

Noise and Vibration Construction

Monitoring Report:

28 May 2021 – 27 November 2021

M4-M5 Link Mainline Tunnels

WestConnex M4-M5 Link Tunnels



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Document Control

Approval and authorisation

Title	M4-M5 Link Mainline Tunnels Noise and Vibration Construction Monitoring Report: 28 May 2021 – 27 November 2021
Document No/Ref	M4M5-LSBJ-PRW-EN-GE01-RPT-0071-01
Document Path	

Version control

Revision	Date	Description
00	30 November 2021	Report developed for distribution
01	9 December 2021	Updated in response to comments

Internal review

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Abbreviations/Glossary

Abbreviation	Expanded text
AA	The Acoustics Advisor for the CSSI
ASBJV	Acciona Samsung Bouygues Joint Venture
CEMP	Construction Environmental Management Plan
CMR	Construction Monitoring Report
CNVMP	Noise and Vibration Monitoring Program
CNVG	Construction Noise and Vibration Guideline (Roads and Maritime, 2016)
CNVIS	Construction Noise and Vibration Impact Statement
CSSI	The Critical State Significant Infrastructure, as described in Schedule 1, the carrying out of which is approved under the terms of the SSI 7485 approval
CoA	NSW Minister for Planning's Conditions of Approval
DEC	Former Department of Environment and Conservation
DECC	Former NSW Department of Environment and Climate Change
EIS	Environmental Impact Statement
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i> (NSW)
EPL	Environment Protection Licence
ER	The Environmental Representative whose role is defined by the Project's CoA A19 – A23
ICNG	Interim Construction Noise Guideline (DECC, 2009)
Minister, the	Minister of the NSW Department of Planning and Environment (or delegate)
NSW	New South Wales
NZS	New Zealand Standard
OOH	Out of Hours
PBR	Pymont Bridge Road civil and tunnel site
PREW	Parramatta Road East and West civil sites
Project, the	M4-M5 Link Mainline Tunnels
REMM	Revised Environmental Management Measures
SPIR	Submissions and Preferred Infrastructure Report
SSI	State Significant Infrastructure
TfNSW	Transport for New South Wales (formerly Roads and Maritime Services)

1 Introduction

1.1 Background

WestConnex is one of the NSW Government's key infrastructure projects which aims to ease congestion, create jobs and connect communities. The 33-kilometre WestConnex motorway will link Sydney's west and south-west with the Sydney Central Business District, Sydney Airport and Port Botany. WestConnex is one component of an integrated solution to meet Sydney's growing transport and infrastructure needs and is consistent with NSW Government transport and planning policies and strategies.

The project was declared by Ministerial Order to be State Significant Infrastructure (SSI) and Critical State Significant Infrastructure (CSSI), under Section 5.12 (4) and Section 5.13 (previously referred to as 115U(4) and 115V prior to amendment of the *Environmental Planning and Assessment Act 1979* (EP&A Act)) as well as under clause 16 of the State Environmental Planning Policy (State and Regional Development) 2011. The project remains subject to assessment under the EP&A Act and requires the approval of the NSW Minister for Planning. The proposal is critical State significant infrastructure by virtue of Schedule 5, clause 4 of State Environmental Planning Policy (State and Regional Development) 2011.

An Environmental Impact Statement (EIS) (AECOM 2017) was prepared and placed on public exhibition from 18 August 2017 to 16 October 2017. Submissions were received from government, agencies, organisations and the public in response to the project. A Submissions and Preferred Infrastructure Report (SPIR) was prepared by Roads and Maritime Services in response to submissions received during the exhibition period. The Project was approved by the Minister for Planning on 17 April 2018.

Subsequently, a Project Modification report (AECOM, September 2018) was prepared and placed on public exhibition for 14 days from 12 September 2018. The Project Modification was approved by the Minister for Planning on 25 February 2019 and the Minister's conditions of approval were also modified.

A Modification Report for MOD 2 was prepared and placed on public exhibition by between 21 August 2019 to 25 September 2019. A Response to Submissions Report was prepared to respond to submissions received during the public exhibition period. This report and a Design Amendment Report were lodged with the Department of Planning, Industry and Environment (DPIE) in April 2020. The Modification was determined by the NSW Minister for Planning on 30 September 2020, along with modification to CoAs.

A Modification Report for MOD 3 was prepared and placed on public exhibition between 20 November and 18 December 2019. A Response to Submissions Report was prepared to respond to submissions received during the public exhibition period. This report was lodged with DPIE in March 2020. The Modification was determined by the NSW Minister for Planning and Public Space on 28 July 2020, along with modification to CoAs.

A Modification Report for MOD 4 was prepared and lodged with DPIE in June 2020. The Modification was determined by DPIE on 28 July 2020, along with modification to CoAs.

A modification Report for MOD 5 was prepared and lodged with DPIE in October 2020. The Modification was determined by DPIE on 17 November 2020, along with modification to CoAs.

1.2 Project Description

The WestConnex M4-M5 Link project is being constructed in two stages:

- Stage 1 (the Project and subject of this document): M4-M5 Link Mainline tunnels
- Stage 2: Rozelle interchange.

WestConnex Transurban has engaged Acciona Samsung Bouygues Joint Venture (ASBJV) to design and construct Stage 1 of the project. 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 would be around 7.5 kilometres long and would generally accommodate up to four lanes of traffic in each direction
- Connections of the mainline tunnels to the M4 East project, comprising:
 - A tunnel-to-tunnel 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 (constructed as part of the M4 East project)
 - 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 tunnel-to-tunnel 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 (which is currently being constructed as part of the New M5 project)
 - 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). The types of facilities that would be contained within the motorway operations complexes would 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
- Fitout (mechanical and electrical) of part of the Parramatta Road ventilation facility at Haberfield (constructed as part of M4 East project) for use by the M4-M5 Link project
- Drainage infrastructure to collect surface and groundwater for treatment at dedicated facilities
- Water treatment would occur at the Project operational water treatment facility
- 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
- Campbell Road civil and tunnel site (C10), St Peters.

An overview of the project footprint and ancillary facilities is presented in the Construction Environmental Management Plan (CEMP). Further detail of the project description is presented in Section 1.3 of the CEMP.

1.3 Purpose of this report

This Noise and Vibration Construction Monitoring Report (CMR) has been prepared to address Minister's Condition of Approval (CoA) C17 of the planning approval (refer to Table 1-1). This report will be provided to the relevant regulatory authorities as detailed in the Noise and Vibration Management Sub-Plan (NVMP) (refer to Table 1-2).

This CMR documents the noise and vibration monitoring results recorded during the reporting period on the WestConnex M4-M5 Link Mainline Tunnels Project (the Project) from 28 May 2021 to 27 November 2021.

Monitoring was undertaken in accordance with the Noise and Vibration Monitoring Program (CNVMP) required under CoA C9(c) to monitor noise and vibration levels during construction.

Table 1-1 CoA requirements for this CMR

CoA no.	Requirement	Reference
C17	The results of the Construction Monitoring Programs must be submitted to the Secretary, and relevant regulatory authorities, for information in the form of a Construction Monitoring Report at the frequency identified in the relevant Construction Monitoring Program.	This Document

Table 1-2 CMR Recipients

NVMP Ref.	Report Recipients
Section 10 Reporting of Monitoring Results	• Department of Planning, Industry and Environment (DPIE) • Environment Protection Authority (EPA)

2 Monitoring Results and Management Response

In accordance with the CNVMP, noise and vibration monitoring were undertaken during the reporting period for modelling verification, at sensitive receivers to assess compliance in response to complaints and for equipment and activity spot checks.

During the reporting period, at receiver (in-property) monitoring in response to complaints and to verify predicted noise and vibration levels was temporarily stopped in June 2021 in response to the COVID-19 pandemic. This was to protect the safety of both the community and ASBJV staff from potential exposure to the Coronavirus. This temporary approach was communicated to the EPA.

2.1 Airborne Noise Monitoring

During the reporting period, 27 airborne noise monitoring events were conducted across the Project during both standard construction hours and out-of-hours (OOH) periods. A summary of these monitoring events is presented in Appendix A.

Regular community notification is provided by the Project to ensure the community is aware of construction works during standard construction hours. Specific notification and verification monitoring are provided for OOH works where required.

Monitoring results were assessed against the relevant noise management levels and predicted criteria to determine compliance.

All airborne noise monitoring results were compliant with the applicable criteria and no additional mitigation measures were required to be implemented.

2.2 Ground-borne Noise Monitoring

During the reporting period, 4 noise monitoring events were undertaken to assess ground-borne noise levels associated with tunnelling works. Monitoring was undertaken in response to community complaints and for verification of predicted noise levels in consultation with residents. A summary of these monitoring events is presented in Appendix B.

Unattended noise loggers were installed at receivers overnight to monitor the internal ground-borne noise levels. Monitoring results were assessed against night-time noise goal of 35dB(A) and the alternative accommodation trigger of 45dB(A) as detailed in Table 8-3 of our Noise and Vibration Management Plan.

Where elevated noise results were recorded, operators reviewed audio recordings to identify noise sources and assess the construction noise contribution.

One property received ongoing noise monitoring for over four weeks; noise levels were below the alternative accommodation trigger from May 6 until June 2, however, in the final week noise level were found to exceed 45 dB(A) and alternative accommodation was immediately offered to nearby properties until tunnel heading excavation passed the property.

All other ground-borne noise monitoring results where construction was the dominant noise source were compliant with the applicable criteria and did not trigger alternative accommodation.

2.3 Vibration Monitoring

During the reporting period, four vibration monitoring events were conducted across the Project. A summary of these monitoring events is presented in Appendix C. Monitoring was undertaken for the following:

- Verification of safe working distances for vibration-generating plant
- Response to community complaints
- Validation of predicted vibration levels

Monitoring results were assessed against the relevant vibration criteria to determine compliance. Three monitoring events were to review potential for property damage and as such, vibration levels were assessed against the German Standard DIN4150-2016 Structural vibration Part 3: Effects of vibration on Structures.

One monitoring events related to human comfort with vibration assessed against the intermittent vibration criteria in Assessing Vibration: A Technical Guideline (DEC, 2006).

All vibration monitoring results were considered compliant with the applicable criteria with no additional management responses were required.

2.4 Real-time Monitoring

Real-time unattended airborne noise and vibration monitoring was undertaken at each of the three tunnelling sites (Campbell Road, PBR and Northcote Street). The locations of the monitors were determined in consultation with the Project's Acoustic Advisor (AA) and access to the monitoring results are available to Project's Environmental Representative (ER) and AA.

Data obtained as part of this monitoring has provided little value to the community or Project team. None of this data has been needed to respond to complaints or in relation to compliance investigations since Project commencement.

Appendix A Airborne Noise Monitoring Results

Type	Date & Time	Purpose	Site	Monitoring Location	Works Monitored	Noise Instrument	Monitoring Duration (mins)	NCA	Noise Management Level (dBA)	Prediction (dBA)	Measured LAeq (dBA)	Comment	Management Response (if required)
Attended	4/06/2021 18:00	Plant / Equipment Spot Check	SPI	SPI Acoustic Shed	Spot check of volumetric pour consisting of 1 cement truck and 1 volumetric mixer with a moxie.	Rion NL-42	1	N/A	N/A	N/A	110.96 SWL	Spot check monitoring was undertaken to verify the SWL (Sound Power Level) of the volumetric mixer and cement truck when operating.	
Attended	22/06/2021 16:45	Response to Community Complaint	PBR	Corner of Booth Street and Pyrmont Bridge Road	Street sweeper in operation on external roads at PBR	Rion NL-42	15	44	54	66	66	Noise from street sweeper was comparable to passing traffic.	
Attended	22/06/2021 17:00	Response to Community Complaint	PBR	Corner of Booth Street and Pyrmont Bridge Road	Street sweeper in operation on external roads at PBR	Rion NL-42	15	44	54	66	67	Noise from street sweeper was comparable to passing traffic.	
Attended	22/06/2021 20:43	OOHW Verification	Wattle St	14 Wattle Street, Haberfield	Pavement removal on Wattle Street	Rion NL-42	15	2	53	83	78	Project work compliant. Construction and traffic noise contribution was roughly equal at an approximate 73 dB	
Attended	22/06/2021 23:53	OOHW Verification	Wattle St	512 Parramatta Road, Ashfield	Pavement restoration work	Rion NL-42	15	1	43	67	67	Project work compliant, construction roughly 60 dB at this location and barely audible over traffic	
Attended	30/06/2021 21:52	OOHW Verification	Wattle St	28 Wattle St, Haberfield	Excavation and pavement removal	Rion NL-42	15	3	44	74	72	Project work compliant and below prediction.	
Attended	30/06/2021 22:08	OOHW Verification	Wattle St	28 Wattle St, Haberfield	Excavation and pavement removal	Rion NL-42	15	3	44	74	70	Project work compliant and below prediction.	
Attended	2/07/2021 0:34	Response to Community Complaint	PBR	72 Pyrmont Bridge Rd, Annandale	PBR Site Operations	Rion NL-42	15	41	46	55	49 (LA90)	In the absence of traffic, noise from site activities is consistent with the CNVIS prediction and therefore within allowable limits.	
Attended	2/07/2021 0:58	Response to Community Complaint	PBR	72 Pyrmont Bridge Rd, Annandale	PBR Site Operations	Rion NL-42	15	41	46	55	51 (LA90)	In the absence of traffic, noise from site activities is consistent with the CNVIS prediction and therefore within allowable limits.	
Attended	2/07/2021 1:17	Response to Community Complaint	PBR	72 Pyrmont Bridge Rd, Annandale	PBR Site Operations	Rion NL-42	15	41	46	55	51 (LA90)	In the absence of traffic, noise from site activities is consistent with the CNVIS prediction and therefore within allowable limits.	
Attended	6/07/2021 3:54	OOHW Verification	SPI	53 Barwon Park Road, St Peters	Volumetric mixer used for 100m3 pour in acoustic shed	Rion NL-42	15	49	45	45	55	Project work compliant. Traffic is the dominant noise source with site noise only heard in the absense of other sources	
Attended	6/07/2021 4:14	OOHW Verification	SPI	2 Campbell Road, St Peters	Volumetric mixer used for 100m3 pour in acoustic shed	Rion NL-42	15	48	45	45	59	Dominant and constant noise source was traffic along Campbell Road. Works onsite were not audible	
Unattended	17/07/2021 6:00	OOHW Verification	SPI	2 Campbell Road, St Peters	Ventilation Fan Removal	ARL Ngara	33hrs	48	49	49	63	Project work compliant. Works are modelled as NML compliant, monitoring revealed traffic on Campbell Road to be the dominant noise source.	
Attended	11/10/2021 22:45	OOHW Verification	SPI	32-34 Campbell Road, St Peters	M8 Shutdown works (Traffic control setup and standing of signs)	Rion NL-42	15	48	51	64	62	Project work compliant. Noise level is below predicted noise level for this work. Hand tools were the dominant noise source in the absence of traffic on Campbell Road.	
Attended	11/10/2021 23:45	OOHW Verification	SPI	32-34 Campbell Road, St Peters	M8 Shutdown works (Noise blanket and sign install, concrete cutting)	Rion NL-42	15	48	51	64	64	Project work compliant. Noise level is within the predicted noise level for this work. Construction was dominant except when traffic was present.	
Attended	12/10/201 0:02	OOHW Verification	SPI	32-34 Campbell Road, St Peters	M8 Shutdown works (Standing signs and concrete cutting)	Rion NL-42	15	48	45	64	63	Project work compliant. Noise level is below the predicted noise level for this work. Heavy vehicle traffic was the noisiest source during this period although construction noise was dominant.	
Attended	12/10/2021 1:44	OOHW Verification	SPI	32-34 Campbell Road, St Peters	M8 Shutdown works (Excavator removing concrete)	Rion NL-42	15	48	45	64	60	Project work compliant. Noise level is below the predicted noise level for this work. Dominant noise source is traffic on Campbell Road.	
Attended	12/10/2021 23:32	OOHW Verification	SPI	32-34 Campbell Road, St Peters	M8 Shutdown works (Excavator removing concrete and sign install)	Rion NL-42	15	48	45	66	61	Project work compliant. Noise level is below the predicted noise level for this work. Dominant noise source is traffic on Campbell Road.	
Attended	13/10/2021 0:35	OOHW Verification	SPI	32-34 Campbell Road, St Peters	M8 Shutdown works (Vac truck undertaking NDD)	Rion NL-42	15	48	45	66	62	Project work compliant. Noise level is below the predicted noise level for this work. Dominant noise source is traffic on Campbell Road.	
Attended	13/10/2021 2:01	OOHW Verification	SPI	32-34 Campbell Road, St Peters	M8 Shutdown works (Vac truck and Excavator removing concrete)	Rion NL-42	15	48	45	66	60	Project work compliant. Noise level was below predictions and the dominant noise source is traffic on Campbell Road.	
Attended	13/10/2021 22:47	OOHW Verification	SPI	32-34 Campbell Road, St Peters	M8 Shutdown works (Traffic control setup and plant movements)	Rion NL-42	15	48	51	53	61	Project work compliant. Noise during traffic gaps is compliant with predicted levels. Dominant noise source is traffic on Campbell Road.	
Attended	13/10/2021 23:05	OOHW Verification	SPI	32-34 Campbell Road, St Peters	M8 Shutdown works (Anchor holes and concrete block lift)	Rion NL-42	15	48	51	53	63	Project work compliant. Noise during traffic gaps is compliant with predicted levels. Dominant noise source is traffic on Campbell Road.	
Attended	14/10/2021 1:45	OOHW Verification	SPI	32-34 Campbell Road, St Peters	M8 Shutdown works (Concrete pour around anchor block)	Rion NL-42	15	48	45	50	59	Project work compliant. Traffic flow on Campbell Road is the dominant noise source. During traffic gaps, noise level from work was within prediction and 'noticable impact' category.	

Type	Date & Time	Purpose	Site	Monitoring Location	Works Monitored	Noise Instrument	Monitoring Duration (mins)	NCA	Noise Management Level (dBA)	Prediction (dBA)	Measured LAeq (dBA)	Comment	Management Response (if required)
Attended	14/10/2021 2:24	OOHW Verification	SPI	32-34 Campbell Road, St Peters	M8 Shutdown works (forming new kerb)	Rion NL-42	15	48	45	50	58	Project work compliant. Dominant noise source was traffic and during traffic gaps the noise level was below prediction	
Attended	23/10/2021 0:32	OOHW Verification	PREW	142 Alt Street, Haberfield	Parramatta Rd Median Fence Repairs	Rion NL-42	15	6	48	54	53	Project work compliant. Dominant noise source was traffic on Parramatta Rd and Alt St.	
Attended	16/11/2021 22:19	OOHW Verification	PBR	72 Pyrmont Bridge Rd, Annandale	Line marking on Pyrmont Bridge Road	Rion NL-42	15	41	50	68	67	Project work compliant with predictions, commenced closest to the residential recievers and were completed in this area by 11PM.	
Attended	16/11/2021 22:39	OOHW Verification	PBR	72 Pyrmont Bridge Rd, Annandale	Line marking on Pyrmont Bridge Road	Rion NL-42	15	41	50	68	69	Project work compliant. Link marking was completed at 22:47 following that traffic was the dominant nosie source	

Appendix B Ground-borne Noise Monitoring Results

Type	Date & Time	Purpose	Site	Monitoring Location	Works Monitored	Noise Instrument	Monitoring Duration	Alternative Accommodation Trigger (dBA)	Measured LAeq (dBA)	Comment	Management Response (if required)
Unattended	20/05/2021 - 9/06/2021	Verification	PBR	43 Reserve Street, Annandale	M1A0 Tunnel Excavation - roadheaders and rockbolters	NGARA*	20 Days	45	35 to >45	Monitoring was ongoing at 43 Reserve St. GBN data for the first three data downloads were below the alternative accommodation trigger. Following receipt of the 4th round of GBN data on 9/06, levels were found to exceed 45dBA and Alternative Accommodation was immediately offered to 43 Reserve St and the other nearby properties until tunnel heading excavation passed the property.	
Unattended	21/05/2021 - 19/06/2021	Response to Community Complaint	PBR	45 Reserve Street, Annandale	M1A0 Tunnel Excavation - roadheaders and rockbolters	NGARA*	29 Days	45	<45	Project works compliant. Domestic noise was dominant noise source during elevated noise periods. All reasonable and feasible mitigations measures were implemented	
Unattended	25/05/2021 - 2/06/2021	Response to Community Complaint	PBR	24 Mayes Street, Annandale	Tunnelling activities and drainage work in M120, M1A0 and M1D0	NGARA*	8 Days	45	<35	Project works compliant. Domestic noise was dominant noise source during elevated noise periods. All reasonable and feasible mitigations measures were implemented	
Unattended	4/06/2021 - 17/06/2021	Response to Community Complaint	PBR	49 Reserve Street, Annandale	M1A0 Tunnel Excavation - roadheaders and rockbolters	NGARA*	13 Days	45	<40	Alternative accommodation was provided to the property, however, monitoring data was found to be compliant, less than both the trigger level and the predicted value	

*NGARA = Acoustic Research Laboratories NGARA Real Time Sound Acquisition System

Appendix C Vibration Monitoring Results

Type	Date & Time	Purpose	Site	Monitoring Location	Internal / External	Works Monitored	Vibration Instrument	Parameter Measured	Monitoring Duration (min)	Vibration Criteria	Maximum Vibration Measured	Comment	Management Response (if required)
Unattended	19/05/2021 13:18	Response to Community Con	PBR	144 Young St, Annandale	Internal	M120 and M1D0 drainage work	INFRA C22	VDV	15 days	0.40 m/s1.75	0.20 m/s1.75	All vibratinos levels were less than the maximum value for human comfort and do not trigger further mitigation measures.	
Unattended	20/05/2021 13:00	PPV Verification	PBR	43 Reserve St, Annandale	Internal	M1A0 Tunnel excavation and rockbolting	INFRA C22	PPV	20 days	5 mm/s	3.13 mm/s	Project work compliant. All vibration levels were less than 5 mm/s therefore unlikely to cuase cosmetic damage.	
Unattended	2/06/2021 16:00	Response to Community Complaint	SPI	81 Princes Highway, St Peters	Internal	M190 remediation work between Ch1460 and 1475	INFRA C22	PPV	2 days	5 mm/s	1.93 mm/s	All vibration levels were less than 5 mm/s and the peak occurred during the maintenance period.	
Unattended	4/06/2021 10:30	Response to Community Complaint	PBR	49 Reserve St, Annandale	Internal	M1A0 trail heading excavation	INFRA C23	PPV	13 days	5 mm/s	3.22 mm/s	Maximum PPV of 3.22 mm/s was at a high frequency (293Hz) well below the criteria for residential and heritage structures.	