

M4-M5 Link Mainline Tunnels

Operational Noise Compliance Report

Prepared for Acciona Samsung Bouygues Joint Venture

May 2024

M4-M5 Link Mainline Tunnels

Operational Noise Compliance Report

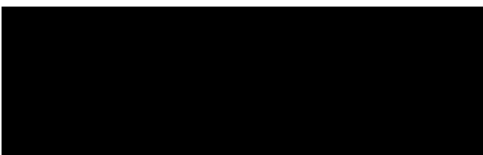
Acciona Samsung Bouygues Joint Venture

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Executive Summary

EMM has been engaged by Acciona Samsung Bouygues Joint Venture (ASBJV) to provide operational noise and vibration design services for Stage 1 of the WestConnex 3A – M4–M5 Link Mainline tunnels project (the Project). The services covered operational road traffic and fixed facilities noise and vibration and were addressed within the Operational Noise and Vibration Review (ONVR¹) for the Project to address E92 of the Conditions of Approval (CoA) SSI 7485.

The scope of the ONVR encompassed the assessment of potential noise and vibration impacts associated with the following:

- road traffic noise within the vicinity of the M4–M5 Link Mainline tunnels, limited to areas where removal of buildings were required along Parramatta Road for ancillary facilities and the closure of Northcote Street; and
- fixed facilities noise on adjoining development and noise sensitive receivers in accordance with E92 Conditions of Approval (CoA) SSI 7485.

The ONVR documented operational noise and vibration mitigation measures to minimise noise and vibration impacts to the community during operation of the Project.

This Operational Noise Compliance Report (ONCR) was prepared to address Condition E95 of the Conditions of Approval (CoA) SSI 7485 and specifically EMM measurements and or supplementary noise modelling to assess compliance for road traffic and mechanical plant and equipment from fixed facilities.

ES1 Part A – Road traffic noise

The Project is a tunnel road development with no above ground road construction. Assessment of road traffic noise impacts was undertaken for a portion of Parramatta Road in the vicinity of the Parramatta Road East and West (PREW) and Northcote civil sites part of the WestConnex project under the ONVR and ONCR. The sole purpose of this report (and the ONVR) was to address potential traffic noise impacts on existing sensitive receivers due to the removal of structures that incidentally acted as noise barriers to dwellings behind the civil sites. Northcote civil site was added to the Project at the request of the Acoustic Advisor (AA) as it had not been previously addressed in the M4 East ONVR or ONCR.

EMM adopted the noise targets applicable to existing roads not subject to redevelopment provided in Table 8 of the Environment Protection Authority (EPA) Road Noise Policy (RNP) as a means of determining whether mitigation measures were required at potentially affected receiver locations.

The existing case noise model was calibrated using noise monitoring and traffic counts conducted simultaneously in November 2023 and also reference noise levels from within the M4 East ONVR.

The noise models for projected traffic volumes have been prepared using the 2021 ‘design year’ traffic models under a build (presence of WestConnex) and factored for 2023 traffic volumes. The presence and absence of the Parramatta Road East and West (PREW) and Northcote civil sites was evaluated considering the historic buildings prior to WestConnex and the resulting vacant sites with retained site hoarding to the residential boundaries. Review of the change in traffic volumes and composition (heavy vehicles) for a 10-year growth scenario has also been discussed.

Noise modelling for the ONVR confirmed that traffic noise levels will generally decrease with the presence of the WestConnex project due to significant reductions in traffic volumes along Parramatta Road. The removal of site structures will however negate such benefits at previously screened receivers. Receivers were identified and

¹ EMM M4-M5 Link Mainline Tunnels. Operational noise and vibration review v17 dated June 2023

considered for noise mitigation due to traffic noise increases greater than 2 dB and where traffic noise levels exceeded the RNP target noise abatement levels for existing roads.

Noise mitigation measures were recommended in accordance with the Transport for NSW (TfNSW) Noise Mitigation Guideline (NMG) to achieve the planning levels provided in Table 8 of the RNP. These mitigation measures were implemented as part of the Project Noise Insulation Program (NIP).

A review of road traffic noise impacts from Parramatta Road has been conducted to address the potential for increased noise exposure because of the removal of buildings for the development of the PREW and Northcote civil sites for M4 East and M4-M5 Link that have since been removed and sites retained as vacant.

ES1.1 Part B – Fixed facilities

The ONVR demonstrated that the design noise criteria outlined in the EPA's NSW Industrial Noise Policy (EPA 2000) would be met provided that the noise and vibration mitigation measures identified were implemented.

The primary fixed facilities are associated with Parramatta Road Ventilation Facility (PRVF) and St Peters Interchange (SPI), including the subterranean substations. The main ventilation facilities are designed with acoustic attenuators on both the atmosphere side and the tunnel side of the fans to mitigate noise from the air path. The ventilation buildings are constructed of either precast concrete or core filled blockwork, with acoustic rated doors and fan isolation mounts to control noise and vibration.

Other fixed facilities including substation buildings and fire pump buildings were constructed of precast concrete, core filled blockwork, and acoustic rated doors to contain noise. Water treatment plant equipment was selected on acoustic performance to minimise noise emissions. Rooftop mechanical plant have acoustic screens and attenuators where required.

The ONCR provides an assessment of attended noise measurements from the operation of the fixed facilities under atypical worst-case operation at night and compares results against the design criteria and provides an assessment of compliance.

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1 Introduction

This ONCR has been prepared to evaluate compliance in terms of road traffic noise and environmental noise and vibration impacts from the operation of the fixed facilities on adjoining development and noise sensitive receivers within the vicinity of the WestConnex Stage 3A M4–M5 Link Mainline Tunnels (the Project). Noise and vibration impacts have been addressed in accordance with E95 of the Conditions of Approval (CoA) SSI 7485.

The only surface road sections relevant to this project that is not covered by other stages of WestConnex are:

- portion of Parramatta Road in the vicinity of the Parramatta Road East and West (PREW) civil sites at Haberfield; and
- portion of Parramatta Road in the vicinity of the Northcote Street (Northcote) civil site between Wolseley Street and Wattle Street, Haberfield.

This assessment addresses commitments identified in Sections 6.7 and 6.9 of the *Technical working paper: Noise and vibration assessment* included in Volume 2d, Appendix J of the *M4–M5 Link Environmental Impact Statement* dated August 2017.

The EIS paper identifies existing structures on the proposed civil sites C1b and C3b (PREW) bordering Parramatta Road which provide shielding to residential dwellings behind. Similarly for the civil sites C3a Northcote site between Wolseley Street and Wattle Street, Haberfield, buildings were removed for the construction of the M4 East and subsequently taken over for M4-M5. As this was not addressed in the M4 East ONVR or ONCR, this Project has reviewed and assessed impacts and compliance. These structures were demolished as part of the establishment of the civil sites. The potential for elevated road traffic noise levels at residential receiver locations due to the removal of these structures was addressed in the ONVR (CoA E92) and compliance has been reviewed in this ONCR (CoA E95).

1.1 Project background and description

The WestConnex M4–M5 Link project was constructed in two stages:

- Stage 1: M4–M5 Link Mainline Tunnels; and
- Stage 2: Rozelle interchange.

WestConnex engaged Lendlease Acciona Bouygues Joint Venture (ASBJV) to design and construct Stage 1 of the project (refer Figure 1.1). The key features of the Mainline tunnels project include:

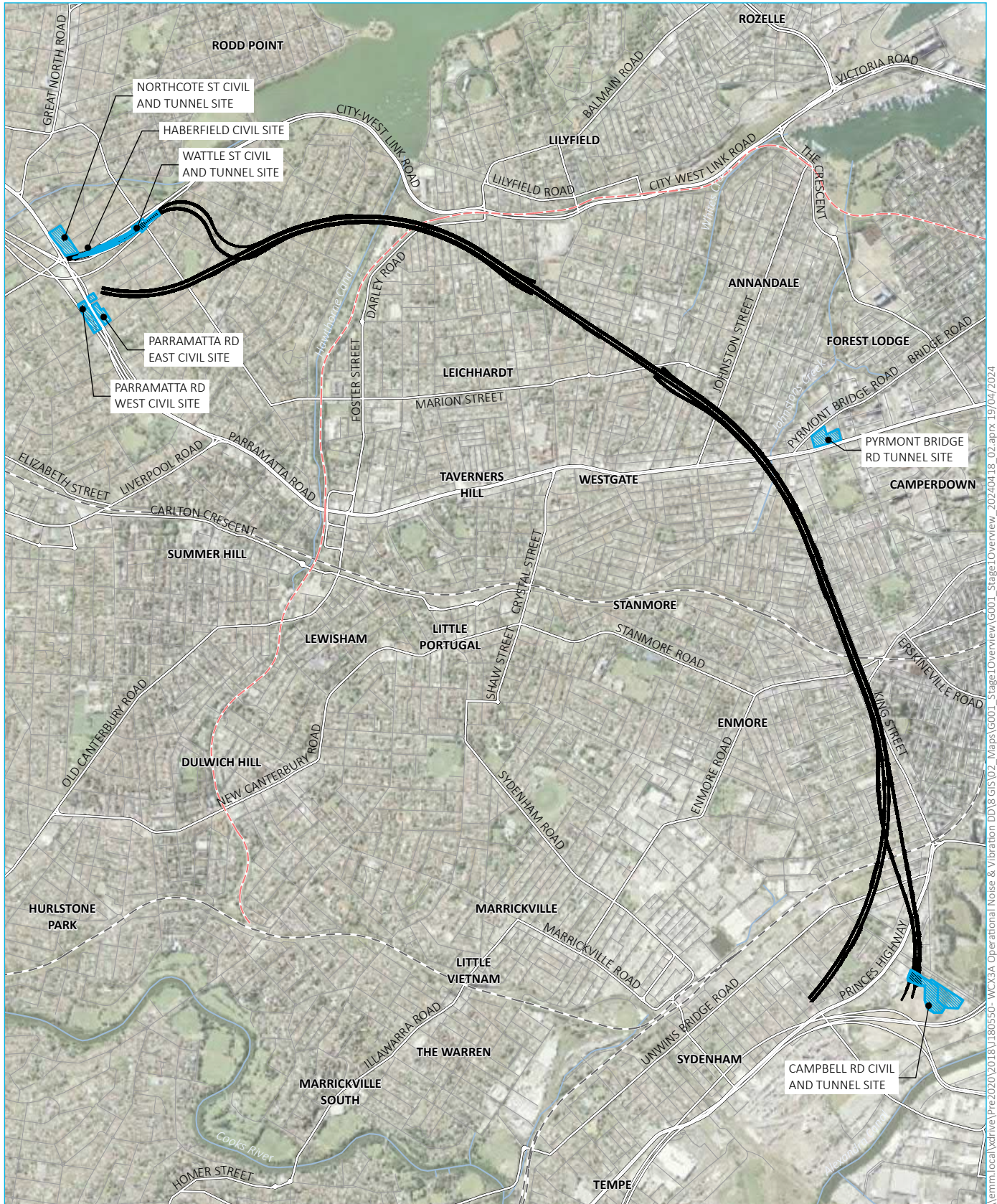
- Twin mainline motorway tunnels between the M4 East at Haberfield and the New M5 at St Peters. Each tunnel is approximately 7.5 kilometres long and accommodates up to four lanes of traffic in each direction.
- Connections of the mainline tunnels to the M4 East project, comprising:
 - a subterranean connection to the M4 East mainline stub tunnels east of Parramatta Road near Alt Street at Haberfield;
 - entry and exit ramp connections between the mainline tunnels and the Wattle Street interchange at Haberfield; and
 - minor physical integration works with the surface road network at the Wattle Street interchange including road pavement and line marking.

- Connections of the mainline tunnels to the New M5 project, comprising:
 - a subterranean connection to the New M5 mainline stub tunnels north of the Princes Highway near the intersection of Mary Street and Bakers Lane at St Peters;
 - entry and exit ramp connections between the mainline tunnels and the St Peters interchange at St Peters; and
 - minor physical integration works with the surface road network at the St Peters interchange including road pavement and line marking.
- Construction of tunnel stubs to provide for future underground connection of the mainline tunnels to the Rozelle interchange and Iron Cove Link.
- A motorway operations complex at St Peters (Campbell Road) (MOC5). Facilities contained within the motorway operations complexes include substations, water treatment plants, ventilation facilities and outlets (the Campbell Road ventilation facility), offices, on-site storage and parking for employees.
- Tunnel ventilation systems, including ventilation supply and exhaust facilities, ventilation fans, ventilation outlets and ventilation tunnels.
- Fit out (mechanical and electrical) as part of the Parramatta Road ventilation facility at Haberfield for use by the M4 East and M4–M5 Link project.
- Drainage infrastructure to collect surface and groundwater for treatment at dedicated facilities.
- Water treatment would occur at the operational water treatment facility at the Campbell Road motorway operations complex.
- Ancillary infrastructure and operational facilities for electronic tolling and traffic control and signage (including electronic signage).
- Emergency access and evacuation facilities, including pedestrian and vehicular cross and long passages and fire and life safety systems.
- Utility works, including protection and/or adjustment of existing utilities, removal of redundant utilities and installation of new utilities.
- Temporary construction ancillary facilities to facilitate construction of the project at the following locations:
 - Northcote Street civil and tunnel site (C3a), Haberfield;
 - Haberfield civil site (C2b), Haberfield;
 - Parramatta Road East civil site (C3b), Haberfield;
 - Parramatta Road West civil site (C1b), Ashfield;
 - Wattle Street civil and tunnel site (C1a), Haberfield;
 - Pyrmont Bridge Road tunnel site (C9), Camperdown/Annandale; and

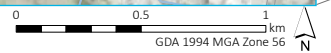
- Campbell Road civil and tunnel site (C10), St Peters.

Northcote Street's western extent was changed from a two-way intersection to a no through road traffic arrangement at the commencement of WestConnex M4 East project (M4 East) in 2016 to facilitate the construction of the Northcote Tunnelling ancillary compound. The M4–M5 link Project took over the Northcote Site compound (C3a), as approved under Modification 1 for the Project in 2019, with the roll over requirement from the M4 East EIS, to reinstate Northcote Street to its original alignment as a two-way intersection at the western extent.

ASBJV have sought and gained approval (SSI-7485 Mod-7) for the permanent closure of Northcote Street, keeping its current cul-de-sac configuration, rather than reinstating to its original alignment prior to the M4 East project. The Northcote Street alignment through the former Northcote civil site incorporates pedestrian and bike access with a landscaped central grass verge and planter boxes.



Source: EMM (2024); DCSSS (2023); GA (2009); Sixmaps (2024)



- KEY**
- Site boundary
 - Proposed M4- M5 Link tunnel alignment
 - Existing environment**
 - Light rail
 - Rail line
 - Major road
 - Minor road
 - Watercourse / drainage line

Stage 1 Overview

M4-M5 Link Mainline Tunnels
Operational Noise Compliance Report

Figure 1.1



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1.2 Relevant Conditions of Approval

The operational road traffic and fixed facilities noise and vibration were addressed within the Operational Noise and Vibration Review (ONVR²) for the Project in accordance with E92 Conditions of Approval (CoA) SSI 7485. The ONVR documented operational noise and vibration mitigation measures to minimise noise and vibration impacts to the community during operation of the Project.

This Operational Noise Compliance Report addresses Condition E95 of the Conditions of Approval (CoA) SSI 7485 and specifically provides measurements and or supplementary noise modelling to assess compliance. In terms of the ONCR, the requirements are summarised under Condition E95 and reproduced below:

Within 12 months of the commencement of operation of the CSSI, the Proponent must undertake monitoring of operational noise to compare actual noise performance of the CSSI against the noise performance predicted in the review of noise mitigation measures required by Condition E92.

The Proponent must prepare an Operational Noise Compliance Report to document this monitoring. The Report must include, but not necessarily be limited to:

- (a) noise monitoring to assess compliance with the operational noise levels predicted in the review of operational noise mitigation measures required under Condition E92;
- (b) a review of the operational noise levels in terms of criteria and noise goals established in the *NSW Road Noise Policy 2011*;
- (c) methodology, location and frequency of noise monitoring undertaken, including monitoring sites at which CSSI noise levels are ascertained, with specific reference to locations indicative of impacts on sensitive receivers;
- (d) details of any complaints and enquiries received in relation to operational noise generated by the CSSI between the date of commencement of operation and the date the report was prepared;
- (e) any required recalibrations of the noise model taking into consideration factors such as noise monitoring and actual traffic numbers and proportions;
- (f) an assessment of the performance and effectiveness of applied noise mitigation measures together with a review and if necessary, reassessment of mitigation measures; and
- (g) identification of additional measures to those identified in the review of noise mitigation measures required by **Condition E92**, that would be implemented with the objective of meeting the criteria outlined in the *NSW Road Noise Policy (EPA, 2011)* and *Industrial Noise Policy (EPA, 2000)*, when these measures would be implemented and how their effectiveness would be measured and reported to the Secretary and the EPA.

The Operational Noise Report must be submitted to the Secretary and the EPA within 60 days of completing the operational noise monitoring and made publicly available.

² EMM M4-M5 Link Mainline Tunnels. Operational noise and vibration review v17 dated June 2023

E95 also references Condition E92 that refers to the preparation of an Operational Noise and Vibration Review (ONVR³) that was prepared by EMM for Acciona Samsung Bouygues Joint Venture (ASBJV) and subsequently endorsed by the Project Acoustic Advisor.

1.3 Scope of the road traffic noise compliance review

1.3.1 Parramatta Road East and West civil sites

A technical working paper was prepared by SLR (2017) for the M4–M5 Link EIS (herein referred to as the EIS Noise and Vibration Impact Assessment (EIS NVIA)). Section 6.9 of the paper discusses potential road traffic noise impacts associated with the demolition of structures on the Parramatta Road East (C3b) and Parramatta Road West civil sites (C1b) or collectively referred to as Parramatta Road East West (PREW). PREW comprises four areas on the eastern and western sides of Parramatta Road at the junction of Alt Street as shown in Figure 1.2.

The commercial structures on the site incidentally acted as acoustic screens to Parramatta Road traffic for residential buildings behind. The removal of these structures was shown in the ONVR to increase exposure to traffic noise for these residential receiver locations, with associated noise mitigations recommended within the ONVR and implemented through the Project Noise Insulation Program (NIP). A summary of the NIP implementation is provided in Appendix A. This issue is now considered closed because of works completed, offers declined by recipients or no response received to Project correspondence. Noise mitigation was also provided prior to construction of the Project to also mitigate noise from utilisation of the ancillary sites at PREW. Whilst it is anticipated that development will occur on these sites in the future, the report is to clarify what has been the impact of the removal of the buildings for residential receivers.

1.3.2 Northcote civil site

Similarly for Northcote civil site, structures were demolished and not reinstated with the site remaining vacant. However, a 3.2 metre high acoustic wall was retained on the northern boundary of the site. The remaining boundaries comprise of open chain mesh fencing to secure the site. Whilst it is anticipated that development will occur on these sites in the future, the report is to clarify what has been the impact of the removal of the buildings for residential receivers on Cove Street, Wolseley Street and Northcote Street. Northcote Street was planned to be reopened at the completion of M4 East and WCX3A project, however the permanent closure of the street was approved under SSI 7485 MOD7.

The removal of building structures on the Northcote civil site has potential to increase road traffic noise contributions from Parramatta Road due to increased noise exposure.

Operational road traffic noise for Northcote Street and Wolseley Street were not a consideration or assessed in the M4 East EIS, M4 East ONVR or WCX3A EIS. However, the M4 East ONVR assessment did consider traffic noise from Parramatta Road to Cove Street, Wolseley Street and Northcote Street in the presence of the previous commercial, retail and residential buildings on the site.

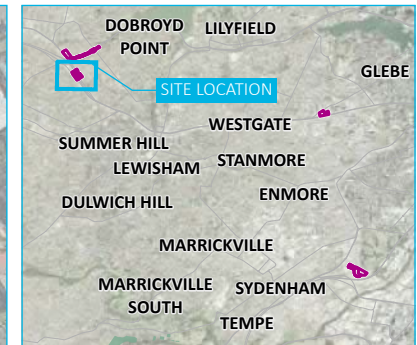
1.4 Scope of the fixed facilities noise compliance review

The fixed facility sites considered in this report are associated with:

³ EMM M4-M5 Link Mainline Tunnels. Operational noise and vibration review v17 dated June 2023

- Parramatta Road Ventilation Facility (PRVF) comprising: ventilation exhaust and supply building, substation; and fire pumps and water tanks.
- St Peters Interchange (SPI) comprising: ventilation exhaust building, fresh air supply building, substation, fire pumps and water tanks, water treatment plant and ancillary facilities – telecommunications, tolling, etc.

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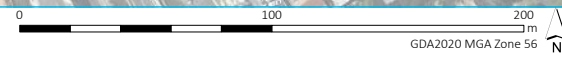
- KEY**
- Site boundary
 - Retained and used for office/workshop for WCX
 - Demolished building
 - Residence affected
 - Gate
- INSET KEY**
- Site boundary
 - Major road
 - NPWS reserve

Parramatta Road east and west
- site structures and receivers

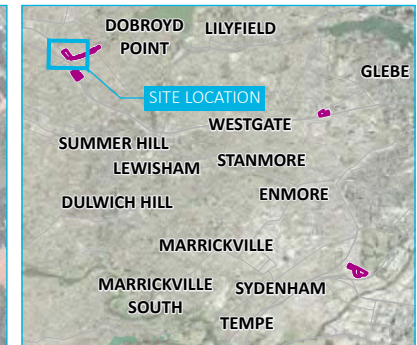
M4-M5 Link Mainline Tunnels
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Figure 1.2



Source: EMM (2024); DCSSS (2023); ESRI (2024); GA (2009)



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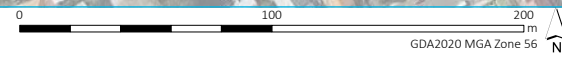
- KEY**
- Site boundary
 - Demolished building
 - Residences affected
- INSET KEY**
- Site boundary
 - Major road
 - NPWS reserve

Northcote Street-site structures and receivers

M4-M5 Link Mainline Tunnels
Operational Noise Compliance Report
Figure 1.3



Source: EMM (2024); DCSSS (2023); GA (2009); Sixmaps (2024)



2 Road traffic noise

2.1 Guidelines and referenced documentation

Documentation referenced in the road traffic noise assessment component of the ONCR are listed below.

2.1.1 Guidelines

- Road Noise Policy (RNP), NSW EPA, March 2011
- Noise Criteria Guideline (NCG), NSW Roads and Maritime Services, April 2015
- Noise Mitigation Guideline (NMG), NSW Roads and Maritime Services, April 2015
- Noise Model Validation Guideline (NMVG), NSW Roads and Maritime Services May 2018

2.1.2 Referenced project documentation

- SLR (2017) *WestConnex M4–M5 Link Technical working paper: Noise and Vibration* prepared as part of the EIS for Roads and maritime services by SLR Consulting Australia Pty Ltd (EIS NVIA)
- SLR (2015) *WestConnex M4 East Project Construction and Operational Noise and Vibration Impact Assessment – Noise and Vibration Technical Paper* prepared as part of the EIS for Roads and maritime services by SLR Consulting Australia Pty Ltd
- ASBJV (2019) *M4–M5 Link Mainline Tunnels Noise Insulation Program – Noise and Vibration Management Sub-plan (NIP)* prepared to satisfy Condition E89 of the CoA SSI-7485
- EMM (2023) *M4-M5 Link Mainline Tunnels – Operational noise and vibration review* prepared to satisfy Condition E92 of the CoA SSI-7485 dated June 2023

2.2 Operational noise criteria

2.2.1 NSW Road Noise Policy

The NSW Government issued the Road Noise Policy (RNP) on 1 July 2011. The document identifies strategies that address the issue of road traffic noise from:

- existing roads;
- new road projects;
- road redevelopment projects; and
- new traffic-generating developments.

Acoustic criteria used to address potential road noise impacts are provided in Table 3 of the RNP as shown in Table 2.1.

Table 2.1 Road traffic noise assessment criteria for residential land uses (Table 3, RNP)

Road category	Type of project/land use	Assessment criteria – dB(A)	
		Day (7.00 am–10.00 pm)	Night (10.00 pm–7.00 am)
Freeway/arterial / sub-arterial roads	1. Existing residences affected by noise from new freeway/arterial/sub-arterial road corridors.	L _{Aeq,15hr} 55 (external)	L _{Aeq,9hr} 50 (external)
	2. Existing residences affected by noise from redevelopment of existing freeway/arterial/sub-arterial roads.	L _{Aeq,15hr} 60 (external)	L _{Aeq,9hr} 55 (external)
	3. Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments.		
Local roads	4. Existing residences affected by noise from new local road corridors	L _{Aeq,1hr} 55 (external)	L _{Aeq,1hr} 50 (external)
	5. Existing residences affected by noise from redevelopment of existing local roads.		
	6. Existing residences affected by additional traffic on existing local roads generated by land use developments.		

Note: Land use developers must meet internal noise goals in the Infrastructure SEPP (Department of Planning NSW 2007) for sensitive developments near busy roads (see Appendix C10, RNP).

Further to the above criteria, noise targets for existing roads not subject of redevelopment are provided in RNP Table 8 as shown in Table 2.2.

Table 2.2 Target noise abatement levels for existing roads not subject to redevelopment

Existing road category	Target noise level – dB(A)	
	Day (7.00 am–10.00 pm)	Night (10.00 pm–7.00 am)
Freeway/arterial/sub-arterial road	L _{Aeq,15hr} 60 (external)	L _{Aeq,9hr} 55 (external)
Local roads	L _{Aeq,1hr} 55 (external)	L _{Aeq,1hr} 50 (external)

The RNP notes the following with regard to targets provided in its Table 8:

For existing roads where no redevelopment is taking place, the primary role of the RNP is to provide a basis for measuring and defining the extent of any existing traffic noise impacts. The target levels in Table 8 are provided as a guide to assessing impacts rather than as achievable targets.

The target levels in Table 8 of the RNP may be used as a basis for addressing impacts from existing roads and, in the absence of specific criteria in the RNP, have been used to address potential noise impacts from the removal of PREW site structures. This assessment has been prepared to address a potential increase in road traffic noise post the demolition of existing structures not part of the road corridor.

2.3 RMS Noise Criteria Guideline

The NCG documents TfNSW's interpretation of the RNP and provides a consistent approach to identifying road noise criteria for TfNSW projects. Noise criteria are assigned to sensitive receivers using the NCG. The NCG provides guidance on how to implement the RNP.

The NCG follows four principles in the assessment of acoustic impacts from road projects. The principles are:

1. Criteria are based on the road development type a residence is affected by due to the road project.
2. Adjacent and nearby residences should not have significantly different criteria for the same road.
3. Criteria for the surrounding road network are assessed where a road project generates an increase in traffic noise greater than 2 dB on the surrounding road network.
4. Protect existing quiet areas from excessive changes in amenity due to traffic noise.

Road project classifications from the NCG are provided in Table 2.3.

Table 2.3 TfNSW Road Project Classification

Road project classification	Description
New road	<ul style="list-style-type: none"> • A project proposes road construction in an undeveloped corridor. • A road project changes the functional class of the road. • A widening, curve straightening or adjustment of the corridor where the upgrade road pavement has been substantially realigned. • A duplication where the new lanes have been substantially realigned from the existing corridor in which case the existing lanes are also assessed as a new road development type. • A bypass where the upgraded road extends beyond the existing road corridor.
Redeveloped road	<ul style="list-style-type: none"> • Widening/adjustment of the corridor where the road segment (including duplicated carriageway) has not been substantially realigned. • Duplication of a carriageway adjacent and parallel with the existing road corridor where the widened road has not been substantially realigned. • Duplication of a carriageway wholly within an existing corridor. • Introduction of on or off ramps to provide access through an intersection that was previously inaccessible for that direction.
Transition zone	A transition zone is the junction between new and redeveloped roads or different functional classes.
Minor works	<p>Some works may be primarily to improve safety. This may include minor straightening of curves, installing traffic control devices, intersection widening and turning bay extensions or making minor road realignments.</p> <p>These works are not considered redeveloped or new as they are not intended to increase the traffic carrying capacity of the overall road or accommodate a significant increase in heavy vehicle traffic.</p>

2.4 Guidance on the evaluation of mitigation measures

The RMS Noise Mitigation Guideline (NMG) provides guidance in managing and controlling road traffic generated noise and describes the principles to be applied when reviewing noise mitigation. The NMG recognises that the criteria recommended by the NCG are not always practicable and that it is not always feasible or reasonable to expect that they should be achieved.

The NMG provides three triggers where a receiver may qualify for consideration of noise mitigation (beyond the adoption of road design and traffic management measures). These are:

- **Trigger 1** – The predicted Build noise level exceeds the NCG controlling criterion and the noise level increase due to the project (i.e. the noise predictions for the Build minus the No Build) is greater than 2 dB.
- **Trigger 2** – The predicted Build noise level is 5 dB or more above the NCG controlling criterion (exceeds the cumulative limit) and the receiver is significantly influenced by project road noise, regardless of the incremental impact of the project.

- **Trigger 3** – The noise level contribution from the road project is acute (daytime $L_{Aeq,15hr}$ 65 dB or higher, or night-time $L_{Aeq,9hr}$ 60 dB or higher) even if noise levels are dominated by a non-project road.

The eligibility of receivers for consideration of additional noise mitigation (over and above road design and traffic management measures) is determined before the benefit of additional noise mitigation (low noise pavement and noise barriers) is included. The requirement for the project is to provide feasible and reasonable additional mitigation for these eligible receivers to meet the NCG controlling criterion. As highlighted in the NMG, once noise has been minimised by feasible and reasonable methods during the corridor planning and road design stages, triggered receivers with residual exceedances of the NCG controlling criteria shall be assessed to determine if they qualify for additional noise mitigation.

2.5 Background studies

2.5.1 Parramatta Road – PREW and Northcote sites

Traffic noise levels prior to the construction of the project were established in the EIS NVIA.

The section of Parramatta Road adjacent the PREW and Northcote sites is not assessed in the EIS NVIA as it is not generally applicable to the M4–M5 Link project area. The M4 East project addressed traffic noise on Parramatta Road south of Wattle Street given the M4 East to Parramatta Road interchange is south of the PREW sites. The M4 East project failed to address potential noise impacts on residences at Wolseley Street and Northcote Street as a result of removal of buildings for the Northcote civil site. Whilst the removal of structures on PREW civil site for the M4-M5 Link were addressed in the Project ONVR.

This compliance review has considered the following:

- Assessment, modelling, and recommendations outlined in the M4-M5 Link ONVR;
- traffic noise levels from the M4 East SLR (2015) report which is representative of traffic volumes and traffic noise levels at the outset of the project prior to WestConnex project;
- projected traffic volumes for the ‘design year’ from the M4 East SLR (2015) report;
- additional traffic noise level measurements by EMM in November 2023; and
- tube counts to confirm existing traffic volumes on Parramatta Road and Wolseley Street in November 2023 during the noise measurement period.

For road project assessments, it is typically required to assess traffic noise levels for a 10-year design period beyond the ‘opening year’. However, it is noted that the sites at PREW and Northcote will likely be redeveloped within 10 years. A review of the potential ‘growth’ of traffic on Parramatta Road reported in the M4 East ONVR indicates that 10-year growth is in the order of 10% for day and up to 30% for night. In terms of traffic noise generation from Parramatta Road this signifies between 0.4dB day and up to 1.1dB increase at night. However heavy vehicle percentage was projected to significantly reduce, hence actual change in noise levels for 10-year growth would be expected to be less than 0.1dB day and 0.5dB night.

This assessment has considered the 2021 design traffic volumes and factored 2023 volumes for a ‘Build’ scenario as both M4 East and M4-M5 Link are constructed and operational. However, the ONVR and this ONCR has also considered the relative impact of the removal of buildings on the PREW and Northcote civil sites.

The ONVR determined potential noise impacts at PREW and recommended a series of noise mitigation strategies to be implemented. These form the Noise Insulation Program (NIP) provided in Appendix A. That was rolled out early in the M4-M5 Link construction phase to assist in minimising construction noise impacts and subsequent operational traffic impacts following removal of civil site structures and is now complete for affected receivers.

2.5.2 Existing noise levels

Unattended noise monitoring was completed at four residential assessment locations for the purpose of evaluating the road traffic noise levels post removal of buildings and structures on the PREW and Northcote civil sites. The equipment, dates and locations are summarised in Table 2.4.

Table 2.4 Unattended noise monitoring summary

ID	Address	Equipment (Serial number)	Dates
NM1	5 Wolseley Street, Haberfield	ARL NGARA (878017)	16 November–27 November 2023
NM2	8 Northcote Street, Haberfield	ARL NGARA (878041)	16 November–27 November 2023
NM3	115 Alt Street, Haberfield ¹	ARL NGARA (EMM02)	16 November–27 November 2023
NM4	136 Bland Street, Haberfield ²	ARL NGARA (EMM07)	16 November–27 November 2023

1. Logger located at high level (approximately 4m above ground level) on site boundary fence and representative of Floor 2
2. Logger located at high level (approximate 2.8m above ground level) on site boundary fence and representative of elevated single level facade

The loggers were calibrated before and on completion of the surveys using a Svantek SV 36 calibrator (s/n 106879). The instruments were within their NATA laboratory calibration period during the time of the monitoring. Loggers were installed at one metre from facades where feasible. The loggers at Alt and Bland Streets (PREW) were located equivalent to elevated ground level and upper floor levels of most affected receivers identified in the ONVR and were typically three to four metres from residential façade but receive some reflection from the building, adjacent site boundary fences and significant reflection from hardstand in front of measurement locations, accordingly no additional façade correction was applied.

Existing traffic noise levels (ie pre project or removal of structures) are based on the unattended noise monitoring conducted as part of the M4 East EIS. Noise data from this monitoring period is detailed in Table 7 of the SLR (2015) report as shown in Table 2.5. Traffic noise levels recorded during this time are representative of traffic noise levels prior to construction works. The additional unattended noise monitoring completed in November 2023 is also included (16/11/23-27/11/23), and charts provided in Appendix C. Summary results of the unattended noise monitoring excluding extraneous noise events are provided in Table 2.5.

Table 2.5 Traffic noise levels

Location	Measured traffic noise levels, dB	
	L _{Aeq,15hr} Day	L _{Aeq,9hr} Night
Pre-project (2015 EIS)		

Table 2.5 Traffic noise levels

Location	Measured traffic noise levels, dB	
	L _{Aeq,15hr} Day	L _{Aeq,9hr} Night
L13 – 119 Alt Street, Ashfield ¹	60	56
L14 – 135 Bland Street, Haberfield ¹	68	65
Post project (2023, EMM)		
M1 – 5 Wolseley Street, Haberfield ²	56	52
M2 – 8 Northcote Street, Haberfield ²	57	54
M3 – 115 Alt Street, Haberfield ²	65	62
M4 – 136 Bland Street, Haberfield ²	63	60

1. ONVR levels - L13 received adjacent site shielding and limited field of view to Parramatta Road, whilst L14 location is far more exposed to Parramatta Road traffic than L13 (extracted from M4 East and M4-M5 Link EIS).
2. Road traffic noise levels measured in November 2023

The 2023 traffic noise levels presented in Table 2.5 were utilised to calibrate the traffic noise model established using the traffic volumes undertaken simultaneously with the unattended noise monitoring.

2.5.3 Traffic volume data

i Project traffic volumes

Future traffic projections for the no-build scenarios have been adopted from M4 East ONVR Annexure C. Traffic volumes relevant to the study area are provided in Table 2.6 in terms of pre-construction of the M4-M5 Link. As would be expected, the ‘build’ scenarios show a significant reduction in road traffic volumes as compared to ‘no build’. In the context of traffic volumes only in section 2.5.3, ‘no build’ relates volumes without the construction of WCX including M4 East and M4-M5 whilst ‘build’ relates to construction of the WCX including M4 East and M4-M5.

Table 2.6 Project Traffic Volumes - combined (M4 East ONVR)

Location	Day – 7.00 am to 10.00 pm			Night – 10.00 pm to 7.00 am		
	Total vehicles	Heavy vehicles %	Speed	Total vehicles	Heavy vehicles %	Speed
PREW						
Parramatta Road at Alt and Bland Street (2021) – no build	37,058	7.9	60	7,182	5.5	60

Table 2.6 Project Traffic Volumes - combined (M4 East ONVR)

Location	Day – 7.00 am to 10.00 pm			Night – 10.00 pm to 7.00 am		
	Total vehicles	Heavy vehicles %	Speed	Total vehicles	Heavy vehicles %	Speed
Parramatta Road at Alt and Bland Street (2031) – no build	40,673	8.7	60	7,978	6.6	60
Parramatta Road at Alt and Bland Street (2021) – build	16,837	3.7	60	3,387	2.8	60
Parramatta Road at Alt and Bland Street (2031) – build	18,566	3.0	60	4,400	3.2	60
Northcote						
Parramatta Road at Great North Road and Wattle Street (2021) – no build	69,936	7.8	60	13,954	6.5	60
Parramatta Road at Great North Road and Wattle Street (2031) – no build	72,576	9.0	60	15,298	7.4	60
Parramatta Road at Great North Road and Wattle Street (2021) – build	37,434	3.9	60	7,361	3.0	60
Parramatta Road at Great North Road and Wattle Street (2031) – build	46,324	3.1	60	9,419	3.3	60

Classified tube counts were undertaken during the monitoring period (November 2023) to correlate with measured noise levels along Wolseley Street and Parramatta Road (Table 2.7). This was critical in being able to filter extraneous events outside of periods where road traffic volumes indicated road traffic noise would be lower than the peak periods.

Table 2.7 Traffic volumes - combined (concurrently with noise monitoring November 2023)

Location	Vehicles (day – 7.00 am to 10.00 pm)			Vehicles (night – 10.00 pm to 7.00 am)		
	Vehicles	Heavy vehicles %	Avg Speed	Vehicles	Heavy vehicles %	Avg Speed
Wolseley Street ¹	171	n/a ²	49	55	n/a ¹	49

Parramatta Road (Northcote)	43,372	9.2	53	10,274	8.8	53
Parramatta Road (PREW)	28,902	9.5	53	8,047	8.6	53

1. Wolseley Street considers peak 1hr as Local Road
2. Wolseley Street has a 3t limit on vehicles. Accordingly, no heavy vehicles were recorded.

The peak hourly vehicle movements for the day period (171 vehicles) and night period (55 vehicles) on Wolseley Street fall within the low volume range of the United Kingdom Department of Transport 1988, *Calculation of Road Traffic Noise* (CoRTN) model. This is relevant in selecting the most acceptable road traffic noise model for the assessment.

Whilst Table 2.6 presents traffic volumes for ‘no build’ relates volumes without the construction of WCX including M4 East and M4-M5 whilst the ‘build’ relates to construction of the WCX including M4 East and M4-M5. For the assessment of the ONCR there is not potential to conduct ‘no build’ traffic counts as WCX were constructed including M4 East and M4-M5.

The assessment has been undertaken to establish the changes of road traffic noise due to removal of buildings and structures on PREW and Northcote civil sites under existing conditions only that constitute a ‘build’ scenario from the WCX EIS. Northcote Street has been closed to through traffic since 2016 as part of the M4 East project construction. This ONCR is not required and does not review or address potential ‘rat running’ driver behaviour on Wolseley Street or the surrounding road network as agreed with the Acoustic Advisor on the Project. However, it is noted that as a result of significant reductions in traffic for Parramatta Road as described in the EIS for the M4–M5 link project (i.e. a drop in the order of 47%) and subsequent delays in intersection performance at Wattle Street, similar reductions in traffic volumes could be experienced for Wolseley Street and surrounding local roads.

A review of the 2023 tube counts confirms that reductions in traffic volumes on Parramatta Road (Northcote) between Great North Road and Wattle Street has eventuated as projected for EIS ‘build’ scenarios for the M4 East and M4-M5 Link. However, the reductions in traffic volumes for Parramatta Road (PREW) between Alt and Bland Streets is not consistent with the anticipated EIS ‘build’ scenarios. After further review and consideration of the road network, it is assumed that this anomaly may well be a result of the teething problems during the final construction/commissioning phases and opening of the WCX Part 3b Rozelle Interchange and delays, with drivers seeking alternative routes south and north rather than to this congested area and potentially other large infrastructure projects utilising Parramatta Road as both volumes and heavy vehicle percentage are higher than projected in EIS for 2021 and 2031 design years.

Noise measurements and traffic counts could be repeated on assumption that traffic utilising the Rozelle Interchange has stabilised and however other infrastructure projects may still skew traffic volumes. The actual benefit of the duplication of the compliance measurements is considered negligible. Assuming reduced traffic volumes for duplicate measurements, there could be a reduction in the noise levels for the PREW measurement locations in the order of 2.3 dB during the day and 3.8 dB during the night, based on design volumes that should be found in reality.

However, for the operation of WCX, the relative difference between the ‘build’ (with preexisting buildings in place) and ‘no build’ (removal of buildings for WCX civil sites) would remain the same. The November 2023 measurements and traffic counts would represent a ‘worst case’ scenario with higher traffic volumes, whilst the ONVR previously identified impacted residences and implemented noise mitigation as part of the NIP.

2.6 Road Traffic Noise Model

2.6.1 Parramatta Road Modelling Inputs

Traffic noise along Parramatta Road has been previously modelled in the SLR (2015) study. The noise model was prepared using the SoundPlan™ noise modelling software. Modelling parameters in this assessment have been based on those included in the SLR (2015) study and updated with current traffic volumes, consideration of buildings previously on PREW and Northcote sites, presence of concrete hardstands on sites, and current hoarding provisions on the site common to boundaries with residential areas.

Guidance was taken from the NMVG as to standard parameters required by TfNSW in establishing a robust noise model. Modelling inputs are provided in Table 2.8.

Table 2.8 Modelling standard parameters – Parramatta Rd

Modelling Parameter	Input
Model	CoRTN Australia (NSW) – adaption included for Australian conditions.
Vehicle speed and volumes	EIS traffic survey and projected traffic volumes SLR (2015) – refer Table 2.6 and Table 2.7 of this document.
Elevation contours	Adopted from DEM of Australia derived from LiDAR 5 metre grid.
Source heights and corrections – consistent with SLR (2015).	0.5 m for car exhausts (0.0 dB). 0.5 m for truck tyre noise (-5.4 dB). 1.5 m for truck engines (-2.4 dB). 3.6 m for truck exhausts (-8.5 dB).
Pavement correction	0 dB for dense graded asphalt – as per Table 16, SLR (2015).
Receiver height	1.5 m above ground for single storey/ground floor. 4.3 m above ground for first floor. 7.1 m for second floor.
Ground factor (consistent with NMVG)	50% over residential areas. 75% over open grass. 0% over hardstands.
Façade correction	+2.5 dB(A) at 1 m from façade.
Australian Road Research Board (ARRB)	-1.7 dB(A) for façade corrections. -0.7 dB(A) for free-field corrections.
L _{A10} to L _{Aeq} correction	-3 dB(A).
Congestion	No correction has been applied for congestion consistent with Table 16 of SLR (2015).
Sensitivity allowance adopted for build/no-build models – refer Section 6.7 of EIS NVIA.	+1 dB(A).

2.6.2 Wolseley Street – Modelling Inputs

Wolseley Street carries relatively low volumes of vehicle traffic consistent with a local road with definitive peak periods of traffic. The SoundPlan™ road noise model has been prepared based on the TNM 2.5 algorithm consistent with the guidance of the RNP. The modelling parameters adopted in the model are summarised in Table 2.9.

Table 2.9 Modelling standard parameters – Wolseley St

Modelling Parameter	Input
Model	Federal Highway Administration (FHWA) Traffic Noise Model 3.0.
Vehicle speed and volumes	Projected traffic volumes – refer to Table 2.7.
Elevation contours	Adopted from DEM of Australia derived from LiDAR 5 metre grid.
Source heights and corrections – consistent with SLR (2015)	0.5 m for car exhausts (0.0 dB). There are no heavy vehicles using Wolseley Street.
Pavement correction	0 dB for dense graded asphalt.
Receiver height	1.5 m above ground for single storey/ground floor. 4.3 m above ground for first floor.
Ground factor	Compacted dense ground.
Façade correction	+2.5 dB(A) at 1 m from façade.
Congestion	No correction has been applied for congestion as free-flowing traffic was observed.

2.7 Model Validation

2.7.1 Parramatta Road – Model validation

Consistent with NMVG, the noise model has been compared against measured noise levels at the site to determine the acceptability of any predictive differences.

Table 2.10 Road noise model validation – Parramatta Rd

Location	Traffic noise level, dB L _{Aeq,15hr}			Traffic noise level, dB L _{Aeq,9hr}		
	Predicted	Measured	Difference	Predicted	Measured	Difference
M2 – 8 Northcote Street, Haberfield ¹	54.9	57.4	-2.5	51.6	53.6	-2.0
M3 – 115 Alt Street, Haberfield ²	66.4	65.2	1.2	59.6	62.0	-2.4

Table 2.10 Road noise model validation – Parramatta Rd

Location	Traffic noise level, dB L _{Aeq,15hr}			Traffic noise level, dB L _{Aeq,9hr}		
	Predicted	Measured	Difference	Predicted	Measured	Difference
M4 – 136 Bland Street, Haberfield	64.6	63.0	1.4	57.8	60	-2.2

1. It is feasible that some localised vehicle movements on Northcote Street may skew the noise monitoring results for this location.
2. Extraneous noise excluded.

The median difference for the road segment encompassing the civil sites falls within +/-2.5 dB and, as such, is considered acceptable without justification or additional calibration consistent with the NMVG (Section 3 and 4). Any adjustment has the potential to further skew results either for day or night assessment periods. The nature of the measurement and tube sites near road junctions (non-signalised) and signalised junctions provides some variability in terms of vehicle speeds and driving characteristics (braking or accelerating) that cannot be reasonably accommodated within a typical simple traffic noise modelling context or by tube counts. The nature of the tube counts is obtaining the vehicle speed at that discrete location and may not represent the vehicle speed for the full road segment that influences road traffic noise levels at the monitoring locations compared to a typical free flowing road segment in the absence of intersections. In addition, the measurement locations representative of closest and most exposed receivers are 47-49 metres from the edge of Parramatta Road at PREW and 75-80m at Northcote civil sites. Considering the predicted and measured levels are below the RNP baseline criteria for Northcote measurement location and levels are consistent with ONVR (and identified sensitive receivers were provided with noise mitigation) for PREW receivers, and potential variability of traffic speeds the calibration level difference is considered acceptable. A review of the logger results (Appendix B) for 115 Alt Street and 136 Bland St (PREW) do also identify some higher than typical noise levels for individual 15 minute periods between 6-7am and late at night that are difficult to exclude but have skewed the results of the L_{Aeq} up and may be the result of emergency vehicles or infrequent very noisy motorbike or car, which from experience is typical of Parramatta Road.

There are no changes to Parramatta Road, and as such, alterations to the modelled standard parameters are limited to:

- road traffic volumes and heavy vehicle percentages;
- change in civil sites with historic buildings or no buildings (but retained hoardings from WCX sites); and
- vehicle speed set to design of 60 km/h consistent with the EIS.
- It is noted that the ONVR provided a conservative assessment with the assessment of removal of building structures also removing the site hoarding which has not happened and is not expected to occur prior to construction of new developments on the PREW and Northcote sites.

2.7.2 Wolseley Street – Model Validation

The Wolseley Street noise model has been compared against measured noise levels at the logger site to determine the acceptability of any predictive tolerances and is presented in Table 2.11. Predicted noise levels were assessed to logger locations as installed on-site using calculated façade reflection values as determined by the TNM noise model.

Table 2.11 Road noise model validation – Wolseley St

Location	Traffic noise level, dB L _{Aeq,15hr}			Traffic noise level, dB L _{Aeq,9hr}		
	Predicted	Measured	Difference	Predicted	Measured	Difference
M1 – 5 Wolseley Street, Haberfield ¹	54.5 ²	55.8	-1.3	50.6 ²	51.6	-1.0

1. Note this calibration includes the measured cumulative noise from Wolseley Street and Parramatta Road due to exposure from both roads.
2. Predictions considered peak 1hr for Wolseley Street contribution.

The difference for Wolseley Street is -1.3 dB for day and -1.0 dB for night showing very good consistency with measured levels and requires no further adjustment. The minor difference could readily be attributed to noise from localised activities (ie non-traffic related). It is noted also that Wolseley Street is the main noise contributor to 5 Wolseley Street, with Parramatta Road in order of 5 dB lower (in absence of buildings on Northcote civil site – but with existing hoardings retained). It is also noted that measured and predicted levels meet the baseline RNP noise criteria for their respective road segments of Parramatta Road (arterial road) and Wolseley Street (local road).

2.8 Parramatta Road - Traffic noise predictions

Traffic noise predictions for the 2023 scenarios with and without the historic buildings and incorporating retained hoarding on sites is provided in Figure 1.2 and Figure 1.3. The key aspect of the noise measurements and modelling is to review the impacts of the removal of building structures on the WCX civil sites, that being ‘without build’ compared to ‘with build’ as presented below in points 3 and 4.

It is important not to confuse the above with the discussion of traffic volumes as outlined in Section 2.5.3 where ‘no build’ relates volumes without the construction of WCX including M4 East and M4-M5 whilst the ‘build’ relates to construction of the WCX including M4 East and M4-M5, as presented in below in points 1 and 2

For the assessment of the ONCR there is not potential to conduct actual ‘no build’ traffic counts as WCX were constructed including M4 East and M4-M5. The ONVR and subsequently this ONCR is simply to focus on the implications of the removal of building structures from the WCX sites at PREW and Northcote. In the context of assessing the change in noise level for the residences behind the PREW site the assessment considered:

1. 2031 ‘no build’ scenario – Incorporates projected 2031 traffic volumes assuming the tunnel was not built and all historic structures on the civil sites are retained (ONVR).
2. 2031 ‘build’ scenario – Incorporates projected 2031 traffic volumes assuming the tunnel was built and all structures on the civil sites are demolished following the completion of the project with no retained hoarding (ONVR).
3. 2023 ‘with build’ scenario – Incorporates current traffic volumes. All historic structures on the civil sites are retained (ONCR).
4. 2023 ‘without build’ scenario – Incorporates current traffic volumes. All historic structures on the civil sites are removed and WCX site hoarding retained (ONCR).

5. A comparison is conducted of the 'with build' (retaining existing historic structures) and 'without build' scenarios (removal of historic structures and retaining of WCX site hoarding) for 2023 volumes, projected 2031 volumes and comparison with ONVR predictions.

The change in noise level for the residences behind the Northcote site, as discussed earlier, only considers changes as a result of removal of buildings only, but retaining of site hoarding and was not directly addressed in the ONVR:

1. 2023 'build' scenario – Incorporates current traffic volumes. All historic structures on the civil sites are retained (ONCR).
2. 2023 'no build' scenario – Incorporates current traffic volumes. All historic structures on the civil sites are removed and WCX site hoarding retained (ONCR).

The ONVR identified all receivers at PREW that would experience increases in road traffic noise levels and outlined those locations that were eligible and provided with noise mitigation through the implementation of the NIP. In each instance the typical worst case exposed façades were considered established from the ONVR predictions and recommendations specifically including 115 Alt Street and 124 Bland Street. The ONVR and ONCR models incorporated multiple façade locations due length and articulation of building facades, which were rationalised in the assessment in order to provide a range of the building exposures. A summary of the results is presented in Table 2.12. It is noted that the ONVR took a conservative approach of no site hoarding with the removal of building structures on the PREW sites, whilst the current model and assessment under the ONCR does include the WCX retained hoarding to represent current site configuration and noise level exposure.

For Northcote site, the measurements and assessment confirmed the baseline RNP target levels were achieved for the worst case impacted receivers. The Northcote locations adopted were:

- 2 Cove Street
- 5 Wolseley Street
- 6 Northcote Street
- 5 Northcote Street

In terms of PREW the ONVR identified numerous receiver locations that were eligible for noise mitigation that was offered and implemented where agreed with the owners of respective properties by Acciona Bouygues Joint Venture (ASBJV) (refer to Appendix A).

Table 2.12 Traffic noise predictions – PREW – Historic Structures (build) v Removed structures with retained hoarding (no build)

Receiver	Floor	Direction	Traffic noise level, dB L _{Aeq,15hr}					Traffic noise level, dB L _{Aeq,9hr}				
			ONVR - 2031 - W	ONVR - 2031 - No	ONCR - 2023 - W	ONCR - 2023 - No	ONVR v ONCR – No	ONVR - 2031 - W	ONVR - 2031 - No	ONCR - 2023 - W	ONCR - 2023 - No	ONVR v ONCR – No
			Structures - No Build Volumes	Structures - Build Volumes	Structures - 2023 volumes	Structures - 2023 volumes	Structures – 2023 volumes	Structures - No Build Volumes	Structures - Build Volumes	Structures - 2023 volumes	Structures - 2023 volumes	Structures – 2023 volumes
142 Alt Street	GF	SE	62	61	57	61	-0.5	58	57	54	57	0.4
142 Alt Street	GF	SW	56	63	54	63	0.3	52	59	51	60	1.2
119 Alt Street	GF	NE	56	62	55	52	-10.0	52	58	52	49	-9.1
119 Alt Street	GF	NW	63	59	60	53	-6.2	59	55	56	50	-5.2
115 Alt Street	GF	SE	50	61	50	53	-8.4	46	57	47	50	-7.5
115 Alt Street	F 1	SE	53	61	52	60	-1.3	49	57	49	57	-0.3
115 Alt Street	F 2	SE	56	61	55	64	2.6	52	57	52	61	3.5
115 Alt Street	GF	NW	50	63	49	53	-9.6	46	58	46	50	-7.7

Table 2.12 Traffic noise predictions – PREW – Historic Structures (build) v Removed structures with retained hoarding (no build)

Receiver	Floor	Direction	Traffic noise level, dB L _{Aeq,15hr}					Traffic noise level, dB L _{Aeq,9hr}				
			ONVR - 2031 - W	ONVR - 2031 - No	ONCR - 2023 - W	ONCR - 2023 - No	ONVR v ONCR – No	ONVR - 2031 - W	ONVR - 2031 - No	ONCR - 2023 - W	ONCR - 2023 - No	ONVR v ONCR – No
			Structures - No Build Volumes	Structures - Build Volumes	Structures - 2023 volumes	Structures - 2023 volumes	Structures – 2023 volumes	Structures - No Build Volumes	Structures - Build Volumes	Structures - 2023 volumes	Structures - 2023 volumes	Structures – 2023 volumes
115 Alt Street	F 1	NW	53	64	51	58	-5.6	49	59	48	55	-3.7
115 Alt Street	F 2	NW	56	64	54	62	-2.0	52	60	51	59	-1.1
115 Alt Street	GF	NW	49	57	48	53	-4.4	45	53	45	50	-3.4
115 Alt Street	F 1	NW	53	59	51	60	1.1	49	55	48	57	2.1
115 Alt Street	F 2	NW	57	60	55	63	2.7	53	56	52	60	3.6
115 Alt Street	GF	NE	55	63	49	52	-11.4	51	58	46	49	-9.5
115 Alt Street	F 1	NE	58	64	52	63	-0.9	54	59	48	60	1.3
115 Alt Street	F 2	NE	60	65	55	67	2.3	56	59	52	64	5.1

Table 2.12 Traffic noise predictions – PREW – Historic Structures (build) v Removed structures with retained hoarding (no build)

Receiver	Floor	Direction	Traffic noise level, dB L _{Aeq,15hr}					Traffic noise level, dB L _{Aeq,9hr}				
			ONVR - 2031 - W	ONVR - 2031 - No	ONCR - 2023 - W	ONCR - 2023 - No	ONVR v ONCR – No	ONVR - 2031 - W	ONVR - 2031 - No	ONCR - 2023 - W	ONCR - 2023 - No	ONVR v ONCR – No
			Structures - No Build Volumes	Structures - Build Volumes	Structures - 2023 volumes	Structures - 2023 volumes	Structures – 2023 volumes	Structures - No Build Volumes	Structures - Build Volumes	Structures - 2023 volumes	Structures - 2023 volumes	Structures – 2023 volumes
115 Alt Street	GF	NE	51	63	56	53	-10.0	47	59	53	50	-9.1
115 Alt Street	F 1	NE	54	64	58	65	0.7	50	60	55	62	1.7
115 Alt Street	F 2	NE	58	65	60	67	2.0	54	60	57	64	3.9
124 Bland Street	GF	NE	61	64	56	55	-9.1	57	59	53	52	-7.1
124 Bland Street	F 1	NE	63	64	59	66	2.4	59	60	56	63	3.3
124 Bland Street	F 2	NE	64	65	61	67	2.3	60	60	58	64	4.3
124 Bland Street	GF	NE	58	64	59	55	-9.5	54	60	56	51	-8.6
124 Bland Street	F 1	NE	60	64	61	66	2.0	56	60	58	63	2.9

Table 2.12 Traffic noise predictions – PREW – Historic Structures (build) v Removed structures with retained hoarding (no build)

Receiver	Floor	Direction	Traffic noise level, dB L _{Aeq,15hr}					Traffic noise level, dB L _{Aeq,9hr}				
			ONVR - 2031 - W	ONVR - 2031 - No	ONCR - 2023 - W	ONCR - 2023 - No	ONVR v ONCR – No	ONVR - 2031 - W	ONVR - 2031 - No	ONCR - 2023 - W	ONCR - 2023 - No	ONVR v ONCR – No
			Structures - No Build Volumes	Structures - Build Volumes	Structures - 2023 volumes	Structures - 2023 volumes	Structures – 2023 volumes	Structures - No Build Volumes	Structures - Build Volumes	Structures - 2023 volumes	Structures - 2023 volumes	Structures – 2023 volumes
124 Bland Street	F 2	NE	63	65	62	67	2.2	59	60	59	64	4.2
124 Bland Street	GF	NW	49	60	47	54	-6.1	45	56	44	51	-5.1
124 Bland Street	F 1	NW	52	61	49	62	0.9	48	57	46	59	1.9
124 Bland Street	F 2	NW	55	61	52	63	2.4	51	57	49	60	3.3
124 Bland Street	GF	SE	62	59	60	57	-2.1	58	55	57	54	-1.2
124 Bland Street	F 1	SE	63	60	61	61	1.1	59	56	58	58	2.0
124 Bland Street	F 2	SE	64	61	62	63	1.9	60	56	59	60	3.9
136 Bland Street	GF	SE	64	60	60	53	-6.8	60	56	57	50	-5.9

Table 2.12 Traffic noise predictions – PREW – Historic Structures (build) v Removed structures with retained hoarding (no build)

Receiver	Floor	Direction	Traffic noise level, dB L _{Aeq,15hr}					Traffic noise level, dB L _{Aeq,9hr}				
			ONVR - 2031 - W	ONVR - 2031 - No	ONCR - 2023 - W	ONCR - 2023 - No	ONVR v ONCR – No	ONVR - 2031 - W	ONVR - 2031 - No	ONCR - 2023 - W	ONCR - 2023 - No	ONVR v ONCR – No
			Structures - No Build Volumes	Structures - Build Volumes	Structures - 2023 volumes	Structures - 2023 volumes	Structures – 2023 volumes	Structures - No Build Volumes	Structures - Build Volumes	Structures - 2023 volumes	Structures - 2023 volumes	Structures – 2023 volumes
136 Bland Street	GF	SW	67	65	63	56	-9.1	63	60	60	53	-7.1
137 Alt Street	GF	NW	66	62	62	60	-2.1	62	58	59	57	-1.2
137 Alt Street	GF	SW	55	67	53	56	-11.4	51	62	50	53	-9.4

1. Criteria based on 60 dB L_{Aeq,15hr} and 55 dB L_{Aeq,9hr}

2. Change in level from ONVR to ONCR greater than 2dB identified in *Italics* for discussion.

It is difficult to directly compare the ONVR and ONCR modelling outcomes due to slightly different modelling assumptions (hoarding / not hoarding) and current 2023 traffic volumes and composition compared to 2031 projected volumes from WCX EIS and M4 East ONVR. For ONCR purposes we have considered like-for-like scenarios (as far as possible) for comparison.

With this in mind and for compliance purposes we consider the prediction data for ONVR – 2031 “Build Scenario” (as described in Point #2 above) with ONCR – 2023 “Without Build” scenario (as described in point 4 above). A review of the results indicates most predictions are below those presented in the ONVR.

A number of predictions under the ONCR traffic data indicate some locations 0.7 to 5.1 dB greater than ONVR predictions. Measured traffic volumes in 2023 for PREW were significantly higher than EIS and M4 East projected volumes for 2021 and 2031 design years for unknown reasons but could be associated with Rozelle interchange and other large infrastructure projects in Sydney. Adjusting for the design 2031 volumes could account for lowering of noise levels by 2.3 dB during the day and 3.8 dB during the night confirming results generally being below ONVR levels and five discrete locations being between 0.1 to 1.3dB of predicted levels in ONVR. The potential 1.3dB technical

exceedance of ONVR criteria is a discrete portion of 115 Alt Street at F2 building level that received noise mitigation under the NIP. The ONVR v17 identified exceedances of 1-5dB, which resulted in Category 1 level mitigation. The outcomes of the ONCR are suggesting ‘worst case’ exceedances of 2.3-6.3dB which would trigger the Category 2 mitigation as per ONVR. The actual mitigation offered and implemented under the NIP is consistent with Category 2-3 (6-8dB for Category 2 and 9-11dB for Category 3) and comprised mechanical ventilation (or optional ceiling fans), acoustic seals for windows, seal around window architraves/door jambs, and seal all vents and openings in addition to acoustic curtains and provision of secondary glazing system. Accordingly, the additional mitigation provided under NIP more than compensates for the worst-case increase of 1.3dB that may occur in the interim prior to the redevelopment of the vacant sites.

A review of the road traffic noise contour noise exposure extracted from ONVR v17 (Appendix C) for Floor 2 receivers at 4.2m above relative level in conjunction with the worst case 1.3dB increase confirms no additional residential receivers would be exposed to increased noise levels that would trigger noise mitigation to further buildings. Exposure of additional buildings beyond those identified in the ONVR is controlled by the existing and retained primary (first line) of dwellings exposed to Parramatta Road. In terms 122 Bland Street for example, this building is shielded primarily by 124 Bland Street as shown in ONVR, whilst the construction of the Woolworths on the corner of Bland Street and Parramatta Road to the south-east has reduced noise exposure for 122 Bland Street and 124 Bland Street, with the field of view to Parramatta Road significantly reduced. Similarly, for Alt Street residences, no significant variance has been identified, however the retaining of site boundary hoarding and building on northern corner site of PREW for office and workshop has resulted in a reduced noise exposure compared to ONVR. The results confirm compliance with the intent and findings of the ONVR and CoA E95.

Table 2.13 Traffic noise predictions – Northcote – Historic Structures (build) v Removed structures with retained hoarding (no build)

Receiver	Floor	Direction	Traffic noise level, dB L _{Aeq,15hr}					Traffic noise level, dB L _{Aeq,9hr}				
			2023 ‘build’	2023 ‘no build’	Change	Exceeds criteria ¹	Qualified for mitigation	2023 ‘build’	2023 ‘no build’	Change	Exceeds criteria ¹	Qualified for mitigation
2 Cove Street	GF	SE	53.3	56.6	3.3	No Below RNP	No	50.0	53.4	3.4	No Below RNP	No
5 Wolseley Street ²	GF	NW	57.3	54.5	-2.8	No	Yes Under NIP	53.8	50.6	-3.2	No Below RNP	Yes Under NIP

Table 2.13 Traffic noise predictions – Northcote – Historic Structures (build) v Removed structures with retained hoarding (no build)

Receiver	Floor	Direction	Traffic noise level, dB L _{Aeq,15hr}					Traffic noise level, dB L _{Aeq,9hr}				
			2023 'build'	2023 'no build'	Change	Exceeds criteria ¹	Qualified for mitigation	2023 'build'	2023 'no build'	Change	Exceeds criteria ¹	Qualified for mitigation
6 Northcote Street	GF	SE	58.3	57.6	-0.7	No	Yes Offered	55.0	53.9	-1.1	No	Yes Offered
5 Northcote Street	GF	NW	61.3	59.3	-2.0	No	Yes Under NIP	58.1	56.0	-2.1	Yes	Yes Under NIP

1. Criteria based on 60 dB L_{Aeq,15hr} and 55 dB L_{Aeq,9hr}

2. Includes contribution from Wolseley and Parramatta Road

2.9 Discussion of traffic noise levels

The results of the noise measurements and modelling presented in this report demonstrate consistency with the requirements of the RNP under CoA E95. It also documents the commitments and design intent of the ONVR through the NIP (Appendix A) that have been offered, implemented or declined.

For Northcote civil site, whilst the removal of buildings had the potential to increase noise exposure to the most affected residences, the reduced traffic volumes and retaining of the site hoarding has more than compensated and resulted in reductions at Wolseley and Northcote Street residences despite being offered and accepting noise mitigation as part of the WestConnex construction and EIS process. An increase in noise exposure is identified for 2 Cove Street, however it is within the baseline RNP levels for arterial roads of $L_{Aeq,15hr}$ 60dB and $L_{Aeq,9hr}$ 55dB and is not eligible for further mitigation. There is no direct comparison that can be provided for Northcote with the ONVR as the scope and area of investigation was confirmed with Acoustics Advisor as previously incorrect and rather than an assessment for 'rat running' behaviour, the sole focus was on the potential of increased in Parramatta Road traffic noise exposure for Northcote, Wolseley and Cove Street residences following the removal of building structures on Northcote site and retaining of site hoarding.

The modelling has demonstrated noise levels on Wolseley Street, from local traffic excluding Parramatta Road, is consistent with that measured in 2022 and reported in the ONVR and satisfies the baseline RNP criteria for local roads of $L_{Aeq,1hr}$ 55dB day and 50dB night.

Measurements and modelling for PREW assessment locations demonstrates strong correlation with the outcomes of the ONVR, with most shown to be less than ONVR predicted levels accounting for design traffic volumes or within 1dB. A single discrete location is 1.3dB above ONVR predictions. The affected assessment locations were offered noise mitigation under the NIP with a range of responses received. The minor change in noise levels does not alter the noise mitigation provided under the ONVR or result in any additional residential receivers exposed to increased noise levels that would trigger noise mitigation to further buildings (Appendix C). The results confirm compliance with the intent and findings of the ONVR and CoA E95.

It is noted that the traffic volumes for Parramatta Road in the vicinity of the PREW site were higher than projected in the WCX EIS and M4 East ONVR. Noise measurements and traffic counts could be repeated on assumption that traffic utilising the Rozelle Interchange has stabilised and other infrastructure projects are not skewing the road traffic volumes and heavy vehicle percentages, however the actual benefit of the duplication of the compliance measurements is considered negligible. Assuming reduced traffic volumes for duplicate measurements, there could be a reduction in the noise levels for the PREW measurement locations in the order of 2.3 dB during the day and 3.8 dB during the night, based on design volumes expected to be found in reality. However, the relative difference between the 'build' (with preexisting building structure in place) and 'no build' (removal of building structures for WCX civil sites) would remain the same. Modelling has demonstrated that noise level exposure for the PREW residences identified in the ONVR is consistent within 1dB taking account traffic volumes for most assessment locations.

In terms of the 2031 year that represents the intended 10 year growth under the EIS, 2031 modelling would not alter the relative difference in noise levels with and without the building structures. There would be a consistent increase for both sites as a result of natural traffic growth. A review of the potential 'growth' of traffic on Parramatta Road reported in the M4 East ONVR indicates that 10-year growth is in the order of 10% for day and up to 30% for night, whilst the heavy vehicle percentage was projected to significantly reduce, hence actual change in noise levels for 10 year growth would be less than 0.1dB day and 0.5dB and would not alter the findings of the ONVR. That is no additional residential receivers would be exposed to increased noise levels that would trigger noise mitigation to further buildings. Furthermore, as noted in the ONVR, it is expected that development would be constructed on the vacant sites well prior to 2031 and provide equivalent or greater acoustic shielding for the residences identified, than the historic buildings on the sites.

3 Fixed facilities environmental noise

3.1 Guidelines and referenced documentation

Documentation referenced in the fixed facility component of the ONCR are listed below.

3.1.1 Guidelines

- Industrial Noise Policy (INP), NSW EPA, January 2000

The INP has since been superseded by the NSW Noise Policy for Industry (NPfi), NSW EPA October 2017, however the WestConnex EIS was approved under the INP and hence the application of that policy is still appropriate and was considered under the ONVR and this ONCR.

3.1.2 Referenced project documentation

- Westconnex M4 East Operational Noise and Vibration Review dated 15 August 2018 M4E-RNZ-RP-00-440-068-001 Rev D_06, Section 9.3, Table 21
- Westconnex New M5, Operational Noise and Vibration Review (ONVR) dated 4 July 2018 Report TH014-05F07 ONVR (r5) Rev F, Table 24 and New M5 EIS Vol 2D Appendix J, Section 4.5.5, Table 30
- WestConnex M4 East Construction Noise and Vibration Management Plan dated 9 June 2017 M4E-ES-PLN-PWD-00241, Annexure B, Table B.1
- WestConnex M4 East Construction Noise and Vibration Management Plan dated 9 June 2017 M4E-ES-PLN-PWD-00241 – Wattle Street residences, Annexure B, Table B.1
- EMM (2023) M4-M5 Link Mainline Tunnels – Operational noise and vibration review prepared to satisfy Condition E92 of the CoA SSI-7485 dated June 2023

3.2 NSW Industrial Noise Policy

The EIS noise criteria for ventilation facilities are presented in Table 3.1 as per CoA E92. The location of noise catchment areas (NCAs) in relation to the project and fixed facilities is shown Figure 3.1 and Figure 3.2.

These criteria have been set in accordance with the NSW 'Industrial Noise Policy' (INP). The goals are for total noise from all noise sources associated with each fixed facility including:

- ventilation exhaust and supply noise;
- noise breakout from fan buildings;
- jet fan noise from tunnel portals; and
- ancillary equipment such as substation transformers, condensers and fans associated with substation buildings, fire pump buildings, and water treatment plants.

Table 3.1 Noise criteria at residences for all fixed facilities, $L_{Aeq,15min}$ dB

Period	Haberfield ⁴				Campbell Road ⁵		
	NCA01	NCA02 ⁶	NCA02 ⁷	NCA06 ⁸	NCA48	NCA49	NCA50
Day	51	46	61	50	60	59	57
Evening	50	46	53	50	50	50	50
Night	43	42	47	44	45	45	44 ⁹

3.3 Cumulative noise

Assessment of noise emissions from the M4–M5 link fixed facilities (PRVF and SPI) has considered the noise level contributions reported for M4 East¹ and New M5² such that the cumulative noise levels from operation of all facilities simultaneously does not exceed the noise criteria outlined in Table 3.1. The allowable noise contributions from M4–M5 link fixed facilities (PRVF and SPI) are summarised in Table 3.2.

The predicted noise contributions reported for the M4 East ONVR results included Stage 3 (M4–M5 – this project). On the assumption that the facilities at PRVF are effectively the same for M4E and M4–M5, allowance goals for M4–M5 PRVF ventilation facilities are typically lower than the overall noise criteria. Noise contributions reported in the New M5 ONVR were less than $L_{Aeq,15min}$ 35 dB at Campbell Street residences (NCA48 and NCA49) and would not contribute to the overall night time noise criterion of $L_{Aeq,15min}$ 45 dB.

Table 3.2 Noise allowance for M4–M5 fixed facilities, $L_{Aeq,15min}$ dB

Period	Haberfield				Campbell Road		
	NCA01	NCA02 ¹⁰	NCA02 ¹¹	NCA06	NCA48	NCA49	NCA50
Day	51	45	61	50	60	59	57
Evening	50	45	53	50	50	50	50
Night	42	40	47	42	45	45	44

⁴ WestConnex M4 East Operational Noise and Vibration Review dated 15 August 2018 M4E-RNZ-RP-00-440-068-001 Rev D_06, Section 9.3, Table 21

⁵ WestConnex New M5, Operational Noise and Vibration Review (ONVR) dated 4 July 2018 Report TH014-05F07 ONVR (r5) Rev F, Table 24 and New M5 EIS Vol 2D Appendix J, Section 4.5.5, Table 30

⁶ WestConnex M4 East Construction Noise and Vibration Management Plan 9 June 2017 M4E-ES-PLN-PWD-00241, Annexure B, Table B.1

⁷ WestConnex M4 East Construction Noise and Vibration Management Plan 9 June 2017 M4E-ES-PLN-PWD-00241 – Wattle Street residences, Annexure B, Table B.1

⁸ WestConnex M4 East Construction Noise and Vibration Management Plan 9 June 2017 M4E-ES-PLN-PWD-00241, Annexure B, Table B.1

⁹ This value has been updated based on an error found in the M4–M5 Link EIS

¹⁰ WestConnex M4 East Construction Noise and Vibration Management Plan 9 June 2017 M4E-ES-PLN-PWD-00241, Annexure B, Table B.1

¹¹ WestConnex M4 East Construction Noise and Vibration Management Plan 9 June 2017 M4E-ES-PLN-PWD-00241 – Wattle Street residences, Annexure B, Table B.1

3.4 Modifying factor adjustments

Where the character of the industrial noise is assessed as particularly annoying (i.e. if it has an inherently tonal, low frequency, impulsive, or is intermittent at night), then an adjustment is to be added to penalise the noise for its potential increase in annoyance. The INP provides definitive procedures for determining whether a penalty or adjustment should be applied.

3.5 Sleep disturbance criteria

The assessment of potential sleep disturbance at residences is required in accordance with the INP application notes where operations occur at night.

The INP application notes suggests that an $L_{A1,1min}$ or L_{Amax} level of RBL plus 15 dB is a suitable screening criterion for sleep disturbance for the night-time period. This applies at 1 m from the most affected façade of a building.

A detailed maximum noise level event assessment is required if the screening criteria is exceeded. Further guidance on potential impact on sleep is provided in the NSW Road Noise Policy (RNP) (DECCW 2011). The RNP references several studies that have been conducted into the effect of maximum noise levels on sleep, and provides the following factors that are key in assessing the extent of impacts on sleep:

- how often high noise events would occur;
- the distribution of likely events across the night-time period and the existing ambient maximum events in the absence of the project;
- whether there are times of day when there is a clear change in the noise environment (such as during early-morning shoulder periods); and
- current scientific literature available at the time of the assessment regarding the impact of maximum noise level events at night.

World Health Organisation (WHO) Night Noise Guideline indicates that L_{Amax} of 42 dB inside a bedroom aligns with the lowest observable adverse effect level that may cause awakenings from sleep. Based on the conservative consumption of a 10 dB(A) noise reduction across a façade with a partially opened window, this results in an external level of L_{Amax} of 52 dB. This level is consistent with the EPA's current NPfl sleep disturbance recommendations that apply the higher of background plus 15dB or 52dB L_{Amax} during the night period.

It is commonly accepted by acoustic practitioners and regulatory bodies that a facade of a residential building of standard construction including a partially open window will reduce external noise levels by 10 dB.

Project sleep disturbance screening criteria are provided in Table 3.3.

Table 3.3 Project sleep disturbance criteria at residences, L_{Amax} dB

Period	Haberfield ²				Campbell Road ²		
	NCA01	NCA02	NCA02 ⁴	NCA06	NCA48	NCA49	NCA50
Night ¹	53	52	57	54	55	55	54 ³

1. Night period is 10.00 pm to 7.00 am

2. Noise criteria taken from the M4–M5 Link EIS

3. This value has been updated based on an error found in the M4–M5 Link EIS.

4. WestConnex M4 East Construction Noise and Vibration Management Plan dated 9 June 2017 M4E-ES-PLN-PWD-00241 – Wattle Street residences

In terms of the fixed facilities and operation of ventilation fans and other support ancillary plant associated with the substation, there are no L_{Amax} events that occur as operation of plant and equipment is effectively steady state. Accordingly, whilst sleep disturbance criteria are applied under a typical INP noise assessment with intermittent or quasi continuous noise sources, they are not typically applicable to continuous operation of mechanical plant and equipment such as the WCX fixed facilities.

3.6 Site and assessment locations

The location of the fixed facilities and assessment locations are presented in Figure 3.1 and Figure 3.2. These were considered in the assessment and design of noise mitigation measures. The closest assessment locations and distances to closest noise source on the respective sites are presented in Table 3.4.

Table 3.4 Assessment locations

Facility	Receiver Type	Address	Distance to closest noise source (m)
PRVF	Residential	19 Earle Street	160
		14–16 Wattle Street	125
		18 and 1–7 Walker Avenue	27
		306 Parramatta Road	110
SPI	Residential	53 Barwon Park Road ¹	70

1. Assessed to upper floor of building.

For assessment of noise from SPI fixed plant and equipment, 53 Barwon Park Road was selected as the most exposed assessment location due to proximity and height of this residential building (four levels) and it being located directly opposite the facility. If the project noise criteria are satisfied at 53 Barwon Park Road (upper floor) then the criteria would also be satisfied at Campbell Street residences and beyond.

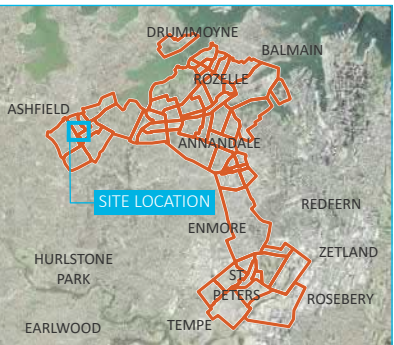
The closest and/or most exposed locations to the relevant ventilation facilities are presented in Table 3.5, Figure 3.1 and Figure 3.2 for the night assessment period. The night assessment period represents the most stringent assessment criteria and if the night noise goals are satisfied, then day and evening levels would also be satisfied.

Table 3.5 Fixed facilities assessment locations and noise compliance levels

Assessment Location	Address	M4–M5 allowance criteria (night) $L_{Aeq,15min}$ dB
PRVF		
A1	19 Earle Avenue	42
A2	14–16 Wattle Street	47
A3	18 Walker Avenue	40
A4	1–7 Walker Avenue	42
A5	306 Parramatta Road	42
SPI		
A1	53 Barwon Park Road ¹	45

1. Assessed to upper floor of building.

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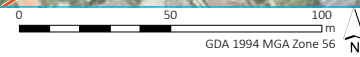
- KEY**
- Indicative site boundary
 - Site layout
 - Noise catchment boundary
 - Heritage item (LEP/SHR)
 - Noise monitoring locations
 - Noise assessment location

Paramatta Road Ventilation Facility (PRVF)- NCAs, assessment and monitoring locations

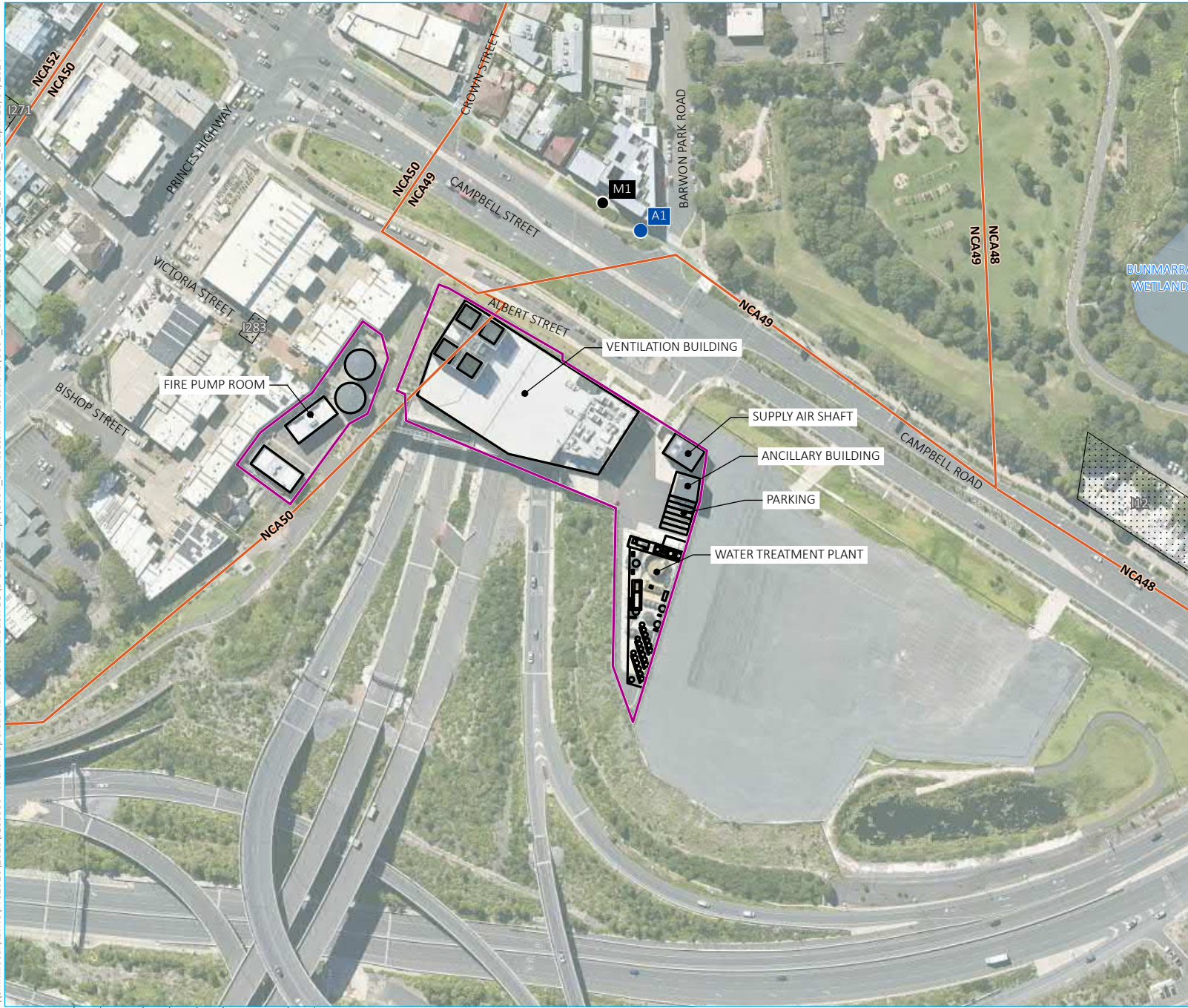
M4-M5 Link Mainline Tunnels
Operational Noise Compliance Report
Figure 3.1



Source: EMM (2024); ABS (2021); DCSSS (2023); GA (2009); MetroMap (2024)



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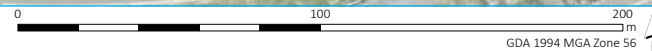


- KEY**
- Indicative site boundary
 - Noise catchment boundary
 - Site layout
 - Heritage item (LEP/SHR)
 - Noise monitoring location
 - Noise assessment location
- INSET KEY**
- Noise catchment boundary

St Peter's Interchange (SPI)
- NCAs, assessment and monitoring locations

M4-M5 Link Mainline Tunnels
Operational Noise Compliance Report
Figure 3.2

Source: EMM (2024); DCSSS (2024); GA (2009); MetroMap (2024)



3.7 Methodology

3.7.1 Overview

Attended environmental noise monitoring was done in general accordance with Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant NSW requirements between 11.00pm Thursday 18 and 2.00am Friday 19 January 2024. Meteorological data was obtained from the Canterbury automatic weather station (AWS) (station ID 066194) and Sydney Olympic Park AWS (station ID 066212) in addition to site observations and live phone App which allowed correlation of atmospheric parameters during measured noise levels.

EMM liaised with WestConnex Motorway Operational Control (MOC) to determine typical worst-case operation of the PRVF and SPI ventilation facilities. These operational parameters were then replicated from 10.30pm to 2.00am on Thursday 18 to 2.00am Friday 19 January 2024. Operational conditions were as follows:

PRVF:

- M4-M5 Link
 - 3 x Exhaust Fans @95%
 - 2 x Supply Fans @56%
 - 17 x Jet Fans on Wattle Street ramps (portal breakout check)
- M4 East
 - 3 x Exhaust Fans @51%

SPI

- M4-M5 Link
 - 3 x Exhaust Fans @65%
 - 25 x Jet Fans on SPI on and off ramps (portal breakout check)

We are advised by the operations team and mechanical engineers that the supply fans are typically only utilised in a 'fire' or 'congested' mode of operation. Similarly, the full suite of exhaust fans is never operated and numerous fans remain on standby only, and would only engage under fire mode. The monitoring and operational parameter approach was discussed with the Acoustic Advisor on the project during the compliance planning phase and prior to measurements on the assumption that if night complies with required criteria, then day and evening would also comply.

EMM were advised that normal operation of the M4-M5 fixed facilities are:

PRVF:

- M4-M5 Link
 - 3 x Exhaust Fans @40%
 - no Supply Fans
 - no jet fans

- M4 East
 - 3 x Exhaust Fans @51%

SPI

- M4-M5 Link
 - 3 x Exhaust Fans @40%
 - no jet fans

3.7.2 Attended noise monitoring

During this survey, attended noise monitoring was conducted during the night period at each location. Duration of each measurement was 15 minutes despite the steady state nature of the ventilation facilities. Atmospheric conditions were also confirmed at each location through the duration of the monitoring to confirm temperature, wind speed and direction.

Measured sound levels from various sources were noted during each measurement, and particular attention was paid to the extent of site's contribution (if any) to measured levels. At each monitoring location, the site-only $L_{Aeq,15minute}$ were measured directly or determined by other methods detailed in Section 7.1 of the NPfI. The L_{Amax} is not applicable as operation of fixed plant is continuous in nature and not intermittent or quasi continuous resulting in no significant fluctuations.

If the exact noise levels from site could not be established due to masking by other noise sources in a similar frequency range, but site noise was determined to be at least 5 dB lower than relevant limits, then a maximum estimate of site noise may be provided. This is expressed as a 'less than' quantity, such as <20 dB or <30 dB.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may be used in this report. When site noise is noted as IA, no site noise was audible at the monitoring location. When site noise is noted as NM, this means site noise was audible but could not be quantified. Where the fixed facility was determined to be inaudible even during breaks in traffic, a conservative estimate of its relative contribution was determined by considered a level 10 dB below the measured L_{A90} background level.

3.7.3 Modifying factors

All measurements were evaluated for potential modifying factors in accordance with the NPfI (as the INP modifying factor adjustments have been withdrawn). Assessment of modifying factors is undertaken at the time of measurement if the site was audible and quantifiable. If applicable, modifying factor penalties have been reported and added to measured site-only L_{Aeq} noise levels.

Low-frequency modifying factor penalties have only been applied to site-only L_{Aeq} levels if the site was the only contributing low-frequency noise source. Specific methodology for assessment of each modifying factor is outlined in Fact Sheet C of the NPfI.

3.7.4 Instrumentation

Equipment used to measure environmental noise levels is detailed in Table 3.6. Calibration certificates are provided in Appendix D.

Table 3.6 Attended noise monitoring equipment

Item	Serial number	Calibration due date	Relevant standard
Svantek SVAN 979 sound level meter	21095	22 July 2024	IEC 61672-1:2002
Svantek V36 calibrator	106879	6 June 2024	IEC 60942:2003

3.8 Results

3.8.1 Total measured noise levels and atmospheric conditions

Overall noise levels measured at each location during attended measurements are provided in Table 3.7. Levels in this table are not necessarily the result of noise from the ventilation facilities.

Table 3.7 Total measured noise levels – 18/19 January 2024

Location	Start date and time	L _{Amax} dB	L _{A1} dB	L _{A10} dB	L _{Aeq} dB	L _{A50} dB	L _{A90} dB	L _{Amin} dB
PRVF¹								
M1	19/1/2024 12:29am	69	62	55	52	49	45	41
M2	19/1/2024 12:02am	98	77	67	69	55	47	44
M3	18/1/2024 11:21pm	59	53	50	48	48	46	43
M4	18/1/2024 11:40pm	67	59	51	50	47	45	44
M5	19/1/2024 12:50am	84	79	72	68	60	49	46
SPI								
M1	19/1/2024 1:40am	70	67	60	56	51	48	45

Notes: 1. Includes operation of M4 East and M4-M5 Link Mainline Tunnels

Atmospheric condition data was checked via a phone App (Willy Weather) and cross referenced with meteorological station data where relevant and shown in Table 3.8 presenting wind speed, direction and temperature. Attended noise monitoring is not done during rain, hail, or wind speeds above 5 m/s at microphone height.

Table 3.8 Measured atmospheric conditions – 18/19 January 2024

Location	Start date and time	Temperature °C	Wind speed m/s	Wind direction ° Magnetic north ¹	Cloud cover 1/8s
PRVF					
M1	19/1/2024 12:29am	19	0-1.5	275	0
M2	19/1/2024 12:02am	20	0-1	255	0
M3	18/1/2024 11:21pm	21	0-1.5	228	0
M4	18/1/2024 11:40pm	20	0-1	228	0

Table 3.8 Measured atmospheric conditions – 18/19 January 2024

Location	Start date and time	Temperature °C	Wind speed m/s	Wind direction ° Magnetic north ¹	Cloud cover 1/8s
M5	19/1/2024 12:50am	19	0-1	284	0
SPI					
M1	19/1/2024 1:40am	20	0-4	240	0

Notes: 1. "-" indicates calm conditions at monitoring location.

3.9 Site only noise levels

3.9.1 Modifying factors

There were no modifying factors, as defined in the INP, applicable during the survey. Measurements for SPI at 53 Barwon Park Road identified potential for low frequency noise, however further analysis confirmed that it did not exceed the requirements under the NPfl low frequency content to incur a modifying factor adjustment with the difference between the C and A weighted noise level being less than 15 dB.

3.9.2 Monitoring results

Table 3.9 provides site noise levels in the absence of other sources, where possible, and includes weather data from the Canterbury AWS for PRVF and site observations and live phone App (Willy Weather utilising Bureau of Meteorology data) for SPI. Cumulative limits for PRVF from M4 East and M4-M5 Link Mainline Tunnels are shown in brackets ().

Table 3.9 Fixed facilities noise levels and limits – 18/19 January 2024

Location	Start Date and Time	Wind		Noise enhancing limits apply? ¹	Limits, dB	Site levels, dB	Compliance, dB	Observations / Comments
		Speed m/s	Direction ²		L _{Aeq,15minute}	L _{Aeq,15minute} ³	L _{Aeq,15minute}	
PRVF⁴								
M1	19/1/2024 12:29am	0-1.5	275	N	42 (43)	IA <35	Yes	Traffic, insects, PRVF not audible during breaks in traffic.
M2	19/1/2024 12:02am	0-1	255	N	47 (48)	<43	Yes	Traffic very close and loud, PRVF ventilation just occasionally audible in breaks in traffic - L _{Aeq} and L _{A90} controlled by traffic, nothing from portals - faint occasional winding noise just audible but not ventilation facility. Adopted L _{Amin} for vent facility
M3	18/1/2024 11:21pm	0-1.5	228	N	40 (42)	<36	Yes	Traffic, insects, PRVF barely audible to inaudible - L _{Aeq} and L _{A90} controlled by traffic
M4	18/1/2024 11:40pm	0-1	228	N	42 (44)	42	Yes	Traffic, insects, PRVF ventilation inaudible, substation audible in breaks in nearby traffic (Parramatta Road), but distant traffic (Wattle Street and Parramatta Road west) still present - L _{Aeq} and L _{A90} controlled by traffic, some local traffic and domestic activities

Table 3.9 Fixed facilities noise levels and limits – 18/19 January 2024

Location	Start Date and Time	Wind		Noise enhancing limits apply? ¹	Limits, dB	Site levels, dB	Compliance, dB	Observations / Comments
		Speed m/s	Direction ²		L _{Aeq,15minute}	L _{Aeq,15minute} ³	L _{Aeq,15minute}	
M5	19/1/2024 12:50am	0-1	284	N	42 (43)	IA <39	Yes	Traffic, insects, PRVF not audible in breaks in traffic, transformer or similar whine from construction site at 215-217 Parramatta Road, Haberfield controlling L _{Amin}
SPI								
M1	19/1/2024 1:40am	0-4	240	N	45	<44	Yes	Local and distant traffic, insects, airport operations, single plane near end of measurement. SPI exhaust fan building audible in breaks in traffic but also other source so not L _{Amin} Transformer doors facing east not audible at 53 Barwon Park Road, audible at Sydney Park east of vent building, not audible at terraces on 2-34 Campbell Road L _{A90} 45dB so <35dB)

Notes:

- Noise enhancing limits are applicable if weather conditions were within parameters specified in NPfl.
- Degrees magnetic north, “-” indicates calm conditions.
- Site-only L_{Aeq,15minute} includes modifying factor penalties if applicable.
- Includes operation of M4 East and M4-M5 Link Mainline Tunnels.

L_{Amax} not applicable as fixed plant is continuous operation and not intermittent or quasi continuous sources.
Cumulative criteria for PRVF from M4 East and M4-M5 Link Mainline Tunnels shown in brackets ()

3.10 Discussion

Attended environmental noise monitoring described in this report was done during the night period of 18 and 19 January 2024 at six monitoring locations.

Attended noise monitoring observations and results (Table 3.9) demonstrate that operational noise from the PRVF and SPI ventilation facilities complied with the design noise criteria outlined in Table 3.5. It is also noted that noise measurements and compliance determination from PRVF included the operation of M4 East ventilation operation as it could not be reasonably excluded from the measurements.

Locations where a contribution could be determined were 1-7 Waker Street (PRVF) and 53 Barwon Park Road (SPI) show good correlation with predicted levels of 42dB and 44dB respectively and satisfy the M4-M5 and overall WCX noise goal allowances. All other locations were inaudible to barely audible, well below the noise goal allowance and a noise contribution could not be established.

The compliance measurement operating parameters considered under this ONCR protocol were atypical for normal M4-M5 Link operations, and during normal modes the levels would be significantly lower.

With compliance under night conditions demonstrated, day and evening noise limits would also be satisfied as agreed with Acoustic Advisor prior to compliance monitoring. No additional noise mitigation is required.

4 Complaints

Since the opening of the WestConnex 3A – M4–M5 Link Mainline tunnels project (the Project) and commencement of traffic and operation of the associated fixed facilities, there have been no noise complaints received by Acciona Samsung Bouygues Joint Venture (ASBJV), TransUrban, Fulton Hogan or reported to Council or other regulatory bodies to EMMs knowledge in regards to fixed facilities at Parramatta Road Ventilation Facility (PRVF) or St Peters Interchange (SPI).

This is consistent with the outcomes of the ONVR and this ONCR, where compliance with the road traffic assessment has been demonstrated for Parramatta Road (PREW and Northcote). Similarly, the operation of mechanical plant and equipment associated with fixed facilities has demonstrated compliance (Table 3.9) with the requirements of CoA E95 of the Approval.

However there has been three complaints at residences along the alignment of the M4-M5 tunnels post operation as summarised in Table 4.1.

Table 4.1 Complaints summary

Date	Address	Description
24 November 2023	52 Dickson Street, Newtown	Claim on consistent vibration levels, some days louder than others but clearly audible without specialist sound equipment, claims of cracking. Claims associated with operation not construction.
27 September 2023	43 Coleridge Street, Leichhardt	Noise inside claimed to be like what occurred during construction tunnelling, consistent noise/vibration level and is present 24/7
30 May 2023	34 Albion Street, Annandale	Vague email trail and potentially related to Rozelle Interchange works however similar consistent vibration experienced and collapsed ceiling.

A review of the complaint locations identify residences are generally above the alignment of the M4-M5 tunnels and would have been exposed to ground vibration and potential regenerated airborne noise from tunnelling and associate construction activities of the M4-M5. These residences would have also been subject to inspection and dilapidation reports pre and post construction.

Tunnels depths are typically greater than 30m but do range from 16-25m in some parts of Camperdown, Annadale and Leichhardt. In terms of operation of M4-M5 and potential for current vibration generation, there is no activities or facilities that could give rise to vibration levels and subsequent regenerated noise in residences from the operation of the tunnel. Passing traffic in tunnel does not generate ground vibration of a level that could be measured or result vibration or audible regenerated noise within residences above the tunnel alignment. Similarly, there is no mechanical plant facilities within the tunnel alignment that can generate the level of ground vibration claimed to be felt and resulting in regenerated noise within the residences.

Aspects of property damage in terms of cosmetic or structural damage are part of the construction phase and are not captured under the ONVR and ONCR process and would have been covered off during the construction works and completion.

When considering the above and in discussion with the Acoustic Advisor, the weight of available evidence suggests these complaints are not a result of operational road traffic noise or mechanical plant from the project.

5 Compliance review

To clearly outline the respective compliance, Table 5.1 provides a summary of the components of Condition E95 and relevant sections of the ONCR where these are addressed. It must be clarified that road traffic noise within the ONVR and ONCR was solely for the review of impacts resulting from the removal of existing building structures at PREW and Northcote civil sites, the existing acoustic walls and hoarding would be retained and that this is a temporary situation that would be fully resolved and result in overall noise reductions from Parramatta Road following redevelopment of the sites well before 2031.

In terms of the 2031 year that represents the intended 10 year growth under the EIS, 2031 modelling would not alter the relative difference in noise levels with and without the building structures. There would be a consistent increase for both sites as a result of natural traffic growth. A review of the potential 'growth' of traffic on Parramatta Road reported in the M4 East ONVR indicates that 10-year growth is in the order of 10% for day and up to 30% for night, whilst the heavy vehicle percentage was projected to significantly reduce, hence actual change in noise levels for 10 year growth would be less than 0.1dB day and 0.5dB and would not alter the findings of the ONCR.

Table 5.1 Compliance E95 – SSI 7485

Condition of Approval E95	Section of ONCR	Compliance
<p>Within 12 months of the commencement of operation of the CSSI, the Proponent must undertake monitoring of operational noise to compare actual noise performance of the CSSI against the noise performance predicted in the review of noise mitigation measures required by Condition E92.</p> <p>The Proponent must prepare an Operational Noise Compliance Report to document this monitoring. The Report must include, but not necessarily be limited to:</p>		
(a) noise monitoring to assess compliance with the operational noise levels predicted in the review of operational noise mitigation measures required under Condition E92;	Section 2.5 Section 3.8	Yes Yes
(b) a review of the operational noise levels in terms of criteria and noise goals established in the <i>NSW Road Noise Policy 2011</i> ;	Section 2.8 and 2.9	Yes
(c) methodology, location and frequency of noise monitoring undertaken, including monitoring sites at which CSSI noise levels are ascertained, with specific reference to locations indicative of impacts on sensitive receivers;	Section 2.5 through to Section 2.8 Section 3.6 and 3.7	Yes Yes
(d) details of any complaints and enquiries received in relation to operational noise generated by the CSSI between the date of commencement of operation and the date the report was prepared;	Section 4	Yes
(e) any required recalibrations of the noise model taking into consideration factors such as noise monitoring and actual traffic numbers and proportions;	Section 2.7 and Section 2.9	None - clarified
(f) an assessment of the performance and effectiveness of applied noise mitigation measures together with a review and if necessary, reassessment of mitigation measures; and	Section 2.9 Section 3.10	Yes Yes

Table 5.1 Compliance E95 – SSI 7485

Condition of Approval E95	Section of ONCR	Compliance
(g) identification of additional measures to those identified in the review of noise mitigation measures required by Condition E92 , that would be implemented with the objective of meeting the criteria outlined in the <i>NSW Road Noise Policy</i> (EPA, 2011) and <i>Industrial Noise Policy</i> (EPA, 2000), when these measures would be implemented and how their effectiveness would be measured and reported to the Secretary and the EPA.	Section 2.9 Section 3.10	None

6 Conclusion

6.1 Road traffic noise

The measurements and modelling confirmed compliance with the requirements of E95 and specifically the NSW Road Noise Policy. Where noise impacts were identified under the ONVR, at receiver noise mitigation has been offered and / or implemented under the NIP. This aspect of the ONVR and ONCR was solely for the review of impacts resulting from the removal of existing building structures at PREW and Northcote civil sites, the existing acoustic walls and hoarding would be retained and that this is a temporary situation that would be fully resolved and result in overall noise reductions from Parramatta Road following redevelopment of the sites well before 2031 design year.

Furthermore, the compliance review has identified improvements in noise exposure for some residents in the vicinity of the Northcote civil site as a result of the acoustic barriers and hoardings providing more acoustic shielding than the pre-existing scattered buildings. Noise levels on Wolseley Street have also been demonstrated to be consistent with the baseline RNP criteria for local roads.

No additional mitigation is required for road traffic noise associated with the Project.

6.2 Fixed facilities environmental noise

Attended measurements under an atypical operating scenario representing a worst case, have demonstrated that the PRVF and SPI fixed facilities satisfied the requirements of CoA E95 and specifically the NSW Industrial Noise Policy and relevant M4-M5 Link noise contributions determined in the ONVR.

No additional noise mitigation measures are required.

Appendix A

Noise Insulation Program (NIP)

WCX3A - Acoustic Treatments Register

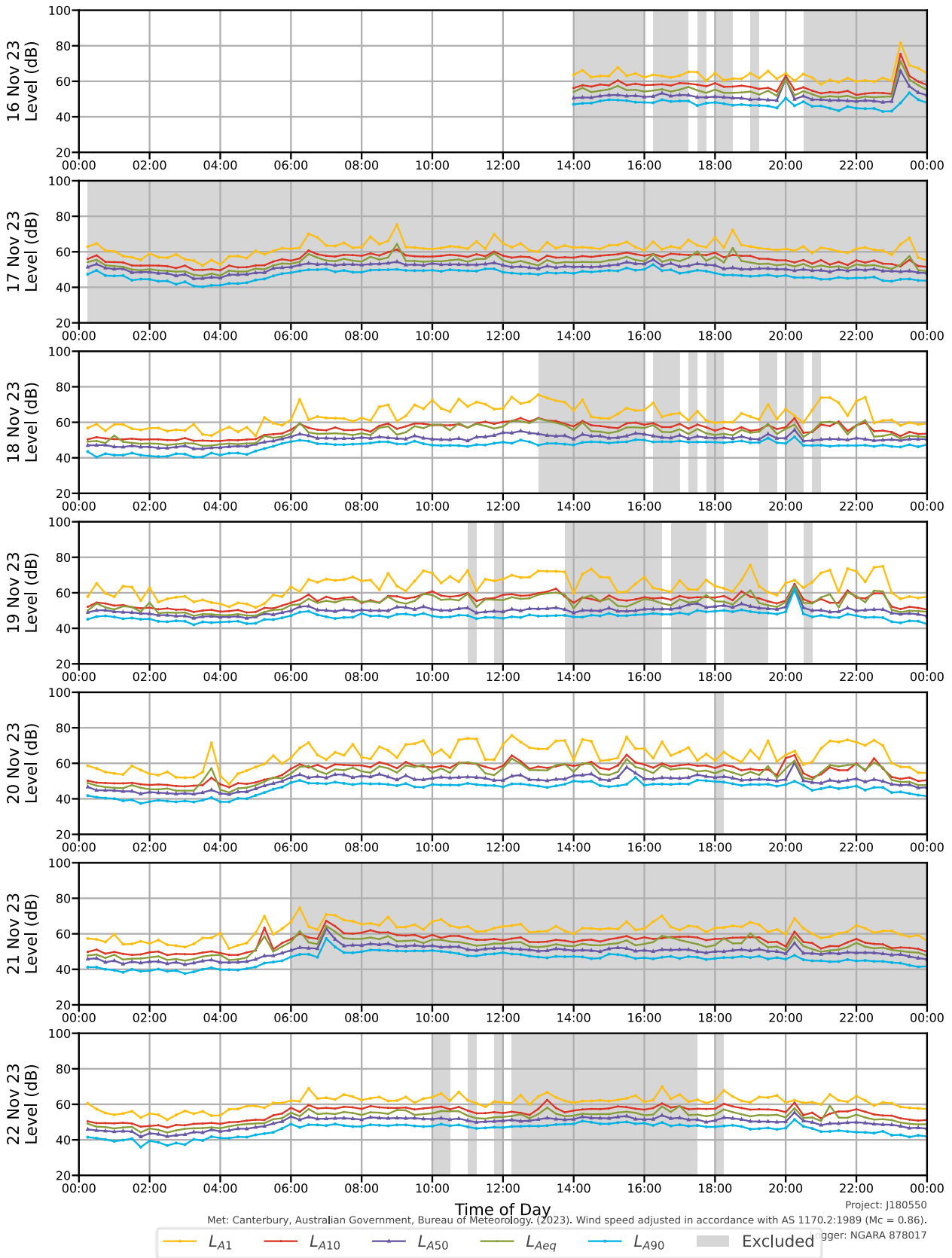
Document Number	Property Address	Status	D&C Deed, Schedule 9 - Status	Transmittal Reference Number	Date Completion Certificate Issued TO WCX
M4M5-LSBJ-PRW-PS-AT01-CER-0001	1 Walker Avenue, Haberfield	Completion certificate received	Certificate received	WCXSTG3A-LSB-001218	26/09/2019
M4M5-LSBJ-PRW-PS-AT01-CER-0005	24 Wattle Street, Haberfield	Completion certificate received	Certificate received	WCXSTG3A-LSB-001218	26/09/2019
M4M5-LSBJ-PRW-PS-AT01-CER-0002	9 Walker Avenue, Haberfield	Completion certificate received	Certificate received	WCXSTG3A-LSB-001218	26/09/2019
M4M5-LSBJ-PRW-PS-AT01-CER-0003	11 Walker Avenue, Haberfield	Completion certificate received	Certificate received	WCXSTG3A-LSB-001218	26/09/2019
M4M5-LSBJ-PRW-PS-AT01-CER-0004	13 Walker Avenue, Haberfield	Completion certificate received	Certificate received	WCXSTG3A-LSB-001218	26/09/2019
M4M5-LSBJ-PRW-PS-AT01-CER-0006	119 Alt Street, Ashfield	Completion certificate received	Certificate received	WCXSTG3A-LSB-001218	26/09/2019
M4M5-LSBJ-PRW-PS-AT01-CER-0007	U07 115 All Street, Ashfield	Completion certificate received	Certificate received	WCXSTG3A-LSB-001218	26/09/2019
M4M5-LSBJ-PRW-PS-AT01-CER-0008	7 Walker Avenue, Haberfield	Completion certificate received	Certificate received	WCXSTG3A-LSB-001262	14/10/2019
M4M5-LSBJ-PRW-PS-AT01-CER-0009	U06 115 All Street, Ashfield	Completion certificate received	Certificate received	WCXSTG3A-LSB-001262	14/10/2019
M4M5-LSBJ-PRW-PS-AT01-CER-0010	U08 124 Bland Street, Ashfield	Completion certificate received	Certificate received	WCXSTG3A-LSB-001286	23/10/2019
M4M5-LSBJ-PRW-PS-AT01-CER-0011	U06 124 Bland Street, Ashfield	Completion certificate received	Certificate received	WCXSTG3A-LSB-001286	23/10/2019
M4M5-LSBJ-PRW-PS-AT01-CER-0012	U34 115 All Street, Ashfield	Completion certificate received	Certificate received	WCXSTG3A-LSB-001286	23/10/2019
M4M5-LSBJ-PRW-PS-AT01-CER-0013	18 Wattle Street, Haberfield	Completion certificate received	Certificate received	WCXSTG3A-LSB-001411	19/11/2019
M4M5-LSBJ-PRW-PS-AT01-CER-0014	U29 115 All Street, Ashfield	Completion certificate received	Certificate received	WCXSTG3A-LSB-001411	19/11/2019
M4M5-LSBJ-PRW-PS-AT01-CER-0015	U30 115 All Street, Ashfield	Completion certificate received	Certificate received	WCXSTG3A-LSB-001411	19/11/2019
M4M5-LSBJ-PRW-PS-AT01-CER-0016	117 All Street, Ashfield	Completion certificate received	Certificate received	WCXSTG3A-LSB-001462	3/12/2019
M4M5-LSBJ-PRW-PS-AT01-CER-0017	5 Northcote Street, Haberfield	Completion certificate received	Certificate received	WCXSTG3A-LSB-001462	3/12/2019
M4M5-LSBJ-PRW-PS-AT01-CER-0018	U01 124 Bland Street	Completion certificate received	Certificate received	WCXSTG3A-LSB-001551	19/12/2019
M4M5-LSBJ-PRW-PS-AT01-CER-0019	34 Wattle Street	Completion certificate received	Certificate received	WCXSTG3A-LSB-002019	1/05/2020
M4M5-LSBJ-PRW-PS-AT01-CER-0020	5 Wolsley Street	Completion certificate received	Certificate received	WCXSTG3A-LSB-002019	1/05/2020
M4M5-LSBJ-PRW-PS-AT01-CER-0021	126 Alt Street	Completion certificate received	Certificate received	WCXSTG3A-LSB-002019	1/05/2020
	U08 115 All Street	Treatment install completed	Contractor Signed Statement Schedule 9 Provided	WCXSTG3A-LSB-WCX-NOT-001082	4/09/2020
	U31 115 All Street	Treatment install completed	Contractor Signed Statement Schedule 9 Provided	WCXSTG3A-LSB-WCX-NOT-001080	4/09/2020
	U09 115 All Street	Treatment install completed	Contractor Signed Statement Schedule 9 Provided	WCXSTG3A-LSB-WCX-NOT-001081	4/09/2020
	U05 124 Bland Street	Treatment install completed	Contractor Signed Statement Schedule 9 Provided	WCXSTG3A-LSB-WCX-NOT-001167	30/10/2020
	30 Walker Avenue	Treatment install completed	Contractor Signed Statement Schedule 9 Provided	WCXSTG3A-LSB-WCX-NOT-001166	30/10/2020
M4M5-LSBJ-PRW-PS-AT01-CER-0022	U18 115 All Street	Treatment install completed	Certificate received	WCXSTG3A-LSB-003838	12/01/2022
M4M5-LSBJ-PRW-PS-AT01-CER-0023	20 Wattle Street	Treatment install completed	Certificate received	WCXSTG3A-LSB-003838	12/01/2022
M4M5-LSBJ-PRW-PS-AT01-CER-0024	U20 115 All Street	Treatment install completed	Certificate received	WCXSTG3A-LSB-003838	12/01/2022
M4M5-LSBJ-PRW-PS-AT01-CER-0025	U32 115 All Street	Treatment install completed	Certificate received	WCXSTG3A-LSB-003838	12/01/2022
M4M5-LSBJ-PRW-PS-AT01-CER-0026	U21 115 All Street	Treatment install completed	Certificate received	WCXSTG3A-LSB-003838	12/01/2022
	137 Alt Street	Treatment install completed	Contractor Signed Statement Schedule 9 Provided		14/06/2023
	U01 139 All Street	Treatment install completed	Contractor Signed Statement Schedule 9 Provided		14/06/2023
	U02 139 All Street	Treatment install completed	Contractor Signed Statement Schedule 9 Provided		14/06/2023
	128 All Street	Treatment Proposal offered - no response			
	136 Bland Street	Treatment Proposal offered - no response			
	17 Walker Avenue	Treatment Proposal offered - no response			
	19 Walker Avenue	Treatment Proposal offered - no response			
	22 Wattle Street	Treatment Proposal offered - no response			
	24 Walker Avenue	Treatment Proposal offered - no response			
	26 Walker Avenue	Treatment Proposal offered - no response			
	28 Walker Avenue	Treatment Proposal offered - no response			
	40 Wattle Street	Treatment Proposal offered - no response			
	5A Walker Avenue	Treatment Proposal offered - no response			
	7A Walker Avenue	Treatment Proposal offered - no response			
	U01 300 Parramatta Road	Treatment Proposal offered - no response			
	U02 124 Bland Street	Treatment Proposal offered - no response			
	U02 300 Parramatta Road	Treatment Proposal offered - no response			
	3 Walker Avenue	Treatment Proposal offered - no response			
	137 Bland Street	Treatment Proposal offered - no response			
	138 Bland Street	Declined inspection			
	142 All Street	Declined inspection			
	32 Walker Avenue	Declined inspection			
	44 Wattle Street	Declined inspection			
	5 Walker Avenue	Declined inspection			
	U03 139 All Street	Declined inspection			
	U03 124 Bland Street	Declined proposed treatment			
	15 Walker Avenue	Declined proposed treatment			
	21 Walker Avenue	Declined proposed treatment			
	26 Wattle Street	Declined proposed treatment			
	34 Walker Avenue	Declined proposed treatment			
	135 Bland Street	Declined proposed treatment		WCXSTG3A-LSB-WCX-NOT-002862	
	36A Wattle Street	Inspection offered - no response			
	6 Northcote Street	Inspection offered - no response			
	U19 115 All Street	Inspection offered - no response			
	U04 124 Bland Street	Identified as ineligible			
	U05 115 All Street	Identified as ineligible			
	U07 124 Bland Street	Identified as ineligible			
	U10 115 All Street	Identified as ineligible			
	U17 115 All Street	Identified as ineligible			
	U22 115 All Street	Identified as ineligible			

Appendix B

Noise Monitoring Charts – November 2023

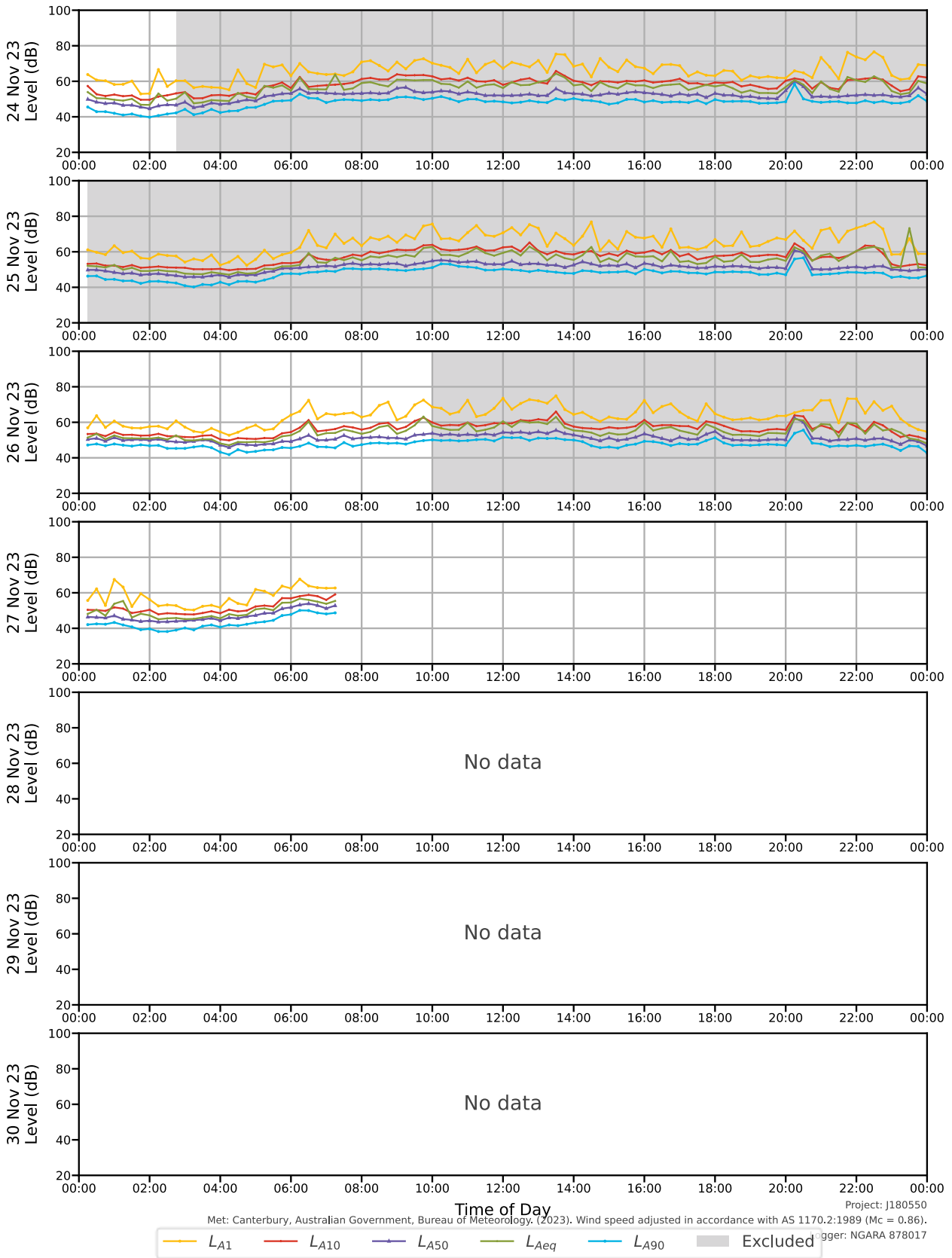


Unattended Logger Levels at 5 Wolseley Street 16 Nov 23 to 23 Nov 23



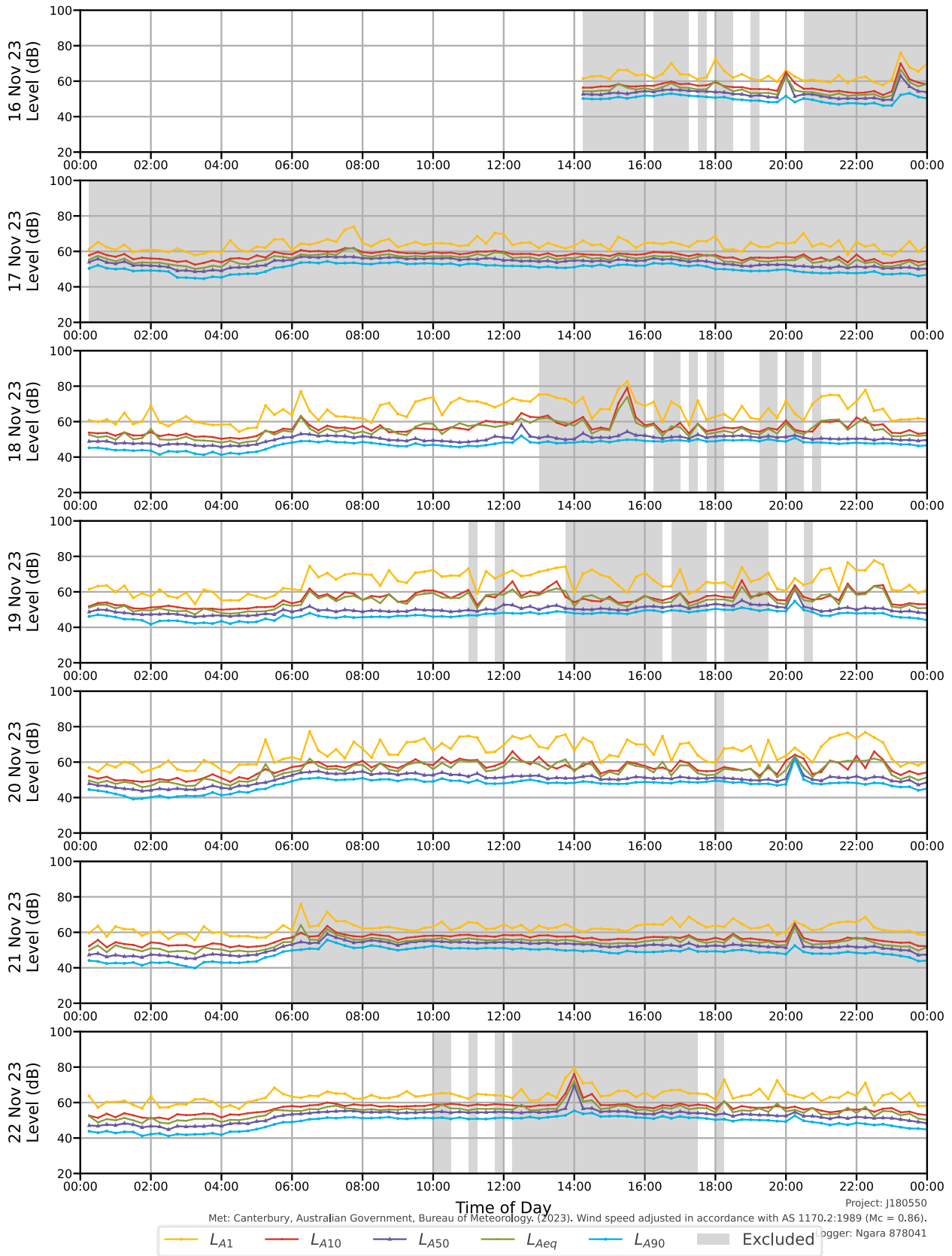


Unattended Logger Levels at 5 Wolseley Street 24 Nov 23 to 01 Dec 23



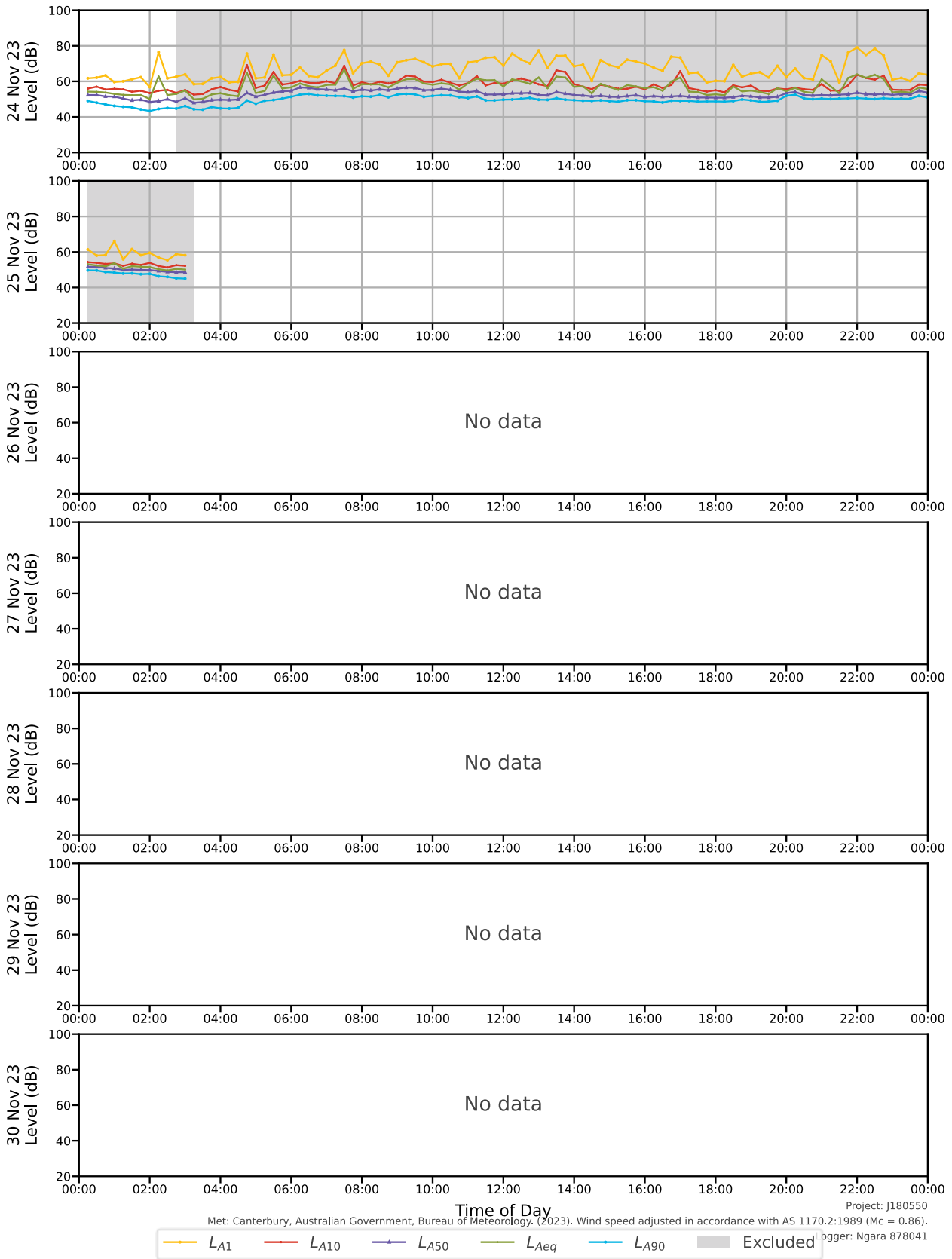


Unattended Logger Levels at 8 Northcote Street 16 Nov 23 to 23 Nov 23



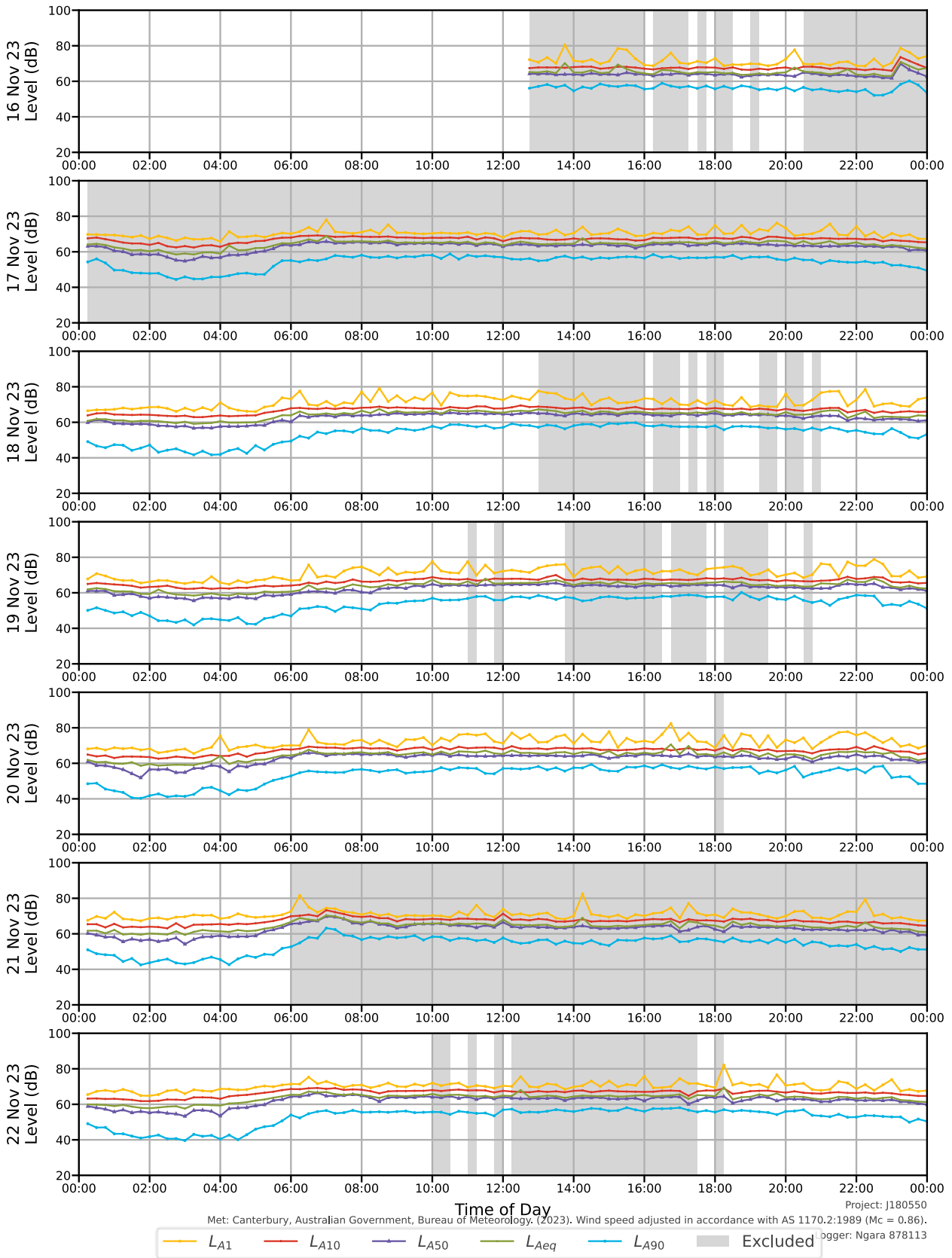


Unattended Logger Levels at 8 Northcote Street 24 Nov 23 to 01 Dec 23



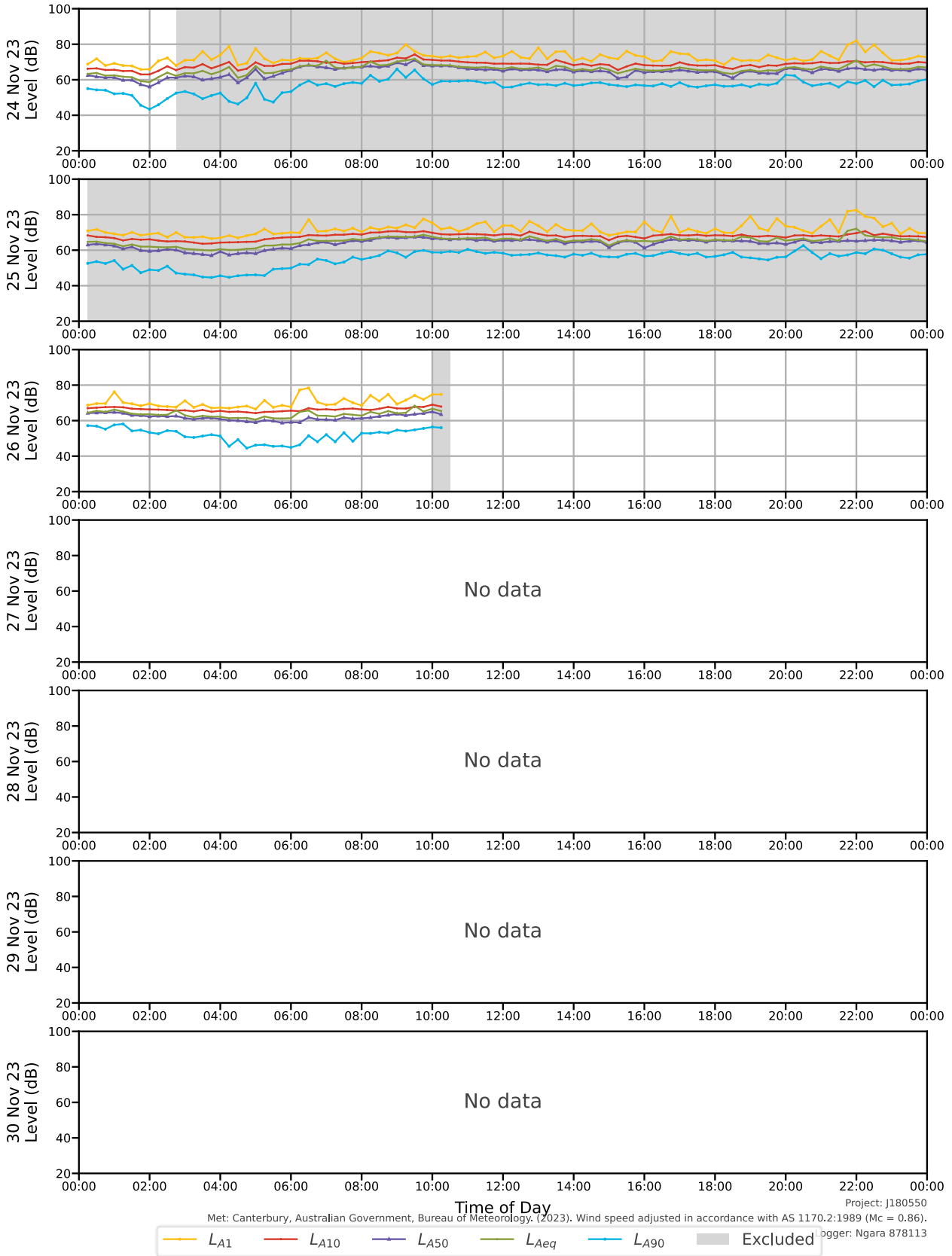


Unattended Logger Levels at 115 Alt Street 16 Nov 23 to 23 Nov 23



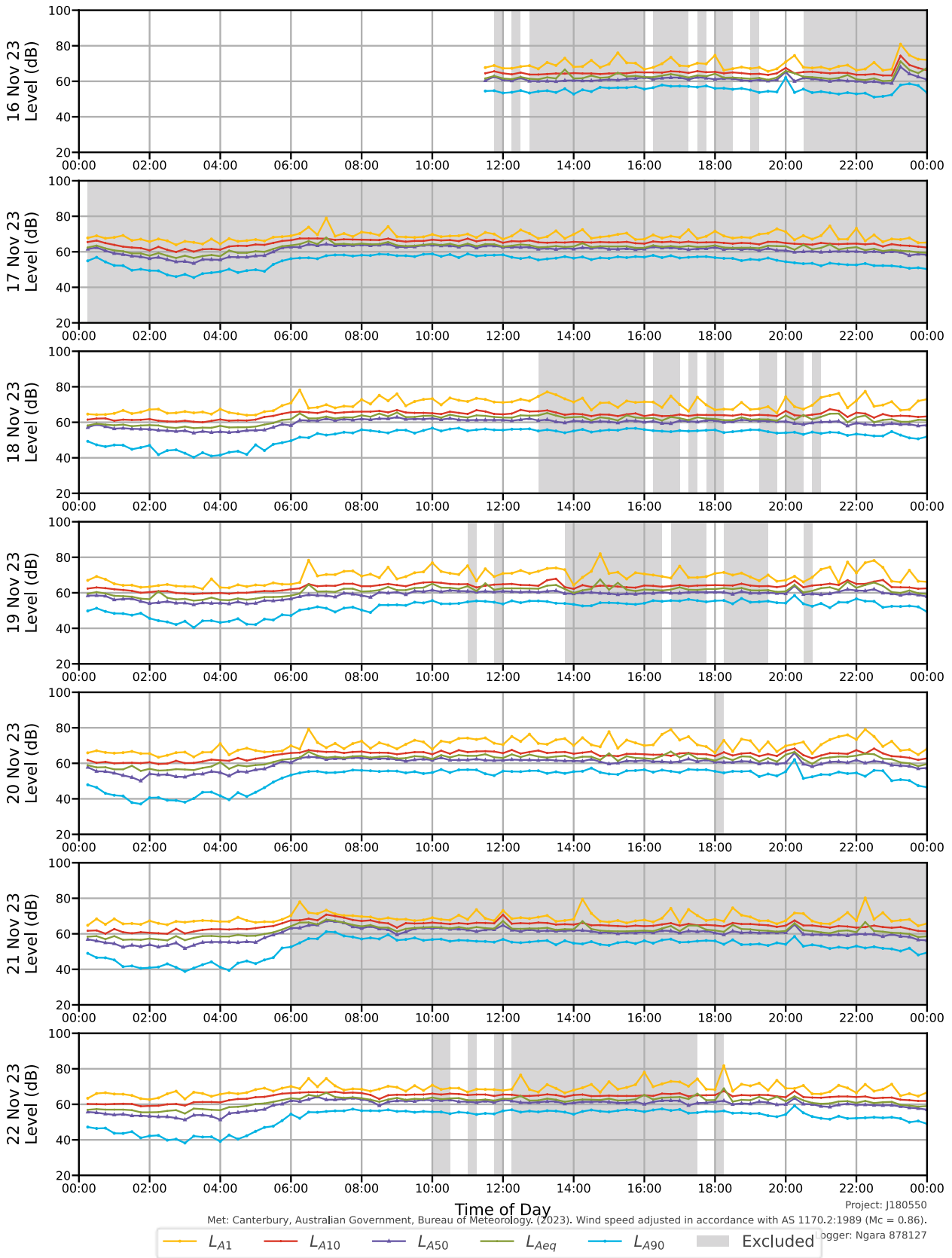


Unattended Logger Levels at 115 Alt Street 24 Nov 23 to 01 Dec 23



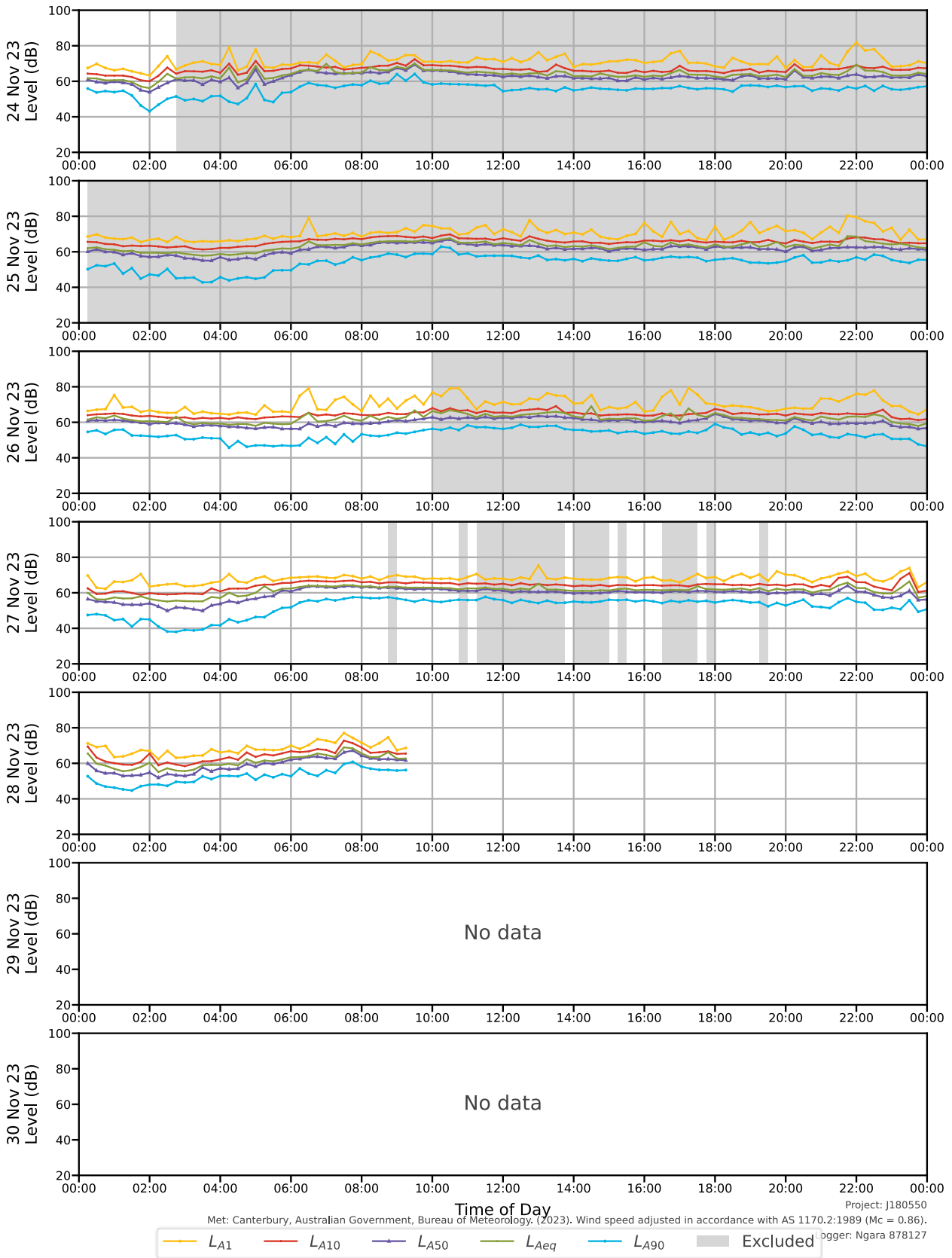


Unattended Logger Levels at 136 Bland Street 16 Nov 23 to 23 Nov 23



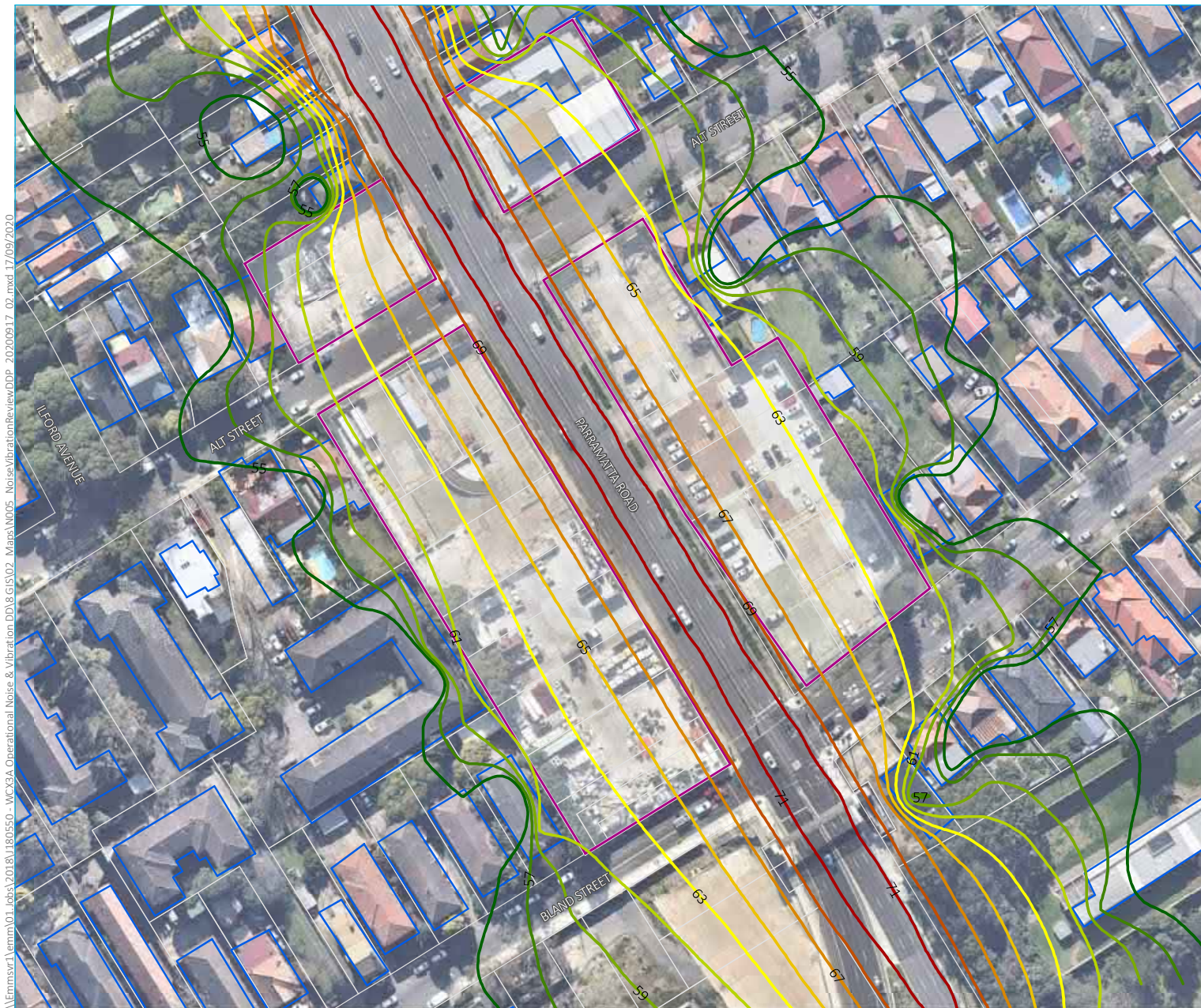


Unattended Logger Levels at 136 Bland Street 24 Nov 23 to 01 Dec 23



Appendix C

ONVR Noise Contours – Build 2031 4.3m above RL



- KEY**
- Site boundary
 - Building/structure
 - Cadastral boundary
- Traffic noise level dB(A) $L_{eq, 15 hr}$
- 55
 - 57
 - 59
 - 61
 - 63
 - 65
 - 67
 - 69
 - 71

Future 2031 - build
Daytime traffic noise contours
Contours 4.3 m above RL

WestConnex Stage 3A
Operational noise and vibration review
Figure A.2



\\emmsvr1\emmsv1\jobs\2018\11805550 - WCC3A - Operational Noise & Vibration\DD\6.GIS\02 - Maps\ND05 - NoiseVibrationReview\DP - 20200917_02.mxd 17/09/2020

Source: EMM (2020); Nearmap (2020); DFSI (2017); GA (2011); ASGC (2006)



\\Emmsv1\emmsv1\jobs\2018\1180550 - WCC3A - Operational Noise & Vibration\DD\6.GIS\02 - Maps\ND05 - Noise\VibrationReview\DP - 20200917_02.mxd 17/09/2020



- KEY**
- Site boundary
 - Building/structure
 - Cadastral boundary
- Traffic noise level dB(A) $L_{eq, 9 hr}$
- 55
 - 57
 - 59
 - 61
 - 63
 - 65
 - 67

Future 2031 - build
Night traffic noise contours
Contours 4.3 m above RL

WestConnex Stage 3A
Operational noise and vibration review
Figure A.4



Source: EMM (2020); Nearmap (2020); DFSI (2017); GA (2011); ASGC (2006)



Appendix D

Calibration Certificates

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: **SLM32962**

EQUIPMENT TESTED: Sound & Vibration Analyzer

Manufacturer: Svantek
Type No: Svan-979 **Serial No:** 21095
Mic. Type: 40AE **Serial No:** 120711
Pre-Amp. Type: SV17 **Serial No:** 25110
Filter Type: 1/3 Octave **Test No:** F032963

Owner: EMM Consulting Pty Ltd
L 13, 175 Scott Street
Newcastle, NSW 2300

Tests Performed: IEC 61672-3:2013 & IEC 61260-3:2016

Comments: All Test passed for Class 1. (See overleaf for details)

CONDITIONS OF TEST:

Ambient Pressure	1008 hPa ±1 hPa	Date of Receipt :	22/06/2022
Temperature	22 °C ±1° C	Date of Calibration :	22/06/2022
Relative Humidity	41 % ±5%	Date of Issue :	23/06/2022

Acu-Vib Test Procedure: AVP10 (SLM) & AVP06 (Filters)

CHECKED BY: **AUTHORISED SIGNATURE:**
Hein Soc

Accredited for compliance with ISO/IEC 17025 - Calibration
Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

This report applies only to the item identified in the report and may not be reproduced in part.
The uncertainties quoted are calculated in accordance with the methods of the ISO Guide to the Uncertainty of Measurement and quoted at a coverage factor of 2 with a confidence interval of approximately 95%.



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Sound Calibrator

IEC 60942:2017

Calibration Certificate

Calibration Number C23274

Client Details EMM Consulting
Ground Floor Suite 01 20 Chandos Street PO Box 21
St Leonards NSW 2065

Equipment Tested/ Model Number : SVANTEK SV 36
Instrument Serial Number : 106879

Atmospheric Conditions

Ambient Temperature : 24.5°C
Relative Humidity : 48.4%
Barometric Pressure : 101.79kPa

Calibration Technician : Shaheen Boaz
Calibration Date : 05 Jun 2023
Secondary Check: Megan Williams
Report Issue Date : 6 Jun 2023

Approved Signatory :

Juan Aguero

Characteristic Tested	Result
Generated Sound Pressure Level	Pass
Frequency Generated	Pass
Total Distortion	Pass

Nominal Level	Nominal Frequency	Measured Level	Measured Frequency
94	1000	94.07	999.99
114	1000	114.05	999.99

The sound calibrator has been shown to conform to the class 1 requirements for periodic testing, described in Annex B of IEC 60942:2017 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed.

Uncertainties of Measurement -

Specific Tests	Uncertainties of Measurement -	Environmental Conditions
Generated SPL	±0.10dB	Temperature ±0.1°C
Frequency	±0.07%	Relative Humidity ±1.9%
Distortion	±0.20%	Barometric Pressure ±0.014kPa

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.



This calibration certificate is to be read in conjunction with the calibration test report.

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NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.



Sound Calibrator IEC 60942:2017 Calibration Test Report

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All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This report applies only to the item tested and shall only be reproduced in full, unless approved in writing by Acoustic Research Labs.



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1. OVERVIEW

This report presents the calibration test results of a SVANTEK SV 36 Acoustic Calibrator, and associated equipment. Calibration is carried out in accordance with *IEC 60942-2017, Electroacoustics - Sound Calibrators*.

Relevant clauses from this standard have been used for periodic testing in conjunction with Acoustic Research Labs internal test methods described in Section 2 of the calibration work instruction manual.

1.1 UNCERTAINTIES

For each test performed, the associated measurement uncertainties are derived at the 95% confidence level and are given with a coverage factor of 2.

The uncertainty applies at the time of measurement only, and takes no account of any drift or other effects that may apply afterwards. When estimating uncertainty at any later time, other relevant information should also be considered, including, where possible, the history of the performance of the instrument and the manufacturer's specifications.

1.2 DOCUMENT CONVENTIONS

Test results which highlight non-conformances relative to the standard, and the sound level meter type specified by the manufacturer have been marked with an **F** in the respective tests.

Any tests that are not required, due to sound level meter configuration, are marked N/A.

2. GENERAL

2.1 ENVIRONMENTAL CONDITIONS DURING TEST

No corrections have been applied to any results obtained to compensate for the environmental conditions.

All tolerance limits stated apply to measurements made at and around reference environmental conditions within the following ranges:

80 kPa to 105 kPa

20°C to 26°C

25% to 90% relative humidity

2.2 CALIBRATION TESTS

Where applicable the following tests were performed in accordance with the requirements of *IEC 60942-2017* Annex B.

2.3 TEST EQUIPMENT USED

All test equipment used during periodic testing are calibrated every 12months by an accredited laboratory, traceable to SI units.

The performance of all equipment during these calibrations and the effects of instrument stability are used to determine the measurement uncertainty of each reported result.

2.3.1 Multi-function Acoustic Calibrator

A Bruel & Kjaer 4226 Multi-function calibrator (S/N - 2985012) was used as the reference for the sound pressure level and the signal frequency.

2.3.2 Sound Level Meter

ARL Ngara Class 1 (S/N - 878035). This device was used for converting acoustic signals into voltages which may be measured by the multimeter.

2.3.3 Audio Analyser

Abonet Audio Analyzer AVR-3710 (S/N - V859B9018). This device was used for measuring the AC voltage output of the reference Ngara unit. The AC level is proportional to the sound pressure level and frequency applied to the reference microphone.

2.3.4 Environmental Monitoring

A MHB-382SD (S/N – AG.44204) was used for measuring environmental conditions during device calibration. It is capable of providing temperature, relative humidity and pressure measurements.

3. CALIBRATION TEST RESULTS

3.1 SOUND PRESSURE LEVEL

3.1.1 Generated Sound Pressure Level

The sound pressure level generated by the sound calibrator was measured three times as an average over 20 s of operation. During each measurement the sound calibrator was decoupled and rotated from the microphone to ensure any variations in operation were captured.

Table 1 – Generated Sound Pressure Level Results

Nominal Level (dB)	Measured Level (dB)	Deviation (dB)	Tolerance (dB)	P/F	U95 (dB)	
94	94.07	0.07	±0.25	P	0.10	Measured Output
114	114.05	0.05	±0.25	P	0.10	Measured Output

3.2 FREQUENCY OUTPUT

The frequency generated by the sound calibrator was measured as an average over 20s of operation. The deviation from expected values is calculated as the absolute value of the difference in per cent between the frequency of the sound generated by the sound calibrator and the corresponding specified frequency.

Table 2 – Frequency Output Results

Nominal Level (dB)	Nominal Frequency (Hz)	Measured Frequency (Hz)	Deviation (Hz)	Tolerance (Hz)	P/F	U95 (%)	
94	1000	999.99	-0.01	±7.00	P	0.07	Measured Output
114	1000	999.99	-0.01	±7.00	P	0.07	Measured Output

3.3 TOTAL DISTORTION

The total distortion, measured over the frequency range from 22,5 Hz to 20 kHz, was measured as an average over 20s of operation.

Table 3 – Total Distortion Results

Nominal Level (dB)	Distortion (%)	Tolerance (%)	P/F	U95 (%)	
94	0.30	±2.50	P	0.20	Measured Output
114	0.75	±2.50	P	0.20	Measured Output

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