Upper South Creek

Advanced Water Recycling Centre and Pipelines

Noise & Vibration CEMP Sub-plan

Document No: USCP-JHG-MPL-ENV-0007
Revision: D

Recommend Documents to be Read in Conjunction

This management plan is to be read in conjunction with the Construction Environmental Management Plan (USCP-JHG-MPL-ENV-0008), Heritage CEMP Sub-plan (USCP-JHG-MPL-ENV-0006 and the Biodiversity CEMP Sub-plan (USCP-JHG-MPL-ENV-0004).

Distribution

There are no restrictions on the distribution or circulation of this CEMP Sub-plan within John Holland.

	Uncontrolled Copy
Authorised By: Date:	Richard Ioffrida (Project Director)

Revisions

Draft issues of this document shall be identified as Revision 01, 02, 03 etc. Upon initial issue this shall be changed to a sequential lettering commencing at Revision A. Revision letters shall commence at Rev. A, B etc.

Date	Rev	Details of Change	Section	Prepared By	Reviewed & Approved By
26.01.2023	01	Initial draft for review	All		A Harrington
21.02.2023	02	Updated in response to SW comments	All	D. O'Brien / B Dechnik	A. Harrington
07.03.2023	03	Updated in response to SW final comments	All	A. Harrington	A. Harrington
14.04.2023	04	Updated in response to ER comments	All	D.O'Brien	A.Harrington
04.05.2023	05	Updated in response to ER and Agency comments	All	M.Segaran	A.Harrington
11.05.2023	06	Updated in response to ER comments	All	M.Segaran	A.Harrington
16.06.2023	07	Updated in response to DPHI comments	All	A.Morris / M.Segaran	A.Harrington
28.06.2023	08	Updated in response to DPHI comments	All	A.Morris / M.Segaran	A.Harrington
22.08.2023	A	Issued for construction	All	M.Segaran	D. O'Brien
02.06.2024	B	Updated to include revised information following EPL variation approval	All	R.Maxwell	A.Harrington
15.08.2024	C	Minor update to Appendix E (Noise and Vibration Monitoring Program)	Appendix E	R.Maxwell	A.Harrington
26.11.2024	D	ISC review of objectives and targets	Section 2	A.Harrington	A.Harrington

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2 December 2024

Cheryl Cahill
Sydney Water Major Projects - Environment Lead
Sydney Water
Level 11, 1 Smith Street
Parramatta NSW 2150

By Email: cheryl.cahill@sydneywater.com.au

Dear Cheryl,

Subject: Environmental Representative (ER) review and approval – Revised Noise and Vibration CEMP Sub-plan, Revision D

SSI-8609189 – Upper South Creek Advanced Water Recycling Centre

Pursuant to SSI-8609189 Condition A28(j), I have reviewed the updated Noise and Vibration Construction Environmental Management Plan (CEMP) Sub-plan (NVCSP) which has undergone minor updates to Section 2.2 with regards to environmental targets.

Complete details of the reviewed document as follows:

- Upper South Creek Advanced Water Recycling Centre and Pipelines – Noise and Vibration CEMP Sub-plan Document No: USCP-JHG-MPL-ENV-0007, Revision D, dated 26/11/2024.

As the approved Environmental Representative (ER) for the Upper South Creek Advanced Recycling Centre Project, I am satisfied the amendments are administrative in nature and are consistent with the terms of the Project Approval (SSI-8609189) and the CEMP, CEMP Sub-plans and monitoring programs approved by the Planning Secretary. I therefore approve the minor amendments to the above listed documentation.

Please feel free to contact me if you require anything further or would like to discuss.

Yours sincerely,

Ben Bracken

Environmental Representative
Upper South Creek Advanced Water Recycling Centre Project
BBEnviro Pty Ltd

Phone: 0410 409 897 Email: ben.bracken@bbenviro.com.au

ACOUSTICS ADVISOR ENDORSEMENT
SYDNEY WATER UPPER SOUTH CREEK PROJECT

Project:	**SSI 8609189**	**Stage:**	**Concept and Stage 1**
Review of	Noise & Vibration CEMP Sub-plan	**Reviewed document reference:**	Upper South Creek Advanced Water Recycling Centre and Pipelines Noise & Vibration CEMP Sub-Plan USCP-JHG-MPL-ENV-0007 Revision D Dated: 26 November 2024
Prepared by:	Larry Clark, Acoustics Advisor		
Date of issue:	14 January 2025		

As approved Acoustics Advisor (AA) for the Sydney Water Upper South Creek Project I reviewed Revision D of the Noise & Vibration CEMP Sub-Plan in conjunction with the Environmental Representative (ER). Revision D has a minor update from Revision C with regards to environmental targets in Section 2.2.

I am satisfied that the amendment made in the update is relevant, minor or of an administrative nature, necessary, and consistent with the terms of SSI Approval 8609189 and the management plans and monitoring programs approved by the Planning Secretary.

On that basis I endorse Revision D of the Noise and Vibration CEMP Sub-Plan, with reference to Condition of Approval A34 (h)(iii).

Larry Clark

Larry Clark, Acoustics Advisor

Glossary & Abbreviations

Abbreviations	Meaning
AA	Independent Acoustic Advisor
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.
Amendment Report	Upper South Creek Advanced Water Recycling Centre Amendment Report (March 2022)
Amendment RtS	Upper South Creek Advanced Water Recycling Centre Submissions Report – project amendments (April 2022)
AMM	Additional Mitigation Measures
ANML	Airbourne noise management level
Attenuation	The reduction in the level of sound or vibration.
AWRC	Advanced Water Recycling Centre
CCS	Community Communication Strategy (applicable to this project is the use of the term Community and Stakeholder Engagement Plan (CSEP))
CEMP	Construction Environmental Management Plan
CNVIS	Construction Noise & Vibration Impact Statement – Describe the construction activities proposed; identifies the potential impacts of those activities on the community; the measures that will be used to reduce impacts on the affected community; how the community will be informed and engaged; and, how noise impacts will be monitored and enforced. They are often referred to as Noise and Vibration Management Plans, Construction Noise and Vibration Impact Statements, Construction Method Statements, Work Method Statements and the like.
CNVS	TfNSW Construction Noise & Vibration Strategy
CoA	Minister's Conditions of Approval
CSSI	Critical State Significant Infrastructure
Daytime, day	The period from 7 am to 6 pm (Monday to Friday) and 8 am to 1 pm (Saturday).
dB(A)	Decibels using the A-weighted scale measured according to the frequency to the human ear.
DCCEEW	(Commonwealth) Department of Climate Change, Energy, the Environment and Water
DEC	Department. of Environment and Conservation NSW
DPHI	NSW Department of Planning, Housing and Infrastructure
EIS	Upper South Creek Advanced Water Recycling Centre Environmental Impact Statement (September 2021)
EIS RtS	Upper South Creek Advanced Water Recycling Centre Submissions Report (March 2022)
ENMM	Environmental Noise Management Manual
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.
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.
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	*Environmental Planning and Assessment Act* 1979
EPBC Act	*Environmental Protection and Biodiversity Conservation Act* 1999
EPL	Environmental Protection Licence
ER	Environmental Representative
Evening	Refers to the period from 6 pm to 10 pm.
EWMS	Environmental Work Method Statements

Abbreviations	Meaning
Extraneous noise	Noise resulting from activities that are not typical of the area. Atypical activities may include construction, and traffic generated by holiday periods and by special events such as concerts or sporting events. Normal daily traffic is not considered to be extraneous.
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.
GNML	Ground-borne noise management level
Heritage item	A place, building, work, relic, archaeological site, tree, movable object or precinct of heritage significance, that is listed under one or more of the following registers: the State Heritage Register under the Heritage Act 1977 (NSW), a state agency heritage and conservation register under section 170 of the Heritage Act 1977 (NSW), a Local Environmental Plan under the EP&A Act, the World, National or Commonwealth Heritage lists under the Environment Protection and Biodiversity Conservation Act 1999 (Cth), and an “Aboriginal object” or “Aboriginal place” as defined in section 5 of the National Parks and Wildlife Act 1974 (NSW)
Highly noise affected	As defined in the Interim Construction Noise Guideline (DECC, 2009)
Highly noise intensive (Infrastructure Approval)	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 h. Impact piling. • Also described in EPL 21800 - • Identified as particularly annoying in section 4.5 of the ICNG; and/or, • Works identified as ‘Highly Noise Intensive Works’ in a planning approval for the activities in this licence; and/or • Any other activity identified by the EPA, and advised to the licensee, following an assessment of the character of the noise emitted by the activity based on the Noise Policy for Industry, Fact Sheet C considerations (EPA, 2017).
ICNG	Interim Construction Noise Guidelines
ISC / ISC 2.1	Infrastructure Sustainable Council Version 2.1
ISC Benchmark	A benchmark listed in the Infrastructure Sustainability Council’s IS v2.1 Technical Manual Design and As Built Rating, notably Env-2 (noise) and Env-3 (vibration)
JH	John Holland (the Principal Contractor)
LGA	Local Government Area
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.
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.
NCA	Noise Catchment Area
NCG	Noise Criteria Guideline
Night	The period from 10 pm to 7 am (Monday to Saturday), and 10 pm to 8 am (Sundays and public holidays)
NMG	Noise Mitigation Guideline
NML	Noise Management Level - has the same meaning as "Airborne Noise Management Levels" in the Interim Construction Noise Guideline (DECC 2009)
Noise Mitigation	Reasonable and feasible noise mitigation measures

Abbreviations	Meaning
NPI	Noise Policy for Industry, Environment Protection Agency 2017
NVCSP	Noise and Vibration CEMP Sub-Plan (this plan)
NVMoP	Noise and Vibration Monitoring Program
OOHW	Out of Hours Work
POEO Act	*Protection of the Environment Operations Act* 1997
PPV	Peak Particle Velocity
Project, the	Upper South Creek Advanced Water Recycling Centre and Pipelines
RBL	Rating Background Level for each period is the medium value of the ABL values for the period over all of the day's measures. There is therefore an RBL value for each period (day, evening, and night)
RNP	Road Noise Policy
ROL	Road Occupancy Licence
RtS	Response to submissions
SMART (principles)	Specific, measurable, achievable, realistic, and time-based
SWC	Sydney Water Corporation (the client and Proponent)
TfNSW	Transport for NSW
TW	Treated Water
UMM	Updated Management Measures
USC	Upper South Creek
VDV	Vibration Dose Value

Note: Glossary provided in The Conditions of Approval for this project (SSI 8609189) and EPL 21800.

CONTENTS

1 Introduction

1.1 Context

This Noise & Vibration CEMP Sub-plan (NVCSP) forms part of the Construction Environmental Management Plan (CEMP) for Upper South Creek Advanced Water Recycling Centre (AWRC) and Pipelines Project (refer to herein as the Project).

This NVCSP has been prepared to address the requirements of:

- Minister's Conditions of Approval (CoA),
- *Upper South Creek Advanced Water Recycling Centre Environmental Impact Statement* (EIS) (September 2021)
- *Upper South Creek Advanced Water Recycling Centre Submission Report* (March 2022)
- *Upper South Creek Advanced Water Recycling Centre Amendment Report* (March 2022)
- *Upper South Creek Advanced Water Recycling Centre Submissions Report – Project Amendments* (April 2022)
- Response to DPHI RFI 1, regarding responses to advice received on the Response to Submissions Report (dated 01 June 2022, 01 July 2022, and 11 July 2022)
- Response to DPHI RFI 2, regarding additional information on Flood Impact Assessment (dated 11 July 2022)
- Commonwealth Controlled Activity approval (EPBC 2020/8816)
- Modification of Infrastructure Approval CSSI 8609189, 26 May 2023 (herein referred to as Mod 1)
- Modification of Infrastructure Approval CSSI 8609189, 10 October 2023 (herein referred to as Mod-2)
- EPL Licence No. 21800 including approved variations on 24/11/2023 and 11/04/2024.
- Infrastructure Sustainability Council Technical Manual version 2.1 (ISC 2.1) requirements, and
- All applicable legislation.

The USC project will be built in stages, consisting of:

Stage 1

- building and operating the AWRC to treat a daily wastewater flow, known as the average dry weather flow (ADWF), of up to 50 megalitres per day (ML/day); and
- building the treated water and brine pipelines to cater for up to 100 ML/day flow coming through the AWRC (but only operating them to transport and release volumes produced by Stage 1).

Future Stages

It is expected that the AWRC will ultimately require expansion to treat wastewater flows up to 100 ML/day. Sydney Water will remain flexible on the size and timing of these future upgrades to accommodate changes in population projections over time. Future stages will be subject to further environmental assessment.

Further detail on project staging is provided in the EIS. This NVCSP applies to Stage1 detailed design, construction, and commissioning only. John Holland (JH) has been appointed by Sydney Water to deliver the USC project works, including detailed design and construction for treating an operational daily wastewater flow of up to 35ML/day. Greater flow capacities (including up to 50ML/day and 100ML/day), as explored in the EIS, are not covered in this NVCSP.

1.2 Project Description and Background

A comprehensive project description, including staging of the project, is outlined in Sections 1.1 to 1.3 of the CEMP. Figure 1.1 includes an overview of the Project site and associated pipelines. Figure 1.2 includes an overview of the ARWC site.

As part of the EIS development, a detailed assessment identified the key noise and vibration issues, characterised the existing environment and surrounding sensitive receiver, quantified predicted construction noise and vibration levels and used preliminary modelling to predict the impact of the project on surrounding receivers. The assessment is included in section 11.2 of the EIS and in Appendix S (Noise & Vibration Impact Assessment). Additional noise and vibration assessment was included in the Amendment Report, within Chapter 7 and the Noise and Vibration Impact Assessment Amendment Report (Appendix D of the Amendment Report).

As this NVCSP does not include the operational component of the project, the management of noise and vibration during construction of all infrastructure, as identified above is the key issue addressed in this plan.

1.3 Purpose

The purpose of this NVCSP is to outline the Project's approach to implement measures to minimise and manage noise and vibration impacts during construction in accordance with the Project's legal, planning, and contractual requirements. Potential noise and vibration impact as a result of project activities requiring management during construction (including cumulative impacts), as identified through ongoing environmental risk analysis, will be managed through SMART principles:

- **S**pecific – noise and vibration mitigation and management measures explored in Section 8 of this Plan specifically speak to JH's approach to noise and vibration generation during construction which was identified in the EIS as a key impact.
- **M**easurable – Inspection and monitoring requirements detailed in Section 9 of this Plan include specific measures or indicators for which inspection and monitoring requirements will be triggered, including a noise and vibration monitoring program (as required under CoA C13(c) and appended to this Plan in Appendix E).
- **A**chievable – Ongoing compliance with CoAs and UMM requirements (Table 3-1 and Table 3-2, respectively), as discussed in Section 8 of this Plan, is achievable throughout the delivery of the USC construction work and represents the minimum requirements to be implemented by JH.
- **R**elevant - The management measures outlined in Section 8 of this Plan represent JH's approach to monitoring and tracking against the objectives, targets, environmental performance outcomes and construction noise and vibration criteria (which are identified in Section 2 and Section 6 of this Plan).
- **T**ime-bound – On a broader scale, the management measures set out within Section 8 of this Plan are required to be implemented for the duration of construction, setting a clear and defined time frame and includes reference to other temporal applications, including during detailed design, pre-construction, post-construction and/or operation.

Figure 1-1a Overview of the AWRC site (Black outline) and Treated Water pipeline (Purple)

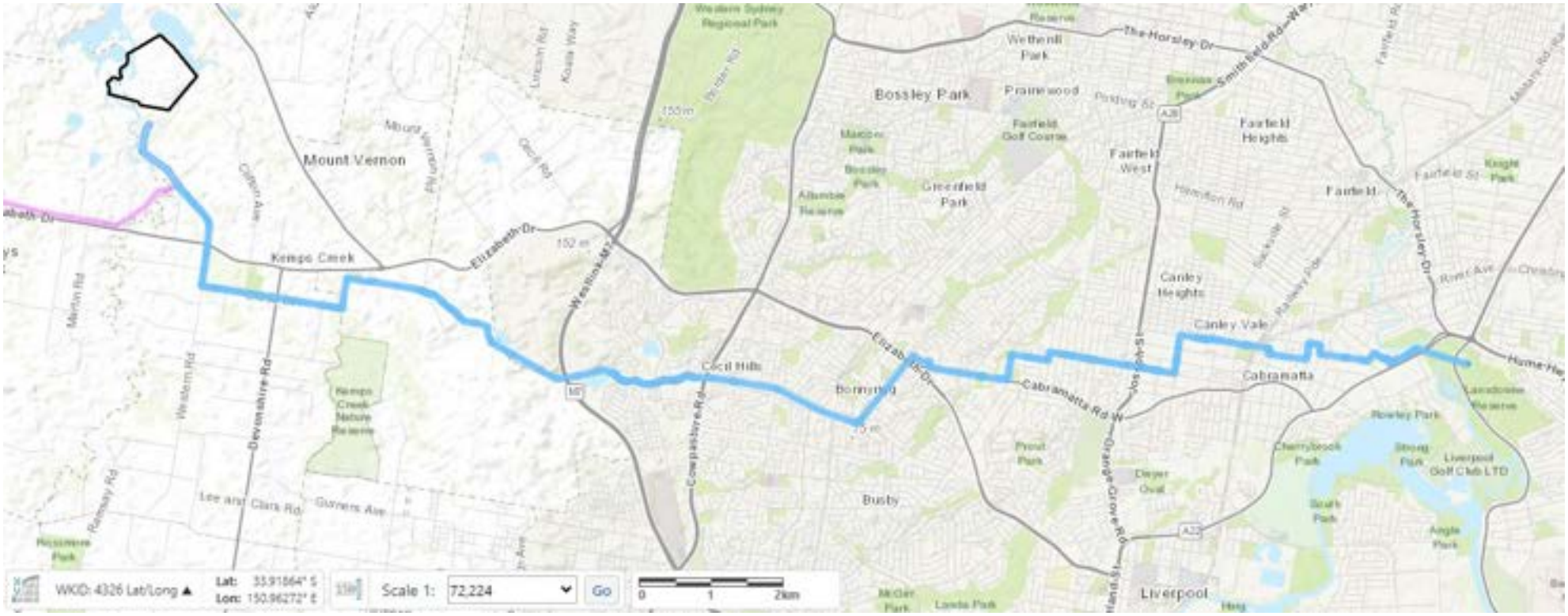


Figure 1-1b Overview of the AWRC site (Black outline) and Brine pipeline (Blue)

Figure 1-2 AWRC site arrangement

2 Objectives and Targets

The objectives and performance criteria identified in this NVCSP is applicable to all construction work associated with the USC Project (John Holland and its subcontractors).

2.1 Objectives

The key objective of this Plan is to ensure the following items, where they include items applicable to noise and vibration management, are described, scheduled and assigned responsibility:

- The Environmental Impact Statement (EIS)
- The Amendment Report
- The Response to Submissions Report
- Updated Management Measures (UMMs)
- Minister's Conditions of Approval
- Commonwealth Controlled Activity Approval (EPBC 2020/8816)
- The Project's Environmental Protection Licence (EPL) 21800
- Infrastructure Sustainability Council Technical Manual version 2.1 (ISC 2.1) requirements
- Relevant legislation and other requirements described in Section 4 of this Plan.

2.2 Targets

Baseline data, including modelling assumptions and outputs, undertaken as part of the Environmental Impact Statement (EIS) (Appendix S Noise and Vibration Impact Assessment), the Construction Noise and Vibration Impact Statement AWRC (Renzo Tonin, 2023), and the Construction Noise and Vibration Impact Statement Pipelines (Renzo Tonin, 2023) have formed the basis for establishing the Projects "SMART" Targets in relation to construction noise and vibration. The following targets have been established for the management of potential impacts due to noise and vibration generated during the construction phase of the project:

- Ensure full compliance with the relevant legislative requirements and/or guidelines, CoA and UMMs, specifically:
    - CoA E40/L5.1 (EPL 21800) (Work Hours) (Table 6-4)
    - CoA E41 L5.2 (EPL 21800) (Highly Noise intensive Work) (Table 6-4)
    - CoA E44 L3.1 (EPL 21800) (Construction noise management measures and vibration criteria)
- Ensure full compliance with the noise management levels defined in Table 6-6, and applied as per the guidance detailed within Table 6-5 with consideration to the following components described within the Noise and Vibration Construction Environmental Management Plan Sub-Plan (NVCSP):
    - Out-of-Hours Works Protocol (OOHW),
    - Out-of-Hours Works Protocol subject to EPL 21800, and
    - Mitigation measures outlined in the Project Construction Noise and Vibration Impact Statement (CNVIS).
- Mitigation measures specified in the documents listed in Section 8.1 & 8.5 of this plan must be implemented to minimise the impact of noise and vibration during construction.
- Ensure training and awareness on best practice noise and vibration management is provided to 100% of construction personnel through site inductions and ongoing training and awareness.
- No structural or cosmetic damage to any building or structures during the construction phase.
- At sensitive receiver locations where, minimum working distances are predicted to exceed Human Comfort levels for continuous vibration, community engagement will be undertaken in accordance with the Community and Stakeholder Engagement Plan (CSEP).
- Ensure compliance with USC Project Sustainability Leadership objectives and targets for the construction phase including:
    - Number of significant noise-related incidents per million hours worked is 0
    - Number of significant vibration-related incidents per million hours worked is 0
    - Number of inspections (weekly) related to noise and vibration as per Section 3.9 of the CEMP

3 Legislative and Guidance Requirements

3.1 Relevant Legislation, Standards and Guidelines

3.1.1 Legislation

All legislation relevant to this NVCSP is included in Appendix A3 of the CEMP.

3.1.2 Standards and Guidelines

The primary guidelines, specifications, and other reference documents relevant to this plan include:

- NSW Interim Construction Noise Guideline (ICNG), Department of Environment and Climate Change 2009
- NSW Road Noise Policy, Department of Environment, Climate Change and Water 2011
- Noise Policy for Industry, Environment Protection Authority 2017
- NSW Assessing Vibration – a technical guideline, Department of Environment and Conservation 2006
- 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
- 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
- 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 DIN4150-2016 Structural vibration Part 3: Effects of vibration on Structures,
- WaterNSW Guideline for Development Adjacent to the Upper Canal and Warragamba Pipelines’
- IAP2 Public Participation Spectrum

3.2 Minister's Conditions of Approval

Table 3-1 below provides a summary of the CoA relevant to noise and vibration and how and where these items are addressed in this Plan.

Table 3-1 CoA relevant to this NVCSP

CoA Reference	Condition Requirement	NVCSP Reference
A9	Where the terms of this approval require consultation to be undertaken, evidence of the consultation undertaken must be submitted to the Planning Secretary and ER (as relevant) with the corresponding documentation. The evidence must include: a. documentation of the engagement with the party identified in the condition of approval that has occurred before submitting the document for approval; b. a log of the dates of engagement or attempted engagement with the identified party; 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; d. outline of the issues raised by the identified party and how they have been addressed; and e. a description of the outstanding issues raised by the identified party and the reasons why they have not been addressed.	Section 5 of this Plan – 'Consultation' and Appendix A – CoA A9 Consultation Summary Report (Noise & Vibration CEMP Sub-plan and Noise & Vibration Monitoring Program)
A30	A suitably qualified and experienced Acoustics Advisor(s) 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.	A suitably qualified and experienced Acoustic Advisor (AA) 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 AA are outlined in Section 3.3 of the CEMP.
A31	Work must not commence until an AA has been approved by the Planning Secretary	The AA engaged for the project has been approved by DPHI. Details regarding the roles and responsibilities of AA are outlined in Section 3.3 of the CEMP.
A32	The Proponent must cooperate with the Acoustic Advisor 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 AA will review and endorse this NVCSP prior to submission to DPHI. Details regarding the roles and responsibilities of AA are outlined in Section 3.3 of the CEMP.
A33	The Proponent may nominate additional suitably qualified and experienced persons to assist the lead AA for the Planning Secretary's approval.	A suitably qualified and experienced Acoustic Advisor and several alternative AAs have 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 AA are outlined in Section 3.3 of the CEMP.

CoA Reference	Condition Requirement	NVCSP Reference
A34	The approved AA must: a. receive and respond to communication from the Planning Secretary in relation to the performance of Stage 1 of the CSSI 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 Condition A43 and A45 of this approval; h. in conjunction with the ER, the AA must: i. as may be requested by the Planning Secretary, help plan, attend or undertake audits of noise and vibration management of Stage 1 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 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 Stage 1 of the CSSI, or as otherwise agreed by the Planning Secretary.	Details regarding the roles and responsibilities of AA are outlined in Section 3.3 of the CEMP.
A43	The Planning Secretary must be notified via the Major Projects Website as soon as possible and no later than 12 hours after the Proponent becomes aware of an incident. The notification must identify the CSSI (including the application number and the name of the CSSI if it has one) and set out the location and nature of the incident.	Section 2.2 Section 9.2 CEMP (Appendix A7)
A44	Subsequent notification must be given and reports submitted in accordance with the requirements set out in Appendix A [Written incident notification and reporting requirements] of this approval.	Section 9.2 CEMP (Appendix A7)
A45	The Planning Secretary must be notified via the Major Projects Website within seven days after the Proponent becomes aware of any non-compliance. The notification must identify the CSSI (including the application number and the name of the CSSI if it has one), identify the condition/s against which the CSSI is non-compliant, the nature of the non-compliance; the reason for the non-compliance (if	Section 9.2 CEMP (Section 3.8)

<table>
<tr><th>CoA Reference</th><th>Condition Requirement</th><th>NVCSP Reference</th></tr>
<tr><td></td><td>known) and what actions have been, or will be, undertaken to address the non-compliance.</td><td></td></tr>
<tr><td>C3</td><td>The CEMP (and relevant CEMP sub-plans) must be endorsed by the ER and then submitted to the Planning Secretary for approval no later than one month before the commencement of construction, or where construction is staged, no later than one month before the commencement of each stage.</td><td>Section 4.1</td></tr>
<tr><td>C4</td><td>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 Conditions A1.

<table><tr><th></th><th>Required CEMP Sub-plan</th><th>Relevant government agencies to be consulted for each CEMP Sub-plan</th></tr><tr><td>(e)</td><td>Noise and vibration</td><td>EPA, WaterNSW and relevant council(s))</td></tr></table></td><td>This NVCSP has been prepared to meet the requirements of CoA C4(e), with consultation requirements detailed in Section 5 of this Plan.</td></tr>
<tr><td>C5</td><td>The CEMP Sub-plans must state how:
a. the environmental performance outcomes identified in the documents listed in Condition A1 will be achieved;
b. the mitigation measures identified in the documents listed in Condition A1 will be implemented;
c. the relevant terms of this approval will be complied with; and
d. issues requiring management during construction (including cumulative impacts), as identified through ongoing environmental risk analysis, will be managed through SMART principles.</td><td>a. environmental performance outcomes related to noise and vibration are discussed in Table 6-1 of this Plan.
b. the mitigation measures identified in the documents listed in Condition A1 are addressed in Table 8-1 of this Plan.
c. the relevant terms of the Infrastructure Approval (SSI-8609189) are identified in Table 3-1 and Table 3-2 of this Plan.
d. the application of SMART principles to the management of noise and vibration issues during construction is discussed in Section 1.3 of this Plan.</td></tr>
<tr><td>C10</td><td>The Noise and Vibration CEMP Sub-Plan must include, but not limited to:</td><td>This NVCSP has been prepared in accordance with this condition and describes how JH proposes to manage noise and vibration during the construction of the Project.</td></tr>
<tr><td>(a)</td><td>details of all sensitive land use(s) (including noise and vibration sensitive working areas) that are potentially exposed to construction noise and vibration;</td><td>Section 5.1 and Appendix D Land Use Survey

Sensitive land uses have been identified in the Land Use Survey, which will be updated as required.</td></tr>
<tr><td>(b)</td><td>construction noise and vibration performance criteria for Stage 1 of the CSSI;</td><td>Section 6

Construction noise and vibration performance criteria are summarised in Section 6 and have been developed in line with CoA E44</td></tr>
<tr><td>(c)</td><td>details of mitigation and management measure and procedures that will be implemented to manage construction noise and vibration impacts;</td><td>Table 8-1

CNVIS

Mitigation and management measures are detailed in Table</td></tr>
</table>

<table>
<tr><th>CoA Reference</th><th>Condition Requirement</th><th>NVCSP Reference</th></tr>
<tr><td></td><td></td><td>8.1 and will be documented in relevant CNVIS.</td></tr>
<tr><td>(d)</td><td>construction timetabling, in particular construction activities outside of standard hours; and</td><td>Table 8.1
CNVIS
Construction timetabling is addressed in Table 8.1 and will be documented in relevant CNVIS.</td></tr>
<tr><td>(e)</td><td>measures to minimise cumulative construction impacts and the likelihood for construction fatigue from both concurrent activities and other projects in the area.</td><td>Section 5.3
Table 8.1
Projects which may take place in the vicinity of the project works are noted in Section 5.3 and controls are addressed in Section 8.</td></tr>
<tr><td>C11</td><td>Construction must not commence until the CEMP and all CEMP Sub-plans have been approved by the Planning Secretary.</td><td>Section 1.5 of the CEMP. The NVCSP is appended to the CEMP as Appendix B5.
Section 4.1</td></tr>
<tr><td>C12</td><td>The CEMP and CEMP sub-plans as approved, including any minor amendments approved by the ER, must be implemented for the duration of construction of Stage 1 of the CSSI</td><td>Section 1.5 of the CEMP. The NVCSP is appended to the CEMP as Appendix B5.</td></tr>
<tr><td>C13</td><td>The following Construction Monitoring Programs must be prepared in consultation with the relevant government agencies identified for each to compare to actual performance of construction of Stage 1 of the CSSI against the performance predicted in the documents listed in Condition A1 or in the CEMP.
<table><tr><th></th><th>Required Construction Monitoring Program</th><th>Relevant government agencies to be consulted for each Construction Monitoring Program</th></tr><tr><td>(c)</td><td>Noise and vibration</td><td>EPA, WaterNSW and relevant council(s))</td></tr></table></td><td>The NVMoP is included in Appendix E of this plan and has been prepared to meet the requirements of CoA C13(c).Consultation requirements are detailed in Section 5 of this Plan.</td></tr>
<tr><td>C14</td><td>Each Construction Monitoring Program (CMP) must have consideration of SMART principles and provide:
a. details of the baseline data available;
b. details of the baseline data to be obtained and when;
c. details of all monitoring of the project to be undertaken;
d. the parameters of the project to be monitored;
e. the frequency of monitoring to be undertaken;
f. the location of monitoring;
g. the reporting of monitoring results and analysis of results against relevant criteria;
h. details of the methods that will be used to analyse the monitoring data;
i. procedures to identify and implement additional mitigation measures where the results of the monitoring indicate unacceptable project impacts; and
j. any consultation to be undertaken in relation to the monitoring programs.</td><td>Appendix E</td></tr>
<tr><td>C15</td><td>The CMP(s) must be endorsed by the ER and then submitted to the Planning Secretary for approval no later than 1 month before the commencement of construction, or where construction is staged, no later than one month before the commencement of each stage.</td><td>Endorsement and approval requirements related to the NVMoP are provided in Appendix E.</td></tr>
<tr><td>C16</td><td>Construction must not commence until the relevant CMP(s) have been approved by the Planning Secretary and all relevant baseline data for the specific construction activity has been collected.</td><td>Approval requirements related to the NVCMoP are provided in Appendix E.</td></tr>
<tr><td>C17</td><td>The CMP(s), as approved, including any minor amendments approved by the ER, must be implemented for the duration of construction and for any longer period set</td><td>Endorsement and approval requirements related to the</td></tr>
</table>

CoA Reference	Condition Requirement	NVCSP Reference
	out in the monitoring program or specified by the Planning Secretary, whichever is greater.	NVCMoP are provided in Appendix E.
C18	The results of the CMP(s) must be submitted to the Planning Secretary, and relevant regulatory agencies in the form of a Construction Monitoring Report at a frequency identified in the relevant CMP.	Reporting requirements related to the NVCMoP are provided in Appendix E.
E39	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 works 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 and Appendix D Land Use Survey A detailed land use survey will be undertaken to confirm sensitive land user(s) potentially exposed to construction noise and vibration, and construction ground-borne noise. The results of the survey will be included in Appendix D.
E40	Work must only be undertaken during the following hours: a. 7:00am to 6:00pm Mondays to Fridays, inclusive; b. 8:00am to 1:00pm Saturdays; and c. at no time on Sundays or public holidays.	Section 6.1 Works will only be scheduled and undertaken during the standard construction hours stated in this condition unless permitted in CoA E42 or EPL 21800. Details regarding the standard construction hours are outlined in Section 6.1. 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 by and stated in Section 8.
E41	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; and 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	Section 6.1 Section 8.1 Appendix C. 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 E42, as outlined in Section 6.1 and Table 3-1 of this Plan. 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 by and stated in Section 8.
E42	Notwithstanding Conditions E40 and E41 work may be undertaken outside the hours specified in any of the following circumstances:	
(a)	Safety and Emergencies, including: i. for the delivery of materials required by the NSW Police Force or other authority for safety reasons; or	Section 6.1 Section 8.4.1

CoA Reference	Condition Requirement	NVCSP Reference
	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. On becoming aware of the need for emergency work in accordance with Condition E42(a), the AA, the ER, the Planning Secretary and the EPA must be notified of the reasons for such work. Best endeavours must be used to notify all noise and/or vibration affected sensitive land user(s) of the likely impact and duration of those work.	
(b)	Work that meets the following criteria: i. construction that causes LAeq (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 ii. 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).	Section 6.1 Section 8.4.2 Section 8.4.3 Appendix C OOHW Protocol (for OOHW not managed by EPL 21800)
(c)	By Approval, including: i. where different construction hours are permitted or required under an EPL in force in respect of the CSSI; or ii. works which are not subject to an EPL that are approved under an Out-of-Hours Work Protocol as required by Condition E43; or iii. negotiated agreements with directly affected residents and sensitive land use(s).	Section 6.1 Section 8.4.2 Section 8.4.3 Appendix C OOHW Protocol (for OOHW not managed by EPL 21800)
E43	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 E40, and that are not subject to an EPL. The Protocol must be submitted to and 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 include:	Section 6.1 Section 8.4.2 Appendix C OOHW Protocol (for OOHW not managed by EPL 21800) It is noted that the majority of OOHWs are anticipated to be managed by EPL 21800 and as detailed in Section 8.4.3. Where works are not subject to EPL 21800, OOHW will be managed in accordance with this CoA, OOHW protocol in Appendix C and Section 8.4.2.
(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: 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, and iii. high risk activities that are approved by the Planning Secretary	Section 8.4.2 Section 5 of the OOHW Protocol (Appendix C) (for works not managed by EPL 21800)
(b)	a process for the consideration of out-of-hours work against the relevant NML and vibration criteria;	Section 4 of the Appendix C OOHW Protocol (for works not managed by EPL 21800)

CoA Reference	Condition Requirement	NVCSP Reference
(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 E55. 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;	Sections 4 and 6 of the Appendix C OOHW Protocol (for works not managed by EPL 21800)
(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	Sections 5 and 7 of Appendix C (for works not managed by EPL 21800)
(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 E42(a) or (b) are met.	Section 6 of the Appendix C (for works not managed by EPL 21800)
E44	Mitigation measures must be implemented with the aim of achieving the following construction noise management levels and vibration objectives: a. construction 'Noise affected' NML established using the Interim Construction Noise Guideline (DECC, 2009); b. vibration criteria established using the Assessing vibration: a technical guideline (DEC, 2006) (for human exposure); c. Australian Standard AS 2187.2 - 2006 "Explosives - Storage and Use - Use of Explosives"; d. BS 7385 Part 2-1993 "Evaluation and measurement for vibration in buildings Part 2" as they are "applicable to Australian conditions"; and e. the vibration limits set out in the German Standard DIN 4150-3: Structural Vibration- effects of vibration on structures (for structural damage). Work that exceeds the noise management levels and/or vibration criteria must be managed in accordance with the Noise and Vibration CEMP Sub-plan required by Condition C4, as applicable. 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.	Section 6 Section 8 Mitigation measures outlined in Section 8 will be implemented with the aim of achieving the construction NMLs and vibration criteria in Section 6. Any works identified as exceeding the NMLs and/or vibration criteria will be managed in accordance with this Plan.
E45	Mitigation measures must be applied when the following residential ground-borne noise levels are exceeded: a. evening (6:00 pm to 10:00 pm) — internal LAeq (15 minute): 40 dB(A); and b. night (10:00 pm to 7:00 am) — internal LAeq (15 minute): 35 dB(A). 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 E43.	Section 6.3 Section 8.1 Appendix C Out of Hours Protocol (for works not managed by EPL 21800) Consideration of CoA E45 has been included in Section 8.1 of this plan.
E46	Noise generating Work in the vicinity of 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 during sensitive periods, unless other reasonable arrangements with the affected institutions are made at no cost to the affected institution.	Section 6.2.2 Section 8
E47	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 6.2.4 Section 8
E48	Construction Noise and Vibration Impact Statements (CNVIS) must be prepared for Work that may exceed the noise management levels, vibration criteria and/or ground-borne noise levels specified in Condition E44 and Condition E45 at any residence outside construction hours identified in Condition E40, or where	Section 7.1

CoA Reference	Condition Requirement	NVCSP Reference
	receivers will be highly noise affected. The CNVIS must include specific mitigation measures identified through consultation with affected sensitive land use(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.	
E49	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.	CNVIS CSEP Section 7.1 Section 8
E50	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:	Section 8
(a)	use of regularly serviced low sound power equipment;	Section 8
(b)	early occupation and later release of road carriageways and construction sites;	Section 8
(c)	scheduling of noisiest works before 11.00 pm Sunday to Thursday and before 12 midnight Friday and Saturday;	Section 3.4 of Appendix C. Section 8 (for works not managed by EPL 21800)
(d)	temporary noise barriers (including the arrangement of plant and equipment) around noisy equipment and activities such as rock hammering and concrete cutting; and	Section 8
(e)	use of alternative construction and demolition techniques.	Section 8
E51	The Proponent must 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. In the event that the vibration testing and attended monitoring shows that the preferred values for vibration are likely to be exceeded, the construction methodology must be reviewed and, if necessary, additional mitigation measures implemented.	Appendix E - Noise and Vibration Monitoring Program Heritage CEMP Sub-plan
E52	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.	Section 8 Appendix E - Noise and Vibration Monitoring Program
E53	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 8 Heritage CEMP Sub-plan
E54	All work undertaken for the construction of Stage 1 of the CSSI, including those undertaken by third parties (such as utility relocations), must be coordinated to ensure respite periods are provided. This must include:	Appendix C (for works not managed by EPL 21800)
(a)	reschedule any work to provide respite to impacted noise sensitive land user(s) so that the respite is achieved in accordance with Condition E55; or	Appendix C (for works not managed by EPL 21800)
(b)	consider the provision of alternative respite or mitigation to impacted noise sensitive land user(s); and	Appendix C (for works not managed by EPL 21800)

CoA Reference	Condition Requirement	NVCSP Reference
(c)	the provision of documentary evidence to the AA in support of any decision made by the Proponent in relation to respite or mitigation.	Appendix C (for works not managed by EPL 21800)
	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 Stage 1 of the CSSI.	Appendix C (for works not managed by EPL 21800)
E55	In order to undertake out-of-hours work outside the hours specified under Condition E40, the appropriate respite periods must be identified for the out-of-hours work in consultation with the community at each affected location on a regular basis. This consultation must include (but not be limited to) providing the community with: a. a progressive schedule for periods of likely out-of-hours work; b. a description of the potential work, location and duration of the out-of-hours work; c. the noise characteristics and likely noise levels of the work; and d. likely mitigation and management measures which aim to achieve the relevant noise management levels and vibration criteria under Condition E44 (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 for information prior to undertaking the Work scheduled for the subject period. 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.	Section 8.1 Section 8.4 Section 8.5 Appendix C (for works not managed by EPL 21800) CSEP

3.3 Updated Management Measures

Table 3-2 below provides a summary of the UMMs relevant to noise and vibration and how these items are addressed in this plan.

Table 3-2 Updated Management Measures relevant to this NVCSP

UMMs Reference	Management Measure Requirement	NVCSP Reference
NV01	**Excessive noise generated during construction** Prepare a Construction Noise and Vibration Management Plan (CNVMP) as part of the project's CEMP. This will include:	This Plan, the Noise & Vibration CEMP Sub-Plan (NVCSP)
	• Roles and responsibilities	Table 8-1
	• Noise sensitive receiver locations	Section 5.1 Appendix D.
	• Construction phase noise and vibration management measures	Table 8.1
	• Monitoring methodology	Appendix E.
	• Community engagement	CSEP
NV02	**Noise during out of hours work (OOHW)** Schedule construction works for standard construction hours, where possible. If it is not possible to restrict the works to the day period, then they are to be completed as early as possible in each work shift. Provide appropriate respite to affected receivers in accordance with the Interim Construction Noise Guideline (ICNG).	Appendix C. Section 8.4.3 (where subject to the EPL)
NV03	**Equipment selection during construction generates excessive noise** Select equipment to minimise noise emissions. For example: • Select equipment with lower noise emissions than alternative equipment. • Use electric/ hydraulic equipment where possible. • Use the minimum size and power requirement to complete a task.	Table 8.1
NV04	**Inefficient operation and maintenance of equipment resulting in noise impacts** Regularly train workers and contractors (such as at toolbox talks) to use equipment in ways to minimise noise, including: • Site managers to periodically check the site and nearby residences for noise problems so that solutions can be quickly applied. • Avoid the use of radios or stereos outdoors. • Avoid the overuse of public address systems. • Avoid shouting and minimise talking loudly and slamming vehicle doors. • Turn off all plant and equipment when not in use. • Maintain and monitor equipment to ensure proper and efficient operation. • Aligning with Sydney Water's Noise Management Code of Behaviour (SWEMS0056.01)	Table 8.1 Section 9.2
NV05	**Inefficient use of construction reverse beepers** Implement and use non-tonal reversing beepers (or an equivalent mechanism) on all construction vehicles and mobile plant, where possible. Consider the use of ambient sensitive alarms that adjust output relative to the ambient noise level.	Table 8.1
NV06	**OOHW results in sleep disturbance of sensitive receivers** Consult with residents that will be impacted by OOHW about measures to manage impacts in accordance with the ICNG, including considering alternative accommodation. This includes residents near long term pipeline tunnelling compounds at Lansvale Park.	Appendix C OOHW Protocol Table 8.1
NV07	**Vibration from construction equipment results in impacts to structures** Investigate opportunities for using alternatives to vibration generating equipment where vibration impacts have the potential to occur.	Table 8.1

UMMs Reference	Management Measure Requirement	NVCSP Reference
NV08	**Vibration from construction equipment results in impacts to structures** Undertake in-situ vibration monitoring to confirm vibration levels and assess potential impacts where minimum vibration impact distances cannot be achieved. Where the monitoring identifies exceedances in the relevant criteria, or where impacts are identified, additional management measures will be identified and implemented to appropriately manage impacts.	Table 8.1 Appendix E.
NV09	**Vibration from construction equipment results in impacts to structures** Complete dilapidation and condition surveys on infrastructure and structures at risk from being damaged by vibration during construction, including heritage items.	Table 8.1
G06	**Environmental management during construction** Develop and implement construction site layout plans as part of the project's CEMP. Development of the plans should consider the following as a minimum: maximise the offset distance between noisy plant and adjacent sensitive receivers, including directing noise-emitting plant away from sensitive receivers	Table 8.1
G10	**Impacts to utilities** Continue to consult and coordinate with other major projects and utility providers that may be impacted during construction, or where cumulative impacts may occur.	Table 8.1 CSEP
NAH02	**Impacts to built heritage – Upper Canal and Liverpool Offtake Reservoir** Construction activities in proximity to the Upper Canal and Warragamba Pipelines will be undertaken in accordance with WaterNSW 'Guideline for Development Adjacent to the Upper Canal and Warragamba Pipelines'. This will include: • dilapidation survey prior to any construction work commencing • monitoring of vibration and ground movement during tunnelling construction.	Table 8.1 Appendix E.

3.4 Infrastructure Sustainability Council Benchmarks

The Project is aiming to achieve the Level 3 benchmarks for noise (Env-2) and vibration (Env-3) in Infrastructure Sustainability (IS) v2.1 Technical Manual Design and As Built Rating (ISC Benchmarks) (herein referred to as ISC v2.1). The relevant benchmarks are listed Table 3-3 and includes references to the benchmarks, the requirements for achieving the benchmark, the necessary evidence and references to documents and/or sections of this NVCSP where the evidence is presented. A Sustainability Management Plan will be developed to describe how sustainability issues will be managed on the project.

Table 3-3 ISC requirements relevant to this NVCSP.

Level	Benchmark	Management Measure	Evidence Required	NVCSP Reference
Noise - Design				
1	DL1.1 The location, extent, type and sensitivity of noise receptors and their pre-existing exposure to noise have been determined.	Baseline studies must be undertaken or reviewed by a suitably qualified professional to identify and assess the pre-existing noise environment prior to any potential project impacts (e.g. undertaking demolition works or breaking ground in construction), and cover: • Relevant environmental parameters including: ○ Peak and average measurements of monitoring parameters ○ Seasonal or time of day variations (whichever is more appropriate for accurate baselines to be established) ○ Specific local variations, representative sampling and links to activities likely to affect the baseline (such as nearby construction works or rail transport services) ○ The measurement criteria or indicators or factors used in the assessments. • Background noise levels to allow for assessment of impact • Consideration of sensitive receptors (see Additional Guidance). A map showing the location of any sensitive receptors must be provided with the baseline studies. If baseline studies have been undertaken and verified as part of a Planning rating, then the requirements of this criterion have been met unless the scope or footprint of the project has changed, new information has emerged (e.g. updated legislation) or five years has passed since the original study. In these circumstances the baseline studies undertaken as part of a Planning rating must be reviewed and updated by a suitably qualified professional or new studies completed as outlined above.	Baseline studies – a separate report or part of an Environmental Impact Assessment (or equivalent) Documentation for suitably qualified professional e.g. CV, LinkedIn profile	Appendix S Noise and Vibration Impact Assessment, EIS Amendments Appendix D Noise and Vibration Assessment, EIS CNVIS Section 5 Appendix D Sustainability Management Plan
1	DL1.2 Modelling for noise has been developed for construction and operation phases of the project.	Noise impacts must be modelled for the construction and operation phases of the project and consider a comparison against the baseline data (DL1.1). Modelled impacts must be developed by a suitably qualified professional and incorporate all equipment proposed to be	Modelled noise impacts for construction and operations, as specified above Documentation for suitably qualified	Appendix S Noise and Vibration Impact Assessment, EIS Amendments Appendix D Noise

Level	Benchmark	Management Measure	Evidence Required	NVCSP Reference
		used through the project's construction and operation that could result in noise impacts. For the operation phase, impacts are normally assessed using modelling results from the design development. Modelled impacts must factor in sensitive receptors and the increased noise impacts they experience, as well as accumulated impacts (i.e. multiple impacts affecting the same sensitive receptor, such as fatigue due to concurrent or enduring construction impacts).	professional e.g. CV, LinkedIn profile.	and Vibration Assessment, EIS CNVIS Section 6 Section 7
1	DL1.3 Noise goals have been identified for construction and operations.	SMART noise goals (see Additional Guidance) must be established for the project considering the baseline data (DL1.1) and modelled impacts (DL1.2) and cover both construction and the operating asset. Documentation for goals must outline: The intended outcome/s (measurable/quantifiable) Any assumptions made, with relevant calculations How the baseline data and modelled impacts have been incorporated. In many cases, noise goals or criteria for infrastructure development and operation will have been established by regulators and may be communicated through approval conditions or licenses. These established goals or criteria are seen as minimum requirements for this criterion and projects are encouraged to consider stretch goals. Noise goals must be reviewed by a suitably qualified professional against the requirements above. If noise goals have been verified as part of a Planning rating, then those goals must inform this criterion. If the scope or footprint of the project has changed, new information has emerged or five years have passed since the goals were verified, then the goals established as part of a Planning rating must be reviewed and updated by a suitably qualified professional.	SMART noise goals for construction e.g. in this NVCSP or CEMP SMART noise goals for operations e.g. in relevant Design Reports Review report from suitably qualified professional and their documentation e.g. CV, LinkedIn profile	Section 2.2 Section 6
1	DL1.4 Measures to achieve noise goals during construction and operation have been identified and implemented.	Measures to meet the noise goals (DL1.3) must be identified and assessed for construction and operation. During the design phase, measures to be implemented for construction and operation must be detailed in relevant documents i.e. measures incorporated into the design to mitigate impacts or improve amenity in operation and controls specified to mitigate impacts or improve amenity during construction. Where exceedances are predicted, these predicted exceedances must be clearly	Measures identified and assessed e.g. this NVCSP, Acoustic Design Reports, Options Assessment, Risk and Opportunity Registers Evidence of implementation e.g. in design reports and drawings, environmental management plans and asset	This plan Section 7 Table 8.1

Level	Benchmark	Management Measure	Evidence Required	NVCSP Reference
		identified with the appropriate control measures to limit the scale of the impact.	management plans as appropriate.	
1	DL1.5 Monitoring requirements for noise receptors have been determined with due regard to the project's noise goals.	A noise monitoring program must be prepared or reviewed by a suitably qualified professional in line with the project's noise goals (DL1.3) and for all scenarios where the risk to sensitive receptors warrants, and outline: Monitoring objectives Risk assessment outcomes used to determine monitoring requirements Monitoring methods (if targeting Level 3 see DL3.2) The frequency, duration and locations of monitoring, any relevant triggers e.g. high-risk activities, complaints, incidents The parameters to be monitored.	Monitoring program or specification, as per above e.g. this NVCSP, Acoustic Design Reports, Scope of Works and Technical Criteria Documentation for suitably qualified professional e.g. CV, LinkedIn profile.	Section 9.3 Appendix E Noise and Vibration Monitoring Program
2	DL2.1 Noise impacts, controls and mitigation measures have been reviewed with affected stakeholders.	Affected stakeholders including those in the local community must be actively engaged to understand and respond to predicted noise impacts for construction and operations, proposed controls and the choices and potential consequences of mitigation measures. These requirements may be linked to aspects of Sta-1 and Sta-2. The project must demonstrate how they have considered stakeholder inputs in proposed noise controls and mitigation measures.	Evidence of engagement with stakeholders, as specified above e.g. outputs from review meetings or other engagement processes, presentation content, feedback register Demonstrate consideration of stakeholder feedback.	Appendix S Noise and Vibration Impact Assessment, EIS Submissions Report, inclusive of Appendix B Amendments Appendix D Noise and Vibration Assessment, EIS Section 4 CSEP
2	DL2.2 Modelling demonstrates no recurring or major exceedances of the noise goals.	Modelling interpreted by a suitably qualified professional must demonstrate no recurring or major exceedances of the project's construction and operations noise goals (set in DL1.3). Modelling of construction and operational noise must be completed for all scenarios where the risk to sensitive receptors warrants, and the risk levels justified.	Construction and operations modelling results showing no recurring or major exceedances Interpretation report by a suitably qualified professional and their documentation e.g. CV, LinkedIn profile	Appendix S Noise and Vibration Impact Assessment, EIS Amendments Appendix D Noise and Vibration Assessment, EIS CNVIS Section 7
3	DL3.1 The review of noise impacts, controls and mitigation measures with affected stakeholders has been expanded to include an ecologist.	The project must include an ecologist with knowledge of the impacts of modelled construction and operational noise on local fauna in the review with affected stakeholders (DL2.1). The project must demonstrate how they have considered the ecologist's recommendations on proposed noise controls and mitigation measures with regard to local fauna.	Evidence of ecologist involvement and their recommendations, e.g. CV, meeting minutes or report Demonstration of how ecologist recommendations have been considered.	Section 4
3	DL3.2 Real-time noise monitoring and public reporting have been specified for construction.	All noise monitoring for the construction phase must be real-time monitoring (for sensitive receptors identified in DL1.1) and transparent public reporting of monitoring results must be specified for construction.	Real-time noise monitoring and public reporting has been specified e.g. NVCSP or CEMP	Section 8 Appendix E Noise and Vibration Monitoring Program
Noise – As Built				
1	ABL1.1 Construction measures to mitigate noise and meet the noise goals established	Mitigation measures (DL1.4) to manage construction phase noise impacts and meet the project's noise goals for construction identified in Design must	Photos or documentation showing control	Section 8

Level	Benchmark	Management Measure	Evidence Required	NVCSP Reference
	in Design have been implemented and monitored.	have been implemented and had their effectiveness monitored. Implementation of measures for the construction phase means providing evidence to show how the measures identified in Design have been actioned and communicated to relevant internal and external stakeholders e.g. through toolbox talk agendas or outlines and community letterbox drops. Monitoring of noise must be undertaken as per the monitoring plan developed during Design (DL1.5). Any divergences from the monitoring plan must be justified. Where exceedances occur, the project must demonstrate why they occur and how they have been managed.	measures implemented on site Results from monitoring records, as per monitoring plan Reasons for and management of exceedances.	Appendix E Noise and Vibration Monitoring Program
2	ABL2.1 Noise impacts and mitigation measures have been regularly reviewed with affected stakeholders and their feedback considered.	Affected stakeholders including those in the local community must be engaged bi-annually to review noise impacts, mitigation measures and the noise monitoring and modelling for construction and operations. These requirements may be linked to aspects of Sta-1 and Sta-2. Any improvement actions agreed with stakeholders must be implemented.	Evidence of bi-annual engagement with stakeholders, as specified above e.g. outputs from review meetings or other engagement processes, presentation content, feedback register Evidence of implementation of agreed improvement actions e.g. management plans, As Built drawings, communications outputs.	Section 4 CSEP
2	ABL2.2 Implemented construction measures have been monitored and no recurring or major exceedances of the noise goals demonstrated.	Monitoring of measures to manage construction phase noise impacts and meet the project's noise goals for construction must demonstrate there are no recurring or major exceedances of the noise goals (DL1.3).	Construction noise monitoring results showing no recurring or major exceedances e.g. monitoring reports, complaints register	Section 9 Appendix E Noise and Vibration Monitoring Program
3	ABL3.1 Noise impacts and implemented mitigation measures have been reviewed with an ecologist regarding impacts on local fauna.	The project must include an ecologist with knowledge of the impacts of construction and operational noise on local fauna in the review with affected stakeholders (ABL2.1). The project must demonstrate how they have addressed the ecologist's recommendation in implemented noise controls and mitigation measures with regard to local fauna.	Evidence of ecologist involvement in review of implemented measures, e.g. CV, meeting minutes or report Demonstration of how ecologist recommendations addressed.	Section 4
Vibration – Design				
1	DL1.1 The location, extent, type and sensitivity of vibration receptors and their pre-existing exposure to vibration have been determined.	Baseline studies must be undertaken or reviewed by a suitably qualified professional to identify and assess the pre-existing vibration environment prior to any potential project impacts, and cover: Relevant environmental parameters including:	Baseline studies – a separate report or part of an Environmental Impact Assessment (or equivalent) Documentation for suitably qualified	Appendix S Noise and Vibration Impact Assessment, EIS Amendments Appendix D Noise

Level	Benchmark	Management Measure	Evidence Required	NVCSP Reference
		○ Seasonal or time of day variations (whichever is more appropriate for accurate baselines to be established) ○ Specific local variations, representative sampling and links to activities likely to affect the baseline (such as nearby construction works or rail transport services) ○ The measurement criteria or indicators or factors used in the assessments. ○ Consideration of sensitive receptors (see Additional Guidance). A map showing the location of any sensitive receptors must be provided with the baseline studies. If baseline studies have been undertaken and verified as part of a Planning rating, then the requirements of this criterion have been met unless the scope or footprint of the project has changed, new information has emerged (e.g. updated legislation) or five years has passed since the original study. In these circumstances the baseline studies undertaken as part of a Planning rating must be reviewed and updated by a suitably qualified professional or new studies completed as outlined above.	professional e.g. CV, LinkedIn profile.	and Vibration Assessment, EIS CNVIS Section 5.1 Appendix D.
1	DL1.2 Modelling for vibration has been developed for the construction and operation phases of the project.	Vibration impacts must be modelled (see Definitions) for the construction and operation phases of the project and consider a comparison against the baseline data (DL1.1). Modelled impacts must be developed by a suitably qualified professional and incorporate all equipment proposed to be used through the project's construction and operation that could result in vibratory impacts. For the operation phase, impacts are normally assessed using modelling results from the design development. Modelled impacts must factor in sensitive receptors (see DL1.1) and the vibration impacts they experience, as well as accumulated impacts (i.e. multiple impacts affecting the same sensitive receptor, such as fatigue due to concurrent or enduring construction impacts). Dilapidation surveys must be undertaken for properties at a high risk of being impacted by vibration. Where the risk of vibration impacts from operations is insignificant, modelling of operational vibration impacts is not required (also applies in Level 2 and 3). Suitable evidence to demonstrate that the risk from vibration is insignificant must be provided.	Modelled vibration impacts for construction and operations. Evidence if operational vibration deemed insignificant e.g. an impact assessment, expert advice or a vibration management plan. Dilapidation survey risk assessment and sample surveys Documentation for suitably qualified professional e.g. CV, LinkedIn profile.	Appendix S Noise and Vibration Impact Assessment, EIS Amendments Appendix D Noise and Vibration Assessment, EIS CNVIS Section 8 Table 9.1

Level	Benchmark	Management Measure	Evidence Required	NVCSP Reference
1	DL1.3 Vibration goals have been identified for construction and operation.	SMART vibration goals (see Additional Guidance) must be established for the project considering the baseline data (DL1.1) and modelled impacts (DL1.2) and cover both construction and operational phases. The project's vibration goals must include no physical damage to buildings or structures attributable to the project. Documentation for goals must outline: The intended outcome/s (measurable/quantifiable) considering both: Damage to buildings and structures Human comfort in buildings Any assumptions made, with relevant calculations How the baseline data and modelled impacts have been incorporated. In many cases, vibration goals or criteria for infrastructure development and operation will have been established by regulators and may be communicated through approval conditions or licenses. These established goals or criteria are seen as minimum requirements for this criterion and projects are encouraged to consider stretch goals. Vibration goals must be reviewed by a suitably qualified professional against the requirements above. If vibration goals have been verified as part of a Planning rating, then those goals must inform this criterion. If the scope or footprint of the project has changed, new information has emerged or five years have passed since the goals were verified, then the goals established as part of a Planning rating must be reviewed and updated by a suitably qualified professional.	SMART vibration goals for construction e.g. in this NVCSP or CEMP SMART vibration goals for operations e.g. in relevant Design Reports Review report from suitably qualified professional and their documentation e.g. CV, LinkedIn profile.	Section 2.2 Section 6.5
1	DL1.4 Measures to achieve vibration goals during construction and operation have been identified and implemented.	Measures to meet the vibration goals (DL1.3) must be identified for construction and operation. In the design phase, measures to be implemented for construction and operation must be detailed in relevant documents i.e. measures incorporated into the design to mitigate impacts or improve amenity in operation and controls specified to mitigate impacts or improve amenity during construction. Where exceedances are predicted, these predicted exceedances must be clearly identified with the appropriate control measures to limit the scale of the impact.	Measures identified and assessed e.g. this NVCSP, Design Reports, Options Assessment, Risk and Opportunity Registers Evidence of implementation e.g. in design reports and drawings, environmental management plans and asset management plans as appropriate.	This plan Section 8 Table 8.1
1	DL1.5 Monitoring requirements for vibration receptors have been determined with	A vibration monitoring program must be prepared or reviewed by a suitably qualified professional in line with the project's vibration goals (DL1.3) and for	Monitoring program or specification, as per above e.g. this NVCSP, Scope of	Section 8

Level	Benchmark	Management Measure	Evidence Required	NVCSP Reference
	due regard to the project's vibration goals.	all scenarios where the risk to sensitive receptors warrants, and outline: Monitoring objectives Risk assessment outcomes used to determine monitoring requirements Monitoring methods The frequency, duration and locations of monitoring and any relevant triggers e.g. high-risk activities The parameters to be monitored.	Works and Technical Criteria Documentation for suitably qualified professional e.g. CV, LinkedIn profile.	Appendix E Noise and Vibration Monitoring Program
2	DL2.1 Vibration impacts, controls and mitigation measures have been reviewed with affected stakeholders.	Affected stakeholders (e.g. asset owners, local community, building occupiers) must be informed of the results of vibration modelling for construction and operations and engaged to review the project's vibration goals, and the choices and potential consequences of mitigation measures for construction and operations. These requirements may be linked to aspects of Sta-1 and Sta-2. The project must demonstrate how they have considered stakeholder inputs in proposed vibration controls and mitigation measures.	Evidence of engagement with stakeholders, as specified above outputs from review meetings or other engagement processes, presentation content, feedback register Demonstrate consideration of stakeholder feedback.	Section 4 CSEP
2	DL2.2 Modelling demonstrates no exceedances of vibration goals for building and structures and no recurring or major exceedances of the vibration goals for human comfort in buildings.	Modelling must demonstrate that there are no exceedances of vibration goals for damage to buildings and structures for construction and operations (DL1.3). Modelling must demonstrate that there are no recurring or major exceedances of vibration goals for human comfort criteria for operations (DL1.3). Modelling of construction and operational vibration must be completed for all scenarios where the risk to sensitive receptors warrants, and the risk levels justified. Modelling must be interpreted by a suitably qualified professional in line with the project's construction and operations vibration goals.	Modelling results showing no exceedances to vibration goals related to damage to buildings and structures Modelling results showing no recurring or major exceedances against human comfort vibration goals Interpretation report by a suitably qualified professional and their documentation e.g. CV, LinkedIn profile.	Section 7
3	DL3.1 Modelling demonstrates no exceedances of vibration goals for human comfort in buildings.	Modelling interpreted by a suitably qualified professional must demonstrate that there are no exceedances of vibration goals for human comfort criteria for operations (DL1.3).	Modelling results showing no exceedances against human comfort vibration goals Interpretation report by a suitably qualified professional, and their documentation e.g. CV, LinkedIn profile.	Operation, not applicable to this sub-plan
Vibration – As Built				
1	ABL1.1 Construction measures to mitigate vibration and meet the vibration goals established in Design have been implemented and monitored.	Mitigation measures (DL1.4) to manage construction phase vibration impacts and meet the project's vibration goals for construction (identified in Design) must have been implemented and had their effectiveness monitored.	Photos or documentation showing control measures implemented on site	Table 8.1 Section 8.2 Appendix E.

Level	Benchmark	Management Measure	Evidence Required	NVCSP Reference
		Monitoring of vibration must be undertaken as per the monitoring plan developed during Design (DL1.5). Any divergences from the monitoring plan must be justified and show that there have been no adverse impacts to sensitive receptors. Where exceedances occur, the project must demonstrate why they occur and how they have been managed.	Results from monitoring records, as per monitoring plan Reasons for and management of exceedances.	
2	ABL2.1 Vibration impacts and mitigation measures have been regularly reviewed with affected stakeholders and their feedback considered.	Affected stakeholders (as per DL2.1) must be engaged every two years (bi-annually) to review vibration impacts, mitigation measures and the vibration monitoring and modelling for construction and operations. These requirements may be linked to aspects of Sta-1 and Sta-2. Any improvement actions agreed with stakeholders must be implemented.	Evidence of bi-annual engagement with stakeholders, as specified above e.g. outputs from review meetings or other engagement processes, presentation content, feedback register Evidence of implementation of agreed improvement actions e.g. management plans, As Built drawings, communications outputs.	Section 4 CSEP
2	ABL2.2 Monitoring and modelling demonstrates no exceedances of vibration goals for damage to buildings and structures.	Monitoring (actual during construction) and modelling (updated for operations if required) of measures to manage vibration impacts related to buildings and structure must demonstrate there are no exceedances of the damage to buildings and structures goals (DL1.3). All complaints received about damage to property must be closed and evidenced as not being in response to works associated with the construction of the project. Monitoring and modelling must be interpreted by a suitably qualified professional in line with the project's construction and operations vibration goals.	Vibration monitoring results showing no exceedances e.g. monitoring reports, complaints register If required, any updated vibration modelling results show no exceedances. Interpretation report by a suitably qualified professional and their documentation e.g. CV, LinkedIn profile.	Section 8 and 9 Appendix E Noise and Vibration Monitoring Program

3.5 Environmental Protection License

Table 3-4 below provides a summary of EPL 21800 conditions relevant to noise and vibration and how and where these items are addressed in this Plan.

Table 3-4 EPL Conditions relevant to this NVCSP

EPL 21800 Reference	Condition Requirement	NVCSP Reference
L3.1	The licensee must minimise noise and vibration impacts at residences and other sensitive land uses. To meet the requirements of this condition the licensee must: a) implement the guidance in the Interim Construction Noise Guideline (DEC, 2009) and the Assessing Vibration: a technical guideline (DEC, 2006); b) implement all reasonable and feasible measures to minimise noise impacts in accordance with the Interim Construction Noise Guideline (DEC, 2009); and c) implement vibration mitigation in accordance with the Assessing Vibration: a Technical Guideline (DEC, 2006). In this condition, 'reasonable' and 'feasible', in relation to noise management, have the same meaning as defined in the Interim Construction Noise Guideline (DEC, 2009).	Section 8
L3.2	When construction activities include 'High Noise Impact Activities and Works' as defined in the special dictionary in this licence, quantitative construction noise assessments must apply a +5dB correction to the measured or predicted level of construction noise at the nearest Noise Sensitive Receiver location before assessment against the Interim Construction Noise Guideline (DECC, 2009) noise management levels.	Section 6.2.3
L5.1	Standard construction hours Unless permitted by another condition of this licence, works and activities must: a) only be undertaken between the hours of 7:00 am and 6:00 pm Monday to Friday; b) only be undertaken between the hours of 8:00 am and 1:00 pm Saturday; and c) not be undertaken on Sundays or Public Holidays.	Section 6.1 Section 8
L5.2	High Noise Impact Activities and Works Unless permitted by another condition of this licence, any High Noise Impact Activities and Works that exceed the applicable Noise Management Level (NML) at a Noise Sensitive Receiver must only be undertaken: a) between 8:00 am and 6:00 pm Monday to Friday; b) between 8:00 am and 1:00 pm Saturday; and c) if high noise impact works are to be conducted continuously and the location of the works means that it is likely to impact the same receivers, then the works must be conducted in continuous blocks of no more than 3 hours, with at least a 1-hour respite between each block of continuous high noise impact work; except as expressly permitted by another condition of this licence. Note: For the purposes of this condition 'continuous' includes any period where there is a less than 1-hour respite between ceasing and recommencing of any work that is subject to this condition.	Section 8
L5.3	Exemptions to standard construction hours for low noise impact works Works and activities may be carried on outside of standard construction hours specified in condition L5.1 if the works and activities do not cause, when assessed at the boundary of the most affected Noise Sensitive Receiver: a) LAeq(15 minute) noise levels greater than 5dB(A) above the day, evening and night Rating Background Level (RBL) as applicable; b) LAmax noise levels greater than 15dB(A) above the night RBL for night works; c) the preferred continuous or impulsive vibration values greater than those for human exposure to vibration, set out for residences in Table 2.2 in Assessing Vibration: a technical guideline (DEC, 2006); and d) the preferred intermittent vibration values greater than those for human exposure to vibration, set out for residences in Table 2.4 in Assessing Vibration: a technical guideline (DEC, 2006). For the purposes of this condition, the RBLs are those contained in an environmental assessment for the activities subject to this licence prepared under the Environmental Planning and Assessment Act 1979. Alternatively, the licensee may use another RBL determined in accordance with the Noise Policy for Industry (EPA, 2017) and provided to the EPA prior to carrying out any works or activities under this condition. The notification requirements under condition L5.8 do not apply to this condition.	Section 8.4.3
L5.4	Exemptions to standard construction hours in exceptional circumstances a) The licensee may undertake works and activities outside of standard construction hours specified in condition L5.1 for: i. emergency works required to avoid the loss of life or property, or to prevent material harm to the environment; and ii. the delivery of oversized plant, structures or materials determined by the police or	Section 8.4.3

EPL 21800 Reference	Condition Requirement	NVCSP Reference
	other authorised authorities to require special arrangements to transport along public roads. b) The licensee must, on becoming aware of the need to undertake emergency works under this condition notify the EPA's Environment Line as soon as practicable and submit a report to the EPA by 4:00 pm on the next business day after the emergency works commenced that describes: i. the cause, time and duration of the emergency; ii. action taken by or on behalf of the licensee in relation to the emergency; and iii. details of any measures taken or proposed to be taken by the licensee to prevent or mitigate against a recurrence of the emergency. For the purposes of this condition, 'material harm to the environment' has the same meaning as in section 147 of the POEO Act. Emergency works do not require a notification under condition L5.8.	
L5.5	Works outside of standard construction hours Under this condition, works and activities may be undertaken outside of standard construction hours specified in condition L5.1 if any of the following circumstances apply: a) carrying on those works and activities during standard construction hours would result in a high risk to construction personnel or public safety, based on a risk assessment carried out in accordance with AS/NZS ISO 31000:2018 "Risk Management"; b) the Relevant Road Network Operator has advised the licensee in writing that carrying out the works and activities during standard construction hours would result in a high risk to road network operational performance; c) a relevant utility service operator has advised the licensee in writing that carrying out the works and activities during standard construction hours would result in a high risk to the operation and integrity of the utility network; d) the TfNSW Transport Management Centre (or other road authority) have refused to issue a road occupancy licence during standard construction hours; or e) Sydney Trains (or other rail authority) requires a rail possession for the activities to be performed outside of standard construction hours. f) the Relevant Road Network Operator or utility service operator has directed the licensee to carry out works and activities outside of standard construction hours.	Section 8.4.3
L5.6	Works outside of standard construction hours - Regulatory Requirements In undertaking any works and activities outside of standard construction hours under condition L5.5, the licensee must comply with the following: a) Prepare a construction noise and vibration impact assessment in accordance with the Interim Construction Noise Guideline (DEC, 2009) that is to include: i. a description of the proposed works and activities outside of standard construction hours; ii. predictions of LAeq (15 minute) dB noise levels at noise sensitive receivers from these works and activities, where noise levels are predicted to be greater than those permitted under condition L5.3; iii. 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 works and activities, including during the period/s predicted to have the highest noise level impacts; iv. consideration of cumulative noise and vibration impacts to sensitive receivers from any other neighbouring construction works that are also likely to impact sensitive receivers. b) Undertake noise monitoring in accordance with the monitoring plan required by condition L5.6(a)(iii). c) Only undertake activities between the hours of 6:00pm on Mondays, Tuesdays, Wednesdays, Thursdays, Fridays and 7:00am the following day (unless permitted by another condition of this licence. d) Activities are not to be undertaken between the hours of 6:00pm on Saturdays, Sundays or Public Holidays and 7:00am the following day (unless permitted by another condition of this licence). e) Ensure that works and activities do not result in noise levels exceeding those specified in condition L5.3 at the same noise sensitive receivers (unless specified in another condition of this licence) on more than: i. 2 consecutive evenings and/or nights at any time; and ii. 3 evenings and/or nights per week; and iii. 10 evenings and/or nights per month. f) Undertake any high noise impact works before 12:00 am (midnight) where reasonable and feasible. g) Where high noise impact activities are undertaken, the respite provisions as per the requirements of condition L5.2(c) do not apply provided that all High Noise Impact Activities and Works are undertaken prior to 12:00 am (midnight). h) Where high noise impact activities are undertaken after 12:00 am (midnight), the respite provisions in condition L5.2(c) apply. i) Upon request of an authorised officer, the licensee must provide within 5 business day: i. the construction noise and vibration impact assessment required by condition L5.6(a); ii. noise monitoring results required by condition L5.6(b); iii. written	Section 8

EPL 21800 Reference	Condition Requirement	NVCSP Reference
	evidence demonstrating the works are necessary and permitted under condition L5.5; and/or iv. any other relevant information or records requested by the EPA. The notification requirements under condition L5.8 apply to this condition.	
L5.7	The licensee must make all reasonable and feasible efforts to coordinate all works outside of standard construction hours with any neighbouring concurrent construction works that have the potential to impact the same Noise Sensitive Receivers. The licensee must ensure Respite Periods are being achieved as much as is reasonably practicable. Note: This condition does not apply to low impact noise work permitted by condition L5.3 or emergency works permitted by L5.4 of this licence.	Section 5 Section 8
L5.8	Works outside of standard construction hours - Notification The licensee must notify potentially affected Noise Sensitive Receivers of works outside of standard construction hours unless notification under this condition is not required as specified in another condition of this licence. a) The notification must: i. be given not less than 5 calendar days and not more than 14 calendar days before those works are to be undertaken, unless otherwise agreed with the affected community and notified to the EPA; ii. be undertaken by letterbox drop, email, text message or other targeted and equivalent method; and iii. be detailed on the project website or other relevant website notified to the EPA. b) The notification required by this Condition must: i. clearly outline the reason that the work is required to be undertaken outside the hours specified in condition L5.1; ii. include a diagram that clearly identifies the location of the proposed works in relation to nearby cross streets and local landmarks; iii. include details of the date, timing and relevant time restrictions that apply to the proposed works; iv. clearly outline in plain English, the location, nature, scope and duration of the proposed works; v. detail the expected noise impact of the works on Noise Sensitive Receivers; vi. clearly state how complaints may be made and additional information obtained; vii. include the number of the telephone complaints line required by condition M4.1, an after hours contact phone number specific to the works undertaken outside the hours specified in condition L5.1, and the project website address; and viii. include consideration of culturally and linguistically diverse Noise Sensitive Receivers where required.	Section 8
L5.9	From 1 December 2023 to 31 October 2024 the Licensee is permitted to undertake works outside of the standard construction hours stipulated in L5.1 where there are planned critical concrete pours and associated activities in forecast temperatures of 35 degrees Celsius and above. Where reasonable and feasible, the notification requirements under L5.8 apply to this condition.	Section 8
L5.10	Works and activities associated with the hydrostatic testing of the brine and treated water pipelines may be undertaken outside the standard construction hours prescribed in condition L5.1 from 11 April 2024 to 31 December 2024, provided that the Licensee: (a) implements all feasible and reasonable noise mitigation measures as per the Construction Noise and Vibration Impact Statement; (b) notifies all impacted noise sensitive receivers in accordance with condition L5.8; (c) undertakes noise monitoring in accordance with condition L5.6.	Section 8
M4.1	All noise and vibration monitoring for the purposes of determining compliance with the conditions of this licence must be undertaken by a Competent Person as defined in the special dictionary of this licence.	Section 8
M4.2	All noise monitoring for the purposes of determining compliance with the conditions of this licence must consider and be generally undertaken in accordance with; (a) Australian Standard AS 1055: 2018 Acoustics - Description and measurement of environmental noise; and (b) the compliance monitoring guidance provided in the chapter 7 'Monitoring Performance' of the Noise Policy for Industry (EPA, 2017).	Section 8
M4.3	All vibration monitoring must be: a) undertaken in accordance with the technical guidance provided in the Assessing Vibration: a technical guideline (DEC, 2006); and b) assessed and reported against the acceptable and maximum values of human exposure to vibration set out in Tables 2.2 and 2.4 of this guideline.	Section 8
M4.4	The licensee must undertake noise and vibration monitoring as directed by an authorised officer of the EPA. Where the monitoring is requested to take place on private land (for example a residential property) the licensee must request permission to access the premises in advance and keep a record of permission requests and responses. If a licensee is unable to obtain permission, the licensee must undertake the monitoring at an indicative location where possible and they must provide the response (including any nil response) to the EPA.	Section 8

EPL 21800 Reference	Condition Requirement	NVCSP Reference
M4.5	Additional Monitoring Conditions The licensee must undertake monitoring, sampling, video recording and/or take photographs: a) if the EPA or licensee reasonably suspects that an event has occurred at the premises or in connection with the carrying out of the activities that has caused, is causing, is likely to cause or has the potential to cause material harm to the environment (whether the harm occurs on or off premises to which the licence applies); b) as soon as practicable; and c) as directed by an authorised officer.	Section 9.4
M6.4	Noise and Vibration Complaints a) the licensee must commence investigation of noise and vibration complaints: i. within two hours of the complaint being made; or ii. in accordance with any documented complaint management agreement between the licensee and the complainant. b) the licensee must offer to the complainant to undertake attended noise or vibration monitoring at their premises if: i. any investigation referred to in this condition identifies works or activities being undertaken on the licensed premises as the likely source of the complaint; and ii. the licensee is not in possession of noise monitoring data representative of the complainants location and of the subject works and activities being undertaken on the licensed premises. c) if the occupant of the dwelling or management personnel of a Noise Sensitive Receiver (other than a dwelling) accepts the offer of attended noise or vibration monitoring the licensee must undertake that attended monitoring: i. as soon as practicable; or ii. at a time agreed with the complainant. d) The licensee must, in respect of each complaint made, advise each complainant of the results of its investigation of their complaint and any proposed remedial action within a reasonable period of time.	Section 8
R4.2	Noise and Vibration Reports a) Upon request of an authorised officer, the licensee must submit a Preliminary Investigation Report to the EPA in respect of any noise or vibration monitoring undertaken in accordance with the requirements of Condition M3.4. b) The Preliminary Investigation Report must be submitted to the EPA by 4:00 pm on the afternoon of the next working day following any noise or vibration monitoring or other time as agreed in writing by EPA. c) The Preliminary Investigation Report must include: i. numerical and/or graphical representation of the noise and vibration monitoring results including both ambient noise levels and the level of noise from activities on the premises only; and ii. the noise levels reported using the following noise descriptors: LAeq,T; LAF90,T; and LAFmax,T (T representing the 15 minute measurement period unless an alternative period is justified); and iii. an assessment of measured construction noise and vibration levels against noise limits or noise management levels specified in this licence, requirements in the project specific Construction Noise and Vibration Plan and/or Impact Statement prepared the activities, relevant noise modelling and any relevant noise guidelines.	Section 9.6
R4.3	In the event of any exceedance of the Best Achievable Noise Performance Objectives identified in the project specific Construction Noise and Vibration Plan and/or Impact Statement ("the plans") prepared for the activities, the licensee must: a) investigate the cause of the exceedance and identify whether all feasible and reasonable noise and vibration mitigation measures identified in the plans have been effectively deployed; b) identify any noise and vibration measures recommended in the plans that were not effectively deployed; c) assess appropriate remedial actions to seek to achieve the best achievable noise performance objectives; d) submit a Follow-Up Investigation Report to the EPA within 5 business days (unless agreed in writing by the EPA) of any noise or vibration monitoring having been undertaken that detected the exceedance; and e) include the following information in the Follow-Up Investigation Report: i. confirmation of whether noise monitoring has been undertaken in accordance with AS1055:2018 and the compliance monitoring guidance provided in the Interim Construction Noise Guideline (DECC, 2009); ii. Confirmation of whether vibration monitoring has been undertaken in accordance with the guidance provided in Assessing Vibration: a technical guideline (DEC, 2006); iii. Details of the prevailing meteorological conditions during the period when the monitoring was undertaken; iv. A map of each noise and vibration monitoring location in relation to the noise source, including relevant distances; v. numerical and graphical representation of the noise and vibration monitoring results; vi. an analysis of the noise and vibration	Section 9.2

EPL 21800 Reference	Condition Requirement	NVCSP Reference
	monitoring results; vii. details of any remedial action taken in relation to the matter; and viii. in cases not the subject of remedial action, detailed justification of the decision not to undertake remedial action.	
E1.1	Work outside standard construction hours - community consultation and agreement. The licensee may work outside standard construction hours (as defined in L4.1) in circumstances other than those permitted under conditions L4.3, L4.4, or any other condition of this licence if the Licensee: a) undertakes community consultation and agreement as described in E1.2; b) submits to the EPA a written request to work outside the standard construction hours attaching information set out in E1.3; and c) obtains approval by the EPA to work outside standard construction hours. The EPA may, in exercising its discretion to approve the works outside standard construction hours, review whether the licensee has obtained community agreement. Specifically, whether a substantial majority of the individual Noise Sensitive Receivers who together comprise the Community Affected Catchments and were contacted has consented to the planned works out of standard hours.	Section 8
E1.2	Any community consultation and agreement undertaken with respect to the proposed out of hours works (OOHW) must: a) be prepared and implemented in accordance with the Interim Construction Noise Guidelines (DEC 2009), the Noise Policy for Industry (EPA, 2017) and AS2436-2010: Guide to noise and vibration control on construction, demolition and maintenance sites; b) include consultation of all noise sensitive receivers within the Community Affected Catchments. This includes Noise Sensitive Receivers that have declined to participate in previous agreements unless a community member has explicitly requested not to be involved in any future consultation about future OOHW; c) ensure that the noise sensitive receivers understand the nature of the works and any predicted impacts, including that consideration is made of additional requirements relevant to the needs of culturally and linguistically diverse Noise Sensitive Receivers, and include details for interpreting services for languages other than English where required. D) include in the community consultations with Noise Sensitive Receivers the following information: i. the actual works proposed; ii. Any expected impacts in clear, plain English based on noise modelling; iii. The expected duration of the works; iv. Any expected benefits for receivers; v. any other known concurrent OOHW that will be occurring; and vi. 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. e) request consent from the Noise Sensitive Receiver for their responses to be provided to the EPA; f) ensure that a record is kept when a licensee is unable to contact a noise sensitive receiver after three attempts, including leaving “sorry I missed you” cards explaining the reason for the visit and requesting a return phone call; and g) demonstrate, where the OOHW is predicted to go on longer than 28 calendar days, that the licensee has consulted the community in relation to re-engagement periods for the purpose of determining agreement from the community is maintained and continuing. Detailed records are to be maintained by the licensee of all community consultations, including attempts to contact Noise Sensitive Receivers, and must be maintained for the duration of the licence. Any Noise Sensitive Receiver who requests a copy of the record of conversations must be supplied with one.	Section 8
E1.3	The licensee must report to the EPA the community consultation and agreement process that was undertaken with the Community Affected Catchments. This report to the EPA must be: a) prepared in writing; b) detail the steps taken to fulfil the requirements of condition E1.2; c) demonstrate that the Noise Sensitive Receivers understood the nature of the works and any predicted impacts, including that consideration was made of additional requirements relevant to the needs of culturally and linguistically diverse Noise Sensitive Receivers; d) provide the script used during the community consultation with Noise Sensitive Receivers; e) report community response and consent rates (including where no contact could be made) against the total community affected catchments, and must be broken down into response and consent rates based on sub-catchments that are delineated by affectation levels; f) include a noise validation monitoring plan as required by E1.4; and g) be submitted to the EPA at least 15 business days prior to any works that are the subject of the agreement being undertaken unless prior arrangements have been made with the EPA. A copy of the report must be: a) kept by the licensee for the duration of this licence including on the premises, and made available to an	Section 8

EPL 21800 Reference	Condition Requirement	NVCSP Reference
	EPA authorised officer on request; and b) be made available on the licensee's project website or another website approved in writing by the EPA for the duration of the OOHWs permitted under condition E1.1. (Personal details of Noise Sensitive Receivers must be omitted).	
E1.4	Noise Validation Monitoring A noise validation monitoring plan must be submitted to the EPA for approval as part of the community agreement documentation prior to any OOHW occurring.	Section 8
E1.5	Validation monitoring must be undertaken for any OOHW that are the approved under condition E1.1 and must: a) be undertaken in accordance with the monitoring plan prepared under condition E1.4; b) be performed by a Competent Person; c) be performed on at least the first 2 occasions (day, evening, nights) where OOHW will be undertaken and are likely to impact Noise Sensitive Receivers; d) be performed on any other occasion (day, evening, night) where the nature of the works is likely to cause greater noise impacts than the first 2 occasions; e) be representative of the impacts in terms of monitoring locations, time and duration of measurements; and f) be recorded and provided to an EPA officer upon request.	Section 8
E1.6	If validation monitoring undertaken under Condition E1.5 shows that noise levels are higher than those predicted by any noise modelling undertaken as part of the community agreement, work practices must be modified immediately so that measured noise levels do not exceed predicted levels. Where it has been determined that works cannot be modified to achieve the predicted noise levels: a) the licensee must report immediately to the EPA; and b) after considering the circumstances EPA may withdraw its permission under E1.1.	Section 8
E1.7	Ongoing community engagement and agreement a) For any approval of OOHW under E1.1 predicted to take longer than 28 calendar days to remain valid, the licensee must be able to demonstrate agreement from the community is maintained and continuing. b) To demonstrate agreement from the community is maintained and continuing the licensee must: i. engage the community to determine if a substantial majority of Noise Sensitive Receivers continue to consent to the OOHW pursuant to the re-engagement period determined under condition E1.2(d); ii. provide the EPA with a report within 7 calendar days of the end of each re-engagement period summarising the community response including ongoing consent rates of the Noise Sensitive Receiver; and c) Where the licensee is unable to demonstrate a substantial majority of agreement from Community Affected Catchment is maintained and continuing: i. the licensee must report immediately to the EPA; and ii. after considering the circumstances EPA may withdraw its permission under E1.1.	Section 8

4 Consultation

Consultation requirements raised in the Infrastructure Approval are explored in detail in Section 2 of the CEMP. Specifically, the NVCSP and the NVMoP have been provided to the following agencies in accordance with CoA C4 and CoA C13, with their details summarised in Appendix A and comments received from the consultation process incorporated in relevant sections of this Plan.

- Acoustic Advisor (AA)
- NSW Environment Protection Authority (EPA)
- Water NSW
- Relevant Councils, including:
  - Wollondilly Shire Council
  - Penrith City Council
  - Liverpool City Council
  - Fairfield City Council
  - Canterbury-Bankstown Council

In line with ISC Noise DL3.1, this NVCSP will be provided to an ecologist with knowledge of the impacts of modelled construction noise on local fauna. Any recommendations provided will be considered and, where appropriate, incorporated into this NVCSP.

Affected stakeholders (as defined in Table 3-3) will be engaged bi-annually to review noise and vibration impacts, mitigations measures and the noise and vibration monitoring and modelling for construction.

Consultation with impacted sensitive receivers will be carried out for noise generating works in the vicinity of potentially-affected community, religious, educational institutions and noise and vibration-sensitive businesses and critical working areas (such as theatres, laboratories and operating theatres) that resulting in noise levels above the NMLs where the works cannot be timetabled outside of sensitive periods.

The Out of Hours Works (OOHW) Protocol was provided to the EPA, Environmental Representative (ER) and Acoustic Advisor (AA) in accordance with CoA E43. The outcomes of the agency consultation were outlined in the CoA A9 Consultation Summary Report. The report has been developed and appended to this Plan (Appendix A) to document and provide evidence of consultation undertaken in accordance with the Infrastructure Approval.

4.1 Endorsement and Approval

Prior to submission of this sub-plan to the Planning Secretary, the initial revision of the NVCSP was endorsed by the ER and AA. This NVCSP was submitted to the Planning Secretary no later than one month before the commencement of construction. No construction commenced until the NVCSP and all CEMP Sub-plans were approved by the Planning Secretary on 8th August 2023. The approved CEMP and CEMP Sub-plans, including any minor amendments approved by the ER and AA as per CoA A34(h)(iii) for the NVCSP, will be implemented for the duration of construction of Stage 1 of the USC project.

4.2 Project Engagement with the Community

The overall approach to engagement is based on understanding stakeholder expectations up front, providing relevant and timely updates on project progress and working closely with the project team and stakeholders to minimise project impacts wherever possible. Given the nature and location of the work, the level of likely public interest and the potential impacts, the engagement approach will range from ‘inform’ to ‘involve’ on the IAP2 Public Participation Spectrum. For most stakeholders impacted by noise and vibration, the project will engage at the ‘inform’ or ‘consult’ level of the spectrum. At the ‘inform’ level, the project will provide relevant community and stakeholders with balanced and objective information to assist them in understanding the problem, alternatives, opportunities and/or solutions. By engaging at the ‘consult’ level, the project will work with the community and stakeholders to ensure that concerns and aspirations are listened to, acknowledged and addressed, and will provide feedback on how stakeholder input influenced the project.

4.2.1 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 is also required in accordance with the projects EPL and CoA E55.

The Community & Stakeholder Engagement Plan (CSEP) outlines how the Project will engage with and notify the community of upcoming works. Specifically, Appendix M of the CSEP outlines the overall community and stakeholder action plan inclusive of a series of tools and/or tasks to implement and/or obtain, which includes consideration of OOHW respite consultation. Examples from the CSEP is outlined below:

- Develop tailored information (FAQs, fact sheets, doorknocking scripts, newsletters, email correspondence etc.) for people querying operational impacts and update throughout project (including OOHW).
- Issue notifications before new types of major construction activities / impacts begin and before any major traffic changes (or out of hours work). Notifications to include contact details, work location map and translation panel. Additionally for OOHW, notifications will also include a progressive schedule for periods of likely OOHW, a description of the potential work and its duration, the noise characteristics and likely noise levels of the work and likely mitigation and management measures which aim to achieve the relevant project specific noise and vibration management levels.
- Update newsletter on progress to all stakeholders ongoingly throughout construction.
- At key project intervals, conduct drop-in information session (with councils and government agencies invited to participate) to provide update on progress and outline remaining construction.

5 Existing Environment

The following sub-sections provide detail on the existing environment on and around the USC construction sites and factors influencing noise and vibration within and adjacent to the Project work areas. Information has been extracted from the Upper South Creek Advanced Water Recycling Centre EIS.

5.1 Sensitive Land User(s)

The project, and specifically the proposed AWRC site, is located in a rural area of Western Sydney, approximately 40km to the west of the Sydney central business district and is part of the Greater Western Sydney region. The AWRC site is set at an elevation of approximately 40m above sea level within a natural depression that follows the alignment of South Creek and Badgerys Creek. The treated water pipeline is approximately 16km in length and leaves the AWRC site in a westerly direction where it directs treated water into the Nepean River at Wallacia via a release structure. The treated water and brine pipelines pass through or near to various land uses over their extent, including industrial, residential, educational, commercial/business, medical, and recreational. The brine pipeline is approximately 24km in length and leaves the AWRC site in an easterly direction where it directs brine by-product into the existing Sydney Water network via the Northern Georges River Submain (NGRS) at Lansdowne for transfer to the Malabar wastewater treatment plant.

A land use survey has been carried out to identify the receiver types and uses of buildings and to confirm sensitive land user(s) (including critical working areas such as operating theatres and precision laboratories) that could potentially be impacted by noise and vibration from the works. This activity builds upon the information that was provided in the EIS through both desktop and ground-truthing exercises in critical areas where works will occur. The land use survey maps prepared in accordance with CoA E39 are presented in Appendix D. This information has also been integrated into the Project GIS and online 3D noise and vibration management software (Gatewave).

The land use survey will continue to be updated throughout the delivery of the Project in accordance with CoA E39. Where other sensitive receivers are identified (including unexpected Aboriginal places or items of environmental heritage), noise and vibration modelling will then account for them and appropriate mitigation measures will be implemented.

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 7:

- 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, such as reading or meditation, which have the potential to be impacted by external noise)
- 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

A noise and vibration impact assessment was prepared as part of the development of the EIS and forms Appendix S of the EIS. An amendment assessment was prepared for the Amendment Report and forms Appendix D of the Amendment Report.

To facilitate the assessment of noise impacts from the Project, during the development of the EIS, receivers within the vicinity of the Project were divided into Noise Catchment Areas (NCAs), which reflect land uses and the nature and types of receivers within each area.

A summary of the NCAs for the Project is provided in Table 5-1 with a brief description of the key characteristics of each area. A map showing the location of each NCA is provided the Land Use Survey documented in Appendix D of this NVCSP.

Noise monitoring results in the M12 Motorway EIS and assumed background noise levels listed in AS 1055.3:1997 were used in the EIS to determine Rating Background Levels (RBLs) and Noise Management Levels (NMLs) for each NCA for daytime, evening and night-time periods. These periods are defined as follows:

- **Day** is defined as 7:00am to 6:00pm, Monday to Friday and 8:00am to 1:00pm Saturday
- **Evening** is defined as 6:00pm to 10:00pm, Monday to Sunday & Public Holidays
- **Night** is defined as 10:00pm to 7:00am, Monday to Friday and 10:00pm to 8:00am Saturdays, Sundays & Public Holidays.

Table 5-1 outlines the NCAs that are relevant to the Project as identified in Appendix C of the Noise and Vibration Impact Assessment (EIS Appendix S).

Table 5-1 Noise Catchment Areas (Reference: EIS, Table 10 of Noise and Vibration Impact Assessment (EIS Appendix S))

NCA	Description
NCA T1	Residential receiver near the AWRC
NCA T2	Residential receiver along Elizabeth Drive (East)
NCA T3	Residential receiver along Elizabeth Drive (West)
NCA T4	Residential receiver along the Northern Road
NCA T5	Residential receiver along Park Road
NCA T6	Residential receiver Wallacia Town Centre
NCA T7	Residential receivers along Silverdale Road
NCA T8	Residential receivers along Bents Basin Road
NCA T9	Residential receivers near North Warragamba
NCA B1	Residential receivers along Western Road
NCA B2	Residential receivers along Cross Street
NCA B3	Residential receivers near Cecil Park
NCA B4	Residential receivers along Kensington Place
NCA B5	Residential receivers along Stirling Street, Feodore Drive, Frederick Road
NCA B6	Residential Receivers along North Liverpool Road
NCA B7	Residential Receivers along Montgomery Road
NCA B8	Residential Receivers along Monash Place and Hebblewhite Place
NCA B9	Residential Receivers along West Cabramatta Road
NCA B10	Residential Receivers along Meadows Road
NCA B11	Residential Receivers along Edensor Road, Harrington Street, John Street
NCA B12	Residential Receivers on John Street (East of Joseph Street)
NCA B13	Residential receivers along Gladstone Street, St John Road, Barley Street
NCA B14	Receivers along Curtin Street and Fairview Road
NCA B15	Residential receiver along Bareena Street, Vale Street, Chancery Street
NCA B16	Residential receiver along Bromley Street, Beckenham Street and Willowbank Crescent
NCA B17	Residential receivers along the Hume Highway
NCA B18	Residential receivers along Knight Street

5.3 Cumulative Noise Impact from Concurrent Work

Construction of the Project will run concurrently with other major infrastructure projects in the region, including the M12 Motorway, Western Sydney International Airport, The Northern Road upgrade (Glenmore Road to Bringelly Road), and Sydney Metro Western Sydney Airport projects. Additional construction works may take place as part of other State Significant Infrastructure or State Significant Development projects, particular those associated with the Aerotropolis. The noise impacts of multiple projects occurring concurrently or consecutively will be addressed by complying with the relevant CoA, UMMs, EPL particularly EPL condition L5.6, CoA E43 (Out-of-Hours Protocol – Works Not Subject to an EPL), E54 (Utility Coordination and Respite) and E55 (Out-of-Hours Works – Community Consultation on Respite). Cumulative impacts from concurrent works will be assessed using the Gatewave noise and vibration management tool, where appropriate.

Other methods that will be employed by the project to manage cumulative noise impacts from concurrent works include:

- Scheduled interface meetings with relevant nearby / adjacent stakeholders which may include discussion on a number of potential environmental aspects and impacts (e.g., noise and vibration, traffic)
- The establishment of dedicated coordinated meetings for a more detailed discussion surrounding project requirements. An OOHW coordination meeting is an example of this and is discussed further in Section 3.5 of the OOHW protocol (Appendix C).

Mitigation measures to minimise these cumulative construction noise impacts are considered in Section 8 of the NVCSP and OOHW Protocol.

6 Project-Specific Noise and Vibration Criteria

Environmental performance outcomes have been developed that are consistent with the various project approval documents. The environmental performance outcomes specific to this NVCSP are presented in the following sub-sections and have been derived from the desired performance outcomes related to noise and vibration raised in the EIS and listed in Table 6-1 below.

Table 6-1 Environmental performance outcomes relevant to the NVCSP

Desired Performance Outcome	How Performance Outcomes Would be Achieved	Measurement Tool
Noise and vibration – Amenity Construction noise and vibration (including airborne noise and ground-borne noise) are effectively managed to minimise adverse impacts on acoustic amenity.	Comply with the relevant criteria from the NSW Industrial Noise Policy and Interim Construction Noise Guideline. Effective management of construction noise and vibration in accordance with relevant guidelines.	Construction activities will be managed in accordance with this NVCSP to meet the project's noise and vibration (amenity) performance outcomes, including monitoring (Section 9.4) to achieve the nominated targets in Section 6, reporting and additional assessment (Section 7), and application of mitigation measures (Section 8).
Noise and vibration – Structural Construction noise and vibration (including airborne noise and ground-borne noise) are effectively managed to minimise adverse impacts on the structural integrity of buildings and items including Aboriginal places and environmental heritage	No damage to any structures	Construction activities will be managed in accordance with this NVCSP and the Heritage CEMP Sub-plan to meet the project's noise and vibration (structural) performance outcomes, including monitoring (Section 9.4) to achieve the nominated targets in Section 6, reporting and additional assessment (Section 7), and application of mitigation measures (Section 8).

The documents outlined in Table 6-2 have been used to establish the Project management levels and goals for assessing construction noise and vibration.

Table 6-2 Policies and standards applicable to construction noise and vibration management

Environmental Impact	Relevant Policy/Standard Used to Establish Noise and Vibration Management Level
Construction hours	Conditions of Approval and EPL 21800
Airborne noise	NSW Interim Construction Noise Guideline (ICNG) (DECC 2009)
Sleep disturbance and maximum noise events	No specific guidelines. NSW EPA Noise Policy for Industry, Guidance taken from the ICNG, the Road Noise Policy (RNP) and Roads and Maritime Environmental Noise Management Manual (ENMM) Practice Note 3
Ground-borne noise	Conditions of Approval Interim Construction Noise Guideline (ICNG)
Construction-related Road traffic noise	No specific guidelines. Guidance taken from the ICNG and the RNP.
Vibration (disturbance to building occupants)	Conditions of Approval NSW DECC's Assessing vibration; a technical guideline (AVTG), published in February 2006, in line with CoA E44(b), which incorporates British Standard BS 6472-2008, Evaluation of human exposure to vibration in buildings (1-80Hz)
Vibration (structural damage to buildings)	Conditions of Approval British Standard 7385:1993 Evaluation and measurement of vibration in buildings – Part 2 Guide to damage from ground-borne vibration DIN4150-2016 Structural vibration Part 3: Effects of vibration on Structures (for structurally unsound heritage structures)
Vibration (structural damage to buried services)	German Standard DIN 4150:2016 – Part 3 Structural vibration in buildings – Effects on structures
Vibration (sensitive scientific and medical equipment) (guidance only)	ASHRAE Applications Handbook (SI) 2003, Chapter 47 Sound and Vibration Control Gordon GC 28 September 1999 Generic Vibration Criteria for Vibration Sensitive Equipment Australian Standard 2834-1995 Computer Accommodation, Chapter 2.9 Vibration

6.1 Construction Hours

The work hours for the Project are defined by the CSSI Project Planning Approval and EPL 21800 which are summarised in Table 6-3. Works may be carried out outside work hours defined, if the requirements of EPL or Project Planning Approval Conditions E42 and E43 (where required) are satisfied.

OOHW is categorised into two time periods, for the purpose of managing impacts and identifying additional mitigation measures, as demonstrated in Table 6-3.

Table 6-3 Work hours and OOHW periods

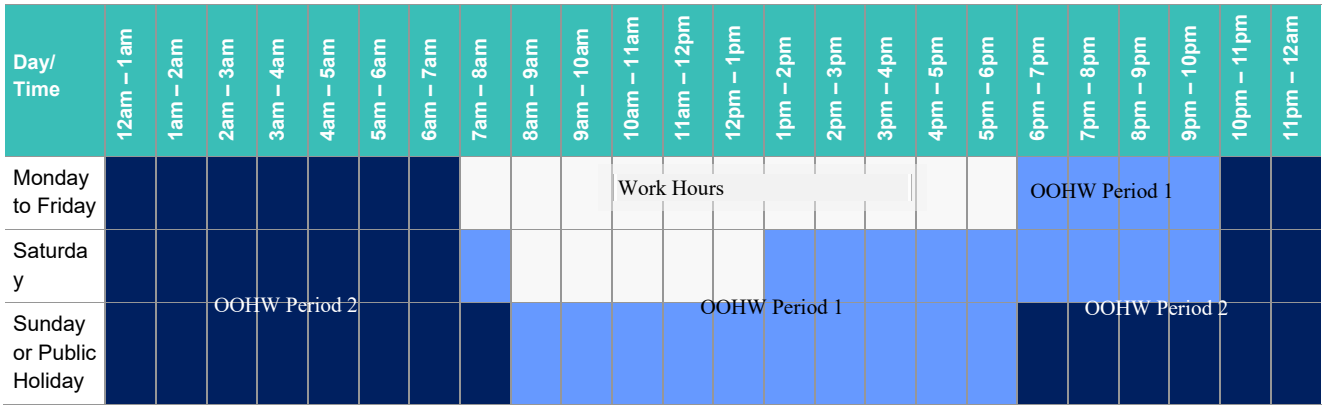


Table 6-4 summarises the information that the CoA require regarding construction working hours for the Project.

Table 6-4 Summary of construction working hours for the Project

CoA	Construction Activity	Monday To Friday	Saturday	Sunday / Public Holiday
E40	Work hours	7:00am to 6:00pm	8:00am to 1:00pm	No work[1]
E41	Highly noise intensive works that result in an exceedance of the applicable NML[2] at the same receiver	8:00am to 6:00pm (+ respite[3])	8:00am to 1:00pm (+ respite[3])	No work[1]
E42(a)	a. Safety and Emergencies, including: i. for the delivery of materials required by the NSW Police Force or other authority for safety reasons; or ii. where it is required in an emergency to avoid injury or the loss of life, to avoid damage or loss of property, to prevent environmental harm. On becoming aware of the need for emergency work in accordance with Condition E42(a), the AA, the ER, the Planning Secretary and the EPA must be notified of the reasons for such work. Best endeavours must be used to notify all noise and/or vibration affected receivers and owners/occupiers of properties identified sensitive land use(s) of the likely impact and duration of those works; or	6:00 pm to 7:00 am	1:00 pm to 8:00 am	Entire day
E42(b)	b. Work that meets all of the following criteria: i. construction that causes LAeq (15 minute) noise levels: • no more than 5 dB(A) above the rating background level at any residence in accordance with the ICNG, o • no more than the 'Noise affected' NMLs specified in Table 3 of the ICNG at other sensitive land user(s); or ii. 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).	6:00 pm to 7:00 am	1:00 pm to 8:00 am	Entire day
E42(c)	c. By Approval, including: i. where different construction hours are permitted or required under an EPL in force in respect of the CSSI; or ii. works which are not subject to an EPL that are approved under an Out-of-Hours Work Protocol as required by Condition E43; or iii. negotiated agreements with directly affected residents and sensitive land use(s).	6:00 pm to 7:00 am	1:00 pm to 8:00 am	Entire day

Notes:

1 No work unless permitted and approved under CoA E42

2 Highly noise intensive work restrictions apply to surface works. The applicable NML for residential receivers is the highly noise affected level of 75dB(A). "Highly Noise Affected" is applied to ICNG recommended standard hours only.

3 if continuously, then not exceeding three hours, with a minimum cessation of Work of not less than one hour

Construction works would be undertaken during the approved standard construction hours wherever possible. Where construction cannot be undertaken during standard construction hours, works will be scheduled as early as possible during the evening and/or night-time periods with the following hierarchy and in accordance with Section :8.4.2 and 8.4.3.

1. 1:00pm to 6:00pm Saturdays
2. 8:00 am to 6:00 pm Sunday (or public holidays) or 6:00 pm to 10:00pm weekdays
3. 10:00 pm to 7:00 am weekday nights
4. 10:00 pm to 8:00 am Saturday night or 6:00 pm to 7:00 am Sunday or public holiday nights.

6.2 Airbourne Construction Noise Objectives

The ICNG provides guidelines for the assessment and management of airborne 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; and
- Provide flexibility in selecting site-specific feasible and reasonable work practices to minimise noise impacts.

6.2.1 Residential Receivers

Table 6-5 below, which was sourced from the ICNG, shows how NMLs at residential receivers are determined and how they are to be applied. The rating background level (RBL) is used when determining the noise management level (NML). The RBL is the overall single-figure background noise level measured in each relevant assessment period (during or outside the recommended standard hours). The term and methodology to obtain RBLs is described in detail within the Noise Policy for Industry (NPfI) (EPA, 2017).

Table 6-5 Airbourne Noise Management Levels (NMLs) at residential receivers

Time of Day	Noise Management Level (NML) $L_{Aeq\ (15min)}$	How to Apply
Standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sunday or public holidays	Noise affected RBL + 10 dB(A)	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq\ (15\ min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, JH would carefully consider other ways to reduce noise to below this level. If no quieter work method is feasible or reasonable and the works proceed, the proponent would provide respite periods and communicate with the impacted residents.
Outside recommended standard hours	Noise affected RBL + 5 dB(A)	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5 dB above the RBL, additional noise mitigation measures should be applied (eg those included in the TfNSW CNVS).

Residential receivers may have been provided (either by past projects or independently designed-and-built) with at-property treatments which allow windows to be fixed or kept closed. Land use survey maps will be updated with this detail as it becomes known. In these cases, the noise benefit achieved by the property treatment can be considered in the assessment of construction airborne noise impacts at these individual receivers and the external residential noise management levels can be conservatively increased by 10dB. Higher adjustments may be adopted, if a qualified acoustic consultant has determined that windows and facades of individual buildings provide a higher level of sound attenuation than 20dB and if it can be demonstrated or reasonable assumed that the windows are fixed or kept closed. JH will determine if specific receivers have benefitted from at-property treatments, however the AA must approve of any modifications to the external residential noise management levels.

6.2.1.1 Sleep Disturbance

Where construction works are planned to extend over more than two consecutive nights, the ICNG recommends that an assessment of sleep disturbance impacts be completed. The ICNG refers to the Environmental criteria for road traffic noise (EPA 1999) for assessing the potential impacts, which notes that to limit the level of sleep disturbance, the L_{Amax} should not exceed the existing L_{90} noise level by more than 15 dB. In situations where this results in an external screening level of less than 55 dB(A), a minimum screening level of 55 dB(A) is set. Note that this is equivalent to a maximum internal noise level of 45 dB(A) with windows open.

Where there are noise events found to be above the initial screening level, further analysis is required to identify:

- the likely number of events that might occur during the night assessment period; and
- Whether events exceed an 'awakening reaction' level of 55 dB(A) L_{AFmax} (internal) that equates to NML of 65 dB(A) externally (assuming open windows).

Sleep disturbance screening and awakening criteria is provided in Table 6-6 below.

6.2.1.2 Adopted Project Noise Management Levels for Residential Receivers

Table 6-6 below shows the NMLs for residential receivers for each of the NCAs described in Section 5.2 and shown in the Land Use Survey documented in Appendix D of this NVCSP. NMLs apply at the most noise-affected locations within the property boundary 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.

Table 6-6 Noise Management Levels (NMLs) for residential receivers (external)

Noise Catchment Area	Monitor ID (EIS)	Noise Management Level ($L_{aeq(15\ Minute)}$ – dB(A)				Sleep Disturbance L_{AFmax}	
		Standard Hours[1] (RBL + 10 dB)	Out-Of-Hours[2] (RBL + 5 dB)			Screening (RBL + 15 dB)	Awaken-ing
		Daytime	Daytime	Evening	Night	Night	Night
NCA T1	L06[3]	45	40	40	36	55	65
NCA T2	L12[3]	50	45	42	35	55	65
NCA T3	L14[3]	52	47	44	38	55	65
NCA T4	Suburban/ Urban[5]	55	50	45	40	55	65
NCA T5	Suburban/ Urban[4]	55	50	45	40	55	65
NCA T6	Suburban/ Urban[4]	55	50	45	40	55	65
NCA T7	Rural[4]	50	45	40	35	55	65
NCA T8	Rural[4]	50	45	40	35	55	65
NCA T9	Rural[4]	50	45	40	35	55	65
NCA B1	L05[3]	58	53	51	42	55	65
NCA B2	L05[3]	58	53	51	42	55	65
NCA B3	L03[3]	64	59	53	42	55	65
NCA B4	L01[3]	55	50	50	45	55	65
NCA B5	L01[3]	55	50	50	45	55	65
NCA B6	Urban[4]	60	55	50	45	55	65
NCA B7	Urban[4]	60	55	50	45	55	65
NCA B8	Suburban/ Urban[4]	55	50	45	40	55	65
NCA B9	Urban[4]	60	55	50	45	55	65
NCA B10	Urban[4]	60	55	50	45	55	65
NCA B11	Suburban/ Urban[4]	55	50	45	40	55	65
NCA B12	Suburban/ Urban[4]	55	50	45	40	55	65
NCA B13	Urban[4]	60	55	50	45	55	65
NCA B14	Suburban/ Urban[4]	55	50	45	40	55	65
NCA B15	Urban[4]	60	55	50	45	55	65
NCA B16	Suburban/ Urban[4]	55	50	45	40	55	65
NCA B17	Urban[5]	60	55	50	45	55	65
NCA B18	Urban[4]	60	55	50	45	55	65
NCA B19	Urban[4]	60	55	50	45	55	65

NOTES:

1 Standard construction hours are 7am to 6pm Monday to Friday and 8am to 1pm Saturdays.

2 Daytime out-of-hours are 7am to 8am and 1pm to 6pm on Saturday, and 8am to 6pm on Sunday and public holidays; evening out-of-hours are 6pm to 10pm Monday to Sunday; and night-time out-of-hours are 10pm to 7am Monday to Friday, 10pm to 8am on Saturday, Sunday and public holidays.

3 Monitoring conducted for the M12 EIS and adopted in the Project EIS

4 Background noise estimates provided in the EIS with reference to AS1055 and NPfI

5 Background noise estimates with reference to AS1055 and NPfI

6.2.2 Other Sensitive Land Uses

The ICNG provides noise management levels for commercial and industrial premises and 'other sensitive' land uses (ICNG, Table 3). The management levels for other noise sensitive receivers not listed in the ICNG that are applicable to the Project, such as hotels and libraries, are derived from AS/NZS 2107:2016 Acoustics – Recommended design sound levels and reverberation times for building interiors and the AAAC Guideline for Child Care Centre Acoustic Assessment. The management levels from AS2107 are the upper range levels to account for the variable and short-term nature of construction noise. Noise Management Levels for other sensitive receivers are featured in Table 6-7.

Table 6-7 Noise Management Levels (NMLs) for other sensitive receivers (non-residential)

Land Use	NML $L_{Aeq(15min)}$	Where NML applies	Referenced from:	Assumed facade loss (conservative)	External equivalent NML - $L_{Aeq(15min)}$
Studio building (music recording studio)	25 dB(A)	Internal noise level	AS2107 'maximum'	20 dB(A)	45 dB(A)
Studio building (film or television studio)	30 dB(A)	Internal noise level	AS2107 'maximum'	20 dB(A)	50 dB(A)
Cinema space, theatre, auditorium	35 dB(A)	Internal noise level	AS2107 'maximum'	20 dB(A)	55 dB(A)
Hotel (Sleeping areas: Hotels near major roads)	40 dB(A)	Internal noise level	AS2107 'maximum'	20 dB(A)	60 dB(A)
Classrooms at schools and other educational institutions	45 dB(A)	Internal noise level	ICNG	10 dB(A)	55 dB(A)
Childcare centre (sleeping areas)	40 dB(A)	Internal noise level	AAAC - guideline for Child Care Centre Acoustic Assessment	10 dB(A)	50 dB(A)
Hospital wards and operating theatres	45 dB(A)	Internal noise level	ICNG	20 dB(A)	65 dB(A)
Places of worship	45 dB(A)	Internal noise level	ICNG	10 dB(A)	55 dB(A)
Library (reading areas)	45 dB(A)	Internal noise level	AS2107 'maximum'	20 dB(A)	65 dB(A)
Hotel (bars and lounges)	50 dB(A)	Internal noise level	AS2107 'maximum'	20 dB(A)	70 dB(A)
Community centres – Municipal Buildings	50 dB(A)	Internal noise level	AS2107 'maximum'	10 dB(A)	60 dB(A)
Restaurant, bar (Bars and lounges/ Restaurant)	50 dB(A)	Internal noise level	AS2107 'maximum'	20 dB(A)	70 dB(A)
Passive recreation (e.g. area used for reading, meditation)	60 dB(A)	External noise level	ICNG	-	60 dB(A)
Active recreation (e.g. sports fields)	65 dB(A)	External noise level	ICNG	-	65 dB(A)
Commercial premises (including offices and retail outlets)	70 dB(A)	External noise level	ICNG	-	70 dB(A)
Industrial premises	75 dB(A)	External noise level	ICNG	-	75 dB(A)

In accordance with CoA E46, noise generating works in the vicinity of potentially-affected community, religious, educational institutions and 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 during sensitive periods, unless other reasonable arrangements with affected institutions are made at no cost to the affected institution.

Where works cannot be timetabled outside of sensitive periods, consultation with impacted sensitive receivers will be carried out, as per the CSEP and discussed in Section 4.2 of this plan.

6.2.3 Annoying Noise

The ICNG identifies 'particularly annoying' activities that require the addition of 5 dB(A) to the predicted level before comparing to the construction Noise Management Level. Annoying activities identified in the ICNG include:

- use of 'beeper' style reversing or movement alarms, particularly at night-time;
- use of power saws, such as used for cutting timber, rail lines, masonry, road pavement or steel work;
- grinding metal, concrete or masonry;
- rock drilling;
- line drilling;
- vibratory rolling;
- rail tamping and regulating;
- bitumen milling or profiling;
- jackhammering, rock hammering or rock breaking; and
- impact piling.

Where monitoring has confirmed that activities described above do not possess annoying characteristics in accordance with the NPfI (e.g. tonality, low frequency), the above addition of 5 dB(A) will not apply. In accordance with CoA A32(b), such monitoring and analysis will be provided to the AA for review.

In addition to the above, the following requirements from Condition L5.6 of EPL 21800 applies for high noise impact works.

- Undertake any high noise impact works before 12:00 am (midnight) where reasonable and feasible.
- Where high noise impact activities are undertaken, the respite provisions as per the requirements of condition L5.2(c) of EPL 21800 do not apply provided that all High Noise Impact Activities and Works are undertaken prior to 12:00 am (midnight).
- Where high noise impact activities are undertaken after 12:00 am (midnight), the respite provisions in condition L5.2(c) of EPL 21800 apply.

6.2.4 National Standard for exposure to noise

In accordance with CoA E47, project worksites will be managed to ensure that noise generated by construction will not exceed the National Standard for exposure to noise in the occupational environment of an eight-hour equivalent continuous A-weighted sound pressure level of LAeq,8h, of 85dB(A) for any employee working at a location near the project. Mitigation measures to address this requirement will be addressed within the Health & Safety Management Plan which will include the requirement for workers to wear appropriate PPE such as earmuffs or similar.

6.3 Ground-Borne Noise Management Levels

The ICNG provides guidelines for the assessment and management of ground-borne construction noise. Ground-borne noise management levels for residences are nominated in the ICNG and CoA E45 and indicate the threshold where management actions would be implemented. This is typically where noise sensitive receivers are located above tunnelling works or other construction activities (e.g. rock breaking).

Table 6-8 (taken from the ICNG and CoA E45) sets out the ground-borne noise management levels and how they are to be applied to residential receivers. These levels are only applicable when ground-borne noise levels are higher than airborne noise levels. The ground-borne noise levels are for evening and night-time periods only, as the objectives are to protect the amenity and sleep of people when they are at home. JH will inform all potentially impacted receivers of the nature of works to be carried out, the expected noise levels and duration, as well as the project's contact/ complaint details.

Table 6-8 Ground-borne Noise Management Levels (NMLs) at residential receivers

Assessment Period	Time Of Day	Ground-Borne NML $L_{aeq(15min)}$
Evening	6:00pm to 10:00pm	40 dB(A) internal
Night	10:00pm to 7:00am	35 dB(A) internal

Table 6-9 Ground-borne Noise Management Levels (NMLs) at other sensitive land users

Assessment Period	NML $L_{Aeq(15min)}$	Where NML Applies	Referenced From
Commercial premises (including offices)	50 dB(A)	Internal noise level	ICNG
Commercial premises (including retail outlets)	55 dB(A)	Internal noise level	AS/NZS 2107:2016 (department stores – main floor)
Industrial premises	55-60 dB(A)	Internal noise level	ICNG and AS/NZS 2107:2016 (assembly lines and process and control room)

In the event of an exceedance of the Ground-borne NMLs set out in Table 6-9 above, mitigation measures will be taken as described in Section 8.1 of this plan.

For other noise sensitive receivers, such as cinema spaces and recording studios, guidance is taken from the recommended 'maximum' internal noise levels in AS/NZS 2107:2000 'Acoustics – For recommended design sound levels and reverberation times for building interiors' to determine suitable noise management levels. These are detailed in Table 6-9.

6.4 Construction-Related Road Traffic Noise

When trucks and other vehicles are operating within the boundary of a construction site, road vehicle noise contributions are included in the overall predicted $L_{Aeq(15minute)}$ construction site noise emissions. When construction-related traffic moves onto the public road network a different noise assessment methodology is appropriate, as vehicle movements would be regarded as ‘additional road traffic’ rather than as part of the construction site.

The community may associate heavy vehicle movements with the project works, when vehicles are travelling on roads located immediately adjacent to construction sites. However, once the heavy vehicles move further from construction sites onto major collector or arterial roads, the noise may be perceived as being part of the general road traffic.

The ICNG refers to the NSW Road Noise Policy (RNP) for the assessment of noise from construction traffic on public roads. In line with the RNP, the project will adopt the following approach for assessing and managing construction traffic noise impact, as outlined in Figure 6-1 below.

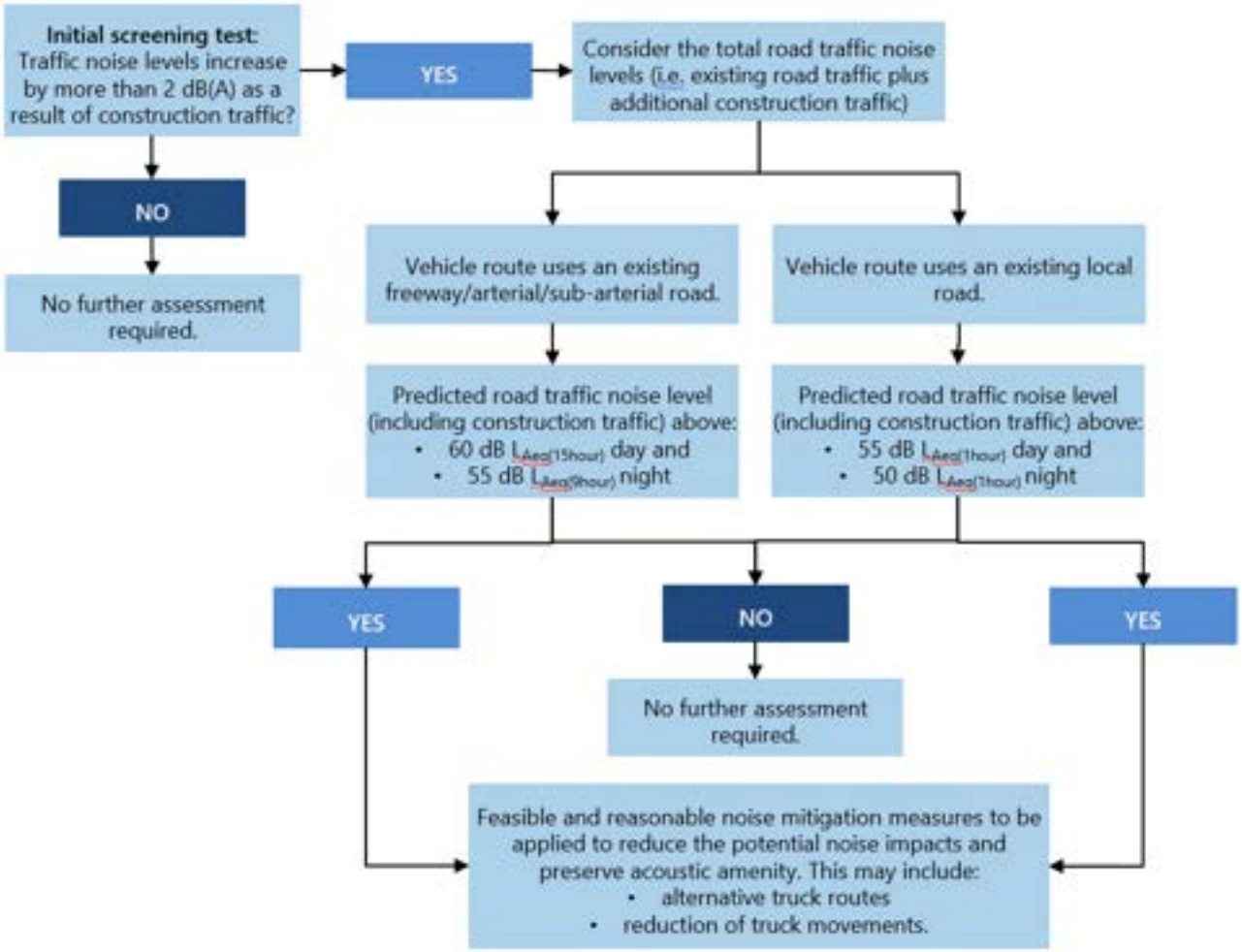


Figure 6-1 Construction-related road traffic noise assessment approach.

In addition to the above, where project trucks and other vehicles are using public roads during the night period, assessment of sleep disturbance is required as outlined in Section 6.2.1.

6.5 Vibration Criteria

6.5.1 Disturbance to Building Occupants

Vibration, with the potential to disturb human occupants of buildings, is managed referencing DECC's Assessing Vibration: a technical guideline (CoA E44(b)). This document provides criteria which are based on the British Standard BS 6472-2008 Evaluation of human exposure to vibration in buildings (1-80Hz).

Intermittent vibration criteria for human comfort, such as from drilling, compacting or other sources which operate intermittently, but which would produce continuous vibration if operated continuously, is presented in Table 6-10. This type of vibration is assessed on the basis of vibration dose values (VDV) and is identified as the most likely source of vibration impacts on the Project.

Table 6-10 Vibration dose value criteria for intermittent vibration

Building Type	Assessment Period[1]	Vibration Dose Values (m/s$^{1.75}$)	
		Preferred	Maximum
Critical working areas (e.g. operating theatres or laboratories)[2]	Daytime or night-time	0.10	0.20
Residential	Daytime	0.20	0.40
	Night-time	0.13	0.26

Building Type	Assessment Period[1]	Vibration Dose Values (m/s$^{1.75}$)	
		Preferred	Maximum
Offices, schools, educational institutions and places of worship	Daytime or night-time	0.40	0.80
Workshops	Daytime 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. There may be cases where sensitive equipment or delicate tasks require more stringent criteria than the human comfort criteria specify above. Source: BS 6472-2008

Continuous vibration from uninterrupted sources assessed on the basis of weighted rms acceleration values are presented in Table 6-11. Project activities are generally not anticipated to result in continuous vibration impacts.
Impulsive vibration can be defined as up to three instances of sudden impact per monitoring period, such as dropping heavy items. Impulsive vibration is assessed on the basis of acceleration values presented in Table 6-11.

Table 6-11 Preferred and Maximum Weighted Root Mean Square Values for Continuous and Impulsive vibration Acceleration (m/s2) 1-80Hz

Location	Assessment period[1]	Preferred values		Maximum values	
		Z-axis	X- and Y-axis	Z-axis	X- and Y-axis
Continuous vibration (rms acceleration, m/s^2)					
Critical working areas (e.g. operating theatres or laboratories)[2]	Daytime or night-time	0.0050	0.036	0.010	0.0072
Residential	Daytime	0.010	0.0071	0.020	0.014
	Night-time	0.007	0.005	0.014	0.010
Offices, schools, educational institutions and places of worship	Daytime or night-time	0.020	0.014	0.040	0.028
Workshops	Daytime or night-time	0.04	0.029	0.080	0.058
Impulsive vibration (rms acceleration, m/s^2)					
Critical working areas (e.g. operating theatres or laboratories)[2]	Daytime or night-time	0.0050	0.0036	0.010	0.0072
Residential	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.10	0.071	0.20	0.14
Offices, schools, educational institutions and places of worship	Daytime or night-time	0.64	0.46	1.28	0.92
Workshops	Daytime or night-time	0.64	0.46	1.28	0.92

NOTES:

Daytime is 7.00 am to 10.00 pm and night-time is 10.00pm to 7.00 am

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 specify above. Source: BS 6472-2008

Source: Table 2.4, Assessing Vibration; a technical guideline, Department of Environment & Climate Change 2006.

To assess the potential for vibration impact on human comfort, an initial screening test will be done based on peak velocity units, as this metric is also used for the cosmetic building damage vibration assessment. This screening test is a conservative approach since it is based on the continuous vibration velocity criteria (i.e., vibration that continues uninterrupted for a defined assessment period) whilst construction works are mostly intermittent. The initial screening test for vibration disturbance to building occupants, based on the peak particle velocity (ppv, mm/s) are presented in Table 6-12. If the predicted vibration exceeds the initial screening test, the total estimated Vibration Dose Value (i.e. eVDV) will be determined based on the level and duration of the vibration event causing exceedance.

Table 6-12 Construction vibration disturbance to building occupants - initial screening test

Place and Time	Maximum peak velocity, mm/s (>8Hz)
Critical areas (day or night)	0.28

Residential buildings 16 hr day	0.56
Residential buildings 8 hr night	0.40
Offices, schools, educational institutions and places of worship (day or night)	1.10
Workshops (day or night)	2.20

6.5.2 Structural Damage to Buildings

Cosmetic damage vibration limits for buildings and associated minimum working distances are identified in British Standard *BS7385 Part 2-1993 Evaluation and measurement for vibration in buildings Part 2* and German Standard *DIN 4150: Part 3-2016 Structural vibration – Effects of vibration on structures*.

The cosmetic damage levels set by BS7385 are considered 'safe limits' up to which no damage due to vibration effects has been observed for particular building types. Table 6-13 sets out the recommended vibration limits from BS7385 for transient vibration to ensure minimal risk of cosmetic damage to residential, commercial and industrial buildings and is frequency dependent and specific to particular categories of structure.

Table 6-13 BS 7385 Transient vibration values for minimal risk of damage

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

6.5.3 Vibration Screening Criteria

The limits presented in Table 6-13 above relate predominantly to transient vibration which does not give rise to resonant responses in structures, and to low-rise buildings. Where the dynamic loading caused by continuous vibration is such as to give rise to dynamic magnification due to resonance, then the guide values in Table 6-13 may need to be reduced by up to 50 percent. This is especially applicable at the lower frequencies where lower guide values apply.

On this basis, a conservative vibration screening criteria per receiver type is given below:

- Reinforced or framed structures (Line 1): 25.0 mm/s
- Unreinforced or light framed structures (Line 2): 7.5 mm/s

At locations 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 required to determine the applicable safe vibration level. The analysis would take into consideration the transient vibration guide values for minimal risk of cosmetic damage set out in Table 6-13.

6.5.4 Heritage Items and Buried Pipework

The German standard provides a conservative criterion for vibration limits for different buildings and buried pipework and has been used to identify the vibration criteria for the Project where the British Standard does not apply. The German standard values for peak particle velocity (PPV) (mm/s) measured at the foundation of the building are summarised in Table 6-14 and short-term vibration on buried pipework is shown in Table 6-15.

Table 6-14 DIN 4150-3 guideline values for short-term vibration on structures

Group	Type Of Structure	Guideline Values Vibration Velocity (Mm/S)		
		Foundations, All Directions at a Frequency of:	Topmost Floor, Horizontal	Floor Slabs, Vertical

		1 to 10Hz	10 to 50 Hz	50 to 100 Hz	All Frequencies	All Frequencies
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 30	40 to 50	40	20
2	Residential buildings and buildings of similar design and/or occupancy	5	5 to 15	15 to 20	15	20
3	Structures that because of their particular sensitivity to vibration, cannot be classified into Group 1 or 2 and are of great intrinsic value e.g. heritage listed buildings	3	3 to 8	3 to 8	8	20

As noted in BS 7385, heritage buildings and structures should not be assumed to be more sensitive to vibration, unless structurally unsound. A conservative vibration damage screening level (peak component particle velocity) for heritage buildings/structures will be set to 3mm/s (the more stringent criterion in the German Standard DIN 4150-2016 Structural Vibration Part 3: Effects of Vibration on Structures). This screening level will allow potentially impacted heritage structures to be identified. If a heritage structure is predicted to be exposed to vibration levels above the conservative vibration screening level of 3mm/s, further investigation would be undertaken to determine whether the structure is structurally unsound. Where a heritage building is deemed to be sensitive to vibration impacts, the more stringent DIN 4150-2016 Group 3 guideline values can be applied. Otherwise, structural damage vibration limits based on BS 7385 (Section 6.5.2 and Section 7) can be applied.

Table 6-15 will be used as a guide and further consultation with utility owners will be undertaken to apply the most appropriate vibration criteria for each utility, in accordance with CoA C5. Where consultation confirms that alternate vibration criteria are required for specific utilities, a technical memorandum will be completed (as required) for that asset and provided to the asset owner (Note: these technical memorandums will sit outside of this Plan). Where assets have a specific exclusion zone for vibration intensive works, this will also be considered in the technical memorandum.

Table 6-15 DIN 4150-3 guideline values for short-term vibration on buried pipework

Line	Pipe material	Guideline Values for Vibration Velocity Measured on the Pipe
1	Steel (including welded pipes)	100 mm/s
2	Clay, concrete, reinforced concrete, pre-stressed concrete, metal (with or without flange)	80 mm/s
3	Masonry, plastic	50 mm/s

6.5.5 Sensitive Scientific and Medical Equipment

Some scientific equipment, such as electron microscopes and microelectronics manufacturing equipment, can require more stringent vibration goals than those applicable to human comfort or cosmetic building damage. Where vibration sensitive equipment is potentially affected by construction works, vibration limits for the operation of the equipment should be taken from manufacturer's data or provided by the equipment owner.

Where this is not available, the generic Vibration Criterion (VC) curves as published by the Society of Photo-Optical Instrumentation Engineers (Colin G. Gordon - 28 September 1999) may be adopted as vibration goals. These generic VC curves are provided below in Table 6-16.

Table 6-16 VC curves for Vibration Sensitive Equipment

Criterion Curve	Max Level (µm/sec, rms)[1]	Detail Size (microns)[2]	Description of Use
VC-A	50	8	Adequate in most instances for optical microscopes to 400X, microbalances, optical balances, proximity and projection aligners, etc.
VC-B	25	3	An appropriate standard for optical microscopes to 1000X, inspection and lithography equipment (including steppers) to 3 micron line widths.
VC-C	12.5	1	A good standard for most lithography and inspection equipment to 1 micron detail size.

Criterion Curve	Max Level (µm/sec, rms)[1]	Detail Size (microns)[2]	Description of Use
VC-D	6	0.3	Suitable in most instances for the most demanding equipment including electron microscopes (TEMs and SEMs) and E-Beam systems, operating to the limits of their capability.
CV-E	3	0.1	A difficult criterion to achieve in most instances. Assumed to be adequate for the most demanding of sensitive systems including long path, laser-based, small target systems and other systems requiring extraordinary dynamic stability.

NOTE:

1 As measured in one-third octave bands of frequency over the frequency range 8 to 100 Hz

2 The detail size refers to the line widths for microelectronics fabrication, the particle (cell) size for medical and pharmaceutical research, etc. The values given consider the observation requirements of many items depend upon the detail size of the process.

7 Construction Noise and Vibration Impact Assessment

To manage potential impacts from noise and vibration during the works, JH will assess predicted noise and vibration impacts associated with the works through the development of a Construction Noise and Vibration Impact Statement (CNVIS) or using a construction noise estimation tool (Gatewave).

7.1 Construction Noise and Vibration Impact Statements

The Construction Noise and Vibration Impact Statements (CNVIS) will be a key site management tool providing clear instructions for managing each construction worksite during construction. Each CNVIS will be prepared before any works that result in noise and vibration impacts commence at the relevant construction worksite. The CNVIS will be prepared for work that has potential to exceed the project NMLs, vibration criteria and/or ground-borne noise levels at any residence outside standard construction hours, or where receivers will be highly noise affected. The CNVIS will include specific mitigation measures identified through consultation with affected sensitive land uses and the mitigation measures will be implemented for the duration of the Works. A copy of the CNVIS will be provided to the AA and ER prior to the commencement of the works however there is no requirement for endorsement or approval.

The CNVIS will be progressively prepared for the construction phase to identify noise and vibration impact predictions and applicable management measures. In accordance with CoA E48, any construction work identified in the CNVIS as exceeding the noise management levels and/ or vibration criteria established in Section 6 will be managed in accordance with this NVCSP.

All CNVIS will be prepared by an appropriately qualified and experienced acoustic consultant.

Each CNVIS would set out the mitigation and management measures required for the construction stage, through consultation with affected sensitive receivers. They will address:

- Scope of work covered by the CNVIS;
- Justification for OOHW (where required);
- Nearest noise and vibration sensitive receivers, based on the land use survey required by CoA E39;
- Construction noise and vibration objectives (outlined in Section 3.2 and 6);
- Construction noise and vibration impact assessment;
- Mitigation options, preferred management measures and ongoing risk management; and
- Noise and vibration monitoring requirements and auditing process.

Construction noise and vibration impacts associated with a construction worksite would be assessed by identifying the construction activities for each worksite, including likely plant and equipment. Construction noise and vibration from the activities would be predicted and assessed against the nominated Noise Management Levels and vibration objectives to identify the risk of impact. Where there is a risk of impact, all reasonable and feasible noise and vibration management measures would be recommended to ensure noise and vibration levels are minimised.

Physical noise mitigation measures such as noise barriers, acoustic sheds and acoustic enclosures around fixed plant will be outlined in the CNVIS. Furthermore, specific management measures such as staging of works, respite periods (CoA E54, E55) and community notification will also be summarised and implemented.

The CNVIS will identify the sensitive receivers that JH is required to notify regarding upcoming works to ensure ongoing noise and vibration risks are managed throughout the Project. This notification will include the likely noise and vibration impacts during the assessed works, the duration of impact and any additional mitigation (e.g. respite periods) that may be required to manage noise and vibration impacts.

Monitored noise and vibration levels will be verified against the predictions made in the relevant CNVIS. This will allow for ongoing review and where necessary, update of the predictive model and a feedback mechanism to construction planning will ensure ongoing noise and vibration risks are identified and managed appropriately.

7.2 Gatewave Noise and Vibration Management Tool

A 3D construction noise and vibration management tool, Gatewave (www.gatewave.com.au), will be developed for the Project to allow defined work areas and activities to be planned, assessed and managed as construction works progress. It would also allow cumulative noise impacts from other aspects of the Project or, where relevant, noise from other construction projects, to be assessed and managed in accordance with this NVCSP.

Gatewave incorporates ground elevation contours, building heights, the built environment and atmospheric conditions to predict construction noise in accordance with the International Standard ISO 9613-2:1996 implementing quality standard ISO 17534-1:2015. All sensitive receivers identified by the land use survey (see Appendix D) are integrated into the Gatewave tool.

CNVISs prepared for the Project would establish the overall impacts associated with worksites, ancillary facilities and tunnelling excavation. The Project environment team would use Gatewave to manage construction noise and vibration impact by defining specific work areas/activities in the CNVIS as construction progresses and identifying:

- Sensitive receivers where predicted noise levels are above the NMLs so that, where there are residual impacts even after all feasible and reasonable mitigation measures have been adopted, mitigation and management measures can be applied in accordance with this NVCSP; and

Buildings/structures within minimum working distances established for cosmetic damage and human annoyance so that appropriate mitigation and management measures can be applied in accordance with this NVCSP. The Project Environment Team Noise and vibration monitoring data would be collected throughout the delivery of the Project in accordance with the NVMoP in Appendix E. This feedback loop would ensure the prediction tool is verified and adjusted as required to ensure accuracy across the Project.

8 Environmental Control Measures

In accordance with CoA E44, mitigation measures will be implemented with the aim of achieving the construction noise management levels and vibration objectives detailed in Section 7 of this Plan. Specific measures and requirements to address contract requirements, EPL 21800, CoA and UMMs in relation to impacts from noise and vibration are outlined in Section 3. The following mitigation measures have been developed with consideration of SMART (specific, measurable, achievable, relevant and time-based) principles.

8.1 Noise and Vibration Management Measures

Table 8-1 Noise and vibration mitigation and management measures

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
General Noise and Vibration Impacts						
NVMM01	Training will be provided to relevant project personnel, including relevant sub-contractors on noise and vibration requirements from this NVCSP through inductions, toolboxes or targeted training. Training will cover the following: • Nominated construction hours, restrictions and general requirements for OOHW • 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 • Avoiding shouting and minimise talking loudly and slamming vehicle doors • Avoiding communicating and signalling using horns • Where practical, operate machines at low speed or power and switch off when not used rather than left idling for prolonged periods • Minimising reversing • Avoiding dropping materials from height and avoiding metal to metal contact on material • All site personnel will be responsible for managing noise from their work activities and to work in a manner that will minimise noise emissions • Measures to minimise sleep disturbance impacts from construction vehicles.	Toolbox talk Induction Noise and vibration awareness training	Prior to construction Construction	Construction Environmental Manager	Best practice CoA C5(c), E40 to E43 UMM NV02, NV03, NV05	Induction records Toolbox talk records
NVMM02	The location of known heritage items and conservation areas in the vicinity of the Project will be shown on sensitive area plans and their location communicated to all site personnel prior to the commencement of works.	Sensitive area plans	Prior to construction	Construction Environmental Manager Construction Project Manager	Best practice UMM NV09	Site Environmental Plans Induction records
NVMM03	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 using notifications under contract provisions and communication with companies using heavy vehicles.	Induction	Construction	Supervisor/ Foreman / Site Engineer	Best practice	Vehicle movement plans Traffic control plans Induction records

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
NVMM04	Noise generated by construction will 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 LAeq,8h of 85 dB(A) for any employee working at a location near the work site.	Induction	Construction	Construction Manager Foreman	CoA E47	Site inspection and monitoring records Health & Safety Management Plan
NVMM05	Dilapidation and condition surveys will be conducted on infrastructure and structures at risk from being damaged by vibration during construction, including heritage items. The need for condition surveys and dilapidation reports will be identified in the CNVIS. Properties at risk of cosmetic damage will be identified through the vibration screening drawings, prepared based on proposed vibration intensive construction activities and presented in the CNVIS prepared for the Project.	CNVIS Dilapidation and condition survey	Construction	Construction Environmental Manager Construction Project Manager	CoA E69 UMM NV09	Site inspection records
Construction Traffic Noise						
NVMM06	Construction vehicle movements will only occur on local roads if approved under CoA E95 to directly access ancillary facilities or the construction boundary.	Relevant traffic noise criteria	Construction	Construction manager	CoA E95	Site inspection records Local road approval (if required)
NVMM07	Deliveries will be minimised where possible. During deliveries, due care will be taken to minimise impacts by limiting periods of engine idling, use of radios instead of shouting, use of non-tonal reversing beepers where possible, avoiding use of chains for lifting or restraining where possible, avoiding local roads where possible, and unloading / loading undertaken during standard hours.	Noise and vibration awareness training	Construction	Construction Manager Foreman Environmental Manager	Best practice UMM NV02 CoA E42 (a) (i)	Induction records Evidence of notification (ER, AA, Planning Secretary & EPA) Evidence of engagement with affected residents / owners or occupiers of properties.
NVMM08	Early occupation and later release of road carriageways and construction sites will be considered, where feasible to minimise noise impacts to receivers from night works.	N/A	Construction	Construction Project Manager Construction Manager	CoA E50 (b)	Road Occupancy Licence (ROL)
Construction Noise Impact from Concurrent Works						
NVMM09	Work will be coordinated between project construction sites and / or non-project construction works to minimise cumulative noise impacts. This may include but not be limited to scheduled coordination meetings with adjacent construction projects (e.g., weekly / fortnightly pending nature of interactions with other projects). Outcomes of any coordination efforts may result in adjustment of the project's noise assessment.	N/A	Construction	Utilities Coordination Manager Construction Project Manager	CoA E54 UMM G10	Meetings with relevant authorities
NVMM10	Additional at source or near source mitigation (such as temporary noise screening) will be considered where	N/A	Construction	Construction Project Manager	CoA C10 (e), E44, E54	Site inspection records

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
	construction noise levels may result in cumulative construction noise impacts, where modified programming is not practical to avoid cumulative noise impacts.			Construction Manager	UMM G10	
NVMM11	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. Consultation will be undertaken consistent with the projects Community and Stakeholder Engagement Plan.	N/A	Construction	Construction Project Manager Construction Manager Community Manager	CoA E55 UMM NV06	Community notification
NVMM12	In undertaking any works and activities outside of standard construction hours under condition L5.5 of EPL 21800, the licensee must comply with the following: • Ensure that works and activities do not result in noise levels exceeding those specified in condition L5.3 of EPL 21800 at the same noise sensitive receivers (unless specified in another condition of this licence) on more than: i. 2 consecutive evenings and/or nights at any time; and ii. 3 evenings and/or nights per week; and iii. 10 evenings and/or nights per month.	N/A	Construction	Construction Project Manager Construction Manager Community Manager Environmental Manager	EPL 21800, Condition L5.6	OOHW registers, meeting minutes
NVMM13	All work will be coordinated to ensure respite periods are provided. This will include: (a) rescheduling work to provide respite to impacted noise sensitive land uses so that the respite is achieved in accordance with Condition E55; or (b) the provision of alternative respite or mitigation to impacted noise sensitive land uses; and (c) the provision of documentary evidence to the AA in support of any decision made in relation to respite or mitigation. 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 Stage 1 of the CSSI.	N/A	Construction	Construction Project Manager Construction Manager Community Manager	CoA E54	Community consultation records
Plant and Equipment						
NVMM14	Where reasonable and feasible, noise and vibration impacts will be reduced through the selection of less noise intensive equipment and methods and electric/hydraulic equipment wherever possible. Plant and equipment will use the minimum size and power requirement to complete a task.	Noise and vibration awareness training	Construction	Construction Manager Foreman	CoA E50 (e) UMM NV03	Site inspection records
NVMM15	The distance between noisy plant items and nearby noise sensitive receivers will be maximised where feasible, with	Noise and vibration awareness training	Construction	Construction Manager Foreman	Best practice CoA E50(e)	Site inspection records

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
	equipment orientated within the available space to reduce noise, this will be documented on site layout plans. Additionally, the use of alternative construction and demolition techniques will be considered where reasonable and feasible to reduce construction noise and vibration impacts.					Site Environmental Plans
NVMM16	Boundary screening including noise barriers will be constructed around construction compounds in accordance with the CNVIS before the commencement of noisy activities to shield sensitive land user(s).	Noise barriers	Construction	Construction manager Construction Project Manager	CoA A20 and E50 (d)	Site inspection records CNVIS
NVMM17	Stationary noisy equipment will be enclosed or shielded where reasonably practicable whilst ensuring that the occupational health and safety of workers is maintained. This would apply to plant and equipment such as generators, stationary concrete cutters, stationary vacuum trucks, and stationary jack hammers. Appendix D of AS2436:2010 lists materials suitable for shielding.	Noise and vibration awareness training	Construction	Construction Manager Foreman	CoA E50 (d)	Site inspection records
NVMM18	Plant and equipment will be used and maintained in a proper and efficient manner, in accordance with the manufacturers' specification. Plant and equipment will be inspected as part of daily prestarts, which will include a visual check that mufflers are not defective and that noise does not sound excessive. An assessment of defective silencing, based on a visual assessment and listening will also be carried out.	Noise and vibration awareness training	Construction	Construction Manager Foreman	CoA E4, E50(a) UMM NV04	Plant inspection records
NVMM19	Equipment with non-tonal movement alarms will be used wherever practicable. Non tonal alarms on plant and equipment will be used for out of hours works. Audible alarms to be set to the minimum volume necessary to adequately perform their function.	Noise and vibration awareness training	Construction	Construction Manager Foreman	UMM NV05 Best practice	Plant inspection records Site inspection records
NVMM20	Work sites will be arranged to minimise reversing and the use of movement alarms on vehicles and mobile plant where practical and safe to do so.	Noise and vibration awareness training	Construction	Construction Manager Foreman	UMM NV05, G06 Best practice	Site inspection records
NVMM21	All power-driven work equipment used will have efficient muffler design and be well maintained.	Noise and vibration awareness training	Construction	Construction Manager Foreman	CoA E4 UMM NV03, NV04 Best practice	Plant inspection records
NVMM22	Regularly serviced low sound power equipment will be used where reasonably practicable.	Noise and vibration awareness training	Construction	Construction Manager Foreman	CoA E4, E50 (a) UMM NV04	Plant inspection records
NVMM23	Plant and equipment will only be operated by appropriately qualified persons (holding the appropriate certification), ensuring competent operation in a proper and efficient manner.	Noise and vibration awareness training	Construction	Construction Manager Foreman	Best practice	Sub-contractor Onboarding
Construction Hours						

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
NVMM24	Where works are required near schools, other religious and educational facilities, noise and vibration-sensitive businesses and critical working areas (such as theatres, laboratories and operating theatres), the Project will consult with the facility to identify sensitive periods, and will schedule the works to avoid times when attendees are more sensitive to noise, unless other reasonable arrangements with the affected institutions are made, at no cost to the affected institution.	N/A	Construction	Construction Project Manager Construction Manager Construction Environmental Manager	CoA E46 UMM NV06	Site inspection records Induction records Consultation records with institutions
NVMM25	Unless otherwise permitted in accordance with an EPL, highly noise intensive works that result in an exceedance of the applicable NML at the same receiver will only be carried out: • Between 8:00 am and 6:00 pm Monday to Friday • Between 8:00 am and 1:00 pm Saturday; and • If continuously, then not exceeding three (3) hours with a minimum respite from those activities and works of not less than one (1) hour between each block. Reasonable and feasible measures will be implemented during standard construction hours for high noise intensive works when undertaken near residential receivers.	Induction	Construction	Construction Project Manager Construction Manager Construction Environmental Manager	CoA E41	Induction records Site inspection records Monitoring records
NVMM26	Where works are required outside standard working hours and are not subject to an EPL, the OOHW Protocol (Appendix C) will be applied. For works which are subject to an EPL, works will be undertaken in accordance with OOHW requirements of that EPL as detailed in Section 8.4.3.	OOHW Protocol OOHW Request Form	Construction	Construction Project Manager Construction Manager Construction Environmental Manager	CoA E43 EPL 21800	Site inspection records Induction records OOHW Request Form Consultation records
NVMM27	Where ROL restrictions allow, night works will be programmed to carry out noisy activities (e.g. saw cutting, hydraulic hammering / breaking) prior to 11pm.	Noise and vibration awareness training	Construction	Construction Manager Foreman	UMM NV02	Site inspection records
NVMM28	Noisiest Works will be scheduled before 11.00 pm Sunday to Thursday and before 12 midnight Friday and Saturday.	OOHW Protocol OOHW Request Form	Construction	Construction Project Manager Construction Manager Construction Environmental Manager	CoA E50	Site inspection records Induction records OOHW Request Form
Noise Barriers						
NVMM29	Where reasonable and feasible, temporary noise barriers such as noise blankets will be installed to protect nearby sensitive receivers from high-noise generating activities.	CNVIS	Prior to construction Construction	Construction Project Manager	CoA E50 Best practice	Site inspection records CNVIS
NVMM30	Structures will be used as noise barriers at compounds where appropriate. These will be implemented as early as possible during the establishment of the compounds.	CNVIS Site layout drawings	Construction	Construction Project Manager Construction Environmental Manager	Best practice	Site inspection records

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
NVMM31	Site access and egress points will be located as far as feasible and reasonable from noise sensitive receivers.	Site layout drawings	Prior to construction	Construction Manager Foreman Construction Environmental Manager	Best practice	Site inspection records Site Environmental Plans
Noise and Vibration Monitoring						
NVMM32	Noise and vibration monitoring will be carried out in accordance with Section 9.4.	Section 9.4 Appendix E- Noise and Vibration Monitoring Program	Construction	Construction Environmental Manager	CoA C13 to C17	Monitoring records
NVMM33	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 management measures that have been implemented are appropriate.	Appendix E - Noise and Vibration Monitoring Program	Construction	Construction Environmental Manager	Best practice	Monitoring records
NVMM34	Attended noise and/or vibration monitoring will be undertaken upon receipt of a complaint, unless monitoring results at or near the receiver for the activity have been collected recently and are within the predicted noise and/or vibration levels. Measured noise/vibration levels will be compared to predicted levels to confirm that all appropriate mitigation measures have been implemented in accordance with the Construction Noise and Vibration Strategy (Transport for NSW, 2021).	CNVIS Appendix E- Noise and Vibration Monitoring Program	Construction	Construction Manager Construction Environmental Manager	Best practice	Monitoring records
NVMM35	Weekly compliance noise level spot checks of plant and requirements will be undertaken to ensure the noise performance level predicted is met or whether noise emissions exceed predictions. This monitoring will also identify defective silencing requirements on the items of plant.	CNVIS Appendix E - Noise and Vibration Monitoring Program	Construction	Construction Manager Construction Environmental Manager	Best practice	Monitoring records
NVMM36	If vibration intensive works are required within the minimum working distances, vibration monitoring or attended vibration trials would be undertaken to ensure that levels remain below the cosmetic damage criterion where possible, including undertaking pre-condition surveys.	CNVIS Appendix E - Noise and Vibration Monitoring Program	Construction	Construction Manager Construction Environmental Manager	Best practice CoA E49	Monitoring records Section 9.3.2
NVMM37	Vibration testing will be conducted before and during vibration generating activities that have the potential to impact on heritage items (including those in proximity to the Upper Canal and Warragamba Pipelines) to identify minimum working distances to prevent cosmetic damage.	CNVIS Appendix E - Noise and Vibration Monitoring Program	Construction	Construction Manager Construction Environmental Manager	CoA E51 UMM NV08	Monitoring records

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
	In the event that the vibration testing and attended monitoring indicate that the preferred values for vibration have been or are likely to be exceeded, the construction methodology will be reviewed by the relevant engineer in consultation with the environment team and, if necessary, additional mitigation measures will be implemented.					
NVMM38	Seek the advice of a heritage specialist on methods and locations for installing equipment to monitor vibration, movement and/ or noise at heritage-listed structures.	Heritage specialist Appendix E - Noise and Vibration Monitoring Program	Construction	Construction Manager Construction Environmental Manager	CoA E52	Monitoring records
NVMM39	Site managers will periodically check the site and nearby residences for noise problems so that solutions can be quickly applied.	Noise and Vibration Monitoring Program	Construction	Construction Manager Construction Environmental Manager	UMM NV04	Monitoring records
NVMM40	In-situ vibration monitoring will be undertaken to confirm vibration levels and assess potential impacts where minimum vibration impact distances cannot be achieved. Where the monitoring identifies exceedances in the relevant criteria, or where impacts are identified, additional management measures will be identified and implemented to appropriately manage impacts.	Noise and Vibration Monitoring Program	Construction	Construction Manager Construction Environmental Manager	UMM NV08	Monitoring records
NVMM41	No temporary or permanent vibration testing equipment will be physically touching the asset as all works will be occurring outside the controlled area.	Heritage CEMP Sub-Plan	Construction	Construction Manager Construction Environmental Manager	UMM NV07	Monitoring records
Consultation and Complaints Management						
NVMM42	Owners and occupiers of properties at risk of exceeding the screening criteria for cosmetic damage will be notified before works that generates vibration commence in the vicinity of those properties. If the potential exceedance is anticipated to occur more than once or extend over a period of 24 hours, owners 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.	Community Communication Strategy	Pre-construction Construction	Construction Environmental Manager Communications Manager	CoA E49	Community notifications
NVMM43	Consultation will be carried out with affected receivers in response to a complaint relating to construction noise and/or vibration impacts in order to organise attended noise and/or vibration monitoring.	CNVIS	Construction	Construction Environmental Manager Communications Manager	Best Practice	Community notifications
NVMM44	Affected sensitive receivers will be consulted prior to the undertaking of OOHW to determine appropriate mitigation measures which may include respite periods.	CNVIS	Construction	Construction Environmental Manager Communications Manager	CoA E55	Community notifications

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
NVMM45	Affected sensitive receivers will be consulted prior to undertaking noise/vibratory intensive works to determine appropriate mitigation measures which may include respite periods	CNVIS	Construction	Construction Environmental Manager Communications Manager	CoA E48	Community notifications
NVMM46	Complaints will be resolved in accordance with Sydney Water's Complaint Policy (Appendix B of the NVCSP), CSEP and reported in accordance with EPL 21800 Condition M6.4.	CSEP	Pre-construction Construction	Communications Manager Construction Environmental Manager	CoA B1 CoA B2	Complaints Register
NVM47	All noise and vibration monitoring for the purposes of determining compliance with the conditions of the CoAs and EPL will be undertaken by a Competent Person as defined in the special dictionary of the EPL.	CNVIS	Pre-construction Construction	Environmental Manager	M4.1	Monitoring records
NVM48	All noise monitoring for the purposes of determining compliance with the conditions of the CoAs and EPL will consider and be generally undertaken in accordance with; (a) Australian Standard AS 1055: 2018 Acoustics - Description and measurement of environmental noise; and (b) the compliance monitoring guidance provided in the chapter 7 'Monitoring Performance' of the Noise Policy for Industry (EPA, 2017).	CNVIS	Pre-construction Construction	Environmental Manager	M4.2	Monitoring records
NVM49	All vibration monitoring will be: a) undertaken in accordance with the technical guidance provided in the Assessing Vibration: a technical guideline (DEC, 2006); and b) assessed and reported against the acceptable and maximum values of human exposure to vibration set out in Tables 2.2 and 2.4 of this guideline.	CNVIS	Pre-construction Construction	Environmental Manager	M4.3	Monitoring records
NVM50	Validation monitoring will be undertaken for any and will: a) be undertaken in accordance with a monitoring plan b) be performed by a Competent Person; c) be performed on at least the first 2 occasions (day, evening, nights) where OOHW will be undertaken and are likely to impact Noise Sensitive Receivers; d) be performed on any other occasion (day, evening, night) where the nature of the works is likely to cause greater noise impacts than the first 2 occasions; e) be representative of the impacts in terms of monitoring locations, time and duration of measurements; and f) be recorded and provided to an EPA officer upon request.	CNVIS	Pre-construction Construction	Environmental Manager	E1.5	Monitoring records
NVM51	If validation monitoring shows that noise levels are higher than those predicted by any noise modelling undertaken as part of a community agreement, work practices will be modified	CNVIS	Pre-construction Construction	Environmental Manager	E1.6	Monitoring records

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
	immediately so that measured noise levels do not exceed predicted levels. Where it has been determined that works cannot be modified to achieve the predicted noise levels: a) John Holland will report immediately to the EPA					
NVM52	Ongoing community engagement and agreement a) For any approval of OOHW in accordance with a community agreement predicted to take longer than 28 calendar days to remain valid, John Holland will be able to demonstrate agreement from the community is maintained and continuing. b) To demonstrate agreement from the community is maintained and continuing John Holland will: i. engage the community to determine if a substantial majority of Noise Sensitive Receivers continue to consent to the OOHW pursuant to the re-engagement period ii. provide the EPA with a report within 7 calendar days of the end of each re-engagement period summarising the community response including ongoing consent rates of the Noise Sensitive Receiver; and c) Where John Holland is unable to demonstrate a substantial majority of agreement from Community Affected Catchment is maintained and continuing John Holland will report immediately to the EPA.	CNVIS	Pre-construction Construction	Environmental Manager	E1.7	CSEP
Heritage						
NVMM53	Before conducting acoustic at-property treatment at any heritage items, JH will seek the advice of a suitably qualified and experienced built heritage expert to ensure any work does not have an adverse impact on the heritage significance of the item.	Heritage specialist	Construction	Construction Manager Construction Environmental Manager	CoA E53	Written advice (memo / report)
NVMM54	Construction activities in proximity to the Upper Canal will be undertaken in accordance with WaterNSW 'Guideline for Development Adjacent to the Upper Canal and Warragamba Pipelines'. This will include: • Dilapidation survey prior to any construction work commencing • Monitoring of vibration and ground movement during tunnelling construction.	Heritage CEMP Sub-plan	Construction	Construction Manager Construction Environmental Manager	UMM NAH02	Monitoring records

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
	• Monitoring criteria will be in accordance to the Noise and Vibration CEMP Sub-plan Section 6.5.4 Monitoring equipment will be established and operated so as not to encroach the zone of controlled area. No monitoring equipment will be physically attached to heritage structure. Monitoring equipment will be appropriately weighed down (for example with a sandbag) to ensure effective connection between the equipment and the ground whilst also ensuring the activity remains outside the controlled area.					

8.2 Maximum Noise Levels for Plant and Equipment

The Sound Power Level (SWL) represents the total noise output of operating plant and equipment. The SWL is used in computer noise models to predict Sound Pressure Levels (SPLs) at nearby receivers.

When undertaking site compliance measurements, it is normally the SPL that is measured at a specified distance (typically 7m) from the plant or equipment.

All plant and equipment used for the Project should have SWL and SPL which are no higher than the corresponding figures shown in Table 8-2. Plant and equipment with SWLs or SPLs higher than those on the table would be deemed to be emitting an excessive level of noise and would not be permitted to operate on the Project. Plant and equipment will be subject to noise level checks to verify compliance with the monitoring and reporting requirements detailed in Section 9.4 and 9.6 respectively.

Table 8-2 Maximum allowable Sound Power Levels for construction equipment

Equipment	Maximum Allowable Sound Power Level (dB) L_{Amax}	Maximum Allowable Sound Pressure Level (dB) L_{Amax} at 7 m	Not recommended Out of Hours (where practicable)
Air track drill	124	99	√
Asphalt truck & sprayer	103	78	
Backhoe	111	86	
Bulldozer D9	116	91	
Chainsaw 4-5hp	114	89	√
Compactor	106	81	
Compressor	109	84	
Concrete pump	109	84	
Concrete saw	118	93	√
Concrete truck	109	84	
Concrete vibrator	113	88	
Daymakers	98	73	
Dump truck	110	85	
Excavator ≤ 10 tonne	100	75	
Excavator ≤ 20 tonne	105	80	
Excavator ≤ 30 tonne	110	85	
Excavator ≤ 40 tonne	115	90	
Excavator ≤ 40 tonne with hydraulic hammer	122	97	√
Fixed crane	113	88	
Franna crane 20t	98	73	
Front end loader	112	87	
Grader 35t	113	88	
Light vehicles	88	63	
Light vehicles (e.g. 4WD)	103	78	
Line marking truck	108	83	
Mobile crane	113	88	
Pavement laying machine	114	89	
Pavement profiler	117	92	√
Piling rig - bored	112	87	√
Piling rig – vibratory driven	116	91	√
Piling rig – impact hammer	126	101	√
Pneumatic hammer (jackhammer)	115	90	√
Power generator	103	78	
Road truck	108	83	

Equipment	Maximum Allowable Sound Power Level (dB) L_{Amax}	Maximum Allowable Sound Pressure Level (dB) L_{Amax} at 7 m	Not recommended Out of Hours (where practicable)
Rock crusher	118	93	√
Roller (large pad foot)	109	84	√
Scissor lift	98	73	
Scraper 651	110	85	
Smooth drum roller	107	82	
Truck (medium rigid)	103	78	
Truck compressor	75	50	
Tub grinder/ mulcher 40-50hp	116	91	√
Vacuum truck	109	84	
Vibratory roller	109	84	√
Water cart	107	82	
Welding equipment	105	80	

8.3 Minimising Vibration Impacts

The pattern of vibration radiation is very different to the pattern of airborne noise radiation and is very site specific. Final vibration levels are dependent on many factors including the actual plant used, its operation and the intervening geology between the activity and the receiver.

Recommended minimum working distances presented in the following sections provide a conservative screening method for indicating buildings and structures where there is a risk of vibration impact. Vibration monitoring would be carried out to confirm the minimum working distances at specific sites, where vibration significant plant is required to operate within or near the recommended minimum working distances.

8.3.1 Human Exposure

Many building occupants assume that building damage is occurring when they feel vibration or observe rattling of loose objects, however the level of vibration at which people perceive vibration or at which loose objects may rattle is far lower than vibration levels that can cause damage to structures. At properties near the construction works, nearby receivers may be able to feel vibration when vibration-generating equipment is being utilised. For this reason, it is appropriate to identify properties where there is a probability of adverse comment so that any concerns can be managed.

Recommended minimum working distances for typical vibration intensive construction equipment for human comfort (response) are shown in Table 8-3. These recommended distances relate to continuous vibration and are presented as a guide only. For most construction activities, vibration emissions are intermittent in nature and for this reason, higher vibration levels occurring over shorter time periods are allowed.

Table 8-3 Recommended minimum working distances (m) - human comfort (response)

Vibration significant plant item	Recommended minimum working distances (m)				
	Critical area	Residence (Day)	Residence (Night)	Office	Workshop
Excavator (tracked) ≤ 5t + hydraulic hammer	25	20	20	15	10
Excavator (tracked) ≤ 15t + hydraulic hammer	30	20	25	15	10
Excavator (tracked) ≤ 35t + hydraulic hammer	40	25	30	20	15
Pneumatic hammer (jackhammer)	25	15	20	10	5
Pile Driver (impact) - upper range	340	200	260	120	70
Pile Driver (impact) - typical range	175	105	135	65	40
40T Vibratory piling rig (90KN)	40	30	35	20	15
Vibratory roller (13t) smooth drum - High vibration	105	55	75	30	15
Vibratory roller (13t) smooth drum - Low vibration	75	40	55	20	10

8.3.2 Buildings and Structures

Pre- and post-construction building condition surveys will be conducted on nearby buildings and structures. Pre-condition reports will include a comprehensively written and photographic condition report produced by an appropriate professional prior to relevant works commencing and will document the existing condition of the property and typically note the location of all visible cracks and/or defects observed by the inspector. The post construction survey will record any changes to the property at construction completion.

Recommended minimum working distances to reduce the risk of cosmetic damage to buildings or structures from typical vibration intensive construction equipment are presented below in Table 8-4. These are aimed at reducing the risk of cosmetic damage (as per BS 7385:1993 and DIN 4150-3:2016) and are based on the vibration screening criteria set in Section 6.5.

Unlike noise, vibration cannot be readily predicted. The minimum working distances below are indicative and will vary depending on the plant item, building types and foundations and local geotechnical conditions. Vibration monitoring would be carried out to confirm the site-specific minimum working distances for this Project.

Table 8-4 Minimum working distances (m) - cosmetic damage[1]

Vibration Significant Plant Item	Minimum Working Distances (M)		
	Reinforced Or Frame Structures (BS7385)[2]	Unreinforced Or Light Framed Structures (BS7385)[2]	Structurally Unsound Heritage Structures (DIN 4150-3)[3]
Excavator (tracked) ≤ 15t + hydraulic hammer	5	5	10
Excavator (tracked) ≤ 35t + hydraulic hammer	5	10	10
Excavator (tracked) ≤ 50t + hydraulic hammer	5	10	20
Pneumatic hammer (jackhammer)	5	5	5
Pile Driver (impact) - upper range	15	30	65
Pile Driver (impact) - typical range	10	15	35
40T Vibratory piling rig (90KN)	5	10	15
Vibratory roller ≤ 13t smooth drum - High vibration	5	5	15
Vibratory roller ≤ 13t smooth drum - Low vibration	5	5	10

NOTES:

1. Minimum working distances are in 5m increments only to account for the intrinsic uncertainty of this screening method
2. Minimum working distance based on vibration screening criterion which reduced the cosmetic damage levels set by BS7385 by 50% due to potential dynamic magnification.
3. A building condition inspection should determine whether a heritage item is structurally unsound.

CoA E49 requires owners of properties at risk of exceeding the screening criteria for cosmetic damage to be notified before the commencement of vibration-generating works. Properties at risk of cosmetic damage will be identified through the vibration screening drawings, prepared based on proposed vibration intensive construction activities and presented in the CNVIS prepared for the Project. Structures within the minimum working distance screening limits and potentially at risk of damage from vibration will be identified on the drawings.

Pre-construction surveys must be offered to the owners of surface and sub-surface structures and other relevant assets identified at risk of damage from vibration, in accordance with CoA E69. Specific properties will be identified in the CNVIS prepared for the Project.

Where properties are identified to be within the recommended minimum working distances presented in Table 8-4 above, vibration monitoring is recommended to determine site specific minimum working distances that will prevent cosmetic and structural damage. If the monitoring above identifies that vibration is likely to exceed the screening criteria for cosmetic damage, further analysis would be undertaken, including consideration of a different construction method with lower source vibration levels and/or implement additional mitigation measures to prevent damage. This notably applies to heritage items to satisfy CoA E51. Furthermore, if the potential exceedance is likely to occur more than once or extend over a period of 24 hours, owners and occupiers would 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.

For highly sensitive receivers (e.g. high technology facilities, laboratories, recording studios and theatres), specific assessment is required to ensure satisfactory operation of the facility and determine if any mitigation or management measures are required to minimise the potential impacts. Highly sensitive receivers in the vicinity of the Project are identified in the Land Use Survey and will be further investigated in the relevant CNVIS.

8.4 Mitigation And Management of Out-of-Hours Work

8.4.1 Emergency Works

Where out-of-hours works are required in an emergency to avoid injury or the loss of life, to avoid damage or loss of property or to prevent environmental harm (CoA E42(b)), JH will notify the AA, the ER, the Planning Secretary and the EPA of the reasons for emergency works. In addition, JH will use best endeavours to notify all potentially noise and/or vibration affected sensitive receivers of the likely impact and duration of those works at the earliest opportunity.

8.4.2 Out-of-Hours Works Protocol – works not subject to an EPL

An Out-of-Hours Work Protocol (OOHW Protocol) has been prepared in accordance with CoA E43. The OOHW Protocol (Appendix C) provides a process for the consideration, management, and approval of work outside the approved construction hours and that is not subject to an EPL. It is noted that most OOHW will be managed in accordance with EPL 21800 which is further detailed in Section 8.4.3. Typically, OOHWs that are not subject to an EPL will involve service investigations, relocations and other works items that are not scheduled activities under the Protection of the Environment Operations Act 1997 (POEO Act) (and associated regulations) and are outside the EPL premise boundary.

The aim of the OOHW Protocol is to ensure that OOHW not subject to an EPL follow a rigorous process to identify the associated risk of adverse impacts on sensitive receivers with regards to the OOHW and will include:

- Consideration of the OOHW against the relevant NMLs and vibration criteria, and provide a determination of low and high-risk activities;
- Processes for the selection and implementation of mitigation measures for residual impacts in consultation with the community;
- Procedures to facilitate the coordination of OOHW with those approved under an EPL or undertaken by a third party, to ensure appropriate respite is provided;
- An approval process for OOHW that considers risks, proposed mitigation, management and coordination, and includes review and approval by the ER and AA for low risk activities and Planning Secretary approval for high-risk activities; and
- Details of notification requirements for affected receivers and the EPA for all approved OOHW, including notification to the Planning Secretary for approved low risk OOHW. The Secretary will be notified of an approved low risk OOHW via email from the environmental manager.

8.4.3 Out-of-Hours Work Protocol – works subject to EPL 21800

8.4.3.1 Justification for carrying out OOHW

In accordance with EPL 21800, the project may undertake OOHW when one or more of the following justifications are in place:

1. Low noise impact works:

Works and activities may be carried on outside of standard construction hours specified in condition L5.3 of EPL 21800 if the works and activities do not cause, when assessed at the boundary of the most affected Noise Sensitive Receiver:

a) LAeq (15 minute) noise levels greater than 5dB(A) above the day, evening and night Rating Background Level (RBL) as applicable;
b) LAmax noise levels greater than 15dB(A) above the night RBL for night works;
c) the preferred continuous or impulsive vibration values greater than those for human exposure to vibration, set out for residences in Table 2.2 in Assessing Vibration: a technical guideline (DEC, 2006); and
d) the preferred intermittent vibration values greater than those for human exposure to vibration, set out for residences in Table 2.4 in Assessing Vibration: a technical guideline (DEC, 2006).

For the purposes of this condition, the RBLs are those contained in an environmental assessment for the activities subject to this licence prepared under the Environmental Planning and Assessment Act 1979. Alternatively, JH may use another RBL determined in accordance with the Noise Policy for Industry (EPA, 2017) and provided to the EPA prior to carrying out any works or activities under this condition. Notification requirements outlined below do not apply when carrying out these works.

2. Exceptional circumstances:

Works and activities may be carried on outside of standard construction hours in the following instances:

a) emergency works required to avoid the loss of life or property, or to prevent material harm to the environment;

b) the delivery of oversized plant, structures or materials determined by the police or other authorised authorities to require special arrangements to transport along public roads.

John Holland will, on becoming aware of the need to undertake emergency works notify the EPA's Environment Line as soon as practicable and submit a report to the EPA by 4:00 pm on the next business day after the emergency works commenced that describes:

- the cause, time and duration of the emergency;
- action taken by or on behalf of the licensee in relation to the emergency; and
- details of any measures taken or proposed to be taken to prevent or mitigate against a recurrence of the emergency.

Emergency works do not require a notification to the community.

3. Specific activities

Concrete pours – From 1 December 2023 to 31 October 2024 John Holland is permitted to undertake works outside of the standard construction hours where there are planned critical concrete pours and associated activities in forecast temperatures of 35 degrees Celsius and above. Where reasonable and feasible, impacted resident will be notified of these works in advance.

Hydrostatic testing – Works and activities associated with the hydrostatic testing of the brine and treated water pipelines may be undertaken outside the standard construction hours prescribed in condition L5.1 from 11 April 2024 to 31 December 2024, provided that the Licensee:

(a) implements all feasible and reasonable noise mitigation measures as per the Construction Noise and Vibration Impact Statement;

(b) notifies all impacted noise sensitive receivers in accordance with condition L5.8;

(c) undertakes noise monitoring in accordance with condition L5.6.

4. Third Party Direction:

John Holland may undertake works outside of standard construction hours if any of the following circumstances apply:

a) carrying on those works and activities during standard construction hours would result in a high risk to construction personnel or public safety, based on a risk assessment carried out in accordance with AS/NZS ISO 31000:2018 "Risk Management";

b) the Relevant Road Network Operator has advised the licensee in writing that carrying out the works and activities during standard construction hours would result in a high risk to road network operational performance;

c) a relevant utility service operator has advised the licensee in writing that carrying out the works and activities during standard construction hours would result in a high risk to the operation and integrity of the utility network;

d) the TfNSW Transport Management Centre (or other road authority) have refused to issue a road occupancy licence during standard construction hours; or

e) Sydney Trains (or other rail authority) requires a rail possession for the activities to be performed outside of standard construction hours.

f) the Relevant Road Network Operator or utility service operator has directed the licensee to carry out works and activities outside of standard construction hours.

When undertaking activities outside of standard construction hours in accordance with Third Party Direction, the following will be undertaken:

- A construction noise and vibration impact assessment will be prepared in accordance with the Interim Construction Noise Guideline (DEC, 2009) that is to include:
  - a description of the proposed works and activities outside of standard construction hours;
  - predictions of LAeq (15 minute) dB noise levels at noise sensitive receivers from these works and activities;
  - 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 works and activities, including during the period/s predicted to have the highest noise level impacts;
  - consideration of cumulative noise and vibration impacts to sensitive receivers from any other neighbouring construction works that are also likely to impact sensitive receivers.

- Undertake noise monitoring in accordance with the monitoring plan.
- Only undertake activities between the hours of 6:00pm on Mondays, Tuesdays, Wednesdays, Thursdays, Fridays and 7:00am the following day.
- Activities are not to be undertaken between the hours of 6:00pm on Saturdays, Sundays or Public Holidays and 7:00am the following day.
- Ensure that works and activities do not result in noise levels exceeding the applicable NML at the same noise sensitive receivers on more than:
    - 2 consecutive evenings and/or nights at any time;
    - 3 evenings and/or nights per week; and
    - 10 evenings and/or nights per month.
- Undertake any high noise impact works before 12:00 am (midnight) where reasonable and feasible.
- Where high noise impact activities are undertaken between 6pm – 12am, respite provisions do not apply provided that all High Noise Impact Activities and Works are undertaken prior to 12:00 am (midnight).
- Where high noise impact activities are undertaken after 12:00 am (midnight), respite provisions (3 hours on and 1 hour off) apply.

5. Community Agreement

John Holland may work outside standard construction hours in circumstances other than those outlined above if:

- John Holland undertakes community consultation and agreement as described below;
- submits to the EPA a written request to work outside the standard construction hours;
- obtains approval by the EPA to work outside standard construction hours.

The EPA may, in exercising its discretion to approve the works outside standard construction hours, review whether the licensee has obtained community agreement. Specifically, whether a substantial majority of the individual Noise Sensitive Receivers who together comprise the Community Affected Catchments and were contacted has consented to the planned works out of standard hours.

Any community consultation and agreement undertaken with respect to the proposed out of hours works will:

- be prepared and implemented in accordance with the Interim Construction Noise Guidelines (DEC 2009), the Noise Policy for Industry (EPA, 2017) and AS2436-2010: Guide to noise and vibration control on construction, demolition and maintenance sites;
- include consultation of all noise sensitive receivers within the Community Affected Catchments. This includes Noise Sensitive Receivers that have declined to participate in previous agreements unless a community member has explicitly requested not to be involved in any future consultation about future OOHW;
- ensure that the noise sensitive receivers understand the nature of the works and any predicted impacts, including that consideration is made of additional requirements relevant to the needs of culturally and linguistically diverse Noise Sensitive Receivers, and include details for interpreting services for languages other than English where required.
- include in the community consultations with Noise Sensitive Receivers the following information:
    - the actual works proposed;
    - Any expected impacts in clear, plain English based on noise modelling;
    - The expected duration of the works;
    - Any expected benefits for receivers;
    - any other known concurrent OOHW that will be occurring; and
    - 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.
- request consent from the Noise Sensitive Receiver for their responses to be provided to the EPA;
- ensure that a record is kept when a licensee is unable to contact a noise sensitive receiver after three attempts, including leaving “sorry I missed you” cards explaining the reason for the visit and requesting a return phone call; and
- demonstrate, where the OOHW is predicted to go on longer than 28 calendar days, that John Holland has consulted the community in relation to re-engagement periods for the purpose of determining agreement from the community is maintained and continuing.
- Detailed records will be maintained by John Holland of all community consultations, including attempts to contact Noise Sensitive Receivers, and will be maintained for the duration of the project. Any Noise Sensitive Receiver who requests a copy of the record of conversations will be supplied with one.

John Holland will report to the EPA the community consultation and agreement process that was undertaken with the Community Affected Catchments. This report to the EPA will be:

- prepared in writing;

- detail the steps taken to fulfil the requirements of EPL condition E1.2;
- demonstrate that the Noise Sensitive Receivers understood the nature of the works and any predicted impacts, including that consideration was made of additional requirements relevant to the needs of culturally and linguistically diverse Noise Sensitive Receivers;
- provide the script used during the community consultation with Noise Sensitive Receivers;
- report community response and consent rates (including where no contact could be made) against the total community affected catchments, and will be broken down into response and consent rates based on sub-catchments that are delineated by affectation levels;
- include a noise validation monitoring plan;
- be submitted to the EPA at least 15 business days prior to any works that are the subject of the agreement being undertaken unless prior arrangements have been made with the EPA.

A copy of the report will be:

- kept by John Holland for the duration of the project including on the premises, and made available to an EPA authorised officer on request;
- made available on the project website or another website approved in writing by the EPA for the duration of the OOHW.

A noise validation monitoring plan will be submitted to the EPA for approval as part of the community agreement documentation prior to any OOHW occurring.

In relation to any OOHW conducted in accordance with the justifications provided above and upon request from an EPA officer, John Holland will provide the following within 5 business days:

- the construction noise and vibration impact assessment
- noise monitoring results
- written evidence demonstrating the works are necessary and permitted in accordance with the justifications above
- any other relevant information or records requested by the EPA.

When undertaking works outside of standard construction hours, John Holland will make all reasonable and feasible efforts to coordinate all works outside of standard construction hours with any neighbouring concurrent construction works that have the potential to impact the same Noise Sensitive Receivers. John Holland will ensure Respite Periods are being achieved as much as is reasonably practicable. This does not apply to low impact noise works and emergency works.

8.4.3.2 Notification requirements

John Holland will notify potentially affected Noise Sensitive Receivers of works outside of standard construction hours where required in accordance with the justifications above. The notification will:

- be given not less than 5 calendar days and not more than 14 calendar days before those works are to be undertaken, unless otherwise agreed with the affected community and notified to the EPA;
- be undertaken by letterbox drop, email, text message or other targeted and equivalent method; and
- be detailed on the project website or other relevant website notified to the EPA.
- The notification will clearly outline the reason that the work is required to be undertaken as OOHW
- include a diagram that clearly identifies the location of the proposed works in relation to nearby cross streets and local landmarks;
- include details of the date, timing and relevant time restrictions that apply to the proposed works;
- clearly outline in plain English, the location, nature, scope and duration of the proposed works;
- detail the expected noise impact of the works on Noise Sensitive Receivers;
- clearly state how complaints may be made and additional information obtained;
- include the number of the telephone complaints line, an after hours contact phone number specific to the works and the project website address; and
- include consideration of culturally and linguistically diverse Noise Sensitive Receivers where required.

8.4.4 Community Consultation on Respite

To satisfy CoA E55, consultation with the community to determine appropriate respite periods would be undertaken where works are:

- undertaken outside standard construction hours; and
- likely to exceed the noise and vibration objectives identified in CoA E44.

The consultation would include, but not be limited to providing the community with:

- a schedule of likely work for a period no less than one (1) month;

- a description of the potential Work, location and duration;
- the noise characteristics and likely noise levels of the work; and
- likely mitigation and management measures to be implemented.

Note: Respite periods can be any combination of days or hours where OOHW would not be more than 5 dB(A) above the rating background level at any residence.

The standard approach to managing noise and vibration impact from OOHW, including respite periods, is outlined in Section 8.5. These approaches would form the basis of discussions with the community. The outcomes of the community consultation, including the identified respite periods and the scheduling of OOHW would be documented and provided to the AA, EPA and Planning Secretary for information within two (2) weeks of completing the community consultation and prior to OOHW commencing.

To satisfy CoA E54, all work undertaken on the Project, including works undertaken by third parties (such as utility relocations), would be coordinated to ensure respite periods are provided in accordance with CoA E55. Where this is unable to be achieved, alternative mitigation to impacted noise sensitive receivers would be considered. This would be documented as part of the CNVIS.

8.5 Additional Noise and Vibration Mitigation Measures

In instances where noise levels are still predicted to exceed the NML at receivers, after the application of all reasonable and feasible mitigation and management measures, the CNVS directs that the Project should consider implementing Additional Mitigation Measures (AMM) such as:

- 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 or nights is increased so that the Project can be completed more quickly;
- Alternative accommodation, options may be provided for residents living close to construction works that are likely to incur unreasonably high impacts over an extended period of time (i.e. more than 2 consecutive nights), this may include residents near Lansvale Park. This is not applicable for highly intrusive activities occurring in the evening/night shoulder period and early morning period;
- Verification, including measurement of the background noise level and construction noise.
    - Ensure that works and activities do not result in noise levels exceeding those specified in condition L5.3 of EPL 21800 at the same noise sensitive receivers (unless specified in another condition of this licence) on more than:

    i. 2 consecutive evenings and/or nights at any time; and

    ii. 3 evenings and/or nights per week; and

    iii. 10 evenings and/or nights per month.

    - Undertake any high noise impact works before 12:00 am (midnight) where reasonable and feasible.
    - Where high noise impact activities are undertaken, the respite provisions as per the requirements of condition L5.2(c) of EPL 21800 do not apply provided that all High Noise Impact Activities and Works are undertaken prior to 12:00 am (midnight).
    - Where high noise impact activities are undertaken after 12:00 am (midnight), the respite provisions in condition L5.2(c) of EPL 21800 apply.
    - i) Upon request of an authorised officer, the licensee must provide within 5 business day:

    i. the construction noise and vibration impact assessment required by condition L5.6(a) of EPL 21800;

ii. noise monitoring results required by condition L5.6(b) of EPL 21800;

iii. written evidence demonstrating the works are necessary and permitted under condition L5.5 of EPL 21800; and/or

iv. any other relevant information or records requested by the EPA.

The relevant Additional Mitigation Measures Matrix (AMMM) are to be used to determine the additional measures to be implemented at residential receivers. The AMMM for airborne noise is reproduced in Table 8-5 and the AMMM for the ground-borne noise and ground-borne vibration are reproduced in Table 8-6 and Table 8-7 respectively.

The AMM for airborne noise is based on external noise levels when applied to residential receivers. If JH confirms that a residential receiver has been provided (either by past projects or independently designed-and-built) with at-property treatments which allow windows to be fixed or kept closed, then the trigger level for AMM may be adjusted to account for reduced internal noise levels. The AA must be consulted to approve any adjustments to the external AMM airborne noise trigger level for residential receivers.

Table 8-5 Airborne Noise - Additional Mitigation Measures matrix

Construction hours	Receiver perception	dB(A) above RBL*	dB(A) above ANML	Additional management measures
Standard Hours Monday-Friday (7am-6pm) Saturday (8am-1pm)	Noticeable	5 to 10	0	-
	Clearly Audible	> 10 to 20	< 10	-
	Moderately intrusive	> 20 to 30	> 10 to 20	PN, V
	Highly intrusive	> 30	> 20	PN, V
	75dBA or greater	N/A	N/A	PN, V, SN
OOHW Period 1 Monday-Friday 6pm-10pm Saturday (7am-8am, 1pm-10pm) Sunday/PH (8am-6pm)	Noticeable	5 to 10	< 5	-
	Clearly Audible	> 10 to 20	5 to 15	PN
	Moderately intrusive	> 20 to 30	> 15 to 25	PN, V, SN, RO
	Highly intrusive	> 30	> 25	PN, V, SN, RO, RP#, DR#
OOHW Period 2 Monday-Saturday (12am-7am, 10pm-12am) Sunday/PH (12am-8am, 6pm-12am)	Noticeable	0 to 10	< 5	PN
	Clearly Audible	> 10 to 20	5 to 15	PN, V
	Moderately intrusive	> 20 to 30	> 15 to 25	PN, V, SN, RP, DR
	Highly intrusive	> 30	> 25	PN, V, SN, AA, RP, DR

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

ANML – Air-borne noise management level

Table 8-6 Ground-borne Noise - Additional Mitigation Measures matrix

Construction hours	Receiver perception	dB(A) above GNML	Additional management measures
Standard Hours Monday-Friday (7am-6pm) Saturday (8am-1pm)	Clearly Audible	< 10	PN
	Moderately intrusive	> 10 to 20	PN
	Highly intrusive	> 20	PN, V, SN
OOHW Period 1 Monday-Friday 6pm-10pm Saturday (7am-8am, 1pm-10pm) Sunday/PH (8am-6pm)	Clearly Audible	< 10	PN
	Moderately intrusive	> 10 to 20	PN, V, RO, SN
	Highly intrusive	> 20	PN, V, SN, RO, RP*, DR*
OOHW Period 2 Monday-Saturday (12am-7am, 10pm-12am) Sunday/PH (12am-8am, 6pm-12am)	Clearly Audible	< 10	PN, V, SN
	Moderately intrusive	> 10 to 20	PN, V, SN, AA, RP, DR
	Highly intrusive	> 20	PN, V, SN, AA, RP, DR

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

* Respite periods and duration reduction are not applicable when works are carried out during OOHW Period 1 Day only (i.e. Saturday 6am-7am & 1pm-6pm, Sundays / Public Holidays 8am-6pm)

GNML – Ground-borne noise management level

Table 8-7 Vibration - Additional Mitigation Measures matrix

Construction hours	Receiver perception	above VML	Additional management measures
Standard Hours Monday-Friday (7am-6pm) Saturday (8am-1pm)	Human disturbance	> HVML	PN, V, RO
	Building damage	> DVML	V, AC
OOHW Period 1 Monday-Friday (6pm-10pm) Saturday (7am-8am, 1pm-10pm) Sunday/PH (8am-6pm)	Human disturbance	> HVML	PN, V, SN, RO, RP, DR
	Building damage	> DVML	V, AC
OOHW Period 2 Monday-Saturday (12am-7am, 10pm-12am) Sunday/PH (12am-8am, 6pm-12am	Human disturbance	> HVML	PN, V, SN, RO, AA, RP, DR
	Building damage	> DVML	V, AC

Notes:
PN = Project notification
V = Verification of monitoring
DR = Duration Reduction
RP = Respite Period
SN = Specific notification, individual briefings, or phone call
AA = Alternative accommodation
RO = Project specific respite offer
AC = Alternative construction methodology

HVML: vibration management level for human disturbance as outlined in Table 6-10

DVML: vibration management level for cosmetic damage to buildings or structures as outlined in Table 6-12

9 Compliance Management

9.1 Roles and Responsibilities

The USC Project Team's organisational structure and overall roles and responsibilities are outlined in Section 3.3 of the CEMP. Specific responsibilities for the implementation of environmental controls in relation to noise and vibration and inspection and monitoring requirements are detailed in Table 8-1 and Appendix E Noise and Vibration Monitoring Program.

As required under CoA A30, a suitably qualified and experienced Acoustic Advisor has been engaged to fulfill the associated role throughout the duration of the works and for no less than six months following completion of construction of Stage 1 of the Project. In accordance with CoA A32, the project will cooperate with the AA for the following:

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

Further details with regards to the Acoustic Advisor roles and responsibilities can be found under Section 3.3.2 (Acoustic Advisor (AA)) of the CEMP.

9.2 Incident Management

John Holland staff will operate in accordance with Sydney Water's Noise Management Code of Behaviour (SWEMS0056.01). Any environmental incidents related to noise and/or vibration will be reported in accordance with the project's environmental incident management plan (IMP), provided in Appendix A7 of the CEMP. The IMP is consistent with Sydney Water's Incident Management Procedure (DC0000506). Any noise and/or vibration incident such as works taking place outside of approved working hours will be reported to Sydney Water within 30 minutes after the incident was first notified, as required by the Sydney Water Environment Incident Reporting Process (REF0866). The John Holland Regional HSEQ team is to be immediately informed of any incident and will advise on the notification of relevant regulators and stakeholders.

As John Holland is the licensee for the applicable construction Environmental Protection Licence (EPL), John Holland will undertake notification to the EPA for any pollution incidents on or around the site via the EPA Environment Line (telephone 131 555) in accordance with Part 5.7 of the Protection of the Environment Operations Act 1997 (NSW) (POEO Act). The circumstances where this will take place include:

- it involves actual or potential harm to the health or safety of human beings or to ecosystems that is not trivial, or
- it results in actual or potential loss or property damage of an amount, or amounts in aggregate, exceeding $10,000 (or such other amount as is prescribed by the regulations)

A summary of noise and vibration impacts, including incident management, will be provided in the project monthly report issued to Sydney Water. Notification and reports will submitted in accordance with the requirements set out in Appendix A of the project planning approval. Any environmental non-compliance relating to noise and/or vibration will be managed in accordance with Section 3.8 of the CEMP.

In the event of any exceedance of the Best Achievable Noise Performance Objectives identified in a CNVIS prepared for the activities, John Holland will:

a) investigate the cause of the exceedance and identify whether all feasible and reasonable noise and vibration mitigation measures identified in the plans have been effectively deployed;

b) identify any noise and vibration measures recommended in the plans that were not effectively deployed;

c) assess appropriate remedial actions to seek to achieve the best achievable noise performance objectives;

d) submit a Follow-Up Investigation Report to the EPA within 5 business days (unless agreed in writing by the EPA) of any noise or vibration monitoring having been undertaken that detected the exceedance; and

e) include the following information in the Follow-Up Investigation Report:

- confirmation of whether noise monitoring has been undertaken in accordance with AS1055:2018 and the compliance monitoring guidance provided in the Interim Construction Noise Guideline (DECC, 2009);
- Confirmation of whether vibration monitoring has been undertaken in accordance with the guidance provided in Assessing Vibration: a technical guideline (DEC, 2006);
- Details of the prevailing meteorological conditions during the period when the monitoring was undertaken;
- A map of each noise and vibration monitoring location in relation to the noise source, including relevant distances;
- numerical and graphical representation of the noise and vibration monitoring results;
- an analysis of the noise and vibration monitoring results;

- details of any remedial action taken in relation to the matter; and
- in cases not the subject of remedial action, detailed justification of the decision not to undertake remedial action.

9.3 Training

All employees, contractors and utility staff working on site will undergo a site induction in which initial training on environmental issues including noise and vibration will be undertaken. The induction training will address elements related to noise and vibration including:

- The training requirements described in NVM01 of Table 8-1.
- Potential sources of noise and vibration specific to the Project;
- Sensitive receivers in proximity to the work area; and
- Mitigation measures implemented during stages of construction to reduce and manage noise and vibration impacts on surrounding sensitive receivers.

Targeted training and awareness in the form of toolbox talks or specific training will also be provided to personnel with a key role in the management of potential impacts of noise and vibration. Further details regarding staff induction and training are outlined in Section 3.5 of the CEMP.

9.4 Monitoring

Noise and vibration monitoring will be undertaken in accordance with the Noise and Vibration Monitoring Program (Appendix E), prepared in line with CoA C13(c), C14 and C15.

In accordance with CoA C16, construction will not commence until the Noise and Vibration Monitoring Program has been approved by DPHI and all relevant baseline data has been collected. The Noise and Vibration Monitoring Program will be implemented for the duration of construction of the Project (CoA C17).

John Holland will undertake monitoring, sampling, video recording and/or take photographs:

- if the EPA or licensee reasonably suspects that an event has occurred at the premises or in connection with the carrying out of the activities that has caused, is causing, is likely to cause or has the potential to cause material harm to the environment (whether the harm occurs on or off premises to which the EPL applies);
- as soon as practicable; and
- as directed by an authorised officer.

9.5 Auditing

Audits (both internal and external) will be undertaken to assess the effectiveness of environmental controls, including compliance with this NVCSP, CoA and other relevant approvals, licenses and guidelines. Audit requirements are detailed in Section 3.9.3 of the CEMP.

9.6 Reporting

Reporting requirements and responsibilities are documented in Section 3.9.4 and 3.9.5 of the CEMP and Appendix E of this plan.

Construction Monitoring Reports will be prepared on a bi-annual basis (every 6 months) in accordance with the NVMoP (Appendix E).

Construction Monitoring Reports will be provided to DPHI and relevant regulatory authorities for information, in line with CoA C13(c) and C18. The reports will also be provided to the AA in accordance with CoA A32(b).

Further to this, the Acoustic Advisor will provide 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 3.9.4 of the CEMP.

In accordance with EPL 21800, condition R4.2, upon request of an authorised officer, John Holland will submit a Preliminary Investigation Report to the EPA in respect of any noise or vibration monitoring undertaken in accordance with the requirements of Condition M3.4. The Preliminary Investigation Report will be submitted to the EPA by 4:00 pm on the afternoon of the next working day following any noise or vibration monitoring or other time as agreed in writing by EPA.

The Preliminary Investigation Report will include:

- numerical and/or graphical representation of the noise and vibration monitoring results including both ambient noise levels and the level of noise from activities on the premises only; and
- the noise levels reported using the following noise descriptors: LAeq,T; LAF90,T; and LAFmax,T (T representing the 15 minute measurement period unless an alternative period is justified); and
- an assessment of measured construction noise and vibration levels against noise limits or noise management levels specified in this licence, requirements in the project specific Construction Noise and Vibration Plan and/or Impact Statement prepared the activities, relevant noise modelling and any relevant noise guidelines.

9.7 NVCSP Update and Amendment

The processes described in Section 3.9 to Section 3.12 of the CEMP may result in the need to update or revise this Plan. This will occur as needed.

Any revisions to this Plan will be in accordance with the process outlined in Section 2 and 3.12 of the CEMP.

A copy of the updated plan and changes will be distributed to all relevant stakeholders in accordance with the approved document control procedure – refer to Section 3.10.2 of the CEMP.

Appendix A – CoA A9 Consultation Summary Report

Appendix B – Complaints Policy

Policy

Complaint policy

1. Overview

1.1 At a glance

This policy explains how we manage complaints.

1.2 Scope

This policy applies to complaints received from customers and consumers and their representatives.

1.3 Objective

We aim to respond to all complaints in a prompt, efficient and fair manner and make all reasonable efforts to resolve the complaint to your satisfaction.
It will help us:

- enhance customer service
- improve our products and services.

2. Policy in detail

We aim to resolve your complaint at the first point of contact by providing a solution or negotiating an agreed course of action. We'll respond to complaints in a prompt, efficient and fair manner and make all reasonable efforts to resolve the complaint to your satisfaction.

If it's not possible to fully investigate and resolve your complaint immediately, we'll give you an initial response within:

- two working days, if you've phoned or spoken directly to us
- five working days, if you've sent us an email or written a letter. We'll try to respond earlier by making direct contact with you.

Our initial response will be either to:

- offer you a solution, or
- explain our intended course of action to resolve your complaint.

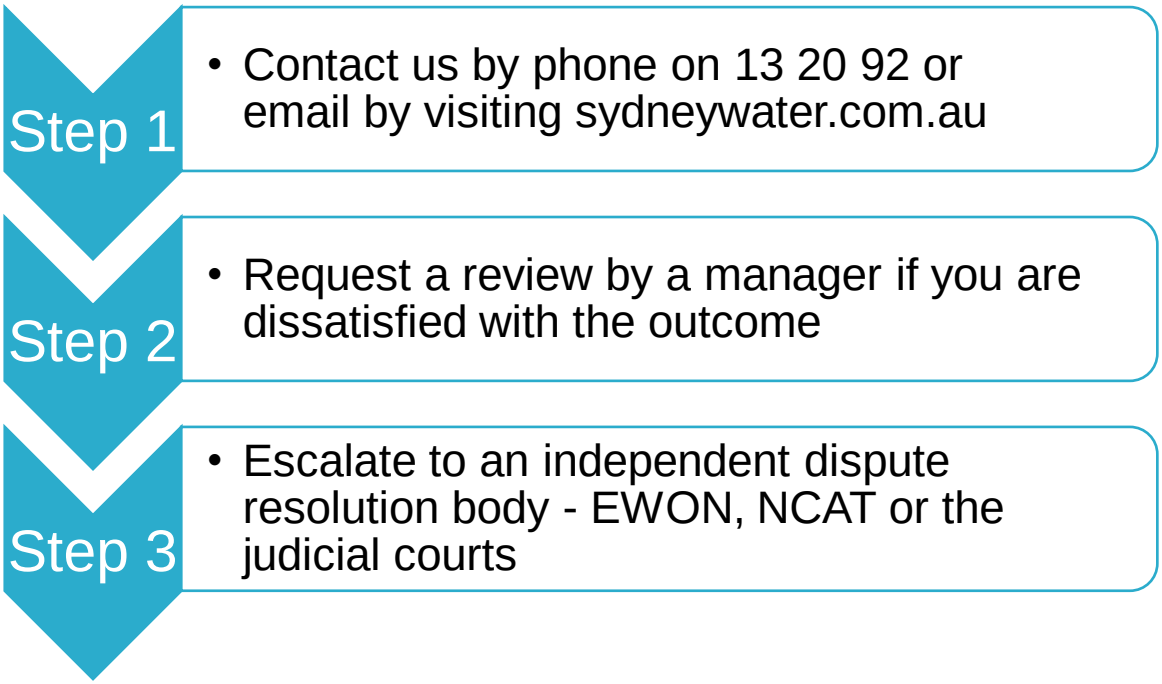
To get an update on your complaint, you can email us, or call us on 13 20 92.

2.1 How can you escalate your complaint?

If you're not happy with our solution, you can choose to have the complaint reviewed again by a manager.

At any time, you can contact an independent dispute resolution body such as the Energy & Water Ombudsman NSW (EWON), the NSW Civil & Administrative Tribunal (NCAT) or you can go through the judicial courts.

The steps to lodge and escalate a complaint with us are:



3. Definitions

Term	Definition	Source
Complaint	• Australian standard providing guidance on complaint handling within an organisation defines a complaint as: 'A complaint is an expression of dissatisfaction made to or about Sydney Water related to its products, services, staff or the handling of a complaint, where a response or resolution is explicitly or implicitly expected or legally required' • A complaint may be lodged by a customer, consumer, their representative, EWON or another independent dispute resolution body, a Government Minister, or a member of the public.	Australian/New Zealand Standard – Guidelines for complaint management in organizations AS/NZS 10002:2014
Customer	A term used either specifically to describe a property owner; or generally to also include a tenant, any consumer of our products or services or their representative or advocate. For the purpose of this policy all complainants are referred to as customer.	Sydney Water Customer Contract
EWON	Energy & Water Ombudsman NSW, an industry-based, independent dispute resolution body. Their services are free to our customers. Freecall 1800 246 545 or visit the EWON website.	Energy & Water Ombudsman NSW
NCAT	NSW Civil & Administrative Tribunal, or NCAT, is an independent dispute resolution body. It reviews administrative decisions made by NSW Government agencies and resolves discrimination matters. Fees generally apply. Call **1300 006 228** and select **Option 1** for all Consumer and Commercial Division enquiries or visit the NCAT website.	NSW Civil & Administrative Tribunal
Staff	A general term for Sydney Water employees and our service providers, including principal contractors, contractors, sub-contractors, consultants and suppliers that provide a specific service to and on behalf of Sydney Water.	Sydney Water

Appendix C – Out-of-Hours Work Protocol

Upper South Creek

Advanced Water Recycling Centre and Pipelines

NVCSP Appendix C
Out-of-Hours Work Protocol

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Recommend Documents to be Read in Conjunction

This management plan is to be read in conjunction with the Construction Environmental Management Plan (USCP-JHG-MPL-ENV-0008) and the Noise & Vibration CEMP Sub-Plan (USCP-JHG-MPL-ENV-0007).

Revisions and Distribution

Distribution

There are no restrictions on the distribution or circulation of this Construction Environmental Plan within John Holland.

	Uncontrolled Copy
Authorised By: Date:	Richard Ioffrida (Project Director)

Revisions

Draft issues of this document shall be identified as Revision 01, 02, 03 etc. Upon initial issue (generally Contract Award) this shall be changed to a sequential number commencing at Revision A. Revision numbers shall commence at Rev. A, B etc.

Date	Rev	Remarks	Section	Prepared By	Reviewed By & Approved By
25.01.2023	01	Initial draft for John Holland and Sydney Water review	All		A Harrington
21.02.2023	02	Updated in response to SW comments	All	D. O'Brien	A. Harrington
07.03.2023	03	Updated in response to SW final comments	All	A. Harrington	A. Harrington
14.04.2023	04	Update in response to ER and AA comments	All	D. O'Brien	A. Harrington
05.05.2023	05	Update in response to ER, AA and Agency comments	All	M.Segaran	A.Harrington
16.06.2023	06	Updated to include DPHI comments	All	A.Morris / M.Segaran	A.Harrington
28.06.2023	07	Updated to include DPHI comments	All	M.Segaran	A.Harrington
22.08.2023	A	Issued for construction	All	M.Segaran	A.Harrington
07.06.2024	B	Updated for EPL variation			

Contents

Glossary/ Abbreviations

Abbreviations	Expanded Text
AA	Acoustic Advisor
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.
Amendment Report	Upper South Creek Advanced Water Recycling Centre Amendment Report (March 2022)
Amendment RtS	Upper South Creek Advanced Water Recycling Centre Submissions Report – project amendments (April 2022)
Attenuation	The reduction in the level of sound or vibration.
AWRC	Advanced Water Recycling Centre
CEMP	Construction Environmental Management Plan
CNVS	Construction Noise and Vibration Strategy
CNVIS	Construction Noise and Vibration Impact Statement
CoA	Condition of Approval
CSEP	Community & Stakeholder Engagement Plan
CSSI	Critical State Significant Infrastructure
Daytime, day	The period from 7 am to 6 pm (Monday to Friday) and 8 am to 1 pm (Saturday).
dBA	Decibels using the A-weighted scale measured according to the frequency of the human ear.
DEC	Department of Environment and Conservation NSW
DECC	Department of Energy and Climate Change
DPHI	NSW Department of Planning, Housing and Infrastructure
EIS	Upper South Creek Advanced Water Recycling Centre Environmental Impact Statement (September 2021)
EIS RtS	Upper South Creek Advanced Water Recycling Centre Submissions Report (March 2022)
ENMM	Environmental Noise Management Manual
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.
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.
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
EPL	Environment Protection Licence
ER	Environmental Representative
Evening	Refers to the period from 6 pm to 10 pm
Extraneous noise	Noise resulting from activities that are not typical of the area. Atypical activities may include construction, and traffic generated by holiday periods and by special events such as concerts or sporting events. Normal daily traffic is not considered to be extraneous.
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.

Abbreviations	Expanded Text
Heritage item	A place, building, work, relic, archaeological site, tree, movable object or precinct of heritage significance, that is listed under one or more of the following registers: the State Heritage Register under the *Heritage Act 1977* (NSW), a state agency heritage and conservation register under section 170 of the *Heritage Act 1977* (NSW), a Local Environmental Plan under the EP&A Act, the World, National or Commonwealth Heritage lists under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth), and an "Aboriginal object" or "Aboriginal place" as defined in section 5 of the *National Parks and Wildlife Act 1974* (NSW)
Highly noise affected	As defined in the Interim Construction Noise Guideline (DECC, 2009)
Highly noise intensive (Infrastructure Approval)	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 h. Impact piling.
ICNG	Interim Construction Noise Guidelines
ISC Benchmark	A benchmark listed in the Infrastructure Sustainability Council's *IS v2.1 Technical Manual Design and As Built Rating*, notably Env-2 (noise) and Env-3 (vibration)
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.
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.
NCA	Noise Catchment Area
NCG	Noise Criteria Guideline
Night	The period from 10 pm to 7 am (Monday to Saturday), and 10 pm to 8 am (Sundays and public holidays)
NMG	Noise Mitigation Guideline
NML	Noise Management Level
Noise Mitigation	Reasonable and feasible noise mitigation measures
NPI	Noise Policy for Industry, Environment Protection Agency 2017
NVCSP	Noise and Vibration CEMP Sub-Plan (or Plan)
NVMoP	Noise and Vibration Monitoring Program
OOHW	Out of Hours Work
POEO Act	*Protection of the Environment Operations Act 1997*
PPV	Peak-Particle Velocity
Project, the	Upper South Creek Advanced Water Recycling Centre and Pipelines Project
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)
UMM	Updated Management Measure
RNP	Road Noise Policy
ROL	Road Occupancy Licence
RtS	Response to submissions
SMART	Specific, measurable, achievable, relevant, and time-based
SWC	Sydney Water Corporation (the Client and Proponent)
TfNSW	Transport for New South Wales
VDV	Vibration Dose Value

Note: Glossary provided in The Conditions of Approval for this project (SSI 8609189).

1 Introduction

This Out-of-Hours Work (OOHW) Protocol (herein referred to as the Protocol) for Stage 1 of the Upper South Creek (USC) Advanced Water Recycling Centre (AWRC) Project (the Project) has been prepared in accordance with Minister's Condition of Approval (CoA) E43. This Protocol identifies a process for the consideration, management and approval of works which are outside the standard construction hours defined in CoA E40 (out-of-hours work) and that are not subject to an Environment Protection Licence (EPL). It is anticipated that most OOHW undertaken on the Project will be undertaken in accordance with EPL 21800 and therefore this Protocol does not apply. OOHW under EPL 21800 will be undertaken in accordance with Section 8.4.3 of the NVCSP.

Typically, OOHW that is not subject to an EPL will involve service investigations, relocations and other works items that are not scheduled activities under the *Protection of the Environment Operations Act 1997* (POEO Act) (and associated regulations) and are outside the EPL premise boundary.

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 E43 requires that this Protocol is prepared in consultation with the ER, AA and the EPA and approved by the Planning Secretary. Out of hours works will not commence until this Protocol the necessary consultation is undertaken and it has been submitted and approved by the Planning Secretary.

1.1 Minister's Conditions of Approval

The CoA relevant to this Protocol are listed in Table 1.1 below. A reference is also included to indicate where the CoA is addressed in this Protocol or other Project documents. It is noted that conditions L5.5 to L5.10 of EPL 21800 do not apply to OOHW undertaken as part of this Protocol.

Table 1.1 Minister's Conditions of Approval Requirements

CoA No.	Condition Requirements	Document Reference	How Addressed
E42	Notwithstanding Conditions E40 and E41 Work may be undertaken outside the hours specified in the following circumstances… c) By Approval, including… (ii) works which are not subject to an EPL that are approved under an Out-of-Hours Work Protocol as required by Condition E43…	Section 2.1 of this Protocol	Section 2.1 of this Protocol identifies that out of hours works not subject to an EPL are to be undertaken in line with this protocol.
E43	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 E40, and that are not subject to an EPL. The Protocol must be submitted to and 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 include: Note: If the Work is subject to an EPL and the EPA does not endorse extended hours as part of the EPL, the extended hours can not be considered under this Protocol.	This Protocol	This protocol identifies a process for works which are outside the hours defined in Conditions E40 and E41 and that are not subject to an EPL. Section 1 identifies the parties to be consulted.
(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: 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, and iii. high risk activities that are approved by the Planning Secretary	Section 5 of this Protocol	An approval process has been outlined in Section 5 of this Protocol that considers the risk of activities, proposed mitigation, management and coordination. Figure 5.1 of this Protocol has also been included to outline the approval process.
(b)	a process for the consideration of out-of-hours work against the relevant NML and vibration criteria;	Section 3 of this Protocol	A process for the consideration of OOHW against the relevant noise and vibration criteria is provided in Section 3 of this Protocol
(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 E55. 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 use(s) would be exposed to, including the number of noise awakening events;	Sections 4 and 6 of this Protocol	Sections 4 and 6 of this Protocol outline the mitigation measures for residual impacts and consultation requirements.
(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	Sections 5 and 7 of this Protocol	Section 6.1

CoA No.	Condition Requirements	Document Reference	How Addressed
(e)	notification arrangements for affected receivers for approved out-of-hours work and notification to the Planning Secretary of approved low risk out-of-hours works. This condition does not apply if the requirements of Condition E42(a) or (b) are met.	Section 6 of this Protocol	Section 6 of this Protocol identifies notification arrangements for approved out of hours works.
E45	Mitigation measures must be applied when the following residential ground-borne noise levels are exceeded: a. evening (6:00 pm to 10:00 pm) — internal LAeq (15 minute): 40 dB(A); and b. night (10:00 pm to 7:00 am) — internal LAeq (15 minute): 35 dB(A). 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 E43.	Section 3.3 of this Protocol	Section 3.3 of this Protocol outlines the relevant ground-born noise management levels.
E55	In order to undertake out-of-hours work outside the hours specified under Condition E40, the appropriate respite periods must be identified for the out-of-hours work in consultation with the community at each affected location on a regular basis. This consultation must include (but not be limited to) providing the community with: a. a progressive schedule for periods of likely out-of-hours work; b. a description of the potential work, location and duration of the out-of-hours work c. the noise characteristics and likely noise levels of the work; and d. likely mitigation and management measures which aim to achieve the relevant noise management levels and vibration criteria under Condition E44 (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 for information prior to undertaking the Work scheduled for the subject period. 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.	Section 6 of this Protocol	Section 6

1.2 Updated Management Measures

Table 1.2 lists the updated management measures (UMMs) for the Project that are relevant to this Protocol. This includes relevant references to where the commitment has been addressed in this Protocol and/or other Project documents.

Table 1.2 Updated Management Measures Relevant to this Protocol

Ref #	Impact	Management Measure	Timing	Where Addressed
NV02	Noise during out of hours work (OOHW)	Schedule construction works for standard construction hours, where possible. If it is not possible to restrict the works to the day period, then they are to be completed as early as possible in each work shift. Provide appropriate respite to affected receivers in accordance with the Interim Construction Noise Guideline (ICNG).	During construction	Section 4 of this Protocol
NV06	OOHW results in sleep disturbance of sensitive receivers	Consult with residents that will be impacted by OOHW about measures to manage impacts in accordance with the ICNG, including considering alternative accommodation. This includes residents near long term pipeline tunnelling compounds at Bents Basin Road and Lansvale Park.	Prior to construction During construction	Section 6 of this Protocol

1.3 Consultation

This Protocol was developed in consultation with the Project Acoustic Advisor (AA), the Project Environmental Representative (ER) and the Environmental Protection Authority (EPA) in accordance with E43. A summary of consultation is found in Appendix A of the NVCSP.

2 OOHW Assessment Process

2.1 Work Hours

The CoA defines the approved working hours for the Project. The work hours for the Project are defined in CoA E40 as being:

- 7:00 am to 6:00 pm Mondays to Fridays, inclusive;
- 8:00 am to 1:00 pm Saturdays; and
- At no time on Sundays or public holidays.

In accordance with CoA E42(c)(ii), 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, as detailed in Table 2.1:

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

The Transport for NSW (TfNSW) Construction Noise and Vibration Strategy (CNVS) defines the construction hours in Section 1.4, then further categorises the OOHW into two time periods, for the purpose of managing impacts and identifying additional mitigation measures.

Table 2.1 Assessment Periods

Day/ Time	12am – 1am	1am – 2am	2am – 3am	3am – 4am	4am – 5am	5am – 6am	6am – 7am	7am – 8am	8am – 9am	9am – 10am	10am – 11	11am – 12	12pm – 1pm	1pm – 2pm	2pm – 3pm	3pm – 4pm	4pm – 5pm	5pm – 6pm	6pm – 7pm	7pm – 8pm	8pm – 9pm	9pm – 10pm	10pm – 11	11pm – 12
Monday to Friday										Work Hours							OOHW Period 1							
Saturday																								
Sunday or Public Holiday		OOHW Period 2									OOHW Period 1							OOHW Period 2						

2.2 OOHW Justification

Construction work associated with the Project will be undertaken in accordance with the assessment and management approach outlined in the Interim Construction Noise Guideline (ICNG). The ICNG outlines standard construction hours and requires that work proposed outside of these hours must be appropriately justified. These requirements are reflected in CoA E40 to E42 for the Project.

OOHW not subject to an EPL that are regulated through this Protocol are summarised in Table 2.2.

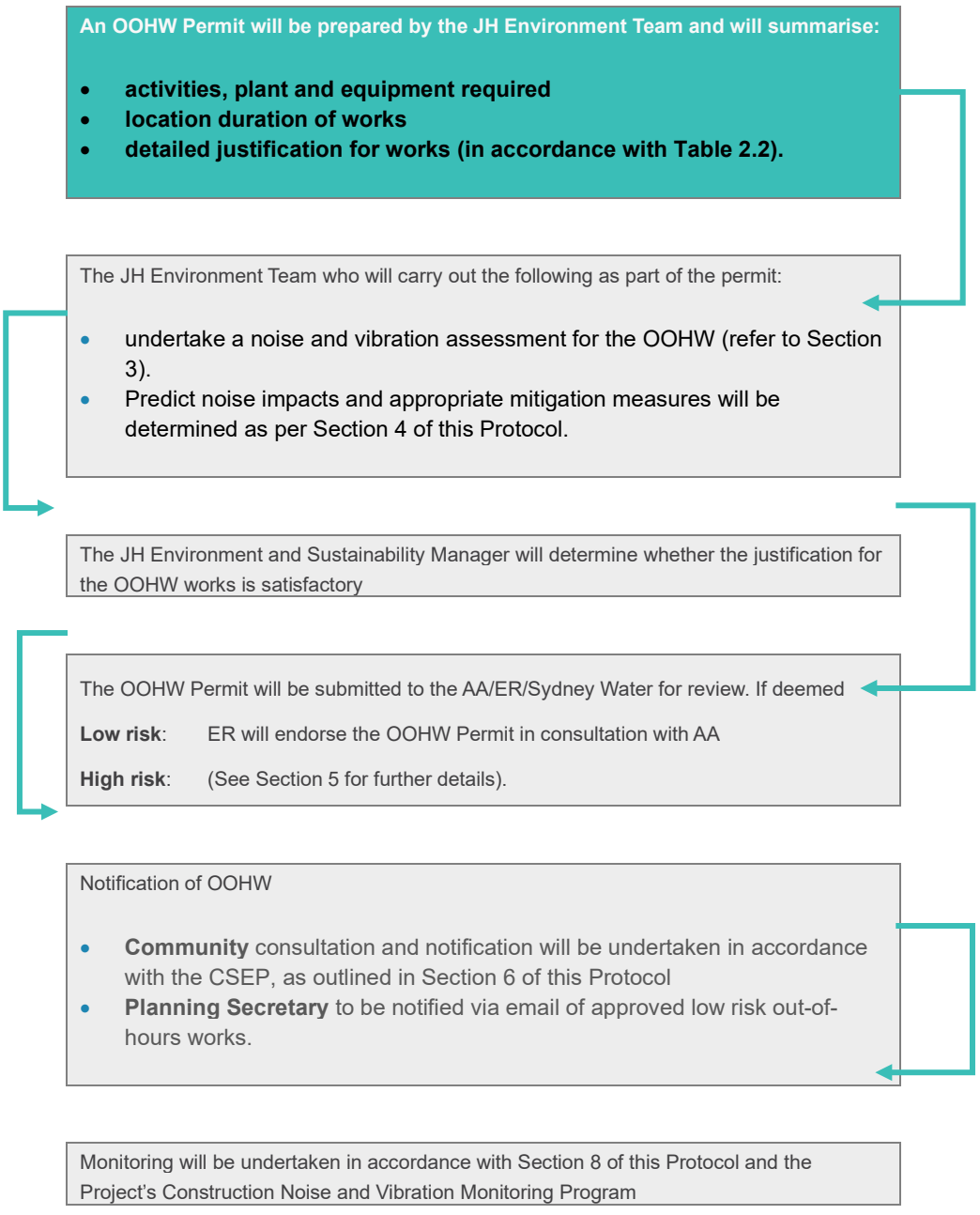
Table 2.2 Justification for OOHW regulated through this Protocol assessment periods

Category	OOHW Justification
A. Safety or emergency work (CoA E42a)	i. for the delivery of materials required by the NSW Police Force or other authority for safety reasons 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
B. Low noise work (CoA E42b)	i. Construction that causes $L_{Aeq(15\ minute)}$ noise levels no more than: • 5 dB(A) above the rating background level at any residence in accordance with the Interim Construction Noise Guideline (DECC, 2009), and • the 'Noise affected' noise management levels specified in Table 3 of the Interim Construction Noise Guideline (DECC, 2009) at other sensitive land uses, or ii. continuous or impulsive vibration values no more than the preferred values for human exposure to vibration, specified in Table 2.2 of Assessing Vibration: a technical guideline (DEC, 2006), measured at the most affected residence, or iii. intermittent vibration values measured at the most affected residence no more than the preferred values for human exposure to vibration, specified in Table 2.4 of Assessing Vibration: a technical guideline (DEC, 2006)
C. Other out-of-hours works	i. 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 – Principles and Guidelines” ii. where the relevant road network operator has advised the Proponent in writing that carrying out the works and activities could result in a high risk to road network operational performance iii. where the relevant utility service operator has advised the Proponent in writing that carrying out the works and activities could result in a high risk to the operation and integrity of the utility network iv. where the TfNSW Transport Management Centre (or other road authority) has advised the Proponent in writing that a road occupancy licence is required and will not be issued for the works or activities during standard construction hours v. Where works are >5dB(A) above the RBL at the nearest residential receiver but works have been approved in accordance with an OOHW permit prepared in accordance with this protocol. The permit will include a qualitative or quantitative noise assessment of the planned works and appropriate mitigation measures are prescribed for the works in accordance with Table 4.1 and Table 4.2 below.
D. Negotiated agreement (CoA E42c iii)	i. where negotiated agreements with directly affected residents and sensitive land uses have been reached

2.3 OOHW Permit

For any proposed OOHW for works that are not subject to an EPL, the following process outlined in Figure 2.1 will be undertaken.

Figure 2.1 JH process for obtaining OOHW Permit



3 OOHW Noise and Vibration Assessment

3.1 Noise

To manage potential impacts from noise and vibration during OOHW, JH'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 (refer to Section 7.2 of the NVCSP for information regarding the prediction tools). 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 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 NVCSP, ICNG and CNVS, will be considered by the JH construction team and the Environment and Sustainability Manager. This will be used to determine the appropriate approval pathway for the OOHW. Ongoing monitoring and validation of predictive outputs will be undertaken as detailed in the NVCSP. Monitoring and validation are to be undertaken in accordance with Section 8.

3.2 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 8 of the NVCSP) 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 Section 9.3 of the NVCSP.

3.3 Ground-borne Noise

When assessing works under the Protocol, impacts to receivers will consider cumulative impacts if the receiver is also affected by tunnelling ground-borne noise at residential levels identified in CoA E45; 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 Section 7.2 of the NVCSP.

3.4 Highly Noise Intensive Equipment

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

- Highly noise intensive activities (rock braking, pile driving or similar) will be carried out before 11.00 pm Monday to Thursday and before 12 midnight Friday and Saturday where reasonable and feasible,
- temporary noise barriers (including the arrangement of plant and equipment) around noisy equipment and activities such as rock hammering and concrete cutting,
- JH 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; and
- Proposed OOHW must be coordinated to avoid the same receiver being affected over 3 consecutive evenings and 2 consecutive nights in the same NCA in any one week, as much as is reasonable. Additional detail around OOHW respite is provided in Section 6.1 of this OOHW Protocol.

In accordance with CoA E55, to identify the appropriate respite periods for work proposed under this Protocol, JH will consult with 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 6.

3.5 Coordination of OOHW Approved by an EPL

As part of the noise and vibration assessment process, the project 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 E54.

Coordination effort must include:

a) rescheduling Work to provide respite to impacted noise sensitive land use(s) so that the respite is achieved in accordance with Condition E55; or

b) the provision of alternative respite or mitigation to impacted noise sensitive land use(s); and

c) the provision of documentary evidence to the AA in support of any decision made in relation to respite or mitigation.

d) Ensure that works and activities do not result in noise levels exceeding those specified in condition L5.3 of EPL 21800 at the same noise sensitive receivers (unless specified in another condition of this licence) on more than:

   i. 2 consecutive evenings and/or nights at any time; and

   ii. 3 evenings and/or nights per week; and

   iii. 10 evenings and/or nights per month.

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 project

4 OOHW Noise and Vibration Management and Mitigation Measures

Following the noise assessment process as described in Section 3, the most appropriate reasonable and feasible management measures will be determined in accordance with the CNVS. Table 4.1 and Table 4.2 detail the relevant additional mitigation measures from the CNVS to be applied during OOHW.

Table 4.1 Triggers for additional mitigation measures – airborne noise

Construction hours	Receiver perception	dB(A) above RBL*	dB(A) above ANML	Additional management measures
Standard Hours Monday-Friday (7am-6pm) Saturday (8am-1pm)	Noticeable	5 to 10	0	-
	Clearly Audible	> 10 to 20	< 10	-
	Moderately intrusive	> 20 to 30	> 10 to 20	PN, V
	Highly intrusive	> 30	> 20	PN, V
	75dBA or greater	N/A	N/A	PN, V, SN
OOHW Period 1 Monday-Friday 6pm-10pm Saturday (7am-8am, 1pm-10pm) Sunday/PH (8am-6pm)	Noticeable	5 to 10	< 5	-
	Clearly Audible	> 10 to 20	5 to 15	PN
	Moderately intrusive	> 20 to 30	> 15 to 25	PN, V, SN, RO
	Highly intrusive	> 30	> 25	PN, V, SN, RO, RP#, DR#
OOHW Period 2 Monday-Saturday (12am-7am, 10pm-12am) Sunday/PH (12am-8am, 6pm-12am)	Noticeable	0 to 10	< 5	PN
	Clearly Audible	> 10 to 20	5 to 15	PN, V
	Moderately intrusive	> 20 to 30	> 15 to 25	PN, V, SN, RP, DR
	Highly intrusive	> 30	> 25	PN, V, SN, AA, RP, DR

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

Table 4.2 Triggers for additional mitigation measures - vibration

Construction hours	Receiver perception	above VML	Additional management measures
Standard Hours Monday-Friday (7am-6pm) Saturday (8am-1pm)	Human disturbance	> HVML	PN, V, RO
	Building damage	> DVML	V, AC
OOHW Period 1 Monday-Friday (6pm-10pm) Saturday (7am-8am, 1pm-10pm) Sunday/PH (8am-6pm)	Human disturbance	> HVML	PN, V, SN, RO, RP, DR
	Building damage	> DVML	V, AC
OOHW Period 2 Monday-Saturday (12am-7am, 10pm-12am) Sunday/PH (12am-8am, 6pm-12am	Human disturbance	> HVML	PN, V, SN, RO, AA, RP, DR
	Building damage	> DVML	V, AC

Notes:
PN = Project notification
V = Verification of monitoring
DR = Duration Reduction
RP = Respite Period
SN = Specific notification, individual briefings, or phone call
AA = Alternative accommodation
RO = Project specific respite offer
AC = Alternative construction methodology

Table 4.3 Triggers for additional mitigation measures – groundborne noise

Construction hours	Receiver perception	dB(A) above GNML	Additional management measures
Standard Hours Monday-Friday (7am-6pm) Saturday (8am-1pm)	Clearly Audible	< 10	PN
	Moderately intrusive	> 10 to 20	PN
	Highly intrusive	> 20	PN, V, SN
OOHW Period 1 Monday-Friday 6pm-10pm Saturday (7am-8am, 1pm-10pm) Sunday/PH (8am-6pm)	Clearly Audible	< 10	PN
	Moderately intrusive	> 10 to 20	PN, V, RO, SN
	Highly intrusive	> 20	PN, V, SN, RO, RP*, DR*
OOHW Period 2 Monday-Saturday (12am-7am, 10pm-12am) Sunday/PH (12am-8am, 6pm-12am)	Clearly Audible	< 10	PN, V, SN
	Moderately intrusive	> 10 to 20	PN, V, SN, AA, RP, DR
	Highly intrusive	> 20	PN, V, SN, AA, RP, DR

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

* Respite periods and duration reduction are not applicable when works are carried out during OOHW Period 1 Day only (i.e. Saturday 6am-7am & 1pm-6pm, Sundays / Public Holidays 8am-6pm)

It should be noted that sensitive receivers may have personal circumstances, which means that the approach to specific additional mitigation measures in Table 4.1 may not be suitable. The Communications Manager and the Public Liaison Officer have 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(f) and A34(c), 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. Refer to Section 3.3.2 of the CEMP for further details on the role and responsibilities of the AA.

5 Approval of 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 JH 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 2 will be undertaken by a member of the JH Environment Team for the proposed OOHW. The outcomes of the noise and vibration assessment, including relevant management measures, will be forwarded to the JH Environment Manager and Public Liaison Officer, who, in consultation with Sydney Water, the ER and AA, will review the level of risk associated with the activity, the predicted impacts and the management measures to be implemented.

The proposed OOHW are classified **low risk** if the noise assessment identifies that the works:

- Meet the perception classification of Noticeable (Table 4.1);
- Meet the perception classification of Clearly Audible (Table 4.1) and above at any one residential receiver for a maximum of:
  - 2 consecutive evenings and/or nights per calendar week; and
  - 3 evenings and/or nights per calendar week; and
  - 10 evenings and/or nights per calendar month.

The effect of the above facilitates two evenings and nights periods in a row and at least one period off before the third period that week. In accordance with CoA E43(a)(ii), the Environmental Representative (ER) has the authority to approve low risk OOHW activities in consultation with the AA.

If the duration limitations outlined above cannot be achieved, the proposed OOHW is classified high risk. Both highly intrusive and moderately intrusive noise may be considered high risk by the AA and ER. In this instance, the assessment of the proposed OOHW and the OOHW Permit will be issued to the Secretary for review and approval.

Applications for 'high risk' work for approval by the Secretary (CoA E43(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).

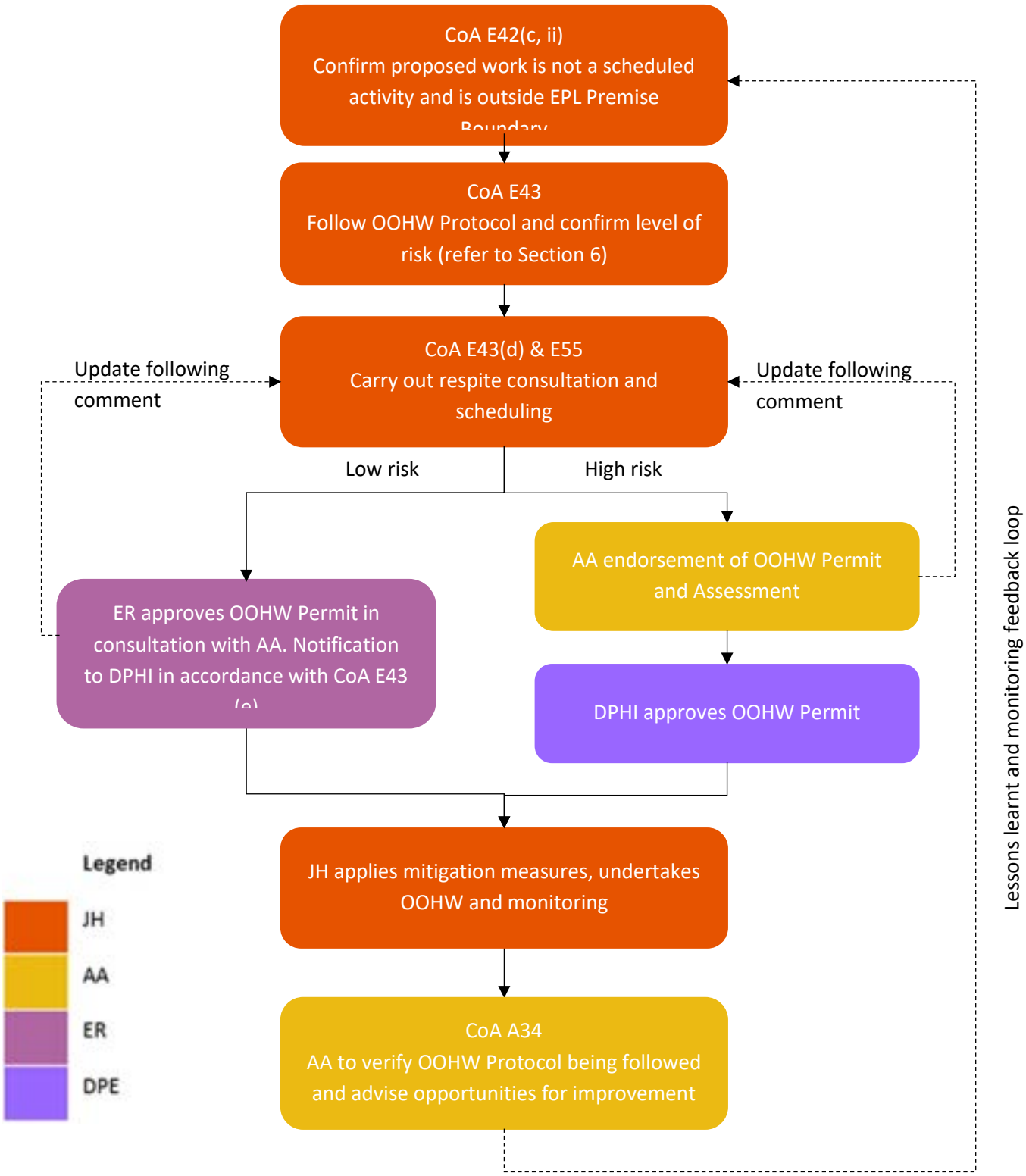
Following approval by the ER (in consultation with the AA) or the Secretary, the approved OOHW Permit will be provided to the relevant construction team by the JH Environment and Sustainability Manager. On receipt of the approved OOHW Permit, any standard and additional mitigation measures that relate 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. Training will be suitably documented, and
- Implemented during OOHW and monitored by the JH 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(f) and CoA A34(c), respectively.

Following the OOHW, JH will review any lessons learnt and monitoring data to help inform future OOHW activities and mitigation measures and minimise impacts.

Figure 5.1 Flow chart of the approval process for OOHW not subject to an EPL



6 OOHW Stakeholder Consultation and Communication

The Public Liaison 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.

In accordance with CoA E43(e), copies of OOHW notifications will be provided to the Planning Secretary. As required by the CSEP, these OOHW notifications would also be available on the website. All community consultation would be carried out in accordance with the CSEP and as required by this Protocol. DPHI will be notified of the approved Low Risk OOHW (in accordance with CoA E43(e)).

Where required by the CNVIS, JH will notify potentially affected sensitive receivers and other stakeholders of planned OOHW. JH 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 CSEP and CoA E55. It will include the provision of the following information to affected receivers:

- A progressive schedule for periods of likely out-of-hours work;
- A description of the potential work, location and duration of the out-of-hours work;
- The noise characteristics and likely noise levels of the works, and
- Likely mitigation and management measures which aim to achieve the relevant noise management levels under Condition E44.

Where appropriate, mitigation measures for the works will be considered in consultation with the community. This will include respite periods and will take into account the predicted noise levels and the likely frequency and duration of any out-of-hours works that sensitive land uses would be exposed to, including the number of noise awakening events.

The outcomes of the community consultation, the identified respite periods and the scheduling of the likely OOHW associated with the project (irrespective of whether undertaken under an EPL or not) will be provided to the AA, ER, EPA and the Planning Secretary for information prior to commencing works scheduled for the subject period.

6.1 Respite

Respite offers for impacted receivers will be considered in accordance with Tables 4.1 and 4.2. Respite may be offered in the form of a reduction or absence of noise emissions for a period of time, or by removing the affected receiver from the noise emission point source (e.g. dinner/movie tickets and/or alternative accommodation offers).

Respite offers will be considered for all OOHW that are predicted to generate impacts higher than the applicable exceedance criteria for the applicable OOHW period. Proposed OOHW must be coordinated to avoid the same receiver being affected over consecutive nights as much as is reasonable. OOHW must be staggered as much as is reasonable to maximise the respite period between OOHW events. If consideration of OOHW of respite offers is required, a decision to implement respite offers will be determined on a case-by-case basis and considering, but not limited to, the following factors:

- The predicted maximum exceedance level;
- The predicted exceedance levels and associated duration and timings of those exceedance levels;
- The overall duration of the predicted exceedance levels;
- Surrounding land uses;
- Community feedback; and
- Any other OOHW that have affected or will affect the same receivers concurrently or within three days of either the start or end of the proposed OOHW.

7 External Approval Authorities for OOHW

7.1 DPHI

In accordance with CoA E43 (a)(iii), if the proposed OOHW (that is not subject to an EPL) includes high risk activities (refer to Section 5), approval of the OOHW will be sought from the Secretary. The ER and AA will review all proposed out-of-hours activities to confirm their risk level, prior to submission to the Planning Secretary.

7.2 Environmental Representative and Acoustics Advisor

In accordance with CoA E43 (a)(ii), if the proposed OOHW (that is not subject to an EPL) only includes low risk activities (refer to Section 5), the OOHW can be approved by the ER, in consultation with the AA.

8 OOHW Monitoring

8.1 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 Appendix E of the NVCSP).

9 OOHW Exceedances / Non-conformances

9.1 Management Response

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

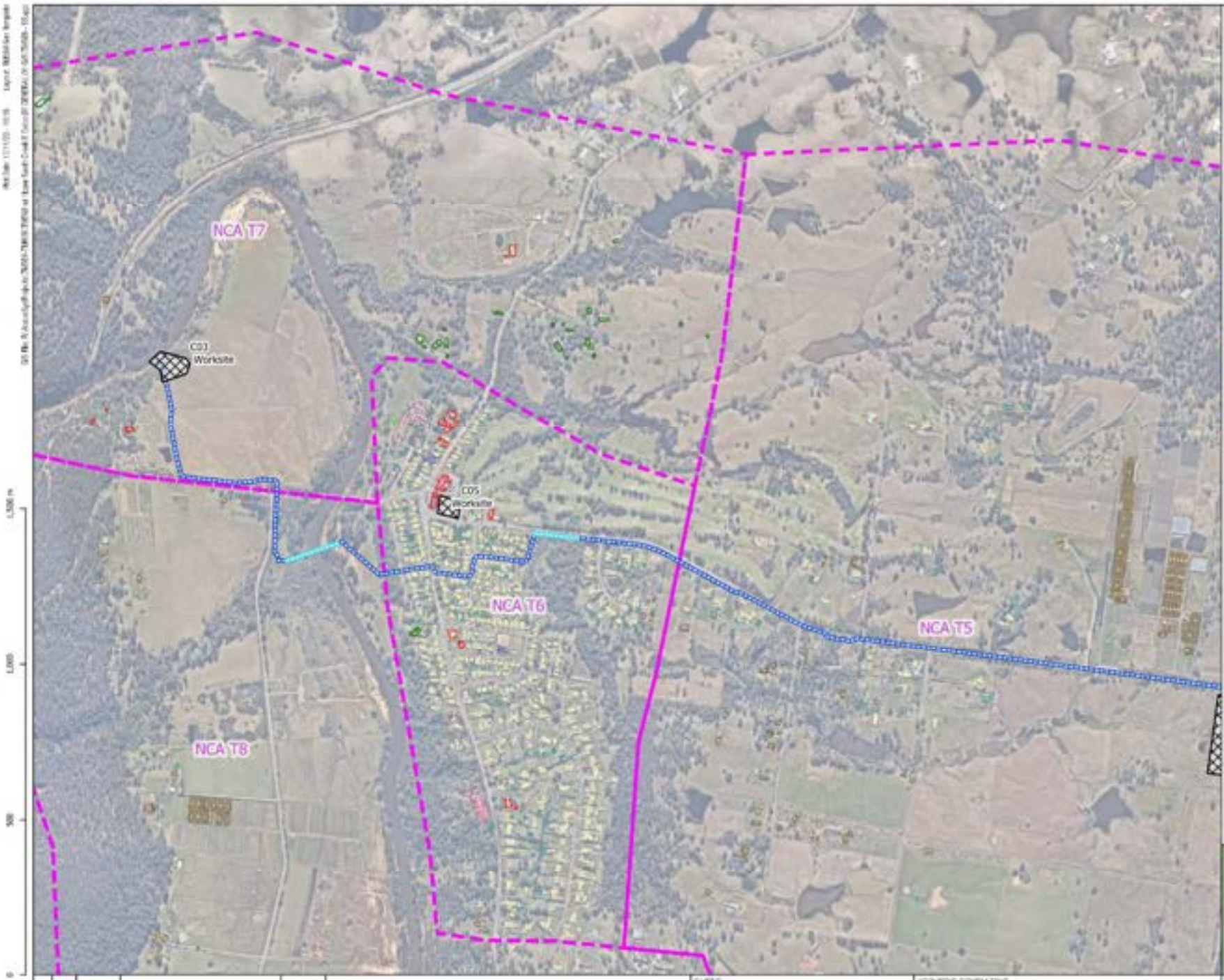
- Cease the noise and/or vibration generating source which causes the exceedance,
- Confirm the monitored levels are not being impacted by other noise or vibration sources,
- Confirm if the exceedance is due to an uncharacteristically loud/vibratory piece of equipment,
- Identify if the equipment can be swapped out for another piece of equipment or alternative equipment or plant, or if additional mitigation can be included during the works,
- 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,
- 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 impacts can be reduced,
- Incorporate AMMs which are relevant to the measured level instead of the predicted level, and
- Communicate lessons learnt to relevant personnel.

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

9.2 Reporting

Noise and vibration complaints will be reported in accordance with the Project's CSEP (summarised in Section 4.2 of the NVCSP), Complaints Policy (Appendix B of the NVCSP) and any EPL requirements.

Appendix D – Land Use Survey Maps



LEGEND

Noise Sensitive Receivers

- Residential
- Mixed use
- Commercial
- Industrial
- Hotel/Motel/Hostel
- Medical facility
- Place of Worship
- Community centre
- Recording studio
- Library/Museum
- Childcare
- Educational
- Theatre/Auditorium
- Cinema
- Laboratory
- Flight simulator
- Animal Enclosure
- Recreational - Passive
- Recreational - Active
- Other
- Heritage

- Project NCAs
- Noise Monitoring Locations

Proposed Pipelines

- Treated Water Pipeline
- Brine Pipeline
- Brine Pipeline - Underbore
- Treated Water Pipeline - Underbore

NCA	NML_DS	NML_DO	NML_E	NML_N
NCA T5	55	50	45	40
NCA T6	55	50	45	40
NCA T7	50	45	40	35
NCA T8	50	45	40	35
NCA T9	50	45	40	35

NCA: Noise Catchment Area
NML: Noise Management Level
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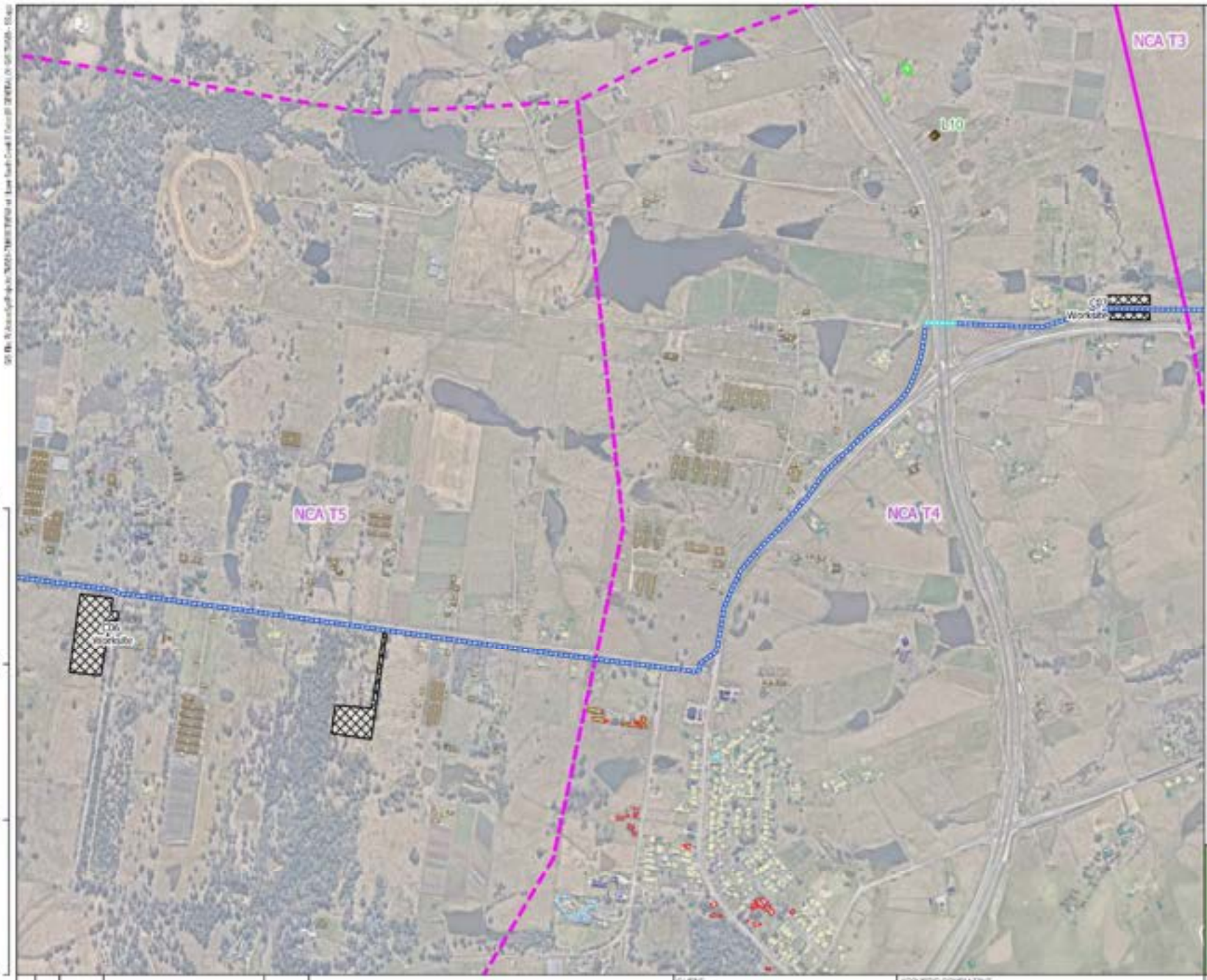
0 200 400 600 800 m
1:12,000 At size A3
FULL SIZE AS REDUCED TO A4
NOTE: Do not scale from this drawing

CLIENT: JOHN HOLLAND

ACOUSTIC CONSULTANT: RENZO TONIN & ASSOCIATES
inspired to achieve

UPPER SOUTH CREEK ADVANCED WATER RECYCLING CENTER AND ASSOCIATED PIPELINES

Landuse, NCAs, Worksites and Proposed Pipelines



LEGEND

Noise Sensitive Receivers

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Proposed Pipelines

- Treated Water Pipeline
- Brine Pipeline
- Brine Pipeline - Underbore
- Treated Water Pipeline - Underbore

NCA	NML_DS	NML_DO	NML_E	NML_N
NCA T3	62	47	44	38
NCA T4	55	50	45	40
NCA T5	55	50	45	40

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UPPER SOUTH CREEK ADVANCED WATER RECYCLING CENTER AND ASSOCIATED PIPELINES

Landuse, NCAs, Worksites and Proposed Pipelines

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Proposed Pipelines

- Treated Water Pipeline
- Brine Pipeline
- Brine Pipeline - Underbore
- Treated Water Pipeline - Underbore

NCA	NML_DS	NML_DO	NML_E	NML_N
NCA T1	45	40	40	38
NCA T2	50	45	42	35
NCA T3	52	47	44	38
NCA T4	55	50	45	40

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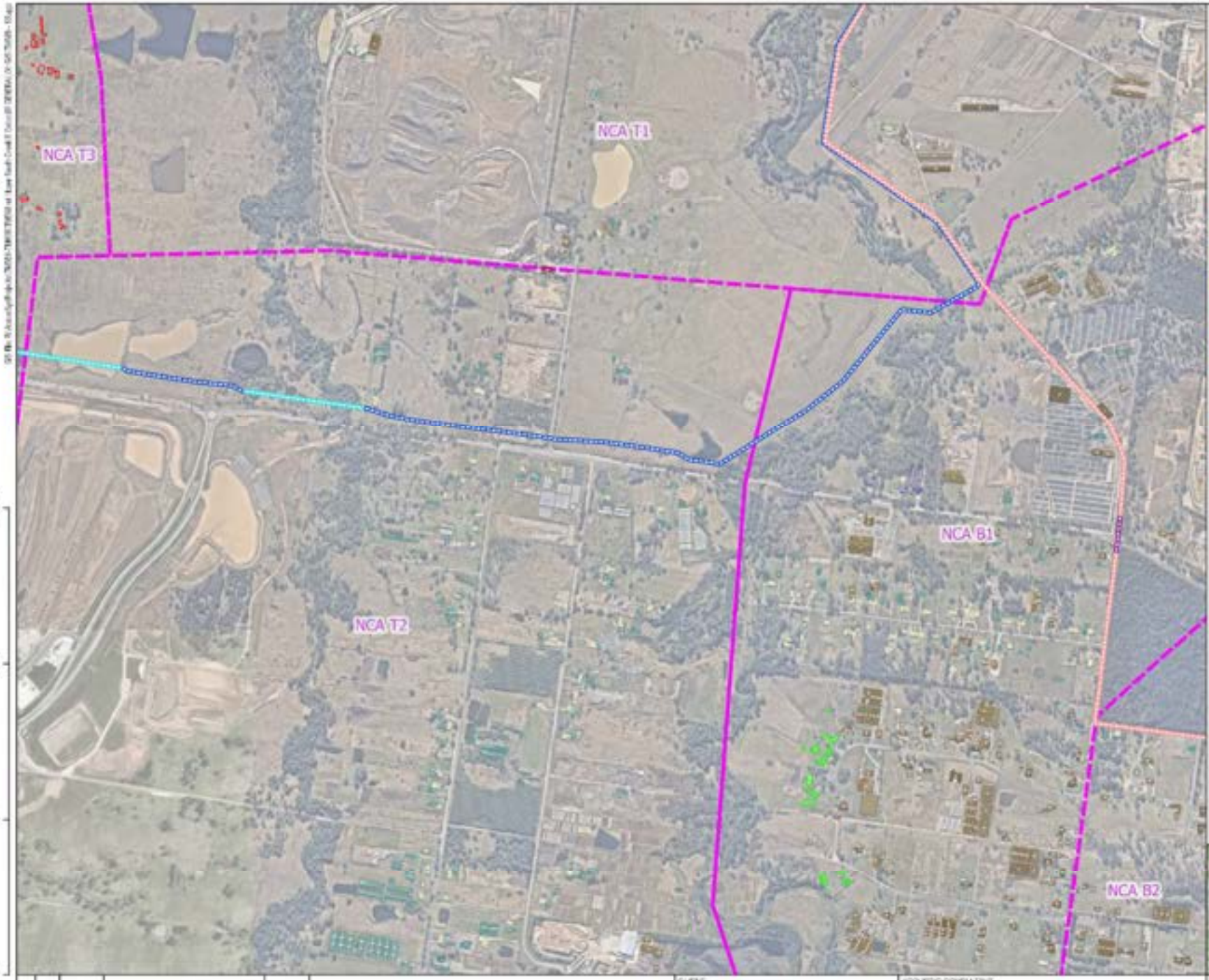
Landuse, NCAs, Worksites and Proposed Pipelines



LEGEND

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Proposed Pipelines

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- Brine Pipeline
- Brine Pipeline - Underbore
- Treated Water Pipeline - Underbore

NCA	NML_DS	NML_DO	NML_E	NML_N
NCA B1	49	44	47	40
NCA B2	49	44	47	40
NCA T1	45	40	40	36
NCA T2	50	45	42	35
NCA T3	52	47	44	38

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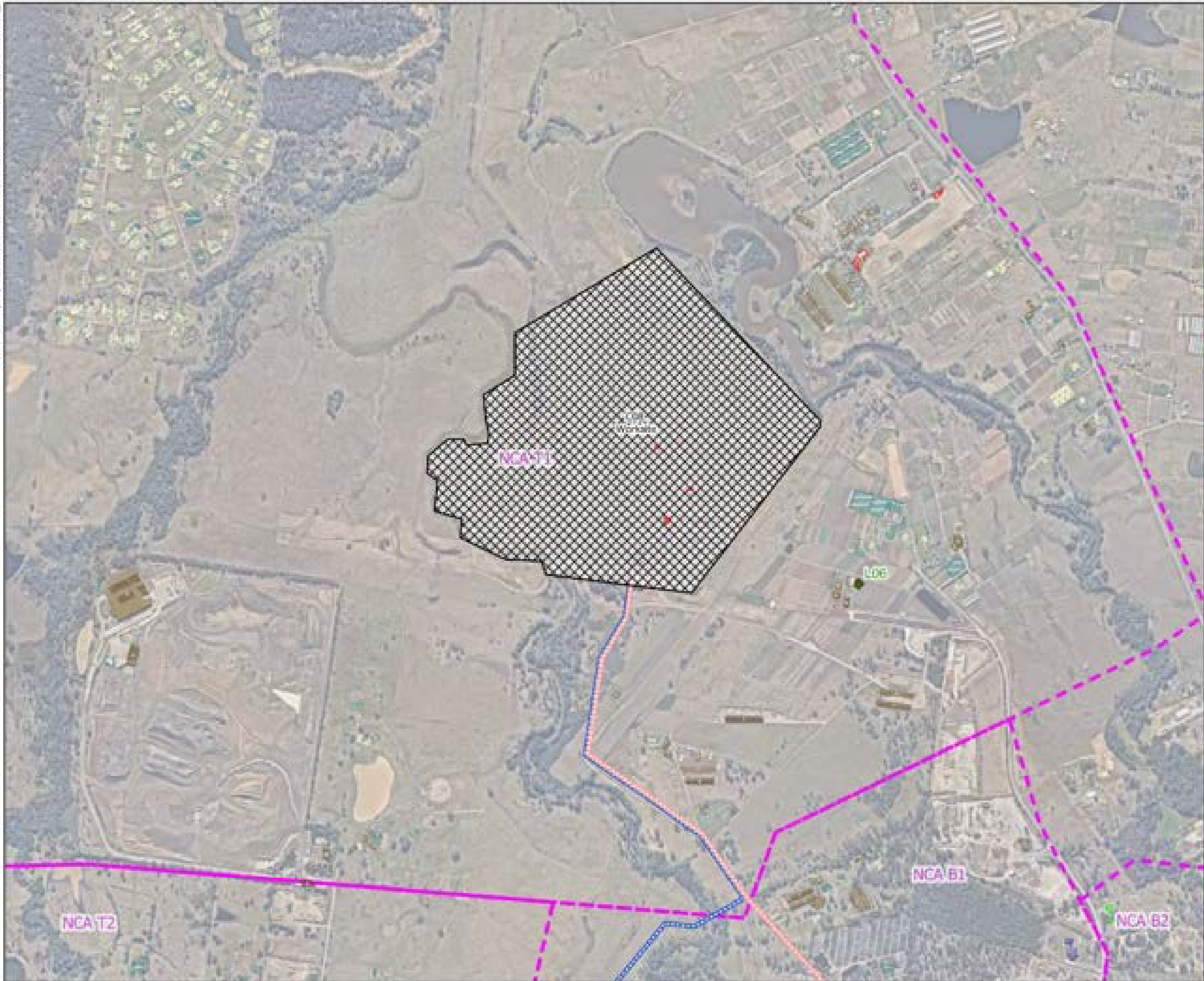

LEGEND

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FULL SIZE A3, REDUCED TO A4
NOTE: Do not scale from the drawing
A3 Original
Co-ordinate System: MGA Zone 56

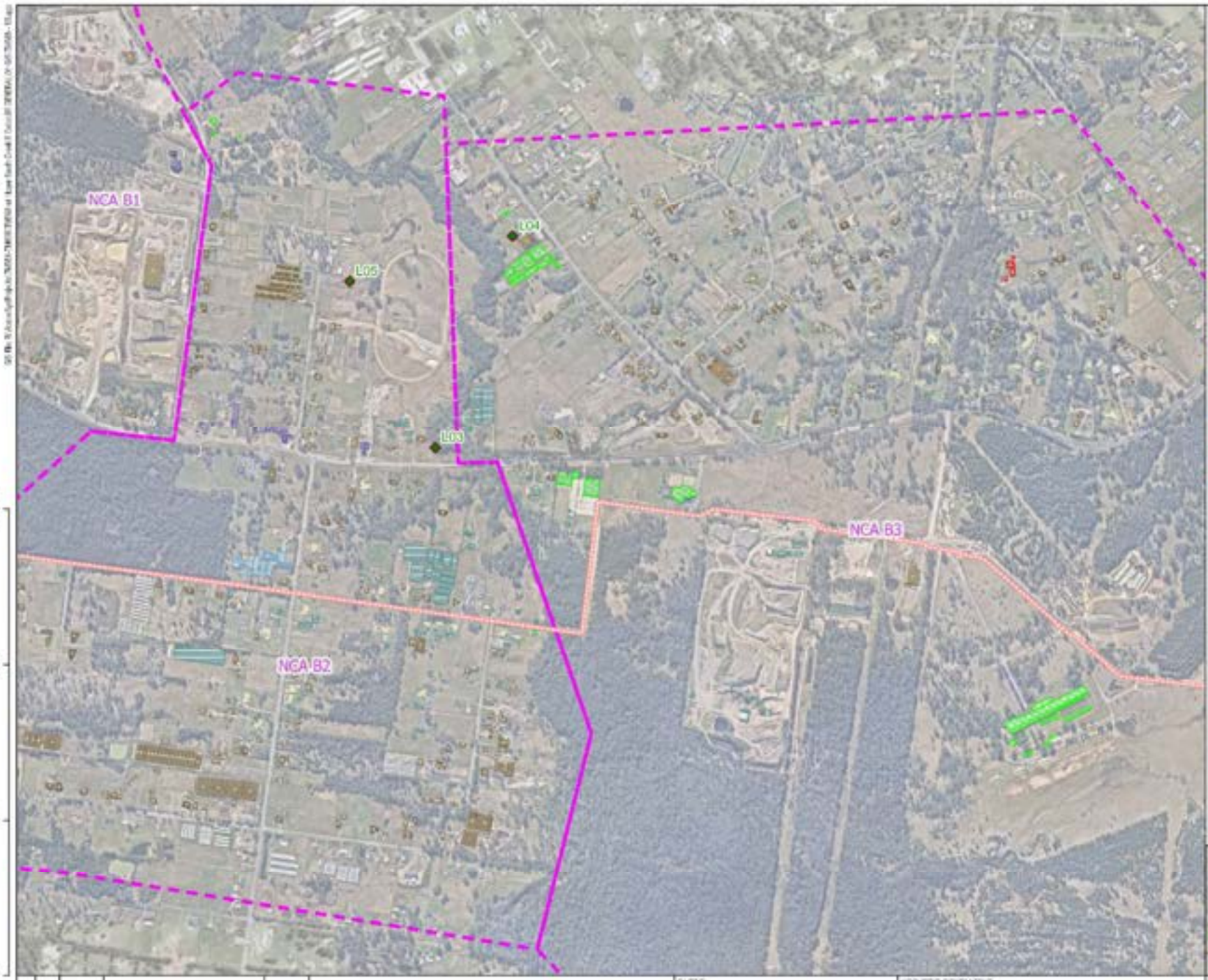
CLIENT: JOHN HOLLAND

ACOUSTIC CONSULTANT: RENZO TONIN & ASSOCIATES — inspired to achieve

UPPER SOUTH CREEK ADVANCED WATER RECYCLING CENTER AND ASSOCIATED PIPELINES

Landuse, NCAs, Worksites and Proposed Pipelines

Sheet 5 of 10



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NCA	NML_DS	NML_DO	NML_E	NML_N
NCA B1	49	44	47	40
NCA B2	49	44	47	40
NCA B3	64	59	53	42

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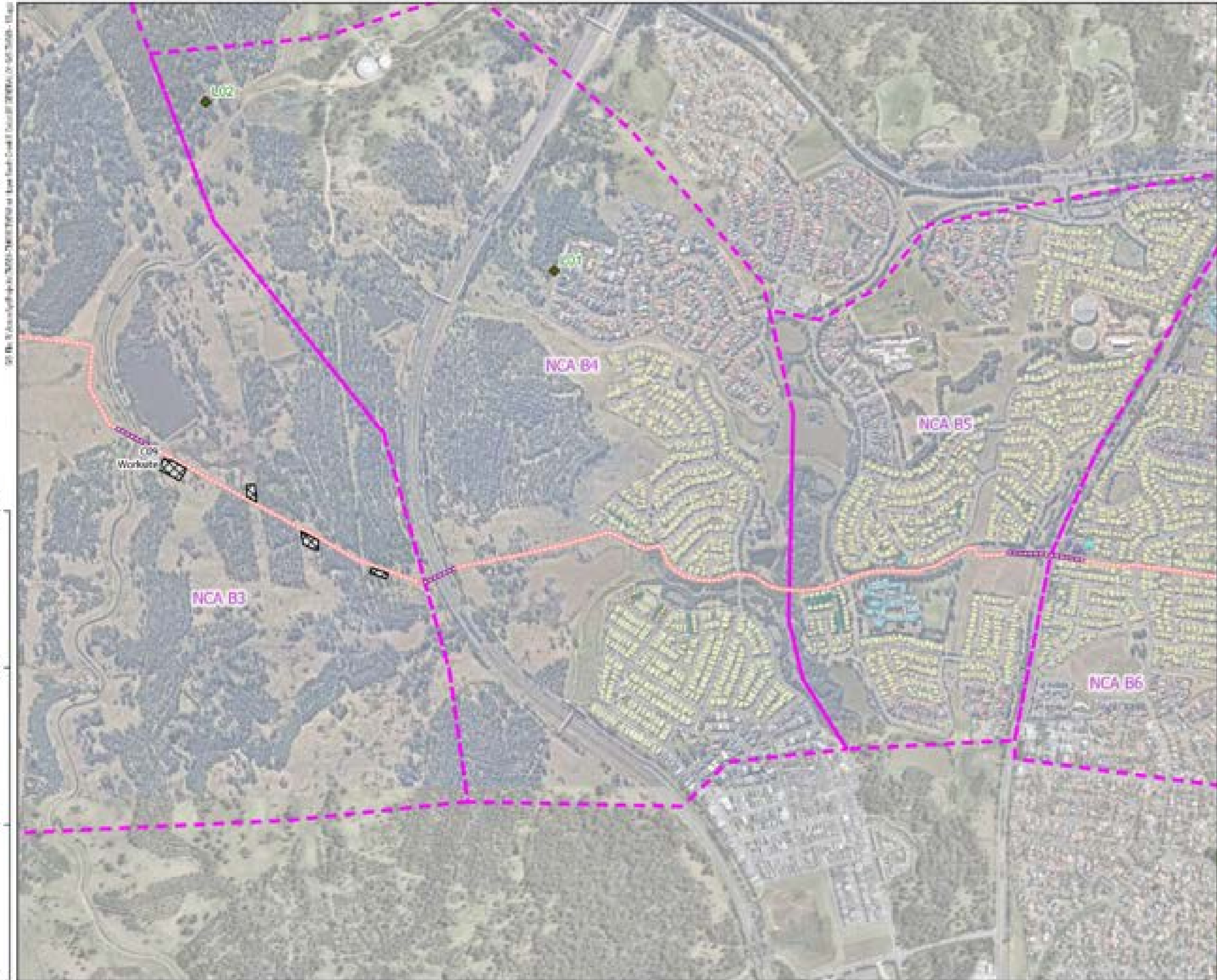

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NCA	NML_DS	NML_DO	NML_E	NML_N
NCA B3	64	59	53	42
NCA B4	55	50	49	45
NCA B5	55	50	49	45
NCA B6	60	55	50	45

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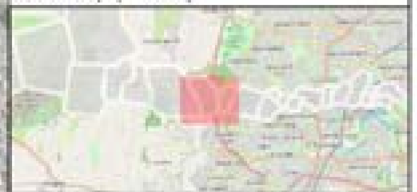

REV	BY	DATE	DESCRIPTION	APPROVED
1	1		Modify Worksites/Pipeline	
0			Prepare figures	

A3 Original | Co-ordinate System: MGA Zone 56

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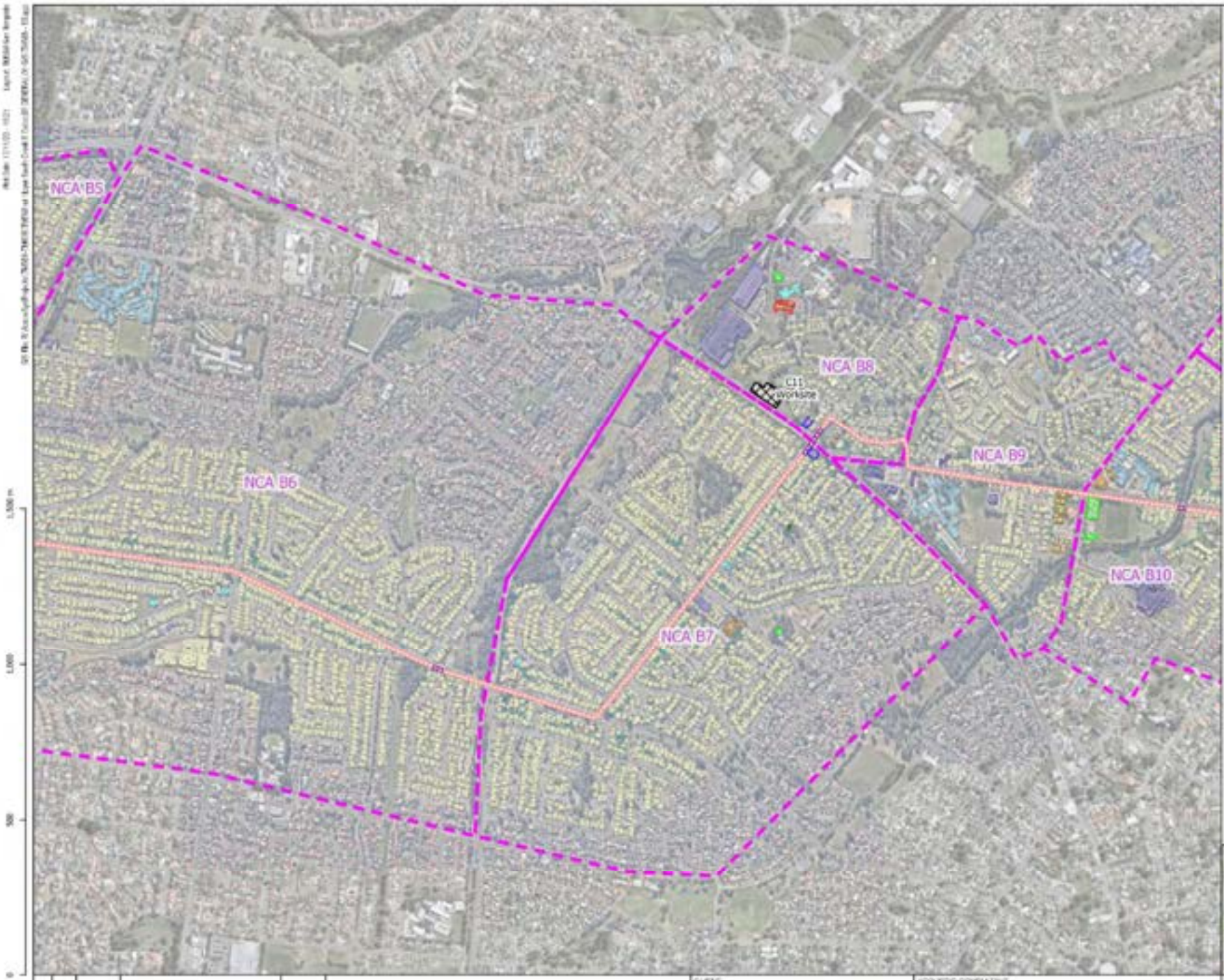
UPPER SOUTH CREEK ADVANCED WATER RECYCLING CENTER AND ASSOCIATED PIPELINES

Landuse, NCAs, Worksites and Proposed Pipelines

Sheet: 7 of 10



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Proposed Pipelines

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NCA	NML_DS	NML_DO	NML_E	NML_N
NCA B10	60	55	50	45
NCA B11	55	50	45	40
NCA B5	55	50	49	45
NCA B6	60	55	50	45
NCA B7	60	55	50	45
NCA B8	60	55	50	45
NCA B9	60	55	50	45

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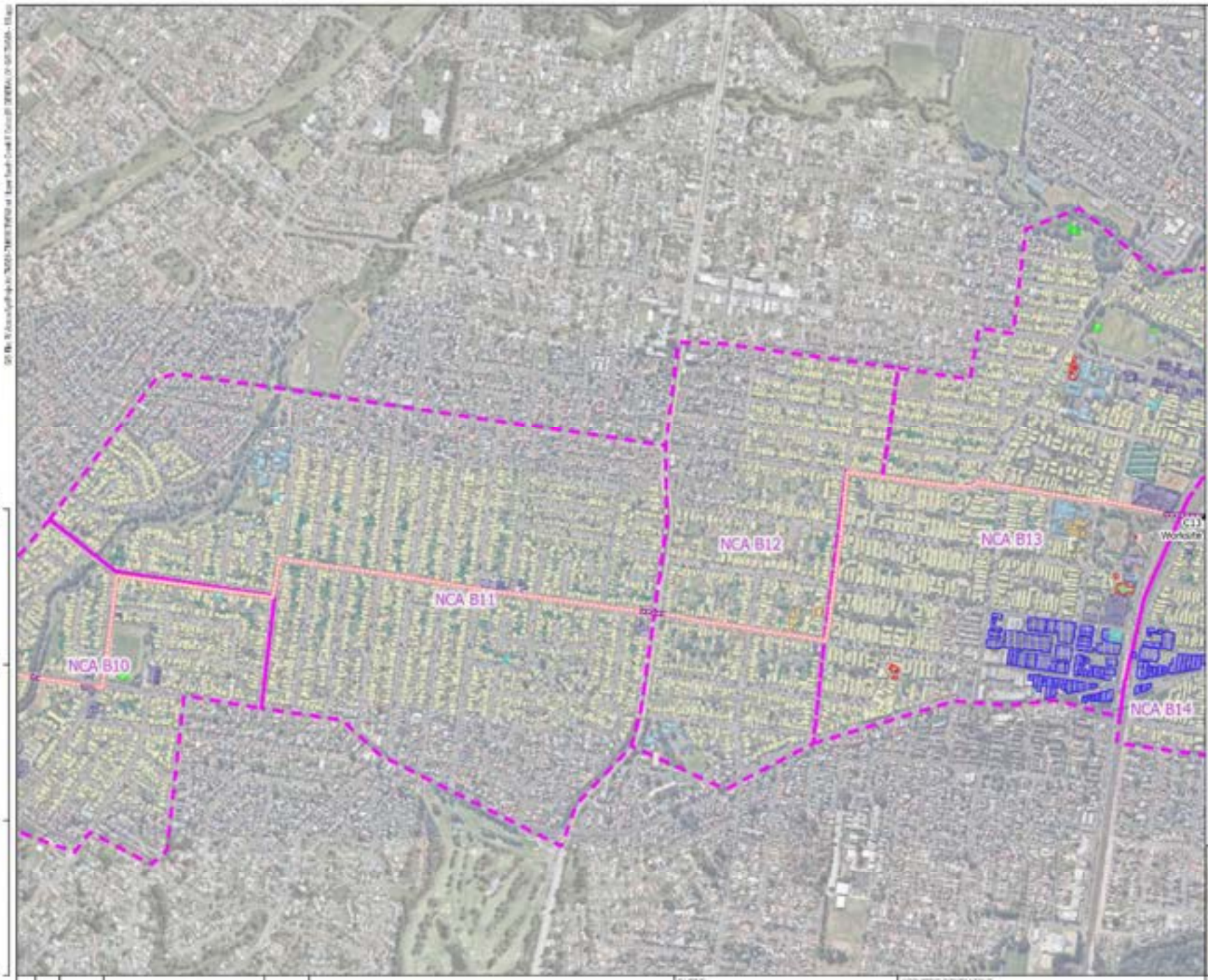
Landuse, NCAs, Worksites and Proposed Pipelines



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NCA	NML_DS	NML_DO	NML_E	NML_N
NCA B10	60	55	50	45
NCA B11	55	50	45	40
NCA B12	55	50	45	40
NCA B13	60	55	50	45
NCA B14	55	50	45	40

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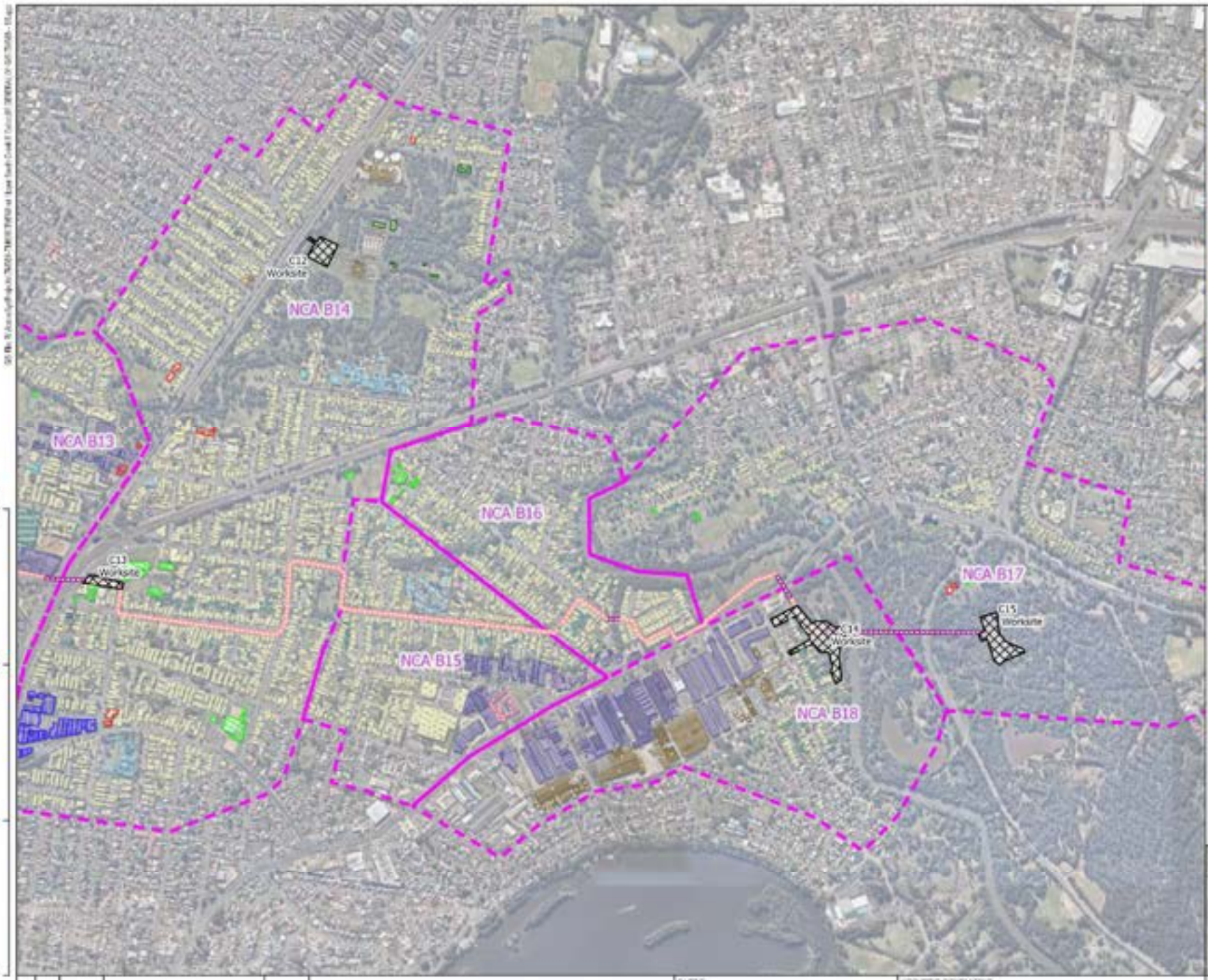
Landuse, NCAs, Worksites and Proposed Pipelines



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NCA	NML_DS	NML_DO	NML_E	NML_N
NCA B13	60	55	50	45
NCA B14	55	50	45	40
NCA B15	60	55	50	45
NCA B16	55	50	45	40
NCA B17	60	55	50	45
NCA B18	60	55	50	45

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UPPER SOUTH CREEK ADVANCED WATER RECYCLING CENTER AND ASSOCIATED PIPELINES

Landuse, NCAs, Worksites and Proposed Pipelines

Appendix F – Safe Working Distances for Typical Vibratory Intensive Plant

Plot Date: 30/05/23 - 12:28 Layout: TM588 MWD

GIS File: R:\Acoustic\Projects\TM501-TM600\TM588 mt Ulgow South Creek\5 Calcs\00 GENERAL\01 GIS\TM588 - 53.qgz

LEGEND

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Receivers within MWD for cosmetic damage

USC AWRC

MWD for cosmetic damage and human annoyance for Vibratory Roller

- Reinforced structures (25.0mm/s ppv)
- Unreinforced structures (7.5mm/s ppv)
- Heritage structures (2.5mm/s ppv)
- Human annoyance - Residential (day)

REV	BY	DATE	DESCRIPTION	APPROVED
r0	SS	30/05/23	Prepare figures	DA

A3 Original | Co-ordinate System: MGA Zone 56

0 100 200 300 400 m

1:8,000 At size A3

FULL SIZE A3, REDUCED TO A4

NOTE: Do not scale from this drawing

N

CLIENT

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RENZO TONIN & ASSOCIATES

inspired to achieve

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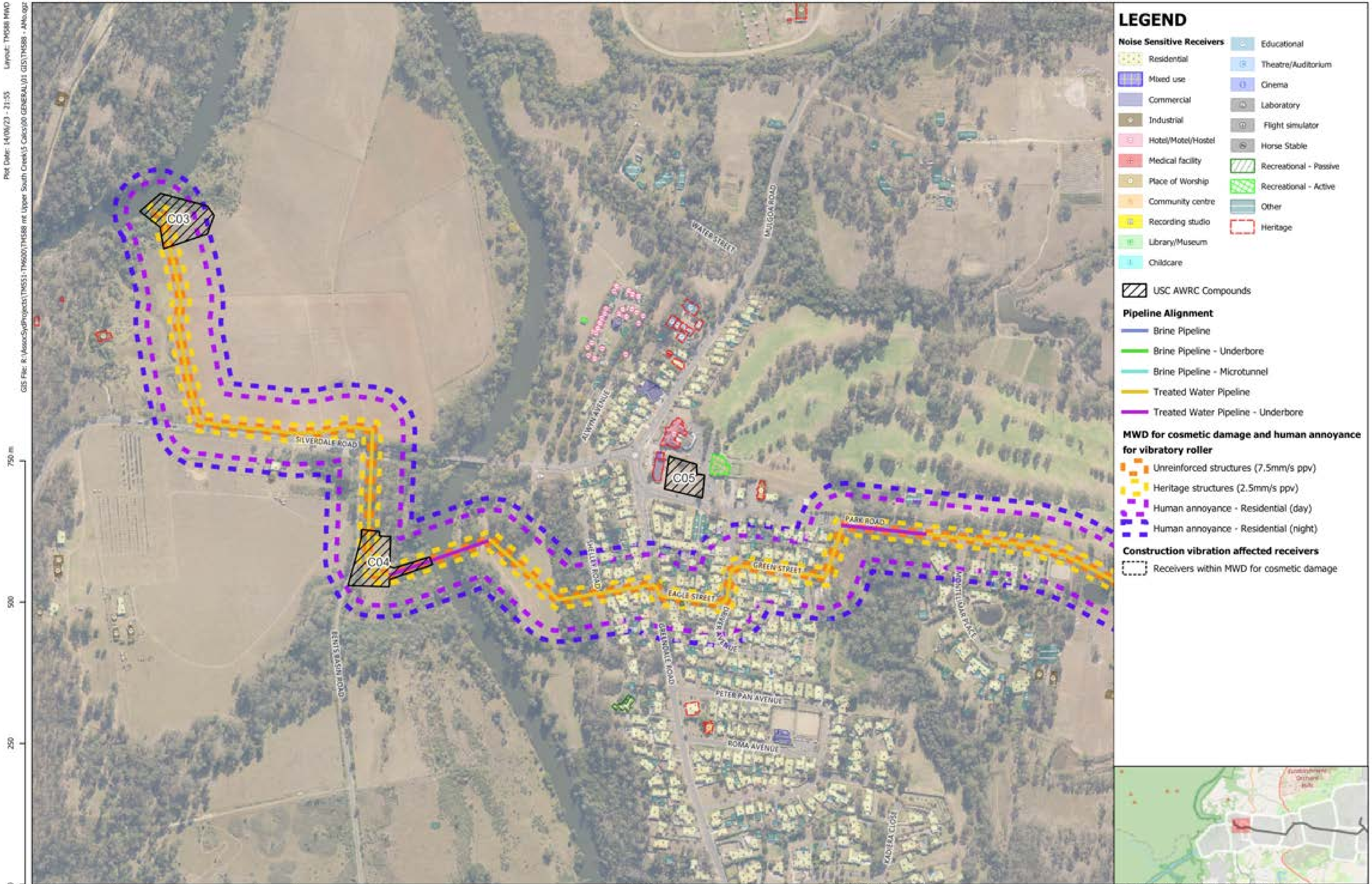
UPPER SOUTH CREEK ADVANCED WATER RECYCLING CENTER

MWD for cosmetic damage and human annoyance

Sheet 1 of 1


Plot Date: 14/06/23 - 21:55
Layout: TM588 MWD
LEGEND
Noise Sensitive Receivers
Residential
Mixed use
Commercial
Industrial
Hotel/Motel/Hostel
Medical facility
Place of Worship
Community centre
Recording studio
Library/Museum
Childcare
Educational
Theatre/Auditorium
Cinema
Laboratory
Flight simulator
Horse Stable
Recreational - Passive
Recreational - Active
Other
Heritage
USC AWRC Compounds
Pipeline Alignment
Brine Pipeline
Brine Pipeline - Underbore
Brine Pipeline - Microtunnel
Treated Water Pipeline
Treated Water Pipeline - Underbore
MWD for cosmetic damage and human annoyance for vibratory roller
Unreinforced structures (7.5mm/s ppv)
Heritage structures (2.5mm/s ppv)
Human annoyance - Residential (day)
Human annoyance - Residential (night)
Construction vibration affected receivers
Receivers within MWD for cosmetic damage
C03
C04
C05
SILVERDALE ROAD
WATER STREET
MULGOA ROAD
ALWYN AVENUE
PARK ROAD
GREEN STREET
EAGLE STREET
SHELLEY ROAD
GREENDALE ROAD
BENTS BASIN ROAD
PETER PAN AVENUE
ROMA AVENUE
750 m
500
250
0

REV	BY	DATE	DESCRIPTION	APPROVER
r0	DA	14/06/23	Prepare figures	AM

A3 Original

Co-ordinate System: MGA Zone 56

0 100 200 300 400 m

1:6,000 At size A3

N

FULL SIZE A3, REDUCED TO A4

NOTE: Do not scale from this drawing.

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UPPER SOUTH CREEK ADVANCED WATER RECYCLING CENTER

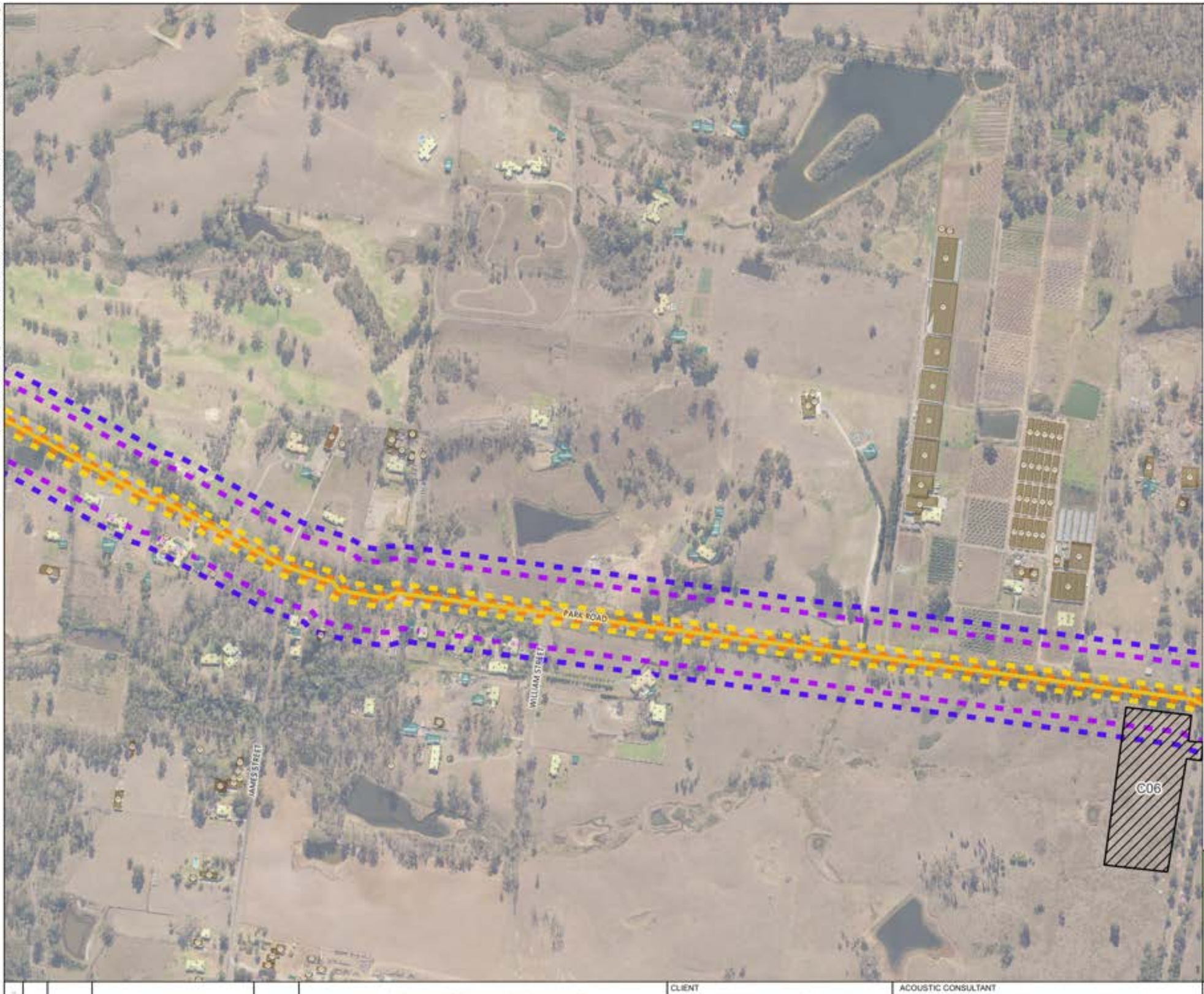
MWD for cosmetic damage and human annoyance

Sheet 1 of 19

Plot Date: 14/06/23 - 21:55 Layout: TM588 MWD

GIS File: R:\AssocSydProjects\TM551-TM600\TM588 mt Upper South Creek\5 Calcs\00 GENERAL\01 GIS\TM588 - AMo.qgz

750 m
500
250
0



LEGEND

Noise Sensitive Receivers

- Residential
- Mixed use
- Commercial
- Industrial
- Hotel/Motel/Hostel
- Medical facility
- Place of Worship
- Community centre
- Recording studio
- Library/Museum
- Childcare
- Educational
- Theatre/Auditorium
- Cinema
- Laboratory
- Flight simulator
- Horse Stable
- Recreational - Passive
- Recreational - Active
- Other
- Heritage

USC AWRC Compounds

Pipeline Alignment

- Brine Pipeline
- Brine Pipeline - Underbore
- Brine Pipeline - Microtunnel
- Treated Water Pipeline
- Treated Water Pipeline - Underbore

MWD for cosmetic damage and human annoyance for vibratory roller

- Unreinforced structures (7.5mm/s ppv)
- Heritage structures (2.5mm/s ppv)
- Human annoyance - Residential (day)
- Human annoyance - Residential (night)

Construction vibration affected receivers

- Receivers within MWD for cosmetic damage

REV	BY	DATE	DESCRIPTION	APPROVED
r0	DA	14/06/23	Prepare figures	AM

A3 Original

Co-ordinate System: MGA Zone 56

0 100 200 300 400 m N

1:6,000 At size A3

FULL SIZE A3, REDUCED TO A4

NOTE: Do not scale from this drawing.

CLIENT

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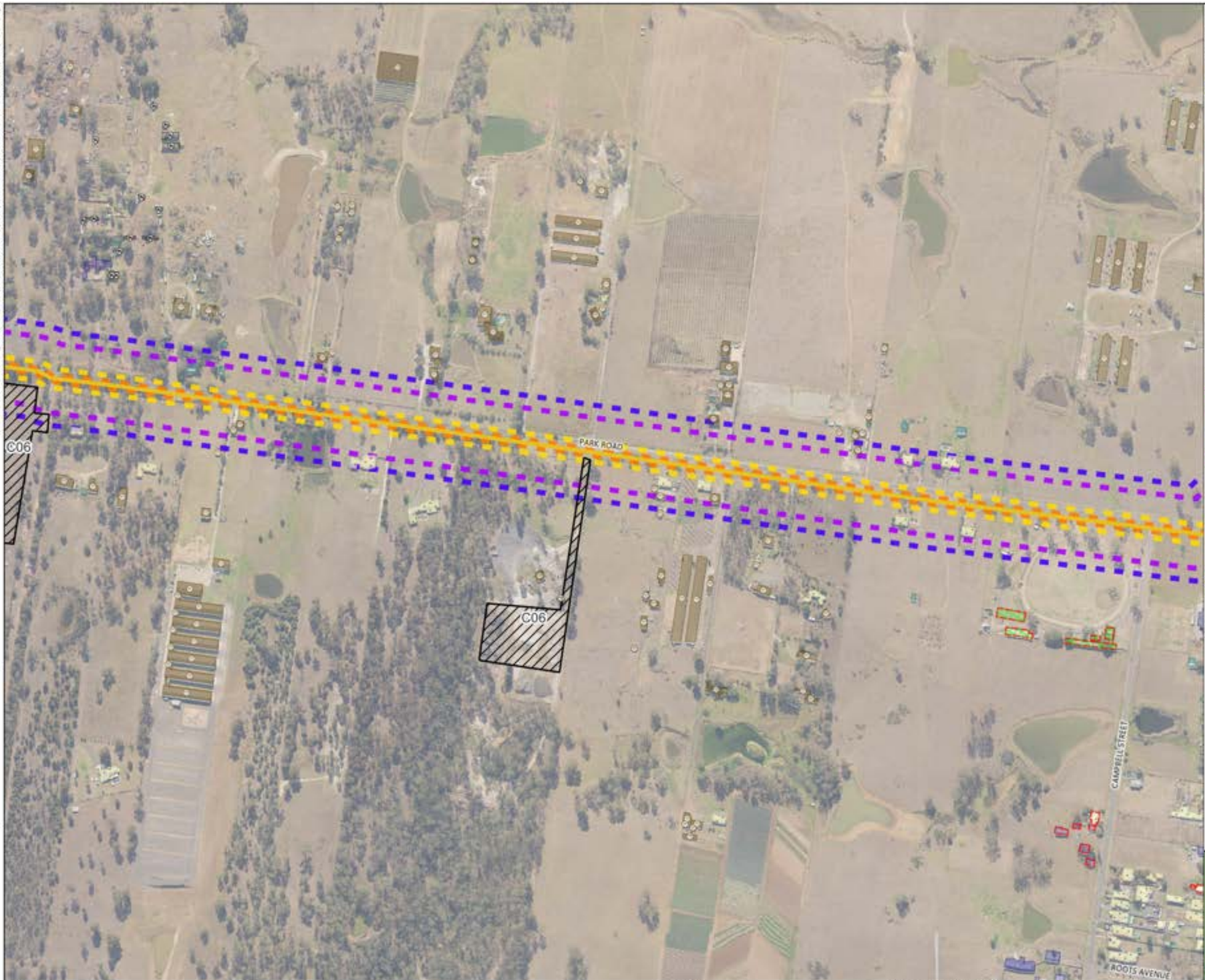
UPPER SOUTH CREEK ADVANCED WATER RECYCLING CENTER

MWD for cosmetic damage and human annoyance

Plot Date: 14/06/23 - 21:56 Layout: TM588 MWD

GIS File: R:\AcousSydProjects\TM551-TM600\TM588 mt Upper South Creek\5 Calcs\00 GENERAL\01 GIS\TM588 - AMo.qgz



LEGEND

Noise Sensitive Receivers

- Residential
- Mixed use
- Commercial
- Industrial
- Hotel/Motel/Hostel
- Medical facility
- Place of Worship
- Community centre
- Recording studio
- Library/Museum
- Childcare
- Educational
- Theatre/Auditorium
- Cinema
- Laboratory
- Flight simulator
- Horse Stable
- Recreational - Passive
- Recreational - Active
- Other
- Heritage

USC AWRC Compounds

Pipeline Alignment

- Brine Pipeline
- Brine Pipeline - Underbore
- Brine Pipeline - Microtunnel
- Treated Water Pipeline
- Treated Water Pipeline - Underbore

MWD for cosmetic damage and human annoyance for vibratory roller

- Unreinforced structures (7.5mm/s ppv)
- Heritage structures (2.5mm/s ppv)
- Human annoyance - Residential (day)
- Human annoyance - Residential (night)

Construction vibration affected receivers

- Receivers within MWD for cosmetic damage

REV	BY	DATE	DESCRIPTION	APPROVED
r0	DA	14/06/23	Prepare figures	AM

A3 Original

Co-ordinate System: MGA Zone 56

0 100 200 300 400 m

1:6,000 At size A3

FULL SIZE A3, REDUCED TO A4

NOTE: Do not scale from this drawing.

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UPPER SOUTH CREEK ADVANCED WATER RECYCLING CENTER

MWD for cosmetic damage and human annoyance

Plot Date: 14/06/23 - 21:57 Layout: TM588 MWD

GIS File: R:\AssocSydProjects\TM551-TM600\TM588 mt Upper South Creek\5 Calcs\00 GENERAL\01 GIS\TM588 - AMo.qgz

C07

C07

ELIZABETH DRIVE

THE NORTHERN ROAD

WILLMINGTON ROAD

PARK ROAD

750 m

500

250

0

LEGEND

Noise Sensitive Receivers

- Residential
- Mixed use
- Commercial
- Industrial
- Hotel/Motel/Hostel
- Medical facility
- Place of Worship
- Community centre
- Recording studio
- Library/Museum
- Childcare
- Educational
- Theatre/Auditorium
- Cinema
- Laboratory
- Flight simulator
- Horse Stable
- Recreational - Passive
- Recreational - Active
- Other
- Heritage

USC AWRC Compounds

Pipeline Alignment

- Brine Pipeline
- Brine Pipeline - Underbore
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- Treated Water Pipeline
- Treated Water Pipeline - Underbore

MWD for cosmetic damage and human annoyance for vibratory roller

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- Heritage structures (2.5mm/s ppv)
- Human annoyance - Residential (day)
- Human annoyance - Residential (night)

Construction vibration affected receivers

- Receivers within MWD for cosmetic damage

REV	BY	DATE	DESCRIPTION	APPROVED
r0	DA	14/06/23	Prepare figures	AM

A3 Original

Co-ordinate System: MGA Zone 56

0 100 200 300 400 m N

1:6,000 At size A3

FULL SIZE A3, REDUCED TO A4

NOTE: Do not scale from this drawing.

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UPPER SOUTH CREEK ADVANCED WATER RECYCLING CENTER

MWD for cosmetic damage and human annoyance

Plot Date: 14/06/23 - 21:57 Layout: TM588 MWD

GIS File: R:\AssocSydProjects\TM551-TM600\TM588 mt Upper South Creek\5 Calcs\00 GENERAL\01 GIS\TM588 - AMo.qgz

LEGEND

Noise Sensitive Receivers

- Residential
- Mixed use
- Commercial
- Industrial
- Hotel/Motel/Hostel
- Medical facility
- Place of Worship
- Community centre
- Recording studio
- Library/Museum
- Childcare
- Educational
- Theatre/Auditorium
- Cinema
- Laboratory
- Flight simulator
- Horse Stable
- Recreational - Passive
- Recreational - Active
- Other
- Heritage

USC AWRC Compounds

Pipeline Alignment

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- Treated Water Pipeline
- Treated Water Pipeline - Underbore

MWD for cosmetic damage and human annoyance for vibratory roller

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- Heritage structures (2.5mm/s ppv)
- Human annoyance - Residential (day)
- Human annoyance - Residential (night)

Construction vibration affected receivers

- Receivers within MWD for cosmetic damage

REV	BY	DATE	DESCRIPTION	APPROVED
r0	DA	14/06/23	Prepare figures	AM

A3 Original

Co-ordinate System: MGA Zone 56

0 100 200 300 400 m

1:6,000 At size A3

FULL SIZE A3, REDUCED TO A4

NOTE: Do not scale from this drawing.

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UPPER SOUTH CREEK ADVANCED WATER RECYCLING CENTER

MWD for cosmetic damage and human annoyance

Plot Date: 14/06/23 - 21:58 Layout: TM588 MWD

GIS File: R:\AssocSydProjects\TM551-TM600\TM588 mt Upper South Creek\5 Calcs\00 GENERAL\01 GIS\TM588 - AMo.qgz

750 m
500
250
0

ELIZABETH DRIVE

BADGERYS CREEK ROAD

LEGEND

Noise Sensitive Receivers

- Residential
- Mixed use
- Commercial
- Industrial
- Hotel/Motel/Hostel
- Medical facility
- Place of Worship
- Community centre
- Recording studio
- Library/Museum
- Childcare
- Educational
- Theatre/Auditorium
- Cinema
- Laboratory
- Flight simulator
- Horse Stable
- Recreational - Passive
- Recreational - Active
- Other
- Heritage

USC AWRC Compounds

Pipeline Alignment

- Brine Pipeline
- Brine Pipeline - Underbore
- Brine Pipeline - Microtunnel
- Treated Water Pipeline
- Treated Water Pipeline - Underbore

MWD for cosmetic damage and human annoyance for vibratory roller

- Unreinforced structures (7.5mm/s ppv)
- Heritage structures (2.5mm/s ppv)
- Human annoyance - Residential (day)
- Human annoyance - Residential (night)

Construction vibration affected receivers

- Receivers within MWD for cosmetic damage

REV	BY	DATE	DESCRIPTION	APPROVED
r0	DA	14/06/23	Prepare figures	AM

A3 Original

Co-ordinate System: MGA Zone 56

0 100 200 300 400 m

1:6,000 At size A3

FULL SIZE A3, REDUCED TO A4

NOTE: Do not scale from this drawing.

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UPPER SOUTH CREEK ADVANCED WATER RECYCLING CENTER

MWD for cosmetic damage and human annoyance

Plot Date: 14/06/23 - 21:58 Layout: TM588 MWD

GIS File: R:\AssocSydProjects\TM551-TM600\TM588 mt Upper South Creek\5 Calcs\00 GENERAL\01 GIS\TM588 - AMo.qgz

750 m

500

250

0

ELIZABETH Drive

LAWSON ROAD

MARTIN ROAD

LEGEND

Noise Sensitive Receivers

- Residential
- Mixed use
- Commercial
- Industrial
- Hotel/Motel/Hostel
- Medical facility
- Place of Worship
- Community centre
- Recording studio
- Library/Museum
- Childcare
- Educational
- Theatre/Auditorium
- Cinema
- Laboratory
- Flight simulator
- Horse Stable
- Recreational - Passive
- Recreational - Active
- Other
- Heritage

USC AWRC Compounds

Pipeline Alignment

- Brine Pipeline
- Brine Pipeline - Underbore
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- Treated Water Pipeline
- Treated Water Pipeline - Underbore

MWD for cosmetic damage and human annoyance for vibratory roller

- Unreinforced structures (7.5mm/s ppv)
- Heritage structures (2.5mm/s ppv)
- Human annoyance - Residential (day)
- Human annoyance - Residential (night)

Construction vibration affected receivers

- Receivers within MWD for cosmetic damage

REV	BY	DATE	DESCRIPTION	APPROVED
r0	DA	14/06/23	Prepare figures	AM

A3 Original

Co-ordinate System: MGA Zone 56

0 100 200 300 400 m

1:6,000 At size A3

FULL SIZE A3, REDUCED TO A4

NOTE: Do not scale from this drawing.

N

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UPPER SOUTH CREEK ADVANCED WATER RECYCLING CENTER

MWD for cosmetic damage and human annoyance

Plot Date: 14/06/23 - 21:59 Layout: TM588 MWD

GIS File: R:\AssocSydProjects\TM551-TM600\TM588 mt Upper South Creek\5 Calcs\00 GENERAL\01 GIS\TM588 - AMo.qgz

750 m
500
250
0

ELIZABETH DRIVE

CLIFTON AVENUE

WESTERN ROAD

LEGEND

Noise Sensitive Receivers

- Residential
- Mixed use
- Commercial
- Industrial
- Hotel/Motel/Hostel
- Medical facility
- Place of Worship
- Community centre
- Recording studio
- Library/Museum
- Childcare
- Educational
- Theatre/Auditorium
- Cinema
- Laboratory
- Flight simulator
- Horse Stable
- Recreational - Passive
- Recreational - Active
- Other
- Heritage

USC AWRC Compounds

Pipeline Alignment

- Brine Pipeline
- Brine Pipeline - Underbore
- Brine Pipeline - Microtunnel
- Treated Water Pipeline
- Treated Water Pipeline - Underbore

MWD for cosmetic damage and human annoyance for vibratory roller

- Unreinforced structures (7.5mm/s ppv)
- Heritage structures (2.5mm/s ppv)
- Human annoyance - Residential (day)
- Human annoyance - Residential (night)

Construction vibration affected receivers

- Receivers within MWD for cosmetic damage

REV	BY	DATE	DESCRIPTION	APPROVED
r0	DA	14/06/23	Prepare figures	AM

A3 Original

Co-ordinate System: MGA Zone 56

0 100 200 300 400 m

1:6,000 At size A3

FULL SIZE A3, REDUCED TO A4

NOTE: Do not scale from this drawing.

N

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UPPER SOUTH CREEK ADVANCED WATER RECYCLING CENTER

MWD for cosmetic damage and human annoyance

Plot Date: 14/06/23 - 22:00 Layout: TM588 MWD

GIS File: R:\AssocSydProjects\TM551-TM600\TM588 mt Upper South Creek\5 Calcs\00 GENERAL\01 GIS\TM588 - AMo.qgz

750 m
500
250
0

©08

LEGEND

Noise Sensitive Receivers

- Residential
- Mixed use
- Commercial
- Industrial
- Hotel/Motel/Hostel
- Medical facility
- Place of Worship
- Community centre
- Recording studio
- Library/Museum
- Childcare
- Educational
- Theatre/Auditorium
- Cinema
- Laboratory
- Flight simulator
- Horse Stable
- Recreational - Passive
- Recreational - Active
- Other
- Heritage

USC AWRC Compounds

Pipeline Alignment

- Brine Pipeline
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- Brine Pipeline - Microtunnel
- Treated Water Pipeline
- Treated Water Pipeline - Underbore

MWD for cosmetic damage and human annoyance for vibratory roller

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- Heritage structures (2.5mm/s ppv)
- Human annoyance - Residential (day)
- Human annoyance - Residential (night)

Construction vibration affected receivers

- Receivers within MWD for cosmetic damage

REV	BY	DATE	DESCRIPTION	APPROVED
r0	DA	14/06/23	Prepare figures	AM

A3 Original | Co-ordinate System: MGA Zone 56

0 100 200 300 400 m N

1:6,000 At size A3

FULL SIZE A3, REDUCED TO A4

NOTE: Do not scale from this drawing.

CLIENT

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UPPER SOUTH CREEK ADVANCED WATER RECYCLING CENTER

MWD for cosmetic damage and human annoyance

Plot Date: 14/06/23 - 22:00 Layout: TM588 MWD

GIS File: R:\AssocSydProjects\TM551-TM600\TM588 mt Upper South Creek\5 Calcs\00 GENERAL\01 GIS\TM588 - AMo.qgz

750 m
500
250
0

OVERETT AVENUE
ELIZABETH DRIVE
CLIFTON AVENUE
SALISBURY AVENUE
WESTERN ROAD
CROSS STREET
PLOWES COURT
DEVONSHIRE ROAD
SUMBRAY AVENUE
TURNBULL AVENUE
EXETER ROAD

LEGEND

Noise Sensitive Receivers

- Residential
- Mixed use
- Commercial
- Industrial
- Hotel/Motel/Hostel
- Medical facility
- Place of Worship
- Community centre
- Recording studio
- Library/Museum
- Childcare
- Educational
- Theatre/Auditorium
- Cinema
- Laboratory
- Flight simulator
- Horse Stable
- Recreational - Passive
- Recreational - Active
- Other
- Heritage

USC AWRC Compounds

Pipeline Alignment

- Brine Pipeline
- Brine Pipeline - Underbore
- Brine Pipeline - Microtunnel
- Treated Water Pipeline
- Treated Water Pipeline - Underbore

MWD for cosmetic damage and human annoyance for vibratory roller

- Unreinforced structures (7.5mm/s ppv)
- Heritage structures (2.5mm/s ppv)
- Human annoyance - Residential (day)
- Human annoyance - Residential (night)

Construction vibration affected receivers

- Receivers within MWD for cosmetic damage

REV	BY	DATE	DESCRIPTION	APPROVED
r0	DA	14/06/23	Prepare figures	AM

A3 Original

Co-ordinate System: MGA Zone 56

0 100 200 300 400 m

1:6,000 At size A3

FULL SIZE A3, REDUCED TO A4

NOTE: Do not scale from this drawing.

N

CLIENT

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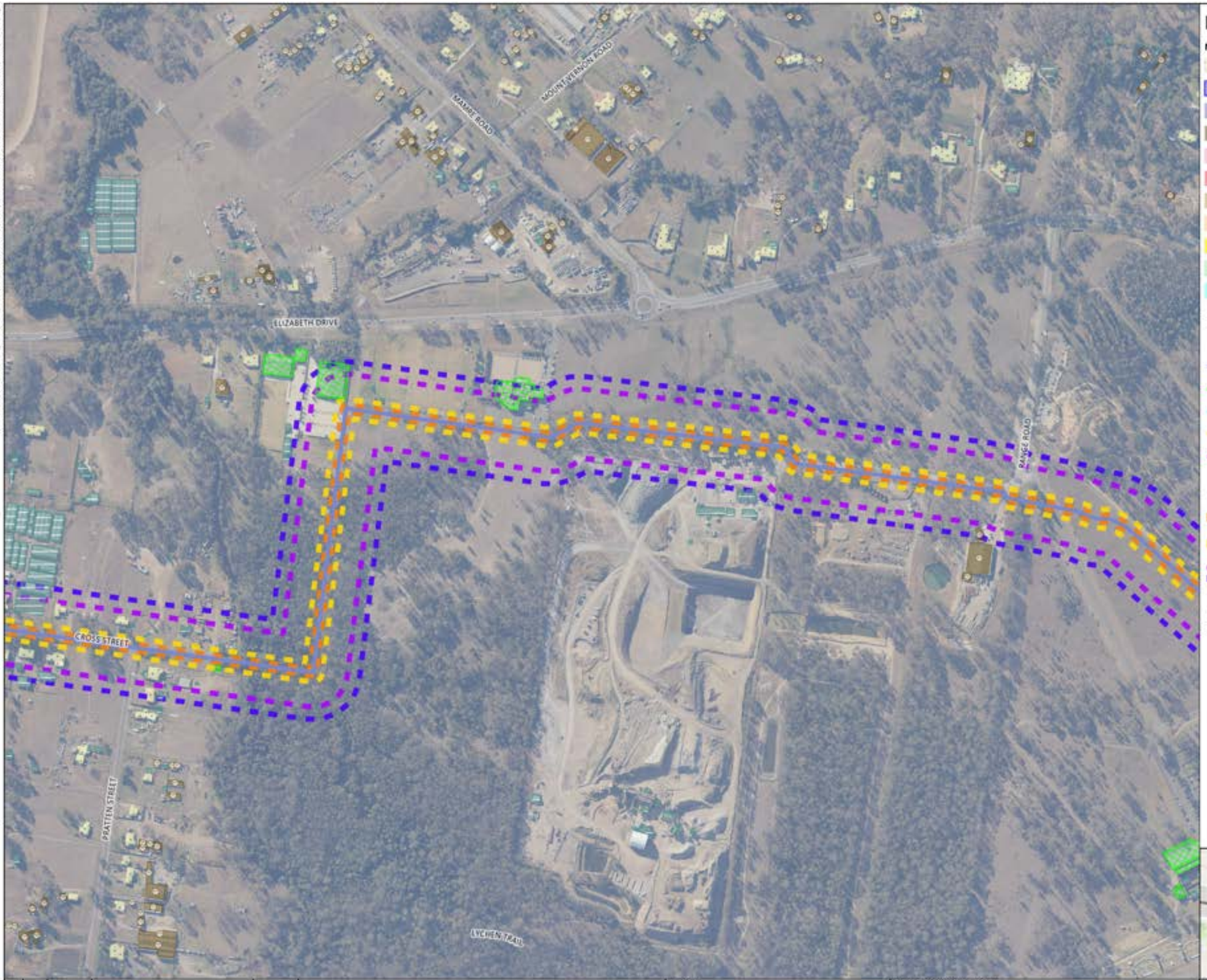
UPPER SOUTH CREEK ADVANCED WATER RECYCLING CENTER

MWD for cosmetic damage and human annoyance

Sheet 10 of 19

Plot Date: 14/06/23 - 22:01 Layout: TM588 MWD

GIS File: R:\AssocSydProjects\TM551-TM600\TM588 mt Upper South Creek\5 Calcs\00 GENERAL\01 GIS\TM588 - AMo.qgz



LEGEND

Noise Sensitive Receivers

- Residential
- Mixed use
- Commercial
- Industrial
- Hotel/Motel/Hostel
- Medical facility
- Place of Worship
- Community centre
- Recording studio
- Library/Museum
- Childcare
- Educational
- Theatre/Auditorium
- Cinema
- Laboratory
- Flight simulator
- Horse Stable
- Recreational - Passive
- Recreational - Active
- Other
- Heritage

USC AWRC Compounds

Pipeline Alignment

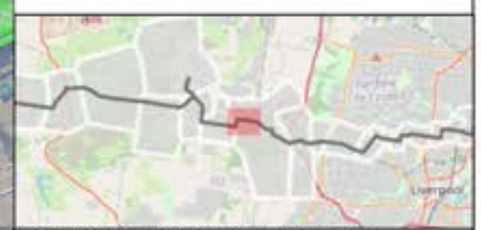
- Brine Pipeline
- Brine Pipeline - Underbore
- Brine Pipeline - Microtunnel
- Treated Water Pipeline
- Treated Water Pipeline - Underbore

MWD for cosmetic damage and human annoyance for vibratory roller

- Unreinforced structures (7.5mm/s ppv)
- Heritage structures (2.5mm/s ppv)
- Human annoyance - Residential (day)
- Human annoyance - Residential (night)

Construction vibration affected receivers

- Receivers within MWD for cosmetic damage



REV	BY	DATE	DESCRIPTION	APPROVED
r0	DA	14/06/23	Prepare figures	AM

A3 Original

Co-ordinate System: MGA Zone 56

0 100 200 300 400 m

1:6,000 At size A3

FULL SIZE A3, REDUCED TO A4

NOTE: Do not scale from this drawing.

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UPPER SOUTH CREEK ADVANCED WATER RECYCLING CENTER

MWD for cosmetic damage and human annoyance

Plot Date: 14/06/23 - 22:01 Layout: TM588 MWD

GIS File: R:\AssocSydProjects\TM551-TM600\TM588 mt Upper South Creek\5 Calcs\00 GENERAL\01 GIS\TM588 - AMo.qgz

750 m

500

250

0

Upper canal system

C09

C09

C09

C09

WESTERN HWY

LEGEND

Noise Sensitive Receivers

- Residential
- Mixed use
- Commercial
- Industrial
- Hotel/Motel/Hostel
- Medical facility
- Place of Worship
- Community centre
- Recording studio
- Library/Museum
- Childcare
- Educational
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- Cinema
- Laboratory
- Flight simulator
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- Recreational - Active
- Other
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USC AWRC Compounds

Pipeline Alignment

- Brine Pipeline
- Brine Pipeline - Underbore
- Brine Pipeline - Microtunnel
- Treated Water Pipeline
- Treated Water Pipeline - Underbore

MWD for cosmetic damage and human annoyance for vibratory roller

- Unreinforced structures (7.5mm/s ppv)
- Heritage structures (2.5mm/s ppv)
- Human annoyance - Residential (day)
- Human annoyance - Residential (night)

Construction vibration affected receivers

- Receivers within MWD for cosmetic damage

REV	BY	DATE	DESCRIPTION	APPROVED
r0	DA	14/06/23	Prepare figures	AM

A3 Original

Co-ordinate System: MGA Zone 56

0 100 200 300 400 m

1:6,000 At size A3

FULL SIZE A3, REDUCED TO A4

NOTE: Do not scale from this drawing.

N

CLIENT

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UPPER SOUTH CREEK ADVANCED WATER RECYCLING CENTER

MWD for cosmetic damage and human annoyance

Plot Date: 14/06/23 - 22:02 Layout: TM588 MWD

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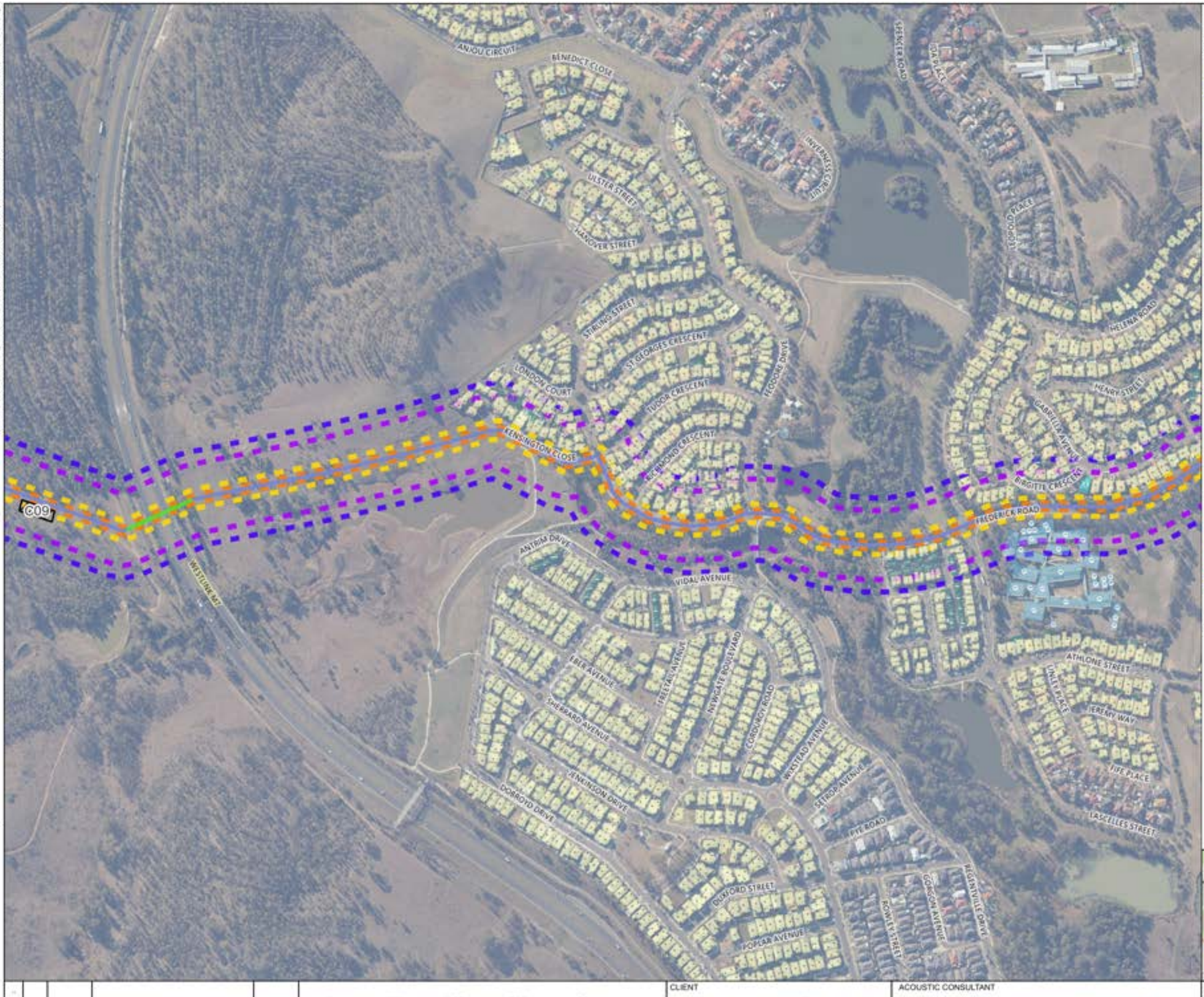

LEGEND

Noise Sensitive Receivers

- Residential
- Mixed use
- Commercial
- Industrial
- Hotel/Motel/Hostel
- Medical facility
- Place of Worship
- Community centre
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- Library/Museum
- Childcare
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- Horse Stable
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USC AWRC Compounds

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- Brine Pipeline - Microtunnel
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- Treated Water Pipeline - Underbore

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- Heritage structures (2.5mm/s ppv)
- Human annoyance - Residential (day)
- Human annoyance - Residential (night)

Construction vibration affected receivers

- Receivers within MWD for cosmetic damage

REV	BY	DATE	DESCRIPTION	APPROVED
r0	DA	14/06/23	Prepare figures	AM

A3 Original | Co-ordinate System: MGA Zone 56

0 100 200 300 400 m

1:6,000 At size A3

FULL SIZE A3, REDUCED TO A4

NOTE: Do not scale from this drawing.

N

CLIENT

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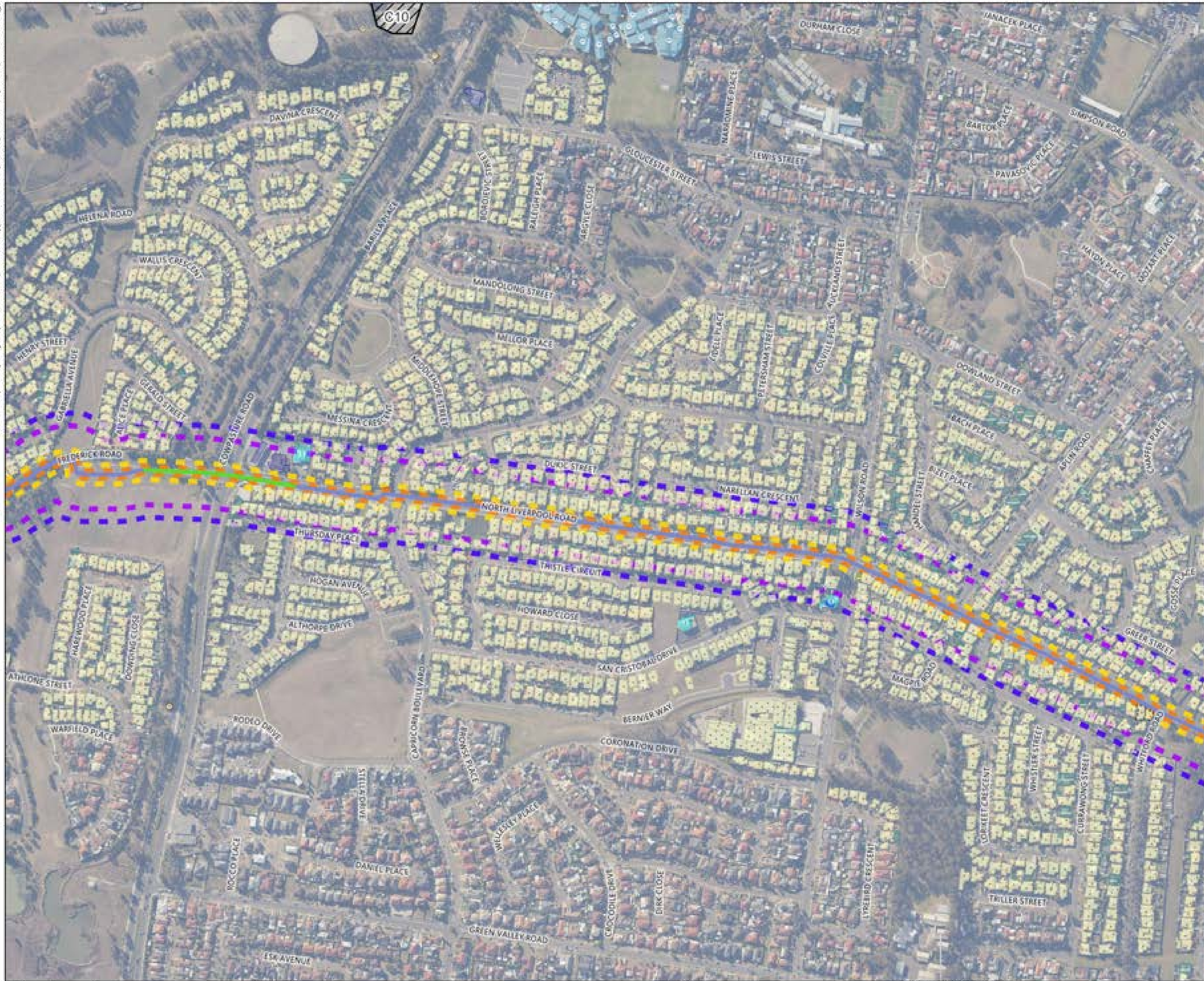
RENZO TONIN & ASSOCIATES
inspired to achieve
Ph (02) 8218 0500 Fax (02) 8218 0501

UPPER SOUTH CREEK ADVANCED WATER RECYCLING CENTER

MWD for cosmetic damage and human annoyance

Layout: TM588 MWD
Plot Date: 14/06/23 - 22:02
GIS File: R:\AssocSydProjects\TM551-TM600\TM588 mt Upper South Creek\5 Calcs\00 GENERAL\01 GIS\TM588 - AMo.qgz



LEGEND

Noise Sensitive Receivers

- Residential
- Mixed use
- Commercial
- Industrial
- Hotel/Motel/Hostel
- Medical facility
- Place of Worship
- Community centre
- Recording studio
- Library/Museum
- Childcare
- Educational
- Theatre/Auditorium
- Cinema
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- Flight simulator
- Horse Stable
- Recreational - Passive
- Recreational - Active
- Other
- Heritage

USC AWRC Compounds

Pipeline Alignment

- Brine Pipeline
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- Brine Pipeline - Microtunnel
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- Receivers within MWD for cosmetic damage

REV	BY	DATE	DESCRIPTION	APPROVER
r0	DA	14/06/23	Prepare figures	AM

A3 Original
Co-ordinate System: MGA Zone 56

0 100 200 300 400 m
1:6,000 At size A3
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FULL SIZE A3, REDUCED TO A4
NOTE: Do not scale from this drawing.

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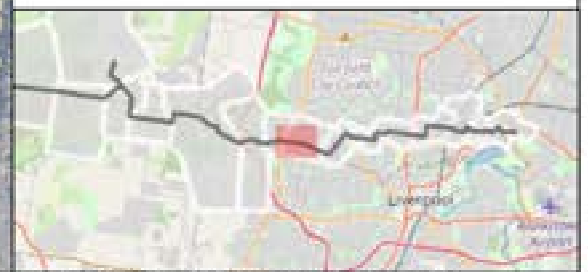

Sheet 14 of 19

Layout: TM588 MWD
Plot Date: 14/06/23 - 22:03
GIS File: R:\AssocSydProjects\TM551-TM600\TM588 mt Upper South Creek\5 Calcs\00 GENERAL\01 GIS\TM588 - AMs.qgz

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750 m
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CROSBIE PLACE
BUNKER PARADE
HICKORY ROAD
JASPER STREET
SATINWOOD CRESCENT
BIRCH STREET
ROSELLA STREET
BISHOP CRESCENT
SANDILANDS ROAD
JOORAN CLOSE
YARRA PLACE
ROOTCRAY STREET
ESSENDON STREET
STRATHFIELD CLOSE
IVOR PLACE
ENFIELD CLOSE
HOMEBUSH STREET
CLARE STREET
IVONNE STREET
HARRINGTON STREET
LIME STREET
BOLD STREET
JOHN STREET
EDENSOR ROAD
GARDEN PLACE
JOHN PLACE
SALTICH PLACE
BEAN CRESCENT
PALISADE CRESCENT
CAVEY PLACE
MOONSHINE AVENUE
BIRDWOOD AVENUE
CABRAMATTA ROAD WEST
HUMPHRIES ROAD
USA CRESCENT
KATIMA STREET
KEWIN AVENUE
YOUNG STREET
LEO STREET
LENA STREET
MEADOWS ROAD
MALCOLM AVENUE
HEMPHILL AVENUE
PRITCHARD STREET
HAIG STREET
HEINZE AVENUE
ANDERSON AVENUE
GRAINGER AVENUE
ANTILL ROAD
BENJAMIN ROAD
TOWNVIEW ROAD
BARTON ROAD
HUTCHENS AVENUE
OLIPHANT STREET
WALLACE PLACE
FLOYD PLACE
ELIZABETH DRIVE
ROSE AVENUE
GOVETT STREET
FIONA STREET
DAVID STREET

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A3 Original

Co-ordinate System: MGA Zone 56

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1:6,000 At size A3

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UPPER SOUTH CREEK ADVANCED WATER RECYCLING CENTER

MWD for cosmetic damage and human annoyance

Layout: TM588 MWD
Plot Date: 14/06/23 - 22:04
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LEGEND

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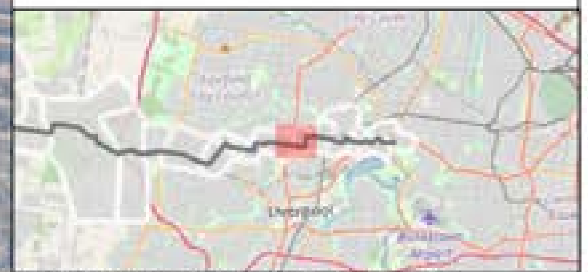

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r0	DA	14/06/23	Prepare figures	AM

A3 Original — Co-ordinate System: MGA Zone 56

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Plot Date: 14/09/23 - 22:04 Layout: TM588 MWD

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750 m
500
250
0

C13

LEGEND

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- Residential
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UPPER SOUTH CREEK ADVANCED WATER RECYCLING CENTER

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Sheet 18 of 19

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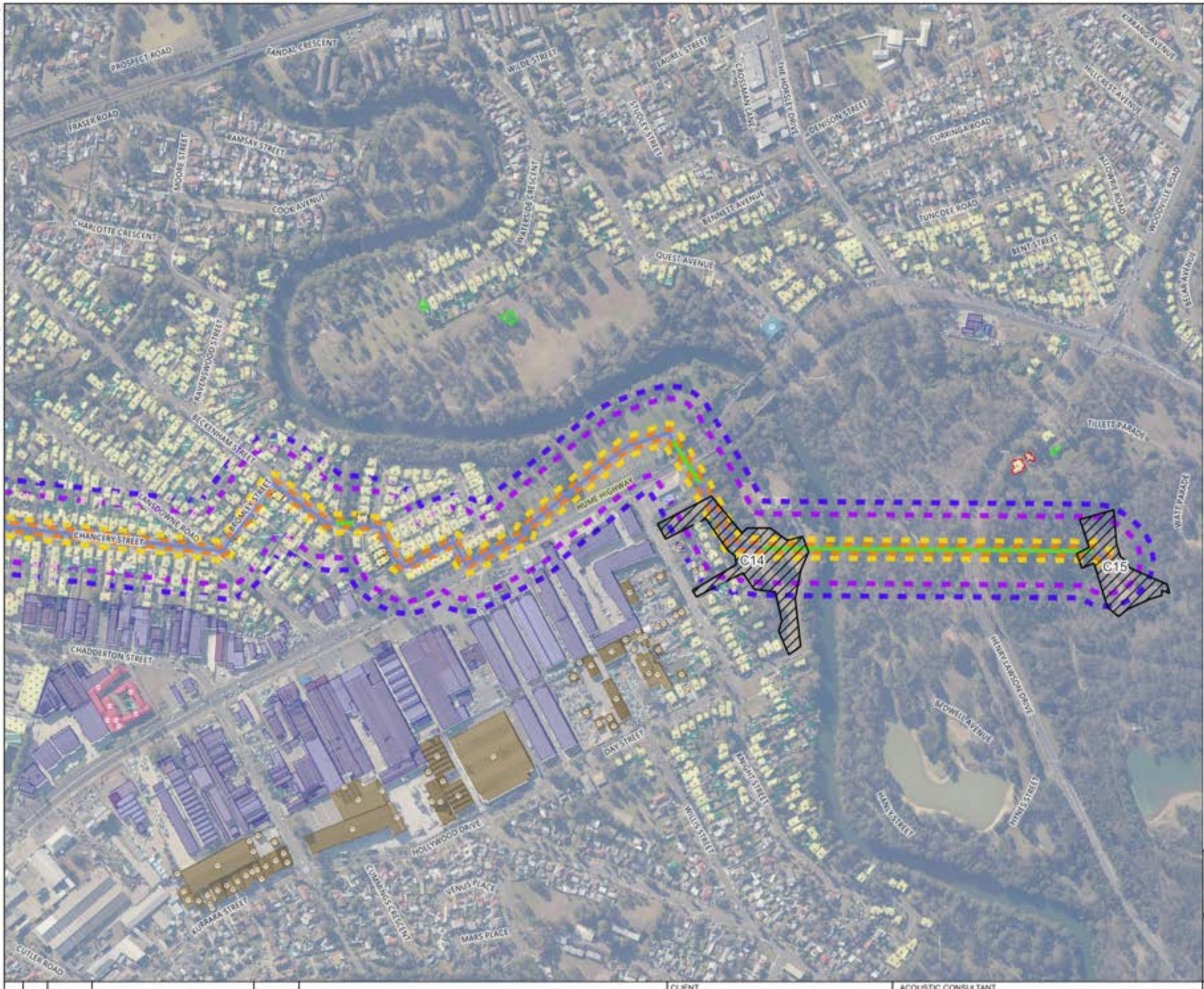

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750 m
500
250
0

0 100 200 300 400 m N

1:6,000 At size A3

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A3 Original | Co-ordinate System: MGA Zone 56 | FULL SIZE A3, REDUCED TO A4 | NOTE: Do not scale from this drawing.

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MWD for cosmetic damage and human annoyance

Appendix E – Noise and Vibration Monitoring Program

Upper South Creek

Advanced Water Recycling Centre and Pipelines

NVCSP Appendix E
Noise & Vibration Monitoring Program

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Recommend Documents to be Read in Conjunction

This management plan is to be read in conjunction with the Construction Environmental Management Plan (USCP-JHG-MPL-ENV-0008) and the Noise & Vibration CEMP Sub-plan (USCP-JHG-MPL-ENV-0007).

Revisions and Distribution

Distribution

There are no restrictions on the distribution or circulation of this Construction Environmental Plan within John Holland.

	Uncontrolled Copy
Authorised By: Date:	Richard Ioffrida (Project Director)

Revisions

Draft issues of this document shall be identified as Revision 01, 02, 03 etc. Upon initial issue this shall be changed to a sequential lettering commencing at Revision A. Revision lettering shall commence at Rev. A, B etc.

Date	Rev	Remarks	Section	Prepared By	Reviewed By & Approved By
25.01.2023	01	Initial draft for John Holland internal and Sydney Water review	All	AM / MT	A Harrington
21.02.2023	02	Updated version in response to Sydney Water comments	All	D O'Brien	A Harrington
07.03.2023	03	Updated in response to Sydney Water final comments	All	A. Harrington	A. Harrington
14.04.2023	04	Updated in response to ER and AA comments	All	D. O'Brien	A. Harrington
16.06.2023	05	Updated following DPHI's comments	All	A. Morris	A. Harrington
22.08.2023	A	Issued for construction	All	M. Segaran	D. O'Brien
02.06.2024	B	Updated to include revised information following EPL variation approval	All	R. Maxwell	A. Harrington
15.08.2024	C	Minor update to reporting requirements	Section 9	R. Maxwell	A. Harrington

Contents

Glossary/ Abbreviations

Abbreviations	Expanded Text
AA	Acoustic Advisor
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.
Amendment Report	Upper South Creek Advanced Water Recycling Centre Amendment Report (March 2022)
Amendment RtS	Upper South Creek Advanced Water Recycling Centre Submissions Report – project amendments (April 2022)
Attenuation	The reduction in the level of sound or vibration.
AWRC	Advanced Water Recycling Centre
CEMP	Construction Environmental Management Plan
CNVG	Construction Noise and Vibration Guideline (superseded by CNVS)
CNVS	Construction Noise and Vibration Strategy
CNVIS	Construction Noise & Vibration Impact Statement – Describe the construction activities proposed; identifies the potential impacts of those activities on the community; the measures that will be used to reduce impacts on the affected community; how the community will be informed and engaged; and, how noise impacts will be monitored and enforced. They are often referred to as Noise and Vibration Management Plans, Construction Noise and Vibration Impact Statements, Construction Method Statements, Work Method Statements and the like.
CoA	Condition of Approval
CSEP	Community & Stakeholder Engagement Plan
CSSI	Critical State Significant Infrastructure
Daytime, day	The period from 7 am to 6 pm (Monday to Friday) and 8 am to 1 pm (Saturday).
dBA	Decibels using the A-weighted scale measured according to the frequency of the human ear.
DEC	Department of Environment and Conservation NSW
DECC	Department of Energy and Climate Change
DPHI	NSW Department of Planning, Housing and Infrastructure
EIS	Upper South Creek Advanced Water Recycling Centre Environmental Impact Statement (September 2021)
EIS RtS	Upper South Creek Advanced Water Recycling Centre Submissions Report (March 2022)
ENMM	Environmental Noise Management Manual
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.
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.
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
EPL	Environment Protection Licence
ER	Environmental Representative
Evening	Refers to the period from 6 pm to 10 pm
Extraneous noise	Noise resulting from activities that are not typical of the area. Atypical activities may include construction, and traffic generated by holiday periods and by special events such as concerts or sporting events. Normal daily traffic is not considered to be extraneous.
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.

Abbreviations	Expanded Text
Heritage item	A place, building, work, relic, archaeological site, tree, movable object or precinct of heritage significance, that is listed under one or more of the following registers: the State Heritage Register under the *Heritage Act 1977* (NSW), a state agency heritage and conservation register under section 170 of the *Heritage Act 1977* (NSW), a Local Environmental Plan under the EP&A Act, the World, National or Commonwealth Heritage lists under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth), and an "Aboriginal object" or "Aboriginal place" as defined in section 5 of the *National Parks and Wildlife Act 1974* (NSW)
Highly noise affected	As defined in the Interim Construction Noise Guideline (DECC, 2009)
Highly noise intensive (Infrastructure Approval)	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 h. Impact piling. • Also described in EPL 21800 - • Identified as particularly annoying in section 4.5 of the ICNG; and/or, • Works identified as 'Highly Noise Intensive Works' in a planning approval for the activities in this licence; and/or • Any other activity identified by the EPA, and advised to the licensee, following an assessment of the character of the noise emitted by the activity based on the Noise Policy for Industry, Fact Sheet C considerations (EPA, 2017).
ICNG	Interim Construction Noise Guidelines
ISC Benchmark	A benchmark listed in the Infrastructure Sustainability Council's *IS v2.1 Technical Manual Design and As Built Rating*, notably Env-2 (noise) and Env-3 (vibration)
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.
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.
NCA	Noise Catchment Area
NCG	Noise Criteria Guideline
Night	The period from 10 pm to 7 am (Monday to Saturday), and 10 pm to 8 am (Sundays and public holidays)
NMG	Noise Mitigation Guideline
NML	Noise Management Level - has the same meaning as "Airborne Noise Management Levels" in the Interim Construction Noise Guideline (DECC 2009)
Noise Mitigation	Reasonable and feasible noise mitigation measures
NPI	Noise Policy for Industry, Environment Protection Agency 2017
NVMoP	Noise and Vibration Monitoring Program, this document
NVCSP	Noise and Vibration CEMP Sub-Plan (or Plan)
OOHW	Out of Hours Work
POEO Act	*Protection of the Environment Operations Act 1997*
PPV	Peak-Particle Velocity
Project, the	Upper South Creek Advanced Water Recycling Centre
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)
REMM	Revised Environmental Management Measure
RMS	Roads and Maritime Services (now Transport for New South Wales)
RNP	Road Noise Policy

Abbreviations	Expanded Text
ROL	Road Occupancy Licence
RTA	Roads and Traffic Authority (now Transport for New South Wales)
RtS	Response to submissions
SMART	Specific, measurable, achievable, relevant, and time-based
SWC	Sydney Water Corporation (the Client and Proponent)
TfNSW	Transport for New South Wales
UMM	Updated Management Measures
VDV	Vibration Dose Value

Note: Glossary provided in The Conditions of Approval for this project (SSI 8609189) and EPL 21800.

1 Introduction

1.1 Context

This Construction Noise and Vibration Monitoring Program (NVMoP, or the Program) has been prepared for the construction of Stage 1 of the Upper South Creek (USC) Advanced Water Recycling Centre (AWRC) project (the Project). The Program forms Appendix E of the Noise and Vibration CEMP Sub-plan (NVCSP) and has been prepared to address the requirements of the Minister's Conditions of Approval (CoA), the Updated Management Measures (UMMs) listed in the Project's Response to Submissions (RtS), the Level 3 benchmarks for noise (Env-2) and vibration (Env-3) in *IS v2.1 Technical Manual Design and As Built Rating* (ISC Benchmarks), EPL 21800 and all applicable legislation.

1.2 Background and Project Description

The Upper South Creek AWRC EIS (September 2021) and the Upper South Creek AWRC Amendment Report (March 2022) 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 based on the Concept Design to address the Environmental Assessment Requirements issued by the Department of Planning, Housing and Infrastructure (DPHI). The noise and vibration assessment was included in the EIS, within Chapter 7 and the Noise and Vibration Technical Paper (Appendix S of the EIS). Additional noise and vibration assessment was included in the Amendment Report, within Chapter 7 and the Noise and Vibration Impact Assessment Amendment Report (Appendix D of the Amendment Report).

The project description is outlined in Sections 1.1 to 1.3 of the CEMP.

1.3 Scope of the Monitoring Program

The scope of this Program is to describe how John Holland (JH) proposes to carry out noise and vibration monitoring during the construction of the Project. Monitoring will be undertaken for modelling verification at sensitive receivers, to assess compliance in response to complaints, monitoring for Out of Hours Work (OOHW) and for equipment spot checks. For further information refer to Sections 5 and 6.

This Program forms part of the Project's Noise and Vibration CEMP Sub-Plan (NVCSP).

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 1.7 of the CEMP.

2 Purpose and Objectives

2.1 Purpose

The purpose of the Program is to describe how, where and when JH will monitor noise and vibration during construction of the Project and supplements the NVCSP, which itself is an Appendix of the Construction Environmental Management Plan (CEMP).

The Program will be implemented to monitor the effectiveness of mitigation measures applied during the construction phase of the Project (refer to Section 9 of the NVCSP).

2.2 Objective

The key objective of this Program is to ensure all CoAs, UMMs, ISC Benchmarks and licence/permit requirements relating to noise and vibration monitoring are described, scheduled, and assigned responsibility as outlined in:

- The Environmental Assessments prepared for the Project;
- Conditions of Approval granted to the project;
- ISC Benchmarks;
- Environment Protection Licence (EPL) 21800; and
- All relevant legislation and other requirements described in Section 3 of the NVCSP.

3 Environmental requirements

3.1 Relevant Legislation

3.1.1 Legislation

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

- Protection of the Environment Operations Act 1997 (POEO Act);
- Environmental Planning & Assessment Act 1979;
- All legislation relevant for the Project is included in Section 4 of the CEMP.

3.1.2 Licences / Permits

The Project will adhere to the noise and vibration conditions and monitoring obligations of the project Environment Protection Licence (EPL 21800).

3.1.3 Guidelines

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

- NSW EPA 2022. Approved methods for the measurement and analysis of environmental noise in NSW
- NSW Interim Construction Noise Guideline (ICNG), Department of Environment and Climate Change 2009;
- NSW Road Noise Policy, Department of Environment, Climate Change and Water 2011;
- Noise Policy for Industry, Environment Protection Authority 2017;
- NSW Assessing Vibration – a technical guideline, Department of Environment and Conservation 2006;
- 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;
- Australian Standard AS/NZS 2107:2016 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;
- 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 DIN4150-2016 Structural vibration Part 3: Effects of vibration on Structures.

3.2 Minister’s Conditions of Approval

Table 3-1 below provides a summary of the CoA relevant to noise and vibration and how and where these items are addressed in this Plan.

Table 3-1 CoA relevant to this NVMoP

CoA Reference	Condition Requirement	Document reference
C13	The following Construction Monitoring Programs must be prepared in consultation with the relevant government agencies identified for each to compare to actual performance of construction of Stage 1 of the CSSI against the performance predicted in the documents listed in Condition A1 or in the CEMP.	This document. Section 3.3

CoA Reference	Condition Requirement	Document reference
	<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>(c)</td><td>Noise and vibration</td><td>EPA, WaterNSW and relevant council(s))</td></tr></table>	
C14	Each Construction Monitoring Program (CMP) must have consideration of SMART principles and provide: a. details of the baseline data available; b. details of the baseline data to be obtained and when; c. details of all monitoring of the project to be undertaken; d. the parameters of the project to be monitored; e. the frequency of monitoring to be undertaken; f. the location of monitoring; g. the reporting of monitoring results and analysis of results against relevant criteria; h. details of the methods that will be used to analyse the monitoring data; i. procedures to identify and implement additional mitigation measures where the results of the monitoring indicate unacceptable project impacts; and j. any consultation to be undertaken in relation to the monitoring programs.	Section 4 Section 5 Section 6 Section 9
C15	The CMP(s) must be endorsed by the ER and then submitted to the Planning Secretary for approval no later than 1 month before the commencement of construction, or where construction is staged, no later than one month before the commencement of each stage.	Section 3.3
C16	Construction must not commence until the relevant CMP(s) have been approved by the Planning Secretary and all relevant baseline data for the specific construction activity has been collected.	Section 3.3 Section 4
C17	The CMP(s), as approved, 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 greater.	Section 9
C18	The results of the CMP(s) must be submitted to the Planning Secretary, and relevant regulatory agencies in the form of a Construction Monitoring Report at a frequency identified in the relevant CMP.	Section 9

3.3 Environmental Protection License

Table 3-2 provides a summary of the EPL 21800 conditions relevant to noise and vibration and how and where these items are addressed in this Plan.

Table 3-2 EPL conditions relevant to this NVMoP

Condition	Condition Requirement	Document reference
M1.2	All records required to be kept by this licence must be: a) in a legible form, or in a form that can readily be reduced to a legible form; b) kept for at least 4 years after the monitoring or event to which they relate took place; and c) produced in a legible form to any authorised officer of the EPA who asks to see them.	Section 5.6
M1.3	The following records must be kept in respect of any samples required to be collected for the purposes of this licence:	Section 5.6

Condition	Condition Requirement	Document reference
	a) the date(s) on which the sample was taken; b) the time(s) at which the sample was collected; c) the point at which the sample was taken; and d) the name of the person who collected the sample.	
M4.1	All noise and vibration monitoring for the purposes of determining compliance with the conditions of this licence must be undertaken by a Competent Person as defined in the special dictionary of this licence.	Section 5.6 and 6.4
M4.2	All noise monitoring for the purposes of determining compliance with the conditions of this licence must consider and be generally undertaken in accordance with; a) Australian Standard AS 1055: 2018 Acoustics - Description and measurement of environmental noise; and b) (b) the compliance monitoring guidance provided in the chapter 7 'Monitoring Performance' of the Noise Policy for Industry (EPA, 2017).	Section 5.6
M4.3	All vibration monitoring must be: a) undertaken in accordance with the technical guidance provided in the Assessing Vibration: a technical guideline (DEC, 2006); and b) assessed and reported against the acceptable and maximum values of human exposure to vibration set out in Tables 2.2 and 2.4 of this guideline.	Section 6.1
M4.4	The licensee must undertake noise and vibration monitoring as directed by an authorised officer of the EPA. Where the monitoring is requested to take place on private land (for example a residential property) the licensee must request permission to access the premises in advance and keep a record of permission requests and responses. If a licensee is unable to obtain permission, the licensee must undertake the monitoring at an indicative location where possible and they must provide the response (including any nil response) to the EPA.	Section 5.1 and 6.1
M4.5	The licensee must undertake monitoring, sampling, video recording and/or take photographs: a) if the EPA or licensee reasonably suspects that an event has occurred at the premises or in connection with the carrying out of the activities that has caused, is causing, is likely to cause or has the potential to cause material harm to the environment (whether the harm occurs on or off premises to which the licence applies); b) as soon as practicable; and c) as directed by an authorised officer.	Section 5.1 and 6.1

3.4 Consultation

This Program will be provided to the EPA, WaterNSW and relevant councils in accordance with CoA C13(c) for review and comment. A summary of the consultation undertaken is provided in Section 4 of the NVCSP.

Community feedback and complaints relating to noise and vibration will be dealt with in accordance with the NVCSP, Community and Stakeholder Engagement Plan (CSEP) and the Complaints Management System.

This monitoring program will be endorsed by the ER and AA and then submitted to the Planning Secretary for approval no later than one month before the commencement of construction.

Prior to submission of this Program to the Planning Secretary, the initial revision of the NVCSP was endorsed by the ER and AA. This NVCSP was submitted to the Planning Secretary no later than one month before the commencement of construction. No construction commenced until the NVCSP (including this Program) and all CEMP Sub-plans were approved by the Planning Secretary on 8th August 2023. The approved NVCSP (including this Program), including any minor amendments approved by the AA as per CoA A34(h)(iii), will be implemented for the duration of construction of Stage 1 of the USC project.

4 Baseline Monitoring Data

Noise monitoring results in the M12 Motorway EIS and assumed background noise levels listed in AS 1055.3:1997 were used in the EIS to determine Rating Background Levels (RBLs) and Noise Management Levels (NMLs) for each Noise Catchment Area (NCA) for daytime, evening and night-time periods. The baseline noise monitoring locations were selected to be representative of the appropriate Noise Catchment Areas (NCAs) within and around the Project, across a mix of existing land uses including residential, commercial, industrial and open space. NMLs for the assessment of construction noise are derived from the relevant RBLs for residential receiver locations. Other sensitive receivers are assigned NMLs based on their usage and in accordance with the ICNG.

Table 4-1 below shows the background noise monitoring and assumed background levels adopted in the EIS which form the basis of the NMLs for residential receivers. The data provided in the EIS is deemed to be suitable for determining the NMLs for the project.

Table 4-1 EIS baseline monitoring and assumed typical background levels for residential receivers (external)

ID	Address	Rating background level (RBL), dB(A)				
		Morning shoulder	Day	Evening	Evening shoulder	Night
L01[1]	Adjacent to Toulouse Street, Cecil Hills	51	45	44	46	40
L03[1]	1383 Elizabeth Drive, Kemps Creek	60	54	48	56	37
L05[1]	12-20 Salisbury Avenue, Kemps Creek	49	39	42	45	35
L06[1]	203 Clifton Avenue, Kemps Creek	43	34	35	39	31
L12[1]	145 m south of Elizabeth Dr – 2300 Elizabeth Drive, Badgerys Creek	50	40	37	44	30
L14[1]	50 m north of Elizabeth Dr – 1953-2109 Elizabeth Drive, Badgerys Creek	50	42	39	48	33
Rural[2]	-	-	40	35	-	30
Suburban/ Urban[3]	-	-	45	40	-	35
Urban[2]	-	-	50	45	-	40

NOTES:

1. Monitoring conducted between June and July 2017 for the M12 EIS and adopted in the Project EIS
2. Background noise estimates provided in the EIS with reference to AS1055 and NPfI
3. Background noise estimates with reference to AS1055 and NPfI

5 Noise Monitoring

5.1 Attended and Unattended Airborne Noise Monitoring

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

- At the location which is used as part of noise prediction assessments;
- 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 verification monitoring is required (Section 8 of the NVCSP). This will 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);
- As directed by an authorised officer of the EPA;
- As otherwise required by the CNVIS, Out of Hours Works (OOHW) Protocol or EPL.
- Following the implementation of mitigation measures or noise attenuation as a result of exceedance of predicted noise levels; and
- 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.

Long-term unattended airborne noise monitoring options will be discussed and determined with the AA. In these instances, noise loggers will record audio to allow for the identification of construction noise contribution and the presence of any extraneous noise, if privacy concerns can be overcome. The use of 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 with reference to a CNVIS, the Project's predictive noise and vibration tool, advice from the AA 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;
- Background noise levels; and
- 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 have exceeded modelling predictions, refer to Section 8 for further information.

JH, as the licensee, must undertake noise and vibration monitoring as directed by an authorised officer of the EPA. Where the monitoring is requested to take place on private land (for example a residential property) the licensee must request permission to access the premises in advance and keep a record of permission requests and responses. If a licensee is unable to obtain permission, the licensee must undertake the monitoring at an indicative location where possible and they must provide the response (including any nil response) to the EPA.

The licensee must undertake monitoring, sampling, video recording and/or take photographs:

a) if the EPA or licensee reasonably suspects that an event has occurred at the premises or in connection with the carrying out of the activities that has caused, is causing, is likely to cause or has the potential to cause material harm to the environment (whether the harm occurs on or off premises to which the licence applies);

b) as soon as practicable; and

c) as directed by an authorised officer.

5.1.1 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, including the EPA Approved Methods. 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 $L_{A(max)}$. Measurements will be recorded on a form consistent with the TFNSW Noise Verification Record Form.
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.

5.2 Attended and Unattended Ground-borne Noise Monitoring

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

- Where appropriate in response to a noise related complaint(s) (determined on a case-by-case basis); and
- As otherwise required by the CNVIS, OOHW Protocol or EPL.

Monitoring will be undertaken in the most affected habitable room of the residence or other sensitive building and will be conducted in conjunction with vibration measurements whenever practicable (refer to Section 6). The room selected for noise monitoring should be well shielded from airborne noise intrusions, such as road traffic noise to allow the ground-borne noise to dominate over non-construction generated airborne noise.

There may be instances where the resident does not allow access to monitor in the most suitable habitable room. In these instances, JH will endeavour to monitor at the next most suitable available room or location, noting this in the monitoring form.

Given that ground-borne noise is mostly noticed during the evening or at night, noise loggers may also be left in place over night and picked up at a mutually agreed time with the resident. In these instances, noise loggers will record audio to allow for the identification of construction noise contribution and the presence of any extraneous noise, if privacy concerns can be overcome.

Where the resident or receiver will not allow the noise logger to record audio, attended noise monitoring will be offered instead. The project will investigate the possibility of other options in the event that the resident or receiver does not permit audio to be recorded. This may include consideration of the use of monitoring equipment that uses direction to source or photos.

Measurements will be carried out by an appropriately trained and competent person in the measurement and assessment of construction noise and vibration, who is familiar with the requirements of the relevant standards and procedures.

5.2.1 Parameters to be Monitored

Ground-borne 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.

Ground-borne noise monitoring will be recorded continuously over a defined sample period, where every 1 minute the data is to be processed statistically and stored in memory. 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_{A1} and $L_{A(max)}$. Measurements will be recorded on a field collection form.

5.3 Real-Time (Unattended) Noise Monitoring

Real-time (unattended) noise monitoring will be undertaken to satisfy ISC Benchmark Env-2 DL3.2. The real-time noise monitors will be installed following approval of this Program.

Real-time noise monitors will be installed in suitable locations. The monitors 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.

The real-time monitoring data will be readily available to the AA in accordance with CoA A32(b) Reporting of monitoring results will be included within the Project Sustainability Report as per the Sustainability Management Plan (SMP).

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

5.3.1 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. The minimum range of noise metrics include the following A-weighted noise levels: L_{A90}, L_{Aeq}, L_{A10} and $L_{A(max)}$.

5.4 Out-of-Hours Protocol Noise Monitoring Requirements

The OOHW Protocol enables OOHW (for works that are not subject to an EPL) under certain circumstances and prescribes requirements that must be complied with to undertake the works.

Typically, OOHW that is not subject to an EPL will involve service investigations, relocations and other works items that are not scheduled activities under the Protection of the Environment Operations Act 1997 (POEO Act) (and associated regulations) and are outside the EPL premise boundary.

In accordance with the Protocol, noise monitoring must be undertaken in accordance with the requirements of the work specific OOHW permit to validate predicted noise impacts. Section 4 of the OOHW Protocol identifies that noise verification monitoring would be undertaken when the impact classification is predicted to be moderately intrusive or highly intrusive (during OOHW period 1) or clearly audible, moderately intrusive or highly intrusive (during OOHW period 2).

5.5 Out-of-Hours EPL Noise Monitoring Requirements

5.5.1 EPL Monitoring Requirements

The project will conduct verification monitoring in accordance with the EPL condition L5.6 (iii) which details 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 works and activities, including during the period/s predicted to have the highest noise level impacts.

The project will also adhere to the conditions and obligations for noise and vibration as listed section “M4 Environmental Monitoring” of the EPL.

5.6 Calibration, QA and Competency for Noise Monitoring

The EPA's *Approved Methods for the Measurement and Analysis of Environmental Noise in NSW* (Approved Methods) details the minimum requirements and good practices for measuring and analysing environmental noise. Noise monitoring conducted for the Project will be conducted in line with the guidance in the Approved Methods.

Noise monitoring is also to be undertaken generally in accordance with:

a) Australian Standard AS 1055: 2018 Acoustics - Description and measurement of environmental noise; and

b) the compliance monitoring guidance provided in the chapter 7 'Monitoring Performance' of the Noise Policy for Industry (EPA, 2017).

All monitoring will be undertaken by competent personnel, suitability certified, trained and experienced in undertaking noise measurements.

Noise monitoring equipment used will be at least Type 1 instruments as per the Approved Methods. The noise monitor and calibrator used will be calibrated in a NATA accredited laboratory prior to use. The equipment will also be regularly calibrated in accordance with manufacturer specifications or relevant Australian Standards at least once every two years. The calibration of the monitoring equipment will be checked in the field before the noise measurement period.

The sound calibrator must comply with the requirements set out in *IEC 60942:2017 Electroacoustics: sound calibrators*, be of the same class as the sound level meter and the calibration must be done at least once every two years.

Records of monitoring equipment calibration will be maintained by JH throughout the delivery of the Project. All monitoring records will be retained throughout the delivery of the Project by JH. Noise monitoring records will be completed to record:

- Date and time of measurement;
- Name of person undertaking the measurement;
- Type and model number of monitoring instrumentation;
- Results of field calibration checks;
- Date of last laboratory calibration in a NATA accredited facility;
- Time of day, length of measurement and any measurement time intervals;
- Monitoring location (including a sketched map/photo of area);
- Photos of the monitoring equipment set up and the activities being monitored;
- 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.

All outdoor noise measurements will be undertaken with a windscreen over the microphone and measurements of noise will be disregarded when rain adversely affects the measurement and/or the wind speed is greater than 5 m/s at the microphone (18 km/h).

Where high background noise levels obscure construction noise contribution during attended noise measurements, operators will either: measure closer to the source and calculate back to the required position, or 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 one metre from walls or other reflective surface, and about 1.5 metres from windows, where such instrument siting is possible.

All records required to be kept by this licence must be:

a) in a legible form, or in a form that can readily be reduced to a legible form;

b) kept for at least 4 years after the monitoring or event to which they relate took place; and

c) produced in a legible form to any authorised officer of the EPA who asks to see them.

The following records must be kept in respect of any samples required to be collected for the purposes of this licence:

a) the date(s) on which the sample was taken;

b) the time(s) at which the sample was collected;

c) the point at which the sample was taken; and

d) the name of the person who collected the sample.

6 Vibration Monitoring

6.1 Short Term Attended and Unattended Vibration Monitoring

Attended vibration monitoring is to be undertaken as follows:

- 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);
- As directed by an authorised officer of the EPA; and
- As otherwise required by the CNVIS, OOHW Protocol or EPL.

Vibration monitoring will be undertaken in accordance with the relevant vibration measurement requirements in the reference standards and documents in Section 3.1.2.

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*. The preferred velocity for continuous and impulsive vibration as per Table C1.1 of the guideline will be used to screen for vibration impacts to human comfort.

Where property damage is a concern, vibration monitoring results will be assessed and reported against the British Standard 7385, (BS7385- 2:1993), as presented in the NVCSP. 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 6.5.4 of the NVCSP. 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 plant;
- 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 non-resilient surfaces;
- The vibration sensor or transducer shall be directly mounted to the vibrating surface using either bees wax or a magnetic mounting plate onto a steel washer, plate or bracket which shall be either fastened or glued to the surface of interest; and
- Where a suitable mounting surface is unavailable, then a metal stake of at least 300mm in length shall be driven into solid ground adjacent to the building of interest and the vibration sensor or transducer shall be mounted on that.

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 attended vibration monitoring is not feasible, due to extended periods of vibration intensive works, an unattended vibration monitoring system may be installed where initial monitoring to establish minimum working distances is insufficient to ensure goal levels are met, due to changing plant or unknow 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 predictions made in the relevant CNVIS or using the Project's predictive tools. Where monitored construction noise levels are found to have exceeded modelling predictions or vibration goals, refer to Section 8 for further information.

JH, as the licensee, must undertake noise and vibration monitoring as directed by an authorised officer of the EPA. Where the monitoring is requested to take place on private land (for example a residential property) the licensee must request permission to access the premises in advance and keep a record of permission requests and responses. If a licensee is unable to obtain permission, the licensee must undertake the monitoring at an indicative location where possible and they must provide the response (including any nil response) to the EPA.

The licensee must undertake monitoring, sampling, video recording and/or take photographs:

a) if the EPA or licensee reasonably suspects that an event has occurred at the premises or in connection with the carrying out of the activities that has caused, is causing, is likely to cause or has the potential to cause material harm to the environment (whether the harm occurs on or off premises to which the licence applies);

b) as soon as practicable; and

c) as directed by an authorised officer.

6.1.1 Parameters to be Monitored

Vibration data will be processed statistically and stored in memory before being transferred to records. The minimum range of vibration metrics to be stored in memory for later retrieval is the following:

- Root-Mean-Square acceleration (RMS); 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 vibrating plant is operational to capture the worst-case vibration levels within the pre-determined 'minimum working distance' from the potentially affected building. Typical 'minimum working distances' for construction equipment are presented in Table 9.3 of the NVCSP.

6.2 Real-Time (Unattended) Vibration Monitoring

The final timing, duration and location of the real-time vibration monitoring will be confirmed in the relevant CNVIS, subject to risk assessment and (if monitoring required) property owner's permission. The monitoring location may vary throughout the works to suit the works location and risk of vibration impact, as identified in the CNVIS.

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 vibration monitoring equipment.

6.2.1 Parameters to be Monitored

Real time vibration monitoring will continuously monitor PPV.

6.3 Out-of-Hours Protocol Vibration Monitoring Requirements

The OOHW Protocol enables OOHW (for works that are not subject to an EPL) under certain circumstances and prescribes requirements that must be complied with to undertake the works.

Typically, OOHW that is not subject to an EPL will involve service investigations, relocations and other works items that are not scheduled activities under the Protection of the Environment Operations Act 1997 (POEO Act) (and associated regulations) and are outside the EPL premise boundary.

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 CNVISs (refer to Section 8.1 of the NVCSP) including:

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

6.4 Calibration and QA for Vibration Monitoring

All monitoring will be undertaken by competent personnel, suitability trained and experienced in undertaking vibration measurements.

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

All monitoring records will be retained throughout the delivery of the Project by JH. 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.).

7 Heritage Listed Structures

In accordance with CoA E51, JH 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, JH will follow the process detailed in Section 8.

Heritage items which have the potential to be impacted by vibration are identified in the Heritage CEMP Sub-Plan and are summarised in Table 7.1. Section 6.5.4 of the NVCSP also provides further detail on the approach to managing potential vibration impacts on heritage structures.

Vibration assessments prepared for the Project will also identify where monitoring should be conducted in the vicinity of heritage items.

In accordance with CoA E52, JH will seek advice from the Project's heritage specialist on methods and locations for installing equipment used for vibration and noise monitoring to or near heritage-listed structures.

Table 7-1 Heritage receivers likely to require vibration monitoring

Receiver	Receiver type	Additional notes
Upper Canal	WaterNSW asset	Upper Canal easement near Cecil Park Model Flying Club. Further consultation required to determine exact location of vibration-sensitive structure and appropriate monitoring location.
1953-2109 Elizabeth Drive, Badgerys Creek	Heritage residence	-

8 Continual Improvement and Corrective Action

Monitored noise and vibration levels will be analysed against the predictions made in the relevant CNVIS or using the Project's predictive tools (NVCSP Section 7.2). Where monitored construction noise levels are found to be above modelling predictions or vibration goals are exceeded, the following actions will be undertaken:

- Revise AMMs which are being applied so as they are appropriate for the measured noise level,
- Cease the noise and/or vibration generating activity which causes the exceeded measurements,
- 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), installing temporary noise attenuating measures (such as noise blankets and hoarding) and utilising alternative construction methodology or a combination of these,
- Review work practices to ensure compliance with the ICNG,
- 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.

JH 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.

Where a complaint relating to human comfort is received, JH 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, JH may offer additional monitoring following the process defined in Section 6.1. The complaint will be managed in accordance with the processes set out in the Community and Stakeholder Engagement Plan (CSEP).

9 Reporting of Monitoring Results

During construction, noise and vibration monitoring data will be collected, tabulated and assessed against the noise and vibration objectives identified in CNVIS. A Noise and Vibration Monitoring Report will be submitted to DPHI and EPA and will be made publicly available.

Reporting requirements associated with the Program for the construction phase of the Project are presented in Table 2.

Table 9-1 – Reporting Requirements

Schedule (During Construction)	Requirements	Recipient (Relevant Authority)
Construction Monitoring Report	Data from real time noise and vibration monitoring will be included in the Project Sustainability Report and reported on a bi-annual basis within a Construction Monitoring Report.	AA, DPHI, EPA
EPL Validation Report	The validation report will be submitted to the EPA within 14 calendar days of the completion of the 'trial period' (refer to Section 5.4).	EPA
Preliminary Investigation Report and Follow-Up Investigation Report	Upon request from an EPA officer, the Preliminary Investigation Report will be submitted to the EPA by COB of the next business day following any noise or vibration monitoring. Where a detected exceedance of a noise goal or limit has occurred a Follow-Up Investigation Report shall be submitted to the EPA within 5 business days (unless otherwise approved by the EPA).	EPA
EPL Annual Return	Annual return to be submitted to the EPA 60 days after the end of each reporting period.	EPA

Separate from the Construction Monitoring Report, Validation Report and Preliminary Investigation Reports, additional records relating to noise and vibration training, toolbox talks, monitoring results and audit results are described in Section 3.5.2 & 3.9.1 of the CEMP. The complaints management and reporting procedure is described in Section 3.6.4 of the CEMP.

Appendix A – Noise Monitoring Data Sheet

DETAILS	
LOCATION OF CONSTRUCTION ACTIVITY:	MONITORING LOCATION/CATCHMENT AREA: NCA
DATE & TIME OF TEST:	TEST CONDUCTED BY:
CONSTRUCTION ACTIVITY:	DISTANCE FROM NOISE SOURCE:
METEROLOGICAL CONDITIONS[1]:	
WIND SPEED: None Light Moderate Strong	WIND DIRECTION:
NOISE ENVIRONMENT[2]:	

NOISE LEVELS AT MONITORING LOCATION		
DAY NML:	EVENING NML:	NIGHT NML:
PREDICTED NOISE LEVEL ($L_{Aeq15min}$):	NOISE ESTIMATE REFERENCE: (for example – CNVIS, OOHW noise assessment)	

SUBJECTIVE ASSESSMENT (mark all that apply and refer over page for detail minute by minute)		
Construction noise inaudible .	Construction noise sometimes audible .	Construction noise audible at most times .
Construction noise clearly audible .	Construction noise is dominant noise source .	
Impulsive Construction noise audible (e.g. rock-breaker) .	Tonal Construction noise audible (e.g. cutting steel) .	

SOUND LEVEL METER ASSESSMENT		
Start Time:	End Time:	Duration of Measurement: 15 minutes
File Name:	*Select time weighting "Fast" not slow*	*Select frequency weighting "A" not C or Linear*
Leq:	Exceedance of NML:	Difference to prediction:
LE:		
LAmax:		
LAmin:		
LA10 (15 min):	$L_{Aeq15min}$	$L_{Aeq15min}$
LA50 (15 min):		
LA90 (15 min):		

SITE ACTIVITIES / MONITORING COMMENTS:
Was metal on metal bangs minimized?
Were Flood lights (if any) directed to prevent light spill?
Was plant that was not in use switched off?
Was there signaling by horns?
Were airbrake silencers correctly installed?
Was there any shouting?
Were there any loud radios, Bluetooth speakers or the equivalent in use?

OBSERVATIONS

[1] i.e. temperature, humidity, cloud cover
[2] e.g. hard/soft groundcover, built or natural solid barrier

0.00 – 1.00	
1.00 – 2.00	
2.00 – 3.00	
3.00 – 4.00	
4.00 – 5.00	
5.00 – 6.00	
6.00 – 7.00	
7.00 – 8.00	
8.00 – 9.00	
9.00 – 10.00	
10.00 – 11.00	
11.00 – 12.00	
12.00 – 13.00	
13.00 – 14.00	
14.00 – 15.00	

MAP