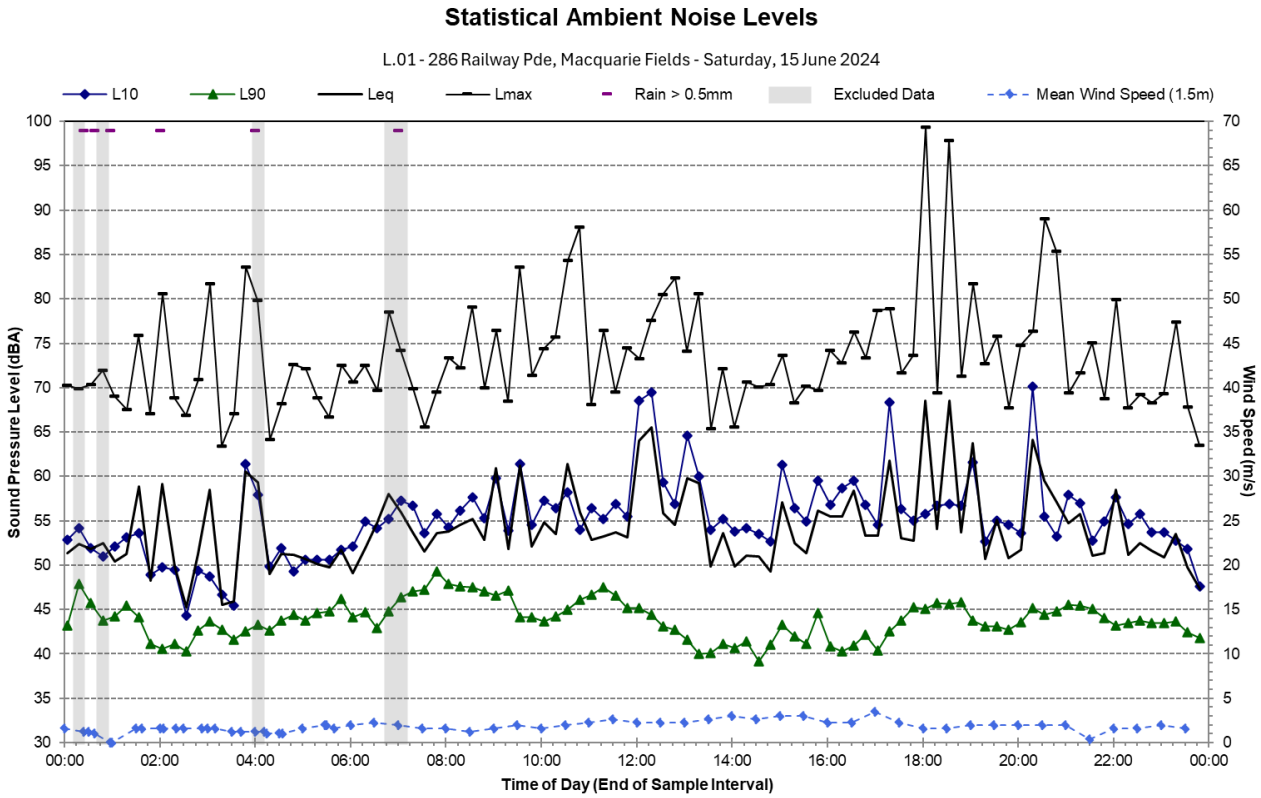

Statistical Ambient Noise Levels
L.01 - 286 Railway Pde, Macquarie Fields - Monday, 10 June 2024
L10
L90
Leq
Lmax
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

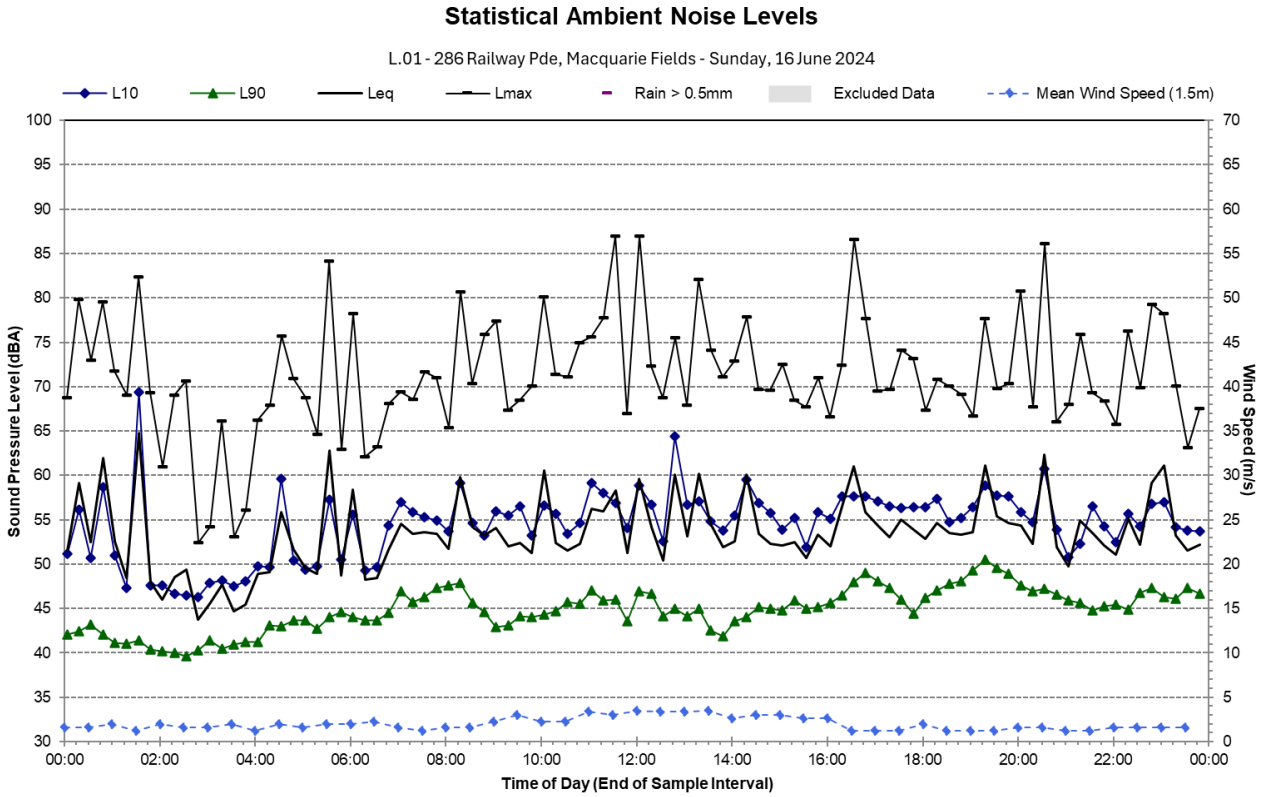

Statistical Ambient Noise Levels
L.01 - 286 Railway Pde, Macquarie Fields - Tuesday, 11 June 2024
L10
L90
Leq
Lmax
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

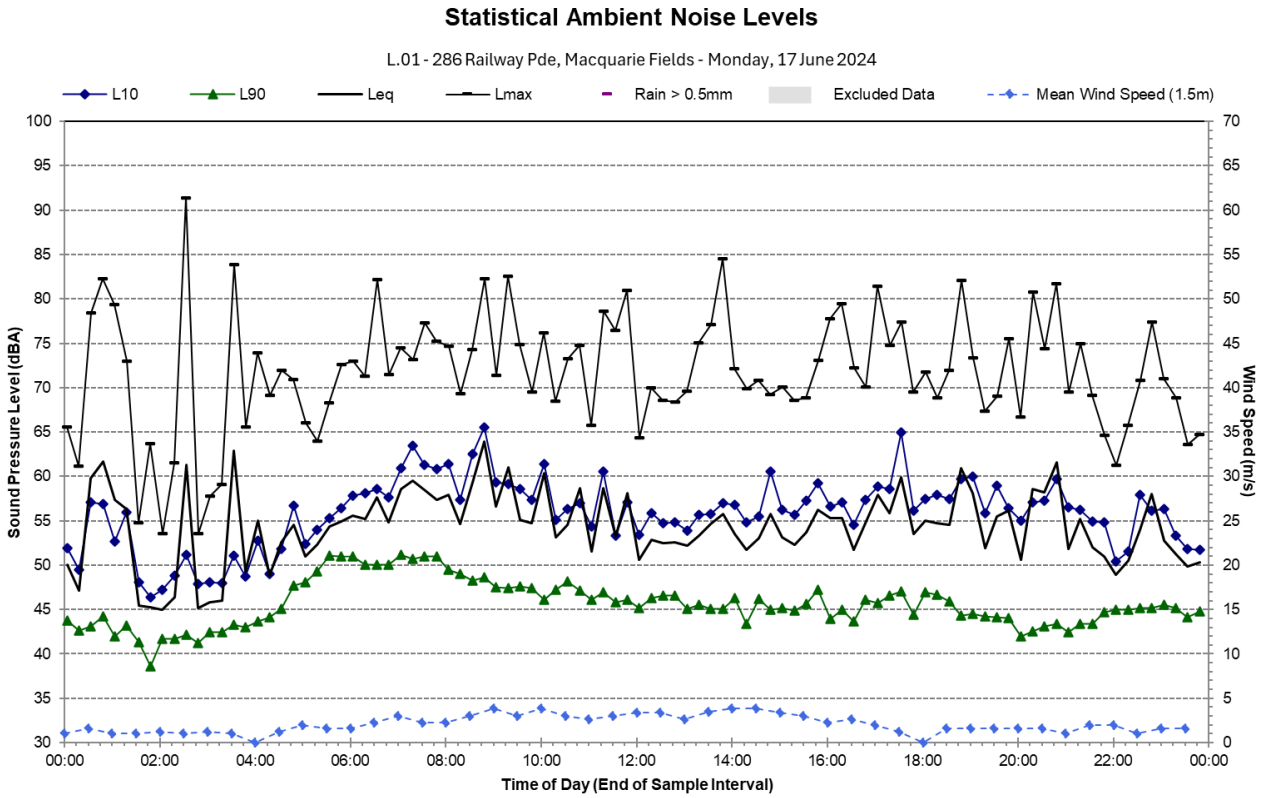

Statistical Ambient Noise Levels
L.01 - 286 Railway Pde, Macquarie Fields - Wednesday, 12 June 2024
L10
L90
Leq
Lmax
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

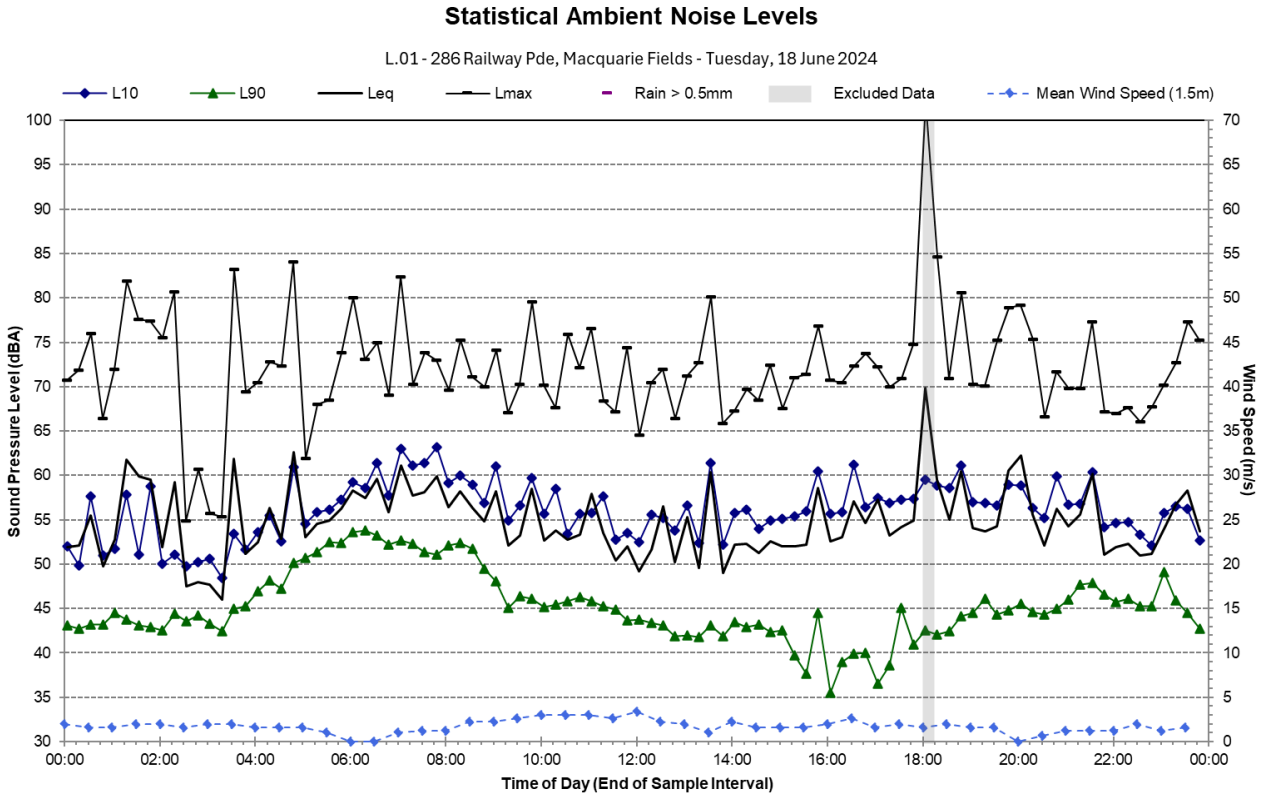

Statistical Ambient Noise Levels
L.01 - 286 Railway Pde, Macquarie Fields - Thursday, 13 June 2024
L10
L90
Leq
Lmax
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

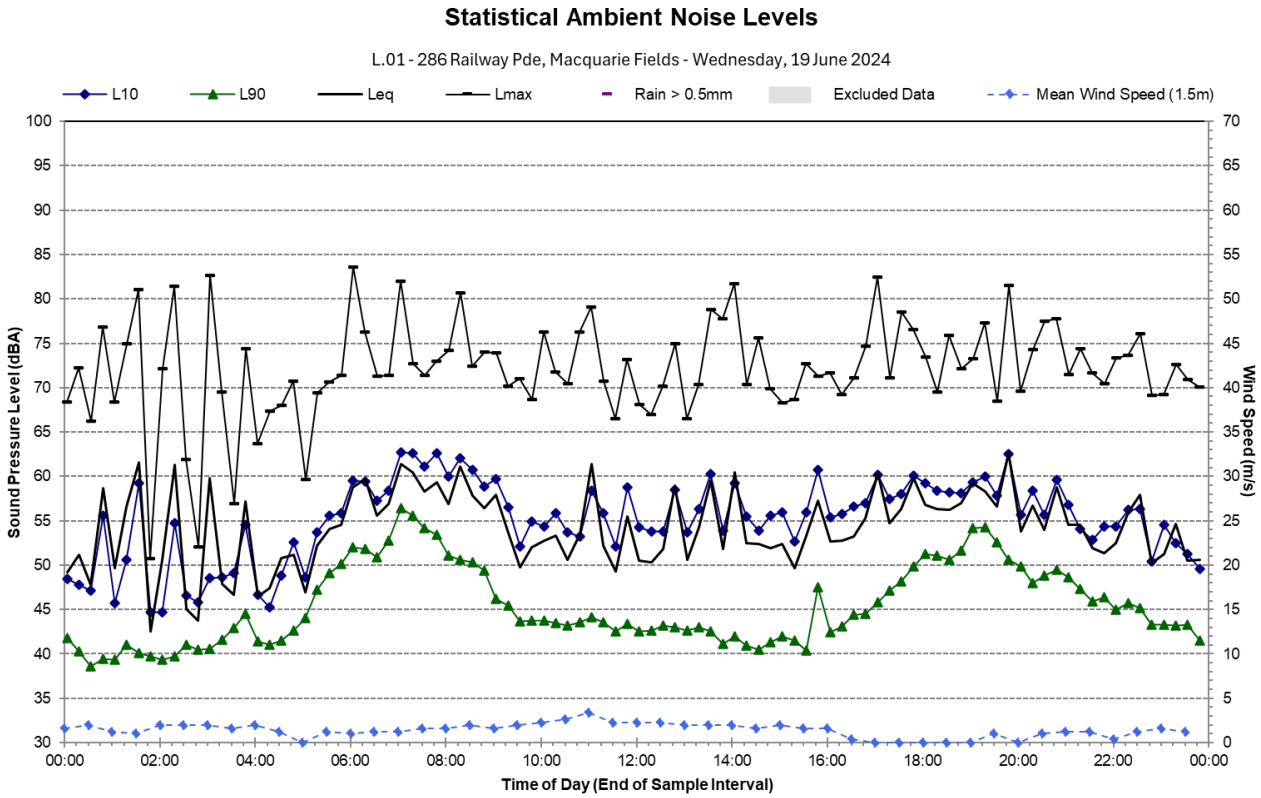

Statistical Ambient Noise Levels
L.01 - 286 Railway Pde, Macquarie Fields - Friday, 14 June 2024
L10
L90
Leq
Lmax
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

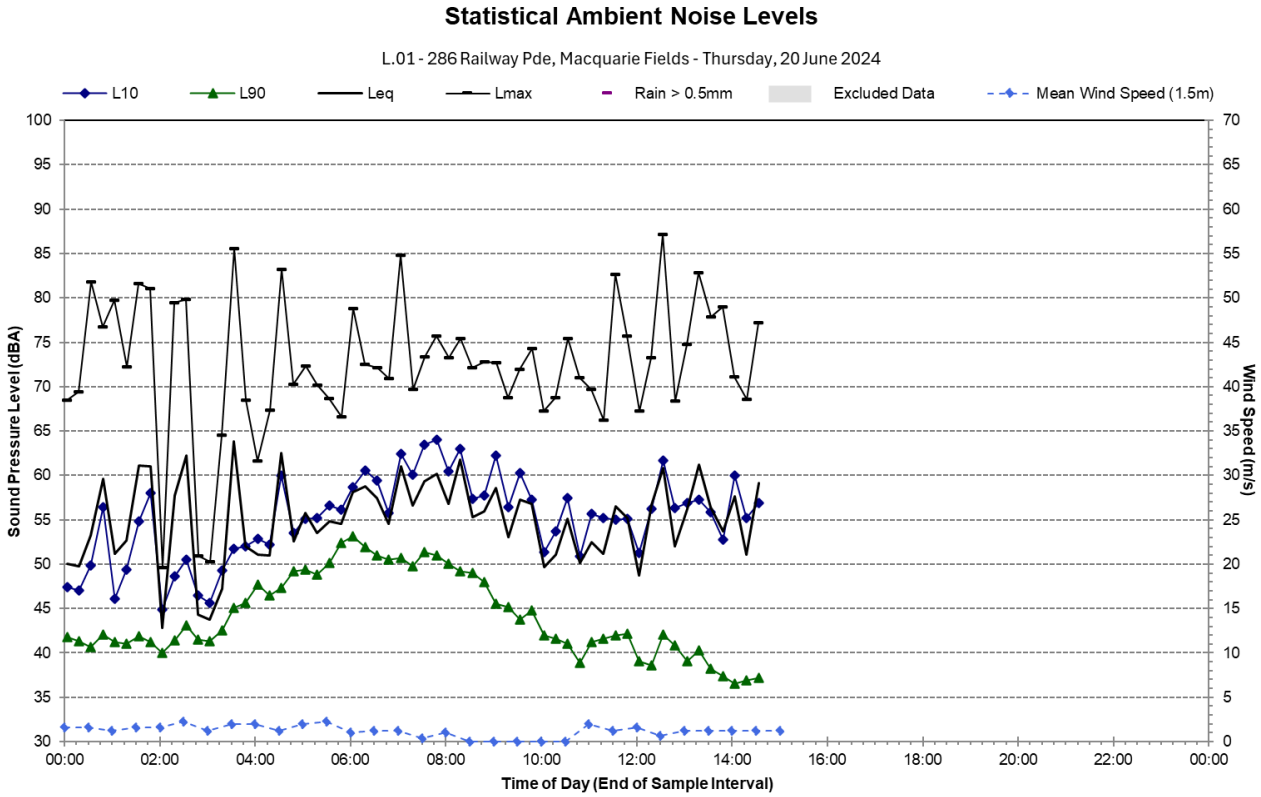

Statistical Ambient Noise Levels
L.01 - 286 Railway Pde, Macquarie Fields - Saturday, 15 June 2024
L10
L90
Leq
Lmax
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
L.01 - 286 Railway Pde, Macquarie Fields - Sunday, 16 June 2024
L10
L90
Leq
Lmax
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
L.01 - 286 Railway Pde, Macquarie Fields - Monday, 17 June 2024
L10
L90
Leq
Lmax
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
L.01 - 286 Railway Pde, Macquarie Fields - Tuesday, 18 June 2024
L10
L90
Leq
Lmax
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
L.01 - 286 Railway Pde, Macquarie Fields - Wednesday, 19 June 2024
L10
L90
Leq
Lmax
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
L.01 - 286 Railway Pde, Macquarie Fields - Thursday, 20 June 2024
L10
L90
Leq
Lmax
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

Noise Monitoring Location	L.02
Noise Monitoring Address	**12 Macquarie Links Drive, Macquarie Fields**

Logger Device Type: Svantek 957, Logger Serial No: 98464

Sound Level Meter Device Type: B&K 2250L, Sound Level Meter Serial No: 3004636

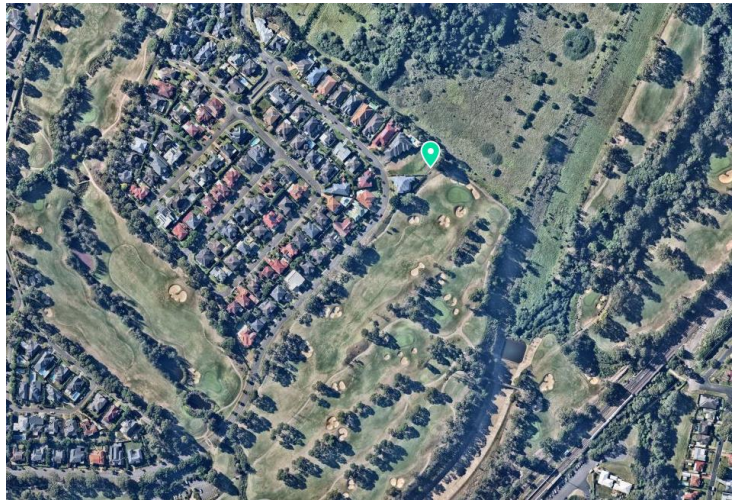
Ambient noise logger deployed at 12 Macquarie Links Drive, Macquarie Fields. Logger located in the empty lot facing the rail corridor...

Attended noise measurements indicate the ambient noise environment at this location is controlled by distant road traffic noise from the Hume Motorway. Natural noise sources such as birds also contribute to the L_{Aeq} at this location. Trains and Aircraft also dominant the LAeq when present.

Recorded Noise Levels (LAmax) 20/06/2024:

Local road traffic noise – 43 to 55 dBA
Aircraft – 49 to 61 dBA
Trains – 41 to 49 dBA
Distant traffic from Hume Motorway – 38 to 42 dBA

Map of Noise Monitoring Location



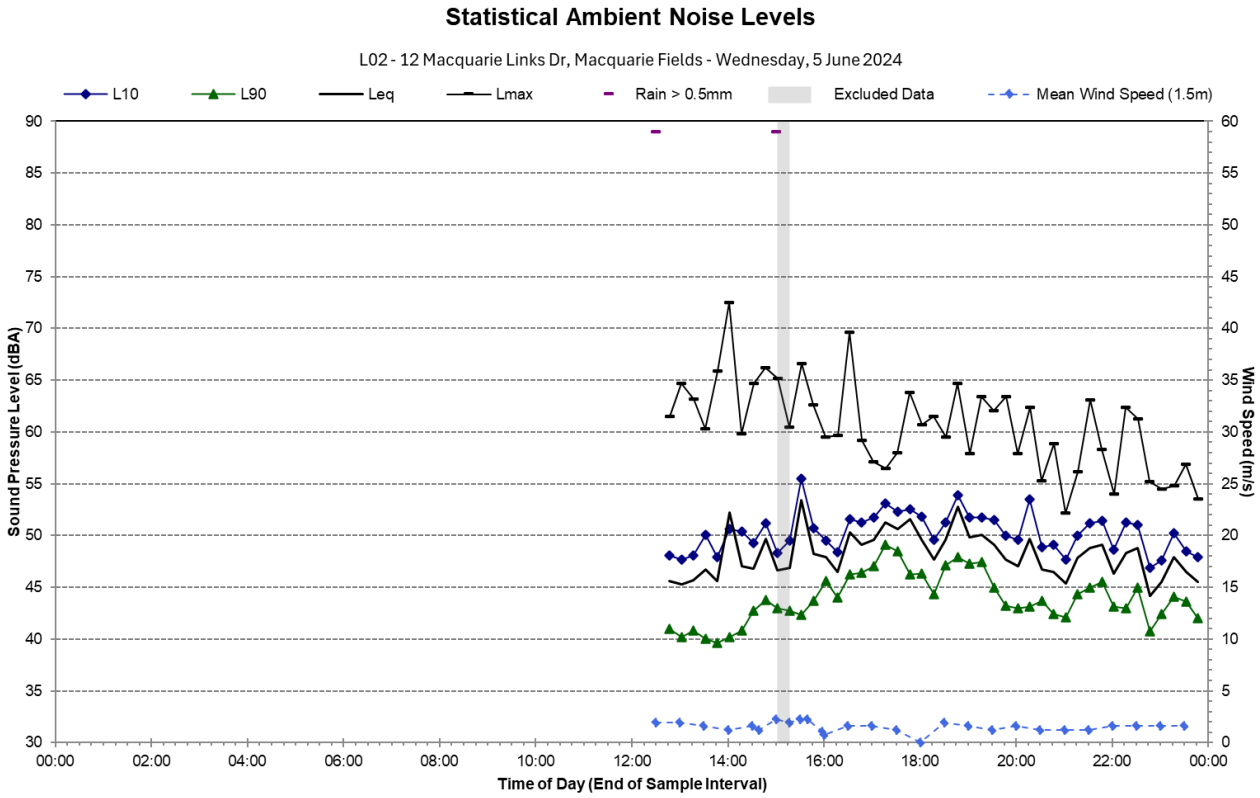
Ambient Noise Logging Results ICNG Defined Time Periods

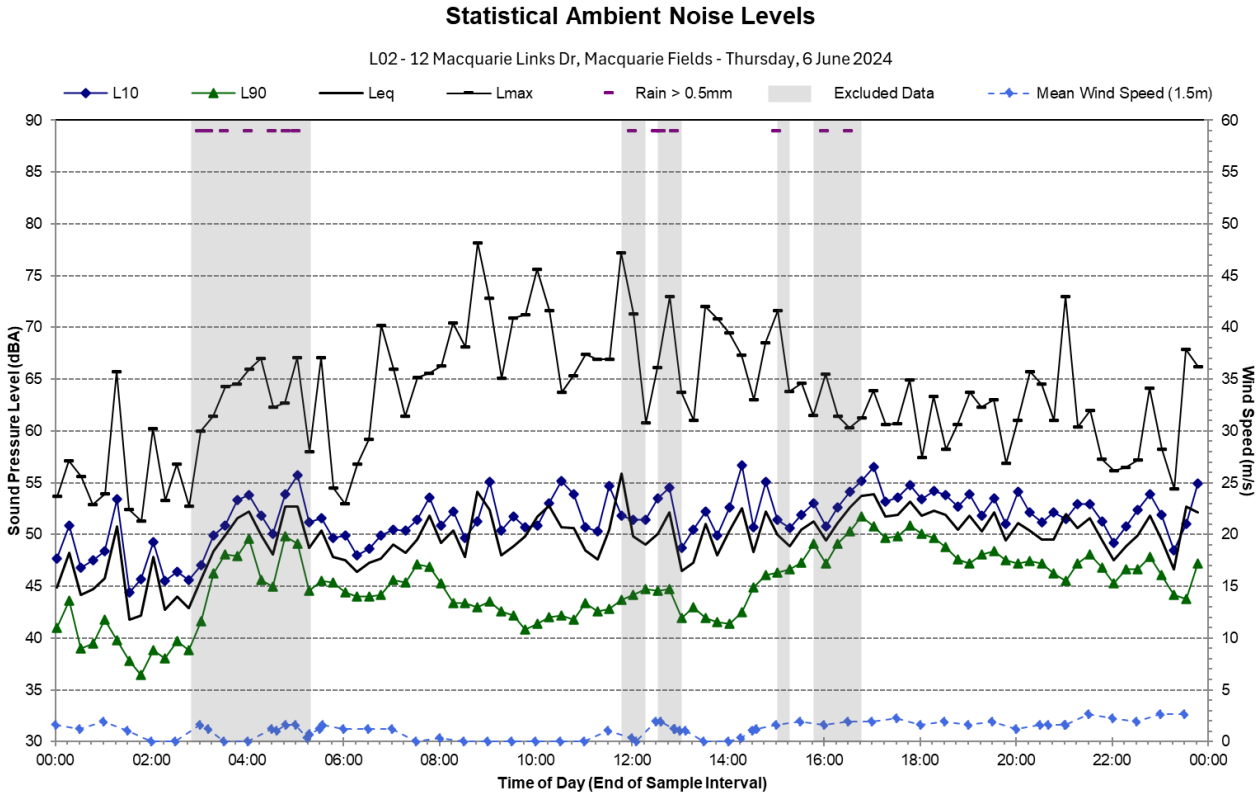
Monitoring Period	Noise Level (dBA)			
	RBL	L_{Aeq}	L10	L1
Daytime	42	51	52	58
Evening	43	50	51	57
Night-time	39	49	50	52

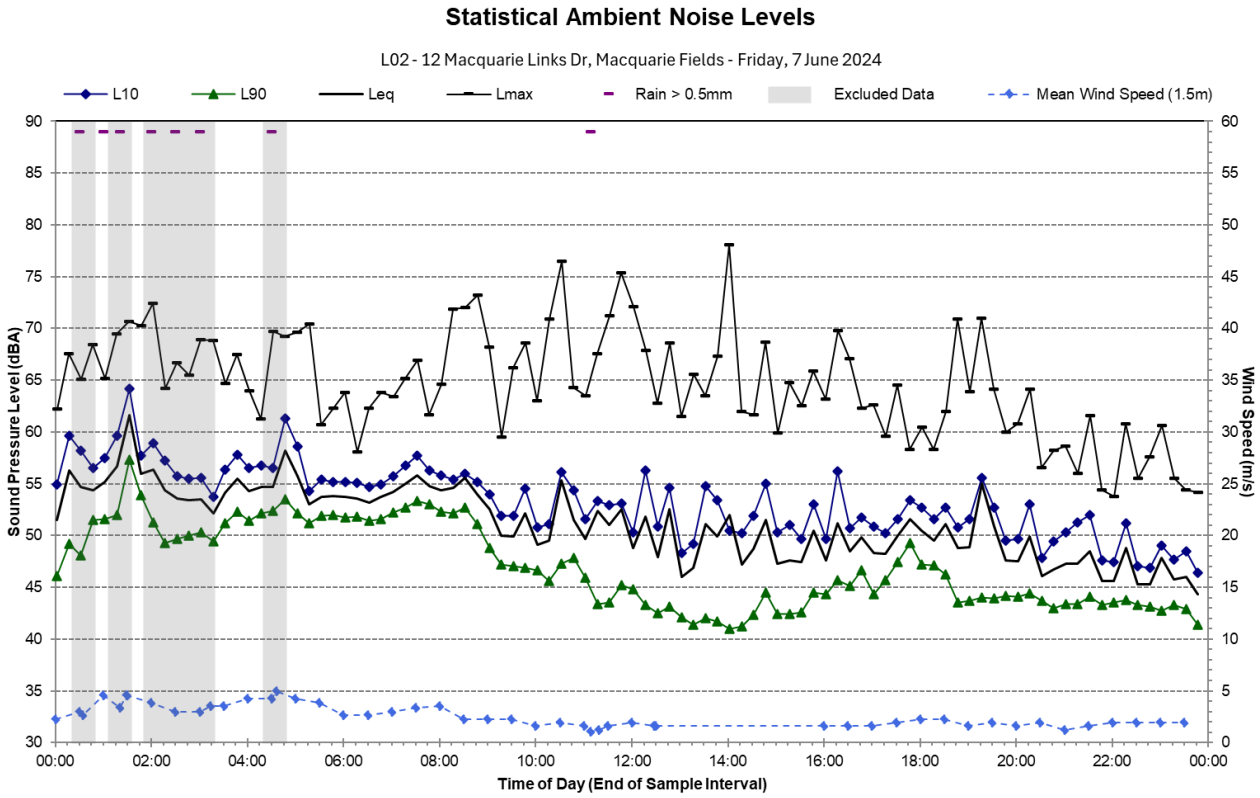
Attended Noise Measurement Results

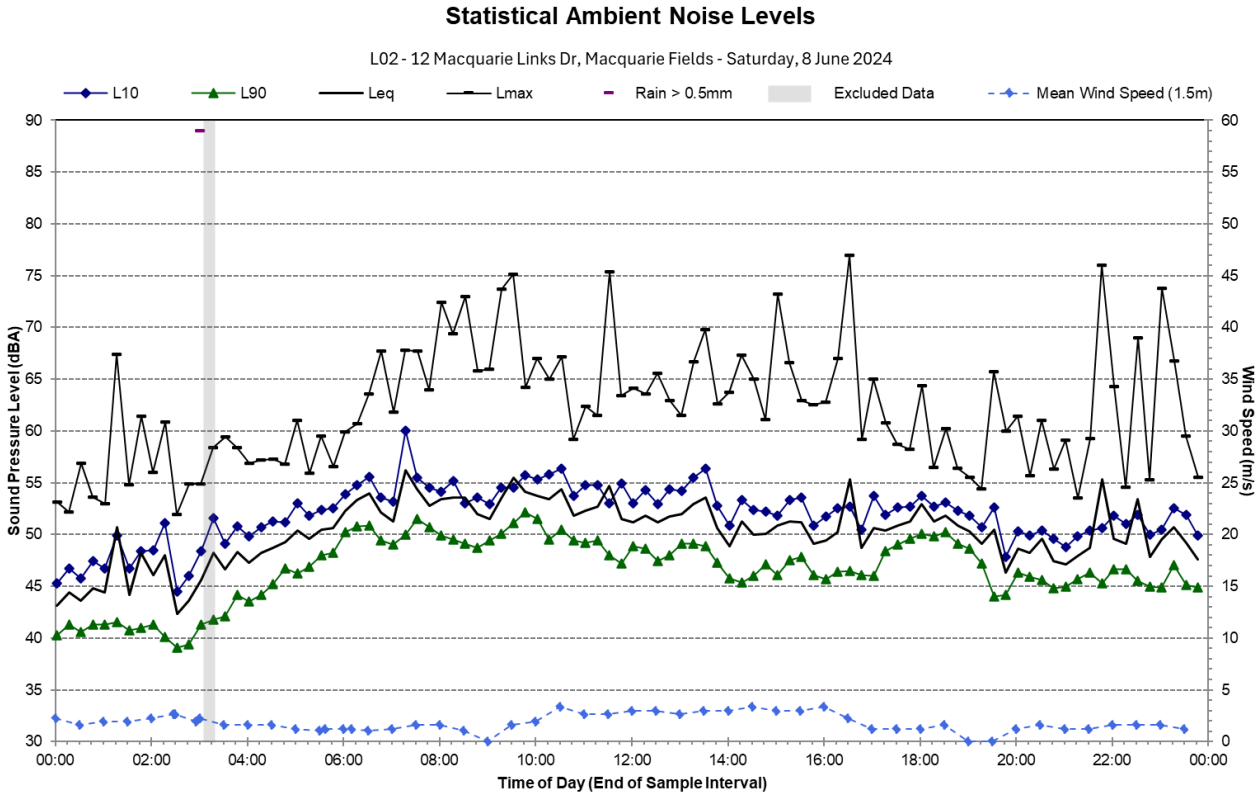
Date	Start Time	Measured Noise Level (dBA)		
		LA90	L_{Aeq}	L_{Amax}
20/06/2024	15:27	38	47	61

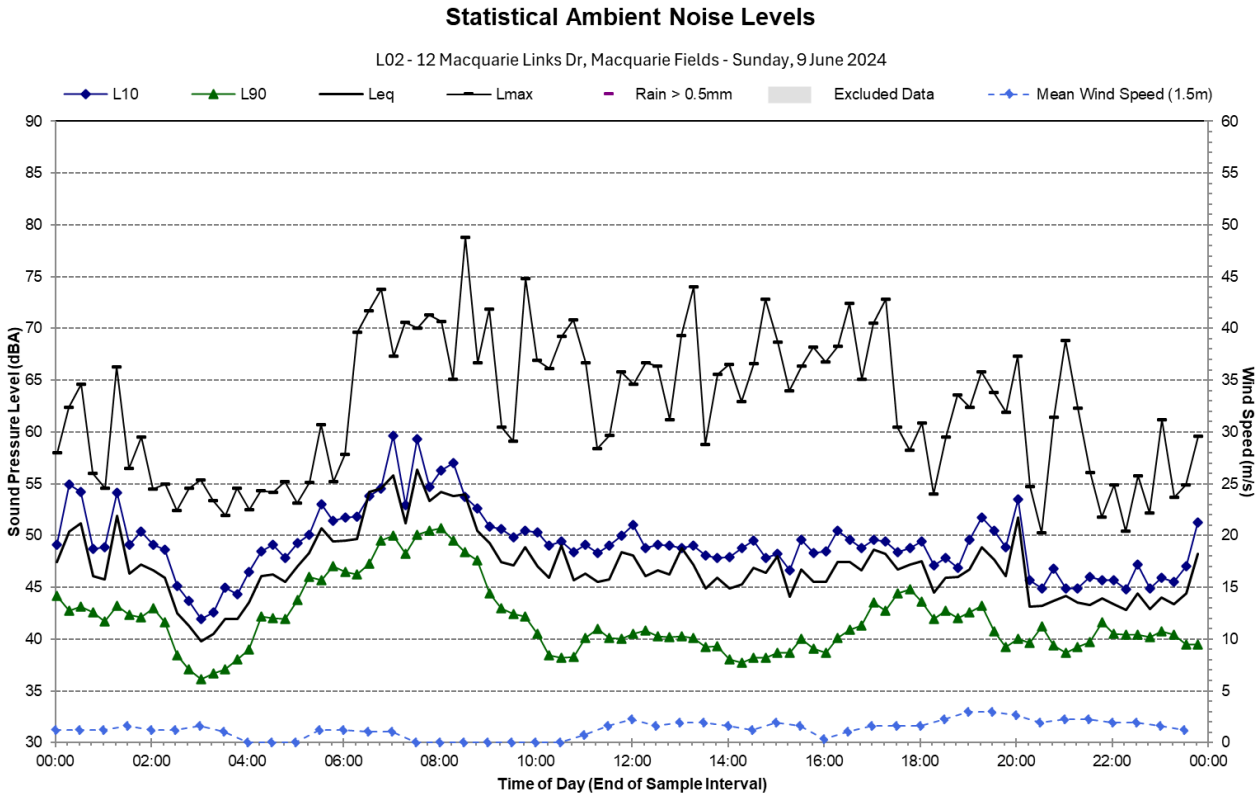
Photo of Noise Monitoring Location

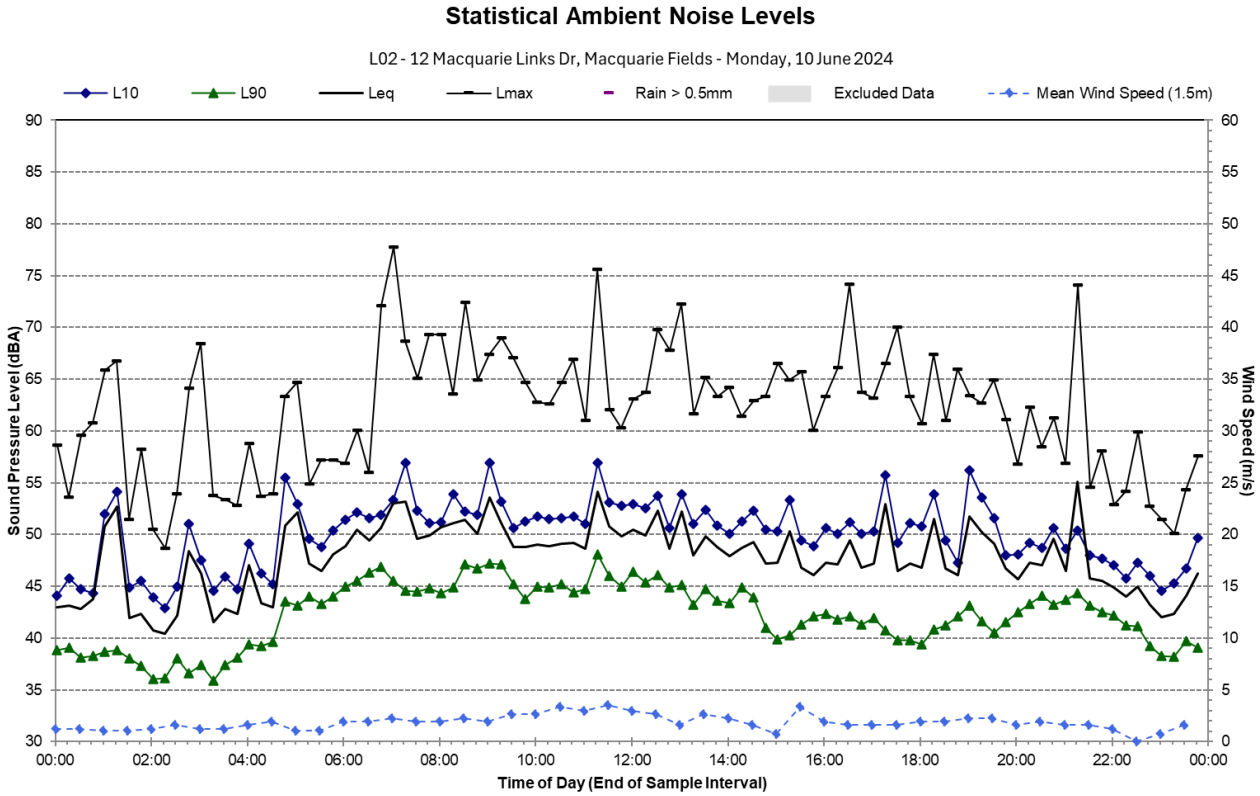

Statistical Ambient Noise Levels
L02 - 12 Macquarie Links Dr, Macquarie Fields - Wednesday, 5 June 2024
L10
L90
Leq
Lmax
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

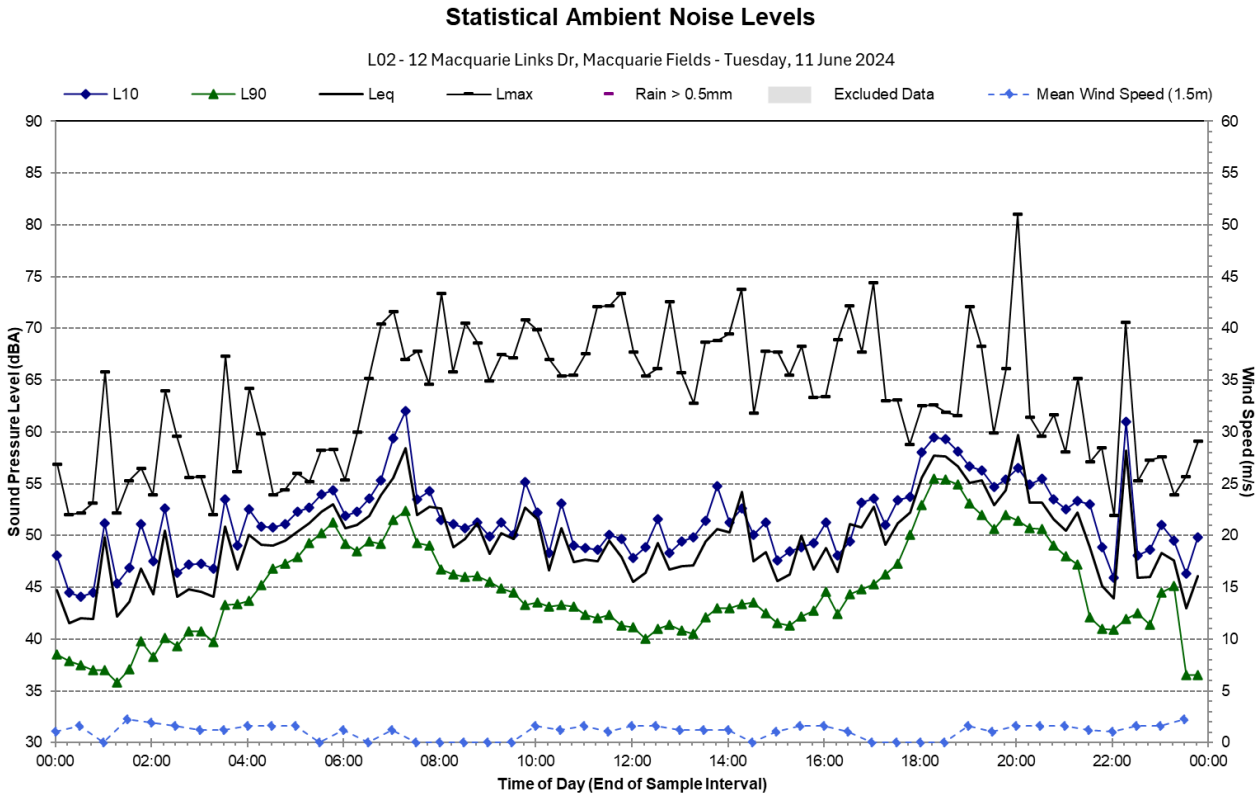

Statistical Ambient Noise Levels
L02 - 12 Macquarie Links Dr, Macquarie Fields - Thursday, 6 June 2024
L10
L90
Leq
Lmax
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

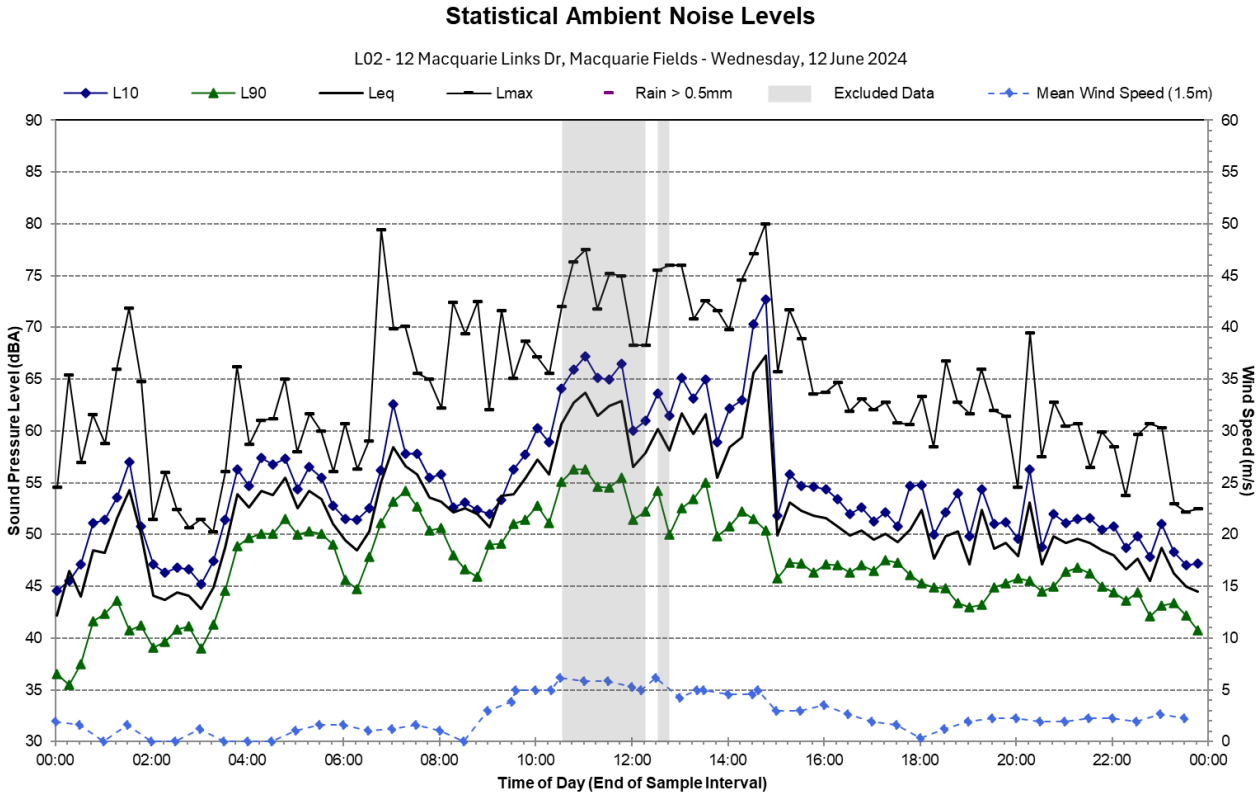

Statistical Ambient Noise Levels
L02 - 12 Macquarie Links Dr, Macquarie Fields - Friday, 7 June 2024
L10
L90
Leq
Lmax
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

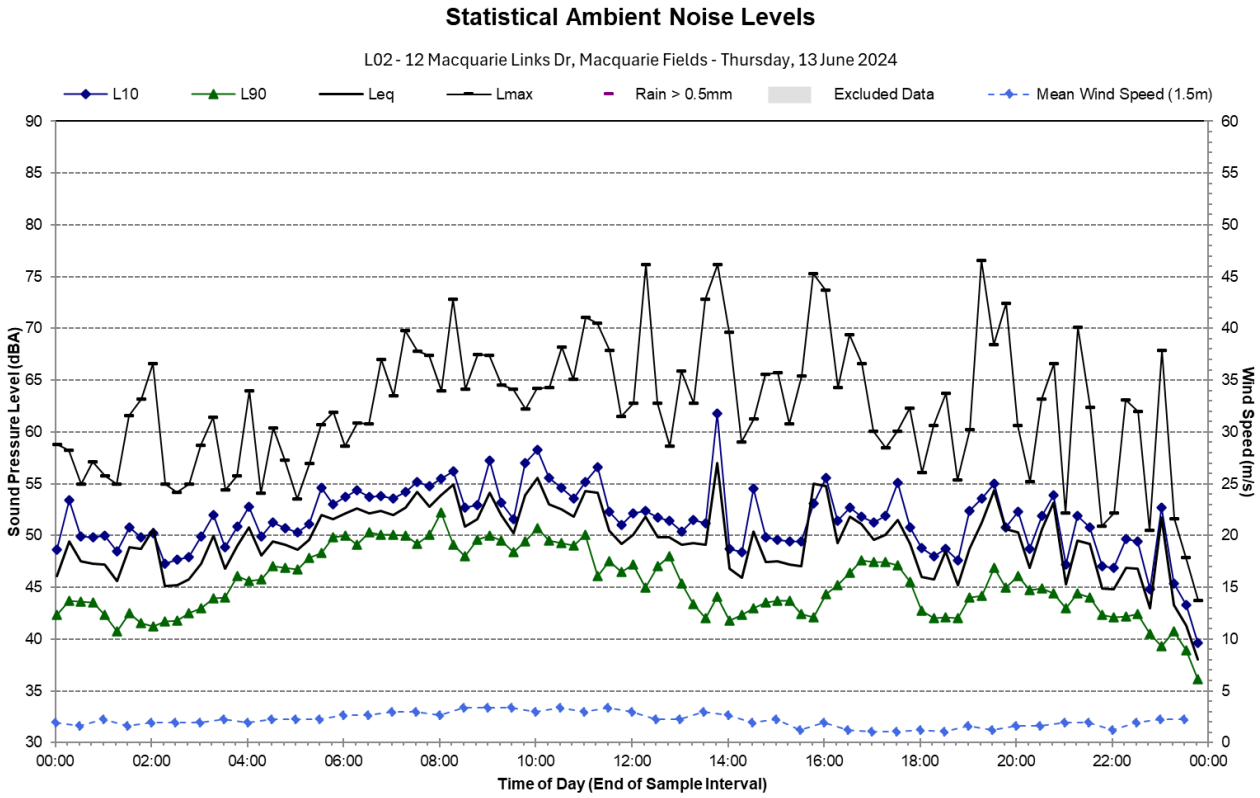

Statistical Ambient Noise Levels
L02 - 12 Macquarie Links Dr, Macquarie Fields - Saturday, 8 June 2024
L10
L90
Leq
Lmax
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

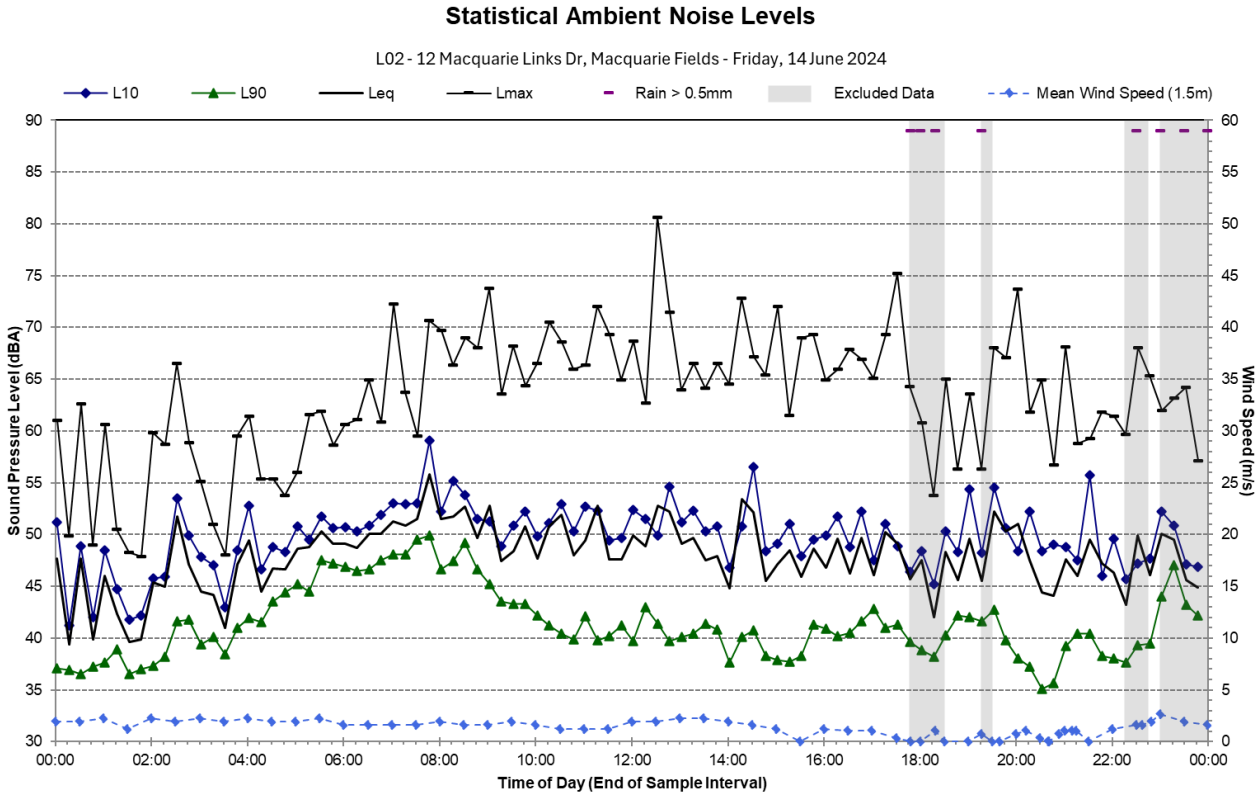

Statistical Ambient Noise Levels
L02 - 12 Macquarie Links Dr, Macquarie Fields - Sunday, 9 June 2024
L10
L90
Leq
Lmax
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

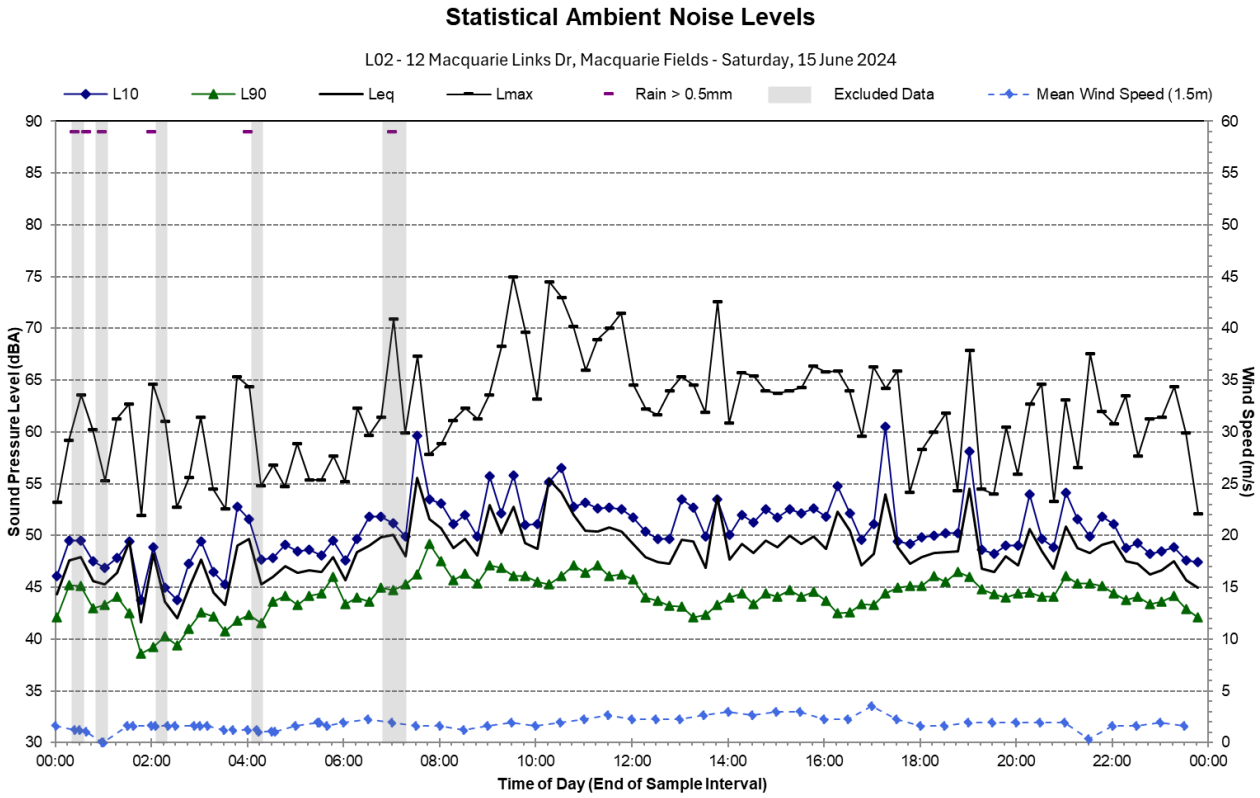

Statistical Ambient Noise Levels
L02 - 12 Macquarie Links Dr, Macquarie Fields - Monday, 10 June 2024
L10
L90
Leq
Lmax
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

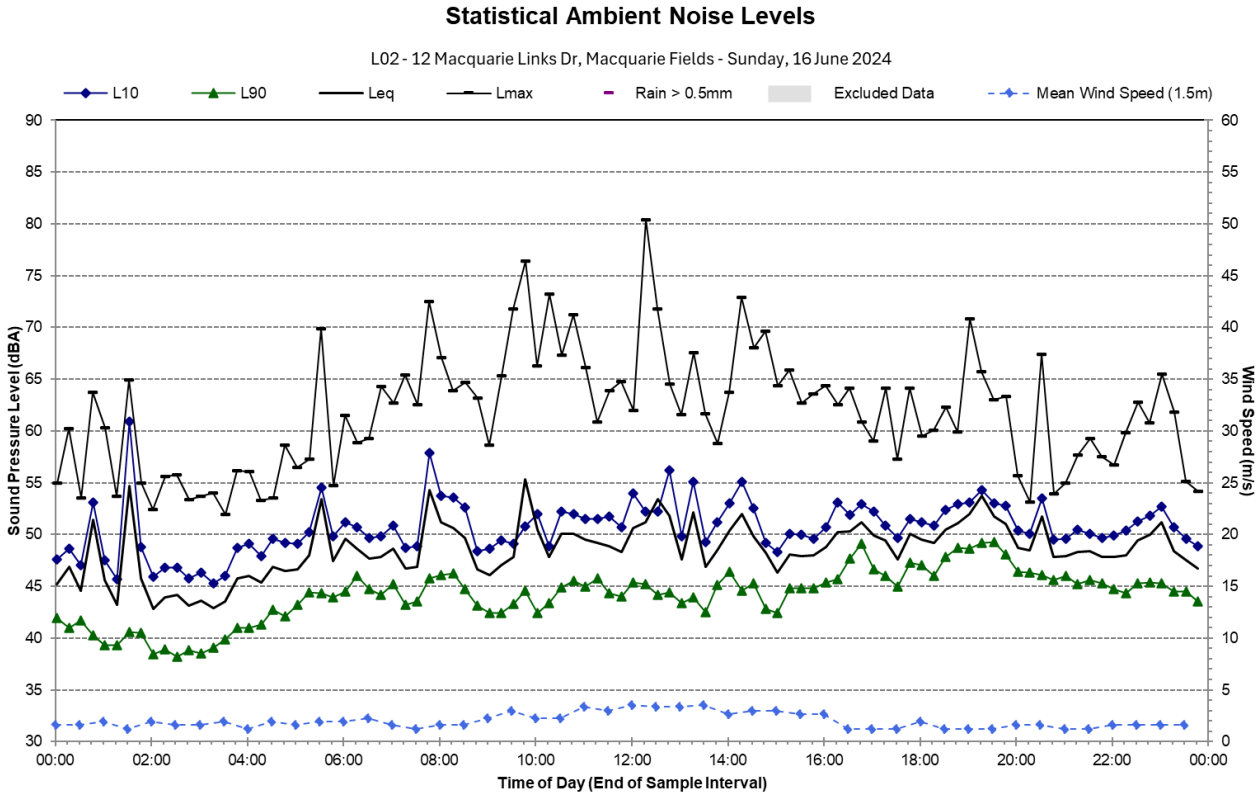

Statistical Ambient Noise Levels
L02 - 12 Macquarie Links Dr, Macquarie Fields - Tuesday, 11 June 2024
L10
L90
Leq
Lmax
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

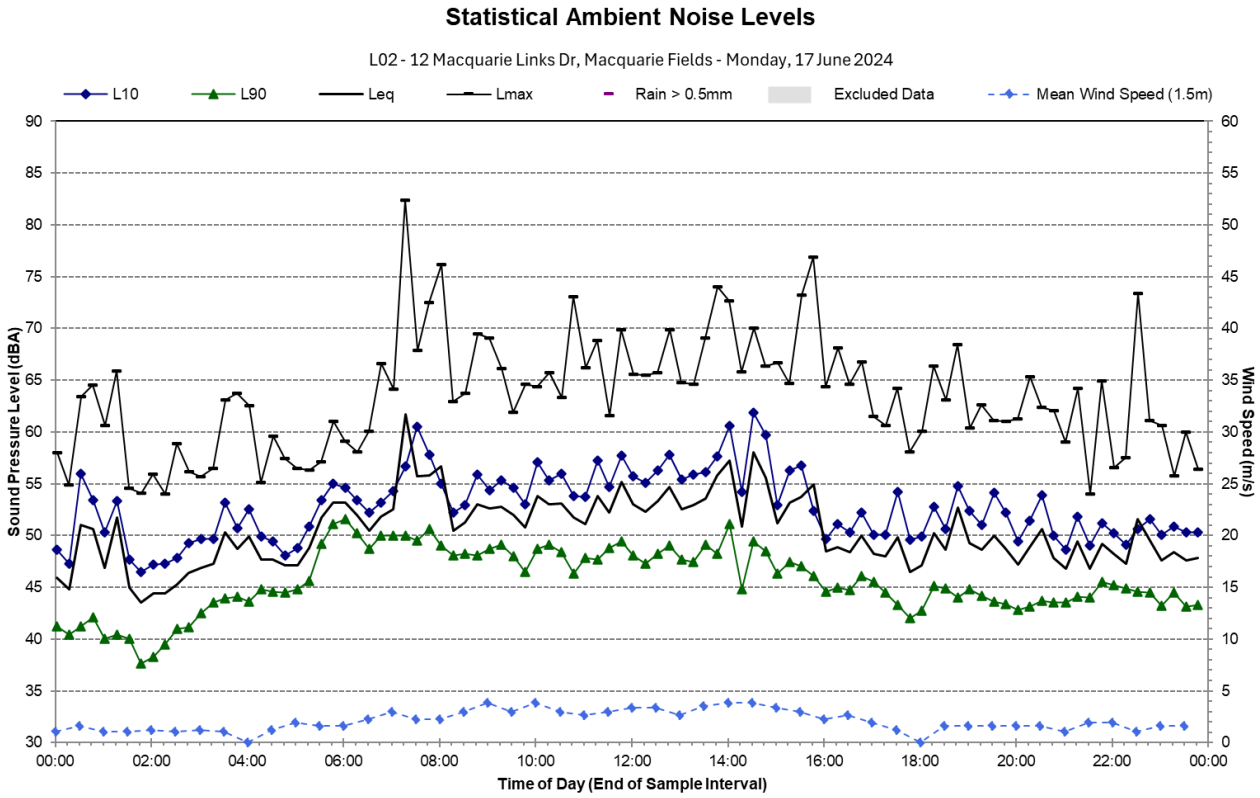

Statistical Ambient Noise Levels
L02 - 12 Macquarie Links Dr, Macquarie Fields - Wednesday, 12 June 2024
L10
L90
Leq
Lmax
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

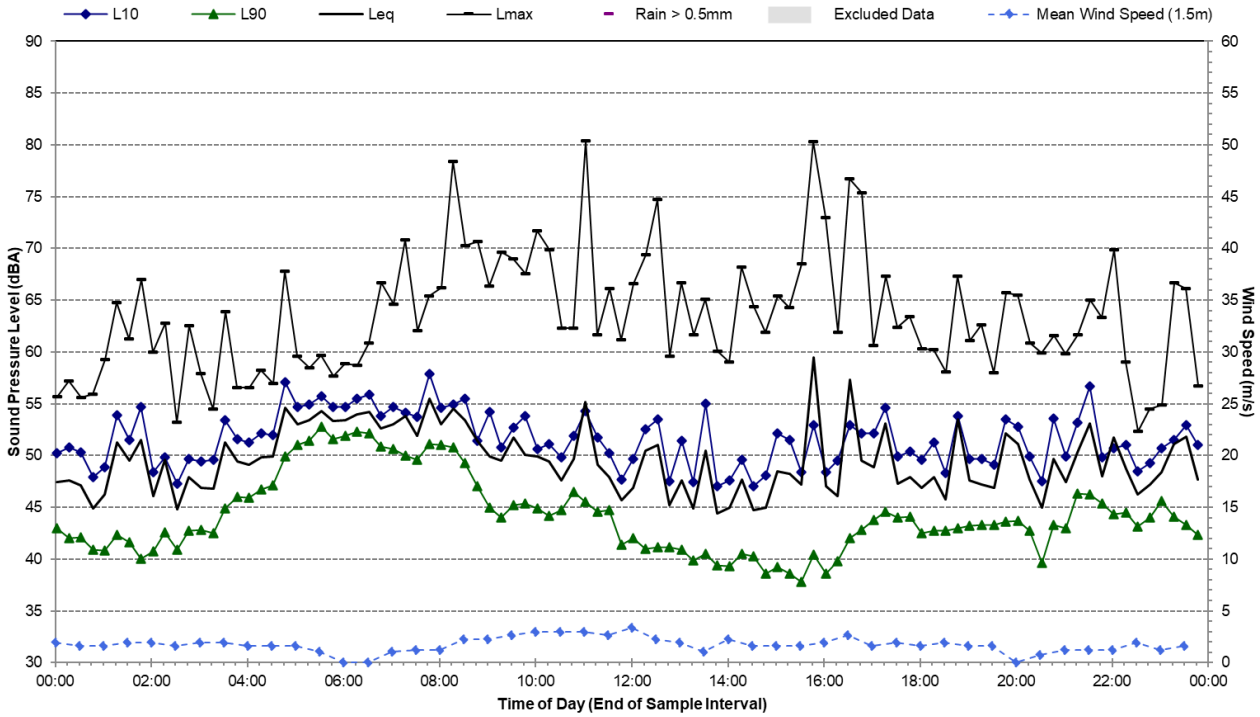

Statistical Ambient Noise Levels
L02 - 12 Macquarie Links Dr, Macquarie Fields - Thursday, 13 June 2024
L10
L90
Leq
Lmax
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

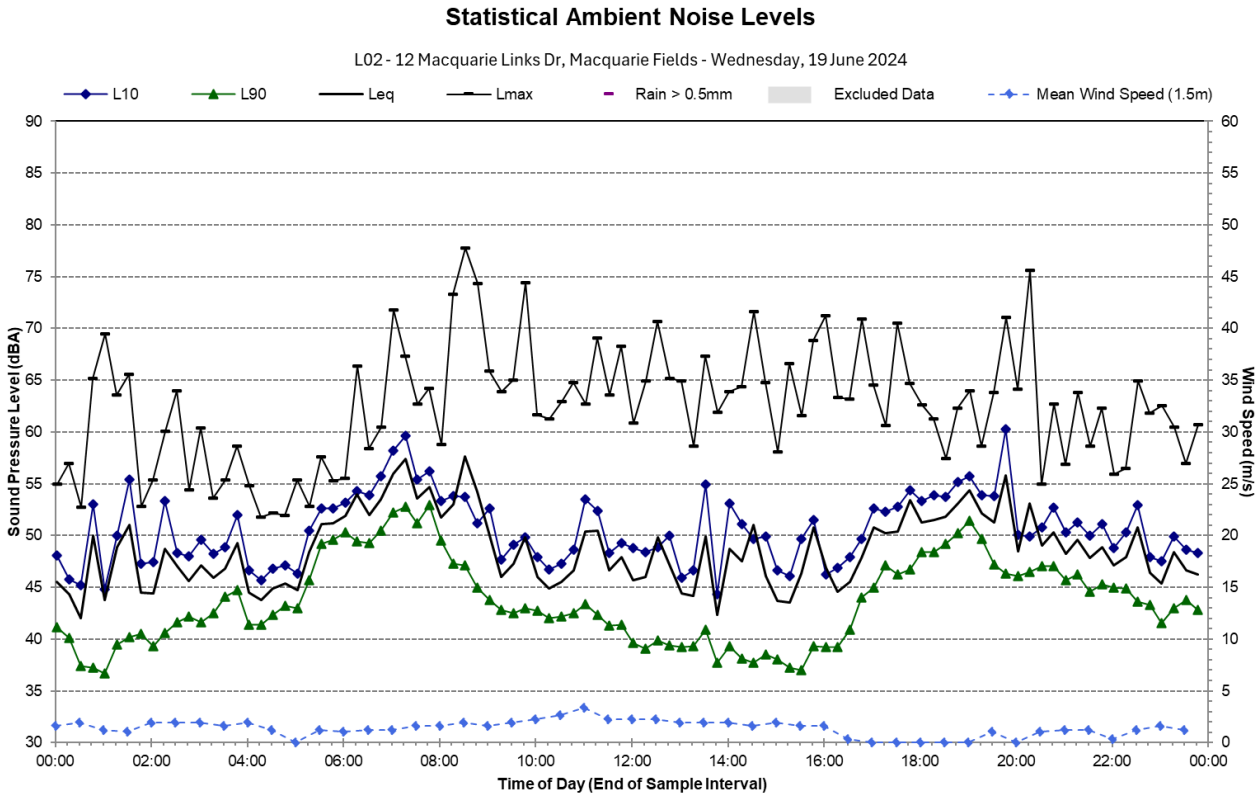

Statistical Ambient Noise Levels
L02 - 12 Macquarie Links Dr, Macquarie Fields - Friday, 14 June 2024
L10
L90
Leq
Lmax
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

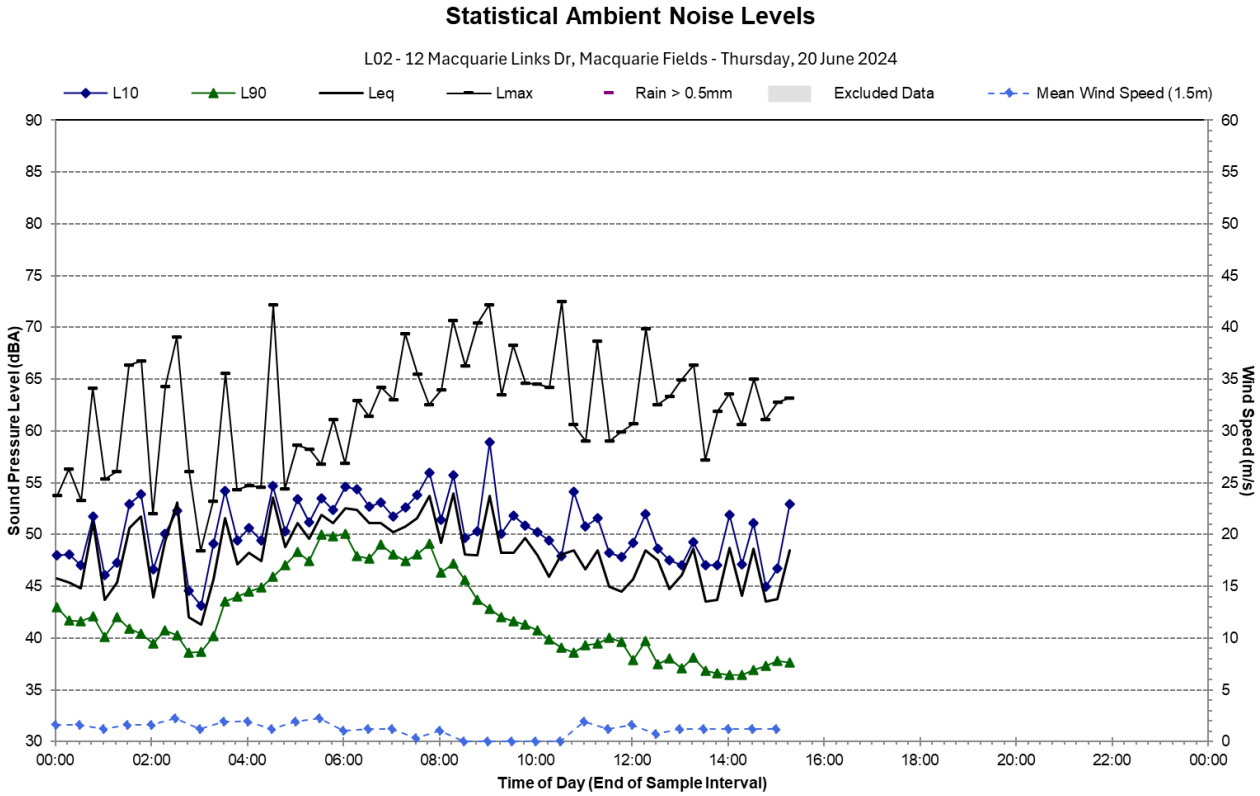

Statistical Ambient Noise Levels
L02 - 12 Macquarie Links Dr, Macquarie Fields - Saturday, 15 June 2024
L10
L90
Leq
Lmax
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
L02 - 12 Macquarie Links Dr, Macquarie Fields - Sunday, 16 June 2024
L10
L90
Leq
Lmax
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
L02 - 12 Macquarie Links Dr, Macquarie Fields - Monday, 17 June 2024
L10
L90
Leq
Lmax
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
L02 - 12 Macquarie Links Dr, Macquarie Fields - Tuesday, 18 June 2024
L10
L90
Leq
Lmax
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
L02 - 12 Macquarie Links Dr, Macquarie Fields - Wednesday, 19 June 2024
L10
L90
Leq
Lmax
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)


Statistical Ambient Noise Levels
L02 - 12 Macquarie Links Dr, Macquarie Fields - Thursday, 20 June 2024
L10
L90
Leq
Lmax
Rain > 0.5mm
Excluded Data
Mean Wind Speed (1.5m)
Sound Pressure Level (dBA)
Wind Speed (m/s)
Time of Day (End of Sample Interval)

Appendix C Construction Equipment

Safe Accessible Transport program – Macquarie Fields Station Upgrade

Noise and Vibration Impact Assessment

Aurecon

SLR Project No.: 610.031874

13 August 2024

Equipment Item			Chainsaw	Chipper	Concrete Mixer Truck	Concrete Pump	Concrete Saw[1]	Concrete Vibrator	Elevated Working Platform	Excavator (14 tonne)	Excavator (22 tonne)	Flatbed Truck	Forklift	Grinder	Hand Tools	Hand Tools (electric)	Hi-Rail Truck	Lighting - Diesel Generator	Mobile Crane - Franna	Mobile Crane (100 tonne)	Mobile Crane (400 tonne)	Piling - Bored	Jack hammer[1]	Roller - Vibratory (12 tonne)[1]	Suction Truck	Truck
SWL LAeq(15min)			114	120	103	106	119	102	97	97	99	100	101	98	94	96	102	98	98	100	106	111	114	109	109	107
On-time in 15-minute period			5	15	7.5	7.5	5	15	15	7.5	7.5	15	15	7.5	15	15	15	15	7.5	15	15	7.5	5	15	15	5
Ref	**Scenario**	**SWL**																								
W.001	Site establishment and enabling works	111							X				X		X			X		X					X	X
W.002	Vegetation clearing	120	X	X											X											X
W.003	Main works - excavation and piling works	114									X				X		X	X				X	X	X		X
W.004	Main works - concrete works around footbridge	108			X	X		X									X	X								
W.005	Main works - installation of new footbridge, lift and stairs	110							X			X	X		X		X	X			X					X
W.006	Decommissioning - removal of stairs and footbridge	112							X	X		X	X		X		X				X		X			
W.007	Main works - platform works, resurfacing etc	117			X	X	X	X	X					X			X	X		X			X	X		
W.008	Main works - platform canopies	109							X		x	X	X			X	X	X		X						X
W.009	Main works - station building modifications	112			X	X		X	X							X		X					X			X
W.010	Main works - station access works, footpaths etc	114			X	X		X						X				X					X	X		X
W.011	Main works – electrical upgrades	112			X	X		X			X	X			X										X	
W.012	Finishing works – landscaping, furniture etc	104								X						X			X							X
W.013	Site compound – general operation	105								X		X			X			X		X						

Appendix D Mitigation Measures

Safe Accessible Transport program – Macquarie Fields Station Upgrade

Noise and Vibration Impact Assessment

Aurecon

SLR Project No.: 610.031874

13 August 2024

Transport CNVG-PTI Standard Mitigation and Management Measures

Action required	Applies to	Details
Management measures		
Implementation of any project specific mitigation measures required	Airborne noise. Ground-borne noise and vibration	In addition to the measures set out in this table, any project specific mitigation measures identified in the EIA documentation (e.g. REF, submissions or representations report) or approval or licence conditions must be implemented.
Implement stakeholder consultation measures	Airborne noise. Ground-borne noise and vibration	Periodic notification (monthly letterbox drop/ email and website notification) detailing all upcoming construction activities delivered to sensitive receivers at least 7 days prior to commencement of relevant works. In addition to periodic notification, the following strategies may be adopted on a case-by-case basis: • Project-specific website • Project infoline • Construction response line • Email distribution list • Web-based surveys • Social media • Community and stakeholder meetings • Community-based forums (if required by approval conditions).
Register of Noise Sensitive Receivers	Airborne noise Ground-borne noise and vibration	A register of most affected noise and vibration sensitive receivers (NVSRs) would be kept on site. The register would include the following details for each NVSR: • Address of receiver • Category of receiver (e.g., residential, commercial etc.) • Contact name and phone number. The register may be included as part of the Project's Community Liaison Plan or similar document and maintained in accordance with the requirements of this plan.
Construction hours and Scheduling	Airborne noise Ground-borne noise and vibration	Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating noise with special audible characteristics and/or vibration levels should be scheduled during less sensitive time periods.
Construction respite period	Airborne noise Ground-borne noise and vibration	Noise with special audible characteristics and vibration generating activities (including jack and rock hammering, sheet and pile driving, rock breaking and vibratory rolling) may only be carried out in continuous blocks, not exceeding three hours each, with a minimum respite period of one hour between each block. 'Continuous' includes any period during which there is less than a one-hour respite between ceasing and recommencing any of the work.

Action required	Applies to	Details
		No more than two consecutive nights of noise with special audible characteristics and/or vibration generating work may be undertaken in the same NCA over any 7-day period, unless otherwise approved by the relevant authority.
Site inductions	Airborne noise Ground-borne noise and vibration	All employees, contractors and subcontractors are to receive an environmental induction. The induction must at least include: • All relevant project specific and standard noise and vibration mitigation measures. • Relevant licence and approval conditions. • Permissible hours of work. • Any limitations on noise generating activities with special audible characteristics. • 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. No excessive revving of plant and vehicle engines. Controlled release of compressed air.
Monitoring	Airborne noise Ground-borne noise and vibration	A noise monitoring program should be carried out for the duration of works in accordance with the Construction Noise and Vibration Management Plan and any approval and licence conditions
Attended vibration measurements	Ground-borne noise and vibration	Attended vibration measurements shall be undertaken at all buildings within 25 m of vibration generating activities when these activities commence 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 and vibration	The CEMP must be regularly updated to account for changes in noise and vibration management issues and strategies.
Source controls		
Plan worksites and activities to minimise noise and vibration	Airborne noise Ground-borne vibration	Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site.

Action required	Applies to	Details
Equipment selection	Airborne noise Ground-borne noise and vibration	Use quieter and less vibration emitting construction methods where feasible and reasonable.
Maximum noise levels	Airborne-noise	The noise levels of plant and equipment must have operating Sound Power or Sound Pressure Levels compliant with the allowable noise levels in Appendix C (of the CNVG-PTI).
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 allowable noise levels in Appendix C (of the CNVG-PTI).
Use and siting of plant	Airborne-noise	Simultaneous operation of noisy plant within discernible range of a sensitive receiver is to be avoided. 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.
Non-tonal 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, including delivery vehicles.
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.
Construction related traffic	Airborne noise	Schedule and route vehicle movements away from sensitive receivers and during less sensitive times. Limit the speed of vehicles and avoid the use of engine compression brakes. Maximise on-site storage capacity to reduce the need for truck movements during sensitive times.
Silencers on mobile plant	Airborne noise	Where possible reduce noise from mobile plant through additional fittings including: Residential grade mufflers Damped hammers such as ‘City’ Model Rammer Hammers Air Parking brake engagement is silenced.
Prefabrication of materials off-site	Airborne noise	Where practicable, pre-fabricate and/or prepare materials off-site to reduce noise with special audible characteristics occurring on site. Materials can then be delivered to site for installation.

Action required	Applies to	Details
Engine compression brakes	Airborne noise	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 whilst ensuring that the occupational health and safety of workers is maintained. Appendix F of AS 2436: 1981 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.

Transport CNVG-PTI Additional Mitigation Measures

Measure	Description	Abbreviation
Periodic Notification	For each Transport project, a notification is produced and distributed to stakeholders via letterbox drop or distributed to the project postal and/or email mailing lists. The same information will be published on the Transport corporate website or equivalent. Periodic notifications provide an overview of current and upcoming work across the project and other topics of interest. The objective is to engage, inform and provide project-specific messages. Advanced warning of potential disruptions (e.g., traffic changes or noisy works) can assist in reducing the impact on stakeholders. The approval conditions for projects specify requirements for notification to sensitive receivers where work may impact them. Content and length are determined on a project-by-project basis and must be approved by Transport prior to distribution. Most projects distribute notifications monthly. Each notification is graphically designed within a branded template. In certain circumstances media advertising may also be used to supplement Periodic Notifications, where considered effective. Periodic Notification may be advised by the Transport Community Engagement Team in cases where AMMM are not triggered as shown in Tables 9 to 11, for example where community impacts extend beyond noise and vibration (traffic, light spill, parking, etc.). In these circumstances the Transport Community Engagement Team will determine the community engagement strategy on a case-by-case basis.	PN

Measure	Description	Abbreviation
Verification Monitoring	Verification monitoring of noise and/or vibration during construction may be conducted at the affected receiver(s) or a nominated representative location (typically the nearest receiver where more than one receiver has been identified). Monitoring can be in the form of either unattended logging (i.e., for vibration provided there is an immediate feedback mechanism such as SMS capabilities) or operator attended surveys (i.e., for specific periods of construction noise). Verification must be undertaken by suitably qualified, trained and experienced personnel using appropriate equipment and methodology, with reference to AS1055. Refer to EPA's guideline 'Approved methods for the measurement and analysis of environmental noise in NSW' for additional guidance on personnel, methodology and equipment requirements. The purpose of monitoring is to confirm that: • Construction noise and vibration from the project are consistent with the predictions in the noise assessment. • Mitigation and management of construction noise and vibration is appropriate for receivers affected by the work. Where noise monitoring finds the actual noise levels exceed those predicted in the noise assessment then immediate refinement of mitigation measures may be required and the CNVIS amended.	V
Specific Notification	Specific notifications are in the form of a personalised letter or phone call to identified stakeholders no later than seven calendar days ahead of construction activities that are likely to exceed the noise objectives. In addition to Specific Notifications and letters communications representatives from the contractor would visit identified stakeholders at least 48 hours ahead of potentially disturbing construction activities and provide an individual briefing. • Letters may be letterbox dropped, hand distributed or emailed. • Phone calls provide affected stakeholders with personalised contact and tailored advice, with the opportunity to provide comments on the proposed work and their specific needs. • Individual briefings are used to inform stakeholders about the impacts of noisy activities and mitigation measures that will be implemented. Individual briefings provide affected stakeholders with personalised contact and tailored advice, with the opportunity to comment on the project. • Specific notifications are used to support periodic notifications, or to advertise unscheduled or high impact work and must be approved by Transport prior to implementation/distribution. Where impacts have already been captured in a Periodic Notification, a Specific Notification may not be required.	SN

Measure	Description	Abbreviation
Respite Offer	The purpose of a project specific respite offer is to provide residents subjected to lengthy periods of noise or vibration respite from an ongoing impact. The offer could comprise pre-purchased movie tickets, bowling activities, meal vouchers or similar offers designed to provide residents with a short break from impact of construction activity outside of their home. This measure is determined on a case-by-case basis and may not be applicable to all Transport projects.	RO
Alternative Accommodation	Alternative accommodation options may be provided for residents living near construction activities likely to incur unreasonably high impacts. Alternative accommodation will be determined on a case-by-case basis and should provide a like-for-like replacement for permanent residents, including provisions for pets, where reasonable and feasible.	AA
Alternative Construction Methodology	Where the vibration assessment identifies that the proposed construction method has a high risk of causing structural damage to buildings near the work, the proponent needs to consider alternative construction options to achieve compliance with the VMLs for building damage. For example, replace large rock breaker with smaller rock breakers or rock saws.	AC
Respite Period	OOHW during evening and night periods will be restricted so receivers are impacted for no more than three consecutive evenings and no more than two consecutive nights in the same NCA in any one week, except where there is Duration Reduction. A minimum respite period of four evenings/five nights shall be implemented between periods of consecutive evening and/or night work. Strong justification must be provided where it is not reasonable and feasible to implement these period restrictions (e.g. to minimise impacts to rail operations), and approval must be given by Transport through the OOHW Approval Protocol. Note: this management measure does not apply to OOHW Period 1 – Days.	RP
Duration Reduction	Where Respite Periods (see management measure above) are counterproductive to reducing noise and vibration impacts to the community, it may be beneficial to increase the number of consecutive evenings and/or nights through Duration Reduction to minimise the duration of the activity. This measure is determined on a project-by project basis and may not be applicable to all Transport projects. Impacted receivers must be consulted and evidence of community support for the Duration Reduction must be provided as justification for the Duration Reduction. A community engagement strategy must be agreed with and implemented in consultation with Transport Community and Stakeholder Engagement Representatives.	DR

Appendix E Construction Noise Contours

Safe Accessible Transport program – Macquarie Fields Station Upgrade

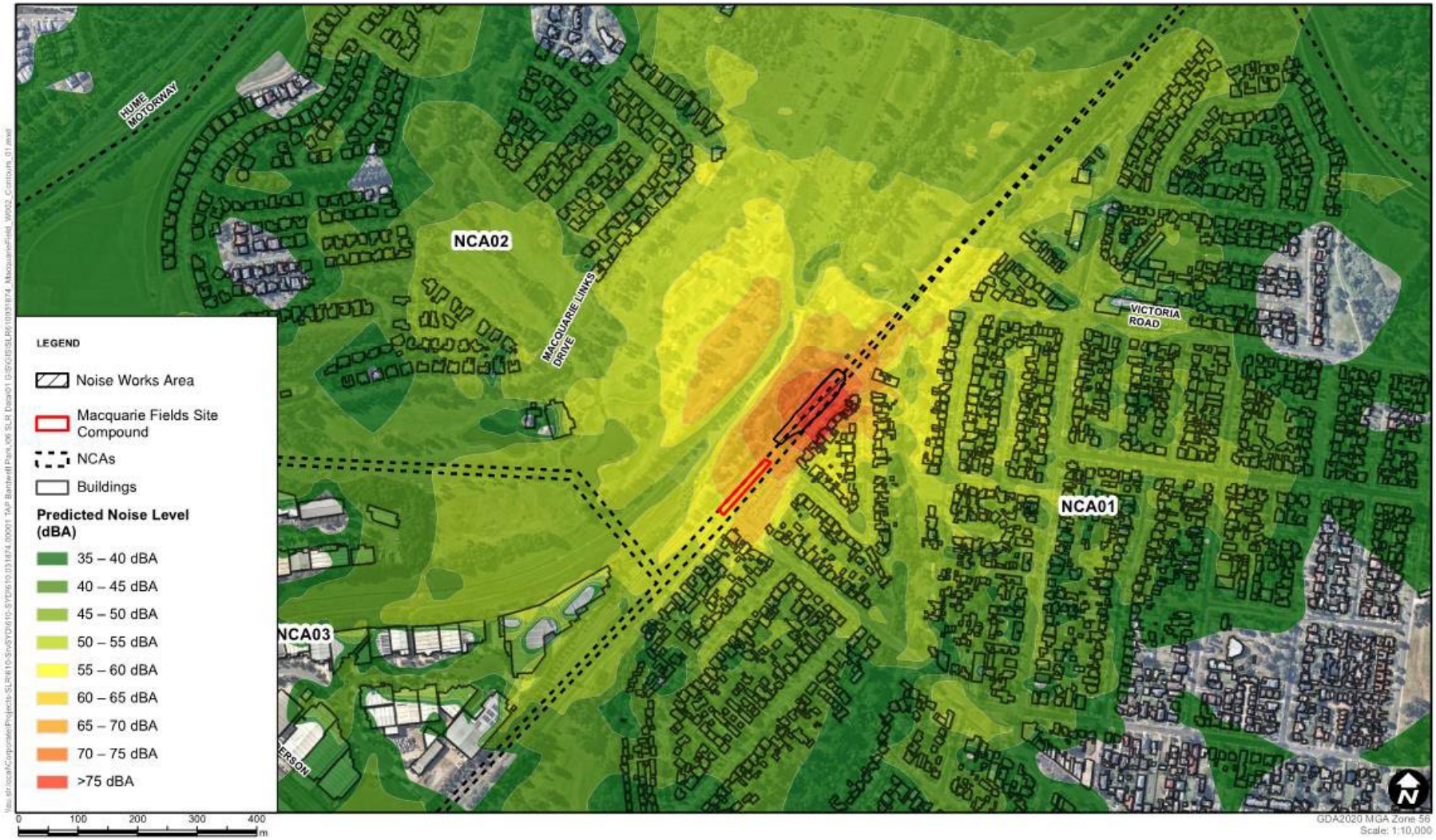
Noise and Vibration Impact Assessment

Aurecon

SLR Project No.: 610.031874

13 August 2024

W.002 – Vegetation Clearing

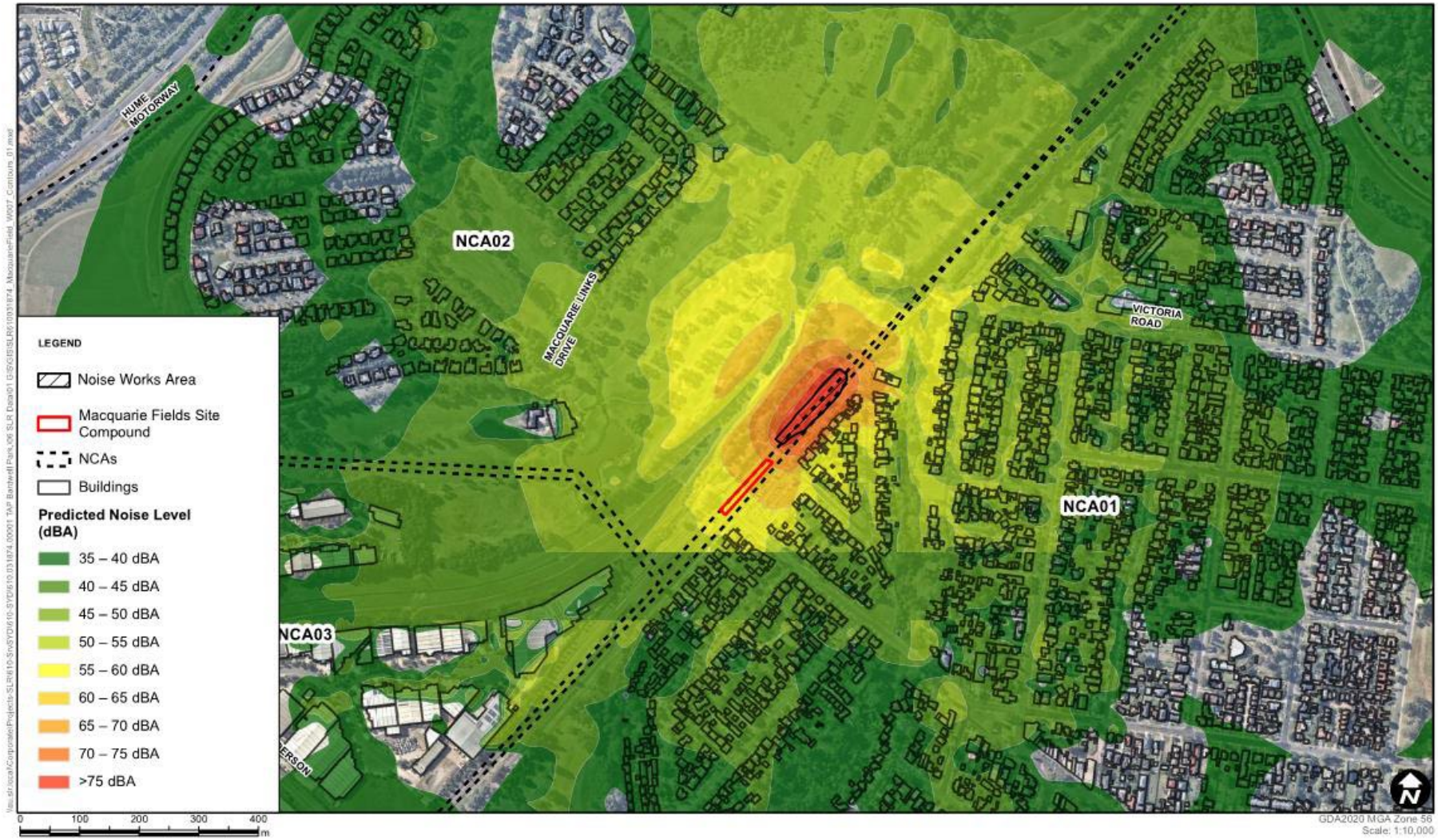


W.003 – Main Works - Excavation And Piling Works

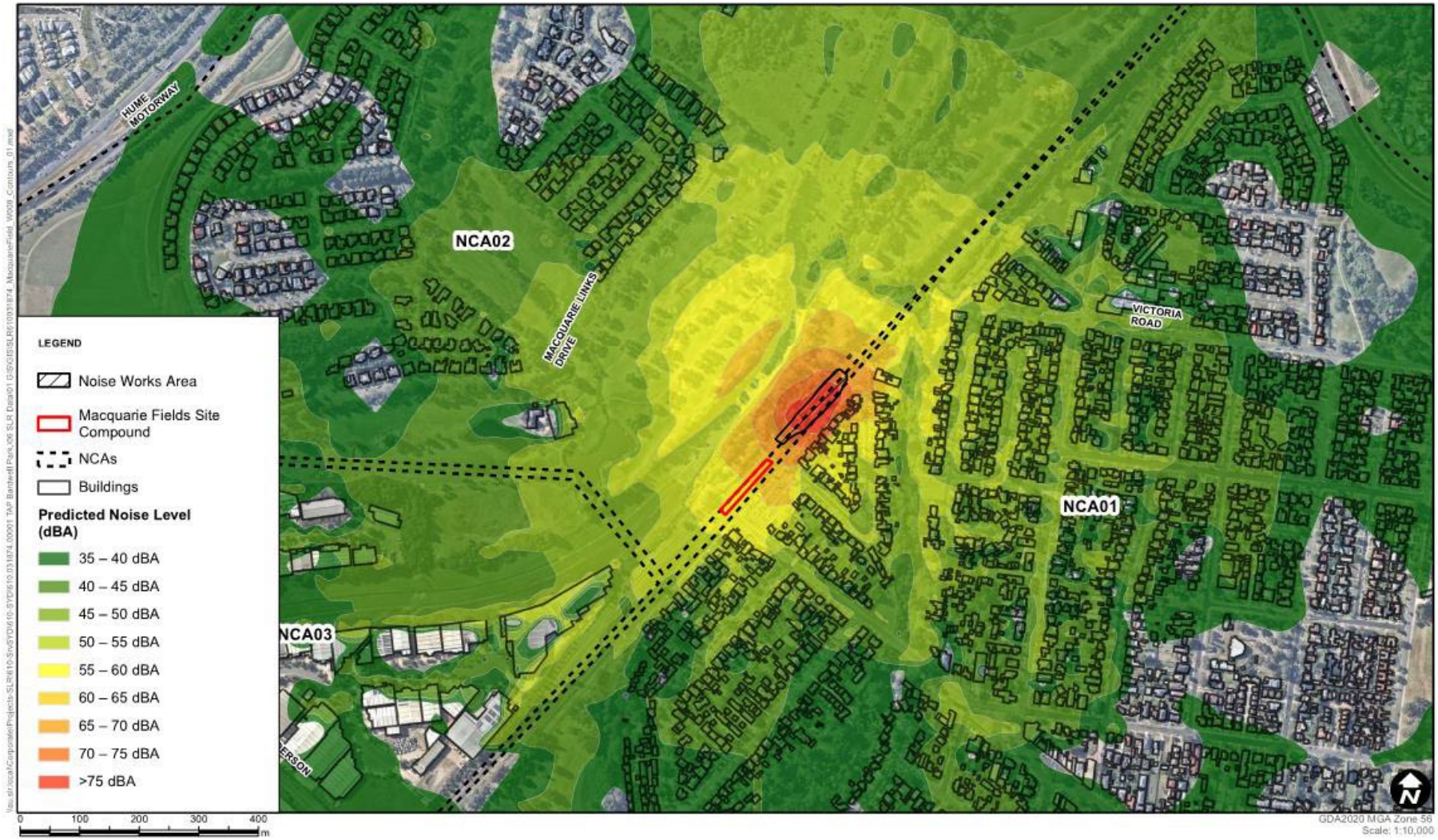
W.005 – Main Works - Installation Of New Footbridge, Lift, Stairs, And Electrical Supply Upgrades

W.006 – Decommissioning- Removal Of Stairs And Footbridge

W.007 – Main Works - Platform Works - Resurfacing, etc

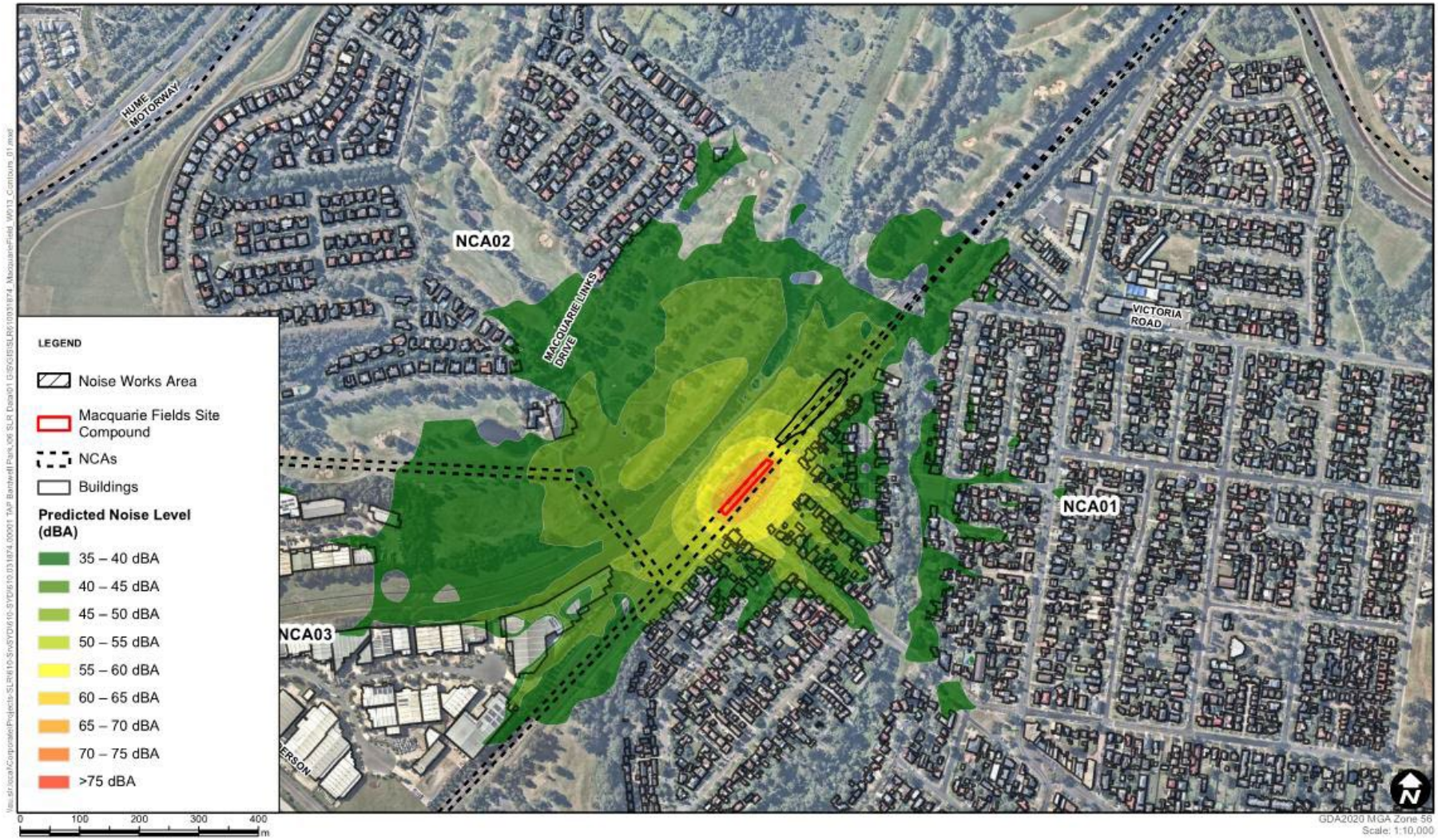


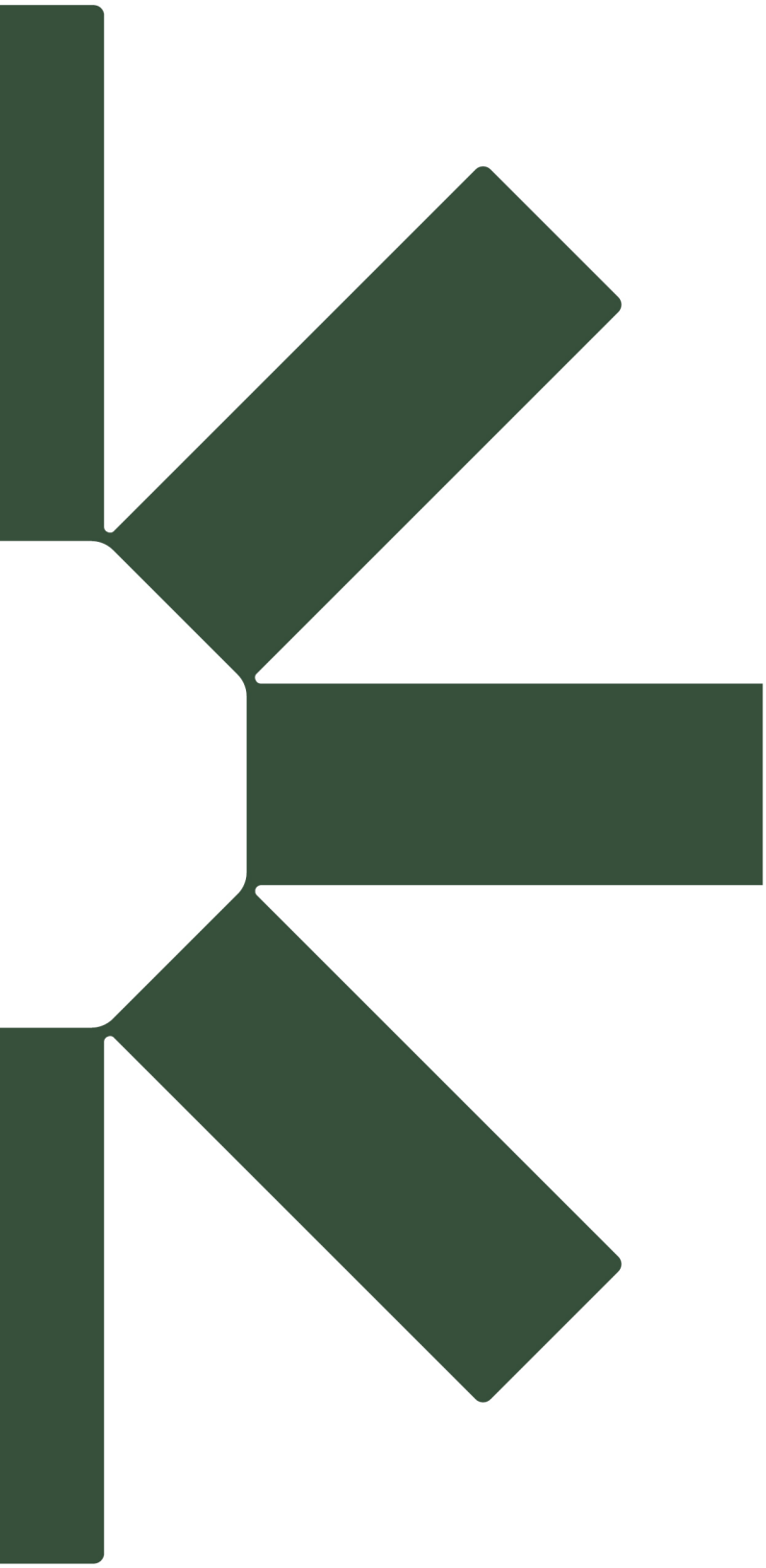
W.008 – Main Works - Installation Of New Platform Canopies



W.010 – Main Works - Station Access Works, Footpaths etc

W.013 – Site Compound – General Operation





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