

# Appendix B3

## Noise and Vibration Management Sub Plan

Western Harbour Tunnel and Warringah Freeway Upgrade

SSI-8863

Stage 2 – Warringah Freeway Upgrade

March 2022

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## Document control

### Approval and certification

<b>Title</b>	Warringah Freeway Upgrade Noise and Vibration Management Sub-Plan
<b>Endorsed by Environment Representative</b>	Maurice Pignatelli
<b>Signed</b>	
<b>Dated</b>	
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<b>Approved on behalf of CPB Downer JV by</b>	Steve Clark
<b>Signed</b>	
<b>Dated</b>	

## Document status

Revision	Date	Description	Approval
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1	28/01/2022	Update to address DPI&E comments	
2	18/02/2022	Update to address DPI&E comments	
3	24/03/2022	Update for consistency with approved Community Communication Strategy	

## Distribution of controlled copies

This Noise and Vibration Management Plan (NVMP) as part of the CEMP is available to all personnel and subcontractors via the Project document control management system. An electronic copy can be found on the Project website.

The document is uncontrolled when printed. One controlled hard copy of the NVMP as part of the CEMP and supporting documentation will be maintained by the Quality Manager at the Project office and on the project website [<https://caportal.com.au/wht>].

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## Glossary/ Abbreviations

Abbreviations	Expanded Text
AA	Acoustics Advisor
ABL	Assessment Background Level
Acoustic enclosure	Can include an engineered and designed shed or enclosure, with airborne noise pathways minimised and treated where feasible and reasonable, endeavouring to achieve the Noise Management Levels in the Interim Construction Noise Guidelines (DECC, 2009). Example treatments include noise curtains, shipping containers, acoustic barriers or fast operating doors to limit breakout noise from enclosures
Ambient noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.
Attenuation	The reduction in the level of sound or vibration.
AVTG	Assessing Vibration – a technical guideline (DEC 2006)
CCS	Community Communication Strategy
CEMP	Construction Environmental Management Plan
CNVG	Construction Noise and Vibration Guideline (Roads and Maritime, 2016)
CoA	Condition of Approval
CSSI	Critical State Significant Infrastructure
dBA	Decibels using the A-weighted scale measured according to the frequency of the human ear.
DEC	Department of Environment and Conservation (now EPA)
DEC	DECC Department of Environment and Climate Change (now EPA)
DECCW	DECCW Department of Environment, Climate Change and Water (now EPA)
DP&E	NSW Department of Planning and Environment (now DPIE)
DPIE	NSW Department of Planning, Industry and Environment
EIS	Environmental Impact Statement
EMS	Environmental Management System
Environmental aspect	Defined by AS/NZS ISO 14001:2015 as an element of an organisation's activities, products or services that can interact with the environment.

Abbreviations	Expanded Text
Environmental impact	Defined by AS/NZS ISO 14001:2015 as any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's environmental aspects.
EMM	Environmental Management Measure
Environmental objective	Defined by AS/NZS ISO 14001:2015 as an overall environmental goal, consistent with the environmental policy, that an organisation sets itself to achieve.
Environmental target	Defined by AS/NZS ISO 14001:2015 as a detailed performance requirement, applicable to the organisation or parts thereof, that arises from the environmental objectives and that needs to be set and met in order to achieve those objectives.
EPA	NSW Environment Protection Authority
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPL	Environmental Protection Licence
Feasible and reasonable	Consideration of best practice taking into account the benefit of proposed measures and their technological and associated operational application in the NSW and Australian context. Feasible relates to engineering considerations and what is practical to build. Reasonable relates to the application of judgement in arriving at a decision, taking into account mitigation benefits and cost of mitigation versus benefits provided, community views and nature and extent of potential improvements.
Highly noise intensive works	Works which are defined as annoying under the Interim Construction Noise Guideline (DECC, 2009) including: (a) use of power saws, such as used for cutting timber, rail lines, masonry, road pavement or steel work; (b) grinding metal, concrete or masonry; (c) rock drilling; (d) line drilling; (e) vibratory rolling; (f) bitumen milling or profiling; (g) jackhammering, rock hammering or rock breaking; and (h) impact piling
ICNG	Interim Construction Noise Guideline (DECC, 2009)
LAeq (15min)	The A-weighted equivalent continuous (energy average) A-weighted sound pressure level of the construction works under consideration over a 15-minute period and excludes other noise sources such as from industry, road, rail and the community.

Abbreviations	Expanded Text
LA (max)	the A-weighted maximum noise level only from the construction works under consideration, measured using the fast time weighting on a sound level meter.
LA1 (1min)	The A-weighted noise level from the construction works under consideration, measured using the fast time weighting on a sound level meter, which is exceeded for more than 1% of the 1 minute measurement period.
LA90 (15min)	The A-weighted noise level excluding the construction works under consideration, measured using the fast time weighting on a sound level meter, which is exceeded for more than 90% of the 15 minute measurement period.
MCoA	Minister's Condition of Approval
MWD	Minimum working distance
NCA	Noise Catchment Area
NML	Noise management level
Noise Mitigation	Feasible and reasonable measures that would minimise or avoid noise impacts
NVMP	Noise and Vibration Management Plan
NVMoP	Noise and Vibration Monitoring Program
OOHW	Out-of-Hours Works – work completed outside of standard construction hours
PPV	Peak Particle Velocity
RBL	The Rating Background Level for each period is the medium value of the Assessment Background Level (ABL) values for the period over all of the days measured. There is therefore an RBL value for each period (day, evening, night and shoulder period)
REMM	Revised Environmental Management Measure
Roads and Maritime	Roads and Maritime Services
RMS	Roads and Maritime Services

Abbreviations	Expanded Text
Sensitive land user(s) / Sensitive receiver(s)	Includes residences, educational institutions (including preschools, schools, universities, TAFE colleges), health care facilities (including nursing homes, hospitals), religious facilities (including churches), child care centres and passive recreation areas (including outdoor grounds used for teaching). Receivers that may be considered to be sensitive include commercial premises (including film and television studios, research facilities, entertainment spaces, temporary accommodation such as caravan parks and camping grounds, restaurants, office premises, and retail spaces) and industrial premises as identified by the Planning Secretary
SSD	State Significant Development
SSI	State Significant Infrastructure
Standard construction hours	Hours during which construction work is permitted by the MCoA. Further defined in Section 6.2
TfNSW	Transport for NSW
Works	Any physical work to construct or facilitate the construction of the CSSI, including low impact work, environmental management measures and utility works. However, does not include activities that informs or enables detailed design of the CSSI and generates noise that is no more than 5 dB(A) above the rating background level (RBL) at any sensitive land user(s)

Note: Refer to *Instrument of Approval - SSI-8863* for additional abbreviations and definitions relevant to the Project.

# 1 Introduction

## 1.1 Context

This Noise and Vibration Management Sub-Plan (NVMP) forms part of the Construction Environmental Management Plan (CEMP) for the Warringah Freeway Upgrade (the Project) a component of the Western Harbour Tunnel and Warringah Freeway Upgrade project.

This NVMP has been prepared to address the requirements of the Minister's Conditions of Approval (MCoA) for the Western Harbour Tunnel and Warringah Freeway Upgrade project, the Western Harbour Tunnel and Warringah Freeway Upgrade Environmental Impact Statement dated January 2020 (the EIS), the Western Harbour Tunnel and Warringah Freeway Upgrade Response to Submissions Report dated September 2020 (the RtS) and applicable guidance and legislation.

This NVMP addresses noise and vibration management applicable to Stage 2 of the Warringah Freeway Upgrade Project as detailed in the Staging Report – Western Harbour Tunnel and Warringah Freeway Upgrade (SSI 8863) – October 2021 Rev 1.

Note: construction activities are not to commence until the CEMP and the applicable sub-plans (including this NVMP) have been endorsed by the ER and approved by the Planning Secretary.

## 1.2 Background and project description

The Western Harbour Tunnel and Warringah Freeway Upgrade project comprises a new motorway tunnel connection across Sydney Harbour, and an upgrade of the Warringah Freeway to integrate the new motorway infrastructure with the existing road network and to enable the future connection of the Beaches Link and Gore Hill Freeway Connection project.

The Warringah Freeway Upgrade (the Project) extends from the northern end of the Sydney Harbour Bridge to Willoughby Road, and will optimise traffic flow, reducing the number of merge points along with introducing a southbound bus lane. The upgrade will also improve Ridge Street and Ernest Street bridges.

The EIS for the Western Harbour Tunnel and Warringah Freeway Upgrade project was prepared and finalised in January 2020 to assess the impacts of construction and operation of the Project. The EIS assessed noise and vibration impacts on sensitive receivers and structures from construction of the Project.

As part of the EIS development, a detailed construction and operational noise and vibration assessment was prepared to address the Secretary's Environmental Assessment Requirements (SEARs) issued by the then Department of Planning and Environment (DP&E). The noise and vibration assessment was included in the EIS as *Western Harbour Tunnel and Warringah Freeway Upgrade Technical working paper: Noise and Vibration*, dated January 2020.

It was concluded in the EIS that sensitive receivers in the vicinity of the Project would be impacted by noise and vibration from the construction works, however these impacts would be managed through the implementation of mitigation and management measures described in this NVMP.

The project description is outlined in section 1.3 of the Construction Environmental Management Plan (CEMP).

## 1.3 Scope of the Sub-Plan

The scope of this NVMP is to describe how CPB Downer JV proposes to manage potential noise and vibration impacts during construction of the Project.



This Sub-plan is applicable to all Project activities under the control of the CPB Downer JV, including all areas where physical works will occur or areas that may otherwise be impacted by the construction works. All CPB Downer JV staff and sub-contractors are required to operate fully under the requirements of this Sub-plan and related environmental management plans, for the duration of the construction program.

This NVMP addresses noise and vibration management applicable to Stage 2 of the Warringah Freeway Upgrade Project as detailed in the Staging Report – Western Harbour Tunnel and Warringah Freeway Upgrade (SSI 8863) – October 2021 Rev 1.


Operational noise and vibration impacts and operation measures do not fall within the scope of this NVMP and therefore are not included within the processes contained within this NVMP.

## **1.4 Environmental management systems overview**

This Sub-plan forms part of the CEMP which provides a structured and systematic approach to environmental management. The CEMP is based on the requirements of the CPB Contractors' Management System (CMS) and the requirements of the CSSI approval.

The CMS is certified to AS/NZS SIO 14001:2015 Environmental Management Systems – requirements with guidance for use. Additional details on the CEMP and Project environmental management system documents are provided in Section 1.5 of the CEMP.

Key interactions for this Sub-plan with other elements of the CEMP include:

-  Heritage Management Sub-plan – details the location of sensitive heritage items for the identification and monitoring of potential vibration effects on these items.

## 2 Purpose and objectives

### 2.1 Purpose

The purpose of this NVMP is to describe how CPB Downer JV proposes to manage potential noise and vibration impacts during construction of the Project.

### 2.2 Objectives

The key objective of the NVMP is to ensure all MCoA, revised environmental management measures (REMMs) and licence/permit requirements relevant to noise and vibration are described, scheduled and assigned responsibility as outlined in:

- The EIS prepared for Western Harbour Tunnel and Warringah Freeway Upgrade
- The RtS prepared for Western Harbour Tunnel and Warringah Freeway Upgrade
- MCoA granted to the project on 21 January 2021
- RMS Specification G36
- All relevant legislation and other requirements described in Section 3.1 of this NVMP.

Furthermore, the CPB Downer JV will aim to meet the performance outcomes from the EIS (Chapter 28, Table 28-4) as required by MCoA C2(d)(i). Relevant performance outcomes are detailed in Table 2-1 including a cross reference to indicate how the matter is addressed in this Sub-plan, in accordance with MCoA C5.

Table 2-1 Performance Outcomes Identified in the EIS Relevant to this Sub-plan

Performance Outcome	How Addressed	Records
<b>Noise and vibration – Amenity</b>		
Include effective management of construction noise and vibration in accordance with relevant guidelines, for example through the use of acoustic sheds	Implement the noise and vibration measures in Section 9 which have been developed in accordance with the guidelines in Section 3.1.3.  Note: the use of acoustic shed is not applicable to this scope of works.  Undertake training, inspections, auditing and recording in accordance with Section 9.3 and Section 3.9 of the CEMP.	Weekly environmental inspection records  Construction Noise and Vibration Impact Statements  Inspection records  Monitoring records  Complaints register

Performance Outcome	How Addressed	Records
<p>Minimise impacts to the local community by:</p> <ul style="list-style-type: none"> <li>Controlling noise and vibration at the source</li> <li>Controlling noise and vibration on the source to receiver transmission path</li> <li>Controlling noise and vibration at the receiver</li> <li>Implementing practicable and reasonable measures to minimise the noise and vibration impacts of construction activities on local sensitive receivers</li> </ul>	<p>Implement the noise and vibration measures in Section 9.</p> <p>Undertake training, inspections, auditing and recording in accordance with Section 9.3 and Section 3.9 of the CEMP.</p>	<p>Weekly environmental inspection records</p> <p>Construction Noise and Vibration Impact Statements</p> <p>Inspection records</p> <p>Monitoring records</p> <p>Complaints register</p>
<b>Noise and vibration – Structural</b>		
Controlling vibration at the source	<p>Implement the noise and vibration measures in Section 9.</p> <p>Undertake training, inspections, auditing and recording in accordance with Section 9.3 and Section 3.9 of the CEMP.</p>	<p>Weekly environmental inspection records</p> <p>Construction Noise and Vibration Impact Statements</p> <p>Inspection records</p> <p>Monitoring records</p> <p>Complaints register</p>
Controlling vibration on the source to receiver transmission path	<p>Implement the noise and vibration measures in Section 9.</p> <p>Undertake training, inspections, auditing and recording in accordance with Section 9.3 and Section 3.9 of the CEMP.</p>	<p>Weekly environmental inspection records</p> <p>Construction Noise and Vibration Impact Statements</p> <p>Inspection records</p> <p>Monitoring records</p> <p>Complaints register</p>
Implementing practicable and reasonable measures to minimise vibration impacts of construction activities on structures	<p>Implement the noise and vibration measures in Section 9.</p> <p>Undertake training, inspections, auditing and recording in accordance with Section 9.3 and Section 3.9 of the CEMP.</p>	<p>Weekly environmental inspection records</p> <p>Construction Noise and Vibration Impact Statements</p> <p>Inspection records</p> <p>Monitoring records</p>

Performance Outcome	How Addressed	Records
		Complaints register

## 2.3 Targets

Targets have been established for the management of noise and vibration impacts during the Project to ensure:

- Full compliance with the relevant legislative requirements, MCoA and environmental management measures
- Implementation of feasible and reasonable noise mitigation measures with the aim of achieving the construction noise management levels detailed in the Interim Construction Noise Guideline (DECC, 2009)
- That blasting activities are only undertaken at designated times and remain within established/agreed criteria
- Complaints from the community and stakeholders are minimised.

## 3 Environmental requirements

### 3.1 Relevant legislation and guidelines

#### 3.1.1 Legislation and regulatory requirements

Legislation relevant to noise and vibration management for this Project includes:

- *Protection of the Environment Operations Act 1997 (NSW)*
- *Environmental Planning & Assessment Act 1979 (NSW)*

All legislation relevant to this NVMP is included in Appendix A1 of the CEMP.

#### 3.1.2 Licences / Permits

An Environment Protection Licence (EPL) will be obtained for the Project. Noise and vibration conditions will be incorporated into this NVMP once issued.

#### 3.1.3 Guidelines

The main guidelines, specifications and policy documents relevant to this plan include:

- RMS QA Specification G36 – Environmental Protection (Management System)
- RMS Construction Noise and Vibration Guidelines (Roads and Maritime 2016)
- NSW Interim Construction Noise Guideline (ICNG), Department of Environment and Climate Change 2009
- NSW Road Noise Policy, Dept. of Environment, Climate Change and Water 2011
- Noise Policy for Industry (NPfI), Environment Protection Authority 2017
- NSW Assessing Vibration – a technical guideline (AVTG), Department of Environment and Conservation 2006
- Australian Standard AS/NZS 2107:2000 Acoustics - Recommended design sound levels and reverberation times for building interiors
- Australian Standard 2834-1995 Computer Accommodation, Chapter 2.9 Vibration
- Australian Standard AS 2187.2 Explosives - Storage and use - Part 2 Use of explosives
- Australian Standard AS2436-2010 Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites
- Australian Standard 2659.1 – 1998 Guide to the use of sound measuring equipment – portable sound level meters
- Australian Standard IEC 61672.1 Electroacoustic – Sound Level Meters – Specifications
- Australian Standard 2775 Mechanical Mounting of Accelerometers
- Australian Standard 1055 Acoustics – Description and Measurement of Environmental Noise
- British Standard BS 6472-2008, 'Evaluation of human exposure to vibration in buildings (1-80 Hz)
- British Standard 7385: Part 2-1993 'Evaluation and measurement of vibration in buildings'

- German Standard DIN4150-1999 Structural vibration Part 3: Effects of vibration on Structures
- Construction Noise and Vibration Strategy ST-157/4.1 (CNVS), Transport for NSW 2019.

## 3.2 Minister's Conditions of Approval

The MCoA relevant to this Plan are listed Table 3-1 below. A cross reference is also included to indicate where the condition is addressed in this Plan or other project management documents.

Table 3-1: Minister's Conditions of Approval

MCoA No.	Condition Requirements	Document Reference	How Addressed
<b>General</b>			
A5	<p>Where the terms of this approval require a document or monitoring program to be prepared or a review to be undertaken in consultation with identified parties, evidence of the consultation undertaken must be submitted to the Planning Secretary with the document. The evidence must include:</p> <p>(a) documentation of the engagement with the party identified in the condition of approval that has occurred before submitting the document for approval;</p> <p>(b) a log of the dates of engagement or attempted engagement with the identified party;</p> <p>(c) documentation of the follow-up with the identified party where engagement has not occurred to confirm that they do not wish to engage or have not attempted to engage after repeated invitations;</p> <p>(d) outline of the issues raised by the identified party and how they have been addressed; and</p> <p>(e) a description of the outstanding issues raised by the identified party and the reasons why they have not been addressed.</p>	<p>Appendix E</p> <p>Section 4</p>	This NVMP has been prepared in consultation with the relevant agencies identified in MCoA C4(b). Records of consultation are included in the Consultation Report in Appendix E.
A20	<b>Boundary Screening</b>	Section 9.1	A mitigation measure has been provided in Section 9.1 to construct boundary

MCoA No.	Condition Requirements	Document Reference	How Addressed
	<p>Boundary screening must be erected between ancillary facilities and are adjacent to sensitive land user(s) for the duration of the ancillary facility is in use unless otherwise agreed with relevant affected residents, business operators or landowners.</p> <p>All Boundary screening must minimise visual impacts on adjacent sensitive land user(s).</p>		screening (including noise barriers) to reduce noise impacts on adjacent sensitive receivers during works.
<b>Acoustics Advisor</b>			
A29	A suitably qualified and experienced Acoustics Advisor(s) (AA) in noise and vibration management, who is independent of the design and construction personnel, must be nominated by the Proponent and engaged for the duration of work (as required by Condition A32) and for no less than six months following completion of construction of the CSSI.	Section 3.4	A suitably qualified and experienced Acoustic Advisor has been nominated and engaged for the duration of works and for no less than six months following completion of construction. Details regarding the roles and responsibilities of Acoustic Advisor are outlined in Section 3.3 of the CEMP.
A30	Work must not commence until an AA has been nominated by the Proponent and approved by the Planning Secretary.	Section 3.4	A suitably qualified and experienced Acoustic Advisor has been nominated and engaged for the duration of works and for no less than six months following completion of construction. The Acoustic Advisor will be approved by DPIE. Details regarding the roles and responsibilities of Acoustic Advisor are outlined in Section 3.3 of the CEMP.



MCoA No.	Condition Requirements	Document Reference	How Addressed
A31	<p>The Proponent must cooperate with the AA by:</p> <p>(a) providing access to noise and vibration monitoring activities as they take place;</p> <p>(b) providing for review of noise and vibration plans, assessments, monitoring reports, data and analyses undertaken; and</p> <p>(c) considering any recommendations to improve practices and demonstrating, to the satisfaction of the AA, why any recommendation is not adopted.</p>	Section 3.4	A suitably qualified and experienced Acoustic Advisor has been nominated and engaged for the duration of works and for no less than six months following completion of construction. Details regarding the roles and responsibilities of Acoustic Advisor are outlined in Section 3.3 of the CEMP.
A32	The Proponent may nominate additional suitably qualified and experienced persons to assist the lead AA for the Planning Secretary's approval.	Section 3.4	A suitably qualified and experienced Acoustic Advisor has been nominated and engaged for the duration of works and for no less than six months following completion of construction. Details regarding the roles and responsibilities of Acoustic Advisor are outlined in Section 3.3 of the CEMP.
A33	Any activities generating noise in excess of 5 dB(A) above the 'Noise affected' Noise Management Levels (NMLs) derived from the Interim Construction Noise Guideline (DECC, 2009) (ICNG) must not commence until an AA, nominated under Condition A29 of this approval, has been approved by the Planning Secretary.	Section 3.4	<p>Any activities generating noise above NMLs will not commence until an Acoustic Advisor has been approved by the DPIE, as outlined in Section 6.2.</p> <p>The Acoustic Advisor was approved by DPIE prior to the commencement of any works. Details regarding the roles and responsibilities of Acoustic Advisor are outlined in Section 3.3 of the CEMP.</p>

MCoA No.	Condition Requirements	Document Reference	How Addressed
A34	<p>The approved AA must:</p> <ul style="list-style-type: none"> <li>(a) receive and respond to communication from the Planning Secretary in relation to the performance of the CSSI in relation to noise and vibration;</li> <li>(b) consider and inform the Planning Secretary on matters specified in the terms of this approval relating to noise and vibration;</li> <li>(c) consider and recommend, to the Proponent, improvements that may be made to avoid or minimise adverse noise and vibration impacts;</li> <li>(d) review all proposed night-time works to determine if sleep disturbance would occur and recommend measures to avoid sleep disturbance or appropriate additional alternative mitigation measures;</li> <li>(e) review all noise and vibration documents required to be prepared under the terms of this approval and, should they be consistent with the terms of this approval, endorse them before submission to the Planning Secretary (if required to be submitted to the Planning Secretary) or before implementation (if not required to be submitted to the Planning Secretary);</li> <li>(f) regularly monitor the implementation of all noise and vibration documents required to be prepared under the terms of this approval to ensure implementation is in accordance with what is stated in the document and the terms of this approval;</li> <li>(g) notify the Planning Secretary of noise and vibration incidents in accordance with Conditions A43 and A45 of this approval;</li> <li>(h) in conjunction with the ER, the AA must:</li> </ul>	Section 3.4	Details regarding the roles and responsibilities of Acoustic Advisor are outlined in Section 3.3 of the CEMP.

MCoA No.	Condition Requirements	Document Reference	How Addressed
	<p>(i) as may be requested by the Planning Secretary or Community Complaints Mediator (required by Condition B12), help plan, attend or undertake audits of noise and vibration management of the CSSI including briefings, and site visits,</p> <p>(ii) in the event that conflict arises between the Proponent and the community in relation to the noise and vibration performance of the CSSI, follow the procedure in the Community Communication Strategy approved under Condition B2 to attempt to resolve the conflict, and if it cannot be resolved, notify the Planning Secretary,</p> <p>(iii) consider relevant minor amendments made to the Ancillary Site Establishment Management Plan, CEMP, relevant sub-plans and noise and vibration monitoring programs that require updating or are of an administrative nature, and are consistent with the terms of this approval and the management plans and monitoring programs approved by the Planning Secretary and, if satisfied such amendment is necessary, endorse the amendment, (this does not include any modifications to the terms of this approval),</p> <p>(iv) review the noise impacts of minor construction ancillary facilities, and</p> <p>(v) prepare and submit to the Planning Secretary and other relevant regulatory agencies, for information, a Monthly Noise and Vibration Report detailing the AA's actions and decisions on matters for which the AA was responsible in the preceding month. The Monthly Noise and Vibration Report must be submitted within seven days following the end of</p>		

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	each month for the duration of the AA's engagement for the CSSI, or as otherwise agreed by the Planning Secretary.								
Construction Environmental Management Plan									
C4	<div>CEMP Sub-plans must be prepared in consultation with the relevant government agencies identified for each CEMP Sub-plan. Details of all information requested by an agency during consultation must be provided to the Planning Secretary as part of any submission of the relevant CEMP Sub-plan, including copies of all correspondence from those agencies as required by Condition A5.</div> <table><tr><td></td><td>Required CEMP Sub-plan</td><td>Relevant government agencies to be consulted for each CEMP Sub-plan</td></tr><tr><td>(b)</td><td>Noise and vibration</td><td>NSW Health, relevant council(s)</td></tr></table>		Required CEMP Sub-plan	Relevant government agencies to be consulted for each CEMP Sub-plan	(b)	Noise and vibration	NSW Health, relevant council(s)	This document	<div>This NVMP has been prepared in accordance with this condition and describes how CPB Downer JV proposes to manage noise and vibration during construction works on the project.</div> <div>Section 4 details the relevant government agencies which needs to be consulted during the preparation of the Plan.</div> <div>The outcomes of the agency consultation are outlined in the Critical Utilities CEMP Consultation Report.</div>
	Required CEMP Sub-plan	Relevant government agencies to be consulted for each CEMP Sub-plan							
(b)	Noise and vibration	NSW Health, relevant council(s)							
C5	<div>The CEMP Sub-plans must state how:</div> <div>(a) the environmental performance outcomes identified in the documents listed in Condition A1 will be achieved;</div> <div>(b) the mitigation measures identified in the documents listed in Condition A1 will be implemented;</div> <div>(c) the relevant terms of this approval will be complied with; and</div> <div>(d) issues requiring management during construction (including cumulative impacts), as identified through ongoing environmental risk analysis, will be managed through SMART principles.</div>	<div>Section 2.2, Appendix E</div> <div>Section 9.1 Section 3.2</div> <div>Section 9.1</div>	<div>This NVMP was prepared in accordance with the environmental performance outcomes identified in the documents listed in CoA A1 and included in Appendix E of this Plan.</div> <div>The noise and vibration mitigation measures which will be implemented are listed in Section 9 of this Plan and are cross referenced against the REMMs in Section 3.3.</div>						

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		Table 9-1 MMNV40-42	<p>Details regarding how CPB Downer JV proposes to comply with the relevant terms of approval are listed in Section 3.2.</p> <p>Noise and vibration issues requiring management have been identified through the EIS and Environmental Risk Assessment Workshop. These issues will be managed through the implementation of this Plan and the measures in Section 9. Mitigation measures identified in Table 9-1: Noise and vibration management and mitigation measures have been developed with consideration of SMART principles.</p> <p>Environmental risk analysis will be ongoing and regularly reviewed in accordance with Section 3.2.1 of the CEMP to ensure effective management of noise and vibration impacts.</p>
C9	The CEMP Sub-plans must be submitted to the Planning Secretary for approval along with, or subsequent to, the submission of the CEMP but in any event, no later than one month before construction.	Section 2 of the CEMP	The CEMP Sub-plans will be submitted for approval to DPIE with or subsequent to the final submissions of the CEMP for DPIE approval.
C10	Construction must not commence until the CEMP and all CEMP Sub-plans have been approved, unless otherwise agreed by the Planning Secretary. The CEMP and CEMP Sub-plans, as approved by the Planning Secretary, including any minor amendments approved by the ER must be implemented for the duration of	Section 1.4 of the CEMP Section 2 of the CEMP	Construction will not commence until the CEMP and all Sub-plans have been endorsed by the ER and approved by DPIE. The CEMP and all Sub-plans will be

MCoA No.	Condition Requirements	Document Reference	How Addressed						
	construction. Where construction of the CSSI is staged, construction of a stage must not commence until the CEMP and sub-plans for that stage have been endorsed by the ER and approved by the Planning Secretary.	Section 1.3 Section 3.2	implemented for the duration of construction.						
Construction Monitoring Programs									
C11	<div>The following Construction Monitoring Programs must be prepared in consultation with the relevant government agencies identified for each to compare actual performance of construction of the CSSI against the performance predicted in the documents listed in Condition A1 or in the CEMP:</div> <table><tr><td></td><td>Required Construction Monitoring Program</td><td>Relevant government agencies to be consulted for each Construction Monitoring Program</td></tr><tr><td>(a)</td><td>Noise and Vibration Monitoring Program</td><td>EPA</td></tr></table>		Required Construction Monitoring Program	Relevant government agencies to be consulted for each Construction Monitoring Program	(a)	Noise and Vibration Monitoring Program	EPA	Appendix B	A Noise and Vibration Monitoring Program has been prepared as Appendix B of this NVMP.
	Required Construction Monitoring Program	Relevant government agencies to be consulted for each Construction Monitoring Program							
(a)	Noise and Vibration Monitoring Program	EPA							
C12	<div>Each Construction Monitoring Program must provide:</div> <div>(a) details of baseline data available;</div> <div>(b) details of baseline data to be obtained and when;</div> <div>(c) details of all monitoring of the project to be undertaken;</div> <div>(d) the parameters of the project to be monitored;</div> <div>(e) the frequency of monitoring to be undertaken;</div> <div>(f) the location of monitoring;</div>	Appendix B	A Noise and Vibration Monitoring Program has been prepared as Appendix B of this NVMP.						

MCoA No.	Condition Requirements	Document Reference	How Addressed
	<p>(g) the reporting of monitoring results and analysis results against relevant criteria;</p> <p>(h) details of the methods that will be used to analyse the monitoring data;</p> <p>(i) procedures to identify and implement additional mitigation measures where the results of the monitoring indicate unacceptable project impacts;</p> <p>(j) a consideration of SMART principles;</p> <p>(k) any consultation to be undertaken in relation to the monitoring programs; and</p> <p>(l) any specific requirements as required by Conditions C13 to C16.</p>		
C13	<p>The Noise and Vibration Monitoring Program must include:</p> <p>(a) noise and vibration monitoring locations determined in consultation with the AA to confirm construction noise and vibration levels;</p> <p>(b) for the purposes of (a), noise monitoring must be undertaken during the day, evening and night-time periods and within the first month of work as well as throughout the construction period and cover the range of activities being undertaken at the sites;</p> <p>(c) a protocol for reviewing the implemented management and mitigation measures, based on the monitoring results, to confirm they are consistent with the CEMP Subplan (Condition C4b), and to identify any additional management and mitigation measures that must be implemented; and</p> <p>(d) a process to undertake real time noise and vibration monitoring. The results of the monitoring must be readily available to the</p>	Appendix B	A Noise and Vibration Monitoring Program has been prepared as Appendix B of this NVMP.

MCoA No.	Condition Requirements	Document Reference	How Addressed
	construction team, Proponent, ER and AA. The Planning Secretary and EPA must be provided with access to the results on request.		
<b>Land Use Survey</b>			
E65	A detailed land use survey must be undertaken to confirm sensitive land user(s) (including critical working areas such as operating theatres and precision laboratories) potentially exposed to construction noise and vibration, construction ground-borne noise and operational noise. The survey may be undertaken on a progressive basis but must be undertaken in any one area before the commencement of work which generates construction or operational noise, vibration or ground-borne noise in that area. The results of the survey must be included in the Noise and Vibration CEMP Sub-plan required by Condition C4.	Section 5.1	<p>A land use survey was carried out, as part of the EIS, refer Appendix A.</p> <p>Additional detailed land use surveys will be undertaken to confirm any changes in sensitive land user(s) as the construction program progresses.</p> <p>The results of the additional surveys will be included in Appendix A.</p>
<b>Construction Hours</b>			



MCoA No.	Condition Requirements	Document Reference	How Addressed
E66	<p>Work must only be undertaken during the following hours:</p> <p>(a) 7:00am to 6:00pm Mondays to Fridays, inclusive;</p> <p>(b) 8:00am to 6:00pm Saturdays; and</p> <p>(c) at no time on Sundays or public holidays</p>	Section 6.2	<p>Works will only be scheduled and undertaken during the approved construction hours stated in this condition unless permitted in CoA E68 or an EPL. Details regarding the approved construction hours are outlined in Section 6.2.</p> <p>The nominated construction hours, restrictions and general requirements for any OOHW will be addressed in the project inductions and specific training or toolboxes, as required as stated in Section 9.</p>
<b>Highly Noise Intensive Work</b>			
E67	<p>Except as permitted by an EPL, highly noise intensive works that result in an exceedance of the applicable NML at the same receiver must only be undertaken:</p> <p>(a) between the hours of 8:00 am to 6:00 pm Monday to Friday;</p> <p>(b) between the hours of 8:00 am to 1:00 pm Saturday; and</p> <p>(c) if continuously, then not exceeding three hours, with a minimum cessation of work of not less than one hour.</p> <p>For the purposes of this condition, 'continuously' includes any period during which there is less than one hour between ceasing and recommencing any of the work.</p>	Section 6.2	<p>Highly noise intensive works that result in an exceedance of the applicable NML at the same receiver will only be scheduled and undertaken at the stated hours, unless otherwise permitted by an EPL or CoA E68, as outlined in Section 6.2 and Appendix C of this NVMP.</p> <p>The nominated construction hours, restrictions and general requirements for any OOHW will be addressed in the project inductions and specific training or toolboxes, as required as stated in Section 9.</p>

MCoA No.	Condition Requirements	Document Reference	How Addressed
<b>Variation to Work Hours</b>			
E68	<p>Notwithstanding Conditions E66 and E67 work may be undertaken outside the hours specified in any of the following circumstances:</p> <p>(a) Safety and Emergencies, including:</p> <ul style="list-style-type: none"> <li>(i) for the delivery of materials required by the NSW Police Force or other authority for safety reasons; or</li> <li>(ii) where it is required in an emergency to avoid injury or the loss of life, to avoid damage or loss of property or to prevent environmental harm.</li> </ul> <p>On becoming aware of the need for emergency work in accordance with Condition E68(a)(ii), the Proponent must notify the AA, the ER, the Planning Secretary and the EPA of the reasons for such work. The Proponent must use best endeavours to notify all noise and/or vibration affected sensitive land user(s) of the likely impact and duration of those work.</p> <p>(b) Low impact, including:</p> <ul style="list-style-type: none"> <li>(i) construction that causes <math>L_{Aeq(15\text{ minute})}</math> noise levels: • no more than 5 dB(A) above the rating background level at any residence in accordance with the ICNG, or • no more than the 'Noise affected' NMLs specified in Table 3 of the ICNG at other sensitive land user(s); or</li> <li>(ii) construction that causes <math>L_{AFmax(15\text{ minute})}</math> noise levels no more than 15 dB(A) above the rating background level at any residence; or</li> <li>(iii) construction that causes:</li> </ul>	<p>Section 6.2</p> <p>Appendix C</p>	<p>An Out of Hours Work (OOHW) Protocol has been prepared in Appendix C of this Plan to address the circumstances which works may be undertaken outside the hours.</p> <p>CPB Downer JV will notify the Acoustic Advisor, the ER and the EPA on becoming aware of the need for emergency works, as outlined in the OOHW Protocol prepared in Appendix C of this Plan.</p>

MCoA No.	Condition Requirements	Document Reference	How Addressed
	<ul style="list-style-type: none"> <li>• continuous or impulsive vibration values, measured at the most affected residence are no more than the preferred values for human exposure to vibration, specified in Table 2.2 of Assessing Vibration: a technical guideline (DEC, 2006), or</li> <li>• intermittent vibration values measured at the most affected residence are no more than the preferred values for human exposure to vibration, specified in Table 2.4 of Assessing Vibration: a technical guideline (DEC, 2006).</li> </ul> <p>(c) By Approval, including:</p> <ul style="list-style-type: none"> <li>(i) where different construction hours are permitted or required under an EPL in force in respect of the CSSI; or</li> <li>(ii) works which are not subject to an EPL that are approved under an Out-of-Hours Work Protocol as required by Condition E69; or</li> <li>(iii) negotiated agreements with directly affected residents and sensitive land user(s).</li> </ul> <p>(d) By Prescribed Activity, including:</p> <ul style="list-style-type: none"> <li>(i) tunnelling (excluding cut and cover tunnelling and surface works) and tunnel fit out works (excluding surface works) are permitted 24 hours a day, seven days a week; or</li> <li>(ii) delivery of material that is required to occur outside of standard construction hours in Condition E66 to directly support tunnelling activities, except between the hours 10:00 pm and 7:00 am to/from WHT7 at Berrys Bay which could result in a sleep disturbance event for receivers in the</li> </ul>		

MCoA No.	Condition Requirements	Document Reference	How Addressed
	<p>proximity of Bay Road and Balls Head Road, Waverton; or</p> <p>(iii) works within an acoustic shed where there is no exceedance of the NMLs; or</p> <p>(iv) trailer suction hopper dredging; or</p> <p>(v) along the Warringah Freeway corridor in accordance with Condition E88.</p>		
<b>Out-Of-Hours Work Protocol – Works Not Subject to an EPL</b>			
E69	<p>An Out-of-Hours Work Protocol must be prepared to identify a process for the consideration, management and approval of work which is outside the hours defined in Conditions E66, and that are not subject to an EPL. The Protocol must be approved by the Planning Secretary before commencement of the Out-of-Hours Work. The Protocol must be prepared in consultation with the ER, AA and EPA. The Protocol must provide:</p> <p>(a) identification of low and high-risk activities and an approval process that considers the risk of activities, proposed mitigation, management, and coordination, including where:</p> <ul style="list-style-type: none"> <li>(i) the ER and AA review all proposed out-of-hours activities and confirm their risk levels,</li> <li>(ii) low risk activities can be approved by the ER in consultation with the AA, and</li> <li>(iii) high risk activities that are approved by the Planning Secretary;</li> </ul> <p>(b) a process for the consideration of out-of-hours work against the relevant NML and vibration criteria;</p>	<p>Section 6.2</p> <p>Appendix C</p>	<p>An OOHW Protocol has been prepared in Appendix C of this NVMP to identify a process for the consideration, management and approval of works which are outside the standard construction hours, and that are not subject to an EPL.</p> <p>The Protocol will be approved by the DPIE before commencing the out of hours works, and will be prepared in consultation with the EPA and the Acoustic Advisor.</p> <p>Out-of-hours-works, not subject to an EPL, will be scheduled, approved and undertaken in accordance with the OOHW Protocol (Appendix C) prepared in accordance with CoA E69.</p>

MCoA No.	Condition Requirements	Document Reference	How Addressed
	<p>(c) a process for selecting and implementing mitigation measures for residual impacts in consultation with the community at each affected location, including respite periods consistent with the requirements of Condition E83. The measures must take into account the predicted noise levels and the likely frequency and duration of the out-of-hours works that sensitive land user(s) would be exposed to, including the number of noise awakening events;</p> <p>(d) procedures to facilitate the coordination of out-of-hours work including those approved by an EPL or undertaken by a third party, to ensure appropriate respite is provided; and</p> <p>(e) notification arrangements for affected receivers for all approved out-of-hours works and notification to the Planning Secretary of approved low risk out-of-hours works.</p> <p>This condition does not apply if the requirements of Condition E68(b) are met.</p>		
<b>Construction Noise Management Levels and Vibration Criteria</b>			
E70	<p>Mitigation measures must be implemented with the aim of achieving the following construction noise management levels and vibration objectives:</p> <p>(a) construction 'Noise affected' NML established using the Interim Construction Noise Guideline (DECC, 2009);</p> <p>(b) vibration criteria established using the Assessing vibration: a technical guideline (DEC, 2006) (for human exposure);</p> <p>(c) Australian Standard AS 2187.2 - 2006 "Explosives - Storage and Use - Use of Explosives";</p> <p>(d) BS 7385 Part 2-1993 "Evaluation and measurement for vibration</p>	<p>Section 6.3</p> <p>Section 6.5.1</p> <p>N/A (Blasting not a feature of the Project)</p>	<p>Mitigation measures outlined in Section 9 will be implemented with the aim of achieving the construction NMLs and vibration criteria. The residential receptor NMLs for project works is in Section 6.</p> <p>Any works identified as exceeding the NMLs and/or vibration criteria will be managed in accordance with this Plan.</p>

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	<p>in buildings Part 2” as they are “applicable to Australian conditions”; and</p> <p>(e) the vibration limits set out in the German Standard DIN 4150-3: Structural Vibration- effects of vibration on structures (for structural damage). Any work identified as exceeding the noise management levels and/or vibration criteria must be managed in accordance with the Noise and Vibration CEMP Sub-plan.</p> <p>Any work identified as exceeding the noise management levels and/or vibration criteria must be managed in accordance with this Sub-plan.</p> <p>Note: The ICNG identifies ‘particularly annoying’ activities that require the addition of 5 dB(A) to the predicted level before comparing to the construction NML.</p>	<p>Section 6.5.2</p> <p>Section 6.5.3</p>	
E71	<p>Mitigation measures must be applied when the following residential ground-borne noise levels are exceeded:</p> <p>(a) evening (6:00 pm to 10:00 pm) — internal LAeq(15 minute): 40 dB(A); and</p> <p>(b) night (10:00 pm to 7:00 am) — internal LAeq(15 minute): 35 dB(A).</p> <p>The mitigation measures must be outlined in the Noise and Vibration CEMP Sub-plan, including in any Out-of-Hours Work Protocol, required by Condition E69</p>	<p>Section 6.3</p> <p>Section 9</p> <p>Table 9-1</p> <p>MMNV33-35</p>	<p>Mitigation measures outlined in Section 9 will be implemented with the aim of achieving the construction NMLs and vibration criteria. Ground-borne noise management levels are presented in Section 6.3.3.</p> <p>Any works identified as exceeding the NMLs and/or vibration criteria will be managed in accordance with this Plan.</p>

MCoA No.	Condition Requirements	Document Reference	How Addressed
E72	Noise generating work in the vicinity of potentially-affected community, religious, educational institutions, noise and vibration-sensitive businesses and critical working areas (such as theatres, laboratories and operating theatres) resulting in noise levels above the NMLs must not be timetabled within sensitive periods, unless other reasonable arrangements with the affected institutions are made at no cost to the affected institution.	Section 6.3 Section 9 Table 9-1 MMNV24	A mitigation measure has been provided in Section 9 to avoid sensitive periods when undertaking noise generating works in the vicinity of potentially-affected community, religious, educational institutions and noise and vibration sensitive businesses and critical working areas.
E73	At no time can noise generated by construction exceed the National Standard for exposure to noise in the occupational environment of an eight-hour (8hr) equivalent continuous A-weighted sound pressure level of LAeq,8h of 85 dB(A) for any employee working at a location near the CSSI	Section 6.3	Noise generated by construction will not exceed the National Standard for exposure to noise in the occupational environment for any employee working at a location near the project. Noise criteria are outlined in Section 6.3.
<b>Construction Noise and Vibration Mitigation and Management</b>			
E74	Industry best practice construction methods must be implemented where reasonably practicable to ensure that noise levels are minimised. Practices must include, but are not limited to: (a) use of regularly serviced low sound power equipment; (b) early occupation and later release of road carriageways and construction sites; (c) scheduling of noisiest works before 11.00 pm Sunday to Thursday and before 12 midnight Friday and Saturday; (d) temporary noise barriers (including the arrangement of plant and equipment) around noisy equipment and activities such as rockhammering and concrete cutting; and (e) use of alternative construction and demolition techniques.	Section 9.1 Table 9-1 MMNV29 MMNV17  MMNV18 MMNV20 MMNV19 MMNV38	Mitigation measures have been provided in Section 9 which will be implemented during construction works to minimise noise levels.

MCoA No.	Condition Requirements	Document Reference	How Addressed
E75	Construction Noise and Vibration Impact Statements (CNVIS) must be prepared for any work that may exceed the noise management levels, vibration criteria and/or ground-borne noise levels specified in Condition E70 and Condition E71 at any residence outside construction hours identified in Condition E66, or where receivers will be highly noise affected. The CNVIS must include specific mitigation measures identified through consultation with affected sensitive land user(s) and the mitigation measures must be implemented for the duration of the works. A copy of the CNVIS must be provided to the AA and ER prior to the commencement of the associated works. The Planning Secretary may request a copy/ies of CNVIS.	Section 8.2	CNVIS(s) will be prepared before works commence that may exceed the NMLs and / or vibration criteria, as detailed in Section 8.2.  The CNVIS will include specific mitigation measures identified through consultation with affected sensitive land user(s) which will be implemented for the duration of the works.
E76	Owners and occupiers of properties at risk of exceeding the screening criteria for cosmetic damage must be notified before work that generates vibration commences in the vicinity of those properties. If the potential exceedance is to occur more than once or extend over a period of 24 hours, owners and occupiers are to be provided a schedule of potential exceedances on a monthly basis for the duration of the potential exceedances, unless otherwise agreed by the owner and occupier. These properties must be identified and considered in the Noise and Vibration CEMP Sub-plan required by Condition C4 and the Community Communication Strategy required by Condition B1.	Section 9.1 Table 9-1 MMNV26	Owners and occupiers of properties at risk of exceeding the screening criteria for cosmetic damage will be notified before works that generate vibration commences in the vicinity of those properties, as detailed in Section 9.1.
<b>Construction Vibration Mitigation - Heritage</b>			
E79	The Proponent must conduct vibration testing during vibration generating activities that have the potential to impact on heritage items to identify minimum working distances (MWDs) to prevent cosmetic damage. In the event that the vibration testing and	Appendix B Table 9-1 MMNV30	Vibration testing will be conducted during vibration generating activities that have the potential to impact on heritage items, as



MCoA No.	Condition Requirements	Document Reference	How Addressed
	attended monitoring shows that the preferred values for vibration are likely to be exceeded, the Proponent must review the construction methodology and, if necessary, implement additional mitigation measures.		outlined in the Noise and Vibration Monitoring Program.
E80	Advice from a heritage specialist must be sought on methods and locations for installing equipment used for vibration, movement and noise monitoring at heritage-listed structures.	Appendix B	The advice of a heritage specialist will be used, as detailed in the Noise and Vibration Monitoring Program.
E81	Before conducting at-property treatment at any heritage item identified in the documents listed in Condition A1, the advice of a suitably qualified and experienced built heritage expert must be obtained and implemented to ensure any such work does not have an adverse impact on the heritage significance of the item.	Section 9.2.1	The advice of a built heritage expert will be used, as detailed in Section 9.2.1

MCoA No.	Condition Requirements	Document Reference	How Addressed
<b>Utility Coordination and Respite</b>			
E82	<p>All work undertaken for the delivery of the CSSI, including those undertaken by third parties (such as utility relocations), must be coordinated to ensure respite periods are provided. The Proponent must:</p> <ul style="list-style-type: none"> <li>(a) reschedule any work to provide respite to impacted noise sensitive land user(s) so that the respite is achieved in accordance with Condition E83; or</li> <li>(b) consider the provision of alternative respite or mitigation to impacted noise sensitive land user(s); and</li> <li>(c) provide documentary evidence to the AA in support of any decision made by the Proponent in relation to respite or mitigation.</li> </ul> <p>The consideration of respite must also include all other CSSI, SSI and SSD projects which may cause cumulative and/or consecutive impacts at receivers affected by the delivery of the CSSI.</p>	<p>Section 9.9</p> <p>Appendix C, Section 4.5</p>	<p>All works, including those undertaken by third parties (such as utility relocations), will be coordinated to ensure respite periods are provided, as identified in Section 9.9 and Section 4.5 of the OOHV Protocol prepared in Appendix C of this Plan.</p>

MCoA No.	Condition Requirements	Document Reference	How Addressed
<b>Out-of-Hours Works – Community Consultation on Respite</b>			
E83	<p>In order to undertake out-of-hours work outside the hours specified under Condition E66, the Proponent must identify appropriate respite periods for the out-of-hours work in consultation with the community at each affected location on a regular basis.</p> <p>This consultation must include (but not be limited to) providing the community with:</p> <ul style="list-style-type: none"> <li>(a) a progressive schedule for periods no less than three months, of likely out-of-hours work;</li> <li>(b) a description of the potential work, location and duration of the out-of-hours work;</li> <li>(c) the noise characteristics and likely noise levels of the work; and</li> <li>(d) likely mitigation and management measures which aim to achieve the relevant noise management levels under Condition E70 (including the circumstances of when respite or relocation offers will be available and details about how the affected community can access these offers). The outcomes of the community consultation, the identified respite periods and the scheduling of the likely out-of-hour work must be provided to the AA, ER, EPA and the Planning Secretary. <p>Note: Respite periods can be any combination of days or hours where out-of-hours work would not be more than 5 dB(A) above the rating background noise level at any residence</p> </li></ul>	<p>Section 6.2</p> <p>Section 9.5.1</p> <p>Section 9.5.2</p>	<p>Appropriate respite periods will be identified for out of hours works as described in Section 9.5.1 and 9.5.2.</p> <p>The outcomes of the community consultation, the identified respite periods and the scheduling of the likely out of hours works will be provided to the Acoustic Advisor, ER, EPA and the DPIE.</p>

MCoA No.	Condition Requirements	Document Reference	How Addressed
<b>Warringah Freeway Upgrade – Noise Mitigation Measures</b>			
E84	<p>The Proponent must implement the Noise Insulation Program (NIP) developed for the Warringah Freeway Upgrade works.</p> <p>Should the NIP be progressively updated, the updated version must be provided to the Planning Secretary for information.</p> <p>Note: the implementation of temporary or permanent noise mitigation measures in accordance with NIP is considered as low impact work as defined in the definitions table Low Impact Work (d).</p>	Section 9.2.1	The Noise Insulation Program (NIP) is outlined in Section 9.2.1.
E85	<p>Landowners whose residential properties are eligible to receive at-property treatment in accordance with the NIP must be advised of the range of options that can be installed at or in their property and given a choice as to which of these they agree to have installed.</p> <p>A copy of all guidelines and procedures that will be used to determine at-property treatment at their residence must be provided to the landowner.</p>	Section 9.2	At-property treatments are outlined in Section 9.2.
E86	The offer for at-property treatment or the application of other noise and vibration mitigation measures does not expire until the out-of-hours work affecting that property are completed, even if the landowner initially refuses the offer.	Section 9.2	At-property treatments are outlined in Section 9.2.
E87	The implementation of at-property treatment does not preclude the application of other noise and vibration mitigation and management measures including temporary and long term accommodation.	Section 9.2	At-property treatments are outlined in Section 9.2.

MCoA No.	Condition Requirements	Document Reference	How Addressed
<b>Warringah Freeway Upgrade – Out-of-Hours Work periods</b>			
E88	<p>Out-of-Hours Work along the Warringah Freeway corridor which results in an exceedance of the relevant NML at the same sensitive land user(s) may be undertaken in accordance with the following criteria:</p> <ul style="list-style-type: none"> <li>(a) two consecutive evenings and/or nights per week; or</li> <li>(b) three non-consecutive evenings and/or nights per week; or</li> <li>(c) 10 evenings and/or nights per month; or</li> <li>(d) except as identified by an EPL; or</li> <li>(e) in accordance with an agreement with a potentially impacted receiver(s) as required by Condition E68(c)(iii) or Condition E83.</li> </ul> <p>Note: These parameters may be increased subject to the development of a framework, which is prepared in consultation with the community and EPA and with consideration of the delivery of the NIP.</p>	<p>Section 6.2 Section 9.3</p>	<p>These OOHW restrictions have been included in Section 6.2 of this Plan.</p> <p>The management procedure for OHW is summarised in Section 9.3.</p> <p>An OOHW Protocol has been prepared in Appendix C of this Plan to address the circumstances which works may be undertaken outside the hours.</p>

MCoA No.	Condition Requirements	Document Reference	How Addressed
<b>Condition Survey</b>			
E107	The Proponent must offer pre-construction surveys and must undertake and prepare Preconstruction Condition Survey Reports where the offer is accepted, on the current condition of surface and sub-surface structures identified as at risk from settlement or vibration by the geotechnical model described in Condition E102 and the CNVIS required by Condition E75 or as directed by the Independent Property Impact Assessment Panel (IPIAP) established under Condition E111. The Pre-construction Condition Survey Reports must be prepared by a suitably qualified and experienced person(s) and must be provided to the owners of the surface and sub-surface structures for review prior to the commencement of potentially impacting works	Section 9.6	This has been included as management measure MMNV31 in Table 9-1 of this Plan. Property surveys and issues rectification are outlined in Section 9.6
E108	Where pre-construction surveys have been undertaken in accordance with Condition E107, subsequent post-construction surveys must be undertaken to assess damage to the surface and sub-surface structures that may have resulted from construction within three months of landowner(s) requests.	Section 9.6	This has been included as management measure MMNV31 in Table 9-1 of this Plan. Property surveys and issues rectification are outlined in Section 9.6
E109	The results of the post-construction surveys undertaken under Condition E108 must be documented in Post-construction Condition Survey Reports for each surface and sub-surface structure surveyed. The Post-construction Condition Survey Reports must be prepared by a suitably qualified and experienced person(s). Copies of the Post-construction Condition Survey Reports must be provided to the owner(s) of the structures surveyed no later than four months following the completion of construction activities that have the potential to impact on the subject surface / subsurface structure.	Section 9.6	Property surveys and issues rectification are outlined in Section 9.6

MCoA No.	Condition Requirements	Document Reference	How Addressed
E110	Where damage has been determined to occur as a result of the project, the Proponent must carry out rectification at its expense and to the reasonable requirements of the surface and sub-surface structure owner(s) within 12 months of completion of construction unless another timeframe is agreed with the owner of the affected surface or sub-surface structure.	Section 9.6	Property surveys and issues rectification are outlined in Section 9.6

### 3.3 Environmental Management Measures

Relevant Revised Environmental Management Measures (REMMs), as identified in Part D of the RtS, are listed in Table 3-2 below. This includes reference to required outcomes, the timing of when the commitment applies, relevant documents or sections of the environmental assessment influencing the outcome and implementation.

Table 3-2: Environmental management measures relevant to this NVMP

Outcome	Ref #	Commitment	Timing	Document reference
Construction noise and vibration impacts	CNV1	<p>A Construction Noise and Vibration Management Plan will be developed for the project. This plan will:</p> <ul style="list-style-type: none"> <li>a) Identify relevant criteria and management levels in relation to noise and vibration</li> <li>b) Identify noise and vibration sensitive receivers and features in the vicinity of the project</li> <li>c) Include standard and additional mitigation from the Construction Noise and Vibration Guideline (Roads and Maritime, 2016a) and detail how and when these will be applied in the project</li> </ul>	Pre-construction	<p>This NVMP</p> <p>Section 6</p> <p>Section 5.1, Appendix A</p> <p>Section 9</p>

Outcome	Ref #	Commitment	Timing	Document reference
		<ul style="list-style-type: none"> <li>d) Describe the approach that will be adopted for carrying out location and activity specific construction noise and vibration impact assessments to assist with designing and selecting of the appropriate mitigation and management measures</li> <li>e) Include protocols that will be adopted to manage works required outside standard construction hours</li> <li>f) Detail the methodology and approach for managing residual construction noise impacts</li> <li>g) Detail the process for managing construction vibration, including heritage structures considering all types of vibration generating works, including blasting</li> <li>h) Outline the procedures and approach for noise and vibration monitoring to be carried out to confirm construction noise and vibration levels in relation to noise and vibration management levels</li> <li>i) Where feasible and reasonable, detail how construction noise impacts from concurrent or consecutive nearby construction works associated with the project will be managed.</li> </ul> <p>The Construction Noise and Vibration Management Plan will be implemented for the duration of construction of the project.</p>		<p>Section 8.2</p> <p>Section 9.3, Appendix C</p> <p>Section 9.8</p> <p>Table 9-1</p> <p>Appendix B</p> <p>Table 9-1</p>



Outcome	Ref #	Commitment	Timing	Document reference
Construction noise and vibration impacts	CNV2	<p>Detailed Construction Noise and Vibration Impact Statements will be carried out for all construction support sites and major construction works required for the project prior to the commencement of construction.</p> <p>The Statements will consider the proposed site layouts and noise and vibration generating activities that will take place during all major stages of the construction support site, assess predicted noise and vibration levels against the relevant management levels, and incorporate feasible and reasonable mitigation and management measures in accordance with the requirements of the Interim Construction Noise Guideline (DECC, 2009) and the Construction Noise and Vibration Guideline (Roads and Maritime, 2016a).</p>	Pre-construction	Section 8.2

Outcome	Ref #	Commitment	Timing	Document reference
Construction noise and vibration impacts during out of hours work	CNV3	<p>An out of hours works protocol will be developed for the construction of the project. The protocol will include:</p> <ul style="list-style-type: none"> <li>a) Details of works required outside standard construction hours, including acceptable justifications for works outside of standard construction hours, what types of works are allowed to take place outside of construction hours, and justifications of why the activities are required outside standard construction hours</li> <li>b) Details of the assessment and approval process (internal and external) for works proposed outside standard construction hours</li> <li>c) Noise and vibration mitigation and management measures that are to be considered and implemented where appropriate to manage potential impacts associated with works outside standard construction hours</li> <li>d) The noise and vibration impact assessment processes that will be followed to identify potentially affected receivers, clarify potential impacts and determine appropriate mitigation and management measures.</li> </ul> <p>The protocol will be prepared in consultation with the Department of Planning, Industry and Environment and the NSW Environment Protection Authority, and independently endorsed. The project protocol will be implemented during the duration of the construction of the project.</p>	Pre-construction	<p>Section 9.3, Appendix C Section 6.2</p> <p>Appendix C</p> <p>Table 9-1. Appendix C</p> <p>Section 8.2</p>

Outcome	Ref #	Commitment	Timing	Document reference
Construction noise and vibration impacts	CNV4	<p>Construction noise and vibration impacts will be monitored periodically throughout all stages of the construction support sites to ensure that:</p> <ul style="list-style-type: none"> <li>a) Impacts are consistent with the noise and vibration levels detailed in the relevant Construction Noise and Vibration Impact Statements</li> <li>b) Noise and vibration impacts are being appropriately managed</li> <li>c) Mitigation measures are effective.</li> </ul>	Construction	Table 9-1, MMNV28
Construction noise and vibration impacts	CNV5	Where feasible and reasonable, unless compliance with the relevant traffic noise criteria can be achieved, or alternative arrangements have been agreed with affected receivers, construction vehicle movements will not occur on local roads beyond those required for direct access to construction sites.	Pre-construction and construction	Table 9-1, MMNV3
Construction vibration impacts	CNV6	<p>Vibration generating activities will be managed through the establishment of minimum buffer distances to achieve screening levels.</p> <p>Where vibration levels are predicted to exceed the screening levels, a more detailed assessment of the impacted structure and attended vibration monitoring will be carried out to ensure vibration levels remain below appropriate limits for that structure.</p> <p>For heritage items, the more detailed assessment will specifically consider the heritage values of the structure in consultation with a heritage specialist to ensure sensitive heritage fabric is adequately monitored and managed.</p> <p>Any damage caused by the project will be rectified.</p>	Pre-construction and construction	Section 8.4.1 Table 9-1, MMNV28 - 30

Outcome	Ref #	Commitment	Timing	Document reference
Construction ground-borne noise impacts	CNV7	Feasible and reasonable measures will be implemented to minimise ground-borne noise where exceedances are predicted.	Construction	Table 9-1
Construction impacts from surface road works	CNV8	<p>Mitigation measures will be implemented for surface road works, local area and utility works, where construction activities are predicted to exceed noise management levels at receivers. Where feasible and reasonable the approaches that will be used include:</p> <ul style="list-style-type: none"> <li>a) Carrying out works during the daytime period when near residential receivers</li> <li>b) Selection of plant and equipment to minimise noise and vibration impacts</li> <li>c) Management of plant and equipment to minimise the generation of noise and vibration impacts</li> <li>d) Community consultation, engagement and notification</li> <li>e) Detailed programming and respite protocols</li> <li>f) Where out of hours works are required, programming the noisiest activities to occur during the less sensitive time periods</li> <li>g) Out of hours works protocols</li> <li>h) Limiting timing of noise intensive work</li> <li>i) Use of portable noise barriers around particularly noisy equipment such as concrete saws and rock hammers in cases where it will effectively reduce noise levels at nearby receivers</li> </ul>	Construction	Table 9-1

Outcome	Ref #	Commitment	Timing	Document reference
		<ul style="list-style-type: none"> <li>j) Management of construction traffic to minimise movements during the night periods along local roads</li> <li>k) Establishing minimum vibration buffer distances for vibration intensive works</li> <li>l) Vibration and blasting trials and/or monitoring along with building condition surveys.</li> </ul>		
Construction blasting impacts	CNV9	<p>A Blast Management Strategy will be prepared in consultation with the NSW Environment Protection Authority to demonstrate that all blasting and associated activities will be carried out in a manner that will not generate unacceptable noise and vibration impacts or pose a significant risk impact to structures and sensitive receivers. The strategy will:</p> <ul style="list-style-type: none"> <li>a) Detail the blasting to be performed including location, method and justification of the need to blast</li> <li>b) Identify any potentially affected noise and vibration sensitive sites including heritage buildings and utilities</li> <li>c) Establish appropriate criteria for blast overpressure and ground vibration levels at each category of noise sensitive site</li> <li>d) Detail storage and handling arrangements for explosive materials and the proposed transport of those materials to the construction support site</li> <li>e) Identify hazardous situations that may arise from the storage and handling of explosives, the blasting</li> </ul>	Construction	N/A – Blasting is not a feature of the Project.

Outcome	Ref #	Commitment	Timing	Document reference
		<p>process and recovery of the blast site after detonation of the explosives</p> <p>f) Determine potential noise and vibration and risk impacts from blasting and appropriate best management practices</p> <p>g) Detail community consultation procedures.</p>		
Cumulative construction noise impacts	CNV10	<p>Construction noise from concurrent and consecutive construction works will be managed to minimise cumulative construction noise impacts. Where feasible and reasonable the approaches that will be used include:</p> <p>a) Coordinating work between project construction sites and construction works to avoid cumulative noise impacts</p> <p>b) Consideration of additional at source or near source mitigation where construction noise levels may result in cumulative construction noise impacts, where programming is not practical to avoid cumulative noise impacts</p> <p>c) Community consultation throughout the project to gauge construction key noise impacts and issues and any unknown impacts from concurrent or consecutive sets of constructions works</p> <p>d) Incorporating additional noise mitigation and management measures with consideration of cumulative and consecutive construction noise impacts based upon coordination between projects.</p>	Construction	<p>Table 9-1 MMNV40</p> <p>MMNV41</p> <p>MMNV42</p> <p>MMNV41</p>

Outcome	Ref #	Commitment	Timing	Document reference
Non-Aboriginal heritage	NAH4	Should at-property noise treatment be required at a premises that is heritage listed, this will be carried out in a manner to minimise heritage impact, and advice of a heritage conservation architect will be sought prior to undertaking the works. Any treatment will be sympathetic to the heritage values of the item, designed with heritage architect input and be reversible where feasible and reasonable.	Pre-construction	Section 9.2.1
Aboriginal heritage – vibration impacts	AH3	Vibration monitoring will be carried out at AHIMS sites that have been identified as requiring monitoring in accordance with the process outlined in mitigation measure AH2. Where possible, works will be conducted in a manner to minimise vibration levels, to less than 2.5 millimetres per second at all structurally unsound AHIMS sites.	Construction	Table 9-1, MMNV28, MMNV30
Aboriginal heritage – vibration impacts	AH4	If vibration monitoring identifies that vibration levels exceed 2.5 millimetres per second at AHIMS sites that have been identified as requiring monitoring, a site visit will be organised with a representative from Metro LALC to record any changes to the integrity of the site that may have resulted from construction vibration, and updated site cards must be prepared accordingly. Condition surveys may include further photogrammetry and 3D-capture techniques.	Construction	Table 9-1 MMNV28, MMNV30
Ground movement impacts	SG4	Pre-construction building/structure condition surveys will be offered and prepared for properties (and heritage assets) within the zone of influence of tunnel settlement (for example within the 5 millimetre predicted surface settlement contour and within 50 metres of surface works) and within the minimum working distances for cosmetic and structural	Pre-construction and Post-construction	Table 9-1 MMNV31

Outcome	Ref #	Commitment	Timing	Document reference
		<p>damage due to vibration. The surveys will be carried out by a suitably qualified person prior to the commencement of the tunnelling and vibration-intensive activities in the vicinity with the potential to affect the building/structure.</p> <p>Within three (3) months of the completion of construction activities that have the potential to impact on the subject surface/subsurface structure, all property owners of buildings for which a preconstruction building condition survey was carried out will be offered a second building condition survey. Where an offer is accepted, post-construction building condition surveys will be carried out by a suitably qualified person. The results of the surveys will be documented in a post-construction building condition survey report for each building surveyed.</p> <p>Copies of building condition survey reports will be provided to the owners of the buildings surveyed within one (1) month of the survey being completed.</p> <p>Any property damage caused by the project will be rectified.</p>		



### 3.4 Acoustics Advisor

As required by CoA A29 through A34, a suitably qualified and experienced Acoustics Advisor (AA) in noise and vibration management, who is independent of the design and construction personnel, has been nominated the TfNSW and engaged for the duration of works and for no less than six months following completion of construction. The Acoustic Advisor was approved by DPIE prior to the commencement of any work (as outlined in CoA 30).

In accordance with CoA A31, CPB Downer JV will cooperate with the AA by:

- a) providing access to noise and vibration monitoring activities as they take place;
- b) providing for review of noise and vibration plans, assessments, monitoring reports, data and analyses undertaken; and
- c) considering any recommendations to improve practices and demonstrating, to the satisfaction of the AA, why any recommendation is not adopted.

The Proponent may nominate additional suitably qualified and experienced persons to assist the lead AA for the Planning Secretary's approval.

In accordance with CoA A34, the AA must:

- a) receive and respond to communication from the Planning Secretary in relation to the performance of the Project in relation to noise and vibration
- b) consider and inform the Planning Secretary on matters specified in the terms of this approval relating to noise and vibration
- c) consider and recommend, to the Proponent, improvements that may be made to avoid or minimise adverse noise and vibration impacts
- d) review all proposed night-time works to determine if sleep disturbance would occur and recommend measures to avoid sleep disturbance or appropriate additional alternative mitigation measures
- e) review all noise and vibration documents required to be prepared under the terms of this approval and, should they be consistent with the terms of this approval, endorse them before submission to the Planning Secretary (if required to be submitted to the Planning Secretary) or before implementation (if not required to be submitted to the Planning Secretary)
- f) regularly monitor the implementation of all noise and vibration documents required to be prepared under the terms of this approval to ensure implementation is in accordance with what is stated in the document and the terms of this approval
- g) notify the Planning Secretary of noise and vibration incidents in accordance with Conditions A43 and A45 of this approval
- h) in conjunction with the ER, the AA must:
  - i. as may be requested by the Planning Secretary or Community Complaints Mediator (required by Condition B12), help plan, attend or undertake audits of noise and vibration management of the CSSI including briefings, and site visits,
  - ii. in the event that conflict arises between the Proponent and the community in relation to the noise and vibration performance of the CSSI, follow the procedure in the Community Communication Strategy approved under Condition B2 to attempt to resolve the conflict, and if it cannot be resolved, notify the Planning Secretary

- iii. consider relevant minor amendments made to the Ancillary Site Establishment Management Plan, CEMP, relevant sub-plans and noise and vibration monitoring programs that require updating or are of an administrative nature, and are consistent with the terms of this approval and the management plans and monitoring programs approved by the Planning Secretary and, if satisfied such amendment is necessary, endorse the amendment, (this does not include any modifications to the terms of this approval)
- iv. review the noise impacts of minor construction ancillary facilities, and
- v. prepare and submit to the Planning Secretary and other relevant regulatory agencies, for information, a Monthly Noise and Vibration Report detailing the AA's actions and decisions on matters for which the AA was responsible in the preceding month. The Monthly Noise and Vibration Report must be submitted within seven days following the end of each month for the duration of the AA's engagement for the CSSI, or as otherwise agreed by the Planning Secretary.

Further details regarding the roles and responsibilities of Acoustic Advisor are outlined in Section 3.3 of the CEMP.

## 4 Consultation

This NVMP including the Out of Hours Works (OOHW) Protocol, will be provided to NSW Health, Willoughby Council and North Sydney Council in accordance with CoA C4 (b) and CoA E69. The OOHW Protocol will also be provided to NSW Environment Protection Authority (EPA), in accordance with CoA E69. The outcomes of the agency consultation are outlined in Appendix E – Consultation Report.

### 4.1 Out of Hours Work Respite Consultation

Ongoing consultation pertaining to the Project's noise and vibration impacts will be required with relevant councils and other stakeholders, including the identification of appropriate respite periods for OOHW with affected receivers identified in the noise assessment. This process is further outlined in the OOHW Protocol. Consultation will be conducted in accordance with the Communication Strategy and CoA E83 (refer Section 9.5).

The Community Communication Strategy (CCS) outlines how the Project will engage with and notify the community of upcoming works. In accordance with the CCS Appendix B – Out of Hours Communication Framework the following suite of communication tools will be considered as part of OOHW respite consultation, where required:

- OOHW notifications (letterbox drops and emails)
  - Providing overarching community notification of upcoming OOHW
- OOHW notices (email, SMS, phone calls and flyers)
  - Reminder to potentially affected residents of commencement of OOHW
- Face to face meetings
- Negotiated agreements
- Alternative accommodation letters of offer
  - Offer alternative accommodation to highly noise affected residents
- Website updates
  - Providing a list of upcoming OOHW
- Phone calls
  - Providing personalised contact and tailored advice about upcoming OOHW.

### 4.2 Endorsement and approval

In accordance with Section 2 of the CEMP, the Environmental Representative (ER) and Acoustic Advisor must endorse this NVMP prior to lodgement to DPIE for approval. This NVMP must be lodged to DPIE for approval at least one month prior to the commencement of construction works.

## 5 Existing environment

The Project is located within the North Sydney and Willoughby local government areas (LGAs). The Warringah Freeway Upgrade will be carried out on the Warringah Freeway from around Fitzroy Street at Milsons Point to around Willoughby Road at Naremburn. Upgrade works would include improvements to bridges across the Warringah Freeway, and upgrades to surrounding roads.

The areas surrounding the project alignment and construction support sites are mostly residential, except for clusters of commercial and industrial receivers around the North Sydney central business district.

The acoustic environment in these residential areas is mostly influenced by noise from the major arterial roads such as Warringah Freeway, Gore Hill Freeway, Pacific Highway and Military Road, as well as local transport activities.

Traffic volumes on these main roads, and resulting noise levels, are generally highest in the morning between 7.00 am and 9.00 am, and lowest between 2.00 am and 3.00 am. Traffic noise on major arterial roads is more continuous, rather than intermittent.

Noise generated by shops, restaurants, employment and entertainment areas can influence the surrounding acoustic environment and may contribute to higher ambient noise levels which locally mask road traffic noise.

### 5.1 Sensitive receivers

A land use survey was carried out, as part of the EIS, to identify the receiver types and uses of buildings that could potentially be impacted by noise or vibration from the Project. The survey was carried out to assist with defining appropriate management objectives for the sensitive receivers (refer Appendix A).

Where future receivers were identified as likely to be in place during the construction period, these have been assessed as the likely future use. In order to meet the requirements of MCoA E65 additional land use surveys of current noise-sensitive receivers at the time of construction would be carried out to confirm all potentially affected receivers.

These additional detailed land use surveys will confirm any changes in sensitive receivers as the construction program progresses. The results of the additional surveys will be included in Appendix A.

As the Project is being constructed within a developed urban area, the Project is surrounded by sensitive receivers. The noise and vibration-sensitive receivers are generally separated into the following major categories, with further details of the breakdowns of categories and noise and vibration objectives presented in Section 6:

- Residential receivers (including mixed use buildings and aged care facilities)
- Other noise and vibration-sensitive receivers, including:
  - Classrooms at schools and other educational institutions
  - Hospital wards and operating theatres
  - Places of worship
  - Childcare centres
  - Active recreation areas (e.g. sports fields/activities which generate their own noise and are generally less sensitive to external noise)

- Passive recreation areas (e.g. areas used for low intensity and low noise producing activities which have the potential to be impacted by external noise such as reading or meditation)
- Community centres
- Special noise and/or vibration-sensitive receivers (e.g. laboratories, recording studios)
- Commercial premises (including offices and retail outlets)
- Industrial premises

## 5.2 Noise Catchment Areas

To facilitate the assessment of noise impacts from the Project, receivers along the route have been divided into Noise Catchment Areas (NCAs). NCAs group individual sensitive receivers by common traits such as existing noise environment and location in relation to the Project. The project has been divided into 48 NCAs which are presented in Appendix A.

## 5.3 Ambient Noise

During preparation of the EIS noise monitoring was carried out along the Project extent to quantify the existing noise environment in areas where receivers may potentially be affected by construction noise. Noise management levels (NMLs) for the assessment of construction noise are derived from measurements of existing noise levels in an area. The rating background level (RBL) is used to determine noise management levels at residential receiver locations.

The long-term noise monitoring results are presented in Table 5-1.

Table 5-1 Long-term noise monitoring results

Monitoring location ID	NCA	Address	L <sub>A90</sub> Rating Background Level (RBL)			L <sub>Aeq</sub> Ambient noise		
			Day	Evening	Night	Day	Evening	Night
15	15:4	1/16 Munro street, McMahon's Point	42	41	38	52	46	44
16	16:1	401/102 Alfred Street, Milsons Point	60	60	50	63	62	58
17	17:2	6 McDougall Street, Kirribilli	55	54	45	60	58	56
19	19:1	91 Ridge Street, North Sydney	52	52	45	57	57	52
20	18:3	14 Montpellier Road, Neutral Bay	54	52	43	59	57	53
21	22:1	306 Miller Street, North Sydney	52	47	36	65	63	58
22	23:2	1/1 Bardsley Gardens, Crows Nest	53	49	41	68	67	63
23	23:1	288 Falcon Street, Neutral Bay	61	54	44	69	68	65

Monitoring location ID	NCA	Address	LA90 Rating Background Level (RBL)			LAeq Ambient noise		
			Day	Evening	Night	Day	Evening	Night
25	26:2	317 Ernest Street, Cammeray	58	54	41	69	66	62
26	25:2	225 Ernest Street, Cammeray	56	52	37	68	66	61
27	25:1	77 Rosalind Street, Cammeray	58	55	43	62	60	57
28	29:1	53 Bellevue Street, Cammeray	64	63	47	67	67	64
29	28:1	12 Warringa Road, Cammeray	47	45	37	54	51	48
30	27:1	57 Park Avenue, Cremorne	49	48	39	59	57	54
31	30:1	18/22-24 Donnelly Road, Crows Nest	58	56	38	62	61	58
32	31:3	79 Brook Street, Naremburn	56	49	37	71	69	65
33	33:2	20/2 Parkes Road, Artarmon	67	63	46	72	70	67
34	33:1	3/2 Cleland Road, Artarmon	55	53	40	59	58	55
35	32:1	1 Chelmsford Avenue, Naremburn	59	55	40	63	61	58
36	34:1	2 Burra Road, Artarmon	44	44	37	53	50	46
37	36:1	16 Walter Street, Willoughby	50	48	38	55	52	49
38	37:1	27 Garland Street, Naremburn	45	44	34	53	52	48
39	38:1	2 Pyalla Street, Northbridge	52	48	37	60	56	57

## 6 Noise and vibration criteria for NSW

The MCoA require construction noise and vibration be managed in accordance with the standards and guidelines outlined in CoA E70. The standards and guidelines adopted for the Project include the following:

- Interim Construction Noise Guideline (ICNG) (DECC, 2009)
- Assessing vibration: a technical guideline (DEC, 2006)
- Australian Standard AS 2187.2 - 2006 “Explosives - Storage and Use - Use of Explosives”
- British Standard BS 7385 Part 2-1993 “Evaluation and measurement for vibration in buildings Part 2”
- German Standard DIN 4150-3: Structural Vibration- effects of vibration on structures (for structural damage)
- Road Noise Policy (RNP) (DECCW, 2011)
- Noise Policy for Industry (NPfI) (Environment Protection Authority, 2017)
- Construction Noise and Vibration Guideline (CNVG) (Roads and Maritime Services, 2016)
- Construction Noise and Vibration Strategy (CNVS) (Transport for NSW 2019)

Relevant elements of these documents are summarised and discussed in the following sections.

### 6.1 Construction noise and assessment objectives

As outlined in CoA E70, the DECC Interim Construction Noise Guideline (ICNG, July 2009) provides guidelines for the assessment and management of construction noise. The ICNG focuses on applying a range of work practices to minimise construction noise impacts rather than focusing on achieving numeric noise levels.

The main objectives of the ICNG are to:

- Identify and minimise noise from construction works
- Focus on applying all ‘feasible’ and ‘reasonable’ work practices to minimise construction noise impacts
- Encourage construction during the recommended standard hours only, unless approval is given for works that cannot be undertaken during these hours
- Reduce time spent dealing with complaints at the project implementation stage
- Provide flexibility in selecting site-specific feasible and reasonable work practices to minimise noise impacts.

## 6.2 Approved construction work hours

Approved working hours for the Project are defined by MCoA E66 to 69, E83 and E88. An EPL will be obtained for the Project, any conditions relating to approved hours of work will be incorporated into Table 6-1 below once issued.

Table 6-1 Construction working hours

MCoA	Construction Activity	Working hours applicable to Condition		
		Monday to Friday	Saturday	Sunday/ Public holiday
E66	Works must be undertaken during the following hours: (a) 7:00 am to 6:00 pm Mondays to Fridays, inclusive (b) 8:00 am to 6:00 pm Saturdays (c) at no time on Sundays or public holidays	7:00am to 6:00pm	8:00am to 6:00pm	No work <sup>1</sup>
E67	Except as permitted by an EPL, highly noise intensive works that result in an exceedance of the applicable NML at the same receiver must only be undertaken: (a) between the hours of 8:00 am to 6:00 pm Monday to Friday (b) between the hours of 8:00 am to 1:00 pm Saturday (c) if continuously, then not exceeding three hours, with a minimum cessation of work of not less than one hour.  For the purposes of this condition, 'continuously' includes any period during which there is less than one hour between ceasing and recommencing any of the work.	8:00am to 6:00pm (plus respite <sup>2</sup> )	8:00am to 1:00pm (plus respite <sup>2</sup> )	No work <sup>1</sup>
E68	Notwithstanding Conditions E66 and E67 work may be undertaken outside the hours specified in any of the following circumstances (Refer Section 9.3 and Appendix C): (a) Safety and Emergencies, including:	6.00pm to 7.00am	6.00pm to 8.00am Sunday	8.00am to 7.00am Monday (8.00am



MCoA	Construction Activity	Working hours applicable to Condition		
		Monday to Friday	Saturday	Sunday/ Public holiday
	<ul style="list-style-type: none"> <li>i. for the delivery of materials required by the NSW Police Force or other authority for safety reasons</li> <li>ii. where it is required in an emergency to avoid injury or the loss of life, to avoid damage or loss of property or to prevent environmental harm</li> </ul> <p>On becoming aware of the need for emergency work in accordance with Condition E8(a)ii, the Proponent must notify the AA, the ER, the Planning Secretary and the EPA of the reasons for such work. The Proponent must use best endeavours to notify all noise and/or vibration affected sensitive land user(s) of the likely impact and duration of those work.</p> <p>(b) Low impact, including:</p> <ul style="list-style-type: none"> <li>i. construction that causes <math>L_{Aeq}(15 \text{ minute})</math> noise levels: • no more than 5 dB(A) above the rating background level at any residence in accordance with the ICNG, or • no more than the 'Noise affected' NMLs specified in Table 3 of the ICNG at other sensitive land user(s); or</li> <li>ii. construction that causes <math>L_{AFmax}(15 \text{ minute})</math> noise levels no more than 15 dB(A) above the rating background level at any residence; or</li> <li>iii. construction that causes: • continuous or impulsive vibration values, measured at the most affected residence are no more than the preferred values for human exposure to vibration, specified in Table 2.2 of Assessing Vibration: a technical guideline (DEC, 2006), or • intermittent vibration values measured at the most affected residence are no more than the preferred values for human exposure to vibration, specified in Table 2.4 of Assessing Vibration: a technical guideline (DEC, 2006).</li> </ul> <p>(c) By Approval, including:</p>			Monday on public holidays)

MCoA	Construction Activity	Working hours applicable to Condition		
		Monday to Friday	Saturday	Sunday/ Public holiday
	<ul style="list-style-type: none"> <li>i. where different construction hours are permitted or required under an EPL in force in respect of the Project; or</li> <li>ii. works which are not subject to an EPL that are approved under an Out-of-Hours Work Protocol as required by Condition E69; or</li> <li>iii. negotiated agreements with directly affected residents and sensitive land user(s).</li> </ul> <p>(d) By Prescribed Activity, including:</p> <ul style="list-style-type: none"> <li>i. tunnelling (excluding cut and cover tunnelling and surface works) and tunnel fit out works (excluding surface works) are permitted 24 hours a day, seven days a week; or</li> <li>ii. delivery of material that is required to occur outside of standard construction hours in Condition E66 to directly support tunnelling activities, except between the hours 10:00 pm and 7:00 am to/from WHT7 at Berrys Bay which could result in a sleep disturbance event for receivers in the proximity of Bay Road and Balls Head Road, Waverton; or</li> <li>iii. works within an acoustic shed where there is no exceedance of the NMLs; or</li> <li>iv. trailer suction hopper dredging; or</li> <li>v. along the Warringah Freeway corridor in accordance with Condition E88.</li> </ul>			
E69	An Out-of-Hours Work Protocol must be prepared to identify a process for the consideration, management and approval of work which is outside the hours defined in Conditions E66, and that are not subject to an EPL (Refer Section 9.3 and Appendix C). The Protocol must be approved by the Planning Secretary before commencement of the Out-of-Hours Work. The Protocol must be prepared in consultation with the ER, AA and EPA. The Protocol must provide:	6.00pm to 7.00am	6.00pm to 8.00am Sunday	8.00am to 7.00am Monday (8.00am Monday on public

MCoA	Construction Activity	Working hours applicable to Condition		
		Monday to Friday	Saturday	Sunday/ Public holiday
	<p>(a) identification of low and high-risk activities and an approval process that considers the risk of activities, proposed mitigation, management, and coordination, including where:</p> <ul style="list-style-type: none"> <li>(i) the ER and AA review all proposed out-of-hours activities and confirm their risk levels,</li> <li>(ii) low risk activities can be approved by the ER in consultation with the AA, and</li> <li>(iii) high risk activities that are approved by the Planning Secretary;</li> </ul> <p>(b) a process for the consideration of out-of-hours work against the relevant NML and vibration criteria;</p> <p>(c) a process for selecting and implementing mitigation measures for residual impacts in consultation with the community at each affected location, including respite periods consistent with the requirements of Condition E83. The measures must take into account the predicted noise levels and the likely frequency and duration of the out-of-hours works that sensitive land user(s) would be exposed to, including the number of noise awakening events;</p> <p>(d) procedures to facilitate the coordination of out-of-hours work including those approved by an EPL or undertaken by a third party, to ensure appropriate respite is provided; and</p> <p>(e) notification arrangements for affected receivers for all approved out-of-hours works and notification to the Planning Secretary of approved low risk out-of-hours works.</p> <p>This condition does not apply if the requirements of Condition E68(b) are met.</p>			holidays)

MCoA	Construction Activity	Working hours applicable to Condition		
		Monday to Friday	Saturday	Sunday/ Public holiday
E83	<p>In order to undertake out-of-hours work outside the hours specified under Condition E66, the Proponent must identify appropriate respite periods for the out-of-hours work in consultation with the community at each affected location on a regular basis.</p> <p>This consultation must include (but not be limited to) providing the community with:</p> <ul style="list-style-type: none"> <li>(a) a progressive schedule for periods no less than three months, of likely out-of-hours work;</li> <li>(b) a description of the potential work, location and duration of the out-of-hours work;</li> <li>(c) the noise characteristics and likely noise levels of the work; and</li> <li>(d) likely mitigation and management measures which aim to achieve the relevant noise management levels under Condition E70 (including the circumstances of when respite or relocation offers will be available and details about how the affected community can access these offers).</li> </ul> <p>The outcomes of the community consultation, the identified respite periods and the scheduling of the likely out-of-hour work must be provided to the AA, ER, EPA and the Planning Secretary.</p> <p>Note: Respite periods can be any combination of days or hours where out-of-hours work would not be more than 5 dB(A) above the rating background noise level at any residence</p> <p>Refer Appendix C – OOHW Protocol</p>	6.00pm to 7.00am	6.00pm to 8.00am Sunday	8.00am to 7.00am Monday (8.00am Monday on public holidays)

MCoA	Construction Activity	Working hours applicable to Condition		
		Monday to Friday	Saturday	Sunday/ Public holiday
E88	<p>Out-of-Hours Work along the Warringah Freeway corridor which results in an exceedance of the relevant NML at the same sensitive land user(s) may be undertaken in accordance with the following criteria:</p> <p>(a) two consecutive evenings and/or nights per week; or</p> <p>(b) three non-consecutive evenings and/or nights per week; or</p> <p>(c) 10 evenings and/or nights per month; or</p> <p>(d) except as identified by an EPL; or</p> <p>(e) in accordance with an agreement with a potentially impacted receiver(s) as required by Condition E68(c)(iii) or Condition E83.</p> <p>Note: These parameters may be increased subject to the development of a framework, which is prepared in consultation with the community and EPA and with consideration of the delivery of the NIP.</p> <p>Refer Appendix C – OOHW Protocol</p>	6.00pm to 7.00am	6.00pm to 8.00am Sunday	8.00am to 7.00am Monday (8.00am Monday on public holidays)

Notes:

1. No work unless permitted and approved in accordance with an EPL
2. Minimum respite in continuous blocks of no more than 3 hours, with at least 1 hour respite between each block of work generating high noise impact, where the location of the work and activities is likely to impact the same noise sensitive receivers; except as expressly permitted by another condition of this licence.

## 6.3 Quantitative noise assessment criteria

### 6.3.1 Airborne Noise

As outlined in CoA E73, noise generated by construction must not exceed the National Standard for exposure to noise in the occupational environment of an eight-hour (8hr) equivalent continuous A-weighted sound pressure level of  $L_{Aeq,8h}$  of 85 dB(A) for any employee working at a location near the CSSI.

#### 6.3.1.1 Residential Receivers

The noise management levels (NMLs) for residential receivers set in accordance with the Construction Noise and Vibration Guideline are provided in Table 6-2. Construction noise impacts on residential receivers are assessed using these noise management levels, set with reference to time of day and background noise (Rating Background Level (RBL)). The RBL for each location was determined based on the quietest period of the day, evening or night assessment period in accordance with the NPfI.

Where noise levels are above the noise management levels, reasonable and feasible noise mitigation needs to be considered. Reasonable and feasible noise mitigation includes site specific measures for noise management, mitigation and treatment measures such as construction noise barriers, acoustic sheds, acoustic enclosures, and restricted construction hours and activities.

Where exceedances of the NMLs are expected, the additional mitigation measures outlined in the CNVG will be implemented to mitigate residual impacts, refer Section 9.8.

There is also a highly noise affected level for construction, above which further mitigation needs to be considered, such as additional consultation and notification, additional respite periods, and alternative accommodation.

Table 6-2 Construction noise management levels – residential receivers

Time of Day	NML, $L_{Aeq,15min}$ , dB(A) <sup>1</sup>	How to Apply
<b>Approved construction hours<sup>2</sup>:</b> Monday to Friday 7 am to 6 pm Saturday 8 am to 6 pm  No work on Sundays or public holidays	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. <ul style="list-style-type: none"> <li>Where the predicted or measured <math>L_{Aeq (15 min)}</math> is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level.</li> <li>The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.</li> </ul>
	Highly noise affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. <ul style="list-style-type: none"> <li>Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account:</li> </ul>

Time of Day	NML, L <sub>Aeq,15min</sub> , dB(A) <sup>1</sup>	How to Apply
		<ol style="list-style-type: none"> <li>times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences)</li> <li>If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.</li> </ol>
<b>Outside approved construction hours</b>	Noise affected RBL + 5 dB	<ul style="list-style-type: none"> <li>A strong justification would typically be required for works outside the recommended standard hours.</li> <li>The proponent should apply all feasible and reasonable work practices to meet the noise affected level.</li> <li>Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community.</li> <li>For guidance on negotiating agreements see section 7.2.2 (ICNG).</li> </ul>

Notes:

- Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence. Noise levels may be higher at upper floors of the noise affected residence.
- Approved construction hours are Monday to Friday 7 am to 6 pm and Saturday 8 am to 6 pm, no work on Sundays or public holidays. Refer CoA E66.

### 6.3.1.2 Non-residential receivers

The noise management levels for non-residential receivers set in accordance with the Interim Construction Noise Guideline are provided in Table 6-3. These levels apply only during hours when the non-residential premises are being used.

The difference between an internal noise level and the external noise level is about 10 dB(A), which provides a conservative assumption that windows are open for ventilation. Buildings where windows are fixed or cannot otherwise be opened may achieve a greater noise level performance.

Table 6-3 Noise management levels at other noise sensitive land uses

Land Use	Where objective applies	Noise management level L <sub>Aeq,15min</sub>
Classrooms at schools, and other educational institutions	Internal noise level	45 dB(A)
Hospital wards and operating theatres	Internal noise level	45 dB(A)
Places of worship	Internal noise level	45 dB(A)
Childcare centre	External noise level	50 dB(A)

Land Use	Where objective applies	Noise management level $L_{Aeq,15min}$
Active recreation areas (e.g. sports fields/activities which generate their own noise and are generally less sensitive to external noise)	External noise level	65 dB(A)
Passive recreation areas (e.g. area used for low intensity and low noise producing activities which could be impacted by external noise such as reading or meditation)	External noise level	60 dB(A)
Community centres	Depends on the intended use of the centre.	Refer to the 'maximum' internal levels in AS2107 for specific uses.
Commercial premises (including offices and retail outlets)	External noise level	70 dB(A)
Industrial premises	External noise level	75 dB(A)
Special noise and/or vibration sensitive (eg laboratories, recording studios)	Depends on the intended use	Refer to the 'maximum' internal levels in AS2107 for specific uses.

### 6.3.1.3 Sleep Disturbance Criteria

Considering the ICNG and RNP guidance, a night-time sleep disturbance 'screening criterion' noise goal of RBL +15 dB(A) (external) is used to identify the receivers where there is potential for sleep disturbance.

Where the sleep disturbance screening criterion is exceeded, further assessment is conducted to determine whether the 'awakening reaction' level of  $L_{Amax}$  65 dB(A) (external) would be exceeded and the likely number of these events. The awakening reaction level is the level above which sleep disturbance is considered likely.

### 6.3.2 Construction Traffic noise

For locations within the construction footprint, where noise levels would increase by more than 2 dB(A) due to construction traffic volumes or a temporary re-route due to a road closure, further assessment will be completed as per the Noise Criteria Guideline (Roads and Maritime, 2015).

### 6.3.3 Ground-borne noise

Ground-borne noise is generated by vibration transmitted through the ground into a structure and is more likely to be noticeable during the evening and night periods, when masking by airborne noise is less likely. Ground-borne noise objectives set in accordance with the Construction Noise and Vibration Guideline are provided in Table 6-4.

Table 6-4 Ground-borne noise objectives

Receiver Type	Ground-borne noise objectives $L_{Aeq,15min}$
Residential (day – 7am to 6pm)	Not applicable



Receiver Type	Ground-borne noise objectives $L_{Aeq,15min}$
Residential (evening – 6pm to 10pm)	40 dB(A) internal
Residential (night – 10pm to 7am)	35 dB(A) internal
Hospital wards and operating theatres	45 dB(A)
Childcare centres	40 dB(A)
Classrooms at schools and other educational institutions	45 dB(A)
Places of worship	45 dB(A)
Community centre	45 dB(A)
Commercial premises (including offices)	50 dB(A)
Commercial premises (including retail outlets)	55 dB(A)
Other noise sensitive receivers	Refer to the 'maximum' internal levels in AS/NZS 2107 for specific uses

## 6.4 Adopted project noise management levels

The project-specific noise objectives for each representative monitoring location for works within and outside approved working hours are presented in Table 6-5.

Figures showing the locations of the referenced NCAs as well as noise sensitive receivers are shown in Appendix A.

Table 6-5 Adopted project noise management levels

NCA Reference	Reference Logger	Approved Hours (RBL + 10 dB)	Outside approved hours: Out of Hours Works (OOHW) (RBL + 5)			Screening Level, $L_{Amax}$ (RBL+15dB)
		Day	Day	Evening	Night	Night
15.1	15	52	47	46	43	53
15.2	15	52	47	46	43	53
15.3	15	52	47	46	43	53
15.4	15	52	47	46	43	53
16.1	16	70	65	65	55	65
16.2	16	70	65	65	55	65
16.3	16	70	65	65	55	65
17.1	17	65	60	59	50	60
17.2	17	65	60	59	50	60
17.3	17	65	60	59	50	60
17.4	17	65	60	59	50	60

NCA Reference	Reference Logger	Approved Hours (RBL + 10 dB)	Outside approved hours: Out of Hours Works (OOHW) (RBL + 5)			Screening Level, $L_{Amax}$ (RBL+15dB)
		Day	Day	Evening	Night	Night
18.1	20	64	59	57	48	58
18.2	20	64	59	57	48	58
18.3	20	64	59	57	48	58
19.1	19	62	57	57	50	60
20.1	19	62	57	57	50	60
21.1	22	63	58	54	46	56
21.2	22	63	58	54	46	56
22.1	21	62	57	52	41	51
22.2	21	62	57	52	41	51
22.3	21	62	57	52	41	51
23.1	23	71	66	59	49	59
23.2	23	71	66	59	49	59
24.1	26	66	61	57	42	52
25.1	27	68	63	60	48	58
26.1	25	68	63	59	46	56
26.2	25	68	63	59	46	56
27.1	30	59	54	53	44	54
28.1	29	57	52	50	42	52
29.1	28	74	69	68	52	62
30.1	31	68	63	61	43	53
30.2	31	68	63	61	43	53
30.3	31	68	63	61	43	53
30.4	31	68	63	61	43	53
31.1	32	66	61	54	42	52
31.2	32	66	61	54	42	52
31.3	32	66	61	54	42	52
32.1	35	69	64	60	45	55
33.1	34	65	60	58	45	55
33.2	34	65	60	58	45	55
33.4	34	65	60	58	45	55
34.1	36	54	49	49	42	52
35.1	33	77	72	68	51	61
36.1	37	60	55	53	43	53
37.1	38	55	50	49	39	49
38.1	39	62	57	53	42	52
38.2	39	62	57	53	42	52

NCA Reference	Reference Logger	Approved Hours (RBL + 10 dB)	Outside approved hours: Out of Hours Works (OOHW) (RBL + 5)			Screening Level, $L_{Amax}$ (RBL+15dB)
		Day	Day	Evening	Night	Night
38.3	39	62	57	53	42	52

Notes:

1. As per section 2.3 of the NPfI, as the community generally expects greater control of noise during the more sensitive evening and night-time periods than during the less sensitive daytime period, the project noise management levels for evening are set at no greater than daytime level, and the night-time is set to be no greater than the day or evening levels.

## 6.5 Vibration criteria

Construction vibration is associated with three main types of impact:

- Disturbance to building occupants
- Potential damage to buildings
- Potential damage to sensitive equipment in a building.

Generally, if disturbance to building occupants is controlled, there is limited potential for structural damage to buildings.

### 6.5.1 Human exposure to vibration

Tactile vibration potentially disturbing human occupants of buildings is managed by reference to Assessing Vibration; a technical guideline (DECC, 2006). This document provides criteria which are based on the British Standard BS 6472-2008 Evaluation of human exposure to vibration in buildings (1-80Hz).

Vibration sources are defined as Continuous, Impulsive or Intermittent. Table 6-6 provides a definition and examples of each type of vibration.

Table 6-6 Types of vibration

Types of vibration	Definition	Examples
Continuous	Continues uninterrupted for a defined period (usually throughout the day-time and/or night-time)	Machinery, steady road traffic, continuous construction activity (such as roadheader excavation).
Impulsive	A rapid build-up to a peak followed by a damped decay that may or may not involve several cycles of vibration (depending on frequency and damping).  It can also consist of a sudden application of several cycles at approximately the same amplitude, providing the duration is short (typically less than 2 seconds)	Infrequent: Activities that create up to three distinct vibration events in an assessment period, e.g. occasional dropping of heavy equipment, occasional loading and unloading.

Types of vibration	Definition	Examples
Intermittent	Can be defined as interrupted periods of continuous or repeated periods of impulsive vibration that varies significantly in magnitude	Trains, nearby intermittent construction activity, passing heavy vehicles, forging machines, impact pile driving, jack hammers.  Where the number of vibration events in an assessment period is three or fewer, they would be assessed against impulsive vibration criteria.

Preferred and maximum values for continuous and impulsive vibration are defined in Table 2.2 of the guideline and are reproduced below in Table 6-7.

Table 6-7 Preferred and maximum levels for human comfort (continuous and impulsive vibration)

Location	Assessment period <sup>1</sup>	Preferred values		Maximum values	
		z-axis	x- and y-axis	z-axis	x- and y-axis
Continuous vibration <sup>3</sup> (weighted rms Acceleration, m/s2, 1-80Hz)					
Critical areas <sup>2</sup>	Day or night-time	0.005	0.0036	0.010	0.0072
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night-time	0.007	0.005	0.014	0.010
Offices, schools, educational institutions and places of worship	Day or night-time	0.020	0.014	0.040	0.028
Workshops	Day or night-time	0.04	0.029	0.080	0.058
Impulsive vibration <sup>3</sup> (Weighted rms Acceleration, m/s2, 1-80Hz)					
Critical areas <sup>2</sup>	Day or night-time	0.005	0.0036	0.010	0.0072
Residences	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.10	0.071	0.20	0.14
Offices, schools, educational institutions and places of worship	Day or night-time	0.64	0.46	1.28	0.92
Workshops	Day or night-time	0.64	0.46	1.28	0.92

Notes:

1. Daytime is 7.00am to 10.00pm and night-time is 10.00pm to 7.00am
2. Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. There may be cases where sensitive equipment or delicate tasks require more stringent criteria than the human comfort criteria specified above. Stipulation of such criteria is outside the scope of their policy and other guidance documents (e.g. relevant standards) and should be referred to. Source: BS 6472-2008
3. Source: Table 2.2, Assessing Vibration; a technical guideline, Department of Environment and Climate Change 2006.

Preferred and maximum values for human comfort are presented in Table 6-8.

Table 6-8 Preferred and maximum levels for human comfort (intermittent vibration)

Location	Assessment period <sup>1</sup>	Preferred values	Maximum values
Intermittent vibration <sup>3</sup> (Vibration Dose Values, VDV, m/s <sup>1.75</sup> , 1-80Hz)			
Critical areas <sup>2</sup>	Day or night-time	0.10	0.20
Residences	Daytime	0.20	0.40
	Night-time	0.13	0.26
Offices, schools, educational institutions and places of worship	Day or night-time	0.40	0.80
Workshops	Day or night-time	0.80	1.60

Notes:

1. Daytime is 7.00 am to 10.00 pm and night-time is 10.00pm to 7.00 am
2. Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. These criteria are only indicative, and there may be a need to assess intermittent values against the continuous or impulsive criteria for critical areas, as noted in BS 6472-1992
3. Source: Table 2.4, Assessing Vibration; a technical guideline, Department of Environment & Climate Change 2006.

### 6.5.2 Structural damage to buildings

Potential structural damage of buildings by vibration is typically managed by ensuring vibration impacting the structure does not exceed certain limits and standards, such as British Standard 7385: Part 2 and German Standard DIN 4150-3. As outlined in the Roads and Maritime's CNVG, guidance for cosmetic damage of structures is provided in the British Standard 7385: Part 2, while German Standard DIN 4150-3 has criteria of particular reference for heritage structures.

There is no current Australian Standard for assessing structural building damage caused by vibration.

British Standard BS 7385: Part 2 Evaluation and measurement of vibration in buildings can be used as a guide to assess the likelihood of building damage from ground vibration. The standard suggests levels at which 'cosmetic', 'minor' and 'major' categories of damage might occur. Damage consists of minor non-structural effects such as hairline cracks on drywall surfaces, hairline cracks in mortar joints and cement render, enlargement of existing cracks and separation of partitions or

intermediate walls from load-bearing walls. 'Minor' damage is considered possible at vibration magnitudes which are twice those given and 'major' damage to a building structure may occur at levels greater than four times those values.

BS 7385 is based on peak particle velocity and specifies damage criteria for frequencies within the range 4 Hz to 250 Hz, being the range usually encountered in buildings. At frequencies below 4 Hz, a maximum displacement value is recommended. The values set in the standard relate to transient vibrations and to low-rise buildings. Continuous vibration can give rise to dynamic magnifications due to resonances and may need to be reduced by up to 50 per cent. Table 6-9 sets out the BS 7385 safe limits for cosmetic damage.

Table 6-9 BS 7385 cosmetic damage safe limits

Line	Type of building	Peak component particle velocity in frequency range of predominant pulse	
		4 Hz to 15 Hz	15 Hz and above
1	Reinforced or framed structures industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
2	Un-reinforced or light framed structures Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

For most construction activities involving intermittent vibration sources such as rock hammers, piling rigs, vibratory rollers, excavators and the like, the predominant vibration energy occurs at frequencies greater than 4 Hz (and usually in the 10 Hz to 100 Hz range). On this basis, the following vibration level (PPV) has been adopted as the assessment criteria for sound structures:

- Reinforced or framed structures – 25 mm/s
- Unreinforced or light framed structures – 7.5 mm/s.

For assessment purposes, a conservative vibration damage screening level of 7.5 mm/s has been adopted for sound structures to identify where further investigation is required.

For structures where the predicted and/or measured vibration levels are greater than shown above (peak component particle velocity), a more detailed analysis of the building structure, vibration source, dominant frequencies and dynamic characteristics of the structure would be done during detailed design to determine the applicable safe vibration level and approach to construction near the structure.

### 6.5.3 Heritage items

Heritage items are considered on a case by case basis, and care should be taken as these structures can be difficult to repair in the case of damage. British Standard BS 5228-2:2009 states that 'a building of historical value should not (unless it is structurally unsound) be assumed to be more sensitive' (p.39) when compared to other structures.

Where a structure is found to have defects, or is structurally unsound following an inspection, maximum vibration criteria are to be established for that specific structure for works to not further damage the structure. As stated previously, German Standard DIN 4150: Part 3 provides guidance for structures that are sensitive to vibration (eg structurally unsound).

A conservative vibration damage screening level of 2.5 mm/s has been adopted for heritage structures. This does not necessarily reflect that there would be a vibration impact on the structure

if this level is exceeded, instead it is a suitable vibration level that is used as part of the construction vibration management process to trigger further investigation.

Any heritage structure predicted to exceed the screening level would be further investigated during detailed design, and appropriate vibration criteria for the structure adopted. If a heritage building or structure is found to be structurally unsound (following inspection), the conservative cosmetic damage objective of 2.5 mm/s peak component particle velocity (from DIN 4150) would be considered, and appropriate protections put in place.

The general approach to managing potential vibration impacts on heritage items would be to:

1. Identify heritage items where the 2.5 mm/s peak component particle velocity objective may be exceeded during specific construction activities
2. Carry out a structural engineering report on identified heritage items, to confirm structural integrity of the building and confirm if item is 'structurally sound'
3. Adopt the appropriate screening level from BS7385 Part 2 if the item was confirmed as 'structurally sound', or
4. Adopt the more conservative cosmetic damage level of 2.5 mm/s peak component particle velocity if the item was confirmed as 'structurally unsound'.

#### 6.5.4 Damage to vibration-sensitive equipment

Some high technology manufacturing facilities, hospitals and laboratories use equipment that is highly sensitive and susceptible to vibration, for example scanning electron microscopes and micro-electronic manufacturing facilities. In addition, buildings housing sensitive computer or telecommunications equipment may require assessment against stricter criteria than those nominated for building damage.

There is no explicit guidance on acceptable vibration levels for sensitive equipment, so recommended vibration levels should be obtained from instrument manufacturers. In the absence of equipment-specific data provided by manufacturers, there are generic vibration limits that can be used to assess the impact of vibration-generating activities on buildings housing vibration-sensitive equipment.

Vibration Criterion (VC) curves are often referred to as they are generic and apply to all tools/equipment types within each category. The VC curves are defined over the frequency range eight to 100Hz.

Table 6-10 summarises a range of suitable vibration limits that are applicable to buildings housing vibration-sensitive equipment which may potentially be affected by construction works associated with the project.

Table 6-10 Acceptable vibration limits on building structure housing sensitive equipment

Equipment requirements	Vibration limit <sup>1</sup> mm/s		Description of Use
	rms	Peak <sup>4</sup>	
Computer areas <sup>2</sup>	0.7	1.0	Barely perceptible vibration. Adequate for computer equipment accommodation environments.
Medical <sup>2,3</sup>	0.1	0.14	Vibration not perceptible. Suitable in most instances for microscopes to 100X and for other equipment of low sensitivity.
VC-A <sup>3</sup>	0.05	0.07	Vibration not perceptible. Adequate in most instances for optical microscopes to 400X, microbalances, optical balances, proximity and projection aligners, etc

Notes:

1. As measured in one-third octave bands of frequency over the frequency range 8 to 100 Hz. Vibration measured on the building structure near vibrating equipment or in areas containing sensitive equipment
2. Based on AS 2834 Computer Accommodation
3. Gordon CG Generic Vibration Criteria for Vibration-sensitive Equipment
4. In the absence of Peak limits, rms limits are converted to Peak by conservatively assuming the vibration signal is sinusoidal and random with a nominal crest factor of 1.414.

#### 6.5.5 Existing rail tunnels

Any development that occurs within a distance of 25 metres horizontally from first reserve (dependent on tunnel dimensions), as defined in Asset Standards Authority (ASA) standard Development Near Rail Tunnels (ASA 2018), must consider vibration impacts on existing rail tunnels. The assessment requirement is a maximum peak particle velocity (PPV) of 15 mm/s at the tunnel lining for brick or mass concrete in good condition, or maximum PPV of 20 mm/s at the tunnel lining for cast iron, steel or concrete segment lining.

#### 6.5.6 Damage to buried utilities

Section 5.3 of DIN 4150: Part 3 sets out guideline values for vibration velocity to be used when evaluating the effects of vibration on buried pipework. These values, which apply at the wall of the pipe, are reproduced and presented in Table 6-11. As part of detailed design, these vibration limits would be considered to minimise the potential for damage to buried utilities from vibration impacts.

Table 6-11 Acceptable vibration limits for effects of short-term vibration on buried pipework

Line	Pipe Material	Guideline values for vibration velocity measured on the pipe, mm/s
1	Steel (including welded pipes)	100
2	Clay, concrete, reinforced concrete, pre-stressed concrete, metal (with or without flange)	80
3	Masonry, plastic	50

Notes:

1. Consideration must also be given to pipe junctions within the building structure as potential substantial changes in mechanical loads on the pipe must be considered.

For long-term vibration, the vibration limits presented in Table 6-11 should be halved.

Recommended vibration goals for electrical cables and telecommunication utilities such as fibre optic cables range from 50 mm/s to 100 mm/s. Although cables may sustain these vibration levels, the utilities they are connected to, such as transformers and switch blocks, may not. If such equipment is encountered during the construction process, an individual vibration assessment would be carried out addressing impact on the utility, and consultation with the utility provider, to confirm specific vibration requirements.



### 6.5.7 Minimum Working Distances for Vibration Intensive Works

Minimum working distances (MWD) for typical vibration intensive construction equipment are provided in the CNVG and are shown in Table 6-12. The minimum working distances are for both cosmetic damage (from BS 7385 and DIN 4150) and human comfort (from AVTG). They are calculated from empirical data which suggests that where work is further from receivers than the quoted minimum distances then impacts are not considered likely.

Table 6-12 Recommended Minimum Working Distances from Vibration Intensive Equipment

Plant Item	Rating/Description	Minimum Distance		
		Cosmetic Damage		Human Response (AVTG)
		Residential and Light Commercial (BS 7385)	Heritage Items (DIN 4150, Group 3)	
Vibratory Roller	<50 kN (1–2 tonne)	5 m	11 m	15 m to 20 m
	<100 kN (2–4 tonne)	6 m	13 m	20 m
	<200 kN (4–6 tonne)	12 m	25 m	40 m
	<300 kN (7–13 tonne)	15 m	31 m	100 m
	>300 kN (13–18 tonne)	20 m	40 m	100 m
	>300 kN (>18 tonne)	25 m	50 m	100 m
Compactor <sup>1</sup>	32t (non-vibratory)	15 m	30 m	40 m
Bulldozer <sup>1</sup>	D10 with ripper	2 m	10 m	20 m
Excavators <sup>1</sup>	<30 tonne (travelling/digging)	10 m	15 m	15 m
Small Hydraulic Hammer	300 kg (5 to 12 t excavator)	2 m	5 m	7 m
Medium Hydraulic Hammer	900 kg (12 to 18 t excavator)	7 m	15 m	23 m
Large Hydraulic Hammer	1,600 kg (18 to 34 t excavator)	22 m	44 m	73 m
Vibratory Pile Driver	Sheet piles	2 m to 20 m	5 m to 40 m	20 m
Impact Piling <sup>1</sup>	Typical driven pile	20 m	30 m	110 m
	338kJ per stroke (23 tonne hammer with 1.5m stroke)	70 m	140 m	330 m
Piling Rig – Bored	≤ 800 mm	2 m (nominal)	5 m	4 m
Jackhammer	Hand held	1 m (nominal)	3 m	2 m

Plant Item	Rating/Description	Minimum Distance		
		Cosmetic Damage		Human Response (AVTG)
		Residential and Light Commercial (BS 7385)	Heritage Items (DIN 4150, Group 3)	
Truck Traffic <sup>1</sup>	On uneven construction haul roads	5 m	10 m	20 m
Concrete Saw <sup>4</sup>	On roads and pavements	1 m	2 m	2 m

Notes:

1. Additional MWDs included from the EIS.
2. Additional MWDs included from the Stage 1A Early Works NVMP.

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

## 7 Environmental aspects and impacts

### 7.1 Construction activities

The Project will involve a range of activities incorporating various heavy machinery, plant and equipment that will operate in a number of locations across the Project. In order to assess the level of potential impact on noise and vibration sensitive receivers, the broad categories of construction activity likely to interact with these receivers are identified below:

Key construction activities would include:

- Site establishment
  - Property acquisition and condition surveys
  - Vegetation clearing, earthworks and demolition of structures
  - Utilities installation, protection, adjustment and relocation
  - Land remediation and heritage salvage and/or conservation works (where required)
  - Installation of site fencing, environmental controls (including noise attenuation and project erosion and sediment controls) and traffic management controls
  - Construction of minor access roads and the provision of property access including the temporary relocation of pedestrian and cycle paths and adjustments to existing intersections, where required
  - Establishment of construction support sites (including temporary site accesses) and acoustic sheds, where required.
- Surface road works
  - Earthworks
  - Bridgeworks
  - Construction of retaining walls
  - Construction and installation of stormwater and cross drainage
  - Pavement works and linemarking
  - Utilities installation and relocation
  - Tolling gantries and associated infrastructure
  - Installation of road furniture, lighting, signage and noise barriers.
- Site rehabilitation
  - Removal of construction support sites
  - Landscaping and rehabilitation of disturbed areas
  - Removal of temporary environmental and traffic controls.

### 7.2 Staging

The former Stage 2A WFU Early Works and Stage 2B WFU Main Works were combined in October 2021. These two stages were heavily integrated and as such, have been combined to form Stage 2 – Warringah Freeway Upgrade Project (the focus of this NVMP).

### 7.3 Impacts

The potential for noise and vibration impacts on sensitive receivers or structures will depend on a number of factors. Typically, these might include:

- The type of plant and equipment in use
- The number of plant and equipment simultaneously in use
- Proximity to sensitive receivers
- Topography and other physical barriers
- Hours/duration of construction works
- Ground condition
- The condition of sensitive receivers
- Cumulative impacts from other project's works
- Proximity of heavy traffic areas such as the highway
- Presence of existing background noise (e.g. from heavy traffic areas).

Noise and vibration impacts attributable to the Project are anticipated (refer Table 7-1). Chapter 9 provides a suite of mitigation measures that will be implemented to avoid or minimise impacts on the receiving community and/or built environment.

Table 7-1 Noise and Vibration impact summary

Construction Activity	Potential Impact	NCA affected	Risk Level prior to mitigation	Mitigation measures	Risk Level following mitigation
Noise walls to mitigate construction noise from the project	Noise and Vibration impacts at sensitive receivers adjacent Noise walls	30.1, 29.1, 25.1, 26.1, 17.4, 17.3	Moderate - High	REMM CNV3, CNV4, CNV05, CNV6, CNV8, CNV10 CoA A34, E67, E83, E84 E88, E72, E74, E75, E76, E79, SG4	Low - Moderate
Site preparation works including clearing of vegetation, installation of temporary fencing and hoarding, installation of environmental controls including erosion and sedimentation controls	Noise and Vibration impacts at sensitive receivers adjacent works area	25.1, 26.1, 26.2, 27.1, 28.1,	Moderate to high	REMM CNV3, CNV4, CNV05, CNV6, CNV8, CNV10 CoA A34, E67, E83, E84 E88, E72, E74, E75, E76, E79, SG4	Low - Moderate
Establishment of ancillary facilities at Blue Street (WFU1), High Street south (WFU2), High Street north (WFU3), Arthur Street east (WFU4), Berry Street east (WFU5), Ridge Street east (WFU6), Merlin Street (WFU7), Cammeray Golf Course (WFU8) and Rosalind Street (WFU9), Northern Hub (NH1)	Noise impacts at sensitive receivers adjacent ancillary facilities	16.1, 16.2, 16.3, 17.2, 17.3, 23.1, 25.1, 26.1, 26.2, 27.1, 28.1,	Moderate to high	REMM CNV3, CNV4, CNV05, CNV6, CNV8, CNV10 CoA A34, E67, E83, E84 E88, E101, E72, E74, E75	Low - Moderate

Construction Activity	Potential Impact	NCA affected	Risk Level prior to mitigation	Mitigation measures	Risk Level following mitigation
Operation of ancillary facilities at Blue Street (WFU1), High Street south (WFU2), High Street north (WFU3), Arthur Street east (WFU4), Berry Street east (WFU5), Ridge Street east (WFU6), Merlin Street (WFU7), Cammeray Golf Course (WFU8) and Rosalind Street (WFU9), Northern Hub (NH1)	Noise impacts at sensitive receivers adjacent ancillary facilities	16.1, 16.2, 16.3, 17.2, 17.3, 23.1, 25.126.1, 26.2, 27.1, 28.1,	Moderate	REMM CNV3, CNV4, CNV05, CNV6, CNV8, CNV10 CoA A34, E67, E83, E84 E88, E101, E72, E74, E75	Low - Moderate
Utility installation, relocation and protection (in addition to the CUT stage works), including installation of Intelligent Transport System and new and relocated drainage	Noise and vibration impacts at sensitive receivers	All NCA's directly adjacent alignment	Moderate to high	REMM CNV3, CNV4, CNV05, CNV6, CNV8, CNV10 CoA A34, E67, E83, E84 E88, E72, E74, E75, E76, E79, SG4	Low - Moderate
Construction of retaining walls	Noise and vibration impacts at sensitive receivers	17.4	Moderate to high	REMM CNV3, CNV4, CNV05, CNV6, CNV8, CNV10 CoA A34, E67, E83, E84 E88, E72, E74, E75, E76, E79, SG4	Low - Moderate
Construction of the new Ridge Street Pedestrian Bridge, including localised excavation, piling, concrete works, roadworks, installation of bridge spans, stairs and ramp and demolition works	Noise and Vibration on sensitive receivers	20.1, 17.4	Moderate to high	REMM CNV3, CNV4, CNV05, CNV6, CNV8, CNV10 CoA A34, E67, E83, E84 E88, E72, E74, E75, E76, E79, SG4	Low - Moderate

Construction Activity	Potential Impact	NCA affected	Risk Level prior to mitigation	Mitigation measures	Risk Level following mitigation
Modifications to the Falcon Street bridge and entry and exit ramps including installation of traffic barriers, concrete works, installation of structural steel, installation of drainage, asphaltting and line marking	Noise and Vibration on sensitive receivers	23.1, 23.2	Moderate to high	REMM CNV3, CNV4, CNV05, CNV6, CNV8, CNV10 CoA A34, E67, E83, E84 E88, E72, E74, E75, E76, E79, SG4	Low - Moderate
Realignment of traffic including demolition of existing barriers, rock walls, drainage, lighting and signage, asphaltting works	Noise and Vibration on sensitive receivers	All NCA's directly adjacent alignment	Moderate to high	REMM CNV3, CNV4, CNV05, CNV6, CNV8, CNV10 CoA A34, E67, E83, E84 E88, E72, E74, E75, E76, E79, SG4	Low - Moderate
Construction of the bridge over Alfred Street exit ramp including excavation and concrete works	Noise and Vibration on sensitive receivers	17.4, 20.1	Moderate to high	REMM CNV3, CNV4, CNV05, CNV6, CNV8, CNV10 CoA A34, E67, E83, E84 E88, E72, E74, E75, E76, E79, SG4	Low - Moderate
High Street bridge widening and ramps including piling and concrete works	Noise and Vibration on sensitive receivers	17.2,17.3,16.3	Moderate to high	REMM CNV3, CNV4, CNV05, CNV6, CNV8, CNV10 CoA A34, E67, E83, E84 E88, E72, E74, E75, E76, E79, SG4	Low - Moderate

Construction Activity	Potential Impact	NCA affected	Risk Level prior to mitigation	Mitigation measures	Risk Level following mitigation
Bulk earthworks for the widening of the Warringah Freeway into the Cammeray Golf Course	Noise and Vibration on sensitive receivers	25.1, 26.1, 26.2, 27.1, 28.1,	Moderate to high	REMM CNV3, CNV4, CNV05, CNV6, CNV8, CNV10 CoA A34, E67, E83, E84 E88, E101, E72, E74, E75, E76, E79, SG4	Low - Moderate
Construction of Warringah Freeway southbound bus lanes including piling and concrete works	Noise and Vibration on sensitive receivers	All NCA's directly adjacent alignment	Moderate to high	REMM CNV3, CNV4, CNV05, CNV6, CNV8, CNV10 CoA A34, E67, E83, E84 E88, E72, E74, E75, E76, E79, SG4	Low to Moderate
Construction of the Ernest Street underpass including excavation, piling and concrete works.	Noise and Vibration on sensitive receivers	23.1, 23.2, 24.1, 25.1, 26.1, 28.1	Moderate to high	REMM CNV3, CNV4, CNV05, CNV6, CNV8, CNV10 CoA A34, E67, E83, E84 E88, E72, E74, E75, E76, E79, SG4	Low to Moderate



### 7.3.1 Indicative Timing

Construction of the WHTWUFU project is planned to commence in 2021, with completion of construction in 2027. Early and enabling works and site establishment would be the first works carried out for the project, with substantial construction starting in 2022.

For the Stage 2 – WUFU project construction is planned to commence in early 2022 and will continue until late 2025. This timing will be subject to review as the procurement processes evolve (refer Table 7-2).

Table 7-2 Proposed Key Construction Dates

Construction Portion	Proposed Start Date	Proposed Finish Date
Site Possession	15 March 2022	15 March 2022
Project Mobilisation	10 September 2022	23 September 2022
Portion 1 – Cammeray Golf Course	16 June 2022	24 January 2023
Portion 2 – Berry St North	23 September 2022	06 September 2023
Portion 3 – Ridge St North	12 September 2022	13 March 2023
Portion 4 – WHT Portal	27 October 2022	01 July 2025
Portion 5 – Ventilation Outlet & Ernest St Bridge	20 October 2022	09 July 2024
Portion 6 – BL Portal & Tie-in	26 November 2022	07 May 2026
Portion 7 – WHT Tie-in	27 October 2022	22 August 2025
Portion 8 – Cammeray Golf Course (BL Stage 1)	20 October 2022	02 December 2024
Portion 9 – Cammeray Golf Course (BL Stage 2)	20 October 2022	12 December 2025
Portion 10 – Carriageway Portion	02 September 2022	15 January 2026

## 8 Construction noise and vibration assessment

The Western Harbour Tunnel and Warringah Freeway Upgrade Technical Working Paper: Noise and Vibration detailed a construction noise and vibration impact assessment. This was completed using three-dimensional models which included all noise sources, receiver locations, topographical and man-made features, and feasible and reasonable noise mitigation measures developed for this project. Models were developed for each of the major stages of construction across the project based on preliminary site layouts and reasonable worst case construction plant and equipment. Feasible and reasonable noise treatment measures and management methods were identified and incorporated into the models to assist in attenuating and managing noise from construction activities.

Actual noise levels would vary greatly depending on a range of factors including the location of the construction works within each construction works area, the distance between noise sources and nearby receivers, the noise intensity of works taking place and the time of day specific activities take place.

### 8.1 Construction activities

A summary of the works areas that have been assessed, as well as the range of proposed noise generating construction activities, is presented in Table 5-127 of the Western Harbour Tunnel and Warringah Freeway Upgrade Technical Working Paper: Noise and Vibration.

Construction noise from these major works areas are assessed in detail in section 5.9.2.2 through to section 5.9.2.13 of the Western Harbour Tunnel and Warringah Freeway Upgrade Technical Working Paper: Noise and Vibration.

### 8.2 Construction noise impacts

Site-specific construction noise and vibration impact statements (CNVIS) will be prepared by an appropriately qualified and experienced acoustic consultant. In accordance with MCoA E75, CNVIS will be prepared for any work that may exceed the noise management levels, vibration criteria and/or ground-borne noise levels specified in CoA E70 and E71 at any residence outside construction hours identified in CoA E66, or where receivers will be highly noise affected.

The CNVIS would include specific mitigation measures identified through consultation with affected sensitive land user(s) and the mitigation measures must be implemented for the duration of the works. A copy of the CNVIS must be provided to the AA and ER for endorsement prior to the commencement of the associated works. The Planning Secretary may request a copy/ies of CNVIS.

The CNVIS will address:

- Scope of work covered by CNVIS
- Justification for OOHW (where required)
- Nearest noise and vibration sensitive land user(s), based on land use survey
- Construction noise and vibration objectives (outlined in Section 6.1)
- Construction noise and vibration assessment
- Specific mitigation measures and preferred management measures, including noise barriers and acoustic enclosures as relevant
- Additional mitigation measures as described in Section 9.8

- Noise and vibration monitoring requirements
- Community notification requirements.

Noise and vibration monitoring data will be collected throughout the delivery of the project construction works in accordance with the Noise and Vibration Monitoring Program (Appendix B) and the CNVIS. This will allow for ongoing review and verification of the predictive model.

The key construction activities to be included in the CNVIS documents for the project are listed below:

- Assessment and installation of at-property treatments and noise walls to mitigate construction noise from the project
- Site preparation works including clearing of vegetation, installation of temporary fencing and hoarding, installation of environmental controls including erosion and sedimentation controls
- Establishment and operation of ancillary facilities at High Street south (WFU2), High Street north (WFU3), Arthur Street east (WFU4), Berry Street east (WFU5), Ridge Street east (WFU6), Merlin Street (WFU7), Cammeray Golf Course (WFU8) and Rosalind Street (WFU9) and Northern Hub (NH1)
- Operation of ancillary facilities at High Street south (WFU2), High Street north (WFU3), Arthur Street east (WFU4), Berry Street east (WFU5), Ridge Street east (WFU6), Merlin Street (WFU7), Cammeray Golf Course (WFU8), Rosalind Street (WFU9) and Northern Hub (NH1)
- Preparation of the Cammeray Golf Course construction support site for the benefit of the WHT works and proposed BL works
- Utility installation, relocation and protection (in addition to the CUT stage works), including new and relocated drainage and installation of Intelligent Transport System (ITS):
  - Underbore and service relocation from Ernest Street through Cammeray Avenue to Rosalind Street
  - ITS node construction (move from Ernest Street to Rosalind)
  - Northbound verge ITS trenching works (between Ch2800- Ch3050)
- CCTV and cleaning of existing drainage structure
- Construction of retaining walls, including excavation, piling, installation of concrete footings, provision of structural support (ie rock anchors or soil nails), shotcreting, drainage structures, installation of panels and backfilling of retaining wall structure
- Construction of the new Ridge Street Pedestrian Bridge, including localised excavation, piling, concrete works, roadworks, installation of bridge spans, stairs and ramp and demolition works
- Bridge modifications and widening works to the Mount Street bridge and Falcon Street bridge and entry and exit ramps including installation of traffic barriers, concrete works, installation of structural steel, installation of drainage, asphaltting and line marking
- Realignment of traffic including demolition of existing barriers, rock walls, drainage, lighting and signage, asphaltting works
- Construction of the bridge over Alfred Street exit ramp including excavation and concrete works
- High Street bridge widening and ramps including piling and concrete works
- Bulk earthworks for the widening of the Warringah Freeway into the Cammeray Golf
- Course, including the micro tunnel for the Green Park drainage pipe (1500mm diameter) from the (proposed) Beaches Link compound

- Construction of Warringah Freeway southbound bus lanes including piling and concrete works
- Construction of the Mount Street (North Street) and Ernest Street (Camberay) underpasses including excavation, piling and concrete works.
- Construction of the inner carriage way:
  - Directional sign removal and relocation to Ernest Street
  - Rock excavation and piling for the WHT cut and cover structure
- Demolition and construction of footpaths at the Falcon and Miller Street intersection
- Installation of stormwater drainage
- Upgrade or capacity improvements of other cross drainage structures which cross underneath the Warringah Freeway
- Upgrade and capacity improvements to the drainage pipelines along the on and off ramps connecting the Warringah Freeway with the existing culvert crossing near Brook Street at Cammeray/Crows Nest
- Upgrading local and arterial roads connecting to the Warringah Freeway Upgrade
- Road pavement works
- Installation of shared user paths and cycleways
- Surface finishing works such as linemarking and the installation of directional signage and other roadside furniture
- Final landscape treatments and rehabilitation works
- Testing and commission works
- Site clean-up and demobilisation including the reinstatement of construction support sites, post construction condition surveys, removal of construction-related signage, and the removal of construction-related environmental controls and traffic management infrastructure

The following process for assessing construction noise and vibration will be implemented during preparation of each CNVIS.

1. Determine noise and vibration objectives for each key construction area:
  - Identify noise and vibration sensitive receivers
  - Determine relevant noise and vibration objectives, with reference to Section 5.1
2. Identify construction stages for each key construction area:
  - Identify construction aspects and key activities, including:
    - Site location
    - Times of operation
    - Activities involved
    - Plant and equipment (including size/type)
  - Identify construction works in the vicinity of the project. Liaise with the Utilities Coordination Manager and other construction projects in the vicinity of the works to ensure cumulative noise and vibration impacts are managed, in particular for OOHV.
3. Predict noise and vibration impacts

*Airborne construction noise*

- Determine  $L_{Aeq}(15 \text{ minute})$  sound power levels for plant and equipment based on operating scenarios for input to noise model
- Establish noise model for construction activity. The noise model should include:
  - Height and location of sources and receivers
  - Distance attenuation (incorporating noise reflections, ground absorption)
  - Effects of noise shielding (topography, buildings, fence, barriers etc.)
  - Effects of standard noise mitigation measures
  - Evaluate façade transmission loss of affected receivers to determine internal noise levels
- Calculate the  $L_{Aeq}(15 \text{ minute})$  noise levels (external and internal) from the proposed construction activities at each receiver and compare these with the construction noise objectives
- For night-time activities, calculate the maximum ( $L_{Amax}$ ) noise levels and compare with the sleep disturbance criterion (RBL +15), applied at the external façade and determine whether the 'awakening reaction' level of  $L_{Amax}$  65 dB(A) (external) would be exceeded. The number of noise awakening events also needs to be predicted in accordance with CoA E69(c).

#### *Construction vibration*

- Determine the location of each plant or equipment item in relation to each receiver
  - Where vibration intensive equipment could potentially be operating in close proximity to receivers, determine whether this is within the minimum working distances (refer to Chapter 10 of the EIS). Note that minimum working distances may differ for heritage items
  - Where plant and equipment may operate within minimum working distances, or for heritage items:
    - Use vibration levels versus distance prediction curves for each plant item
    - Determine the vibration likely to occur at each building location
    - For highly sensitive, equipment, assessment may need to incorporate structural response of building and particular sensitivities of equipment
4. Assess noise and vibration impacts. Where predicted noise and vibration exceeds the objectives identified in Step 1:
- Identify key hours of impact for affected sensitive receivers (refer to Section 5.1)
  - Implement appropriate reasonable/feasible standard mitigation measures (refer to Section 9)
  - Predict noise and vibration impact at receivers, incorporating nominated mitigation measures, based on the expected noise reduction from mitigation measures
  - Consider additional mitigation measures and apply as appropriate.

### **8.3 Noise management tool**

A surface works noise prediction tool has been developed for the purpose of assisting with managing impacts from specific sets of local area works associated with the construction of the Project. The tool allows:

- Flexibility in assessing specific scenarios of local area works,
- Assessment where works are undertaken at multiple locations, and

- Multiple combinations of equipment that may be used during each stage of works in the suburban environment that would be encountered.

The tool will be used to predict daytime and out of hours construction noise levels which will be compared against the Noise Management Level (NML) for each receiver. Appropriate mitigation and management measures can be adopted, as required by this NVMP.

Verification and adjustment of the prediction tool will occur throughout construction via monitoring. Noise and vibration monitoring data will be collected in accordance with the Noise and Vibration Monitoring Program (refer to Appendix B). This feedback loop will ensure the prediction tool is verified and adjusted as required to ensure accuracy across the various sections of the Project alignment.

Respite will be managed in accordance with CoA E88 and/or any EPL requirements.

Note: The noise management tool does not replace the CNVIS. CNVIS documents will be stand-alone and definitive documents that guide the deployment of specific mitigation measures and practices at each site.

## 8.4 Construction vibration

### 8.4.1 Vibration assessment

For the Warringah Freeway Upgrade surface road works it is likely that some form of compaction will be required at most sites. Where vibration intensive activities be required, site-specific buffer distances for these activities (e.g. compaction, rock hammering) must be measured on site where plant and equipment are likely to operate close to or within the typical MWDs. Site-specific buffer distances would then be maintained to comply with relevant vibration limits.

For heritage items, a more detailed assessment will specifically consider the heritage values of the structure in consultation with a heritage specialist to ensure sensitive heritage fabric is adequately monitored and managed (as required by EMM CNV6).

Across the Warringah Freeway Upgrade surface road works it is assumed that vibration-intensive activities such large rock hammers could be used as part of the upgrade works with the MWDs of 22 metres for sound structures, 30 metres for unsound structures and 73 metres for human response used to assess potential vibration impacts. A range of other vibration-intensive plant may be used as part of the Warringah Freeway Upgrade surface road works. The typical MWDs for other vibration-intensive plant items that may be used in the works are presented in Table 6-12 (Section 6.5.7).

The number of receiver buildings that are within the MWDs across the major works areas have been assessed and are presented in Table 5-231 of the Western Harbour Tunnel and Warringah Freeway Upgrade Technical Working Paper: Noise and Vibration. Potential vibration impacts to receivers would depend on vibration source levels, the separation distance, the intervening soil and rock strata, dominant frequencies of vibration and the receiver structure.

As noted above, site-specific construction noise and vibration impact statements (CNVIS) will be prepared in accordance with MCoA E75. While works are ongoing vibration testing would be completed in accordance with MCoA E79. The location of heritage items that may be potentially affected by vibration can be found in Sections 5 and 6 of the Heritage Management Plan (Appendix B5 of the CEMP).

## 9 Environmental control measures

### 9.1 Noise and vibration mitigation and management measures

In accordance with MCoA E70, mitigation measures (such as those listed within Chapter 6 of the ICNG and Appendix B of the CNVG) must be implemented with the aim of achieving the construction noise management levels and vibration objectives.

Specific measures and requirements to address contract specifications, MCoA and REMMs in relation to impacts from noise and vibration are outlined in Table 9-1. The following mitigation measures have been developed with consideration of SMART (specific, measurable, achievable, relevant and time-based) principles.

Table 9-1: Noise and vibration management and mitigation measures

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
<b>General</b>						
MMNV1	<p>Training will be provided to relevant Project personnel, including relevant subcontractors on noise and vibration requirements from this NVMP through inductions, toolboxes or targeted training. Training will cover the following:</p> <ul style="list-style-type: none"> <li>• Nominated construction hours, restrictions and general requirements for OOHV</li> <li>• Avoiding use of radios or stereos outdoors during standard working hours where residents or Public Schools may be affected and at all times during work outside standard working hours</li> <li>• Avoiding shouting and minimise talking loudly and slamming vehicle doors</li> <li>• Avoiding communicating and signalling using Horns</li> <li>• Where practical, operate machines at low speed or power and switch off when not used rather than left idling for prolonged periods</li> <li>• Minimising reversing</li> <li>• Avoiding dropping materials from height and avoiding metal to metal contact on material</li> <li>• All site personnel will be responsible for managing noise from their work activities and to work in a manner that will minimise noise emissions</li> </ul>	<p>Induction materials</p> <p>Toolbox talk</p>	<p>Prior to construction</p> <p>Construction</p>	Environment Manager	CPB Downer JV Practice	<p>Induction records</p> <p>Toolbox talk record</p>



ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
	<ul style="list-style-type: none"> <li>Measures to minimise sleep disturbance impacts from construction vehicles.</li> </ul>					
MMNV2	<p>All employees, contractors and subcontractors are to receive a Project induction prior to commencing work on site. The environmental component, covered in the induction or toolboxes, will include:</p> <ul style="list-style-type: none"> <li>Existence and requirements of this NVMP</li> <li>Relevant legislation and guidelines</li> <li>Normal construction hours and exemptions</li> <li>The process for seeking approval for out-of-hours works, including consultation</li> <li>Location of noise sensitive areas</li> <li>Complaints reporting and recording</li> <li>How to implement noise and vibration management measures</li> <li>Specific responsibilities to minimise impacts on the community and built environment from noise and vibration associated with the works.</li> </ul>	Induction materials	Prior to construction Construction	Environment Manager	CPB Downer JV Practice	Induction records Toolbox talk record
<b>Construction Traffic Noise</b>						
MMNV3	Project-related heavy-vehicle movements will be tracked to and from site (at the gates of the construction sites) and truck numbers will be managed to be within the volume modelled within the relevant CNVIS with the aim of limiting any associated increases in road traffic noise levels.	Noise and Vibration Monitoring Program CNVIS	Construction	Environment Manager Project Manager	CPB Downer JV Practice, CNV5	Monitoring records

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
	<p>Where the relevant noise increase is greater than 2 dB, consideration would also be given to the actual noise levels associated with construction traffic and whether or not these levels comply with the following road traffic noise criteria in the RNP:</p> <ul style="list-style-type: none"> <li>• 60 dB <math>L_{Aeq(15\text{hour})}</math> day and 55 dB <math>L_{Aeq(9\text{hour})}</math> night for existing freeway/ arterial/ sub-arterial roads</li> <li>• 55 dB <math>L_{Aeq(1\text{hour})}</math> day and 50 dB <math>L_{Aeq(1\text{hour})}</math> night for existing local roads.</li> </ul> <p>In addition to the above, where Project trucks and other vehicles are using public roads during the night period, assessment of sleep disturbance will be required.</p> <p>Note: This measure only applies to roads within 600 m of the Project sites in line with the RMS Noise Criteria Guideline (NCG).</p> <p>If Project-related heavy vehicle movements do not comply with the above criteria, alternative truck routes or potential reduction of truck movements will be considered.</p> <p>Where feasible and reasonable, unless compliance with the relevant traffic noise criteria can be achieved, or alternative arrangements have been agreed with affected receivers, construction vehicle movements will not occur on local roads beyond those required for direct access to construction sites.</p>					

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
MMNV4	Prior to arriving on site, drivers will be advised of designated vehicle routes, parking locations, acceptable delivery hours specific to the site and other relevant practices (i.e. minimising the use of engine brakes and no extended periods of engine idling). This will be communicated by the contractor using notifications under contract provisions and communication with schedulers from companies using heavy vehicles.	Induction materials	Construction	Foreman Site Engineer	CPB Downer JV Practice	Vehicle movement plans Traffic control plans Induction records
MMNV5	The contractor will ensure construction vehicle contractors and drivers are aware of noise management measures to minimise any sleep disturbance impacts.  Horns or other noisy methods not to be used for signalling. No loud radios, bluetooth speakers or the like.	Induction materials	Construction	Foreman Site Engineer Environment Manager	CPB Downer JV Practice	Induction records
MMNV6	Out-of-hours deliveries will be minimised where possible. Where out of hours deliveries are required, due care will be taken to minimise impacts (i.e. no extended periods of engine idling, use of radios instead of shouting, non-tonal reversing beepers where possible, unloading/loading to be undertaken during approved hours, loads to be pre-slung as much as practicable, slings to be used instead of chains unless chains are mandated by lifting or restraint requirements).	Induction materials CNVIS	Construction	Foreman Site Engineer	CPB Downer JV Practice	Induction records

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
MMNV7	All construction plant and equipment used on site will be fitted with properly maintained noise suppression devices in accordance with the manufacturer's specifications.	Plant risk assessment Manufacturer's specifications	Construction	Supervisor/ Foreman	G36	Plant inspection record
MMNV8	<p>All construction plant and equipment used on the site will be maintained in an efficient condition, in accordance with the manufacturers' specification. If a piece of plant or equipment is found to exceed the noise levels included in modelling, the following will occur:</p> <ul style="list-style-type: none"> <li>• If available and appropriate, a quieter piece of plant or equipment will be used in place of the offending plant/equipment</li> <li>• On-site mitigation (e.g. noise blankets) will be reviewed</li> <li>• The noise assessment will be repeated with the accurate noise level of the plant/equipment</li> </ul>	Plant risk assessment Manufacturer's specifications CNVIS	Construction	Supervisor/ Foreman	G36	<p>Plant inspection record</p> <p>Site inspection records</p> <p>Plant maintenance records</p>

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
MMNV9	All construction plant and equipment used on the site will be operated in a proper and efficient manner.	Plant risk assessment Toolbox talk SWMS	Construction	Supervisor/ Foreman	G36	Site inspection records Safety inspection records SWMS Toolbox talk record Plant operator certificates of competency and records of inductions
MMNV10	Non-tonal movement alarms will be used in place of tonal reversing alarms for the contractor owned plant and subcontract plant used at night or during the day.  Audible alarms to be set to the minimum volume necessary to adequately perform their function.	Plant risk assessment Toolbox talk SWMS	Construction	Supervisor/ Foreman	G36	Plant inspection records SWMS Site inspection records Toolbox talk record

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
MMNV11	Plant and machinery will be switched off when it is not in use for more than 15 minutes	Induction materials Toolbox talk	Construction	Supervisor/ Foreman	CPB Downer JV Practice	Induction records Site inspection records Pre-start briefing SWMS
MMNV12	Where possible, maintenance work on plant and equipment will be undertaken off site. If maintenance is to be onsite the task will be carried out away from noise sensitive receivers and during approved hours where reasonable and feasible. Maintenance undertaken outside approved hours would use mitigations such as acoustic enclosures or working underground where the noise is predicted to exceed the NML.	Toolbox talk SWMS	Construction	Foreman	CPB Downer JV Practice	Induction records SWMS Meeting minutes Toolbox talk record
MMNV13	Consider noise when selecting construction methods and substitute for quieter methods where reasonable and feasible.	Induction materials Toolbox talk SWMS	Construction	Foreman Project Engineer	CPB Downer JV Practice	Induction records SWMS Meeting minutes Toolbox talk record

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
MMNV14	Use appropriately sized equipment, avoiding overpowered plant.  Plant and equipment to be appropriate for use in an urban residential situation.	Induction materials Toolbox talk SWMS	Construction	Project Manager Foreman	CPB Downer JV Practice	Induction records SWMS Meeting minutes Toolbox talk record
MMNV15	Additional temporary screening or enclosures will be considered for plant and equipment where additional measures are required to meet relevant NMLs, or where plant and equipment is known to exceed the NMLs	SWMS	Construction	Project Manager Foreman	CPB Downer JV Practice	Site inspection records SWMS
MMNV16	Stationary noise sources would be enclosed or shielded where reasonable and feasible. This would apply to plant and equipment such as generators, stationary concrete cutters, stationary asphalt corers, stationary vacuum trucks, and stationary jack hammers	SWMS	Construction	Project Manager Foreman	CPB Downer JV Practice	Site inspection records SWMS
<b>General Construction Hours</b>						
MMNV17	Construction activities associated with the Project will be carried out in accordance with the hours in the NVMP.  Early occupation and later release of road carriageways and construction sites will be	Induction materials	Construction	Project Manager	MCoA E66, E67, E68 CoA E74 (b)	Induction records Site inspection records ROLs

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
	considered, where feasible to minimise noise impacts to receivers throughout the Project.					
MMNV18	<p>Except as permitted by an EPL, highly noise intensive works that result in an exceedance of the applicable NML at the same receiver will only be carried out:</p> <ul style="list-style-type: none"> <li>Between 8:00 am and 6:00 pm Monday to Friday</li> <li>Between 8:00 am and 1:00 pm Saturday</li> <li>In continuous blocks not exceeding three (3) hours each with a minimum respite from those activities and works of not less than one (1) hour between each block.</li> </ul> <p>Noisiest works will be scheduled before 11.00 pm Sunday to Thursday and before 12 midnight Friday and Saturday</p>	<p>Induction materials</p> <p>Project EPL</p>	Construction	<p>Project Manager</p> <p>Environment Manager</p>	MCoA E67	<p>Induction records</p> <p>Site inspection records</p>
MMNV19	<p>OOHW is to be carried out in accordance with:</p> <ul style="list-style-type: none"> <li>Project Out-of-Hours-Works Protocol</li> <li>Project EPL</li> </ul>	<p>Induction materials</p> <p>OOHW Protocol</p> <p>Project EPL</p>	Construction	<p>Project Manager</p> <p>Environment Manager</p>	<p>MCoA E69</p> <p>CNV3</p> <p>EPL</p>	<p>Induction records</p> <p>OOHW Permits</p> <p>Site inspection records</p>
<b>Noise barriers</b>						



ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
MMNV20	Noise barriers (such as site hoardings) will be constructed around ancillary facilities.  Temporary noise barriers will be used around noisy equipment and activities such as rock-hammering and concrete cutting.	CNVIS	Prior to construction Construction	Project Manager	MCoA E74 REMM CNV8	Site inspection records
MMNV21	Structures will be used as noise barriers at compounds where appropriate.	CNVIS Site layout drawings	Construction	Project Manager Environment Manager	CPB Downer JV Practice	Site inspection records
MMNV22	Site access and egress points will be located as far as feasible and reasonable from noise sensitive receivers.	Traffic subplan	Prior to construction	Foreman Site Engineer Environment Manager	CPB Downer JV Practice	Site inspection records  Meeting minutes
<b>Consultation and Complaints Management</b>						
MMNV23	Residences/sensitive receivers will be notified of construction activities that are likely to affect their noise and vibration amenity in accordance with the Community Communication Strategy (CCS). Information provided will include: <ul style="list-style-type: none"> <li>The types of activities to be undertaken</li> <li>The timing of activities including expected start and finish</li> <li>The location of activities</li> </ul>	Community Strategy CEMP	Prior to construction Construction	Project Manager Environment Manager	CPB Downer JV Practice EPL MCoA E83	Community notifications

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
	<ul style="list-style-type: none"> <li>Details of the community information line and how to make an enquiry and/or complaint.</li> </ul> <p>If the potential vibration exceedance is to occur more than once or extend over a period of 24 hours, owner and occupiers will be provided a monthly schedule of potential exceedances for the duration of the potential exceedances, unless otherwise agreed by the owner and occupier.</p>					
MMNV24	Where noise assessments predict noise levels above the NMLs at community, religious, educational institutions and noise and vibration-sensitive businesses and critical working areas, consultation with the potentially affected receiver will be undertaken to identify sensitive periods and minimise impacts, where possible. Work must not be timetabled within sensitive periods, unless other reasonable arrangements with the affected institutions are made at no cost to the affected institution.	CNVIS	Prior to construction Construction	Project Manager  Environment Manager  Communications & Stakeholder Manager	MCoA E72	Consultation records
MMNV25	All complaints will be managed in accordance with the CCS and EPL.	Communications Strategy	Construction	Communications & Stakeholder Manager	G36 Sect 3.7.4	Complaints register
MMNV26	Owners and occupiers at risk of exceeding the screening criteria for cosmetic damage will be notified before works that generate vibration commence in the vicinity of those properties. If the potential exceedance is to occur more than once or	Vibration Screening Criteria Drawings	Prior to construction Construction	Project Manager  Environment Manager	MCoA E76	Consultation records

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
	extend over a period of 24 hours, owner and occupiers will be provided a schedule of potential exceedances on a monthly basis for the duration of the potential exceedances, unless otherwise agreed by the owner and occupier. These receivers will be identified in the CNVIS.	Community Communications Strategy		Communications & Stakeholder Manager		
MMNV27	Monitoring will be undertaken in response to complaints, as determined on a case by case basis.	Noise and Vibration Monitoring Program	Construction	Communications & Stakeholder Manager  Environment Manager	CPB Downer JV Practice	Monitoring records
<b>Survey, Monitoring and Reporting</b>						
MMNV28	<p>Noise and vibration monitoring will be carried out in accordance with the Project's Noise and Vibration Monitoring Program.</p> <p>Construction noise and vibration impacts will be monitored periodically throughout all stages of the construction support sites to ensure that:</p> <ul style="list-style-type: none"> <li>a) Impacts are consistent with the noise and vibration levels detailed in the relevant Construction Noise and Vibration Impact Statements</li> <li>b) Noise and vibration impacts are being appropriately managed</li> <li>c) Mitigation measures are effective.</li> </ul>	Noise and Vibration Monitoring Program	Construction	Environmental Manager	CPB Downer JV Practice, AH3, AH4, CNV4	Monitoring records

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
MMNV29	Verification monitoring will be carried out during the initial stages of activities for which a location and activity specific noise and vibration impact assessment has been prepared to confirm that actual noise and vibration levels are consistent with noise and vibration impact predictions and that the mitigation and management measures that have been implemented are appropriate.	Noise and Vibration Monitoring Program CNVIS	Construction	Project Manager  Project Engineer  Foreman Environment Manager	CPB Downer JV Practice	Monitoring records
MMNV30	The contractor will conduct vibration monitoring before and during vibration generating activities that have the potential to impact on heritage items (including aboriginal heritage). Monitoring will identify MWDs to prevent cosmetic damage.  If vibration monitoring identifies that vibration levels exceed 2.5 mm/s at Aboriginal heritage sites that have been identified as requiring monitoring, a site visit will be organised with a representative from Metro LALC to record any changes to the integrity of the site that may have resulted from construction vibration, and updated site cards must be prepared accordingly. Condition surveys may include further photogrammetry and 3D-capture techniques	Noise and Vibration Monitoring Program	Construction	Environment Manager	MCoA E79, AH3, AH4	Monitoring records
MMNV31	The contractor will offer pre-construction condition surveys on the current condition of surface and sub-surface structures identified as at risk from settlement or vibration by the geotechnical model. The surveys and subsequent condition survey reports will be prepared by a suitable qualified and experienced person and will be provided to owners	Community Communications Strategy	Prior to Construction Construction	Project Manager	G36 Sect 4.7 MCoA E107, E108, E109, E110, SG4	Monitoring records Condition survey reports

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
	of the structure prior to the commencement of potentially impacting works. Where a pre-construction survey was undertaken, owners will be offered a post-construction survey within three months of the completion of construction.					
MMNV32	<p>The condition survey report will include as a minimum:</p> <ul style="list-style-type: none"> <li>• Photograph of the subject building</li> <li>• Record site details – age, construction, site slope and provision for drainage, presence of trees</li> <li>• Types of defects and their positions and extents on the floor plan</li> <li>• Photograph of external view and photograph of all defects of significance (especially if of concern to the owner), or typical examples of say, hairline plaster cornice cracks</li> <li>• Details of the inspector's qualification and expertise</li> </ul>	Community Communications Strategy	Prior to Construction Construction	Project Manager	G36 Sect 4.7	Monitoring records
<b>Ground-borne Noise Mitigation Measures</b>						
MMNV33	Provide specific notifications to receivers where the ground-borne noise levels are predicted to exceed the night-time NML.	Community Communications Strategy	Construction	Project Manager	MCoA E71	Community notifications

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
MMNV34	Select the smallest rock hammers capable of efficiently completing the work, where feasible and reasonable.	Community Communications Strategy	Construction	Project Manager Foreman		Site inspection records
MMNV35	A ground-borne noise assessment will be undertaken for the Project. Ground-borne noise mitigation measures will be implemented in accordance with the assessment, this NVMP and relevant MCoA.	NVMP	Construction	Environment Manager Project Manager	MCoA E70, E71	Site inspection records
<b>Other Mitigation Measures</b>						
MMNV36	No swearing or unnecessary shouting or loud stereos/radios on site.  Dropping of materials from height, throwing of metal items and slamming of doors will also be avoided.  Horns or other noisy methods not to be used for signalling.	Induction materials Toolbox talks	Construction	Foreman	CPB Downer JV Practice	Induction records Toolbox talk record Site inspection records
MMNV37	Safe working distances for vibration intensive plant would be complied with where feasible and reasonable. This would include the consideration of smaller equipment when working in close proximity to existing structures. Where the safe working distance cannot be achieved vibration monitoring will be carried out in accordance with the Noise and Vibration Monitoring Program.	Noise and Vibration Monitoring Program	Construction	Foreman Environment Manager	G36 Sect 4.7	Induction records Site inspection records

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
MMNV38	The use of alternative construction and demolition techniques will be considered where predicted noise levels exceed the NML	NVMP	Construction	Foreman Environment Manager	MCoA E74	Site inspection records
MMNV39	The Project will use regularly serviced low sound power equipment where reasonable and feasible	NVMP	Construction	Foreman Environment Manager	MCoA E74	Site inspection records
<b>Impact From Concurrent Works</b>						
MMNV40	Work will be coordinated between project construction sites and / or non-project construction works to avoid cumulative noise impacts.	N/A	Construction	Utilities Coordination Manager Project Manager Environment Manager	REMM CNV1 (i) and CNV10	Meetings with relevant authorities
MMNV41	Additional at source or near source mitigation will be considered where construction noise levels may result in cumulative construction noise impacts, where programming is not practical to avoid cumulative noise impacts.	N/A	Construction	Project Manager Environment Manager	REMM CNV1 (i) and CNV10	Site inspection records
MMNV42	Community consultation will be undertaken throughout the project to gauge impacts from construction noise and any unknown impacts from concurrent or consecutive sets of construction works.	N/A	Construction	Project Manager Communications & Stakeholder Manager	REMM CNV1 (i), CNV8 (d) and CNV10	Community notification

## 9.2 At-property treatment

### 9.2.1 Noise Insulation Program

The Noise Insulation Program (NIP) is a requirement of MCoA E84. The NIP has been developed and will be managed separately to the NVMP. The Noise Insulation Program aims to reduce construction fatigue and improve amenity for residential receivers. The purpose of the Program is to describe the scope for the implementation of construction at-property treatment by the contractor, and the process to implement this treatment at residential receivers during delivery of the Design and Construction of the Project in accordance with MCoA E85, E86 and E87.

In accordance with MCoA E81 and REMM NAH4, CPB Downer JV will seek the advice of a suitably qualified and experienced built heritage expert prior to implementing any at-property treatments on heritage items, to ensure any such work does not have an adverse impact on the heritage significance of the item. Any treatment will be sympathetic to the heritage values of the item, designed with heritage architect input and be reversible where feasible and reasonable.

### 9.2.2 Early implementation of operational noise mitigation measures

Operational noise mitigation measures will be confirmed within the ONR described within MCoA E89. The ONR is to be provided to the Planning Secretary within 12 months of the start of construction and its measures implemented within 6 months following submission where operational noise mitigation measures will not be physically affected by works.

Where implementation of operational noise mitigation measures is not proposed early in accordance with MCoA E89 and MCoA 90, the contractor will prepare a report providing justification as to why, along with details of temporary measures that would be implemented to reduce construction noise impacts, until such time that the operational noise mitigation measures identified in the ONR are implemented.

In accordance with MCoA E90 this report will be endorsed by the AA and submitted to DPIE within 6 months of submitting the ONR.

## 9.3 Management procedures for OOHW

In accordance with MCoA E69 and MMNV19, an Out-of-Hours Work (OOHW) Protocol will be prepared in consultation with the EPA, ER and AA and approved by the Planning Secretary before commencement of OOHW. The OOHW Protocol defines the process for seeking approval for out of hours works, including consultation (refer Appendix C).

The protocol will address out of hours works which are not subject to the EPL and will include a process for approval and hold points relating to:

- identification of low and high-risk activities and an approval process that considers the risk of activities, proposed mitigation, management, and coordination including where:
  - i. the ER and AA review all proposed out-of-hours activities and confirm their risk levels
  - ii. low risk activities can be approved by the ER in consultation with the AA
  - iii. high risk activities that are approved by the Planning Secretary
- a process for the consideration of out-of-hours work against the relevant NML and vibration criteria
- a process for selecting and implementing mitigation measures for residual impacts in consultation with the community at each affected location, including respite periods



consistent with the requirements of CoA E83. The measures must take into account the predicted noise levels and the likely frequency and duration of the out-of-hours works that sensitive land user(s) would be exposed to, including the number of noise awakening events

- procedures to facilitate the coordination of out-of-hours work including those approved by an EPL or undertaken by a third party, to ensure appropriate respite is provided
- notification arrangements for affected receivers for all approved out-of-hours works and notification to the Planning Secretary of approved low risk out-of-hours works.

All OOHW (except in emergency situations) will be documented on the relevant OOHW Form.

In accordance with CoA E88, Out-of-Hours Work along the Warringah Freeway corridor which results in an exceedance of the relevant NML at the same sensitive land user(s) may be undertaken in accordance with the following criteria:

- a) two consecutive evenings and/or nights per week; or
- b) three non-consecutive evenings and/or nights per week; or
- c) 10 evenings and/or nights per month; or
- d) except as identified by an EPL; or
- e) in accordance with an agreement with a potentially impacted receiver(s) as required by Condition E68(c)(iii) or Condition E83.

## **9.4 Vibration Screening Criteria**

Properties at risk of cosmetic damage would be identified through review of the proposed vibration intensive construction activities and the vibration screening criteria nominated in Sections 6.5.2 and 6.5.3.

In accordance with MCoA E76, owners and occupiers of identified properties will be notified before works that generate vibration commence near these properties. If the potential exceedance is to occur more than once or extend over a period of 24 hours, owner and occupiers will be provided a monthly schedule of potential exceedances for the duration of the potential exceedances, unless otherwise agreed by the owner and occupier.

## **9.5 Communication and consultation**

### **9.5.1 Proactive consultation and notification**

Residents, property owners, businesses and community facilities near construction sites will have a wide range of unique needs and concerns regarding construction impact. CPB Downer JV will engage through multiple channels to notify and build understanding of the likely impacts of airborne noise, ground-borne noise and vibration, and the reasonable and feasible options available to mitigate these impacts, including respite. In accordance with MCoA E83, consultation with the affected community must be undertaken on a regular basis.

### **9.5.2 Consultation with sensitive receivers**

Sensitive receivers such as community, religious, educational institutions and noise and vibration sensitive businesses and critical working areas (e.g. theatres, laboratories and operating theatres) potentially affected by the Project will be consulted to develop timetables of works and specific mitigation measures to satisfy MCoA E83. The outcomes of this consultation will be fed back into the construction noise and vibration management system and will assist with the final timetabling, respite periods and detailed design of mitigation measures for the site, where reasonable and feasible.

In addition, the contractor will consult with proponents of other construction works near the Project worksites and take reasonable steps to coordinate works to minimise cumulative noise and vibration impact and coordinate respite for affected sensitive receivers, to satisfy MCoA E82 and E83.

Consultation will be conducted in accordance with the Communication Strategy and CoA E83. It will include the provision of the following information to affected receivers:

- A progressive schedule of likely out-of-hours work for a period of no less than three (3) months,
- A description of the potential out-of-hours, including location and duration,
- The noise characteristics and likely noise levels of the works, and
- Likely mitigation and management measures.

The outcomes of the community consultation, the identified respite periods and the scheduling of the likely OOHWS will be provided to the AA, ER, EPA and the Secretary.

## **9.6 Property surveys and issues rectification**

In line with MCoA 107, the contractor will offer and undertake pre-construction condition surveys on the current condition of surface and sub-surface structures identified as at risk from settlement or vibration by the geotechnical model described in MCoA E102 or as identified in the CNVIS. The pre-construction condition surveys and reports will be prepared by a suitably qualified and experienced person(s) and the report will be provided to the owners of the surface and sub-surface structures for review prior to the commencement of potentially impacting works.

Where pre-construction condition surveys have been undertaken in accordance with MCoA E107, subsequent post-construction condition surveys will be offered and undertaken where accepted by the landowner to assess damage to the surface and sub-surface structures that may have resulted from the construction of the Project within three months of the construction completion (MCoA E108).

The results of the surveys will be documented in Pre-construction and Post-construction Condition Survey Reports for each surface and sub-surface structure surveyed. Copies of the Condition Survey Reports will be provided to the owner(s) of the structures surveyed for review prior to the commencement of potentially impacting works and no later than four months following the completion of construction that have the potential to impact the subject structure. Where damage has been determined to occur as a result of the Project, rectification would occur at the Contractors expense and to the reasonable requirements of the surface and sub-surface structure owner(s) within twelve months of completion of construction unless another timeframe is agreed with the owner of the affected surface or sub-surface structure.

## **9.7 Heavy vehicle transport noise**

Construction traffic (Including heavy vehicles) will be managed in accordance with the Traffic, Transport and Access Management Plan (TTAMP).

The Project Team will track heavy vehicle movements to and from sites and manage truck numbers with the aim of limiting any associated increases in road traffic noise levels on public roads during the night-time period to no more than 2 dB(A), within 600 m of the Project sites. Increases in road traffic noise of more than 2 dB(A) during the night-time period will be managed in accordance with the CNVG. The proposed heavy vehicle numbers will be assessed for predicted noise increase prior to the night-time operation of that number of heavy vehicles in the CNVIS prepared for each construction ancillary facility (refer to Section 8.2).

## 9.8 Additional noise and vibration mitigation measures

In instances where noise levels are still predicted to exceed the NML at receivers, after the application of noise mitigation and management measures (refer to Section 9.1), the CNVG directs that the Project should consider implementing the additional mitigation measures such as (refer to Appendix C of the CNVG for more detail):

- Notification (letterbox drop or equivalent) detailing work activities, time periods of which these will occur, impacts and mitigation measures
- Specific notifications, which provide additional information when relevant and informative to more highly affected receivers than covered in general letterbox drops
- Phone calls, which detail relevant information to identified/affected stakeholders and provide personalised contact, tailored advice and the opportunity to comment on the proposed work
- Individual briefings, which inform stakeholders about the impacts of high noise activities and mitigation measures, and provide personalised contact, tailored advice and the opportunity to comment on the proposed work
- Respite offers, to provide residents with respite from an ongoing impact
- Respite period 1, where out-of-hours construction noise in OOHW Period 1 is generally limited to no more than three consecutive evenings per week
- Respite period 2, where night-time construction noise in OOHW Period 2 is generally limited to two consecutive nights
- Duration respite, which is where the work duration, number of evenings and/or nights is increased so the Project can be completed more quickly
- Alternative accommodation (in accordance with Appendix B3 of the Community Communications Strategy),
- Alternative construction methodology, and/or
- Verification, including measurement of the background noise level and construction noise.

The relevant Additional Mitigation Measures Matrix (AMMM) from the CNVG are to be used to determine the additional measures to be implemented. The AMMM for airborne noise is reproduced in Table 9-2 and the AMMM for the ground-borne noise and ground-borne vibration are reproduced in Table 9-3 and Table 9-4.

Table 9-2: Airborne Noise - Additional Mitigation Measures Matrix

Predicted Airborne (LAeq, 15min) noise level at receiver			Additional Mitigation Measures
Perception	dBA above RBL	dBA above NML	Type <sup>1</sup>
<b>All hours</b>			
75 dBA or greater			N,V,PC,RO
<b>Approved Hours: Mon - Fri (7am - 6pm), Sat (8am - 6pm), Sun/Pub Hol (Nil)</b>			
Noticeable	5 to <10	0	-
Clearly Audible	10 to <20	<10	-
Moderately Intrusive	20 to 30	10 to 20	N, V
Highly Intrusive	> 30	> 20	N, V
<b>OOHW Period 1: Mon - Fri (6pm - 10pm), Sat (7am - 8am &amp; 6pm - 10pm), Sun/Pub Hol (8am - 6pm)</b>			
Noticeable	5 to <10	< 5	-
Clearly Audible	10 to <20	5 to <15	N, R1, DR
Moderately Intrusive	20 to 30	15 to 25	V, N, R1, DR
Highly Intrusive	> 30	> 25	V, IB, N, R1, DR, PC, SN
<b>OOHW Period 2: Mon - Fri (10pm - 7am), Sat (10pm - 8am), Sun/Pub Hol (6pm - 8am)</b>			
Noticeable	5 to <10	< 5	N
Clearly Audible	10 to <20	5 to <15	V, N, R2, DR
Moderately Intrusive	20 to 30	15 to 25	V, IB, N, PC, SN, R2, DR
Highly Intrusive	> 30	> 25	AltA, V, IB, N, PC, SN, R2, DR

Notes:

1. AltA = Alternative Accommodation, V = Verification, IB = Individual Briefings, N = Notification, R1 = Respite period 1, R2 = Respite Period 2, DR = Duration Respite, PC = Phone Calls, SN = Specific Notifications.
2. NML = Noise Management Level, HA = Highly Affected (>75 dBA – applies to residences only).
3. Offers of Alternative Accommodation will be provided in accordance with Appendix B3 of the CCS, ie where impacts are planned to extend over more than two consecutive nights.

Table 9-3: Ground-borne Noise - Additional Mitigation Measures Matrix

Predicted Ground-borne (LAeq, 15min) noise level at receiver		Additional Mitigation Measures	
Perception	dBA above GB NML	Type <sup>1</sup>	Apply to <sup>2</sup>
Approved Hours: Mon - Fri (7am - 6pm), Sat (8am - 6pm), Sun/Pub Hol (Nil)			
N/A	Vibration only applicable during approved hours		
OOHW Period 1: Mon - Fri (6pm - 10pm), Sat (7am - 8am & 6pm - 10pm), Sun/Pub Hol (8am - 6pm)			
Clearly Audible	<10	N	All
Moderately Intrusive	10 to 20	V, N, R1, DR, SN	All
Highly Intrusive	>20	V, IB, N, PC, SN, R1, DR	All
OOHW Period 2: Mon - Fri (10pm - 7am), Sat (10pm - 8am), Sun/Pub Hol (6pm - 8am)			
Clearly Audible	<10	V, N, SN	All
Moderately Intrusive	10 to 20	AltA, V, IB, N, PC, RP, SN, R2, DR	All
Highly Intrusive	>20	AltA, V, IB, N, PC, RP, SN, R2, DR	All

Notes:

1. AltA = Alternative Accommodation, V = Validation of predicted levels, IB = Individual Briefings, N = Notification, R1 = Respite period 1, R2 = Respite Period 2, DR = Duration Respite, PC = Phone Calls, SN = Specific Notifications.
2. All affected receivers.
3. Offers of Alternative Accommodation will be provided in accordance with Appendix B3 of the CCS, ie where impacts are planned to occur on two or more consecutive nights.

Table 9-4: Vibration - Additional Mitigation Measures Matrix

Predicted vibration level at receiver		Additional Mitigation Measures	
Perception	Trigger	Type <sup>1</sup>	Apply to <sup>2</sup>
<b>Approved Hours: Mon - Fri (7am - 6pm), Sat (8am - 6pm), Sun/Pub Hol (Nil)</b>			
Predicted Vibration Exceeds Human Comfort Screening Levels		V, N, RO	All
Predicted Vibration Exceeds Structural Damage Screening Levels		V, AC	All
<b>OOHW Period 1: Mon - Fri (6pm - 10pm), Sat (7am - 8am &amp; 6pm - 10pm), Sun/Pub Hol (8am - 6pm)</b>			
Predicted Vibration Exceeds Human Comfort Screening Levels		V, IB, N, RO, PC, RO, SN	All
Predicted Vibration Exceeds Structural Damage Screening Levels		V, AC	All
<b>OOHW Period 2: Mon - Fri (10pm - 7am), Sat (10pm - 8am), Sun/Pub Hol (6pm - 8am)</b>			
Predicted Vibration Exceeds Human Comfort Screening Levels		AltA, V, IB, N, PC, RO, SN	All
Predicted Vibration Exceeds Structural Damage Screening Levels		V, AC	All

Notes:

1. AltA = Alternative Accommodation, AC = Alternative Construction Methodology, V = Validation of predicted levels, IB = Individual Briefings, N = Notification, RO = Respite Offer (project specific), PC = Phone Calls, SN = Specific Notifications.
2. All affected receivers.
3. Offers of Alternative Accommodation will be provided in accordance with Appendix B3 of the CCS, ie where impacts are planned to occur on two or more consecutive nights.

## 9.9 Respite

In accordance with CoA E82, all work undertaken for the delivery of the Project, including those undertaken by third parties (such as utility relocations) and other Critical/State Significant Infrastructure, and State Significant Development, must be coordinated to ensure respite periods are provided. CPB Downer JV must:

- Reschedule any work to provide respite to impacted noise sensitive receivers so that the respite is achieved in accordance with CoA E83; or
- Consider the provision of alternative respite or mitigation to impacted noise sensitive land user(s); and
- Provide documentary evidence to the Acoustic Advisor in support of any decision made by CPB Downer JV in relation to respite or mitigation. This will be provided as part of the OOHW permit (refer Annexure 1).

Further respite requirements are outlined in Appendix C.

## 10 Compliance management

### 10.1 Roles and responsibilities

The CPB Downer JV organisational structure and overall roles and responsibilities are outlined in Section 3.3 of the CEMP. Specific responsibilities for the implementation of environmental controls are detailed in Chapter 9 of this NVMP.

### 10.2 Training

All personnel, including employees, contractors, subcontractors and utility staff working on site will undergo site induction training relating to construction noise and vibration management issues.

The induction training or toolboxes will address elements related to noise and vibration management including:

- Existence and requirements of this NVMP
- Relevant legislation and guidelines
- Normal construction hours and exemptions
- The process for seeking approval for out of hours works, including consultation
- Location of noise sensitive areas
- Complaints reporting and recording
- How to implement noise and vibration management measures
- Specific responsibilities to minimise impacts on the community and built environment from noise and vibration associated with the works.

Further details regarding staff induction and training are outlined in Section 3.5 of the CEMP.

### 10.3 Inspection and monitoring

Inspections of sensitive areas and activities with the potential to generate noise and vibration impacts will occur for the duration of the Project. Requirements and responsibilities in relation to monitoring and inspections are documented in Section 3.8.1 and 3.8.2 of the CEMP.

Noise and vibration monitoring will also occur routinely for the duration of the Project, in accordance with the Project's Noise and Vibration Monitoring Program which is provided in Appendix B.

Monitored noise and vibration levels will be analysed against the predictions made in the relevant noise and vibration assessment or using the Project's predictive tools. Where monitored noise levels are found to be above modelling predictions or vibration goals are exceeded, the following actions will be undertaken:

- Cease the noise generating source which causes the exceeded predictions
- Confirm the monitored levels are not being impacted by other noise or vibration sources
- Confirm if the exceedance is due to an uncharacteristically loud piece of equipment
- Identify if the equipment can be swapped out for another piece of equipment or alternative equipment or plant, or if additional mitigation can be included in the site design

- Confirm if the exceedance is due to an uncharacteristically vibratory piece of equipment
- Confirm the modelling reflects the actual activity being undertaken
- Implement other feasible and reasonable measures which may include reducing plant size, modifying time of works, changing operational settings (such as turning off the vibratory function of the machine), and using alternative construction methodology or a combination of these
- Review work practices to ensure compliance with the management levels set out in this NVMP
- Review and revise AMMs as necessary
- Ensure the learnings from the above are fed back into the noise modelling assessment process for fine-tuning
- Continue work where impacts can be reduced
- Communicate lessons learnt to relevant personnel

CPB Downer JV will review the work or activity or combination of simultaneous works or activities as soon as practicable and where possible, modify the work or activity to prevent any recurrence. In the case of above prediction monitoring results, the need for modelling to be reviewed will also be considered. Lessons learnt will be communicated to relevant personnel in toolbox talks.

### **10.3.1 Noise and vibration monitoring**

Noise and vibration monitoring will be undertaken in accordance with the Noise and Vibration Monitoring Program (Appendix B), prepared in line with CoA C11(a), C12 and C13.

Attended monitoring of construction noise levels will be undertaken as follows:

- Monitoring will be carried out at the commencement of activities for which a location and activity specific noise and vibration impact assessment has been prepared which identifies that validation monitoring is required to confirm that actual noise and vibration levels are consistent with noise and vibration impact predictions and that the management measures that have been implemented are appropriate
- Where a change in methodology, plant or equipment is anticipated to result in a significant increase in construction noise impact
- Where appropriate in response to a noise related complaint(s) (determined on a case-by-case basis) and in accordance with EPL conditions
- As directed by an authorised officer of the EPA
- As otherwise required by the CNVIS
- Following the implementation of mitigation measures or noise attenuation as a result of exceedance of predicted noise levels
- Ongoing spot checks for noise intensive plant and equipment will be undertaken throughout construction to ensure compliance with the maximum noise level goals for construction equipment. Spot checks would be carried out as required on a case-by-case basis, such as in response to a plant/equipment specific noise related complaint and during noise and vibration assessment validation monitoring when it is possible to isolate the noise from one piece of plant or equipment.

Unattended airborne noise monitoring will also be completed, with a noise logger deployed to obtain noise results over longer periods. Attended and unattended noise monitoring locations will vary and be determined on a case-by-case basis by a CNVIS or in response to complaints.

In accordance with the ICNG the duration and amount of noise monitoring will depend on the scale of the construction activities and extent of expected noise impacts. Noise monitoring will cover a



representative period of the construction activity. A representative period is the stage of a construction activity where all the plant and equipment operating is consistent with the full range of plant and equipment modelled in the noise and vibration assessment, i.e. noise monitoring is not to be undertaken when the key noise contributing plant and equipment are turned off. The CNVIS identifies the representative periods. Where possible, monitoring will be undertaken at the most affected noise sensitive receiver's location in proximity to the Project's construction activities.

Noise monitoring locations will consider factors including:

- The location of previous monitoring sites
- The proximity of the receiver to a Project worksite
- The sensitivity of the receiver to noise
- The location of the source being monitored
- Access requirements/limitations
- Background noise levels
- The expected duration of the impact.

Monitored noise levels will then be analysed against the predictions made in the relevant CNVIS.

All environmental noise monitoring will be taken with the following meter settings:

- Time Constant: Fast (i.e. 125 milliseconds)
- Frequency Weightings: A-weighting
- Sample period: 15 minutes.

Environmental noise monitoring (excluding spot checks of plant and equipment) will be recorded over 15-minute sample intervals, excluding periods of extraneous noise until a representative sample has been obtained. A representative sample will be determined by operator, who will be competent, suitability trained and experienced in undertaking noise measurements and familiar with the relevant Australian Standards. The minimum range of noise metrics to be stored in the memory for later retrieval include the following A-weighted noise levels:  $L_{A90}$ ,  $L_{Aeq}$ ,  $L_{A10}$ ,  $L_{A(min)}$  and  $L_{A(max)}$ .

For spot checks of noise intensive plant and equipment, duration of monitoring will depend on the source of noise being monitored. Sources of continuous noise (such as generators), measurements will be monitored over one-to-two-minute intervals. For dynamic plant, such as front-end loaders, spot checks will capture a representative activity, such as one truck-and-dog load cycle.

## **10.4 Complaints**

Complaints will be recorded and managed as detailed in Section 3.7.3 of the CEMP.

## **10.5 Auditing**

Audits (internal and external) will be undertaken to assess the effectiveness of environmental controls, compliance with this NVMP, MCoA and other relevant approvals, licenses and guidelines.

Audit requirements are detailed in Section 3.9.3 of the CEMP.

## **10.6 Reporting**

Reporting requirements and responsibilities are documented in Section 3.9.4 and 3.9.5 of the CEMP. Additional reporting will also be generated as required in assessment documents and the Construction Noise Monitoring Program.

Specific reports prepared in response to noise and vibration will include:

- Reporting required in accordance with the POEO Act and Regulations
- Monthly Noise and Vibration Reports, prepared by the AA and submitted to the Secretary and other relevant regulatory agencies for information, which will detail the AA's actions and decisions on matters for which the AA was responsible in the preceding month
- Construction Noise and Vibration Monitoring reports identified in the Noise and Vibration Monitoring Program in Appendix B.

# 11 Review and improvement

## 11.1 Continuous improvement

Continuous improvement of this Plan will be achieved by the ongoing evaluation of environmental management performance against environmental policies, objectives and targets for the purpose of identifying opportunities for improvement.

The continuous improvement process will be designed to:

- Identify areas of opportunity for improvement of environmental management and performance
- Determine the cause or causes of non-conformances and deficiencies
- Develop and implement a plan of corrective and preventative action to address any non-conformances and deficiencies
- Verify the effectiveness of the corrective and preventative actions
- Document any changes in procedures resulting from process improvement
- Make comparisons with objectives and targets.

## 11.2 Update and amendment

The processes described in Section 3.9 and Section 3.13 of the CEMP may result in the need to update or revise this NVMP. This will occur as needed.

The revised document will then be issued to the Project Manager and the ER for certification of the changes. The ER can approve minor changes. Minor changes would typically include those that:

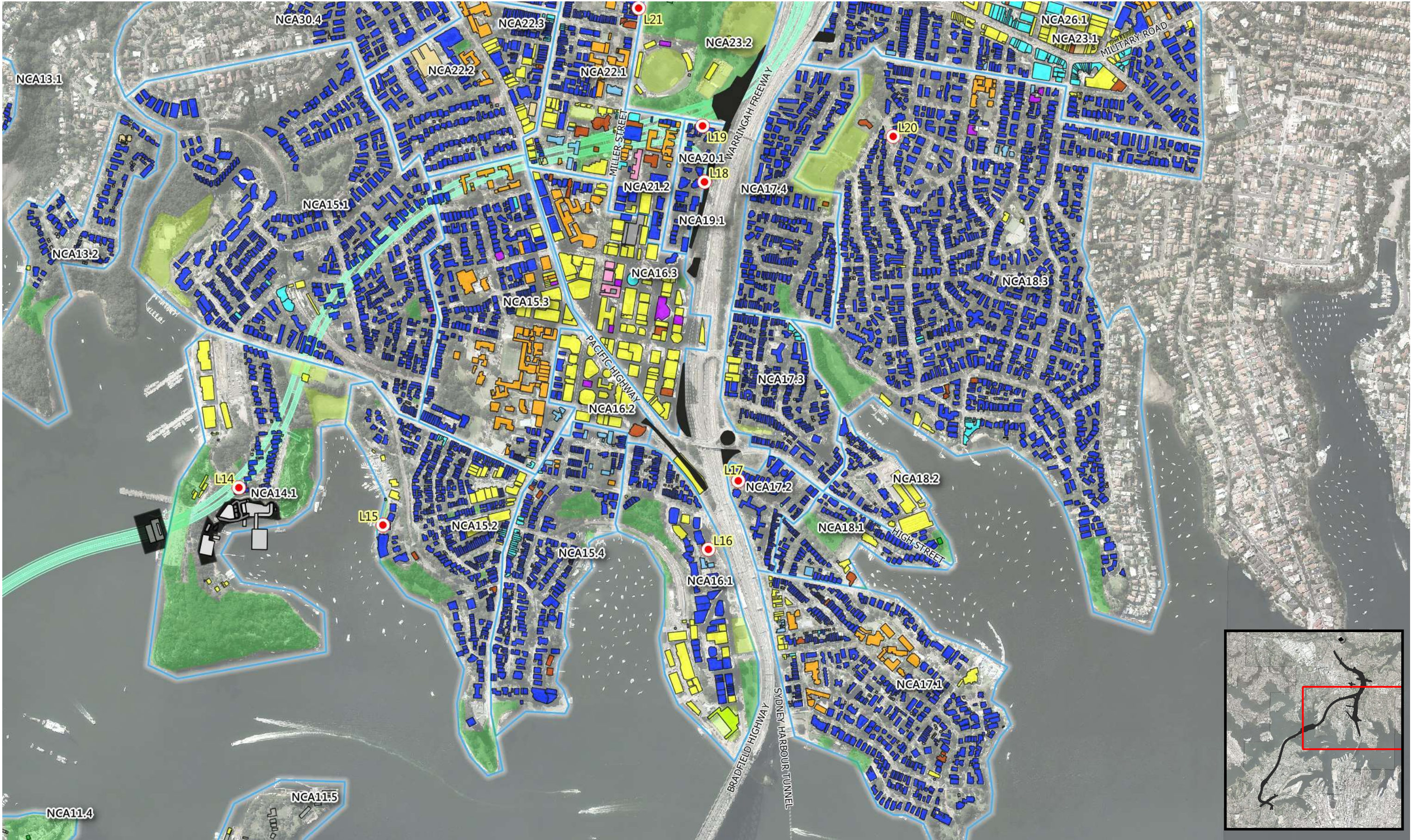
- Are editorial in nature eg staff and agency/authority name changes
- Do not increase the magnitude of impacts on the environment when considered individually or cumulatively
- Do not compromise the ability of the Project to meet approval or legislative requirements
- Lower the level of overall environmental risk or bring the project into line with predicted risks
- Are required as a result monitoring, inspection and audit results
- Result from consideration of recent and relevant incidents and any lessons learnt
- Are required because of any new regulatory obligations
- Where a review of the effectiveness of environmental controls has identified that improvements are needed
- Are required because of changes in operational needs such as resourcing
- Are required because of feedback from TfNSW and other relevant stakeholders

Where the ER deems it necessary, the amended CEMP will be forwarded to the Planning Secretary for approval.

A copy of the updated NVMP and changes will be distributed to all relevant stakeholders in accordance with the approved document control procedure – refer to Section 3.11.2 of the CEMP.

## Appendix A - NCAs and sensitive receivers





Legend

- Construction support site layout

Construction site footprint

Noise catchment boundary

Noise monitoring location

Western Harbour tunnel alignment

Fitout of the M4-M5 Link tunnels
- Receiver type

Residential

Mixed use

Commercial/Industrial

Childcare

Educational

Medical

Place of Worship

Other noise sensitive receivers

Recreational - Passive

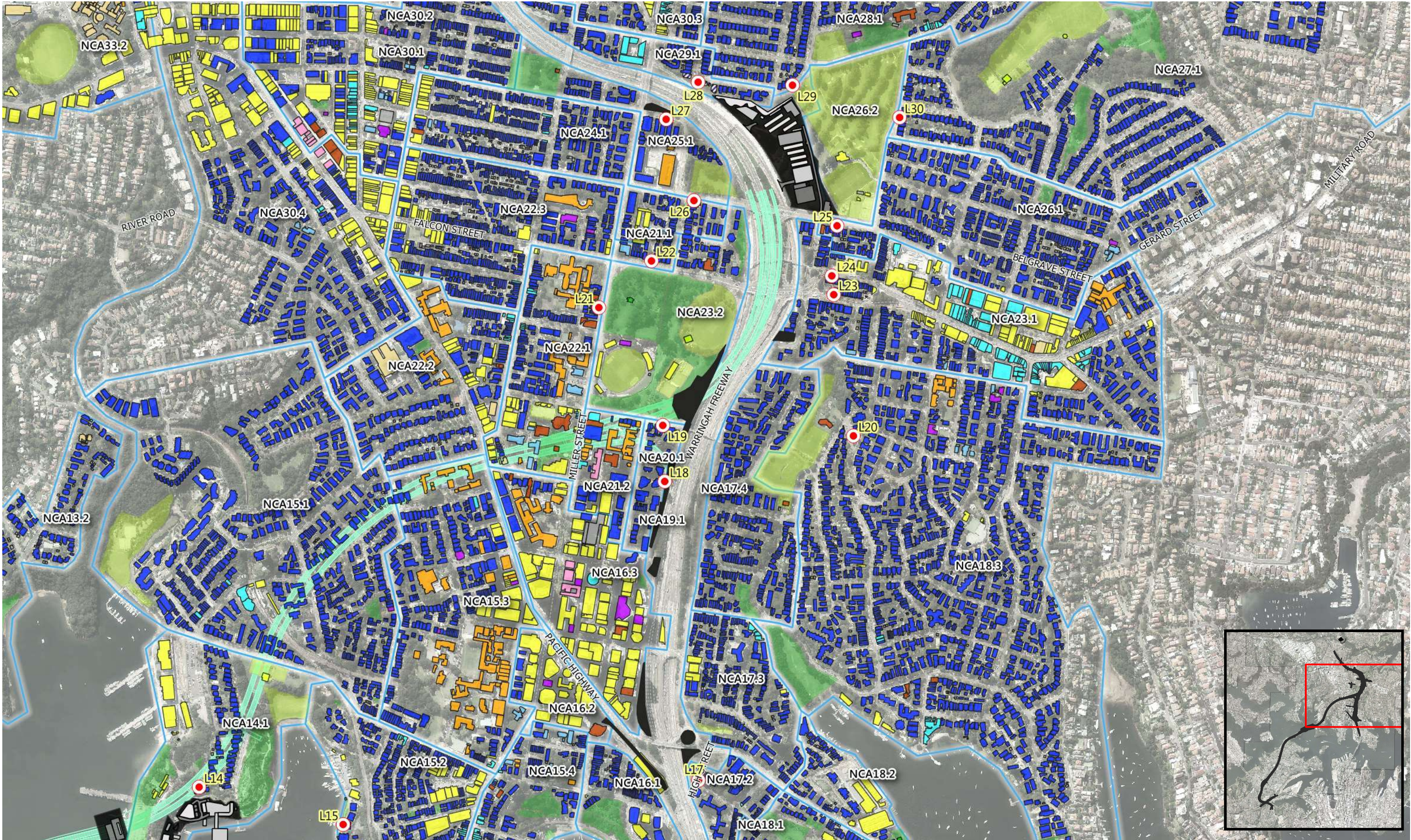
Recreational - Active

Non-receiver building

Project acquisition

Other major project acquisition





## Legend

- Construction support site layout
- Construction site footprint
- Noise catchment boundary
- Noise monitoring location
- Western Harbour tunnel alignment
- Fitout of the M4-M5 Link tunnels

## Receiver type

- Residential
- Mixed use
- Commercial/Industrial
- Childcare
- Educational
- Medical
- Place of Worship
- Other noise sensitive receivers
- Recreational - Passive
- Recreational - Active
- Non-receiver building
- Project acquisition
- Other major project acquisition

Client:  
Roads and Maritime  
Services (RMS)

Project:  
Western Harbour Tunnel and  
Warringah Freeway Upgrade

Description:  
Building use identification  
Warringah Freeway - Lower Centre

Consultant:  
**RENZO TONIN & ASSOCIATES**  
*inspired to achieve*

1/418A Elizabeth Street, SURRY HILLS NSW 2010  
P: 02 8218 0500 F: 02 8218 0501

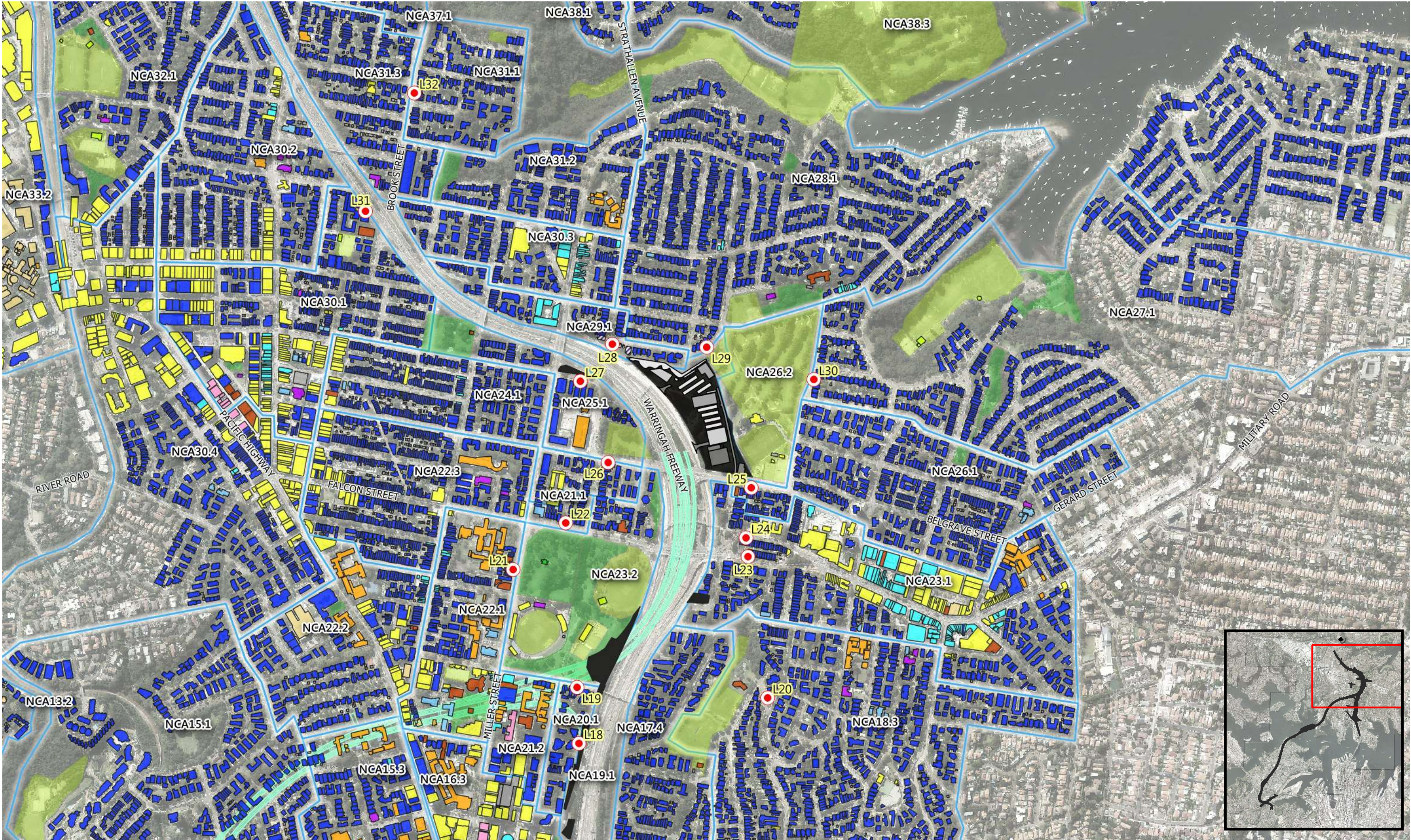
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### Legend

- Construction support site layout
- Construction site footprint
- Noise catchment boundary
- Noise monitoring location
- Western Harbour tunnel alignment
- Fitout of the M4-M5 Link tunnels

### Receiver type

- Residential
- Mixed use
- Commercial/Industrial
- Childcare
- Educational
- Medical
- Place of Worship
- Other noise sensitive receivers
- Recreational - Passive
- Recreational - Active

- Non-receiver building
- Project acquisition
- Other major project acquisition

Client:  
Roads and Maritime  
Services (RMS)

Project:  
Western Harbour Tunnel and  
Warringah Freeway Upgrade

Description:  
Building use identification  
Warringah Freeway - Upper Centre

Consultant:  
**RENZO TONIN & ASSOCIATES**  
*inspired to achieve*

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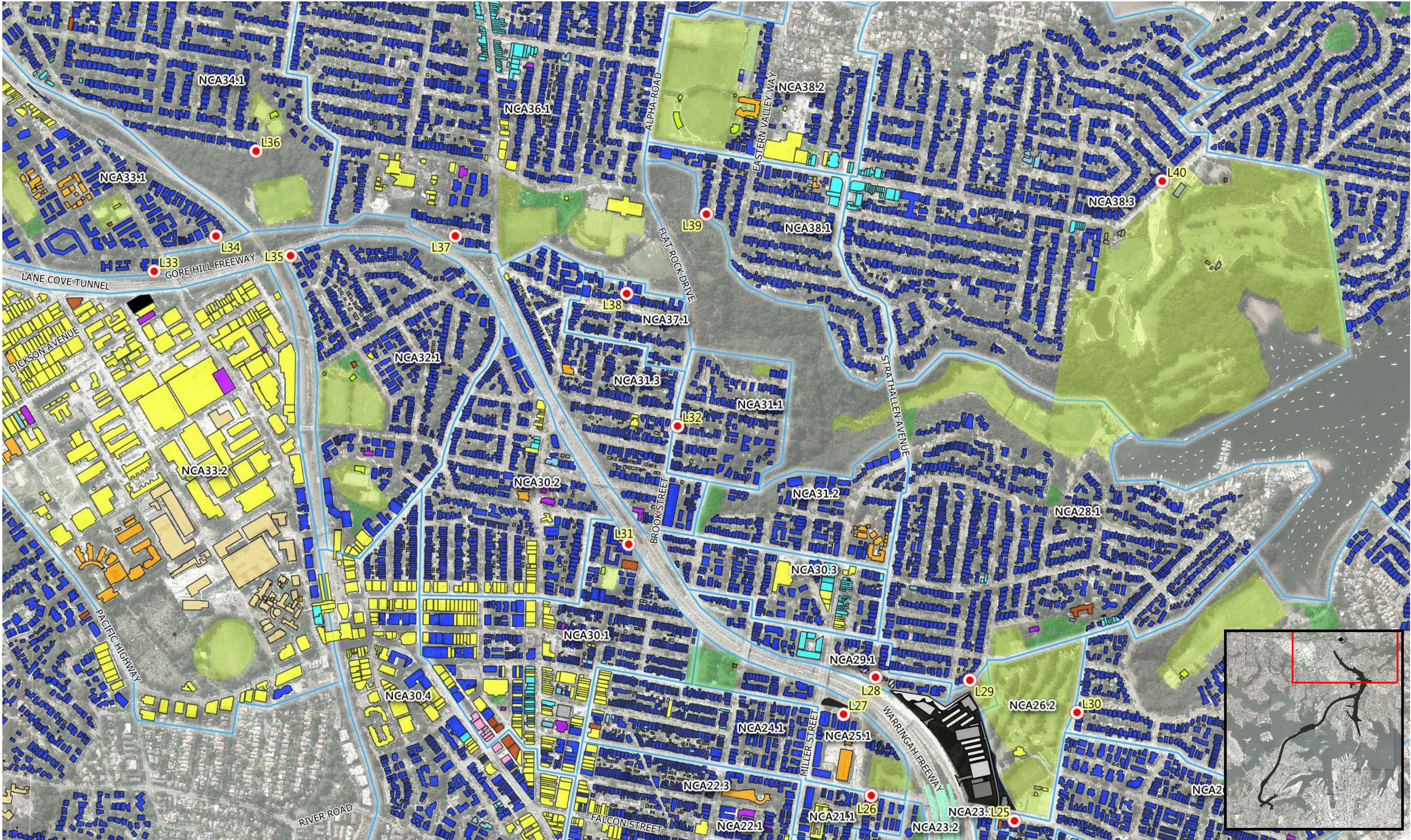
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Legend

- Construction support site layout
- Construction site footprint
- Noise catchment boundary
- Noise monitoring location
- Western Harbour tunnel alignment
- Fitout of the M4-M5 Link tunnels

Receiver type

- Residential
- Mixed use
- Commercial/Industrial
- Childcare
- Educational
- Medical
- Place of Worship
- Other noise sensitive receivers
- Recreational - Passive
- Recreational - Active

- Non-receiver building
- Project acquisition
- Other major project acquisition

Client:  
Roads and Maritime  
Services (RMS)

Project:  
Western Harbour Tunnel and  
Warringah Freeway Upgrade

Description:  
Building use identification  
Warringah Freeway - North

Consultant:  
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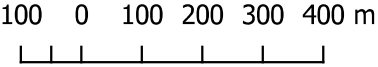
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Sheet: A3

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Legend

- Construction support site layout
- Construction site footprint
- Noise catchment boundary
- Noise monitoring location
- Western Harbour tunnel alignment
- Fitout of the M4-M5 Link tunnels

Receiver type

- Residential
- Mixed use
- Commercial/Industrial
- Childcare
- Educational
- Medical
- Place of Worship
- Other noise sensitive receivers
- Recreational - Passive
- Recreational - Active

- Non-receiver building
- Project acquisition
- Other major project acquisition

Client:  
Roads and Maritime  
Services (RMS)

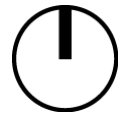
Project:  
Western Harbour Tunnel and  
Warringah Freeway Upgrade

Description:  
Building use identification  
Waltham Street

Consultant:  
**RENZO TONIN**  
& ASSOCIATES  
*inspired to achieve*

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## Appendix B - Noise and Vibration Monitoring Program

# Appendix B3

## Noise and Vibration Monitoring Program

Western Harbour Tunnel and Warringah Freeway Upgrade

SSI-8863

Warringah Freeway Upgrade

January 2022

WHTBLWFU-CPBD-NWW-NV-PRG-000001

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## Document status

Revision	Date	Description	Approval
A	3/3/2021	Addendum 7	
B	1/10/2021	For consultation	
C	11/11/2021	Internal review and incorporation of ER & stakeholder consultation feedback	
0	16/11/2021	Endorsed by ER and submission to DPI&E	
1	28/01/2022	Update to address DPI&E comments	

## Distribution of controlled copies

This NVMP forms an Appendix to the CNVMP which, as part of the CEMP, is available to all personnel and sub-contractors via the Project document control management system. An electronic copy can be found on the Project website.

The document is uncontrolled when printed. One controlled hard copy of the NVMP as part of the CEMP and supporting documentation will be maintained by the Quality Manager at the Project office [and on the project website].

Copy number	Issued to	Version

## Glossary/ Abbreviations

Abbreviations	Expanded Text
AA	Acoustics Advisor
ABL	Assessment Background Level
Acoustic enclosure	Can include an engineered and designed shed or enclosure, with airborne noise pathways minimised and treated where feasible and reasonable, endeavouring to achieve the Noise Management Levels in the Interim Construction Noise Guidelines (DECC, 2009). Example treatments include noise curtains, shipping containers, acoustic barriers or fast operating doors to limit breakout noise from enclosures
Ambient noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.
Attenuation	The reduction in the level of sound or vibration.
AVTG	Assessing Vibration – a technical guideline (DEC 2006)
CEMP	Construction Environmental Management Plan
CNVG	Construction Noise and Vibration Guideline (Roads and Maritime, 2016)
CoA	Condition of Approval
CSSI	Critical State Significant Infrastructure
dBA	Decibels using the A-weighted scale measured according to the frequency of the human ear.
DEC	Department of Environment and Conservation (now EPA)
DEC	DECC Department of Environment and Climate Change (now EPA)
DECCW	DECCW Department of Environment, Climate Change and Water (now EPA)
DP&E	NSW Department of Planning and Environment (now DPIE)
DPIE	NSW Department of Planning, Industry and Environment
EIS	Environmental Impact Statement
EMS	Environmental management system
Environmental aspect	Defined by AS/NZS ISO 14001:2015 as an element of an organisation's activities, products or services that can interact with the environment.

Abbreviations	Expanded Text
Environmental impact	Defined by AS/NZS ISO 14001:2015 as any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's environmental aspects.
EMM	Environmental Management Measure
Environmental objective	Defined by AS/NZS ISO 14001:2015 as an overall environmental goal, consistent with the environmental policy, that an organisation sets itself to achieve.
Environmental target	Defined by AS/NZS ISO 14001:2015 as a detailed performance requirement, applicable to the organisation or parts thereof, that arises from the environmental objectives and that needs to be set and met in order to achieve those objectives.
EPA	NSW Environment Protection Authority
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPL	Environmental Protection Licence
ER	Environmental Representative
ERG	Environmental Review Group
EWMS	Environmental Work Method Statements
Feasible and reasonable	Consideration of best practice taking into account the benefit of proposed measures and their technological and associated operational application in the NSW and Australian context. Feasible relates to engineering considerations and what is practical to build. Reasonable relates to the application of judgement in arriving at a decision, taking into account mitigation benefits and cost of mitigation versus benefits provided, community views and nature and extent of potential improvements.
ICNG	Interim Construction Noise Guideline (DECC, 2009)
LAeq (15min)	The A-weighted equivalent continuous (energy average) A-weighted sound pressure level of the construction works under consideration over a 15-minute period and excludes other noise sources such as from industry, road, rail and the community.
LA (max)	the A-weighted maximum noise level only from the construction works under consideration, measured using the fast time weighting on a sound level meter.
LA1 (1min)	The A-weighted noise level from the construction works under consideration, measured using the fast time weighting on a sound level meter, which is exceeded for more than 1% of the 1 minute measurement period.



Abbreviations	Expanded Text
LA90 (15min)	The A-weighted noise level excluding the construction works under consideration, measured using the fast time weighting on a sound level meter, which is exceeded for more than 90% of the 15 minute measurement period.
MCoA	Minister's Condition of Approval
MWD	Minimum working distance
NCA	Noise Catchment Areas
NML	Noise management levels
NVMP	Noise and Vibration Management Plan
NVMoP	Noise and Vibration Monitoring Program
OEH	Office of Environment and Heritage
OOHW	Out-of-Hours Works – work completed outside of standard construction hours
PPV	Peak Particle Velocity
RBL	The Rating Background Level for each period is the medium value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period (day, evening and night)
Roads and Maritime	Roads and Maritime Services
Sensitive land user(s) / Sensitive receiver(s)	Includes residences, educational institutions (including preschools, schools, universities, TAFE colleges), health care facilities (including nursing homes, hospitals), religious facilities (including churches), child care centres and passive recreation areas (including outdoor grounds used for teaching). Receivers that may be considered to be sensitive include commercial premises (including film and television studios, research facilities, entertainment spaces, temporary accommodation such as caravan parks and camping grounds, restaurants, office premises, and retail spaces) and industrial premises as identified by the Planning Secretary
SWL	Sound Power Level
SPL	Sound Pressure Level
TfNSW	Transport for NSW
Works	Any physical work to construct or facilitate the construction of the CSSI, including low impact work, environmental management measures and utility works. However, does not include activities that informs or enables detailed design of the CSSI and generates noise that is no more than 5 dB(A) above the rating background level (RBL) at any sensitive land user(s)

Note: Refer to *Instrument of Approval - SSI-8863* for additional abbreviations and definitions relevant to the Project.

# 1 Introduction

## 1.1 Context

This Noise and Vibration Monitoring Program (monitoring Program) has been prepared for the Design and Construction of Warringah Freeway Upgrade (the Project). This monitoring Program has been prepared to address the requirements of the Minister's Condition of Approval (CoA) C13(a, b c and d), the Western Harbour Tunnel and Warringah Freeway Upgrade Environmental Impact Statement (EIS) and all applicable guidance and legislation. This Monitoring Program has been developed with consideration of SMART principles. All monitoring will be specific, measurable, achievable, relevant and timebound.

## 1.2 Background and project description

The Western Harbour Tunnel and Warringah Freeway upgrade EIS (Jacobs/Arcadis 2020) assessed noise and vibration impacts on sensitive receivers and structures during construction and operation of the Project, within Chapter 10 and the Noise and Vibration Technical Working Paper (Appendix G of the EIS).

The EIS identified the potential for noise and vibration impacts during construction which are dependent on the types of construction activity in progress and the proximity of works to sensitive receivers. However, it concluded any potential impacts could be managed by tailored mitigation and management measures, including construction noise and vibration monitoring. Please refer to section 1.3 of the Construction Environmental Management Plan (CEMP) for the Project description.

## 1.3 Scope of the Monitoring Program

The scope of this Monitoring Program describes how CPB Downer JV proposes to carry out noise and vibration monitoring during the construction of the Project. Monitoring will be undertaken to verify the prediction of noise and vibration impacts to sensitive receivers and structures, to assess compliance in response to complaints, for equipment spot checks, verification of construction traffic. Monitoring will assess the adequacy, completeness and effectiveness of the noise mitigation measures being used, and whether additional mitigation should be deployed. For further information refer to Sections 6 and 7.

This Monitoring Program forms part of the Project's Noise and Vibration Management Plan. Operational noise and vibration monitoring does not fall within the scope of this monitoring Program and therefore is not included within the processes contained within this monitoring Program.

## 1.4 Environmental management systems overview

The environmental management system overview is described in section 1.5 of the CEMP.

## 2 Purpose and objectives

### 2.1 Purpose

The purpose of this monitoring Program is to describe how CPB Downer JV proposes to conduct noise and vibration monitoring during construction of the Project.

This monitoring Program will apply for the duration of the Project's construction works, unless a longer period is specified by the Secretary of the Department of Planning, Industry and Environment (DPIE).

The monitoring undertaken as part of this program will compare actual performance of construction of the CSSI against the performance predicted in the documents listed in Condition A1 or in the CEMP

### 2.2 Objectives

The key objective of the monitoring program is to ensure all CoA, environmental management measures and licence/permit requirements relevant to noise and vibration are described, scheduled and assigned responsibility as outlined in:

- The environmental impact assessment prepared for Western Harbour Tunnel and Warringah Freeway upgrade
- Conditions of Approval granted to the project on 21<sup>st</sup> January 2021
- Roads and Maritime specifications G36
- Response to Submissions (RtS)
- All relevant legislation and other requirements described in Section 3.1 of this monitoring program

### 3 Minister's Conditions of Approval

The MCoA that relate to construction noise and vibration and how they are being addressed by the Project are provided in the CNVMP. MCoA that specifically relate to this Noise and Vibration Monitoring Program are provided in Table 3-1 below. A cross-reference is included to indicate where each condition is addressed in this OOHV Protocol or other project management document.

Table 3-1: Minister's Conditions of Approval that address out of hours works

Reference	Relevant condition	Where addressed						
A31	<p>The Proponent must cooperate with the AA by:</p> <p>(a) providing access to noise and vibration monitoring activities as they take place;</p> <p>(b) providing for review of noise and vibration plans, assessments, monitoring reports, data and analyses undertaken; and</p> <p>(c) considering any recommendations to improve practices and demonstrating, to the satisfaction of the AA, why any recommendation is not adopted.</p>	NVMP Section 3.4						
C11	<p>The following Construction Monitoring Programs must be prepared in consultation with the relevant government agencies identified for each to compare actual performance of construction of the CSSI against the performance predicted in the documents listed in Condition A1 or in the CEMP:</p> <table border="1"> <thead> <tr> <th></th><th>Required Construction Monitoring Programs</th><th>Relevant government agencies to be consulted for each Construction Monitoring Program</th></tr> </thead> <tbody> <tr> <td>(a)</td><td>Noise and Vibration Monitoring Program</td><td>EPA</td></tr> </tbody> </table>		Required Construction Monitoring Programs	Relevant government agencies to be consulted for each Construction Monitoring Program	(a)	Noise and Vibration Monitoring Program	EPA	This Monitoring Program Section 2 Section 4.2
	Required Construction Monitoring Programs	Relevant government agencies to be consulted for each Construction Monitoring Program						
(a)	Noise and Vibration Monitoring Program	EPA						
C12	<p>Each Construction Monitoring Program must provide:</p> <p>(a) details of baseline data available;</p> <p>(b) details of baseline data to be obtained and when;</p> <p>(c) details of all monitoring of the project to be undertaken;</p> <p>(d) the parameters of the project to be monitored;</p> <p>(e) the frequency of monitoring to be undertaken;</p> <p>(f) the location of monitoring;</p> <p>(g) the reporting of monitoring results and analysis results against relevant criteria;</p> <p>(h) details of the methods that will be used to analyse the monitoring data;</p> <p>(i) procedures to identify and implement additional mitigation measures where the results of the monitoring indicate unacceptable project impacts;</p> <p>(j) a consideration of SMART principles;</p> <p>(k) any consultation to be undertaken in relation to the monitoring programs; and</p>	<p>This Program Section 5</p> <p>Section 6/ Section 7</p> <p>Section 10</p> <p>Section 11</p>						

Reference	Relevant condition	Where addressed
	(l) any specific requirements as required by Conditions C13 to C16.	
C13	<p>The Noise and Vibration Monitoring Program must include:</p> <p>(a) noise and vibration monitoring locations determined in consultation with the AA to confirm construction noise and vibration levels;</p> <p>(b) for the purposes of (a), noise monitoring must be undertaken during the day, evening and night-time periods and within the first month of work as well as throughout the construction period and cover the range of activities being undertaken at the sites;</p> <p>(c) a protocol for reviewing the implemented management and mitigation measures, based on the monitoring results, to confirm they are consistent with the CEMP Subplan (Condition C4b), and to identify any additional management and mitigation measures that must be implemented; and</p> <p>(d) a process to undertake real time noise and vibration monitoring. The results of the monitoring must be readily available to the construction team, Proponent, ER and AA. The Planning Secretary and EPA must be provided with access to the results on request.</p>	<p>NVMP Appendix B</p> <p>Section 6.1, Section 7.1</p> <p>Section 10</p> <p>Section 6.2 Section 7.2</p>
C17	The Construction Monitoring Programs must be developed in consultation with relevant government agencies as identified in Condition C11. Details of all information requested by an agency during consultation must be provided to the Planning Secretary as part of any submission of the relevant Construction Monitoring Programs, including copies of all correspondence from those agencies as required by Condition A5.	Section 4.2
C18	The Construction Monitoring Programs must be endorsed by the ER and then submitted to the Planning Secretary for approval at least one month before the commencement of construction.	Section 4.2
C19	Unless otherwise agreed with the Planning Secretary, construction must not commence until all of the relevant Construction Monitoring Programs have been approved by the Planning Secretary, and all relevant baseline data for the specific construction activity has been collected.	Section 4.2
C20	The Construction Monitoring Programs, as approved by the Planning Secretary including any minor amendments approved by the ER must be implemented for the duration of construction and for any longer period set out in the monitoring program or specified by the Planning Secretary, whichever is the greater.	Section 4.2
C21	The results of the Construction Monitoring Programs must be submitted to the Planning Secretary, and relevant regulatory agencies, for information in the form of a Construction Monitoring Report at the frequency identified in the relevant Construction Monitoring Program.	<p>NVMP Appendix B</p> <p>Section 11</p>

Reference	Relevant condition	Where addressed
	Note: Where a relevant CEMP Sub-plan exists, the relevant Construction Monitoring Program may be incorporated into that CEMP Sub-plan.	
E79	The Proponent must conduct vibration testing during vibration generating activities that have the potential to impact on heritage items to identify minimum working distances to prevent cosmetic damage. In the event that the vibration testing and attended monitoring shows that the preferred values for vibration are likely to be exceeded, the Proponent must review the construction methodology and, if necessary, implement additional mitigation measures.	NVMP Appendix B Section 8
E80	Advice from a heritage specialist must be sought on methods and locations for installing equipment used for vibration, movement and noise monitoring at heritage-listed structures.	NVMP Appendix B Section 8

## 4 Environmental requirements

### 4.1 Relevant legislation

#### 4.1.1 Legislation

All legislation relevant to this NVMP is included in Section 3 of the NVMP.

#### 4.1.2 Guidelines

The main guidelines, specifications and policy documents relevant to this Plan include: [

- Roads and Maritime QA Specification G36 – Environmental Protection (Management System).
- Roads and Maritime Construction Noise and Vibration Guidelines (Roads and Maritime 2016)
- NSW Interim Construction Noise Guideline (ICNG), Department of Environment and Climate Change 2009
- NSW Road Noise Policy, Dept. of Environment, Climate Change and Water 2011
- NSW Noise Policy for Industry, Environment Protection Authority 2017
- NSW Assessing Vibration – a technical guideline (AVTG), Department of Environment and Conservation 2006
- Australian Standard AS/NZS 2107:2000 Acoustics - Recommended design sound levels and reverberation times for building interiors
- Australian Standard 2834-1995 Computer Accommodation, Chapter 2.9 Vibration
- Australian Standard AS 2187.2 Explosives - Storage and use - Part 2 Use of explosives
- Australian Standard AS2436-1981 Guide to Noise Control on Construction, Maintenance and Demolition Sites
- Australian Standard 2659.1 – 1998 Guide to the use of sound measuring equipment – portable sound level meters
- Australian Standard IEC 61672.1 Electroacoustic – Sound Level Meters – Specifications
- Australian Standard 2775 Mechanical Mounting of Accelerometers
- Australian Standard 1055 Acoustics – Description and Measurement of Environmental Noise
- British Standard BS 6472-2008, 'Evaluation of human exposure to vibration in buildings (1-80Hz)
- British Standard 7385: Part 2-1993 'Evaluation and measurement of vibration in buildings'
- German Standard DIN4150-1999 Structural vibration Part 3: Effects of vibration on Structures,
- ISO 3744 Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Engineering methods for an essentially free field over a reflecting plane
- ISO 3746 Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Survey method using an enveloping measurement surface over a reflecting plane



- ISO 6393 Earth-moving machinery - Determination of sound power level - Stationary test conditions
- ISO 6395 Earth-moving machinery - Determination of sound power level - Dynamic test conditions.

## 4.2 Consultation

Community feedback and complaints relating to noise and vibration will be dealt with in accordance with the Noise and Vibration Management Plan (NVMP), Communication Strategy (CS) and the Complaints Management System.

The monitoring program has been developed in consultation with the EPA as identified in Condition CoA C11 and C17. All information requested by EPA during consultation will be provided to the Planning Secretary as part of any submission of the monitoring program, including copies of all correspondence from those agencies as required by CoA A5 (refer NVMP Appendix E).

In accordance with CoA C18, this monitoring program must be endorsed by the ER and then submitted to the Planning Secretary for approval at least one month before the commencement of construction.

Unless otherwise agreed with the Planning Secretary, construction must not commence until all of the relevant Construction Monitoring Programs have been approved by the Planning Secretary, and all relevant baseline data for the specific construction activity has been collected (CoA C19).

In accordance with CoA C20, this monitoring program, as approved by the Planning Secretary including any minor amendments approved by the ER will be implemented for the duration of construction and for any longer period set out in the monitoring program or specified by the Planning Secretary, whichever is the greater.

## 4.3 Environment Protection Licence Requirements

An EPL (**to be advised**) was issued for the Project on (**to be advised**).

Applicable requirements from the EPL will be incorporated into this Program.

## 5 Baseline Monitoring Data

As part of the EIS process, baseline noise monitoring was conducted between June and September 2017 at a total of 24 locations. The baseline noise monitoring locations were selected to be representative of Noise Catchment Areas (NCAs) within and around the Project, across a mix of existing land uses including residential, commercial, industrial, and open space.

For further information regarding baseline noise monitoring refer to Section 4 of the NVMP, the sensitive receiver landuse survey included as Appendix A of the NVMP and Chapter 10.5 of the EIS and Appendix G (Technical Working Paper: Noise and Vibration).

No further additional baseline monitoring is anticipated for construction noise assessment, however, if required, it will be undertaken in accordance with the relevant guidance and the NVMP will be updated as necessary and issued to DPIE for approval.

The noise monitoring locations are shown in Figure 5-1 and the results are summarised in Table 5-1.

Figure 5-1: Baseline Noise Monitoring Locations (EIS)

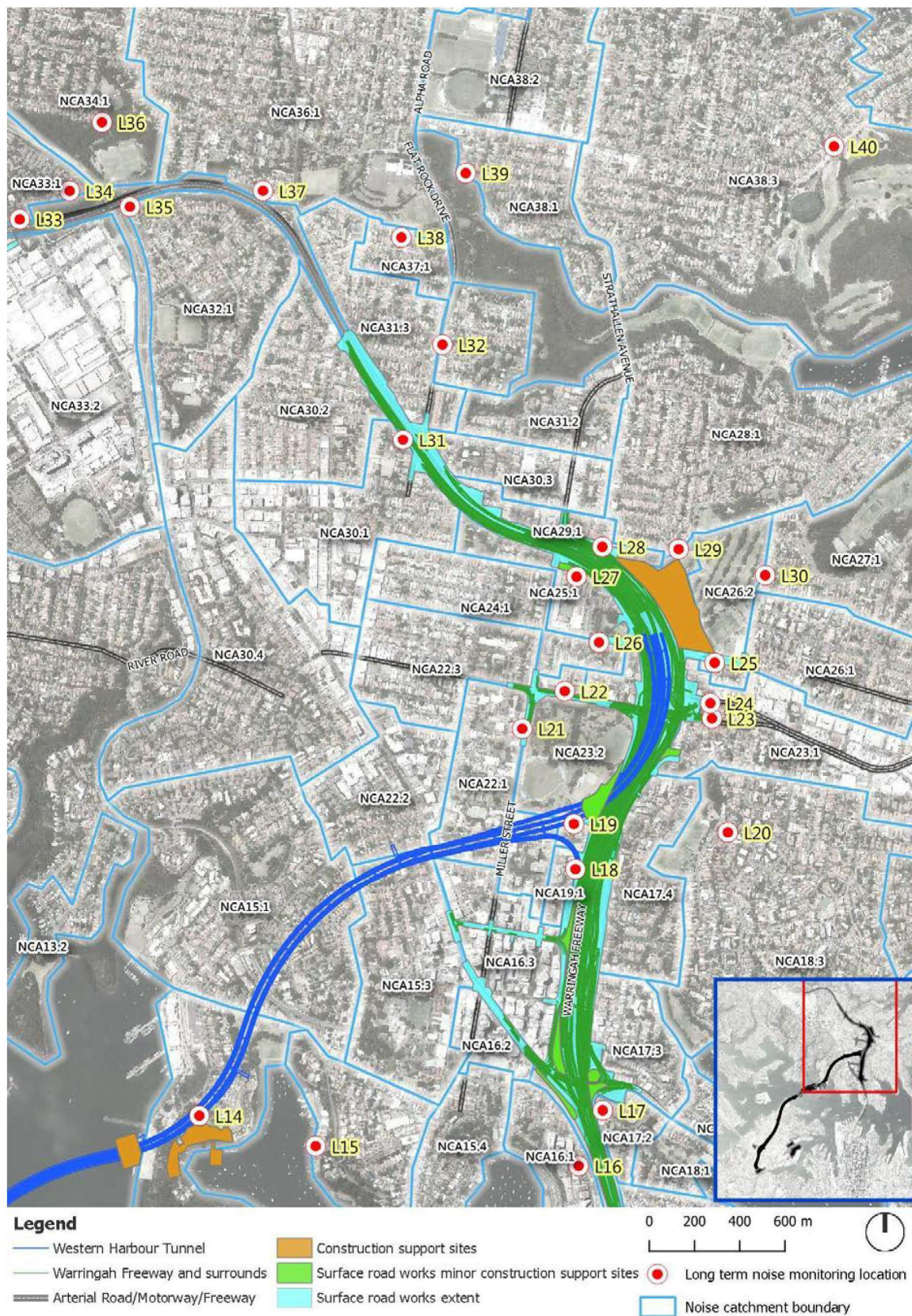




Table 5-1: Baseline Noise monitoring Results (EIS)

Monitoring Location ID	Address	LA90 Rating Background Level (RBL)			LAeq Ambient noise Levels		
		Day <sup>1</sup>	Evening <sup>2</sup>	Night <sup>3</sup>	Day <sup>1</sup>	Evening <sup>2</sup>	Night <sup>3</sup>
L14	5 Balls Head Road, Waverton	41	37	33	51	47	45
L15	1/16 Munro Street, McMahons Point	42	41	38	52	46	44
L16	401/102 Alfred Street, Milsons Point	60	60	50	63	62	58
L17	6 McDougall Street, Kirribilli	55	54	45	60	58	56
L18	1/191-195 Walker Street, North Sydney	73	71	55	76	75	72
L19	91 Ridge Street, North Sydney	52	52	45	57	57	52
L20	14 Montpellier Road, Neutral Bay	54	52	43	59	57	53
L21	306 Miller Street, North Sydney	52	47	36	65	63	58
L22	1/1 Bardsley Gardens, Crows Nest	53	49	41	68	67	63
L23	288 Falcon Street, Neutral Bay	61	54	44	69	68	65
L24	5 Military Road, Neutral Bay	58	54	44	69	68	65
L25	317 Ernest Street, Cammeray	58	54	41	69	66	62
L26	225 Ernest Street, Cammeray	56	52	37	68	66	61
L27	77 Rosalind Street, Cammeray	58	55	43	62	60	57
L28	53 Bellevue Street, Cammeray	64	63	47	67	67	64
L29	12 Warringa Road, Cammeray	47	45	37	54	51	48
L30	57 Park Avenue, Cremorne	49	48	39	59	57	54
L31	18/22-24 Donnelly Road, Crows Nest	58	56	38	62	61	58
L32	79 Brook Street, Naremburn	56	49	37	71	69	65
L33	20/2 Parkes Road, Artarmon	67	63	46	72	70	67
L34	3/2 Cleland Road, Artarmon	55	53	40	59	58	55

Monitoring Location ID	Address	LA90 Rating Background Level (RBL)			LAeq Ambient noise Levels		
		Day <sup>1</sup>	Evening <sup>2</sup>	Night <sup>3</sup>	Day <sup>1</sup>	Evening <sup>2</sup>	Night <sup>3</sup>
L35	1 Chelmsford Avenue, Naremburn	59	55	40	63	61	58
L36	2 Burra Road, Artarmon	44	44	37	53	50	46
L37	16 Walter Street, Willoughby	50	48	38	55	52	49
L38	27 Garland Street, Naremburn	45	44	34	53	52	48
L39	2 Pyalla Street, Northbridge	52	48	37	60	56	57
L40	375 Sailors Bay Road, Northbridge	43	40	36	66	63	58

Notes:

1. Day: 7.00am to 6.00pm Monday to Saturday and 8.00am to 6.00pm Sundays & Public Holidays
2. Evening: 6.00pm to 10.00pm Monday to Sunday & Public Holidays
3. Night: 10.00pm to 7.00am Monday to Saturday and 10.00pm to 8.00am Sundays & Public Holidays
4. As required by the NPfl, the external ambient noise levels presented are free-field noise levels. (ie. no facade reflection)

## 6 Noise Monitoring

### 6.1 Attended and Unattended airborne noise monitoring

Attended monitoring of construction noise levels will be undertaken as follows:

- Monitoring will be carried out at the commencement of activities for which a location and activity specific noise and vibration impact assessment (CNVIS) has been prepared. Validation monitoring may be required to confirm that actual noise and vibration levels are consistent with noise and vibration impact predictions and that the management measures that have been implemented are appropriate,
- Noise monitoring will be undertaken during the day, evening and night-time periods and within the first month of work as well as throughout the construction period and cover the range of activities being undertaken at the sites,
- Noise monitoring locations will be subject to the outcomes of the CNVIS and final work area layouts. Monitoring locations and will be selected in consultation with the Acoustic Advisor (AA).
- Where a change in methodology, plant or equipment is anticipated to result in a substantial increase in construction noise impact,
- Where appropriate in response to a noise related complaint(s) (determined on a case-by-case basis) and in accordance with EPL Condition,
- As directed by an authorised officer of the EPA,
- As otherwise required by a CNVIS (refer to NVMP Section 7.2 for information regarding CNVIS, specific monitoring requirements will be identified in the relevant CNVIS as they are location and task specific), Out of Hours Works (OOHW) Protocol (Appendix C of NVMP) or EPL (refer Section 4.3),
- Following the implementation of mitigation measures or attenuation as a result of noise exceedance, and
- As part of ongoing spot checks for noise intensive plant and equipment, which will be undertaken throughout construction to ensure compliance with the maximum noise level goals for construction equipment. Spot checks would be carried out as required on a case-by-case basis, such as in response to a plant/equipment specific noise related complaint and during noise and vibration assessment validation monitoring when it is possible to isolate the noise from one piece of plant or equipment.

Noise monitoring will be undertaken as summarised in Table 6-1.

Table 6-1: Summary of Noise Monitoring Schedule

Type of Monitoring	Description / Activity Monitored	Timing / Frequency	Parameters to be measured
Attended noise	Activities for which a location and activity specific noise and vibration impact assessment has been prepared	Start of activities	Noise levels predicted by CNVIS or Construction noise estimation tool; management measures are appropriate
Attended noise	Various / range of activities being undertaken	First month of construction, and throughout construction (day, evening, and night-time periods)	Noise levels predicted by CNVIS or Construction noise estimation tool; management measures are appropriate
Attended noise	Activity requiring a change in methodology, plant or equipment	Start of activity	Noise levels predicted by CNVIS or Construction noise estimation tool; management measures are appropriate
Attended noise	Activity that resulted in complaint	After complaint	Noise levels predicted by CNVIS or Construction noise estimation tool; management measures are appropriate
Attended noise	As directed by the CNVIS or Construction noise estimation tool	As directed by the CNVIS or Construction noise estimation tool	Noise levels predicted by CNVIS or Construction noise estimation tool; management measures are appropriate
Attended noise	OOHW	At various times during OOHW activities	Noise levels predicted by CNVIS or Construction noise estimation tool; management measures are appropriate
Attended noise	Any activity that resulted in an exceedance of predicted noise levels	After the implementation of mitigation measures or noise attenuation that were required following the exceedance	Noise levels predicted by CNVIS or Construction noise estimation tool; management measures are appropriate
Attended noise – spot checks	Noise intensive plant and equipment	Periodic	Compliance with the maximum noise level goals for construction equipment (refer to the CNVG)

When identified as necessary in the CNVIS, unattended airborne noise monitoring will also be completed, with a noise logger deployed to obtain noise results over longer period. In these instances, noise loggers can record audio to allow for the identification of construction noise contribution and the presence of any extraneous noise as required, if privacy concerns can be overcome. The use of real time unattended airborne noise monitoring is detailed in Section 5.3.

Attended and unattended noise monitoring locations will vary and be determined on a case-by-case basis by a CNVIS, the Project's predictive noise and vibration tool or in response to complaints.

In accordance with the ICNG the duration and amount of noise monitoring will depend on the scale of the construction activities and extent of expected noise impacts. Noise monitoring will cover a representative period of the construction activity. A representative period is the stage of a construction activity where all the plant and equipment operating is consistent with the full range of plant and equipment modelled in the noise and vibration assessment, i.e. noise monitoring is not to be undertaken when the key noise contributing plant and equipment are turned off. The CNVIS will identify the representative periods.

Where possible, monitoring will be undertaken at the most affected noise sensitive receiver's location in proximity to the Project's construction activities. Noise monitoring locations will consider factors including:

- The location of previous and baseline monitoring sites
- The proximity of the receiver to a Project worksite
- The sensitivity of the receiver to noise
- The location of the source being monitored
- Access requirements/limitations
- Background noise levels
- The expected duration of the impact.

Monitored noise levels will then be analysed against the predictions made in the relevant CNVIS or using the Project's predictive tools. Where monitored construction noise levels are found to be above modelling predictions are exceeded corrective action will be taken, refer to Section 9 for further information.

#### **6.1.1 Parameters to be monitored**

All environmental noise monitoring will be taken with the following meter settings:

- Time Constant: Fast (i.e. 125 milliseconds),
- Frequency Weightings: A-weighting, and
- Sample period: 15 minutes.

Environmental noise monitoring (excluding spot checks of plant and equipment) will be recorded over 15-minute sample intervals, excluding periods of extraneous noise until a representative sample has been obtained. A representative sample will be determined by the operator, who will be competent, suitability trained and experienced in undertaking noise measurements and familiar with the relevant Australian Standards (as detailed in Section 3 of the NVMP). The minimum range of noise metrics to be measured include the following A-weighted noise levels:  $L_{A90}$ ,  $L_{Aeq}$ ,  $L_{A10}$ ,  $L_{A(min)}$  and  $L_{A(max)}$ .

For spot checks of noise intensive plant and equipment, duration of monitoring will depend on the source of noise being monitored. For sources of continuous noise (such as generators), measurements will be monitored over one-to-two-minute intervals. For dynamic plant, such as front-end loaders, spot checks will capture a representative activity, such as one truck-and-dog load cycle.



## 6.2 Real Time (unattended) noise monitoring

Real-time (unattended) noise monitoring will be undertaken to satisfy CoA C13 (d). The real-time noise monitors will be installed on an as needs basis depending on risk of noise exceedance as identified in the CNVISs.

The location of the real-time noise monitoring equipment will be subject to the final work area layouts and suitability of monitoring locations and will be selected in consultation with the Acoustic Advisor (AA).

The monitor will be installed by a person appropriately trained in the measurement and assessment of construction noise and vibration, who is familiar with the requirements of the relevant standards and procedures and the establishment of real-time monitoring equipment (refer Section 6.4).

The real-time monitoring data will be readily available to Transport for NSW (TfNSW), the Environmental Representative (ER) and AA. The real-time monitoring data will be available to DPIE and EPA on request following an initial screening review, to identify any anomalies or corruption in the dataset.

Where weather may have influenced noise results, the details of inclement weather will be provided in any reporting required.

### 6.2.1 Parameters to be monitored

Real-time unattended noise monitoring will be taken with the following meter settings:

- Time Constant: Fast (i.e. 125 milliseconds),
- Frequency Weightings: A-weighting, and
- Sample period: 15 minutes.

Real-time noise monitoring will be recorded over 15-minute sample intervals, where every 15 minutes the data is to be processed statistically in real-time and displayed. The minimum range of noise metrics include the following A-weighted noise levels:  $L_{A90}$ ,  $L_{Aeq}$ ,  $L_{A10}$  and  $L_{A(max)}$ .

## 6.3 Out of Hours Monitoring

The CoA allows out-of-hours works (for scheduled activities) under certain circumstances and prescribes requirements that must be complied with to undertake the works. These are described in the Out of Hours Work Protocol Appendix C of the CNVMP.

The requirement for out of hours monitoring would be determined based on the results of CNVISs for proposed out of hours works.

The CNVISs would be prepared and submitted to the ER, AA and EPA as per the requirements of CoA E75 and would include a monitoring plan to validate the noise predictions, based on monitoring at the boundary of representative sensitive receivers during noise generating activities that are representative of the out-of-hours works.

**EPL OOHW monitoring and reporting requirements to be included here once gained**

## 6.4 Calibration, QA and competency

Monitoring and data analysis will be undertaken with reference to Australian Standard AS 1055 Acoustics - Description and measurement of environmental noise, ICNG and CNVG.

All monitoring will be undertaken by competent personnel, suitability trained and experienced in undertaking noise measurements. A competent person must satisfy one or more of the following:

- have qualifications and/or experience sufficient to fulfil the requirements of 'member' grade of the Australian Acoustical Society

- undertake the duties of an acoustic consultant on behalf of a consultancy firm that is a member of the Association of Australasian Acoustical Consultants
- have a recognised tertiary qualification in a discipline pertinent to acoustics, or
- be able to demonstrate competence through professional experience and/or technical expertise.

Competence demonstrated through professional experience may be supplemented with training delivered by a trained acoustician who is a member of the Australian Acoustical Society, and AA spot checks of monitoring events to confirm personnel are undertaking the monitoring in a competent manner.

Noise monitoring equipment used will be at least Type 2 instrumentation calibrated in accordance with manufacturer specifications or relevant Australian Standards.

The calibration of the monitoring equipment will be checked in the field before and after the noise measurement period, in accordance with relevant standards and guidelines. Records of monitoring equipment calibration will be maintained by CPB Downer JV throughout the delivery of the Project.

Noise monitoring records will be completed to record:

- Date and time of measurement,
- Name of person undertaking the measurement,
- Type and serial number of monitoring instrumentation,
- Results of field calibration checks,
- Records of monitoring equipment calibration (i.e. copies of calibration certificates),
- Time of day, length of measurement and any measurement time intervals,
- Monitoring location (including a sketched map/photo of area),
- Measurement location details and number of measurements at each location,
- Weather conditions during measurements,
- Operation and activities of the noise sources under investigation,
- Estimated contribution of the Project's activities, and
- Noise due to other extraneous and environmental sources (e.g. traffic, aircraft, trains, dogs barking, insects).

Noise monitoring will be undertaken and recorded in accordance with the relevant noise measurement requirements in the reference standards and documents in Section 3.1 of the NVMP.

All outdoor noise measurements will be undertaken with a windscreen over the microphone and measurements will be disregarded (if the measurement is adversely affected by weather) when it is more than a light rain and/or the wind speed is greater than 5 m/s (18 km/h) at the microphone. Rain would be considered light if the sound of the rain is 10dB(A) less than the noise source being monitored.

Where high background noise levels mask the construction noise contribution during attended noise measurements, operators will measure closer to the source and calculate back to the required position; measure with the source noise off and then on (where possible) and calculate the difference; or use the 'pause and cut' feature on the sound level meter to try to exclude as much of the extraneous noise as possible.

Where possible, noise monitoring is to be carried out at least 3.5 m from any reflective surface other than the ground and the preferred microphone/measurement height is 1.2-1.5 m above the ground.

Measurements taken inside buildings should be at least 1 m from walls or other reflective surface, and about 1.5 m from windows, where such instrument siting is possible.

## 7 Vibration Monitoring

### 7.1 Short term attended and unattended vibration monitoring

Attended vibration monitoring is to be undertaken as follows:

- Vibration monitoring locations will be subject to the outcomes of the CNVIS and final work area layouts. Monitoring locations will be selected in consultation with the Acoustic Advisor (AA).
- At the commencement of operation for each plant or activity on site, which has the potential to generate significant vibration levels, where the vibration screening criteria is likely to be exceeded or as determined by a vibration assessment,
- At the commencement of vibration generating activities that have the potential to impact on heritage items to confirm/identify the minimum working distances to prevent cosmetic damage,
- Where vibration sensitive locations are determined to fall within the 'minimum working distances' established for each item of plant, so to refine the indicative minimum working distances,
- Where appropriate in response to a vibration related complaint(s) (determined on a case-by-case basis) and in accordance with the EPL,
- As directed by an authorised officer of the EPA, and
- As otherwise required by a CNVIS refer to NVMP Section 7.2 for information regarding CNVIS, however, specific monitoring requirements will be identified in the relevant CNVIS and not prescribed in this Program), OOHWP Protocol (Section 6.3) or EPL (i.e. as directed by authorised officer of the EPA).

Vibration monitoring will be undertaken in accordance with the relevant vibration measurement requirements in the reference standards and documents in Section 3.1. of the NVMP.

Where human comfort is a concern, vibration monitoring results will be assessed and reported against the values set out in Tables 2.2 and 2.4 of the EPA's Assessing Vibration – a technical guideline.

Where property damage is a concern, vibration monitoring results will be assessed and reported against the criteria as presented in the CNVMP. For heritage structures, BS7385-2:1993 does not provide numerical vibration levels to prevent structural damage. The approach that will be adopted for the Project to assess and manage potential vibration impact on heritage structures is outlined in Section 5.5.3 of the NVMP. Vibration monitoring shall be undertaken in accordance with the vibration measurement requirements stipulated in the reference standards and documents listed above. The following notes of importance are included here:

- Vibration monitoring equipment shall be placed outside at the footings or foundations of the building of interest, closest to the vibrating source. The surface should be solid and rigid to best represent the vibration entering the structure of the building under investigation,
- The vibration sensor or transducer shall not be mounted on loose tiles, loose gravel or other resilient surfaces,
- The vibration sensor or transducer shall be directly mounted to the vibrating surface using adhesive or a magnetic mounting plate onto a steel washer, shall be either fastened or glued to the surface of interest to ensure a direct coupling, and

Where vibration monitoring is undertaken to measure tactile vibration levels, vibration monitoring results shall be assessed and reported against the acceptable values of human exposure to vibration set out in Tables 2.2 and 2.4 of the EPA's Assessing Vibration – a technical guideline.

The following information shall be recorded:

- Date and time of measurements,
- Name of person undertaking the measurements,
- Type and model number of instrumentation,
- Description of the time aspects of each measurement (i.e. sample times, measurement time intervals and time of day),
- Sketch/photo map of area and measurement location,
- Measurement location details and number of measurements at each location,
- Operation and load conditions of the vibrating plant under investigation, and
- Possible vibration influences from other sources (e.g. domestic vibrations, other mechanical plant, traffic, etc.).

Where required for extended periods of vibration generating works, an unattended vibration monitoring system will be installed where initial monitoring to establish minimum working distances is insufficient to ensure goal levels are met, due to changing plant or unknown ground conditions. Unattended monitors will warn plant operators (e.g. via flashing light, SMS, etc.) that vibration is approaching levels where there is potential for cosmetic damage to buildings and structures.

Where unattended vibration monitors are left in place on a private property they will be picked up at a mutually agreed time with the resident.

Monitored vibration levels will be analysed against the applicable vibration goals, and predictions made in the relevant CNVIS or using the Project's predictive tools. For where monitored construction noise levels are found to be above modelling predictions or vibration goals are exceeded corrective action will be taken, refer to Section 9 for further information.

#### **7.1.1 Parameters to be monitored**

The minimum range of vibration metrics to be measured are:

- Root-Mean-Square acceleration (RMS), and/or
- Vector-sum peak-particle velocity (PPV).

All short term attended vibration monitoring will be recorded over a representative sampling interval where the worst-case vibration levels can be captured. Where unattended vibration monitoring is proposed, monitoring will be undertaken continuously whilst the vibration intensive plant is operational to capture the worst-case vibration levels within the pre-determined 'minimum working distance' from the potentially affected building.

## **7.2 Real Time Unattended Vibration Monitoring**

Real-time (unattended) vibration monitoring will be undertaken to satisfy CoA C13 (d). Real time monitors will be implemented on an as needs basis as identified in a CNVIS.

The exact location of the real-time vibration monitoring equipment will be determined in consultation with the AA and be subject to the worksite final layouts and suitability of monitoring locations. The monitor will be installed by a person appropriately trained in the measurement and assessment of construction noise and vibration, who is familiar with the requirements of the relevant standards and procedures and the establishment of vibration monitoring equipment.

The real-time monitoring data will be readily available to TfNSW, the ER and AA. The real-time monitoring data will be available to DPIE and EPA on request following an initial screening review, to identify any anomalies or corruption in the dataset.

#### **7.2.1 Parameters to Monitored**

Real time vibration monitoring will continuously monitor PPV consistent with methodology described for attended and unattended vibration monitoring.

### **7.3 Out of hours Protocol monitoring requirements**

The Out-of-Hours Works Protocol enables out-of-hours works (for works that are not subject to an EPL) under certain circumstances and prescribes the requirements that must be complied with to undertake the works.

If vibration intensive activities are proposed as OOHV and have the potential to impact on sensitive receivers or structures, they will be assessed for compliance with minimum working distances as defined in the relevant CNVISs (refer to Section 7.3 of the CNVMP) including:

- Cosmetic structural damage impacts,
- Disturbance to building occupants due to vibration.

Where required, vibration monitoring may be undertaken to ensure vibration levels are within criteria.

### **7.4 Calibration and QA**

All monitoring will be undertaken by competent personnel, suitability trained and experienced in undertaking vibration measurements (refer Section 6.4).

All vibration instruments will be calibrated in accordance with manufacturers specifications or relevant Australian Standards. Records of monitoring equipment calibration will be maintained by CPB Downer JV throughout the delivery of the Project.

All monitoring records will be retained throughout the delivery of the Project by CPB Downer JV. Vibration monitoring records will be completed to record:

- Date and time of measurements,
- Name of person undertaking the measurements,
- Calibration dates of monitoring equipment,
- Type and model number of instrumentation,
- Time of day, length of measurement and measurement time intervals,
- Monitoring location (including a sketched map/photo of area),
- Measurement location details and number of measurements at each location,
- Operation and load conditions of the vibrating plant under investigation, and
- Possible vibration influences from other sources (e.g. domestic vibrations, other mechanical plant, traffic etc.).

## 8 Heritage Listed Structures

In accordance with CoA E79, CPB Downer JV will conduct vibration testing before and during vibration generating activities that have the potential to impact on heritage items, to identify minimum working distances to prevent cosmetic damage. Should vibration testing and monitoring show that the preferred values for vibration are likely to be exceeded, CPB Downer JV will follow the process in Section 10.

Heritage items which have the potential to be impacted by vibration are identified in the Non-Aboriginal Heritage Management Plan. Vibration Screening. Section 8 of the CNVMP provides further detail on the approach to managing potential vibration impacts on heritage structures.

Vibration assessments prepared as part of the CNVIS documents for the Project will also identify where monitoring should be conducted at heritage items.

CPB Downer JV will seek the advice of the Project's heritage and noise and vibration specialists, on methods and locations for installing equipment used for vibration, movement and noise monitoring of heritage-listed structures. CPB Downer JV will seek the advice of a suitably qualified and experienced built heritage expert prior to implementing any at-property treatments on heritage items, to ensure any such work does not have an adverse impact on the heritage significance of the item.

## 9 Heavy Vehicle Transport Noise

CPB Downer JV will track heavy vehicle movements to and from sites and manage truck numbers with the aim of limiting any associated increases in road traffic noise levels during the night-time period to no more than 2 dB(A). The number of heavy vehicles entering and /or exiting will be tracked at the gates of each construction site. Any assumptions regarding the number of heavy vehicle movements to and from the sites will be identified in the CNVIS prepared for each worksite.

## 10 Continual improvement and corrective action

Monitored noise and vibration levels will be analysed against the applicable NMLs, vibration goals, and predictions made in the relevant CNVIS or using the Project's predictive tools. Where monitored construction noise levels are found to be above modelling predictions or vibration goals are exceeded, the following actions will be undertaken:

Cease the noise and/or vibration generating activity which causes the exceeded predictions,

- Confirm the monitored levels are not being impacted by other noise or vibration sources,
- Confirm if the exceedance is due to an uncharacteristically loud piece of equipment,
- Identify if the equipment can be swapped out for another piece of equipment or alternative equipment or plant,
- Confirm if the exceedance is due to an uncharacteristically vibratory piece of equipment,
- Confirm that the modelling reflects the actual activity being undertaken,
- Implement other feasible and reasonable measures which may include reducing plant size, modifying time of works, changing operational settings (such as turning off the vibratory function of the machine), and utilising alternative construction methodology or a combination of these,
- Review work practices to ensure compliance with the ICNG,
- Notify AA and seek advice,
- Ensure that the learnings from the above are fed back into the noise modelling assessment process for fine-tuning,
- Continue work where impacts can be reduced, and
- Communicate lessons learnt to relevant personnel.

CPB Downer JV will review the work or activity or combination of simultaneous works or activities and where possible, modify the work or activity to prevent any recurrence. Lessons learnt will be communicated to relevant personnel in toolbox talks.

Where a complaint relating to human comfort is received, CPB Downer JV will review the noise and vibration model. If it is determined from the review that there is insufficient local monitoring to validate the noise and vibration model, CPB Downer JV will offer additional monitoring following the process defined in Section 6.1.



## 11 Reporting of Monitoring results

During construction, noise and vibration monitoring data will be collected, tabulated and assessed against baseline conditions and performance criteria. Real time noise and vibration monitoring data will be made available to DPIE and EPA, on request, in accordance with CoA C11(d).

Reporting requirements associated with the Program for the construction phase of the Project are presented in Table 10.1.

Table 11-1: Reporting Requirements

Schedule (during construction)	Requirements	Recipient (relevant authority)
Construction Monitoring Report	In line with MCoA C21, data from noise and vibration monitoring will be reported on a 12-monthly basis within a Construction Monitoring Report.	AA, DPIE, EPA
Noise / vibration investigation Report	Upon request from an EPA officer, an Investigation Report will be submitted to the EPA in relation to specific noise and vibration complaints received	EPA

Additional records relating to noise and vibration training, toolbox talks, monitoring results and audit results are described in Section 3.11 of the CEMP. The complaints management and reporting procedure is described in Section 3.7.4 of the CEMP.



## Appendix C - Out of Hours Work Protocol

# Appendix B3

## Out of Hours Work Protocol

Western Harbour Tunnel and Warringah Freeway Upgrade

SSI-8863

Stage 2 – Warringah Freeway Upgrade

March 2022

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## Document control

### Approval and certification

<b>Title</b>	Out of Hours Work Protocol
<b>Endorsed by Environment Representative</b>	Maurice Pignatelli
<b>Signed</b>	
<b>Dated</b>	
<b>Approved on behalf of TfNSW by</b>	Rob Owens
<b>Signed</b>	
<b>Dated</b>	
<b>Approved on behalf of CPB Downer JV by</b>	Steve Clark
<b>Signed</b>	
<b>Dated</b>	

## Document status

Revision	Date	Description	Approval
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0	16/11/2021	Endorsed by ER and submission to DPI&E	
1	17/01/2022	Update to address DPI&E comments	

## Distribution of controlled copies

This OOHW Protocol as part of the CEMP is available to all personnel and sub-contractors via the Project document control management system. An electronic copy can be found on the Project website.

The document is uncontrolled when printed. One controlled hard copy of the OOHW Protocol as part of the CEMP and supporting documentation will be maintained by the Quality Manager at the Project office [and on the project website].

Copy number	Issued to	Version



## Glossary/ Abbreviations

Abbreviations	Expanded Text
AA	Acoustics Advisor
ABL	Assessment Background Level
Acoustic enclosure	Can include an engineered and designed shed or enclosure, with airborne noise pathways minimised and treated where feasible and reasonable, endeavouring to achieve the Noise Management Levels in the Interim Construction Noise Guidelines (DECC, 2009). Example treatments include noise curtains, shipping containers, acoustic barriers or fast operating doors to limit breakout noise from enclosures
Ambient noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.
Attenuation	The reduction in the level of sound or vibration.
AVTG	Assessing Vibration – a technical guideline (DEC 2006)
CEMP	Construction Environmental Management Plan
CNVG	Construction Noise and Vibration Guideline (Roads and Maritime, 2016)
CoA	Condition of Approval
CSSI	Critical State Significant Infrastructure
dBA	Decibels using the A-weighted scale measured according to the frequency of the human ear.
DEC	Department of Environment and Conservation (now EPA)
DEC	DECC Department of Environment and Climate Change (now EPA)
DECCW	DECCW Department of Environment, Climate Change and Water (now EPA)
DP&E	NSW Department of Planning and Environment (now DPIE)
DPIE	NSW Department of Planning, Industry and Environment
EIS	Environmental Impact Statement
EMS	Environmental management system
Environmental aspect	Defined by AS/NZS ISO 14001:2015 as an element of an organisation's activities, products or services that can interact with the environment.

Abbreviations	Expanded Text
Environmental impact	Defined by AS/NZS ISO 14001:2015 as any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's environmental aspects.
EMM	Environmental Management Measure
Environmental objective	Defined by AS/NZS ISO 14001:2015 as an overall environmental goal, consistent with the environmental policy, that an organisation sets itself to achieve.
Environmental target	Defined by AS/NZS ISO 14001:2015 as a detailed performance requirement, applicable to the organisation or parts thereof, that arises from the environmental objectives and that needs to be set and met in order to achieve those objectives.
EPA	NSW Environment Protection Authority
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPL	Environmental Protection Licence
ER	Environmental Representative
ERG	Environmental Review Group
EWMS	Environmental Work Method Statements
Feasible and reasonable	Consideration of best practice taking into account the benefit of proposed measures and their technological and associated operational application in the NSW and Australian context. Feasible relates to engineering considerations and what is practical to build. Reasonable relates to the application of judgement in arriving at a decision, taking into account mitigation benefits and cost of mitigation versus benefits provided, community views and nature and extent of potential improvements.
Highly noise intensive works	Works which are defined as annoying under the Interim Construction Noise Guideline (DECC, 2009) including: (a) use of power saws, such as used for cutting timber, rail lines, masonry, road pavement or steel work; (b) grinding metal, concrete or masonry; (c) rock drilling; (d) line drilling; (e) vibratory rolling; (f) bitumen milling or profiling; (g) jackhammering, rock hammering or rock breaking; and (h) impact piling
ICNG	Interim Construction Noise Guideline (DECC, 2009)

Abbreviations	Expanded Text
LAeq (15min)	The A-weighted equivalent continuous (energy average) A-weighted sound pressure level of the construction works under consideration over a 15-minute period and excludes other noise sources such as from industry, road, rail and the community.
LA (max)	the A-weighted maximum noise level only from the construction works under consideration, measured using the fast time weighting on a sound level meter.
LA1 (1min)	The A-weighted noise level from the construction works under consideration, measured using the fast time weighting on a sound level meter, which is exceeded for more than 1% of the 1 minute measurement period.
LA90 (15min)	The A-weighted noise level excluding the construction works under consideration, measured using the fast time weighting on a sound level meter, which is exceeded for more than 90% of the 15 minute measurement period.
MCoA	Minister's Condition of Approval
MWD	Minimum working distance
NCA	Noise Catchment Areas
NML	Noise management levels
NVMP	Noise and Vibration Management Plan
NVMoP	Noise and Vibration Monitoring Program
OEH	Office of Environment and Heritage
OOHW	Out-of-Hours Works – work completed outside of standard construction hours
PPV	Peak Particle Velocity
RBL	The Rating Background Level for each period is the medium value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period (day, evening, night and shoulder period)
Roads and Maritime	Roads and Maritime Services
SWL	Sound Power Level

Abbreviations	Expanded Text
Sensitive land user(s) / Sensitive receiver(s)	Includes residences, educational institutions (including preschools, schools, universities, TAFE colleges), health care facilities (including nursing homes, hospitals), religious facilities (including churches), child care centres and passive recreation areas (including outdoor grounds used for teaching). Receivers that may be considered to be sensitive include commercial premises (including film and television studios, research facilities, entertainment spaces, temporary accommodation such as caravan parks and camping grounds, restaurants, office premises, and retail spaces) and industrial premises as identified by the Planning Secretary
SPL	Sound Pressure Level
SSD	State Significant Development
SSI	State Significant Infrastructure
TfNSW	Transport for NSW
Works	Any physical work to construct or facilitate the construction of the CSSI, including low impact work, environmental management measures and utility works. However, does not include activities that informs or enables detailed design of the CSSI and generates noise that is no more than 5 dB(A) above the rating background level (RBL) at any sensitive land user(s)

Note: Refer to *Instrument of Approval - SSI-8863* for additional abbreviations and definitions relevant to the Project.

# 1 Introduction

## 1.1 Context

This Out-of-Hours Work Protocol (herein referred to as the Protocol) for the Warringah Freeway Project - Stage 2 (the Project) has been prepared in accordance with conditions of approval (CoA) E68(c)(ii) and E69. It defines the process for assessment and approval of work undertaken outside of standard construction working hours (out-of-hours work, OOHW) that is not subject to an Environment Protection Licence (EPL).

The majority of OOHW undertaken for the Project are intended to be performed subject to an EPL. Once obtained, a copy of the current EPL premise boundary will be available on the Project Website (<https://caportal.com.au/rms/wht>).

In the event OOHW are required that will not be subject to an EPL, this Protocol will be implemented.

OOHW that is not subject to an EPL has the potential to exceed relevant noise management levels (NMLs) determined in accordance with the approach outlined in the Interim Construction Noise Guidelines (DECC, 2009) (ICNG). As OOHW has the potential to impact on the amenity of adjacent sensitive receivers, the work requires assessment and approval prior to commencement.

CoA E69 requires that this Protocol is prepared in consultation with the ER, AA and the EPA and approved by the Planning Secretary.

## 1.2 Background and project description

The Western Harbour Tunnel and Warringah Freeway upgrade EIS (Jacobs/Arcadis 2020) assessed noise and vibration impacts on sensitive receivers and structures during construction and operation of the Project, within Chapter 10 and the Noise and Vibration Technical Working Paper (Appendix G of the EIS).

The EIS identified the potential for noise and vibration impacts during construction which are dependent on the types of construction activity in progress and the proximity of works to sensitive receivers. However, it concluded any potential impacts could be managed by tailored mitigation and management measures, including construction noise and vibration monitoring. Please refer to section 1.3 of the Construction Environmental Management Plan (CEMP) for the Project description.

## 2 Purpose and objectives

The CoA defines the approved working hours for the Project. The approved construction working hours for the Project are defined in CoA E66 as being:

- 7:00 am to 6:00 pm Mondays to Fridays, inclusive;
- 8:00 am to 6:00 pm Saturdays; and
- At no time on Sundays or public holidays.

In accordance with CoA E69, this Protocol defines the process for the assessment and approval of work that is not subject to an EPL and needs to occur outside of the time periods stipulated above (i.e. needs to occur during an OOHW period).

This Protocol will apply to the two following OOHW periods:

- OOHW Period 1:
  - Monday to Friday: 6pm to 10pm;
  - Saturday: 7am to 8am and 6pm to 10pm; and
  - Sunday and Public Holidays: 8am to 6pm;
- OOHW Period 2:
  - Monday to Friday: after 10pm and prior to 7am;
  - Saturday: after 10pm and prior to 8am; and
  - Sunday and Public Holidays: after 6pm and prior to 8am.

In accordance with CoA E88, Out-of-Hours Work along the Warringah Freeway corridor which results in an exceedance of the relevant NML at the same sensitive land user(s) may be undertaken in accordance with the following criteria:

- a) two consecutive evenings and/or nights per week; or
- b) three non-consecutive evenings and/or nights per week; or
- c) 10 evenings and/or nights per month; or
- d) except as identified by an EPL; or
- e) in accordance with an agreement with a potentially impacted receiver(s) as required by Condition E68(c)(iii) or Condition E83.

### 2.1 Minister's Conditions of Approval

The MCoA that relate to construction noise and vibration and how they are being addressed by the Project are provided in the NVMP. MCoA relevant to this OOHW Protocol are provided in Table 1. A cross-reference is included to indicate where each condition is addressed in this OOHW Protocol or other project management document.



Table 1 - Minister's Conditions of Approval that address out of hours works

Reference	Relevant condition	Where addressed
A34	<p>The approved AA must:</p> <p>(d) review all proposed night-time works to determine if sleep disturbance would occur and recommend measures to avoid sleep disturbance or appropriate additional alternative mitigation measures</p>	Section 5
E66	<p>Work must only be undertaken during the following hours:</p> <p>(a) 7:00am to 6:00pm Mondays to Fridays, inclusive;</p> <p>(b) 8:00am to 6:00pm Saturdays; and</p> <p>(c) at no time on Sundays or public holidays</p>	Section 2
E67	<p>Except as permitted by an EPL, highly noise intensive works that result in an exceedance of the applicable NML at the same receiver must only be undertaken:</p> <p>(a) between the hours of 8:00 am to 6:00 pm Monday to Friday;</p> <p>(b) between the hours of 8:00 am to 1:00 pm Saturday; and</p> <p>(c) if continuously, then not exceeding three hours, with a minimum cessation of work of not less than one hour.</p> <p>For the purposes of this condition, 'continuously' includes any period during which there is less than one hour between ceasing and recommencing any of the work.</p>	Section 4.4
E68	<p>Notwithstanding Conditions E66 and E67 work may be undertaken outside the hours specified in any of the following circumstances:</p> <p>(a) Safety and Emergencies, including:</p> <p>(i) for the delivery of materials required by the NSW Police Force or other authority for safety reasons; or</p> <p>(ii) where it is required in an emergency to avoid injury or the loss of life, to avoid damage or loss of property or to prevent environmental harm.</p> <p>On becoming aware of the need for emergency work in accordance with Condition E68(a)(ii), the Proponent must notify the AA, the ER, the Planning Secretary and the EPA of the reasons for such work. The Proponent must use best endeavours to notify all noise and/or vibration affected sensitive land user(s) of the likely impact and duration of those work.</p> <p>(b) Low impact, including:</p> <p>(i) construction that causes LAFmax(15 minute) noise levels: • no more than 5 dB(A) above the rating background level at any residence in accordance with the ICNG, or • no more than the 'Noise affected' NMLs specified in Table 3 of the ICNG at other sensitive land user(s); or</p> <p>(ii) construction that causes LAFmax(15 minute) noise levels no more than 15 dB(A) above the rating background level at any residence; or</p>	<p>Section 1.1</p> <p>Section 3.1</p> <p>Refer to Section 6.2 of NVMP</p>

Reference	Relevant condition	Where addressed
	<p>(iii) construction that causes:</p> <ul style="list-style-type: none"> <li>• continuous or impulsive vibration values, measured at the most affected residence are no more than the preferred values for human exposure to vibration, specified in Table 2.2 of Assessing Vibration: a technical guideline (DEC, 2006), or</li> <li>• intermittent vibration values measured at the most affected residence are no more than the preferred values for human exposure to vibration, specified in Table 2.4 of Assessing Vibration: a technical guideline (DEC, 2006).</li> </ul> <p>(c) By Approval, including:</p> <p>(i) where different construction hours are permitted or required under an EPL in force in respect of the CSSI; or</p> <p>(ii) works which are not subject to an EPL that are approved under an Out-of-Hours Work Protocol as required by Condition E69; or</p> <p>(iii) negotiated agreements with directly affected residents and sensitive land user(s).</p> <p>(d) By Prescribed Activity, including:</p> <p>(i) tunnelling (excluding cut and cover tunnelling and surface works) and tunnel fit out works (excluding surface works) are permitted 24 hours a day, seven days a week; or</p> <p>(ii) delivery of material that is required to occur outside of standard construction hours in Condition E66 to directly support tunnelling activities, except between the hours 10:00 pm and 7:00 am to/from WHT7 at Berrys Bay which could result in a sleep disturbance event for receivers in the proximity of Bay Road and Balls Head Road, Waverton; or</p> <p>(iii) works within an acoustic shed where there is no exceedance of the NMLs; or</p> <p>(iv) trailer suction hopper dredging; or</p> <p>(v) along the Warringah Freeway corridor in accordance with Condition E88.</p>	
E69	<p>An Out-of-Hours Work Protocol must be prepared to identify a process for the consideration, management and approval of work which is outside the hours defined in Conditions E66, and that are not subject to an EPL. The Protocol must be approved by the Planning Secretary before commencement of the Out-of-Hours Work. The Protocol must be prepared in consultation with the ER, AA and EPA.</p> <p>The Protocol must provide:</p>	This document Annexure 1
	<p>(a) identification of low and high-risk activities and an approval process that considers the risk of activities, proposed mitigation, management, and coordination, including where:</p> <p>(i) the ER and AA review all proposed out-of-hours activities and confirm their risk levels,</p>	Section 6  Section 6.1

Reference	Relevant condition	Where addressed
	(ii) low risk activities can be approved by the ER in consultation with the AA, and (iii) high risk activities that are approved by the Planning Secretary;	
	(b) a process for the consideration of out-of-hours work against the relevant NML and vibration criteria;	Section 3, Annexure 1
	(c) a process for selecting and implementing mitigation measures for residual impacts in consultation with the community at each affected location, including respite periods consistent with the requirements of Condition E83. The measures must take into account the predicted noise levels and the likely frequency and duration of the out-of-hours works that sensitive land user(s) would be exposed to, including the number of noise awakening events;	Section 4 Section 5 Section 7
	(d) procedures to facilitate the coordination of out-of-hours work including those approved by an EPL or undertaken by a third party, to ensure appropriate respite is provided; and	Section 4.5
	(e) notification arrangements for affected receivers for all approved out-of-hours works and notification to the Planning Secretary of approved low risk out-of-hours works.  This condition does not apply if the requirements of Condition E68(b) are met.	Section 7
E70	<p>Mitigation measures must be implemented with the aim of achieving the following construction noise management levels and vibration objectives:</p> <p>(a) construction 'Noise affected' NML established using the Interim Construction Noise Guideline (DECC, 2009);</p> <p>(b) vibration criteria established using the Assessing vibration: a technical guideline (DEC, 2006) (for human exposure);</p> <p>(c) Australian Standard AS 2187.2 - 2006 "Explosives - Storage and Use - Use of Explosives";</p> <p>(d) BS 7385 Part 2-1993 "Evaluation and measurement for vibration in buildings Part 2" as they are "applicable to Australian conditions"; and</p> <p>(e) the vibration limits set out in the German Standard DIN 4150-3: Structural Vibration- effects of vibration on structures (for structural damage). Any work identified as exceeding the noise management levels and/or vibration criteria must be managed in accordance with the Noise and Vibration CEMP Sub-plan.</p> <p>Any work identified as exceeding the noise management levels and/or vibration criteria must be managed in accordance with this Sub-plan.</p> <p>Note: The ICNG identifies 'particularly annoying' activities that require the addition of 5 dB(A) to the predicted level before comparing to the construction NML.</p>	Noted

Reference	Relevant condition	Where addressed
E75	Construction Noise and Vibration Impact Statements (CNVIS) must be prepared for any work that may exceed the noise management levels, vibration criteria and/or ground-borne noise levels specified in Condition E70 and Condition E71 at any residence outside construction hours identified in Condition E66, or where receivers will be highly noise affected. The CNVIS must include specific mitigation measures identified through consultation with affected sensitive land user(s) and the mitigation measures must be implemented for the duration of the works. A copy of the CNVIS must be provided to the AA and ER prior to the commencement of the associated works. The Planning Secretary may request a copy/ies of CNVIS.	Section 4
E82	<p>All work undertaken for the delivery of the CSSI, including those undertaken by third parties (such as utility relocations), must be coordinated to ensure respite periods are provided. The Proponent must:</p> <p>(a) reschedule any work to provide respite to impacted noise sensitive land user(s) so that the respite is achieved in accordance with Condition E83; or</p> <p>(b) consider the provision of alternative respite or mitigation to impacted noise sensitive land user(s); and</p> <p>(c) provide documentary evidence to the AA in support of any decision made by the Proponent in relation to respite or mitigation.</p> <p>The consideration of respite must also include all other CSSI, SSI and SSD projects which may cause cumulative and/or consecutive impacts at receivers affected by the delivery of the CSSI.</p>	Section 4.5
E83	<p>In order to undertake out-of-hours work outside the hours specified under Condition E66, the Proponent must identify appropriate respite periods for the out-of-hours work in consultation with the community at each affected location on a regular basis.</p> <p>This consultation must include (but not be limited to) providing the community with:</p> <p>(a) a progressive schedule for periods no less than three months, of likely out-of-hours work;</p> <p>(b) a description of the potential work, location and duration of the out-of-hours work;</p> <p>(c) the noise characteristics and likely noise levels of the work; and</p> <p>(d) likely mitigation and management measures which aim to achieve the relevant noise management levels under Condition E70 (including the circumstances of when respite or relocation offers will be available and details about how the affected community can access these offers).</p> <p>The outcomes of the community consultation, the identified respite periods and the scheduling of the likely out-of-hour work must be provided to the AA, ER, EPA and the Planning Secretary.</p>	Section 5 Section 7

Reference	Relevant condition	Where addressed
	Note: Respite periods can be any combination of days or hours where out-of-hours work would not be more than 5 dB(A) above the rating background noise level at any residence.	
E88	<p><b>Warringah Freeway Upgrade – Out-of-Hours Work periods</b></p> <p>Out-of-Hours Work along the Warringah Freeway corridor which results in an exceedance of the relevant NML at the same sensitive land user(s) may be undertaken in accordance with the following criteria:</p> <ul style="list-style-type: none"> <li>(a) two consecutive evenings and/or nights per week; or</li> <li>(b) three non-consecutive evenings and/or nights per week; or</li> <li>(c) 10 evenings and/or nights per month; or</li> <li>(d) except as identified by an EPL; or</li> <li>(e) in accordance with an agreement with a potentially impacted receiver(s) as required by Condition E68(c)(iii) or Condition E83.</li> </ul>	Section 2

## 3 OOHW Assessment Process

### 3.1 OOHW Justification

Construction work associated with the Project will be undertaken in accordance with the assessment and management approach outlined in the ICNG and the Roads and Maritime Construction Noise and Vibration Guideline (CNVG).

The approved construction hours for the Project are outlined in CoA E66, where work is proposed outside of these hours, it must be appropriately justified with consideration to the ICNG. These requirements are reflected in CoA E68 for the Project. The ICNG outlines five categories of work that might be undertaken out of hours. OOHW may be required on public infrastructure projects, such as on road construction projects, to sustain the operational integrity of roads.

Justification for any activities proposed as OOHW must be established to the satisfaction of the Environmental Representative (ER) and the Acoustic Advisor.

As per CoA E69, all OOHW that are not subject to an EPL are regulated through this Protocol. This may include:

- Works which could result in a high risk to construction personnel or public safety, based on a risk assessment carried out in accordance with AS/NZS ISO 31000:2009 “Risk Management – Principals and Guidelines”,
- Where the relevant road network operator has advised CPB Downer JV in writing that carrying out the works and activities could result in a high risk to road network operational performance,
- Where the relevant utility service operator has advised CPB Downer JV in writing that carrying out the works and activities could result in a high risk to the operation and integrity of the utility network,
- Where the Transport for New South Wales (TfNSW) Transport Management Centre (or other road authority) has advised CPB Downer JV in writing that a road occupancy licence is required and will not be issued for the works or activities during the hours specified in CoAs E66 and E67.

Note: once an EPL is obtained for the Project, this Protocol will be revised to include details of EPL conditions that relate to OOHW.

### 3.2 OOHW Permit

For any proposed OOHW, the following process will be carried out:

1. An OOHW Permit will be prepared that summarises the activities, equipment required, location and duration, timing, predicted noise levels, standard mitigation measures and additional mitigation measures, and includes a detailed justification for works (in accordance with Section 3.1),
2. The OOHW Permit will be submitted to the Environment Team, who will undertake a noise and vibration assessment for the OOHW (refer to Section 4). Predicted noise impacts and appropriate mitigation measures will be determined as per Section 5 of this Protocol.
3. The CPB Downer JV Environment and Suitability Manager will determine whether the justification for the OOHW works is satisfactory.
4. Approval of the OOHW Permit will follow the process outlined in Section 6 of this Protocol,
5. Community consultation and notification will be undertaken in accordance with the Communication Strategy, as outlined in Section 7 of this Protocol, and



6. Monitoring will be undertaken in accordance with Section 9 of this Protocol and the Project's Construction Noise and Vibration Monitoring Program.

## 4 OOHW Noise and Vibration Assessment

In accordance with CoA E69(b) this section outlines the noise and vibration assessment process where OOHW is assessed against the relevant NML and vibration criteria.

Site-specific construction noise and vibration impact statements (CNVIS) will be prepared by an appropriately qualified and experienced acoustic consultant. In accordance with MCoA E75, CNVIS will be prepared for any work that may exceed the noise management levels, vibration criteria and/or ground-borne noise levels specified in CoA E70 and E71 at any residence outside construction hours identified in CoA E66, or where receivers will be highly noise affected. Refer Section 8 of the NVMP.

The CNVIS would include specific mitigation measures identified through consultation with affected sensitive land user(s) and the mitigation measures must be implemented for the duration of the works. The CNVIS documents will provide all feasible and reasonable noise mitigation measures to ensure the best achievable noise levels for each scope of work. A copy of the CNVIS must be provided to the AA and ER prior to the commencement of the associated works. The Planning Secretary may request a copy/ies of CNVIS.

### 4.1 Noise

To manage potential impacts from noise and vibration during OOHW, CPB Downer JV's noise and vibration specialists have developed tools that enable the prediction and assessment of potential noise and vibration impacts resulting from proposed OOHW in specific work areas. These prediction tools provide assistance in managing noise and vibration impacts on sensitive receivers, based on the specific work areas and types of construction machinery operating in the work area. The tools will identify the potentially affected sensitive receivers, the predicted impacts (including the number of noise awakening events) and any additional mitigation measures required. To minimise cumulative noise impacts, the prediction tools will also consider any other OOHW that is planned during the proposed OOHW.

The results of the OOHW noise assessment, including the selection of reasonable and feasible management measures from the NVMP, ICNG and CNVG, will be considered by the CPB Downer JV construction team and the Environment Manager. This will be used to determine the appropriate approval pathway for the OOHW (refer Section 6 and Annexure 1). Ongoing monitoring and validation of predictive outputs will be undertaken as detailed in the NVMP. Monitoring and validation are to be undertaken in accordance with Section 5 and Section 9.

### 4.2 Vibration

If vibration intensive activities are proposed as OOHW and have the potential to impact on sensitive receivers or structures, they will be assessed for compliance with minimum working distances as defined in relevant Construction Noise and Vibration Impact Statements (CNVISs) (refer to Section 7.2 of the NVMP) including:

- Cosmetic structural damage impacts,
- Disturbance to building occupants due to vibration.

Ongoing monitoring and validation of predictive outputs will be undertaken as detailed in the NVMP. Monitoring and validation are to be undertaken in accordance with Section 5 and Section 9.

### 4.3 Ground-borne Noise

When assessing works under the Protocol, impacts to receivers will consider cumulative impacts if the receiver is also affected by ground-borne noise at residential levels identified in CoA E71; 40dB(A) 6pm-10pm and 35dB(A) 10pm-7am. Inputs to the assessment will use validated ground-borne noise predictions using the tools detailed in the NVMP.

## 4.4 Highly noise intensive work

As required by CoA E67, except as permitted by an EPL, highly noise intensive works that result in an exceedance of the applicable NML at the same receiver must only be undertaken:

- between the hours of 8:00 am to 6:00 pm Monday to Friday
- between the hours of 8:00 am to 1:00 pm Saturday
- if continuously, then not exceeding three (3) hours, with a minimum respite from those activities and works of not less than one (1) hour.

'Continuous' includes any period during which there is less than one (1) hour between ceasing and recommencing any of the work.

For OOHW subject to this Protocol that involves the use of highly noise intensive equipment:

- Highly noise intensive equipment will be used prior to 10 pm where reasonable and feasible,
- Where the above cannot be achieved, the equipment will be used prior to midnight where reasonable and feasible, and
- CPB Downer JV will consider use of alternative respite periods to minimise noise impacts, such as reduced respite periods to try and complete highly noise intensive works as early in the night as possible.

In accordance with CoA E83, to identify the appropriate respite periods for work proposed under this Protocol, CPB Downer JV will consult with the ER, AA and the community at each affected location. The affected locations will be identified from the Project's noise prediction tool outputs for the proposed OOHW. The outcomes of the consultation and the noise prediction tool outputs will also be used to identify appropriate mitigation measures to be implemented for the proposed OOHW. The process for stakeholder consultation for OOHW is further detailed in Section 7.

## 4.5 Coordination of OOHW

As part of the noise and vibration assessment process (in accordance with CoA E69(d)), CPB Downer JV will ensure all OOHW permitted by either an EPL or this protocol are co-ordinated to implement appropriate respite and/or mitigation measures for potentially affected sensitive receivers.

In accordance with CoA E88, CPB Downer JV will ensure that no more than 2 nights per week or 10 nights per month of out-of-hours work will occur that impacts the same receiver by more than 5 dB above RBL, except as identified by an EPL or in accordance with an agreement with a potentially impacted receiver(s) as required by Condition E68(c)(iii) or Condition E83.

To facilitate the coordination of out-of-hours work with other projects, the following actions will be undertaken throughout the construction phase:

- CPB Downer JV will seek to identify any relevant third parties in proximity to proposed OOHW. This will primarily occur through consultation with DPIE, relevant Councils and Utility providers.
- CPB Downer JV to provide as much advance notice as possible regarding works to be undertaken out of hours to any identified relevant third parties. Notice will be provided in writing and in accordance with the Communication Strategy and Community Action Plan
- CPB Downer JV Project Manager, Utility Coordination Manager and/or Community Manager to communicate with relevant third parties. The frequency of communication is dependent on the nature of OOHW being proposed by both CPB Downer JV and any relevant third parties
- If out-of-hours works from any relevant third parties are being undertaken in close proximity to proposed OOHW, the proposed OOHW will be reviewed to ensure appropriate respite periods are provided.

In accordance with CoA E82, all work undertaken for the delivery of the Project, including those undertaken by third parties (such as utility relocations) and other Critical/State Significant

Infrastructure, and State Significant Development, must be coordinated to ensure respite periods are provided. CPB Downer JV must:

- Reschedule any work to provide respite to impacted noise sensitive receivers so that the respite is achieved in accordance with CoA E83; or
- Consider the provision of alternative respite or mitigation to impacted noise sensitive land user(s); and
- Provide documentary evidence to the Acoustic Advisor in support of any decision made by CPB Downer JV in relation to respite or mitigation. This will be provided as part of the OOHW permit (refer Annexure 1).

It is noted that other projects / utility providers / etc. may also have their own procedures in place regarding out-of-hours works. This procedure may need to be altered to consider external influences.

## 5 OOHW Noise and Vibration Management Procedures

Following the noise and vibration assessment process as described in Section 4, the most appropriate reasonable and feasible management measures will be determined in accordance with the NVMP, ICNG, and the standard mitigation measures set out in Appendix B of the CNVG.

In addition, the CNVG directs that the Project should consider implementing the additional mitigation measures detailed in Appendix C of the CNVG where feasible and reasonable, and as outlined in Table 2 and Table 3 below.

In accordance with the CNVG, the additional mitigation measures (AMMs) are defined as follows:

- **Notification (N):** consists of a letterbox drop (or equivalent) detailing work activities, time periods over which these will occur, impacts and mitigation measures.
- **Specific Notification (SN):** provides additional information when relevant and informative to more highly affected receivers than covered in general letterbox drops.
- **Phone Calls (PC):** detailing relevant information made to identified/affected stakeholders.
- **Respite Offers (RO):** to provide residents with respite from ongoing impact. In accordance with CoA E83 note, respite can be any combination of days or hours where out-of-hours works would not be more than 5dBA above the rating background level (Table 2, noticeable category).
- **Respite Period 1 (R1):** where out-of-hours construction noise in OOHW Period 1 is generally limited to no more than three consecutive evenings per week.
- **Respite Period 2 (R2):** where out-of-hours construction noise in OOHW Period 2 is generally limited to two consecutive nights.
- **Duration Respite (DR):** where an agreement with the community has been made, it may be beneficial to increase the work duration, number of evenings or nights worked through Duration Respite so that the project can be completed more quickly (refer Section 7.1).
- **Alternative Accommodation (AltA):** will be offered to residents living in close proximity to construction works that are likely to experience highly intrusive noise levels. The specifics of the offer will be identified on a case-by-case basis. Additional aspects for consideration shall include whether the highly intrusive activities occur throughout the night or before midnight.
- **Verification (V):** includes the measurement of the background noise level and construction noise to verify that actual noise levels do not exceed predicted noise levels, and that applied mitigation measures are appropriate.

Table 2 and Table 3 detail the relevant additional mitigation measures from the CNVG to be applied during OOHW.

It should be noted that the sensitive receivers may have personal circumstances, which means that the approach to specific additional mitigation measures in Table 2 and 3 may not be suitable. The Communications and Stakeholder Manager has the authority to amend the approach for specific sensitive receivers by taking into account the personal circumstances that may apply.

In accordance with CoA A34(d),(e) and (f), the AA will regularly monitor and review the implementation of this OOHW protocol, including the nominated mitigation measures, and will consider and recommend any necessary improvements that may be made to avoid or minimise adverse noise and vibration impacts. This will ensure that appropriate noise and vibration mitigation measures are applied throughout the delivery of the Project.

Table 2 - Triggers for additional mitigation measures – airborne noise

Predicted airborne LAeq (15min) noise level at sensitive receiver			Additional mitigation measures
Perception	dB(A) above RBL	dB(A) above NML–	Type <sup>1</sup>
<b>All hours</b>			
75 dB(A) or greater			N, V, PC, RO
<b>OOHW period 1<sup>2</sup></b>			
Noticeable	5 to <10	<5	--
Clearly audible	10 to <20	5 to <15	N, R1, DR
Moderately intrusive	20 to 30	15 to 25	V, N, R1, DR
Highly intrusive	>30	>25	V, IB, N, R1, DR, PC, SN
<b>OOHW period 2<sup>3</sup></b>			
Noticeable	5 to <10	<5	N
Clearly audible	10 to <20	5 to <15	V, N, R2, DR
Moderately intrusive	20 to 30	15 to 25	V, IB, N, PC, SN, R2, DR
Highly intrusive	>30	>25	AltA <sup>4</sup> , V, N, PC, SN, R2, DR

Note:

1. AltA = Alternative Accommodation, V = Verification, IB = Individual Briefings, N = Notification, R1 = Respite period 1, R2 = Respite Period 2, DR = Duration Respite, PC = Phone Calls, SN = Specific Notifications.
2. OOHW Period 1 refers to Mon-Fri (6pm-10pm), Sat (7am-8am & 6pm-10pm), Sun/Pub Hol (8am-6pm).
3. OOHW Period 2 refers to Mon-Fri (10pm-7am), Sat (10pm-8am), Sun/Pub Hol (6pm-8am).
4. Temporary relocation to be offered where construction works are planned to extend over more than two consecutive nights at that impact classification.



Table 3 - Triggers for additional mitigation measures - vibration

Predicted vibration level at sensitive receiver	Additional mitigation measures	
	Type <sup>1</sup>	Apply to
<b>OOHW period 1<sup>2</sup></b>		
Predicted Vibration Exceeds Human Comfort Screening Levels	V, IB, N, RO, PC, RO, SN	All affected receivers
Predicted Vibration Exceeds Structural Damage Screening Levels	V, AC	All affected receivers
<b>OOHW period 2<sup>3</sup></b>		
Predicted Vibration Exceeds Human Comfort Screening Levels	AltA <sup>4</sup> , V, IB, N, PC, RO, SN	All affected receivers
Predicted Vibration Exceeds Structural Damage Screening Levels	V, AC	All affected receivers

Note:

1. AltA = Alternative Accommodation, AC = Alternative Construction Methodology, V = Validation of predicted levels, IB = Individual Briefings, N = Notification, RO = Respite Offer (project specific), PC = Phone Calls, SN = Specific Notifications.
2. OOHW Period 1 refers to Mon-Fri (6pm-10pm), Sat (7am-8am & 6pm-10pm), Sun/Pub Hol (8am-6pm)
3. OOHW Period 2 refers to Mon-Fri (10pm-7am), Sat (10pm-8am), Sun/Pub Hol (6pm-8am)
4. Temporary relocation to be offered where construction works are planned to extend over two or more consecutive nights at that impact classification.

## 6 Approval of OOHW not subject to an EPL

### 6.1 Identification of Risk Level

In accordance with CoA E69(a)(ii), the Environmental Representative (ER) has the authority to approve low risk OOHW activities in consultation with the Acoustic Advisor. Any high risk OOHW activities must be approved by the Planning Secretary.

In accordance with CoA E69(a)(i), the ER and AA will review all proposed out-of-hours activities and confirm their risk levels.

Low risk work is defined as:

1. OOHW assessed vibration to remain below human comfort limits at sensitive receivers, **and**
2. OOHW assessed to meet the perception classification of Noticeable (refer Table 2), **or**
3. OOHW assessed to meet the perception classification of Clearly Audible (refer Table 2) at any one residential receiver for a maximum of:
  - a. Three evenings and night periods in a calendar week with only two consecutive evenings and night periods permitted
  - b. A maximum of 10 evenings and nights periods in a calendar month.

Note: In accordance with CoA E88 the effect of the items above facilitates two evening and night periods in a row and at least one period off before the third period that week. Four consecutive nights are not permitted e.g. two consecutive nights at the end of one week, with two consecutive nights at the start of the next week. In this instance at least one period off would be required before commencing work the next week. Exceptions to these limits only apply where identified by an EPL or in accordance with an agreement with a potentially impacted receiver(s) (CoA E68(c)(iii) or CoA E83).

Additional measures for providing respite may need to be considered where residents are restricted from leaving home to seek respite during COVID-19 lockdown orders. This would be handled on a case-by-case basis.

If the noise and duration limitations outlined above cannot be achieved, the proposed OOHW will be classified as high risk. In this instance, the assessment of the proposed OOHW and the OOHW Permit will be issued to the Planning Secretary for review and approval.

### 6.2 Approval Process

Refer to Annexure 1 for a flow chart of the approval process for OOHW not subject to an EPL.

When it is identified that OOHW are required and are not subject to an EPL, the engineer responsible for the work will submit an OOHW Permit to the CPB Downer JV Environment Team. This OOHW Permit will include details of the proposed activity and justification for the need to carry out the work as OOHW.

Following this, the noise and vibration assessment process as described in Section 4 will be undertaken by a member of the CPB Downer JV Environment Team for the proposed OOHW. The outcomes of the noise and vibration assessment, including relevant management measures, will be forwarded to the Environment Manager who in consultation with the AA, will review the level of risk associated with the activity, the predicted impacts and the management measures to be implemented.

Applications for 'high risk' work for approval by the Planning Secretary (CoA E69 (a)(iii)) will include a noise assessment that comprises either a Construction Noise and Vibration Impact Statement (CNVIS) or noise modelling outputs and relevant management measures. The form of noise assessment required for each application will be determined based on the nature of the works (type, duration etc).

Following approval by the ER (in consultation with the AA) or the Planning Secretary, the approved OOHW Permit will be provided to the relevant construction team by the Environment Manager. On receipt of the approved OOHW Permit, any standard and additional mitigation measures that relate to the OOHW will be:

- Implemented prior to OOHW (such as specific conditions that relate to the community),
- Communicated to relevant workforce and site personnel before each shift to introduce/reinforce work restrictions, management measures and expected workforce behaviour, and
- Implemented during OOHW and monitored by the CPB Downer JV Environment Team to confirm/validate the noise predictions.

Prior to, and during the OOHW, the AA will verify that the above approach has been followed and advise opportunities for improvement in accordance with CoA A34(c). CPB Downer JV will consider any recommendation made by the AA to improve OOHW practices.

Following the OOHW, CPB Downer JV will review any lessons learnt and monitoring data to help inform future OOHW activities and mitigation measures and minimise impact.

CPB Downer JV will provide noise and vibration monitoring results and any other relevant information reasonably requested to the AA, ER and TfNSW for the purposes of review and verification.

## 7 OOHW Stakeholder Consultation and Communication

The Communications Team will use a range of communication tools to provide clear, effective and timely information to the predicted affected sensitive receivers and stakeholders. The method of communication will be chosen based on the nature of works and the potential impacts. All community consultation would be carried out in accordance with the Communication Strategy and as required by this Protocol.

In accordance with CoA E69(e), notification will be provided for affected receivers for all approved out-of-hours works and notification to the Planning Secretary of approved low risk out-of-hours works.

In accordance with CoA E83, copies of OOHW notifications would be provided to the ER, AA, DPI&E and EPA on a monthly basis. As required by the Communication Strategy, these OOHW notifications would also be available on the Project website.

Where required by the CNVG, CPB Downer JV will notify potentially affected sensitive receivers and other stakeholders of planned OOHW. In accordance with the requirements of the Environmental Protection License (EPL), all OOHW notification shall be undertaken not less than 5 calendar days and not more than 14 calendar days before the work is to be carried out. As discussed in Section 4, CPB Downer JV will identify appropriate respite periods for OOHW in consultation with the community at each affected location.

This consultation will be conducted in accordance with the Communication Strategy and CoA E83. It will include the provision of the following information to affected receivers:

- A progressive schedule of likely out-of-hours work for a period of no less than three (3) months,
- A description of the potential out-of-hours, including location and duration,
- The noise characteristics and likely noise levels of the works, and
- Likely mitigation and management measures.

The outcomes of the community consultation, the identified respite periods and the scheduling of the likely OOHW will be provided to the AA, ER, EPA and the Planning Secretary.

### 7.1 Community Agreement

In accordance with CoA E68(c)(iii), variation to working hours may occur following negotiated agreements with affected residents and sensitive land user(s). If such negotiated agreements can be made the overall duration of OOHW may be reduced. Negotiated agreements made in accordance with CoA E68(c)(iii) would allow proposed OOHW to occur outside of the provisions of Respite 1 and Respite 2. This provision would allow for an accelerated program of OOHW by permitting additional OOHW shifts per week.

CPB Downer JV may identify OOHW which would provide benefit to the community if completed through an accelerated program. In these instances, CPB Downer JV may engage with and seek agreement from the noise affected community to conduct the works through this accelerated program.

CPB Downer JV must engage with and seek agreement in writing from all sensitive receivers which modelling has predicted to be impacted by noise greater than the NML (this includes receivers that have previously declined to participate in agreements). The agreement must detail:

- The actual works proposed
- Expected impacts in clear, simple English based on noise modelling
- Expected duration of the works
- Any expected benefits for the receivers

- Any other concurrent OOHW that will be occurring
- Any other OOHW that will be occurring on the nights preceding and following the proposed works or, if the proposed work precedes or follows a weekend period, any other OOHW that will be occurring on the weekend.

Agreement must be reached with a substantial majority of potentially affected sensitive receivers. Community agreements will be undertaken in accordance with the Community Communications Strategy prepared under CoA B1. CPB Downer JV must keep a record of all attempts made to contact sensitive receivers and requests made to the body corporate; these records must be kept for the duration of the OOHW. Where CPB Downer JV is not able to contact a sensitive receiver, the receiver will be recorded as having no response.

## 7.2 Respite Consultation

Respite (for example Respite Period 1 and Respite Period 2 identified in Table 2 and Table 3) generally involves programming the works so they are undertaken in blocks so that any one receiver is not impacted by noise and vibration for continuous periods. In accordance with CoA E69(c) mitigation measures must consider the predicted noise levels and the likely frequency and duration of the out-of-hours works that sensitive receivers would be exposed to, including the number of sleep disturbance events.

Additionally, in accordance with CoA E82, the consideration of respite must also include all other Critical State Significant Infrastructure, State Significant Infrastructure and State Significant Development projects which may cause cumulative and/or consecutive impacts at receivers affected by the delivery of the CSSI.

In accordance with CoA E83, where OOHW is required, CPB Downer JV will identify appropriate duration respite periods for the OOHW in consultation with the community at each affected location, as identified by the assessment process outlined in Section 4. Based on the noise assessment, duration respite will be considered as a mitigation measure when the trigger levels in Table 2 are exceeded. This is identified as 'DR' in the table. OOHW notifications will provide contact details for receivers that wish to discuss further options outside the consultation described above.

The outcomes of the community consultation, the identified respite periods and the scheduling of the likely out-of-hours works will be provided to the Acoustic Advisor, ER, EPA and Planning Secretary in the form of a Community Respite Consultation Summary Report. These reports will be developed following each respite consultation event required under CoA E83.

## **8 External Approval Authorities for OOHW**

### **8.1 Environmental Representative and Acoustics Advisor**

In accordance with CoA E69 (a)(ii), if the proposed OOHW (that is not subject to an EPL) only includes low risk activities (refer to Section 6), the OOHW can be approved by the ER, in consultation with the AA.

### **8.2 DPI&E**

In accordance with CoA E69 (a)(iii), if the proposed OOHW (that is not subject to an EPL) includes high risk activities (refer to Section 6), approval of the OOHW will be sought from the Planning Secretary.



## 9 OOHW Monitoring

### 9.1 Noise and vibration monitoring

Noise and vibration monitoring of OOHW will be conducted and documented in accordance with the Project's Construction Noise and Vibration Monitoring Program (refer to Annexure B of the NVMP).

In accordance with the ICNG the duration and amount of noise monitoring will depend on the scale of the construction activities and extent of expected noise impacts. Noise monitoring will cover a representative period of the construction activity. A representative period is the stage of a construction activity where all the plant and equipment operating is consistent with the full range of plant and equipment modelled in the noise and vibration assessment, i.e. noise monitoring is not to be undertaken when the key noise contributing plant and equipment are turned off. The CNVIS will identify the representative periods.

Where possible, monitoring will be undertaken at the most affected noise sensitive receiver's location in proximity to the Project's construction activities. Noise monitoring locations will consider factors including:

- The location of previous and baseline monitoring sites,
- The proximity of the receiver to a Project worksite,
- The sensitivity of the receiver to noise,
- Access requirements/limitations
- Background noise levels and
- The expected duration of the impact.

Monitored noise and vibration levels will be analysed against the applicable NMLs, vibration goals, and the predictions made in the relevant CNVIS or using the Project's predictive tools. Where monitored construction noise levels are found to be above modelling predictions or vibration goals are exceeded, corrective action will be taken (i.e. Stop work; review mitigation measures and revise appropriately). Refer to Section 10 of the Construction Noise and Vibration Monitoring Program for further information.

## 10 OOHW Exceedances / Non-conformances

### 10.1 Management response

Where monitored noise and vibration levels are found to be above modelling predictions or vibration goals, the following actions will be undertaken:

- Cease the noise and/or vibration generating source which causes the exceedance,
- Confirm the monitored levels are not being impacted by other noise or vibration sources,
- Confirm if the exceedance is due to an uncharacteristically loud/vibratory piece of equipment,
- Identify if the equipment can be swapped out for another piece of equipment or alternative equipment or plant, or if additional mitigation can be included in the site design,
- Confirm that the modelling reflects the actual activity being undertaken,
- Implement other feasible and reasonable measures which may include reducing plant size,
- modifying time of works, changing operational settings (such as turning off the vibratory function of the machine), utilising alternative construction methodology or a combination of these, and review/revise AMMs to ensure appropriate measures have been implemented,
- Refine the noise modelling assessment process based on the learnings. For example, if noise or vibration predictions are lower/higher than expected, OOHW scheduling would be updated accordingly to comply with the numbers of nights permitted to be worked per week,
- Continue work where noise and/or vibration levels can be reduced and align with modelling predictions or vibration goals, and
- Communicate lessons learnt to relevant personnel.

Previously recorded non-conformances will be considered prior to the approval of further OOHW permits.

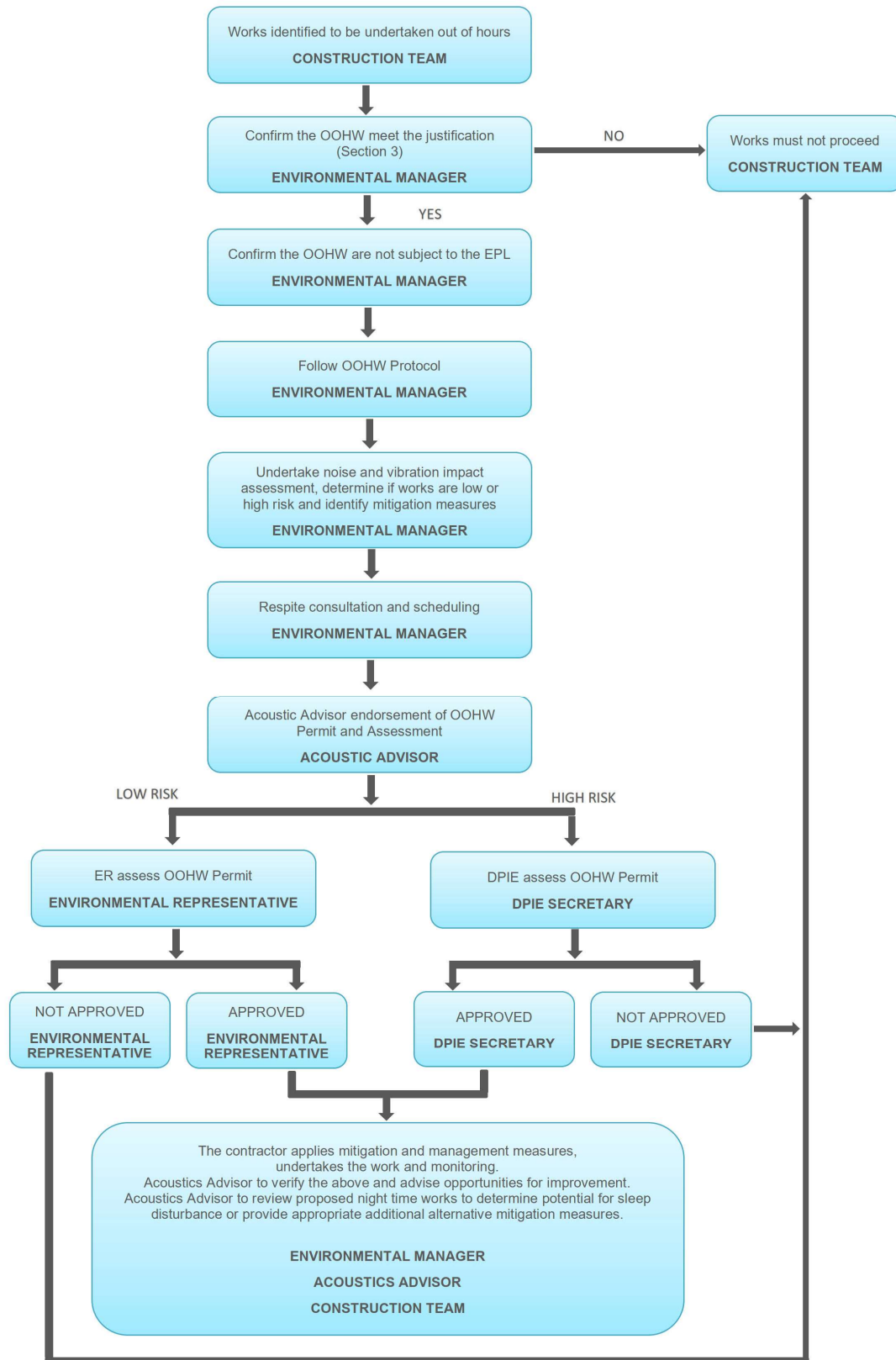
### 10.2 Reporting

Noise and vibration complaints will be reported in accordance with the Project Communication Strategy and any EPL requirements.

Construction Monitoring Reports will be prepared and submitted to DPIE and relevant regulatory authorities for information, in line with CoA C21 as described in Section 11 of the Noise and Vibration Monitoring Program.

The Acoustic Advisor provides a Monthly Noise and Vibration Report detailing the Acoustic Advisor's actions and decisions on matters for which the Acoustic Advisor is responsible, in accordance with CoA A34(h)(v) and included in Section 3 of the CEMP.

## Annexure 1 – OOHW Protocol Approval Flow Chart



Note: Where OOHW permits are not approved / endorsed the construction work must not proceed.

## Appendix D – Noise and Vibration Exceedance - Corrective Procedure

Monitored noise and vibration levels will be analysed against the relevant NMLs, vibration goals, and predictions made in the relevant CNVIS or using the Project's predictive tools. Where monitored construction noise levels are found to be above modelling predictions or vibration goals are exceeded, the following actions will be undertaken:

Cease the noise and/or vibration generating activity which causes the exceeded predictions,

- Confirm the monitored levels are not being impacted by other noise or vibration sources,
- Confirm if the exceedance is due to an uncharacteristically loud piece of equipment,
- Identify if the equipment can be swapped out for another piece of equipment or alternative equipment or plant,
- Confirm if the exceedance is due to an uncharacteristically vibratory piece of equipment,
- Confirm the modelling reflects the actual activity being undertaken,
- Implement other feasible and reasonable measures which may include reducing plant size, modifying time of works, changing operational settings (such as turning off the vibratory function of the machine), and using alternative construction methodology or a combination of these,
- Review work practices to ensure compliance with the ICNG,
- Ensure learnings from the above are fed back into the noise modelling assessment process for fine-tuning,
- Continue work where impacts can be reduced, and
- Communicate lessons learnt to relevant personnel.

CPB Downer JV will review the work or activity or combination of simultaneous works or activities and where possible, modify the work or activity to prevent any recurrence. Lessons learnt will be communicated to relevant personnel in toolbox talks.

Where a complaint relating to human comfort is received, CPB Downer JV will review the noise and vibration model. If it is determined from the review that there is insufficient local monitoring to validate the noise and vibration model, CPB Downer JV will offer additional monitoring following the process defined in Section 7.1.

## Appendix E – Consultation Report

# **CoA A5 Consultation Report Noise and Vibration Sub-Plan**

Western Harbour Tunnel and Warringah  
Freeway Upgrade

Stage 2

**Transport for New South Wales**



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# **CoA A5 Consultation Summary Report – Noise and Vibration Sub-Plan**

Transport for NSW

Western Harbour Tunnel and Warringah  
Freeway Upgrade

Stage 2

November 2021

Rev 0

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## Document control

<b>Title</b>	Consultation Report – Noise and Vibration Sub-Plan
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## Version control

<b>Revision</b>	<b>Date</b>	<b>Description</b>	<b>Approval</b>
A	10/11/21	Consultation undertaken on NVMP	
0	16/11/21	Endorsed by ER and submission to DPI&E	

## Glossary/Abbreviations

Abbreviation	Expanded text
CEMP	Construction Environmental Management Plan
CoA	NSW Minister for Planning Conditions of Approval
CSSI	Critical State Significant Infrastructure
DPIE	Department of Planning, Industry and Environment
EIS	Environmental Impact Statement
EPA	NSW Environment Protection Authority
EPL	Environment Protection Licence
Minister, the	NSW Minister for Planning, Industry and Environment
NML	Noise Management Level
Planning Approval	The Planning Approval includes the Conditions of Approval, the EIS and the Submissions and Preferred Infrastructure Report (SSI-8863)
Proponent, the	Transport for NSW
Project, the	Western Harbour Tunnel and Warringah Freeway Upgrade
RBL	Rating Background Level
REMM	Revised Environmental Mitigation and Management Measure
RtS	Response to Submissions Report
WHTBL	Western Harbour Tunnel and Beaches Link
WHTWFU	Western Harbour Tunnel and Warringah Freeway Upgrade
WFU	Warringah Freeway Upgrade

# 1 Introduction

## 1.1 Background

The Western Harbour Tunnel and Warringah Freeway Upgrade (WHTWUFU) (the project) forms a core component of the broader Western Harbour Tunnel and Beaches Link (WHTBL) program of works. The project comprises two main components:

- A new crossing of Sydney Harbour involving twin tolled motorway tunnels connecting the M4-M5 Link at Rozelle and the Warringah Freeway at North Sydney (the Western Harbour Tunnel)
- Upgrade and integration works along the existing Warringah Freeway, including infrastructure required for connections to the Beaches Link and Gore Hill Freeway Connection project. Reconfiguration works as part of the Warringah Freeway Upgrade would optimise the road corridor and improve the performance of the Sydney Harbour Tunnel, the Sydney Harbour Bridge and the Western Harbour Tunnel.

Due to its importance, the WHTWUFU project was declared to be Critical State Significant Infrastructure (CSSI) by the Minister for Planning and Public Space on 9 November 2020.

On 21 January 2021, the Department of Planning, Industry and Environment (DPIE) approved the construction and operation of the WHTWUFU project (SSI 8863).

A detailed description of the project is provided in Chapter 5 of the Western Harbour Tunnel and Warringah Freeway Upgrade Environmental Impact Statement (EIS).

The WHTWUFU project will be delivered in numerous stages:

- Stage 1 - Early and enabling works:
  - Stage 1A - Critical utility installation, relocation and protection (CUT) (the subject of this Construction Environmental Management Plan (CEMP))
  - Stage 1B - Cammeray Golf Course adjustment works (CGC)
- Stage 2 - Warringah Freeway Upgrade project:
- Stage 3 - Western Harbour Tunnel project (WHT).

Further detail on each stage is provided in the WHTWUFU project Staging Report.

The Noise and Vibration Management Sub-Plan applies only to Stage 2 of the project. CPB Downer JV has been appointed by Transport for New South Wales (TfNSW) to deliver the Warringah Freeway Upgrade project.



## 1.2 Purpose of this Consultation Report

This Consultation Report has been prepared to meet the requirements of the CSSI approval, in particular Condition of Approval (CoA) A5. CoA A5 outlines the requirements for undertaking and documenting consultation undertaken during the preparation of approval documents or monitoring programs required under relevant the CoA for those documents. This Consultation Report has been prepared to consolidate the consultation undertaken during the preparation of the following documents:

- CoA C4(d): Noise and Vibration Management Sub-plan
- CoA E69: Out of Hours Work Protocol – Works Not Subject to an EPL

Consultation required during the development of the two documents is detailed in Table 1-1.

*Table 1-1 Consultation Requirements*

CoA ID	Document	Consultation requirement
C4(b)	Noise and Vibration Sub-plan	NSW Health and relevant Councils
E69	Out of Hours Work Protocol	ER, AA and EPA

## 1.3 CoA Compliance

This section discusses the compliance of this Consultation Report with the relevant CoA as applicable to consultation required to be undertaken during the development of the NVMP.

Table 1-2 lists the applicable CoA, where and how they have been addressed in this Consultation Report.

*Table 1-2 Compliance with applicable CoA*

CoA ID	CoA Detail	Where Addressed	How Addressed
A5	Where the terms of this approval require a document or monitoring program to be prepared or a review to be undertaken in consultation with identified parties, evidence of the consultation undertaken must be submitted to the Planning Secretary with the document. The evidence must include:	This Consultation Report.	This consultation report identifies each of the stakeholders and agencies consulted in the preparation of this plan (Section 1.2).  Full correspondence and documentation exchanged during consultation is found in Appendix 1 to Appendix 4 inclusive.
A5	(a) documentation of the engagement with the party identified in the condition of approval that has occurred before submitting the document for approval;	This Consultation Report.	Full correspondence and documentation exchanged during consultation is found the Appendix 1 to Appendix 4 inclusive.  Each appendix relates to a different stakeholder and agency, thereby ensuring all evidence for each is consolidated in a single appendix. All correspondence is provided in a chronological order.

A5	(b) a log of the dates of engagement or attempted engagement with the identified party;	Section 2 of this Report.	<p>Section 2 includes, by stakeholder and agency, a log of all points of engagement completed or attempted.</p> <p>It also summarises the issues raised by each stakeholder.</p>
A5	(c) documentation of the follow-up with the identified party where engagement has not occurred to confirm that they do not wish to engage or have not attempted to engage after repeated invitations;	Section 2 of this Report.	<p>Section 2 includes, by stakeholder and agency, a log of all points of engagement completed or attempted.</p>
A5	(d) outline of the issues raised by the identified party and how they have been addressed; and	Section 2 of this Report and Appendix 1 to Appendix 5 inclusive.	<p>Section 2 identifies all the issues raised during consultation. It provides in tabular format:</p> <ul style="list-style-type: none"> <li>• Issue raised;</li> <li>• Date raised;</li> <li>• How it was addressed or justification as to why it wasn't addressed;</li> </ul> <p>Section 2 then provides cross- referencing to the relevant Appendix identifying where evidence of the above is documented in full within this Report.</p> <p><i>Note: Section 2 is broken down into each Stakeholder consulted with, and each has their own table addressing the above.</i></p>
A5	(e) a description of the outstanding issues raised by the identified party and the reasons why they have not been addressed.	Section 2 of this Report and Appendix 1 to Appendix 5 inclusive.	<p>Section 2 identifies all the issues raised during consultation. It provides in tabular format:</p> <ul style="list-style-type: none"> <li>• Issue raised;</li> <li>• Date raised;</li> <li>• How it was addressed or justification as to why it wasn't addressed.</li> </ul> <p><i>Note: Section 2 is broken down into each Stakeholder consulted with, and each has their own table addressing the above.</i></p>

C4	The following CEMP Sub-plans must be prepared in consultation with the relevant government agencies identified for each CEMP Sub-plan. Details of all information requested by an agency during consultation must be provided to the Planning Secretary as part of any submission of the relevant CEMP Sub-plan, including copies of all correspondence from those agencies as required by Condition A5.	This Report	This Report has been prepared to address the consultation undertaken during the development of the NVMP.
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#### 1.4 Consultation Process

Consultation with stakeholders and agencies was undertaken using the following means:

- Formal correspondence (DPIE Portal notifications)
- Formal correspondence (standard email)
- Phone Calls.

## 2 Stakeholder and agency consultation

This Section of the Consultation Report provides detail of consultation undertaken with each stakeholder and agency in the preparation of the CEMP. In particular it contains:

A consultation log that identifies:

- Consultation dates (actual and attempted)
- Form of consultation
- Whether responses and / or comments were received
- Summary of the issues raised, including how they have been addressed

Documentary evidence of all the correspondence received and sent through the consultation phase is contained in the Appendices at the end of this Report. The Appendices and this Section are broken down by stakeholder and agency, not by issue.

### 2.1 NVMP – North Sydney Council

Consultation with North Sydney Council (NSC) commenced on 5 October 2021 and concluded 2 November 2021.

Table 2-1 below includes the details of engagement between CPB Downer JV and NSC regarding the NVMP. Table 2-2 includes a summary of the issues raised, how those were addressed and closed out. Full evidence of correspondence is in Appendix 1 of this report.

*Table 2-1 Engagement log – NVMP – North Sydney Council*

#	Date	Correspondence		From	Recipient
		Form / Type	Purpose		
1	5/10/2021	email	Provision of draft NVMP to NSC for review	H.Chemney	G.McConnell
2	14/10/2021	email	Reminder to NSC of timeframes for review comments and offer of live review / page turn of document	H.Chemney	G.McConnell
3	26/10/2021	email	Provision of review comments from NSC to CPB Downer JV	G.McConnell	H.Chemney

Table 2-2 below summarises the consultation comments received from NSC on the NVMP.

*Table 2-2 Summary of issues – NVMP – North Sydney Council*

Document Section, CoA or REMM	Comment Raised	Date Raised	How Addressed / Justification Why Not Addressed
General	The Western Harbour Tunnel and Warringah Freeway Upgrade project EIS included a noise and	26/10/2021	Note only

	vibration assessment which concluded that sensitive receivers in the vicinity of the project would be impacted by noise and vibration; and that these would be managed through the implementation of mitigation and management measures described in the submitted Noise & Vibration Management Plan (NVMP).		
General	The scope and purpose of the NVMP is to describe how it is proposed to manage potential noise and vibration impacts during construction of the project.	26/10/2021	Note only
General	The NVMP outlines the Ministers Conditions of Approval and identifies/comments upon how these are proposed to be addressed.	26/10/2021	Note only
General	Overall the NVMP provides a framework of the measures that can be taken in the event sensitive receivers will be impacted by noise and vibration during construction. Noise management levels are identified as are the noise limits above which noise mitigation measures must be considered if reasonable and feasible.	26/10/2021	Note only
General	As yet site specific noise and vibration impact statements have not been prepared. As construction works proceed site specific noise & vibration statements will be prepared and noise and vibration monitoring will be undertaken.	26/10/2021	Note only
General	As stated above, the NVMP is a framework of what measures can be	26/10/2021	Note only

	taken when deemed necessary		
General	There are no comments at this time. It is acknowledged that there will be a level of noise associated with the project. There is a protocol for out of hours work.	26/10/2021	Note only

## 2.2 NVMP – Willoughby Council

Consultation with Willoughby Council commenced on 5 October 2021 and concluded 27 October 2021.

Table 2-3 below includes the details of engagement between CPB Downer JV and Willoughby Council regarding the NVMP. Table 2-4 includes a summary of the issues raised, how those were addressed and closed out. Full evidence of correspondence is in Appendix 2 of this report.

*Table 2-3 Engagement log – NVMP – Willoughby Council*

#	Date	Correspondence		From	Recipient	
		Form / Type	Purpose			
1	5/10/2021	email	Provision of draft NVMP to Willoughby Council for review	H.Chemney	A.Gillies, C.Binns, G.Farrelly	
2	6/10/2021	email	Response from Willoughby Council confirming receipt of plans	A.Gillies	H.Chemney	
3	27/10/2021	email	Comments received from Willoughby Council	A.Gillies	H.Chemney	

Table 2-4 below summarises the consultation comments received from Willoughby Council on the NVMP.

*Table 2-4 Summary of issues – NVMP – Willoughby Council*

Document Section, CoA or REMM	Comment Raised	Date Raised	How Addressed / Justification Why Not Addressed
General	Council has reviewed the Noise and Vibration Management Sub-Plan and the Noise and Vibration Monitoring Program and finds them satisfactory. The following additional comments are provided. It is highly likely that Council will receive complaints from the community in regards to	27/10/2021	Note only.



	construction noise. The MCoA are quite extensive and cover community consultation, out of hours work and monitoring. Complaints should be directed to the Community Complaints Mediator and the Environmental Protection Authority (EPA).		
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### 2.3 NVMP – NSW Health

Consultation with NSW Health commenced on 1 October 2021 and concluded 18 October 2021.

Table 2-5 below includes the details of engagement between CPB Downer JV and NSW Health regarding the NVMP. Table 2-6 includes a summary of the issues raised, how those were addressed and closed out. Full evidence of correspondence is in Appendix 3 of this report.

*Table 2-5 Engagement log – NVMP – NSW Health*

#	Date	Correspondence		From	Recipient
		Form / Type	Purpose		
1	1/10/2021	email	Provision of draft NVMP to NSW Health for review	H.Chemney	L.Gupta, M.Staff, R.Broome, N.Ives
2	18/10/2021	email	Response from NSW Health advising they made initial comments at the EIS stage and no further comment is being provided.	N.Ives	H.Chemney

Table 2-6 below summarises the consultation comments received from NSW Health on the NVMP.

*Table 2-6 Summary of issues – NVMP – NSW Health*

Document Section, CoA or REMM	Comment Raised	Date Raised	How Addressed / Justification Why Not Addressed
N/A	N/A	N/A	N/A

### 2.4 NVMP – EPA

Consultation with EPA commenced on 1 October 2021 and concluded 3 November 2021.

Table 2-5 below includes the details of engagement between CPB Downer JV and EPA regarding the NVMP. Table 2-6 includes a summary of the issues raised, how those were addressed and closed out. Full evidence of correspondence is in Appendix 4 of this report.

*Table 2-7 Engagement log – NVMP – EPA*

Correspondence			
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#	Date	Form / Type	Purpose	From	Recipient
1	1/10/2021	email	Provision of draft NVMP to EPA for review	H.Chemney	A.Young, K.Sorensen
2	20/10/2021	email	Response from EPA advising they would provide comments on the NVMP by 29/10/21	A.Young	H.Chemney
3	3/11/2021	email	Provision of response from EPA (via DPIE Portal) with comments on NVMP.	R.Owens	H.Chemney

Table 2-6 below summarises the consultation comments received from EPA on the NVMP.

*Table 2-8 Summary of issues – NVMP – EPA*

Document Section, CoA or REMM	Comment Raised	Date Raised	How Addressed / Justification Why Not Addressed
Glossary /Abbreviations	The document would benefit from a definition of “noise mitigation”. The term should be defined to mean: ‘feasible and reasonable noise mitigation measures’.	3/11/2021	Definition added to glossary: "Feasible and reasonable measures that would minimise or avoid noise impacts"
Section 3.1.1	It is suggested to include Environmental Planning & Assessment Act 1979 and remove reference to the Noise Control Regulation (2008) – unless its inclusion can be justified.	3/11/2021	Updated
Section 3.2	It is unclear why condition A9 regarding the Noise Insulation Programme (NIP) is not included in Table 3-1.	3/11/2021	A9 is not relevant to this plan as the plan does not cover the scope of the NIP
Section 3.2	It is unclear why the blasting conditions have not been included in Table 3-1 (E95 to E99). The Environmental Management Measures in Section 3.3 include Construction blasting impacts (CNV9).	3/11/2021	All REMMs relevant to noise and vibration are identified in Section 3.3 of the plan, however blasting is not a feature of this project.
Section 4.1	It is unclear why the requirements of condition E83 (Out-of-Hours Works – Community Consultation on Respite) have not been mentioned or discussed in this section. The EPA queries: 1. how the community will be able to influence respite periods; and 2. what respite periods the proponent seek to provide. (This is discussed further below, regarding Appendix B3 – Out of Hours Works Protocol.)	3/11/2021	Reference added to CoAE83. This is further discussed in Section 9.5

Section 5.3	It is recommended that noise monitoring locations in Table 5-1 are crossreferenced with correlated Noise Catchment Areas (NCA).	3/11/2021	Column added for NCA
Sections 7.3.1 and 7.3.2	<p>Section 7.3.1 “Early Works Impacts” states:  “The Warringah Freeway Upgrade early works will occur during the first 12 months of works. A summary of activities and potential impacts are included in Table 7-1.”</p> <p>Section 7.3.2 “Main Works Impacts” states:  “The Warringah Freeway Upgrade main works will commence after the first 12 months of early works and will include all works remaining to complete this project. The main works will be subject to a separate CEMP and in turn a separate NVMP sub plan.”</p> <p>Prior to Section 7, there is no mention of the Warringah Freeway Upgrade Works having more than one package of CEMP/NVMP documents. If this is the case, then this information should be stated early in the report.</p> <p>Section 1.3 “Scope of the Sub-Plan” makes no mention that this NVMP for the Warringah Freeway Upgrade is for Main Works, distinct from Early Works, nor does it identify the scope of early works or main works. This should be clarified and contextualised.</p>	3/11/2021	Early works and main works now combined and called Stage 2. Sections updated in NVMP
Section 7.3.2	Table 7-1 references CV3. It is queried whether this is a typo and it should be “CNV3”.	3/11/2021	Typo fixed (CNV3)
Section 8.2	Paragraph 1, Line 5 (2nd last sentence): The EPA recommends the inclusion of the words “for endorsement” as follows: “A copy of the CNVIS must be provided to the AA and ER for endorsement prior to the commencement of the associated works” to be consistent with condition A34(e) regarding the role of the Acoustic Advisor.	3/11/2021	Updated as suggested
Section 8.2	<p>Paragraph 2, dot point 6: “The CNVIS will address: ...</p> <p>☐ “Mitigation options and preferred management measures, including noise barriers and acoustic enclosures as relevant” (dot point 6)</p> <p>It is recommended this be changed to reflect condition E75. The CNVIS should outline “specific mitigation measures” and not “mitigation options”.</p>	3/11/2021	Updated as suggested

	<p>The purpose of the CNVIS is to guide deployment of specific mitigation measures at sites and should be the final delivery document to secure the best achievable outcomes for the community. It should therefore outline the specific mitigation measures for each site. For the noise levels reported in a CNVIS to be an effective performance benchmark they must reflect the best achievable noise levels after the effect of all mitigation is considered and factored into the predicted levels.</p>		
Sections 8.2 and 8.3	<p>The relationship between the CNVIS and 'Noise Management Tool' is unclear. The EPA questions whether the CNVIS's will be stand-alone and definitive documents that guide the deployment of specific mitigation measures and practices at each site; or if assessment will be deferred to sub documents / assessments that use the prediction tool as work sites and activities are progressively rolled out. It is recommended the NVMP identify which document will have definitive and auditable mitigation measures outlined for each activity and each work site.</p>	3/11/2021	<p>Note added to Section 8.3: "The noise management tool does not replace the CNVIS. CNVIS documents will be stand-alone and definitive documents that guide the deployment of specific mitigation measures and practices at each site."</p>
Section 8.2	<p>Part 3. Regarding Airborne Construction Noise, dot point 4: For night-time activities, calculate the maximum (L<sub>Amax</sub>) noise levels and compare with LA(1 min) 65 dB(A) sleep disturbance criterion, applied at the external façade. The sleep disturbance criterion should be consistent with Section 6.3.1.3: "A night-time sleep disturbance 'screening criterion' noise goal of RBL +15 dB(A) is used to identify the receivers where there is potential for sleep disturbance. Where the sleep disturbance screening criterion is exceeded, further assessment is conducted to determine whether the 'awakening reaction' level of L<sub>Amax</sub> 65 dB(A) would be exceeded and the likely number of these events. The awakening reaction level is the level above which sleep disturbance is considered likely."</p>	3/11/2021	<p>Updated to align with Section 6.3.1.3</p>
Section 9.1	<p>Table 9-1: Noise and Vibration Management and Mitigation Measures: MMNV20 states: "Noise barriers (such as site hoardings) will be constructed around ancillary facilities as detailed within the CNVIS (Note: this does not include temporary noise blankets, whose location is not specified in the CNVIS). Temporary</p>	3/11/2021	<p>Text updated. Reference to CNVIS in MMNV20 removed as CNVIS has not yet been undertaken.</p>

	<p>noise barriers will be used around noisy equipment and activities such as rock-hammering and concrete cutting.”</p> <p>This measure indicates that the CNVIS will not include temporary noise blankets. The EPA recommends that the MMNV20 identify when, how and who will decide when temporary noise blankets are likely to be effective and deployed.</p> <p>The absence of this alludes to the possibility that the CNVIS will not be a definitive “how to” to undertake activities using all feasible and reasonable measures i.e. “best practice” as required by condition E74. The CNVMP should identify what checks, balances and accountability will be used to ensure compliance with condition E74 at all times.</p> <p>It also suggests that the noise levels reported in a CNVIS may not take into account all available noise mitigation options. If this is the case, it would be difficult to determine how the reported noise levels in the CNVIS can be used as a performance indicator as proposed in the Noise Monitoring Program as they may not represent best practice.</p>		
Section 9.1	<p>Table 9-1: Noise and Vibration Management and Mitigation Measures: MMNV29: The EPA recommends the inclusion of the words “mitigation and” as follows:</p> <p>Verification monitoring will be carried out during the initial stages of activities for which a location and activity specific noise and vibration impact assessment has been prepared to confirm that actual noise and vibration levels are consistent with noise and vibration impact predictions and that the mitigation and management measures that have been implemented are appropriate.</p> <p>The EPA supports the approach that verification monitoring should be as much about noise levels as about confirming the placement and effectiveness of “mitigation and management measures”.</p>	3/11/2021	Updated as Suggested
Section 9.3	<p>Condition E88 restricts the numbers of out of hours works occasions that may be performed along the Warringah Freeway Corridor over a week / month period. The condition does not appear to allow exceptions through the out of hours works protocol.</p> <p>The relationship between works allowable (or indeed restrictions) imposed by E88</p>	3/11/2021	Reference to E88 added to Section 9.3

	and works that may be approved via the OHWP need to be determined and clearly outlined.		
Appendix B3 - Noise and Vibration Monitoring Program – Warringah Freeway Upgrade			
Section 1.3	It is recommended that the Scope of the Monitoring Programme include a specific requirement that “monitoring” will extend to an assessment of the adequacy, completeness and effectiveness of the noise mitigation measures being used, and whether additional mitigation should be deployed.	3/11/2021	Additional text added as suggested.
Sections 6.2 and 7.2	Real time (unattended) noise and vibration monitoring is required under condition C13(d). The monitoring program has deferred this to an undefined and later time. The EPA requires that the project consults with the EPA as more details on the design and deployment of the real time noise and vibration monitoring is known.	3/11/2021	Noted
Section 6.3	Note only: Includes the following comment, “EPL OOHW monitoring and reporting requirements to be included here once gained”.	3/11/2021	Note
Section 6.4	The competency requirements for staff undertaking noise monitoring should be clearly presented in the monitoring program, and more importantly the procedural checks and balances and training requirements to ensure that competency is achieved clearly presented.	3/11/2021	Section 6.4 updated to include competency requirements
Section 10	Continual improvement and corrective action: It is recommended that where noise and vibration monitoring identifies an exceedance of predicted noise and vibration level in CNVIS documents, that the actions include notifying the AA to seek advice.	3/11/2021	Additional text added as suggested.
Appendix B3 – Out of hours work protocol – Warringah Freeway Upgrade			
General comment	It is recommended the proponent seek advice / interpretation from DPIE about the relationship between the Out-of-Hours Works Protocol approval pathway and condition E88 (Warringah Freeway Upgrade – Out-of-Hours Work Periods). E88 would appear to place a cap on out-of-hours works and there does not appear to be a provision that allows the OOHWP to adjust that cap.	3/11/2021	The limits of E88 apply to all OOHW. Exceptions to these limits only apply where identified by an EPL or in accordance with an agreement with a potentially impacted receiver(s) (CoA E68(c)(iii) or CoA E83).



Section 4.5 and generally	<p>It is unclear what “respite” from out-of-hours works the proponent is seeking to provide. This should be stated clearly and simply – e.g. a statement such as: “the proponent will ensure that no more than X nights per week or X nights per month of out-of-hours work will occur that impacts the same receiver by more than 5 dB above RBL”.</p> <p>This goes to the issue / question of defining and understanding the limits imposed by condition E88 and having a clear understanding of what respite goals are being adopted and indeed how the community can inform those respite goals.</p>	3/11/2021	Additional text added as suggested
Section 6.1	<p>It is essential that the relationship between the E88 works and works approved by the OOHWP is established. This is to avoid a situation where works are undertaken 2-3 nights under the auspices of E88 and then another 2-3 nights per week under the auspices of works approved through the low risk category of the OOHWP.</p>	3/11/2021	Additional text added to Section 6.1 for clarity. The limits of E88 apply to all OOHWP. Exceptions to these limits only apply where identified by an EPL or in accordance with an agreement with a potentially impacted receiver(s) (CoA E68(c)(iii) or CoA E83).
Section 10	<p>The EPA queries how the proponent will ensure that noise and vibration assessments prepared to support out-of-hours works applications under the protocol present the levels achievable through the application of all feasible and reasonable noise mitigation measures. The corrective measures under this section could promote some “tolerances” being incorporated into the modelling which would not be ideal. Predicted noise levels in CNVIS and other assessments to support out-of-hours work need to be the best achievable noise levels especially where these levels are to be used as performance benchmarks as proposed in these documents.</p>	3/11/2021	Additional text added to Section 4: “The CNVIS documents will provide all feasible and reasonable noise mitigation measures to ensure the best achievable noise levels for each scope of work.”

# Appendix 1 North Sydney Council consultation records

## Jacqueline McKenzie

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**From:** Chemney, Howard <Howard.Chemney@pcplr.com.au>  
**Sent:** Tuesday, 26 October 2021 11:40 AM  
**To:** Aaron McKenzie; Steven Luzuriaga; Williams, Antony; NVandenberg  
**Cc:** Jacqueline McKenzie  
**Subject:** FW: Western Harbour Tunnel and Warringah Freeway Upgrade -Noise & Vibration Management Plan..

[EXTERNAL] This email originated from outside of the Organisation.

FYI

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**From:** Gavin McConnell <Gavin.McConnell@northsydney.nsw.gov.au>  
**Sent:** Tuesday, 26 October 2021 11:38 AM  
**To:** Chemney, Howard <Howard.Chemney@pcplr.com.au>  
**Subject:** Fw: Western Harbour Tunnel and Warringah Freeway Upgrade -Noise & Vibration Management Plan..

**CAUTION:** This email originated from outside of the Organisation.

Howard,  
Please find below our comments regarding the Noise and Vibration CEMP.  
Regards,  
Gavin

---

**Subject:** Western Harbour Tunnel and Warringah Freeway Upgrade -Noise & Vibration Management Plan..

Hi Gavin,

Following are my comments re the Noise & Vibration Management Plan.

The Western Harbour Tunnel and Warringah Freeway Upgrade project EIS included a noise and vibration assessment which concluded that sensitive receivers in the vicinity of the project would be impacted by noise and vibration; and that these would be managed through the implementation of mitigation and management measures described in the submitted Noise & Vibration Management Plan (NVMP).

The scope and purpose of the NVMP is to describe how it is proposed to manage potential noise and vibration impacts during construction of the project.

The NVMP outlines the Ministers Conditions of Approval and identifies/comments upon how these are proposed to be addressed.

Overall the NVMP provides a framework of the measures that can be taken in the event sensitive receivers will be impacted by noise and vibration during construction. Noise management levels are identified as are the noise limits above which noise mitigation measures must be considered if reasonable and feasible..

As yet site specific noise and vibration impact statements have not been prepared. As construction works proceed site specific noise & vibration statements will be prepared and noise and vibration monitoring will be undertaken.

As stated above, the NVMP is a framework of what measures can be taken when deemed necessary.

There are no comments at this time. It is acknowledged that there will be a level of noise associated with the project. There is a protocol for out of hours work.

Please let me know if you need anything further..

Regards,

fiona

**Fiona Mulcahy**  
Team Leader Environmental Health  
P 9936 8100  
E [council@northsydney.nsw.gov.au](mailto:council@northsydney.nsw.gov.au)



[www.northsydney.nsw.gov.au](http://www.northsydney.nsw.gov.au)



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## McKenzie, Jacqueline

---

**From:** Chemney, Howard <Howard.Chemney@pcplr.com.au>  
**Sent:** Thursday, 14 October 2021 1:28 PM  
**To:** Gavin McConnell  
**Cc:** Rob Owens; Jacqueline McKenzie  
**Subject:** RE: Warringah Freeway Upgrade - Ancillary Site Establishment Management Plan consultation

[EXTERNAL] This email originated from outside of the Organisation.

Hi Gavin,

Just following up on the below.

Please let me know if Council have any queries during this review stage or require a live review / page turn on any of the documents submitted.

This is also a reminder that all comments must be received back by Tuesday 26<sup>th</sup> October.

Thanks

Howard  
0410 542 009

---

**From:** Chemney, Howard  
**Sent:** Tuesday, 5 October 2021 5:04 PM  
**To:** Gavin McConnell <Gavin.McConnell@northsydney.nsw.gov.au>  
**Cc:** Rob Owens <Rob.Owens@transport.nsw.gov.au>; Jacqueline McKenzie <jacqueline.mckenzie@dswjv.com.au>  
**Subject:** RE: Warringah Freeway Upgrade - Ancillary Site Establishment Management Plan consultation

Hi Gavin,

Further to the below emails and apologies for not sending these last Friday as indicated - please find attached both the CEMP (Construction Environmental Management Plan) and the ASEMP (Ancillary Site Establishment Management Plan) for the Warringah Freeway Upgrade for Councils review.

In addition, please note the CEMP has a number of sub-plans relevant to this stage of the works identified as follows:

- Traffic, Transport & Access Management Sub-plan
- Noise & Vibration Management Sub-plan
- Flora & Fauna Management Sub-plan
- Air Quality and Odour Management Sub-plan
- Soil and Surface Water Management Sub-plan
- Heritage Management Sub-plan (which includes both indigenous and non-indigenous heritage)

I will send these on in separate emails / via drop box given size limitations.

As indicated below, the consultation period for all these plans is for 3 weeks and therefore all comments must now be received back by Tuesday 26<sup>th</sup> October. Comments received after this date may not be addressed in time and will be considered during future revisions. We are also happy to assist you in your review of the

document by undertaking a live review / page turn to discuss issues directly. Please contact me should you wish to take up this offer.

Many thanks

Howard

---

**From:** Chemney, Howard

**Sent:** Tuesday, 28 September 2021 5:53 AM

**To:** Gavin McConnell <[Gavin.McConnell@northsydney.nsw.gov.au](mailto:Gavin.McConnell@northsydney.nsw.gov.au)>

**Cc:** Rob Owens <[Rob.Owens@transport.nsw.gov.au](mailto:Rob.Owens@transport.nsw.gov.au)>; Jacqueline McKenzie <[jacqueline.mckenzie@dswjv.com.au](mailto:jacqueline.mckenzie@dswjv.com.au)>

**Subject:** Warringah Freeway Upgrade - Ancillary Site Establishment Management Plan consultation

Hi Gavin,

Further to the below – it is also a requirement of Condition A17 of the Infrastructure Approval SSI 8863 that we consult with Council on the Ancillary Site Establishment Management Plan (ASEMP). This plan outlines the environmental management practices and procedures to be implemented for the establishment of the construction ancillary facilities / construction support sites. A snippet of this condition is reproduced below:

#### **SITE ESTABLISHMENT WORK**

##### **Ancillary Site Establishment Management Plan**

**A17** Before establishment of any construction ancillary facility (excluding minor construction ancillary facilities determined by the **ER** to have minimal environmental impact and those established under **Condition A19**), the Proponent must prepare an **Ancillary Site Establishment Management Plan** which outlines the environmental management practices and procedures to be implemented for the establishment of the construction ancillary facilities. The **Ancillary Site Establishment Management Plan** must be prepared in consultation with the relevant council and government agencies. The Plan must be submitted to the Planning Secretary for approval one month before the establishment of any construction ancillary facilities. The **Ancillary Site Establishment Management Plan** must detail the management of the construction ancillary facilities and include:

- (a) a description of activities to be undertaken during establishment of the construction ancillary facility (including scheduling and duration of work to be undertaken at the site);
- (b) figures illustrating the proposed operational site layout and the location of the closest sensitive land user(s);
- (c) a program for ongoing analysis of the key environmental risks arising from the site establishment activities described in subsection (a) of this condition, including an initial risk assessment undertaken prior to the commencement of site establishment work;
- (d) details of how the site establishment activities described in subsection (a) of this condition will be carried out to:
  - (i) meet the performance outcomes stated in the documents listed in **Condition A1**, and
  - (ii) manage the risks identified in the risk analysis undertaken in subsection (c) of this condition; and
- (e) a program for monitoring the performance outcomes, including a program for construction noise monitoring.

Nothing in this condition prevents the Proponent from preparing individual **Ancillary Site Establishment Management Plans** for each construction ancillary facility.

We will be sending over the ASEMP for consultation with Council this Friday 1<sup>st</sup> October.

As with the CEMP sub-plans, the consultation period is for 3 weeks and therefore all comments must be received back by Friday 22<sup>nd</sup> October. Comments received after this date may not be addressed in time and will be considered during future revisions. We are also happy to assist you in your review of the document by undertaking a live review / page turn to discuss issues directly. Please contact me should you wish to take up this offer.

Please note that TfNSW will also be issuing this plan formally for consultation via the DPIE Portal.



Thanks

## Howard Chemney

Environment & Sustainability Manager

### Warringah Freeway Upgrade

M 0410 542 009

E [Howard.Chemney@cpbcon.com.au](mailto:Howard.Chemney@cpbcon.com.au)

---

**From:** Chemney, Howard

**Sent:** Monday, 27 September 2021 6:20 PM

**To:** Gavin McConnell <[Gavin.McConnell@northsydney.nsw.gov.au](mailto:Gavin.McConnell@northsydney.nsw.gov.au)>

**Cc:** Rob Owens <[Rob.Owens@transport.nsw.gov.au](mailto:Rob.Owens@transport.nsw.gov.au)>; Jacqueline McKenzie <[jacqueline.mckenzie@dswjv.com.au](mailto:jacqueline.mckenzie@dswjv.com.au)>

**Subject:** Warringah Freeway Upgrade - Construction Environmental Management Plan consultation

Hi Gavin,

This email is to advise you that CPB Downer JV will be sending over a number of sub-plans to the Warringah Freeway Upgrade Construction Environmental Management Plan (CEMP) for consultation with Council this Friday 1<sup>st</sup> October.

Our requirement to consult with Council on these plans is contained in Condition C4 of the Infrastructure Approval SSI 8863 as snipped below and included in the attachment.

**C4** The following **CEMP Sub-plans** must be prepared in consultation with the relevant government agencies identified for each **CEMP Sub-plan**. Details of all information requested by an agency during consultation must be provided to the Planning Secretary as part of any submission of the relevant **CEMP Sub-plan**, including copies of all correspondence from those agencies as required by **Condition A5**.

	Required CEMP Sub-plan	Relevant government agencies to be consulted for each CEMP Sub-plan
(a)	Traffic, transport and access	Relevant council(s)
(b)	Noise and vibration	NSW Health, relevant council(s)
(c)	Flora and Fauna	DPI Fisheries, DPIE Water, EESG, and relevant council(s)
(d)	Air quality and odour	NSW Health, and relevant council(s)

(e)	Soil and surface water	DPIE Water, EESG, EPA, Sydney Water (if Sydney Water's assets are affected) and relevant council(s)
(f)	Groundwater	DPIE Water, EESG, EPA, Sydney Water (where it is proposed to discharge groundwater into Sydney Water's assets) and relevant council(s)
(g)	Maritime Heritage	Heritage NSW and relevant council(s)
(h)	Non-Aboriginal Heritage	Heritage NSW and relevant council(s)
(i)	Aboriginal Cultural Heritage	Heritage NSW
(j)	Dredging and Disposal Management Plan	EPA, DPI Fisheries, Port Authority of NSW (including Harbour Master)

Specifically we are required to consult with Council on the following project relevant sub-plans:

- Traffic, Transport & Access Management Sub-plan
- Noise & Vibration Management Sub-plan
- Flora & Fauna Management Sub-plan
- Air Quality and Odour Management Sub-plan

- Soil and Surface Water Management Sub-plan
- Heritage Management Sub-plan (which includes both indigenous and non-indigenous heritage)

The consultation period is for 3 weeks and therefore all comments must be received back by Friday 22nd October. Comments received after this date may not be addressed in time and will be considered during future revisions.

To assist you in your review of the documents we are happy to undertake a live review / page turn to discuss issues directly. Please contact me should you wish to take up this offer.

Please note that TfNSW will also be issuing these plans formally for consultation via the DPIE Portal.

Thanks

## Howard Chemney

Environment & Sustainability Manager

**Warringah Freeway Upgrade**

M 0410 542 009

E [Howard.Chemney@cpbcon.com.au](mailto:Howard.Chemney@cpbcon.com.au)

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\*\*\*\*\*

## **Appendix 2 Willoughby Council consultation records**

27 October 2021

Howard Chemney  
CPB Downer Joint Venture  
[Howard.Chemney@cpbcon.com.au](mailto:Howard.Chemney@cpbcon.com.au)  
Warringah Freeway Upgrade project

Dear Sir,

**RE: WARRINGAH FREEWAY UPGRADE – ANCILLARY SITE ESTABLISHMENT PLAN (ASEMP)  
AND CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP) SUB-PLANS –  
COMMENTS FROM WILLOUGHBY CITY COUNCIL**

Infrastructure Approval (Application no. SSI 8863) for the Western Harbour Tunnel (WHT) and Warringah Freeway Upgrade (WFU) project was granted by the Minister for Planning and Public Spaces on 21 January 2021. The WHT/WFU project is being constructed in three stages:

**Stage 1 – Early and Enabling Works:**

- **Stage 1A** – Critical utility installation, relocation and protection
- **Stage 1B** – Cammeray Golf Course adjustment works

**Stage 2 – Warringah Freeway Upgrade project**

- **Stage 2A** – Warringah Freeway Upgrade early works
- **Stage 2B** – Warringah Freeway Upgrade main works

**Stage 3 – Western Harbour Tunnel project**

Council understands that the CPB Downer Joint Venture has been selected by the NSW Government to deliver Stage 2 – the WFU project.

As part of the conditions of the Infrastructure Approval, the CPB Downer Joint Venture is required to consult with Council on a range of plans related to the WFU project. Accordingly, draft versions of the following documents were sent to Willoughby City Council (Council) via email on 5 October 2021 requesting comment:

- 1. Ancillary Site Establishment Plan (ASEMP)**
- 2. Construction Environmental Management Plan (CEMP) Sub-Plans:**
  1. Traffic, Transport & Access Management Sub-Plan
  2. Noise & Vibration Management Sub-Plan
  3. Flora & Fauna Management Sub-Plan
  4. Air Quality and Odour Management Sub-Plan
  5. Soil and Surface Water Management Sub-Plan
  6. Heritage Management Sub-Plan

Given the WFU project footprint and proposed construction works are located almost completely within the North Sydney Council local government area (LGA), the impacts on Willoughby City Council are likely to be minimal. However, Council has reviewed most of the Plans and provides the following comments to ensure that environmental, traffic and transport and other impacts are satisfactorily managed.

## 1. Ancillary Site Establishment Management Plan (ASEMP):

Reference no. **WHTBLWFU-CPBD-NWW-EV-PLN-000001-B**

Dated 1 October 2021

Given the size of the ASEMP and relatively short time in which to provide a response, Council staff have not had the opportunity to review this Plan in detail. However, following a recent meeting with the CPB Downer Joint Venture project team where the ASEMP was discussed, Council is able to provide the following general comments.

The ASEMP relates to the Warringah Freeway Upgrade (WFU) project and has been prepared in accordance with the Minister's Conditions of Approval (MCoA) for the Western Harbour Tunnel and Warringah Freeway Upgrade project.

The ASEMP has been prepared to address the requirements of MCoA, the Western Harbour Tunnel and Warringah Freeway Upgrade Environmental Impact Statement (dated January 2020) (the EIS), the Western Harbour Tunnel and Warringah Freeway Upgrade Response to Submissions Report (dated September 2020) (the RtS) and applicable guidance and legislation.

This ASEMP applies to the WFU component of the project, the key features of which include the following:

- Upgrade and reconfiguration of the Warringah Freeway from immediately north of the Sydney Harbour Bridge through to Willoughby Road at Naremburn.
- Upgrades to interchanges at Falcon Street in Cammeray and High Street in North Sydney.
- New and upgraded pedestrian and cyclist infrastructure.
- New, modified and relocated road and shared user bridges across the Warringah Freeway
- Connection of the Warringah Freeway to the portals for the Western Harbour Tunnel mainline tunnels and the Beaches Link tunnels, which will consist of a combination of trough and cut and cover structures.
- Upgrades to existing roads around the Warringah Freeway to integrate the Project with the surrounding road network.
- Upgrades and modifications to bus infrastructure, including relocation of the existing bus layover along the Warringah Freeway, and improvements to the geometry and connectivity of the existing southbound bus lane.



- Other operational infrastructure, including surface drainage and utility infrastructure, signage, tolling, lighting, CCTV and other traffic management systems.

The ASEMP outlines the environmental management practices and procedures to be implemented for the establishment of construction ancillary facilities and must be submitted to the Planning Secretary for approval one month before the installation of any ancillary facilities (excluding minor construction ancillary facilities).

As per Figure 1-2 (Overview of the construction support sites) on page 16 of the ASEMP, none of the construction support sites for the WFU project are located within the Willoughby LGA. There is proposed to be a site WHT11 Waltham Street in Artarmon however it is presumed that this will only be used as part of the later Stage 3 WHT works.

Given these facts, Council has no comments on the ASEMP at this stage. It seems comprehensive and thorough in its detail and proposed environmental management measures. Council requests that the project team consult with Council in future as required and as detailed in Section 7.6 (Community Engagement) on page 77 of the ASEMP.

## 2. Construction Environmental Management (CEMP) Sub-Plans:

### 2.1 Traffic, Transport & Access Management Sub-Plan (TTAMP)

*Reference no. WHTBLWFU-CPBD-NWW-TF-PLN-000003-B*

*Dated 1 October 2021*

Given the size of the TTAMP and relatively short time in which to provide a response, Council staff have not had the opportunity to review this Plan in detail. However, following a recent meeting with the CPB Downer Joint Venture (CCPBJV) project team on 13 October 2021, where the TTAMP was discussed, Council is able to provide the following general comments.

At this meeting, the CPBDJV project team outlined the broad scope of the TTAMP and its road network and road network management approach. The minutes for this meeting previously provided to Council by CPBDJV reflect the discussion, selected areas of concern for Council and operational arrangements for liaison with Council. It is noted that the TTAMP appears to provide mechanisms for these concerns to be managed.

It is understood that the main area of works for the WFU project will be located south of Brook St i.e. within North Sydney LGA. Minimal or no construction activity is planned beyond Brook St, outside of any advanced warning signs and incidence response measures.

Nevertheless, construction works are likely to have impacts in terms of flow-on construction traffic effects and delays to existing traffic flows within the vicinity of the project. As such, Council wants to ensure that such impacts are minimised and adequately managed.





Council would like the TTAMP to provide assurance that it addresses and minimises the impacts from the construction of the WFU project in relation to the Willoughby LGA in at least the following key areas of concern:

- Safety for all road users, access to the Willoughby LGA, congestion minimisation, no or minimal movement of construction traffic in Willoughby LGA and no construction worker parking.
- The flexibility for Council to raise issues and for these to be resolved in an acceptable manner, which may include, and not limited to, changes to the TTAMP, site specific management plans, infrastructure, technology, operational and communication measures
- To seek and receive accurate and timely advice in response to community concerns.

In addition, the following advice is provided on specific matters related to the TTAMP:

#### Road network management and operation in Willoughby City Council

- Please note that road network management and operation in Willoughby City Council is managed through a broad and comprehensive permit system including: Road Opening permits, Crane/Heavy Plant and Road Occupancy permits and Work Zone permits. The provision of permits is mandatory when work is to be undertaken on Council's road network. There is a fee and conditions applicable for all permits. Council requests that the CPBDJV project team contact the Traffic and Transport Team should any such permits be required.

#### Heavy vehicle movements

- The surge in heavy vehicle movements associated with the construction of the WFU project increases the risks of delays, queues, congestion, noise, and air pollution, particularly during weekday morning and afternoon peak periods and potential for incidents on Willoughby Council's local road network. It is critical that the current operation, use and performance of the routes used for all sites are effectively investigated and all safety hazards identified so that the hazards are mitigated to always maximise safety for all road users.
- Haulage Routes (North) on page 66 of the TTAMP does not indicate the route taken in Miller Street as it approaches the Warringah Freeway. It is Council's preference that all heavy vehicles turn right and use the Warringah Freeway to head southerly and not use Strathallen Avenue. Strathallen Avenue is a narrow State Road with both significant horizontal and vertical alignment changes that would lead to safety and amenity (noise) issues for residents if heavy vehicles use this route.

#### Bicyclist and pedestrian safety and amenity

- The need to maximise the safety and amenity of bicyclist and pedestrians during construction is recognised in the TTAMP. The approach adopted is outlined in Section 4.6 and Section 5.7. The information provided does not address the impact when traffic changes impact on bicycle

routes such as the proposed arrangements at the bicycle link connecting Warringah Freeway with Amherst Street.

- There is significant concern with the management of bicyclists (and pedestrians) along the Warringah Freeway, west of the Brook Street on-ramp; and at the Brook Street on-ramp. The plans provided in the TTAMP i.e. WFU-JAJ-DRG-TW-00-(1106, 1107, 1206, 1216, 1306, 1316, 1406, 1506, 2006 and 2106) indicate the retention of the two-way bicycle link along the Freeway and crossing of the Brook Street on-ramp to/from Amherst St and Warringah Freeway under multiple traffic changes.
- The safety of bicyclists under this arrangement is of significant concern. These vulnerable road users will need to negotiate a road environment with construction infrastructure, changing road and traffic management environments and high speed traffic movements. Council is requesting that the CPBDJV project team review the management approach and designs to maximise safety for bicyclists at this location including considering options such as provision of infrastructure to grade separate motor vehicle and bicyclists; and the temporary closure and rerouting to eliminate this conflict point.

#### Future consultation on traffic and transport matters

- As per Section 6.2.1 of the TTAMP, it is understood that a Traffic and Transport Liaison Group (TTLG) will be created by the project team and is proposed to meet monthly to discuss construction staging, community concerns associated with traffic changes, impacts on road, path and public transport users and operators. Furthermore, a Traffic Control Group (TCG) is also described in Section 6.2.2 however these will be weekly meetings.
- Council has previously confirmed that a representative from Council's Traffic and Transport Team will be able to attend the more infrequent TTLG meetings as required. Council requests that the CPBDJV project team contact the Traffic and Transport Team to confirm attendance and agendas for these future meetings.

## **2.2 Noise & Vibration Management Sub-Plan:**

*Reference no. WHTBLWFU-CPBD-NWW-NV-PLN-000005-B*

*Dated 1 October 2021*

Council has reviewed the Noise and Vibration Management Sub-Plan and the Noise and Vibration Monitoring Program and finds them satisfactory. The following additional comments are provided.

It is highly likely that Council will receive complaints from the community in regards to construction noise. The MCoA are quite extensive and cover community consultation, out of hours work and monitoring. Complaints should be directed to the Community Complaints Mediator and the Environmental Protection Authority (EPA).



### **2.3 Flora & Fauna Management Sub-Plan:**

*Reference no. WHTBLWFU-CPBD-NWW-EO-PLN-000004*

*Dated 1 October 2021*

Council has not reviewed this Sub-Plan in detail. Given the works will take place within the North Sydney LGA, there would seem to be negligible impacts on flora and fauna within the Willoughby LGA. However, it is noted that Willoughby Creek and Flat Rock Creek have been mentioned in the Sub-Plan. Although these creeks are located some distance from the existing Freeway and proposed project footprint, the project team should contact Council to discuss any requirements and appropriate environmental management measures, should direct or indirect impacts be identified in future that have not already been identified and addressed in this Sub-Plan.

### **2.4 Air Quality and Odour Management Sub-Plan:**

*Reference no. WHTBLWFU-CPBD-NWW-AH-PLN-000008-B*

*Dated 1 October 2021*

Council has reviewed this Sub-Plan and finds it satisfactory. Air quality impacts are a particular area of concern for both Council and the community, both from the works themselves and construction traffic to, from and within the project footprint. Given the works will take place within the North Sydney LGA, there would seem to be only minor, peripheral impacts in terms of air quality and odour within the Willoughby LGA. Council strongly encourages the project team to ensure that air quality monitoring procedures are thorough and transparent to assuage community concerns both within Willoughby and North Sydney LGAs.

### **2.5 Soil and Surface Water Management Sub-Plan:**

*Reference no. WHTBLWFU-CPBD-NWW-WA-PLN-000006*

*Dated 1 October 2021*

Council has reviewed the Soil and Surface Water Management Sub-Plan and makes the following comments.

The MCoA refer to a Section A1 or A2 Site Audit Statement accompanied by an Environmental Management Plan (EMP). No mention is made in regard to consultation with the EPA or councils on the suitability of the EMP if there are ongoing maintenance requirements in terms of encapsulated/remaining contaminated material or monitoring/pretreatment prior to discharge of groundwater back into the aquifer. Whilst the Site Auditor will be responsible for ensuring the suitability of any EMP, bodies responsible for the management of the land or the receiving waters impacted by the EMP should be consulted with to ensure the plan is practicable and reasonable, plus there could be ongoing costs. Whilst the MCoA cannot be modified, a written undertaking could be made by the certified Contaminated Land Consultant to conduct consultation with the land



owners/managers and relevant councils regarding the suitability of any proposed EMP before it is submitted to the Site Auditor for assessment and a Site Audit Statement is issued.

## 2.6 Heritage Management Sub-Plan:

Reference no. **WHTBLWFU-CPBD-NWW-HE-PLN-000007**

Dated 1 October 2021

Council has reviewed the Heritage Management Sub-Plan and makes the following comments.

From a review of Willoughby Local Environmental Plan 2012 (LEP) heritage mapping and:

- Figure 5-1 (AHIMS site in the vicinity of the project area)
- Figure 5-2 (Location of non-Aboriginal heritage items and potential heritage items within the project area Map 1 of 2)
- Figure 5-3 (Location of non-Aboriginal heritage items and potential heritage items within the project area Map 2 of)

of the Heritage Sub-Plan, it is noted that the southwest border of the Naremburn Central Township heritage conservation area is located next to the existing Warringah Freeway. Several local heritage items are also located in the vicinity of Willoughby Rd and its intersection with the Freeway.

According to section 5.2 of the Heritage Sub-Plan (pg. 20):

*Of those heritage items identified within the study area, 134 items would either have no impact or a negligible impact from the Project due to either the low impact activities proposed or the distances between these items and the project construction works. Impacts on these 134 items would be limited to temporary noise, vibration and/or visual impacts during construction, and managed through the implementation of minimum working distances for vibration intensive construction activities and other standard construction management measures.*

It is unclear why the two heritage conservation areas in the North Sydney Council LGA (Camberay Conservation Area and Holtermann Estate A Conservation Area, Crows Nest) have been listed in Table 5-1 (Non-Aboriginal heritage items within the project area) of the Heritage Sub-Plan, but the aforementioned Naremburn Central Township heritage conservation area has not.

It is also unclear from the various documents what exactly is planned in the vicinity of this area, but presumably it would be various roadworks that create noise and vibration. As such, Council believes there may be indirect impacts on the Naremburn Central Township heritage conservation area, similar to those listed for the two North Sydney heritage conservation areas, namely:



- *Temporary and permanent visual impacts due to the removal of heritage fabric and the construction of permanent operational infrastructure within and adjacent to the heritage boundary.*
- *Temporary vibration impacts due to construction activities within and adjacent to the heritage boundary.*

As such, Council requests further clarification on what, if any, measures are proposed to safeguard properties located within the Naremburn Central Township heritage conservation area, as well as the several local heritage items located in the vicinity of Willoughby Rd and the Freeway.

In this regard, Council notes the requirements of Conditions E79, E80 and E81 of the Infrastructure Approval and the proposed environmental mitigation and management measures as detailed in section 7.7 (Vibration monitoring and acoustic treatment of heritage items) of the Heritage Sub-Plan.

There are no Aboriginal (AHIMS) heritage items located within vicinity of the project area and thus Council would agree that there would be no impacts on the AHIMS items mapped in the Willoughby LGA for this stage of the broader WHT and WFU project. Such impacts would be related to the future Beaches Link and Gore Hill Freeway Connection project.

## Conclusion:

Thank you for your giving Council the opportunity to provide comment on these Plans. Please contact Andrew Gillies, Strategic Transport Planner on **9777 7655** or [Andrew.Gillies@Willoughby.nsw.gov.au](mailto:Andrew.Gillies@Willoughby.nsw.gov.au) if you wish to discuss these matters further.

Yours sincerely,

**Ian Arnott**  
**PLANNING MANAGER**

## Jacqueline McKenzie

---

**From:** Chemney, Howard <Howard.Chemney@pcplr.com.au>  
**Sent:** Tuesday, 5 October 2021 5:47 PM  
**To:** Chris Binns; Andrew Gillies; Gordon.Farrelly@Willoughby.nsw.gov.au  
**Cc:** Rob Owens; Jacqueline McKenzie  
**Subject:** RE: Warringah Freeway Upgrade - Ancillary Site Establishment Management Plan (ASEMP) / Construction Environmental Management Plan sub-plans  
**Attachments:** WHTBLWUFU-CPBD-NWW-EO-PLN-000004-B\_FFMP.pdf; WHTBLWUFU-CPBD-NWW-NV-PLN-000005-B\_NVMP.pdf; WHTBLWUFU-CPBD-NWW-WA-PLN-000006-B\_SWMP.pdf; WHTBLWUFU-CPBD-NWW-HE-PLN-000007-B\_HM.pdf; WHTBLWUFU-CPBD-NWW-AH-PLN-000008-B\_AQMP.pdf

[EXTERNAL] This email originated from outside of the Organisation.

Hi Chris, Andrew and Gordon,

As indicated in the email below, please find attached the following sub-plans for your review:

- Noise & Vibration Management Sub-plan
- Flora & Fauna Management Sub-plan
- Air Quality and Odour Management Sub-plan
- Soil and Surface Water Management Sub-plan
- Heritage Management Sub-plan (which includes both indigenous and non-indigenous heritage)

The Traffic, Transport and Access Management Sub-plan will be sent via dropbox due to its size.

Thanks

### Howard Chemney

Environment & Sustainability Manager

#### Warringah Freeway Upgrade

M 0410 542 009

E [Howard.Chemney@cpbcon.com.au](mailto:Howard.Chemney@cpbcon.com.au)

---

**From:** Chemney, Howard <Howard.Chemney@cpbcon.com.au>  
**Sent:** Tuesday, 5 October 2021 5:44 PM  
**To:** 'Chris Binns' <Chris.Binns@Willoughby.nsw.gov.au>; 'Andrew Gillies' <Andrew.Gillies@Willoughby.nsw.gov.au>; 'Gordon.Farrelly@Willoughby.nsw.gov.au' <Gordon.Farrelly@Willoughby.nsw.gov.au>  
**Cc:** 'Rob Owens' <Rob.Owens@transport.nsw.gov.au>; 'Jacqueline McKenzie' <jacqueline.mckenzie@dswjv.com.au>  
**Subject:** Warringah Freeway Upgrade - Ancillary Site Establishment Management Plan (ASEMP) / Construction Environmental Management Plan sub-plans

Hi Chris, Andrew and Gordon,

This email is to advise you that CPB Downer JV are required to consult with Willoughby Council on the Ancillary Site Establishment Management Plan (ASEMP) and Construction Environmental Management Plan (CEMP) sub-plans as detailed in conditions A17 and C4 of the Infrastructure Approval SSI 8863 for the Warringah Freeway Upgrade (see attachment).

With regards to the CEMP sub-plans we are required to consult with Council on the following sub-plans:

- Traffic, Transport & Access Management Sub-plan
- Noise & Vibration Management Sub-plan



- Flora & Fauna Management Sub-plan
- Air Quality and Odour Management Sub-plan
- Soil and Surface Water Management Sub-plan
- Heritage Management Sub-plan (which includes both indigenous and non-indigenous heritage)

Please find attached the Ancillary Site Establishment Management Plan (ASEMP) for your review with the other sub-plans to follow in a separate email. The Traffic, Transport and Access Management Sub-plan will be sent via dropbox due to its size.

Please note the consultation period for all plans is for 3 weeks and therefore all comments must be received back by Tuesday 26th October. Comments received after this date may not be addressed in time and will be considered during future revisions.

To assist you in your review of the documents we are happy to undertake a live review / page turn to discuss issues directly. Please contact me should you wish to take up this offer.

Please note that TfNSW will also be issuing these plans formally for consultation via the DPIE Portal.

Thanks

## Howard Chemney

Environment & Sustainability Manager

**Warringah Freeway Upgrade**

M 0410 542 009

E [Howard.Chemney@cpbcon.com.au](mailto:Howard.Chemney@cpbcon.com.au)

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## Appendix 3 NSW Health consultation records

## McKenzie, Jacqueline

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**From:** Nick Ives (Northern Sydney LHD) <nick.ives@health.nsw.gov.au>  
**Sent:** Monday, 18 October 2021 10:02 AM  
**To:** Chemney, Howard  
**Cc:** Rob Owens; Jacqueline McKenzie  
**Subject:** RE: Warringah Freeway Upgrade - Ancillary Site Establishment Management Plan consultation - NSW Health

[EXTERNAL] This email originated from outside of the Organisation.

Hi Howard,

I refer to the below documentation regarding Warringah Freeway Upgrade.

- Ancillary Site Establishment Management Plan (1 October 2021 WHTBLWFU-CPBD-NWW-EV-PLN-000001-B);
- Air Quality Management Sub Plan (1 October 2021 WHTBLWFU-CPBD-NWW-AH-PLN-000008-B);
- Noise and Vibration Management Sub-Plan (1 October 2021 WHTBLWFU-CPBD-NWW-NV-PLN-000005-B); and
- Instrument of Approval SSI 8863

This documentation has been noted by Sydney Public Health Unit, Northern Sydney Public Health Unit and the Environmental Health Branch of NSW Health.

NSW Health made initial comments at the EIS stage of the project. No further comment is being provided.

If you have any enquiries please contact me.

### Nick Ives

Environmental Health Manager | **Northern Sydney Public Health Unit**

36-76 Palmerston Road, Hornsby, NSW 2077

Tel (02) 9485 6973 | Fax (02) 9485 6092 | Mob 0416 224 241 | [nick.ives@health.nsw.gov.au](mailto:nick.ives@health.nsw.gov.au)



**Health**  
Northern Sydney  
Local Health District

---

**From:** Chemney, Howard [mailto:Howard.Chemney@pcplr.com.au]  
**Sent:** Thursday, 14 October 2021 1:41 PM  
**To:** Leena Gupta (Sydney LHD) <Leena.Gupta@health.nsw.gov.au>; Michael Staff (Northern Sydney LHD) <Michael.Staff@health.nsw.gov.au>; Richard Broome <Richard.Broome@health.nsw.gov.au>; Nick Ives (Northern Sydney LHD) <nick.ives@health.nsw.gov.au>  
**Cc:** Rob Owens <Rob.Owens@transport.nsw.gov.au>; Jacqueline McKenzie <jacqueline.mckenzie@dswjv.com.au>  
**Subject:** RE: Warringah Freeway Upgrade - Ancillary Site Establishment Management Plan consultation - NSW Health

Hi Lena, Michael, Richard and Nick,

Just following up on the below.

Please let me know if you / NSW Health have any queries during this review stage or require a live review / page turn on any of the documents submitted.

This is also a reminder that all comments must be received back by Friday 22<sup>nd</sup> October.

Thanks

Howard  
0410 542 009

---

**From:** Chemney, Howard

**Sent:** Friday, 1 October 2021 11:42 AM

**To:** [leena.gupta@health.nsw.gov.au](mailto:leena.gupta@health.nsw.gov.au); [michael.staff@health.nsw.gov.au](mailto:michael.staff@health.nsw.gov.au); [Richard.broome@health.nsw.gov.au](mailto:Richard.broome@health.nsw.gov.au); [Nick.Ives@health.nsw.gov.au](mailto:Nick.Ives@health.nsw.gov.au)

**Cc:** Rob Owens <[Rob.Owens@transport.nsw.gov.au](mailto:Rob.Owens@transport.nsw.gov.au)>; Jacqueline McKenzie <[jacqueline.mckenzie@dswjv.com.au](mailto:jacqueline.mckenzie@dswjv.com.au)>

**Subject:** RE: Warringah Freeway Upgrade - Ancillary Site Establishment Management Plan consultation - NSW Health

Hi Leena, Michael, Richard and Nick,

Further to the below correspondence, please find attached the following plans for your consultation:

- Ancillary Site Establishment Management Plan
- Noise & Vibration Management Sub-plan
- Air Quality and Odour Management Sub-plan

The consultation period is for 3 weeks and therefore we request all comments must be received back by Friday 22<sup>nd</sup> October.

Please give me a call if you need any clarification.

Thanks

Howard

0410 542 009

---

**From:** Chemney, Howard

**Sent:** Tuesday, 28 September 2021 4:24 PM

**To:** [leena.gupta@health.nsw.gov.au](mailto:leena.gupta@health.nsw.gov.au); [michael.staff@health.nsw.gov.au](mailto:michael.staff@health.nsw.gov.au); [Richard.broome@health.nsw.gov.au](mailto:Richard.broome@health.nsw.gov.au); [Nick.Ives@health.nsw.gov.au](mailto:Nick.Ives@health.nsw.gov.au)

**Cc:** Rob Owens <[Rob.Owens@transport.nsw.gov.au](mailto:Rob.Owens@transport.nsw.gov.au)>; Jacqueline McKenzie <[jacqueline.mckenzie@dswjv.com.au](mailto:jacqueline.mckenzie@dswjv.com.au)>

**Subject:** Warringah Freeway Upgrade - Ancillary Site Establishment Management Plan consultation - NSW Health

Hi Leena, Michael, Richard and Nick,

Further to the below – it is also a requirement of Condition A17 of the Infrastructure Approval SSI 8863 that we consult with NSW Health on the Ancillary Site Establishment Management Plan (ASEMP). This plan outlines

the environmental management practices and procedures to be implemented for the establishment of the construction ancillary facilities / construction support sites. A snippet of this condition is reproduced below:

#### **SITE ESTABLISHMENT WORK**

##### **Ancillary Site Establishment Management Plan**

**A17** Before establishment of any construction ancillary facility (excluding minor construction ancillary facilities determined by the **ER** to have minimal environmental impact and those established under **Condition A19**), the Proponent must prepare an **Ancillary Site Establishment Management Plan** which outlines the environmental management practices and procedures to be implemented for the establishment of the construction ancillary facilities. The **Ancillary Site Establishment Management Plan** must be prepared in consultation with the relevant council and government agencies. The Plan must be submitted to the Planning Secretary for approval one month before the establishment of any construction ancillary facilities. The **Ancillary Site Establishment Management Plan** must detail the management of the construction ancillary facilities and include:

- (a) a description of activities to be undertaken during establishment of the construction ancillary facility (including scheduling and duration of work to be undertaken at the site);
- (b) figures illustrating the proposed operational site layout and the location of the closest sensitive land user(s);
- (c) a program for ongoing analysis of the key environmental risks arising from the site establishment activities described in subsection (a) of this condition, including an initial risk assessment undertaken prior to the commencement of site establishment work;
- (d) details of how the site establishment activities described in subsection (a) of this condition will be carried out to:
  - (i) meet the performance outcomes stated in the documents listed in **Condition A1**, and
  - (ii) manage the risks identified in the risk analysis undertaken in subsection (c) of this condition; and
- (e) a program for monitoring the performance outcomes, including a program for construction noise monitoring.

Nothing in this condition prevents the Proponent from preparing individual **Ancillary Site Establishment Management Plans** for each construction ancillary facility.

We will be sending over the ASEMP for consultation with NSW Health this Friday 1<sup>st</sup> October.

As with the CEMP sub-plans, the consultation period is for 3 weeks and therefore all comments must be received back by Friday 22nd October. Comments received after this date may not be addressed in time and will be considered during future revisions. We are also happy to assist you in your review of the document by undertaking a live review / page turn to discuss issues directly. Please contact me should you wish to take up this offer.

Please note that TfNSW will also be issuing this plan formally for consultation via the DPIE Portal.

Thanks

### **Howard Chemney**

Environment & Sustainability Manager

**Warringah Freeway Upgrade**

M 0410 542 009

E [Howard.Chemney@cpbcon.com.au](mailto:Howard.Chemney@cpbcon.com.au)

---

**From:** Chemney, Howard

**Sent:** Monday, 27 September 2021 6:26 PM

**To:** [leena.gupta@health.nsw.gov.au](mailto:leena.gupta@health.nsw.gov.au); [michael.staff@health.nsw.gov.au](mailto:michael.staff@health.nsw.gov.au); [Richard.broome@health.nsw.gov.au](mailto:Richard.broome@health.nsw.gov.au); [Nick.Ives@health.nsw.gov.au](mailto:Nick.Ives@health.nsw.gov.au)

**Cc:** Rob Owens <[Rob.Owens@transport.nsw.gov.au](mailto:Rob.Owens@transport.nsw.gov.au)>; Jacqueline McKenzie <[jacqueline.mckenzie@dswjv.com.au](mailto:jacqueline.mckenzie@dswjv.com.au)>

**Subject:** Warringah Freeway Upgrade - Construction Environmental Management Plan consultation - NSW Health

Hi Leena, Michael, Richard and Nick,

This email is to advise [you](#) that CPB Downer JV will be sending over a number of sub-plans to the Warringah Freeway Upgrade Construction Environmental Management Plan (CEMP) for consultation with Council this Friday 1<sup>st</sup> October.

Our requirement to consult with NSW Health on these plans is contained in Condition C4 of the Infrastructure Approval SSI 8863 as snipped below and included in the attachment.

**C4** The following **CEMP Sub-plans** must be prepared in consultation with the relevant government agencies identified for each **CEMP Sub-plan**. Details of all information requested by an agency during consultation must be provided to the Planning Secretary as part of any submission of the relevant **CEMP Sub-plan**, including copies of all correspondence from those agencies as required by **Condition A5**.

	Required CEMP Sub-plan	Relevant government agencies to be consulted for each CEMP Sub-plan
(a)	Traffic, transport and access	Relevant council(s)
(b)	Noise and vibration	NSW Health, relevant council(s)
(c)	Flora and Fauna	DPI Fisheries, DPIE Water, EESG, and relevant council(s)
(d)	Air quality and odour	NSW Health, and relevant council(s)

(e)	Soil and surface water	DPIE Water, EESG, EPA, Sydney Water (if Sydney Water's assets are affected) and relevant council(s)
(f)	Groundwater	DPIE Water, EESG, EPA, Sydney Water (where it is proposed to discharge groundwater into Sydney Water's assets) and relevant council(s)
(g)	Maritime Heritage	Heritage NSW and relevant council(s)
(h)	Non-Aboriginal Heritage	Heritage NSW and relevant council(s)
(i)	Aboriginal Cultural Heritage	Heritage NSW
(j)	Dredging and Disposal Management Plan	EPA, DPI Fisheries, Port Authority of NSW (including Harbour Master)

Specifically we are required to consult with NSW Health on the following project relevant sub-plans:

- Noise & Vibration Management Sub-plan
- Air Quality and Odour Management Sub-plan

The consultation period is for 3 weeks and therefore all comments must be received back by Friday 22<sup>nd</sup> October. Comments received after this date may not be addressed in time and will be considered during future revisions.

To assist you in your review of the documents we are happy to undertake a live review / page turn to discuss issues directly. Please contact me should you wish to take up this offer.

Please note that TfNSW will also be issuing these plans formally for consultation via the DPIE Portal.

Thanks

**Howard Chemney**

Environment & Sustainability Manager  
**Warringah Freeway Upgrade**  
M 0410 542 009



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Views expressed in this message are those of the individual sender, and are not necessarily the views of NSW Health or any of its entities.

# Appendix 4 EPA consultation records

## McKenzie, Jacqueline

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**From:** Rob Owens <Rob.Owens@transport.nsw.gov.au>  
**Sent:** Wednesday, 3 November 2021 9:43 PM  
**To:** howard.chemney@cpbcon.com.au  
**Cc:** Jacqueline McKenzie; Mark Russell  
**Subject:** WFU Plans EPA comments  
**Attachments:** 03.11.21\_EPA comment on AQMP\_C4d C11b\_SSI 8863.pdf; 03.11.21\_EPA comment on NVMP\_C11a E69\_SSI 8863.pdf; 03.11.21\_EPA comment on SWMP\_C4e C11c\_SSI 8863.pdf

[EXTERNAL] This email originated from outside of the Organisation.

Hi Howard,

Please find attached the review comments from EPA:

- Air quality management plan and monitoring program
- Noise and vibration management plan and monitoring program
  - o Inclusive of OOHW protocol
- Soil and water management plan and monitoring program
- ASEMP – no comments

I'm unsure if these were sent directly to you, I received them through the portal and wanted to issue them to you immediately in the interest of time.

Talk with you tomorrow,

Rob

Rob Owens  
Environment and Sustainability Manager  
Warringah Freeway Upgrade  
Central River & Eastern Harbour City | Safety Environment & Regulation  
**Transport for NSW**

M 0435 578 294  
101 Miller Street, North Sydney NSW 2060



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DOC21/952129

3 November 2021

Mr Howard Chemney  
Environment and Sustainability Manager  
CPB Downer Joint Venture  
(for Transport for NSW)

(via Major Projects Planning Portal)

Dear Mr Chemney

**Western Harbour Tunnel and Warringah Freeway Upgrade (SSI 8863)  
EPA Comment on Post Approval Document: Noise and Vibration Management Sub Plan –  
Warringah Freeway Upgrade (Conditions C11(a) and E69)**

I am writing to you in reply to your request to the Environment Protection Authority (EPA) to comment on the draft document *Appendix B3: Noise and Vibration Management Sub Plan*, Rev B, dated 1 October 2021, (the NVMP) that has been prepared for the Warringah Freeway Upgrade package of construction works for the above project.

In accordance with condition C11(a) of the SSI 8863 approval the proponent must prepare a Noise and Vibration Monitoring Program in consultation with the EPA. The proponent is also required to consult with the EPA for the Out-of-Hours Work Protocol (OOHWP) under condition E69. The monitoring program has been included as Appendix B of the NVMP and OOHWP as Appendix C.

The EPA has reviewed the NVMP. The review is high level and does not extend to matters relating to cosmetic and structural damage and the Noise Insulation Program, as these are outside the EPA's regulatory function. The EPA notes that as an outcomes-based regulator, the EPA does not typically comment on management plans or prescribes specific mitigation measures. It is ultimately the proponent's responsibility to implement sufficient actions and mitigations to comply with the conditions of the environment protection licence. Comments are in the following table:

Section	Comment
Glossary / Abbreviations	The document would benefit from a definition of "noise mitigation". The term should be defined to mean: 'feasible and reasonable noise mitigation measures'.
Section 3.1.1	It is suggested to include <i>Environmental Planning &amp; Assessment Act 1979</i> and remove reference to the Noise Control Regulation (2008) – unless its inclusion can be justified.
Section 3.2	It is unclear why condition A9 regarding the <i>Noise Insulation Programme</i> (NIP) is not included in Table 3-1.
Section 3.2	It is unclear why the blasting conditions have not been included in Table 3-1 (E95 to E99). The Environmental Management Measures in Section 3.3 include Construction blasting impacts (CNV9).

Section	Comment
Section 4.1	It is unclear why the requirements of condition E83 (Out-of-Hours Works – Community Consultation on Respite) have not been mentioned or discussed in this section. The EPA queries: <ol style="list-style-type: none"> <li>1. how the community will be able to influence respite periods; and</li> <li>2. what respite periods the proponent seek to provide. (This is discussed further below, regarding <i>Appendix B3 – Out of Hours Works Protocol</i>.)</li> </ol>
Section 5.3	It is recommended that noise monitoring locations in Table 5-1 are cross-referenced with correlated Noise Catchment Areas (NCA).
Sections 7.3.1 and 7.3.2	<p>Section 7.3.1 “Early Works Impacts” states:  <i>“The Warringah Freeway Upgrade early works will occur during the first 12 months of works. A summary of activities and potential impacts are included in Table 7-1.”</i></p> <p>Section 7.3.2 “Main Works Impacts” states:  <i>“The Warringah Freeway Upgrade main works will commence after the first 12 months of early works and will include all works remaining to complete this project. <u>The main works will be subject to a separate CEMP and in turn a separate NVMP sub plan.</u>”</i></p> <p>Prior to Section 7, there is no mention of the Warringah Freeway Upgrade Works having more than one package of CEMP/NVMP documents. If this is the case, then this information should be stated early in the report.</p> <p>Section 1.3 “Scope of the Sub-Plan” makes no mention that this NVMP for the Warringah Freeway Upgrade is for Main Works, distinct from Early Works, nor does it identify the scope of early works or main works. This should be clarified and contextualised.</p>
Section 7.3.2	Table 7-1 references CV3. It is queried whether this is a typo and it should be “CNV3”.
Section 8.2	Paragraph 1, Line 5 (2 <sup>nd</sup> last sentence): The EPA recommends the inclusion of the words “for endorsement” as follows: <i>“A copy of the CNVIS must be provided to the AA and ER <u>for endorsement</u> prior to the commencement of the associated works”</i> to be consistent with condition A34(e) regarding the role of the Acoustic Advisor.
Section 8.2	<p>Paragraph 2, dot point 6: <i>“The CNVIS will address: ...</i></p> <ul style="list-style-type: none"> <li>• <i>“Mitigation options and preferred management measures, including noise barriers and acoustic enclosures as relevant”</i> (dot point 6)</li> </ul> <p>It is recommended this be changed to reflect condition E75. The CNVIS should outline “<u>specific mitigation measures</u>” and not “<i>mitigation options</i>”.</p> <p>The purpose of the CNVIS is to guide deployment of specific mitigation measures at sites and should be the final delivery document to secure the best achievable outcomes for the community. It should therefore outline the specific mitigation measures for each site. For the noise levels reported in a CNVIS to be an effective performance benchmark they must reflect the best achievable noise levels after the effect of all mitigation is considered and factored into the predicted levels.</p>
Sections 8.2 and 8.3	<p>The relationship between the CNVIS and ‘Noise Management Tool’ is unclear. The EPA questions whether the CNVIS’s will be stand-alone and definitive documents that guide the deployment of specific mitigation measures and practices at each site; or if assessment will be deferred to sub documents / assessments that use the prediction tool as work sites and activities are progressively rolled out.</p> <p>It is recommended the NVMP identify which document will have definitive and auditable mitigation measures outlined for each activity and each work site.</p>
Section 8.2	Part 3. Regarding <i>Airborne Construction Noise</i> , dot point 4:

Section	Comment
	<p><i>For night-time activities, calculate the maximum (L<sub>Amax</sub>) noise levels and compare with LA(1 min) 65 dB(A) sleep disturbance criterion, applied at the external façade.</i></p> <p>The sleep disturbance criterion should be consistent with Section 6.3.1.3:</p> <p><i>“A night-time sleep disturbance ‘screening criterion’ noise goal of RBL +15 dB(A) is used to identify the receivers where there is potential for sleep disturbance. Where the sleep disturbance screening criterion is exceeded, further assessment is conducted to determine whether the ‘awakening reaction’ level of L<sub>Amax</sub> 65 dB(A) would be exceeded and the likely number of these events. The awakening reaction level is the level above which sleep disturbance is considered likely.”</i></p>
Section 9.1	<p>Table 9-1: Noise and Vibration Management and Mitigation Measures: MMNV20 states: <i>“Noise barriers (such as site hoardings) will be constructed around ancillary facilities as detailed within the CNVIS (Note: this does not include temporary noise blankets, whose location is not specified in the CNVIS). Temporary noise barriers will be used around noisy equipment and activities such as rock-hammering and concrete cutting.”</i></p> <p>This measure indicates that the CNVIS will not include temporary noise blankets. The EPA recommends that the MMNV20 identify when, how and who will decide when temporary noise blankets are likely to be effective and deployed.</p> <p>The absence of this alludes to the possibility that the CNVIS will not be a definitive “how to” to undertake activities using all feasible and reasonable measures i.e. “best practice” as required by condition E74. The CNVMP should identify what checks, balances and accountability will be used to ensure compliance with condition E74 at all times.</p> <p>It also suggests that the noise levels reported in a CNVIS may not take into account all available noise mitigation options. If this is the case, it would be difficult to determine how the reported noise levels in the CNVIS can be used as a performance indicator as proposed in the Noise Monitoring Program as they may not represent best practice.</p>
Section 9.1	<p>Table 9-1: Noise and Vibration Management and Mitigation Measures: MMNV29: The EPA recommends the inclusion of the words “mitigation and” as follows:</p> <p><i>Verification monitoring will be carried out during the initial stages of activities for which a location and activity specific noise and vibration impact assessment has been prepared to confirm that actual noise and vibration levels are consistent with noise and vibration impact predictions and that the <u>mitigation and</u> management measures that have been implemented are appropriate.</i></p> <p>The EPA supports the approach that verification monitoring should be as much about noise levels as about confirming the placement and effectiveness of “mitigation and management measures”.</p>
Section 9.3	<p>Condition E88 restricts the numbers of out of hours works occasions that may be performed along the Warringah Freeway Corridor over a week / month period. The condition does not appear to allow exceptions through the out of hours works protocol.</p> <p>The relationship between works allowable (or indeed restrictions) imposed by E88 and works that may be approved via the OHWP need to be determined and clearly outlined.</p>
<b>Appendix B3 - Noise and Vibration Monitoring Program – Warringah Freeway Upgrade</b>	
Section 1.3	<p>It is recommended that the Scope of the Monitoring Programme include a specific requirement that “monitoring” will extend to an assessment of the adequacy, completeness and effectiveness of the noise mitigation measures being used, and whether additional mitigation should be deployed.</p>
Sections 6.2 and 7.2	<p>Real time (unattended) noise and vibration monitoring is required under condition C13(d). The monitoring program has deferred this to an undefined and later time.</p>



Section	Comment
	The EPA requires that the project consults with the EPA as more details on the design and deployment of the real time noise and vibration monitoring is known.
Section 6.3	<b>Note only:</b> Includes the following comment, <i>"EPL OOHW monitoring and reporting requirements to be included here once gained"</i> .
Section 6.4	The competency requirements for staff undertaking noise monitoring should be clearly presented in the monitoring program, and more importantly the procedural checks and balances and training requirements to ensure that competency is achieved clearly presented.
Section 10	Continual improvement and corrective action: It is recommended that where noise and vibration monitoring identifies an exceedance of predicted noise and vibration level in CNVIS documents, that the actions include notifying the AA to seek advice.
<b>Appendix B3 – Out of hours work protocol – Warringah Freeway Upgrade</b>	
General comment	It is recommended the proponent seek advice / interpretation from DPIE about the relationship between the Out-of-Hours Works Protocol approval pathway and condition E88 (Warringah Freeway Upgrade – Out-of-Hours Work Periods). E88 would appear to place a cap on out-of-hours works and there does not appear to be a provision that allows the OOHWP to adjust that cap.
Section 4.5 and generally	It is unclear what "respite" from out-of-hours works the proponent is seeking to provide. This should be stated clearly and simply – e.g. a statement such as: <i>"the proponent will ensure that no more than X nights per week or X nights per month of out-of-hours work will occur that impacts the same receiver by more than 5 dB above RBL"</i> . This goes to the issue / question of defining and understanding the limits imposed by condition E88 and having a clear understanding of what respite goals are being adopted and indeed how the community can inform those respite goals.
Section 6.1	It is essential that the relationship between the E88 works and works approved by the OOHWP is established. This is to avoid a situation where works are undertaken 2-3 nights under the auspices of E88 and then another 2-3 nights per week under the auspices of works approved through the low risk category of the OOHWP.
Section 10	The EPA queries how the proponent will ensure that noise and vibration assessments prepared to support out-of-hours works applications under the protocol present the levels achievable through the application of all feasible and reasonable noise mitigation measures. The corrective measures under this section could promote some "tolerances" being incorporated into the modelling which would not be ideal. Predicted noise levels in CNVIS and other assessments to support out-of-hours work need to be the best achievable noise levels especially where these levels are to be used as performance benchmarks as proposed in these documents.

Should you require clarification of any of the above please contact Anna Timbrell on 9274 6345 or email [anna.timbrell@epa.nsw.gov.au](mailto:anna.timbrell@epa.nsw.gov.au)

Yours sincerely

**ALEKSANDRA YOUNG**  
Unit Head  
Regulatory Operations Metro South

## McKenzie, Jacqueline

---

**From:** Chemney, Howard <Howard.Chemney@pcplr.com.au>  
**Sent:** Friday, 1 October 2021 11:19 AM  
**To:** Aleksandra Young; Kurt Sorensen  
**Cc:** Rob Owens; Jacqueline McKenzie  
**Subject:** RE: Warringah Freeway Upgrade - Construction Environmental Management Plan / Monitoring Program consultation - NSW EPA  
**Attachments:** WHTBLWHU-CPBD-NWW-EV-PLN-000001-B\_ASEMP.pdf; WHTBLWFU-CPBD-NWW-WA-PLN-000006-B\_SWMP.pdf; WHTBLWFU-CPBD-NWW-NV-PLN-000005-B\_NVMP.pdf; WHTBLWFU-CPBD-NWW-AH-PLN-000008-B\_AQMP.pdf

[EXTERNAL] This email originated from outside of the Organisation.

Hi Aleksandra and Kurt,

Further to the below correspondence, please find attached the following plans for your consultation:

- Ancillary Site Establishment Management Plan
- Soil & Water Management Plan
- Noise & Vibration Management Plan
- Air Quality Management Plan

The consultation period is for 3 weeks and therefore we request all comments must be received back by Friday 22nd October.

Please give me a call if you need any clarification.

Thanks

Howard

0410 542 009

---

**From:** Chemney, Howard  
**Sent:** Tuesday, 28 September 2021 5:55 AM  
**To:** 'Aleksandra Young' <Aleksandra.Young@epa.nsw.gov.au>; 'Kurt Sorensen' <Kurt.Sorensen@epa.nsw.gov.au>  
**Cc:** 'Rob Owens' <Rob.Owens@transport.nsw.gov.au>; 'Jacqueline McKenzie' <jacqueline.mckenzie@dswjv.com.au>  
**Subject:** RE: Warringah Freeway Upgrade - Construction Environmental Management Plan / Monitoring Program consultation - NSW EPA

Hi Aleksandra and Kurt,

Further to the below – it is also a requirement of Condition A17 of the Infrastructure Approval SSI 8863 that we consult with NSW EPA on the Ancillary Site Establishment Management Plan (ASEMP). This plan outlines the environmental management practices and procedures to be implemented for the establishment of the construction ancillary facilities / construction support sites. A snippet of this condition is reproduced below:

## SITE ESTABLISHMENT WORK

### Ancillary Site Establishment Management Plan

A17 Before establishment of any construction ancillary facility (excluding minor construction ancillary facilities determined by the **ER** to have minimal environmental impact and those established under **Condition A19**), the Proponent must prepare an **Ancillary Site Establishment Management Plan** which outlines the environmental management practices and procedures to be implemented for the establishment of the construction ancillary facilities. The **Ancillary Site Establishment Management Plan** must be prepared in consultation with the relevant council and government agencies. The Plan must be submitted to the Planning Secretary for approval one month before the establishment of any construction ancillary facilities. The **Ancillary Site Establishment Management Plan** must detail the management of the construction ancillary facilities and include:

- (a) a description of activities to be undertaken during establishment of the construction ancillary facility (including scheduling and duration of work to be undertaken at the site);
- (b) figures illustrating the proposed operational site layout and the location of the closest sensitive land user(s);
- (c) a program for ongoing analysis of the key environmental risks arising from the site establishment activities described in subsection (a) of this condition, including an initial risk assessment undertaken prior to the commencement of site establishment work;
- (d) details of how the site establishment activities described in subsection (a) of this condition will be carried out to:
  - (i) meet the performance outcomes stated in the documents listed in **Condition A1**, and
  - (ii) manage the risks identified in the risk analysis undertaken in subsection (c) of this condition; and
- (e) a program for monitoring the performance outcomes, including a program for construction noise monitoring.

Nothing in this condition prevents the Proponent from preparing individual **Ancillary Site Establishment Management Plans** for each construction ancillary facility.

We will be sending over the ASEMP for consultation this Friday 1<sup>st</sup> October.

As with the CEMP sub-plans, the consultation period is for 3 weeks and therefore all comments must be received back by Friday 22nd October. Comments received after this date may not be addressed in time and will be considered during future revisions. We are also happy to assist you in your review of the document by undertaking a live review / page turn to discuss issues directly. Please contact me should you wish to take up this offer.

Please note that TfNSW will also be issuing this plan formally for consultation via the DPIE Portal.

Thanks

**Howard Chemney**

Environment & Sustainability Manager

**Warringah Freeway Upgrade**

M 0410 542 009

E [Howard.Chemney@cpbcon.com.au](mailto:Howard.Chemney@cpbcon.com.au)

---

**From:** Chemney, Howard

**Sent:** Monday, 27 September 2021 6:46 PM

**To:** Aleksandra Young <[Aleksandra.Young@epa.nsw.gov.au](mailto:Aleksandra.Young@epa.nsw.gov.au)>; Kurt Sorensen <[Kurt.Sorensen@epa.nsw.gov.au](mailto:Kurt.Sorensen@epa.nsw.gov.au)>

**Cc:** Rob Owens <[Rob.Owens@transport.nsw.gov.au](mailto:Rob.Owens@transport.nsw.gov.au)>; Jacqueline McKenzie <[jacqueline.mckenzie@dswjv.com.au](mailto:jacqueline.mckenzie@dswjv.com.au)>

**Subject:** Warringah Freeway Upgrade - Construction Environmental Management Plan / Monitoring Program consultation - NSW EPA

Hi Aleksandra and Kurt,

This email is to advise you that CPB Downer JV will be sending over a number of sub-plans to the Warringah Freeway Upgrade Construction Environmental Management Plan (CEMP) for consultation with Council this Friday 1<sup>st</sup> October. We will also be sending a number of monitoring programs.

Our requirement to consult with NSW EPA on these plans / programs is contained in Condition C4 & C6 of the Infrastructure Approval SSI 8863 as snipped below and included in the attachment.

- C4** The following **CEMP Sub-plans** must be prepared in consultation with the relevant government agencies identified for each **CEMP Sub-plan**. Details of all information requested by an agency during consultation must be provided to the Planning Secretary as part of any submission of the relevant **CEMP Sub-plan**, including copies of all correspondence from those agencies as required by **Condition A5**.

	Required CEMP Sub-plan	Relevant government agencies to be consulted for each CEMP Sub-plan
(a)	Traffic, transport and access	Relevant council(s)
(b)	Noise and vibration	NSW Health, relevant council(s)
(c)	Flora and Fauna	DPI Fisheries, DPIE Water, EESG, and relevant council(s)
(d)	Air quality and odour	NSW Health, and relevant council(s)

(e)	Soil and surface water	DPIE Water, EESG, EPA, Sydney Water (if Sydney Water's assets are affected) and relevant council(s)
(f)	Groundwater	DPIE Water, EESG, EPA, Sydney Water (where it is proposed to discharge groundwater into Sydney Water's assets) and relevant council(s)
(g)	Maritime Heritage	Heritage NSW and relevant council(s)
(h)	Non-Aboriginal Heritage	Heritage NSW and relevant council(s)
(i)	Aboriginal Cultural Heritage	Heritage NSW
(j)	Dredging and Disposal Management Plan	EPA, DPI Fisheries, Port Authority of NSW (including Harbour Master)

## CONSTRUCTION MONITORING PROGRAMS

- C11** The following **Construction Monitoring Programs** must be prepared in consultation with the relevant government agencies identified for each to compare actual performance of construction of the CSSI against the performance predicted in the documents listed in **Condition A1** or in the **CEMP**:

	Required Construction Monitoring Programs	Relevant government agencies to be consulted for each Construction Monitoring Program
(a)	Noise and Vibration Monitoring Program	EPA
(b)	Air Quality (including Odour) Monitoring	EPA
(c)	Surface Water Monitoring Program	DPIE Water, (Sydney Water if any Sydney Water assets are impacted), EPA
(d)	Groundwater Monitoring Program	DPIE Water, EPA
(e)	Marine Monitoring Program	DPI Fisheries, EPA
(f)	Dredging Monitoring Program	DPI Fisheries, EPA

Specifically we are required to consult with NSW EPA on the following project relevant sub-plans / monitoring programs:

- Soil and Surface Water Management Sub-plan (including Surface Water Monitoring Program and Groundwater Management Procedure)
- Noise and Vibration Monitoring Program



- Air Quality (including odour) Monitoring Program

The consultation period is for 3 weeks and therefore all comments must be received back by Friday 22nd October. Comments received after this date may not be addressed in time and will be considered during future revisions.

To assist you in your review of the documents we are happy to undertake a live review / page turn to discuss issues directly. Please contact me should you wish to take up this offer.

Please note that TfNSW will also be issuing these plans formally for consultation via the DPIE Portal.

Thanks

## Howard Chemney

Environment & Sustainability Manager

**Warringah Freeway Upgrade**

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