Construction Noise and Vibration Management Sub-Plan

2600-0018 N2NS SP1
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Document Control

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Revision History

REVISION	DATE ISSUED	DESCRIPTION
A	22/10/2020	Issued for Internal Review
B	11/11/2020	Issued for Review
C	03/02/2021	Amended to Address Comments
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E	26/02/2021	Issued for Review
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2	04/08/2022	Reviewed and updated by T4MR, ARTC and the Project ER. OOHW Protocol updated to include CoAs and EPL Conditions relating to negotiated agreements.
3	16/06/2023	Reviewed, with minor changes made.

Table of Contents

Appendices

List of Tables

List of Figures

Compliance Matrix

Table 1: EPBC Conditions of Approval ((EPBC 2016/7729)

CONDITION REFERENCE	Requirements	WHERE ADDRESSED
PART B- STANDARD ADMINISTRATIVE CONDITIONS		
2	The approval holder must notify the Department in writing of the date of commencement of the action within 10 business days after the date of commencement of the action.	CEMP
4	The approval holder must maintain accurate and complete compliance records.	CEMP - Section 8
5	If the Department makes a request in writing, the approval holder must provide electronic copies of compliance records to the Department within the timeframe specified in the request.	CEMP - Section 8
Annual Compliance Reporting		
6	The approval holder must prepare a compliance report for each 12 month period following the date of commencement of the action, or otherwise in accordance with the annual date that has been agreed with in writing by the Minister. The approval holder must: a) Publish each compliance report on the website within 60 business days following the relevant 12 month period; b) Notify the Department by email that a compliance report has been published on the website and provide the weblink for the compliance report within five business days of the date of publication; c) Keep all compliance reports publicly available on the website until this approval expires;	CEMP - Section 8
Reporting non-compliance		
7	The approval holder must notify the Department in writing of any: incident, non-compliance with the conditions of this approval; or non-compliance with the commitments made in any element of the Construction Environmental Management Plan, (required under Part C- State Infrastructure approval) referred to in condition 1. The notification must be given as soon as practicable, and not later than two business days after becoming aware of the incident or non-compliance. The notification must specify: a) Any condition which is or may be in breach; b) A short description of the incident and/or non-compliance; and c) The location (including co-ordinates), date and time of the incident and/or non-compliance. In the event the exact information cannot be provided, provide the best information available.	CEMP - Section 10
8	The approval holder must notify the Department in writing of any: incident, non-compliance with the conditions of this approval; or non-compliance with the commitments made in any element of the Construction Environmental Management Plan, (required under Part C- State Infrastructure approval) referred to in condition 1. The notification must be given as soon as practicable, and not later than two business days after becoming aware of the incident or non-compliance specifying: a) Any corrective action or investigation which the approval holder has already taken or intends to take in the immediate future	CEMP - Section 10

CONDITION REFERENCE	Requirements	WHERE ADDRESSED
	b) The potential impacts of the incident or non -compliance and; c) The method and timing of any remedial action that will be undertaken by the approval holder.	

Table 2: Minister's Conditions of Approval (SSI 7474)

REQUIREMENT REFERENCE	DETAILS	WHERE ADDRESSED
A1	The CSSI may only be carried out in accordance with the terms of this approval and generally in accordance with the description of the CSSI in the Inland Rail – Narrabri to North Star Environmental Impact Statement, Volumes 1-7 (prepared by GHD and dated November 2017), the Inland Rail – Narrabri to North Star Submissions Preferred Infrastructure Report (ARTC, dated December 2019) and (updated BDAR, RtS on the SPIR and RFI responses).	CEMP - Section 3
A2	The CSSI must be carried out in accordance with all procedures, commitments, preventative actions, performance criteria and mitigation measures set out in in the documents listed in Condition A1 unless otherwise specified in, or required under, this approval.	CEMP - Section 3
A3	In the event of an inconsistency between the documents listed in Condition A1 or any other document required under this approval, and a term of this approval, the term of this approval prevails to the extent of the inconsistency. Note: For the purpose of this condition, there will be an inconsistency between a term of this approval and any document if it is not possible to comply with both the term and the document.	CEMP - Section 3
A4	The Proponent must comply with the written requirements or directions of the Planning Secretary, including in relation to: a) the environmental performance of the CSSI; b) any document or correspondence under the terms of this approval in relation to the CSSI (including the provision of such documentation or correspondence); c) any independent appointment or dismissal made in relation to the CSSI; d) any notification given to the Planning Secretary under the terms of this approval; e) any audit of the construction or operation of the CSSI; f) the terms of this approval and compliance with the terms of this approval (including anything required to be done under this approval); g) the carrying out of any additional monitoring or mitigation measures; and in respect of ongoing monitoring and management obligations, compliance with an updated or revised version of a guideline, protocol, Australian Standard or policy required to be complied with under this approval.	CEMP - Section 3
A5	Where the terms of this approval require a document or monitoring program to be prepared or a review to be undertaken in consultation with identified parties, evidence of the consultation undertaken must be submitted to the Planning Secretary with the document. The evidence must include:	Section 2 and Appendix F

REQUIREMENT REFERENCE	DETAILS	WHERE ADDRESSED
	▸ documentation of the engagement with the party identified in the condition of approval that has occurred before submitting the document for approval; ▸ a log of the dates of engagement or attempted engagement with the identified party and a summary of the issues raised by them; ▸ 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; ▸ outline of the issues raised by the identified party and how they have been addressed; and ▸ a description of the outstanding issues raised by the identified party and the reasons why they have not been addressed.	
A6	Any document that must be submitted, or approval that must be obtained, within a timeframe specified in or under the conditions of this approval may be submitted within a later timeframe agreed with the Planning Secretary. This condition does not apply to the immediate written notification required in respect of an incident under Condition A41. The Proponent must provide supporting evidence so that the Secretary can consider the need, environmental impacts and consistency of any request. Note: Inaction and/or expedience will not be supported as justifications for need unless it can be demonstrated that there are beneficial environmental impacts associated with the request.	CEMP - Section 8
A16	Ancillary facilities that are not identified by description and location in the EIS; can only be established and used in each case if: b) they are not located next to a sensitive receiver (including where an access road is between the facility and the receiver), unless the sensitive receiver landowner and occupier have given written acceptance to the carrying out of the relevant facility in the proposed location; and d) the establishment and use of the facility can be carried out and managed within the performance outcomes set out in the terms of this approval, including in relation to environmental impacts.	CEMP Section 6.4
A21	Facilities including lunch sheds, office sheds, material lay down sites, stockpile areas, areas used to assemble infrastructure, and portable toilet facilities can be established and operated where they satisfy the following criteria: (a) are located within the construction boundary; and (b) have been assessed by the ER to have - (i) low amenity impacts to surrounding residences and businesses, after consideration of matters such as compliance with the Interim Construction Noise Guideline (DECC, 2009), traffic and access impacts, dust and odour impacts, and visual (including light spill) impacts, and (ii) low environmental impact with respect to waste management and flooding, and	CEMP Section 6.4

<table>
<tr><th>REQUIREMENT REFERENCE</th><th>DETAILS</th><th>WHERE ADDRESSED</th></tr>
<tr><td></td><td>(iii) no impacts on biodiversity, soil and water, and heritage items beyond those already approved under other terms of this approval.</td><td></td></tr>
<tr><td>C4</td><td>The following CEMP Sub-plans must be prepared in consultation with the relevant government agencies and relevant Councils identified for each CEMP Sub-plan and be consistent with the CEMP referred to in the EIS.
<table>
<tr><th></th><th>Required CEMP Sub-plan</th><th>Relevant government authorities to be consulted for each CEMP Sub-plan</th></tr>
<tr><td>(b)</td><td>Noise and Vibration</td><td>Relevant councils</td></tr>
</table></td><td>Section 2 & Appendix F</td></tr>
<tr><td>C5</td><td>The CEMP Sub-plans Listed in Condition C4 must state how:
the environmental performance outcomes identified in the documents listed in Condition A1, as modified by these conditions, will be achieved;
the mitigation measures identified in the documents listed in Condition A1, as modified by these conditions will be implemented;
the relevant terms of this approval will be complied with; and
issues requiring management during construction (including coordination of concurrent activities of other projects as well as concurrent activities in this CSSI), as identified through ongoing environmental risk analysis, will be managed.</td><td>Section 10.1

Sections 2 and 10.2</td></tr>
<tr><td>C6</td><td>The CEMP Sub-plans must be developed in consultation with relevant parties identified in Condition C4. Details of all information requested by an agency to be included in a CEMP Sub-plan as a result of consultation, including copies of all correspondence from those agencies, must be provided with the relevant CEMP Sub-plan.</td><td>Section 2 and Appendix F</td></tr>
<tr><td>C7</td><td>Any of the CEMP Sub-plans may be submitted to the Secretary along with, or subsequent to, the submission of the CEMP, but in any event, no later than one (1) month prior to construction.</td><td>Noted</td></tr>
<tr><td>C13</td><td>Construction must not commence until the CEMP and all CEMP Sub-plans have been approved by the Secretary. The CEMP and CEMP Sub-plans, as approved by the Secretary, including any minor amendments approved by the ER, must be implemented for the duration of construction. Where the CSSI is being staged, construction of that stage is not to commence until the relevant CEMP and sub-plans have been endorsed by the ER and approved by the Secretary.</td><td>CEMP Section 3</td></tr>
<tr><td>C14</td><td>The following Construction Monitoring Programs must be prepared in consultation with the relevant government agencies and relevant councils identified for the Construction Monitoring Programs to compare actual performance of construction of the CSSI against performance predicted in the documents specified in Condition A1.
<table>
<tr><th></th><th>REQUIRED CEMP SUB-PLAN</th><th>RELEVANT GOVERNMENT AUTHORITIES TO BE CONSULTED FOR EACH CONSTRUCTION MONITORING PROGRAM</th></tr>
<tr><td>(a)</td><td>Noise and Vibration</td><td>Nil</td></tr>
</table></td><td>Section 2, Section 11 & Appendix F</td></tr>
<tr><td>C15</td><td>Each Construction Monitoring Program must provide:
a) details of baseline data available;</td><td>Section 11</td></tr>
</table>

REQUIREMENT REFERENCE	DETAILS	WHERE ADDRESSED
	b) details of any baseline data to be obtained and when; c) details of all monitoring of the CSSI to be undertaken; d) the parameters of the CSSI to be monitored; e) the frequency of monitoring to be undertaken; f) the location of monitoring; g) the reporting of monitoring and analysis results against relevant criteria; h) procedures to identify and implement additional mitigation measures where results of monitoring are unsatisfactory; and any consultation required in relation to the monitoring programs.	
C16	The Construction Monitoring Programs must be developed in consultation with relevant government agencies as identified in Condition C14 of this approval and must include information requested by an agency to be included in a Construction Monitoring Programs during such consultation. Details of all information requested by an agency including copies of all correspondence from those agencies, must be provided with the relevant Construction Monitoring Program.	Section 2, Section 11 and Appendix F
C17	The Construction Monitoring Programs must be endorsed by the ER and then submitted to the Planning Secretary for approval at least one month before the commencement of construction.	Section 11.2
C18	Construction must not commence until the Planning Secretary has approved all of the required Construction Monitoring Programs, and all relevant baseline data for the specific construction activity has been collected.	CEMP Section 1.1
C19	The Construction Monitoring Programs, as approved by the Planning Secretary including any minor amendments approved by the ER must be implemented for the duration of construction and for any longer period set out in the monitoring program or specified by the Planning Secretary, whichever is the greater.	CEMP Section 3 Construction Noise and Vibration Management Sub-Plan (Section 11). Construction Traffic, Transport and Access Management Sub-Plan (Section 5.2). Construction Soil and Water Management Sub-Plan (Section 7.2).
C20	The results of the Construction Monitoring Programs must be submitted to the Planning Secretary, and relevant regulatory agencies, for information in the form of a Construction Monitoring Report at the frequency identified in the relevant Construction Monitoring Program. Note: *Where a relevant CEMP Sub-plan exists, the relevant Construction Monitoring Program may be incorporated into that CEMP Sub-plan.*	CEMP Section 8.9
E1	Works must be undertaken during the following hours: a) 7:00 am to 6:00 pm Mondays to Fridays; b) 7:00 am to 6:00 pm Saturdays; and c) at no time on Sundays or public holidays.	Section 8.1.1 Section 10.1
E2	Notwithstanding Condition E1, works affecting any given receiver may be undertaken during the hours of 6.00 am to 6.00 pm each day over a three (3) month period provided that there is no work between the hours of 6:00 pm on a Saturday and 7:00 am on a Monday every second week.	Section 8.1.1 Section 10.1

REQUIREMENT REFERENCE	DETAILS	WHERE ADDRESSED
E3	Notwithstanding Conditions E1 and E2, works associated with the CSSI may be undertaken outside the hours specified under those conditions in the following circumstances: a) for the delivery of materials required by the NSW Police Force or other authority for safety reasons; or b) 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; or c) where different construction hours are permitted under an EPL in force in respect of the CSSI; or d) work approved under an Out-of-Hours Work Protocol for work not subject to an EPL as required by Condition E8; or e) where a negotiated agreement is in force, in accordance with Condition E4 and E5; or f) construction that causes LAeq(15 minute) noise levels: i. no more than 5 dB(A) above the rating background level at the façade of any residence in accordance with the Interim Construction Noise Guideline (DECC, 2009) or if between the hours of 10:00 pm and 7:00 am no more than 52 dB(A)LA(max) or more than 15 dB(A)LA(Max) above the rating background level whichever is the higher, and ii. no more than the noise management levels specified in Table 3 of the Interim Construction Noise Guideline (DECC, 2009) at other sensitive land uses, and iii. continuous or impulsive vibration values, measured at the most affected residence are no more than those for human exposure to vibration, specified in Table 2.2 of Assessing Vibration: a technical guideline (DEC, 2006), and iv. intermittent vibration values measured at the most affected residence are no more than those for human exposure to vibration, specified in Table 2.4 of Assessing Vibration: a technical guideline (DEC, 2006).	Section 8.1.2
E4	The Proponent may reach negotiated agreements with sensitive receivers (owners and occupiers) to carry out works in accordance with the hours and noise limits specified in the negotiated agreements.	Section 8.1.2
E5	All negotiated agreements must be in writing and finalised before the commencement of works.	Section 8.1.2
E6	On becoming aware of the need for emergency works in accordance with Condition E3(b), the Proponent must notify the Department in writing to compliance@planning.nsw.gov.au, the ER and the EPA of the need for that work. The Proponent must use best endeavours to notify all affected sensitive receivers of the likely impact and duration of those works.	Section 8.1.2 Section 10.1
E7	Except as permitted by an EPL or approved through an Out of Hours Works Protocol (for works not subject to an EPL), highly noise intensive work that results 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;	Section 8.1.1

REQUIREMENT REFERENCE	DETAILS	WHERE ADDRESSED
	b) between the hours of 8:00 am to 1:00 pm Saturday; and c) in continuous blocks not exceeding three hours each with a minimum respite from those activities and works of not less than one hour between each block. For the purpose of this condition, 'continuous' includes any period during which there is less than a one-hour respite between ceasing and recommencing any works that are the subject of this condition.	
E8	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 E1 and E2, and that is not subject to an EPL. The Protocol must be approved by the Planning Secretary before commencement of the relevant out-of-hours work. The Protocol must be prepared in consultation with the EPA. The Protocol must: a) provide a process for the consideration of out-of-hours work against the relevant noise and vibration criteria, including the determination of low and high-risk activities; b) provide a process for the identification and implementation of mitigation measures for residual impacts, including respite periods in consultation with the community at each affected location; c) identify procedures to facilitate the coordination of out-of-hours work approved by an EPL to ensure appropriate respite is provided; d) identify an approval process that considers the risk of activities, proposed mitigation, management, and coordination, including where: e) low risk activities can be approved by the ER, and high risk activities that are approved by the Planning Secretary; and identify Department, EPA and community notification arrangements for approved out-of-hours works, which maybe detailed in the Communication Strategy.	Appendix D NOTE: This OOHW Protocol applies to all works undertaken on the Project not just those works not subject to an EPL.
E9	Noise generating work 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 within sensitive periods or during important events, unless other reasonable arrangements with the affected institutions are made at no cost to the affected institution or as otherwise approved by the Planning Secretary.	Section 10.1
E10	Mitigation measures must be implemented with the aim of achieving the following construction noise management levels and vibration criteria: a) construction 'Noise affected' noise management levels 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) BS 7385 Part 2-1993 "Evaluation and measurement for vibration in buildings Part 2" as they are "applicable to Australian conditions"; and	Section 7 Section 10

REQUIREMENT REFERENCE	DETAILS	WHERE ADDRESSED
	d) the vibration limits set out in the German Standard DIN 4150-3: Structural Vibration- effects of vibration on structures (for structural damage). Any works identified as exceeding the noise management levels and/or vibration criteria must be managed in accordance with the Construction Noise and Vibration Management Sub-plan required by Condition C4. *Note: The Interim Construction Noise Guideline identifies 'particularly annoying' activities that require the addition of 5 dB(A) to the predicted level before comparing to the construction Noise Management Level.*	
E11	Owners and occupiers of properties at risk of exceeding the screening criteria for cosmetic damage must be notified before construction 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, owner and occupiers must be provided with a schedule of potential exceedances for the duration of the potential exceedances, unless otherwise agreed by the owner and occupier. These properties must be identified and considered in the Construction Noise and Vibration Management Sub-plan required by Condition C4.	Section 10.1 Section 10.3
E12	This approval does not permit blasting.	Blasting is not proposed on the project.
E73	The Proponent must undertake dilapidation surveys on the current condition of surface and subsurface structures owned by third parties and identified at risk from vibration. The dilapidation surveys must be prepared by a suitably qualified and experienced person(s).	Section 10.4
E74	The results of the dilapidation surveys must be provided to the relevant owners of surface and sub-surface structures for review prior to the commencement of potentially impacting works.	Section 10.4
E75	Subsequent dilapidation surveys must be undertaken to assess damage to the surface and subsurface structures that may have resulted from the construction of the CSSI within three months of the completion of construction, unless otherwise agreed by the Secretary.	Section 10.4
E76	The results of the subsequent dilapidation surveys for each surface and sub-surface structure surveyed must be provided to the relevant owners of the structures within one (1) month of undertaking the surveys.	Section 10.4
E77	The Proponent must carry out rectification at its expense and to the reasonable requirements of the surface and sub-surface structure owner(s) within three (3) months of completion of the post-dilapidation surveys unless otherwise agreed with the owner of the affected surface and subsurface structure.	Section 10.4

Table 3: Revised Mitigation Measures (RMM)

REQUIREMENT REFERENCE	DETAILS	WHERE ADDRESSED
Noise and Vibration		
C4.1 Noise and vibration management	The Inland Rail NSW Construction Noise and Vibration Management Framework (provided in Appendix J) would be implemented, and the preferred infrastructure proposal would be constructed, with the aim of	This plan

REQUIREMENT REFERENCE	DETAILS	WHERE ADDRESSED
	achieving the construction noise management levels and vibration criteria identified by the noise and vibration assessment. All feasible and reasonable noise and vibration mitigation measures would be implemented. Any activities that could exceed the construction noise management levels and vibration criteria would be identified and managed in accordance with the Inland Rail NSW Construction Noise and Vibration Management Framework and the CEMP. Notification of impacts would be undertaken in accordance with the communication management plan for the preferred infrastructure.	
D4.2 Noise and vibration management	Where vibration levels are predicted to exceed the screening criteria, a more detailed assessment of the structure and vibration monitoring would be carried out in accordance with the Inland Rail NSW Construction Noise and Vibration Management Framework, to ensure vibration levels remain below appropriate limits for that structure.	This plan

Table 4: SPIR Construction Environment Management Plan Outline

ISSUE	MANAGEMENT MEASURE	WHERE ADDRESSED
Noise and Vibration		
Notification and behavior	Notification undertaken during construction would inform relevant stakeholders of the work locations and timing, and the potential for noise impacts. Construction sites and compounds located within 200 metres of sensitive receivers would be managed to minimise noise generating activities, including unnecessary shouting, loud stereos/radios, dropping of materials from height, throwing of metal items, and slamming of doors, particularly at the start and finish of shifts.	Section 2.1 CEMP Section 6.4
Construction hours and scheduling	The relevant noise and vibration criteria would be defined. For work undertaken in the vicinity of receivers where 'highly noise affected' impacts are predicted: ▸ High noise and vibration generating activities would only be carried out in continuous blocks, not exceeding three hours each, with a minimum respite period of one hour between each block. ▸ No more than four consecutive nights of high noise and/or vibration generating work would be undertaken over any seven day period, unless otherwise approved by ARTC.	Section 8.1 Section 10
Equipment and plant	Quieter and less vibration emitting construction methods would be used where reasonable and feasible. The noise levels of plant and equipment would have operating sound power or sound pressure levels that comply with the required criteria. Simultaneous operation of noisy plant within range of sensitive receivers would be avoided. The offset distance between noisy plant and adjacent sensitive receivers would be maximised as far as practicable. Plant used intermittently would be throttled down or shut down. Noise-emitting plant would be directed away from sensitive receivers. Stationary noise sources (such as pumps, compressors, fans etc.) would be enclosed or shielded whilst ensuring that the health and safety of workers is maintained. Consider site topography when situating plant and use structures (such as site shed placement, earth bunds, fencing, noise barriers) to shield receivers from noise.	Section 10

ISSUE	MANAGEMENT MEASURE	WHERE ADDRESSED
Traffic flow and deliveries	For construction sites located near sensitive receivers, plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site. Loading and unloading of materials/deliveries would occur as far as possible from sensitive receivers, and preferably during standard construction hours. Site access points and roads would be selected to minimise impacts on sensitive receivers. Where practicable, delivery vehicles would be fitted with straps rather than chains for unloading.	Section 10 TTAMP CEMP Section 6.4
Measuring and monitoring	Attended vibration measurements would be undertaken at the commencement of vibration generating activities located in close proximity to sensitive receptors to confirm that vibration levels are within the acceptable range to prevent cosmetic building damage. Additional vibration and noise monitoring may be required in response to complaints.	Section 10 Section 11
Vibration	Where construction is required within the safe working buffer distance, alternative work methods would be considered, such as the use of smaller equipment. If no alternative work method is feasible or reasonable, then compliance vibration monitoring would be undertaken. Trial vibration testing would be undertaken as required, prior to undertaking any high vibration activities. Trials would be undertaken in non-sensitive areas and at a range of distances from the source. The results of the trial monitoring would be compared against predicted vibration levels and the potential for impact refined, if deemed appropriate. The trial period may also be used to determine the effectiveness of source-based mitigation measures, such as changing the operating speed of the vibratory roller to generate a higher frequency of vibration, which may allow for a higher vibration threshold at the structure. For identified properties within buffer distances, or where pre-construction monitoring indicates that vibration levels from construction activities would exceed the target levels, a dilapidation survey of potentially affected structures would be undertaken to enable post-construction verification.	Section 10.1 Section 10.3 Section 11

Table 5: SEARs Environmental Performance Outcomes

REQUIREMENT REFERENCE	DETAILS	WHERE ADDRESSED
11 Noise and vibration - amenity	Construction noise and vibration (including airborne noise, ground-borne noise and blasting) are effectively managed to minimise adverse impacts on acoustic amenity.	This plan
	Increases in noise emissions and vibration affecting nearby properties and other sensitive receivers during operation of the proposal are effectively managed to protect the amenity and well-being of the community.	This plan
12 Noise and vibration - structural	Construction noise and vibration (including airborne noise, ground-borne noise and blasting) are effectively managed to minimise adverse impacts on the structural integrity of buildings, items including aboriginal places and environmental heritage, and nearby road infrastructure.	This plan

Glossary

ACRONYM / ABBREVIATION	DEFINITION
AMS	Activity Method Statement
ANML	Airborne Noise Management Level
ARTC	Australian Rail Track Corporation
CAD	Computer-Aided Design
CEMP	Construction Environmental Management Plan
CoA	Conditions of Approval
CSEMP	Community and Stakeholder Engagement Management Plan
CSSI	Critical State Significant Infrastructure
CNVIS	Construction Noise and Vibration Impact Statement
DPIE	Department of Planning Industry and Environment
ECM	Environmental Control Map
ECRTN	Environmental Criteria for Road Traffic Noise
EIS	Environmental Impact Statement
EMS	Environmental Management System
EPA	Environmental Protection Authority
EPBC	Environmental Protection and Biodiversity Conservation Act
EPL	Environment Protection Licence
EP&A	Environmental Planning and Assessment Act (1979)
ER	Environment Representative
GIS	Geographic Information System
GMR	Global Mandatory Requirement
HMP	Heritage Management Plan
HSEQS	Health, Safety, Environment, Quality and Sustainability
ICNG	Interim Construction Noise Guideline
IMS	Integrated Management System
IR	Inland Rail
ISCA	Infrastructure Sustainability Council of Australia
N2NS	Narrabri to North Star (Separable Portion 1)
NML	Noise Management Level
NVMP	Noise and Vibration Management Plan
RBL	Rating Background Noise Level
RMM	Revised Mitigation Measure
ROL	Road Occupancy Licence
RTS	Response to Submissions
SEARs	Secretary's Environmental Assessment Requirements
SEMP	Site Establishment Management Plan
SEP	Site Environment Plan

ACRONYM / ABBREVIATION	DEFINITION
SPIR	Submissions Preferred Infrastructure Report
SuMP	Sustainability Management Plan
TRA	Task Risk Assessment
TTAMP	Traffic, Transport and Access Management Plan
TfNSW	Transport for NSW
VDV	Vibration Dose Value
VML	Vibration Management Level
WRA	Workplace Risk Assessment

1 Plan Overview

1.1 Purpose and Scope

This Construction Noise and Vibration Management Plan (CNVMP) forms part of the Construction Environmental Management Plan (CEMP) for the Narrabri to North Star (N2NS) Project and details the key mitigation measures that will be implemented by Trans4m Rail in order to minimise and manage the noise and vibration impacts during the construction of the N2NS Project.

This Plan has been prepared to address the relevant requirements of the Project's planning Approval, the Revised Mitigation Measures (RMMs), applicable legislation, the Environmental Impact Statement (EIS), the Environment Protection Licence (EPL) and contractual requirements. The CNVMP is consistent with the ARTC Inland Rail Environment and Sustainability Policy, ARTC Environmental Policy and Trans4m Rail's Environment and Heritage Policy (Appendix B – CEMP).

Construction will not commence until the CEMP, CEMP sub-plans and the Construction Monitoring Programs are endorsed by the Environment Representative (ER) and approved by the Secretary of the Department of Planning, Industry and Environment (DPIE). The CEMP and Construction Monitoring Programs will be submitted to the Secretary for approval no later than one month prior to the commencement of construction. The CEMP and CEMP Sub-plans, as approved by the Secretary, including any minor amendments approved by the ER, must be implemented for the duration of construction.

This Plan builds on the noise and vibration assessment and analysis undertaken in the N2NS Project's Environmental Impact Statement (EIS) and Submissions and Preferred Infrastructure Report (SPIR). Assessments were undertaken by GHD as part of the EIS, to determine the impacts of airborne noise and vibration and construction traffic. The EIS presented noise impacts based on a worst-case assessment.

This has identified the suite of reasonable and feasible noise mitigation measures the project will implement when delivering the N2NS works. This Plan sets out the modelling process used and summarises the mitigation measures to be implemented.

1.2 Objectives and Targets

The following noise and vibration objectives will apply to all construction activities:

- Avoid or minimise unreasonable environmental and social impacts associated with noise or vibration.
- Comply with all relevant noise and vibration regulatory requirements.
- Maintain positive and cooperative relationships with local communities.
- Reasonable and feasible mitigation measures are implemented to minimise and manage noise and vibration impacts on surrounding residents, commercial and other sensitive receivers.
- Any complaints are addressed in a timely and efficient manner.

The following noise and vibration management targets will apply to construction:

- Full compliance with the CoAs and EPL Conditions.
- Minimise noise and vibration levels to achieve specified criteria.
- Minimise stakeholder complaints and ensure all complaints are addressed in a timely and appropriate manner.
- Control noise and vibration at the source as a priority.

The implementation of the mitigation measures will ensure the performance targets are achieved. This will be managed through project inductions, specialised training, toolbox talks, inspections, and environmental monitoring and auditing. Project inductions will inform Trans4m Rail personnel (including subcontractors) of the management measures, while toolbox talks and specialised training will ensure they are reinforced throughout the construction program.

1.3 Environment Policy

Trans4m Rail believes that respect for the Project location, its surroundings and the communities in which it operates is essential for project success, as well as compliance with all environmental, sustainability and community requirements. This commitment is described in Trans4m Rail's Environment Policy which can be found in Appendix B of the CEMP.

1.4 Project Description

The N2NS Project is one of 13 projects that make up the Inland Rail Project. The route is within the Narrabri, Moree Plains and Gwydir Local Government Areas (LGAs) in north west NSW. N2NS extends approximately 171km from north of Narrabri Junction, terminating at North Star and the project is generally within the existing rail corridor. Works over the Gwydir Floodplain are excluded from the N2NS Project. This construct only contract will be delivered by Trans4m Rail (an unincorporated Joint Venture between SEE Civil Pty Ltd and John Holland Pty Ltd). Further detail on the project, including construction scope of works and construction schedule can be found in Section 4 of the CEMP.

2 Community and Stakeholder Engagement

Trans4m Rail's Community and Stakeholder Engagement Management Plan (CSEMP) provides a clear framework for active communication and stakeholder engagement and management. The Plan outlines how Trans4m Rail will meet best practice community and project outcomes by keeping the community and other stakeholders informed, minimising potential impacts and responding to the needs and requirements of stakeholders. The CSEMP contains procedures and strategies to manage community and stakeholder engagement activities as they align to the Project delivery program. To the extent practicable, Trans4m Rail will provide stakeholders with open and transparent consultation.

CoA A5 and C4 require that the CNVMP be prepared in consultation with:

- Narrabri Shire Council;
- Moree Plains Shire Council; and
- Gwydir Shire Council.

The consultation efforts can be summarised as:

- 12th November 2020 - Rev. B of the N2NS Construction Noise and Vibration Management Sub-Plan was submitted to Narrabri, Moree Plains and Gwydir Shire Councils via Aconex on the 12th November 2020.

  An email was also sent to the above-mentioned Stakeholders via Outlook advising them that the document had been transmitted via Aconex and to make contact with a member of the Project Team if there were any questions or problems accessing or opening the document.

  Moree Plains Shire Council provided a response on the 27th November 2020, these comments have been considered and addressed in the CNVMP. Refer to Appendix F for details.

  No response was received from Narrabri or Gwydir Shire Councils at the time.

- 3rd February 2021 - An email was issued via Outlook to all abovementioned stakeholders on the 3rd February 2021 advising that the Project Team was still seeking feedback on the N2NS Construction Noise and Vibration Management Sub-Plan.

  Gwydir Shire Council responded on the 3rd February 2021, advising "No Comment", refer to Appendix F.

  Narrabri Shire Council provided comment on the 5th February 2021, refer to Appendix F.

As required by CoA C6, details of all information requested by an agency to be included in a CEMP Sub-plan as a result of consultation can be found in Appendix F. Appendix F also provides an assessment of where comments have been addressed in the NVMP.

In addition to the consultation undertaken with the relevant Councils, the NSW EPA was consulted in accordance with CoA E8 with regards to the Project's Out of Hours Works Protocol (OOHW Protocol). This OOHW Protocol is attached as Appendix D. On the 3rd February 2021, the OOHW Protocol was transmitted to the NSW EPA via Aconex and discussed via a phone call. The EPAs comments have been incorporated into the OOHW Protocol and associated OOHW Application Forms.

The Newell Highway in the vicinity of the N2NS project is proposed to be upgraded within the N2NS construction phase, (although not included in N2NS Project scope). Trans4m Rail and ARTC will liaise with Transport for NSW (TfNSW) at regular intervals (nominally monthly) with the aim of developing and implementing measures aimed at reducing any potential cumulative impacts from the simultaneous construction of the rail link and Newell Highway upgrade works. Any additional measures identified will be incorporated into this plan and the relevant Site Environmental Plan/s. Coordination with other construction works is discussed further in Section 10.2.

2.1 Proactive and responsive community consultation

Throughout the delivery of the N2NS Project Trans4m Rail will also consult with:

- Potentially noise and/or vibration affected receivers including community, religious and educational institutions (refer to the Trans4m Rail CSEMP); and

- Proponents of other construction works near the N2NS Works (e.g. the Newell Highway Upgrade project).

Stakeholder feedback relevant to construction noise and vibration will be included in Consultation Manager, where appropriate.

Residents, property owners, businesses and community facilities near the construction sites and rail alignment will have a wide range of unique needs and concerns about construction impact. Trans4m Rail will engage through multiple channels to notify and build understanding of the likely impacts of noise and vibration, and the reasonable and feasible options available to mitigate these impacts, including respite. Every effort will be made by Trans4m Rail to mitigate these impacts.

When informing sensitive receivers on the level of noise and vibration to be expected from construction activities, potential impacts will be described using qualitative terminology consistent with the Inland Rail Noise and Vibration Management Strategy (e.g. noticeable, clearly audible, moderately intrusive, highly intrusive).

In order to undertake out-of-hours work, Trans4m Rail will identify appropriate respite periods for the out-of-hours works 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 schedule of likely out-of-hours work for a period no less than three (3) months;
- the potential works, location and duration;
- the noise characteristics and likely noise levels of the works; and
- likely mitigation and management measures.

The outcomes of the community consultation, the identified respite periods and the scheduling of the likely out-of-hour works must be provided to the EPA and the Planning Secretary, if requested.

3 Legal and Compliance Requirements

3.1 Legislation

This Plan is prepared in accordance with the:

- *Environmental Planning and Assessment Act 1979*
- *Protection of the Environment Operations Act 1997* (POEO Act)
- *Protection of the Environment Operations (Noise Control) Regulation 2017 (Noise Regs)*

3.2 Project Compliance requirements

Key planning requirements from the Project Planning Approval are summarised in the Compliance Matrix included at the beginning of this Plan.

Additional noise and vibration management requirements from the N2NS contract including the Project Planning Approval and Revised Environmental Management Measures are included in Section 10.

Trans4m Rail have obtained an Environment Protection Licence, (EPL) in accordance with the POEO Act. All conditions set by the EPL are obligatory for the N2NS Works and all relevant licence conditions (i.e. relevant to noise and vibration management as well as out of hours work) will be applied in accordance this Plan.

This NVMP was endorsed by the Environmental Representative on 11th March 2021 and a copy of the endorsement letter can be provided upon written request.

3.3 Guidelines

Guidelines and standards relating to the management of noise and vibration include:

- Inland Rail Noise and Vibration Management Strategy (01-9000-PE-P11-ST-0003-V3.3) (ARTC 2016)
- Inland Rail NSW Construction Noise & Vibration Management Framework (0-9000-ENV-00-RP0001) (ARTC 2018)
- Environmental Criteria for Road Traffic Noise (EPA 1999)
- NSW Road Noise Policy, Department of Environment, Climate Change and Water NSW, March 2011 (RNP)
- NSW Noise Policy for Industry 2017
- RTA Environmental Noise Management Manual (RTA 2001)
- Interim Construction Noise Guideline (DECC 2009)
- Assessing Vibration: A Technical Guideline (DECC 2006)
- AS1055.1 – 1997 Acoustics – Description and Measurement of Environmental Noise
- AS2436 – 2010 Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites
- AS1055 Acoustics – Description and Measurement of Environmental Noise
- AS2659.1 – 1998 Guide to the use of sound measuring equipment – portable sound level meters
- AS2775 Mechanical Mounting of Accelerometers
- International Standard IEC 61672.1 Electroacoustic – Sound Level Meters – Specifications
- International Standard IEC 60942 ‘Electroacoustics – Sound calibrators
- ISO 3744 Acoustics – Determination of sound power levels and sound energy levels of noise sources using sound pressure – Engineering methods for an essentially free field over a reflecting plane
- ISO 3746 Acoustics – Determination of sound power levels and sound energy levels of noise sources using sound pressure – Survey method using an enveloping measurement surface over a reflecting plane
- ISO 6393 Earth-moving machinery – Determination of sound power level – Stationary test conditions
- ISO 6395 Earth-moving machinery – Determination of sound power level – Dynamic test conditions.
- NATA General Accreditation Guidance – General Equipment – Calibration and Checks, General Equipment Table 2018.
- British Standard BS 6472-2008 Evaluation of human exposure to vibration in buildings (1-80Hz)
- British Standard 7385: Part 2 Evaluation and Measurement of Vibration in Buildings
- German Standard DIN4150-3:2016 Vibration in buildings – Part 3: Effects on structures
- German DIN 4150: Part 3 – 1999 Effects of Vibration on Structure (DIN 1999).

4 Environmental Risk Assessment

A summary of the key findings from the EIS and the Submissions and Preferred Infrastructure Report (SPIR) are outlined below. Further details of noise and vibration impacts predicted for the project can be found in the N2NS EIS and associated Technical Report 5 (Noise and Vibration Assessment) and SPIR Appendix C Noise and Vibration Technical Information.

- There is the potential for construction noise to exceed relevant criteria at various sensitive receivers along the proposal site. Although construction noise would be temporary and localised in nature, the potential impacts would be managed through the implementation of noise control measures.
- Activities such as pre-possession, skim track reconditioning, full depth reconditioning, and drainage construction, are likely to impact the largest number of receivers due to the higher level of noise emitted by the anticipated equipment.
- Construction activities undertaken outside of the primary proposal construction hours (i.e. 6am to 6pm as per SPIR) increase the impacted receivers to those within about 1,500 metres for bridge works and 700 metres for other activities.
- For works within primary proposal construction hours:
  - ✓ Construction activities have the potential to exceed the noise management level in residential areas, but less so in rural areas;
  - ✓ Construction activities have the potential to exceed the noise management level at non-residential sensitive receivers including educational, child-care and hospital facilities. Construction noise management levels are applicable as an internal level only when the facilities are in use; and
  - ✓ Construction activities have the potential to exceed the noise management level at recreational areas including bushland areas, parks and sporting facilities when these areas are in use.
- In relation to vibration from general construction activities, the expected magnitude of ground vibration is not expected to be sufficient to cause structural damage if the equipment operates at distances greater than 18 metres from standard residential buildings or structures of similar construction.
- The expected magnitude of ground vibration at heritage structures is not expected to be sufficient to cause structural damage if the equipment operates at distances greater than 35 metres from heritage buildings and structures. However, many items are potentially within this distance from the works and may therefore be affected.

Based on the results from the EIS and SPIR, ARTC also completed a sensitive receiver “heat map”. This heat map applies a 700m buffer around sensitive receivers for general construction works and 1,500m for bridge works and identifies the locations of potentially affected receivers.

4.1 Risk Assessment and Management

Section 7 of Trans4m Rail’s CEMP contains a project risk assessment including an assessment of construction noise and vibration risks. Noise and vibration risk is summarised in Table 6.

Table 6: Noise and Vibration Risk Assessment

CONSTRUCTION ACTIVITY/ ASPECT	POTENTIAL IMPACT	RISK LEVEL PRIOR TO MITIGATION	INDICATIVE MITIGATION MEASURES	RISK LEVEL FOLLOWING MITIGATION	DOCUMENTS / PROCEDURES / TRAINING REQUIRED
Site establishment **Clearing and grubbing** **Demolition** **Earthworks and drainage** **Bridge work** **Piling** **Paving** **Saw cutting** **Rock hammering** **OOHW**	Noise impacts on local residents and sensitive receivers from construction activities including out of hours works	High	The noise and vibration management sub-plan would detail how potential noise and vibration impacts would be mitigated and managed during construction. The plan would include the listed management measures. Where the noise and vibration levels are predicted to exceed the criteria after implementation of the general work practices, the additional mitigation measures detailed in Section 10 would be implemented. The requirements of relevant standards and guidelines, including AS 2436-2010 Guide to noise and vibration control on construction, demolition and maintenance sites and the Interim Construction Noise Guideline (DECC, 2009) would be addressed. The plan would also reference the complaints management procedures specified in the communication and complaints management plan Notification undertaken during construction would inform relevant stakeholders of the work locations and timing, and the potential for noise impacts. Construction sites and compounds located within 200 metres of sensitive receivers would be managed to minimise noise generating activities, including unnecessary shouting, loud stereos/radios, dropping of materials from height, throwing of metal items, and slamming of doors, particularly at the start and finish of shifts. For work undertaken in the vicinity of receivers where 'highly noise affected' impacts are predicted: ▸ High noise and vibration generating activities would only be carried out in continuous blocks, not exceeding three hours each, with a minimum respite period of one hour between each block. ▸ No more than four consecutive nights of high noise and/or vibration generating work would be undertaken	Medium	Construction Noise and Vibration Management Plan Interim Construction Noise Guideline Environmental Control Maps Site Environment Plan Complaints Procedure CSEMP (incl. Complaints Register) Induction Toolbox Talks – noise and vibration Construction Noise and Vibration Impact Statement/s OOHW Applications
	Noise impacts on local residents and sensitive receivers from construction traffic	Medium		Medium	
	Damage to structures (including heritage structures and utilities) from vibration caused by construction activities	Medium		Low	

CONSTRUCTION ACTIVITY/ ASPECT	POTENTIAL IMPACT	RISK LEVEL PRIOR TO MITIGATION	INDICATIVE MITIGATION MEASURES	RISK LEVEL FOLLOWING MITIGATION	DOCUMENTS / PROCEDURES / TRAINING REQUIRED
			over any seven-day period, unless otherwise approved by ARTC. ▸ Quieter and less vibration emitting construction methods would be used where reasonable and feasible. ▸ The noise levels of plant and equipment would have operating sound power or sound pressure levels that comply with the required criteria. ▸ Simultaneous operation of noisy plant within range of sensitive receivers would be avoided. ▸ The offset distance between noisy plant and adjacent sensitive receivers would be maximised as far as practicable. ▸ Plant used intermittently would be throttled down or shut down. ▸ Noise-emitting plant would be directed away from sensitive receivers. ▸ Stationary noise sources (such as pumps, compressors, fans etc.) would be enclosed or shielded whilst ensuring that the health and safety of workers is maintained. ▸ Consider site topography when situating plant and use structures (such as site shed placement, earth bunds, fencing, noise barriers) to shield receivers from noise. ▸ For construction sites located near sensitive receivers, plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site. ▸ Loading and unloading of materials/deliveries would occur as far as possible from sensitive receivers, and preferably during standard construction hours. ▸ Site access points and roads would be selected to minimise impacts on sensitive receivers. ▸ Where practicable, delivery vehicles would be fitted with straps rather than chains for unloading.		

CONSTRUCTION ACTIVITY/ ASPECT	POTENTIAL IMPACT	RISK LEVEL PRIOR TO MITIGATION	INDICATIVE MITIGATION MEASURES	RISK LEVEL FOLLOWING MITIGATION	DOCUMENTS / PROCEDURES / TRAINING REQUIRED
			Attended vibration measurements would be undertaken at the commencement of vibration generating activities located in close proximity to sensitive receptors to confirm that vibration levels are within the acceptable range to prevent cosmetic building damage. Additional vibration and noise monitoring may be required in response to complaints. Where construction is required within the safe working buffer distance, alternative work methods would be considered, such as the use of smaller equipment. If no alternative work method is feasible or reasonable, then compliance vibration monitoring would be undertaken. Trial vibration testing would be undertaken as required, prior to undertaking any high vibration activities. Trials would be undertaken in non-sensitive areas and at a range of distances from the source. The results of the trial monitoring would be compared against predicted vibration levels and the potential for impact refined, if deemed appropriate. The trial period may also be used to determine the effectiveness of source-based mitigation measures, such as changing the operating speed of the vibratory roller to generate a higher frequency of vibration, which may allow for a higher vibration threshold at the structure. For identified properties within buffer distances, or where pre-construction monitoring indicates that vibration levels from construction activities would exceed the target levels, a dilapidation survey of potentially affected structures would be undertaken to enable post-construction verification.		

Section 26.3 of the N2NS EIS provides a summary of the potential residual impacts for the project with a description of how these potential residual impacts would be managed. No residual construction noise or vibration management impacts have been identified.

Recommended mitigation measures identified in Table 6 are incorporated in Trans4m Rail's management and mitigation measures detailed in Section 10.

5 Environmental Management Framework

5.1 Trans4m Rail Environmental Management System

Trans4m Rail will be utilising an Environmental Management System (EMS) (which is certified to ISO AS/NZS14001) to enhance its' environmental performance on the N2NS Project. This is discussed in detail in Section 8 of the CEMP.

5.2 Roles and Responsibilities

Section 8 of Trans4M Rail's CEMP details roles and responsibilities for environmental management (including Noise and Vibration). Trans4m Rail's Environment Manager has overall responsibility for the implementation of environmental matters on the Project and the General Superintendent is responsible for field implementation of environmental requirements and control measures (including noise and vibration requirements and control measures). It is important to note that all personnel are responsible for ensuring the environmental values are protected.

In addition, Trans4m Rail have engaged Renzo Tonin & Associates, noise and vibration specialists, to undertake comprehensive noise and vibration monitoring and to prepare this Plan. During delivery, noise and vibration specialists will continue to provide advice and services in the development and implementation of this Plan and associated documents to ensure impacts can be avoided, minimised or appropriately mitigated including:

- Contributing towards the preparation of Construction Noise and Vibration Impact Statements;
- Providing advice on measures to prevent vibration and direct impacts to heritage (and other) structures; and
- Undertaking noise and vibration monitoring, where required.

5.3 Competence, Training and Awareness

All personnel performing environmental management activities for and on behalf of Trans4m Rail will be trained, qualified and competent. Personnel performing specified assigned tasks shall be qualified on the basis of appropriate education, training, skills and/or experience, as appropriate. Section 8 of the CEMP details competence, training and awareness and includes:

- Inductions;
- Tool box talks;
- Daily pre-start meetings;
- Resource planning; and
- Trans4m Rail's Training Matrix.

5.4 Hold Points

Hold Points will be implemented on this Project for the purpose of minimising the likelihood of an incident when undertaking specific construction activities that have a greater environmental risk. Section 8 of the CEMP discusses Hold Points. Hold Points specific to noise and vibration management include out of hours work activities.

5.5 Environmental and Sustainability Inspections

Section 8 of Trans4m Rail's CEMP details environmental and sustainability inspections, including inspections related to the CNVMP. Table 7 lists the details of each type of environmental and sustainability inspection to be undertaken on the Project.

Table 7: Inspection Schedule

ACTIVITY	FREQUENCY	RESPONSIBILITY	RECORD
Site inspection*	Daily	Supervisor/s	Site / Daily Diary
Environmental and Sustainability	Weekly	Environment Coordinator/s	Environmental and Sustainability Checklist (Soteria)
ER Inspection	Monthly (or more frequent as required)	Environmental Manager Environmental Representative	ER Inspection Report (SharePoint)
Pre and Post Rainfall Inspections	As required	Environment Coordinator/s	Pre / Post Rainfall Inspection (Soteria)

*Includes all works performed by Trans4m Rail, consultants, and sub-contractor partners on the Project.

5.6 Compliance Monitoring and Reporting

The Trans4m Rail Environment Team will undertake environmental inspections, monitoring, audits and reporting to develop and evaluate the effectiveness of environmental controls. This will include:

- General observations for the daily management of noise and vibration controls shall be documented in site dairies by the Site Supervisor;
- Regular inspection of noise and vibration controls shall be undertaken by the Environmental Coordinator/s and Site Supervisor using the Environment and Sustainability Inspection Checklist and uploaded to Soteria;
- Effectiveness of noise and vibration controls shall be regularly reviewed by the Environmental Coordinator/s for adequacy having regard for changing circumstances;
- Monthly reporting to Inland Rail on noise and vibration management will be recorded through Project Monthly Reports;
- Six monthly independent audits by a suitably qualified professional. NOTE: The Independent Audit Report and response will be made publicly available in accordance with CoA A38(c);
- ER regular monitoring of the implementation of the documents listed in the CoA;
- Noise and vibration monitoring results, complaints and other compliance matters will be reported to the NSW EPA quarterly (in accordance with EPL Condition R4.1) and annually (in accordance with EPL Condition R1.1).
- The broader EMP auditing process is discussed further in Section 8 of Trans4m Rail's CEMP; and
- The results of any noise and vibration monitoring undertaken will be assessed against the NMLs and those predicted in the CNVISs and reported 6 monthly to DPE, Inland Rail and the ER.

5.7 Construction Monitoring Program

In accordance with CoA C15, Trans4m Rail will undertake noise and vibration monitoring as detailed in the Noise and Vibration Monitoring program (Section 11). Vibration monitoring will also be conducted both before and during vibration generating activities that have the potential to impact on heritage items to identify minimum working distances to prevent cosmetic damage.

Details of the noise and vibration monitoring program are included in Section 11.

5.8 Reporting and Communication

Reporting (including reporting of monitoring results) will include monthly internal project reports to ARTC. Compliance monitoring and reporting are discussed in further detail in Sections 8 and 9 of Trans4m Rail's CEMP.

Quarterly and annual reporting to the NSW EPA is also required under EPL Condition R4.1 and R1.1, respectively.

5.9 Site Environmental Plans

Trans4m Rail will use Site Environmental Plans (SEPs) to aid in the identification and protection of significant environmental features associated with the project. The SEPs will include:

- Specific measures included in the relevant work method statements to prevent adverse environmental impacts.

SEPs are further discussed in Section 8 of the CEMP.

5.10 Environmental Management Procedures, Forms and Other Documents

The Project's EMS procedures, activity specific procedures, forms and other documents provide instructions and records relating to both environmental and non-environmental activities throughout the Project. These are discussed in detail in Section 8 of the CEMP.

5.11 Communication and Complaints Management

Trans4m Rail's Community and Stakeholder Engagement Management Plan (CSEMP) and Section 9 of the CEMP details communication and complaints management processes and procedures. The CSEMP identifies key stakeholder groups that will be consulted and engaged with during the Project and outlines the communication tools that will be used to consult and engage with these groups. During construction, any comments, feedback or complaints relating to noise and vibration will be addressed through the Complaints Management System. The Complaints Management System includes a complaints register within the stakeholder database Consultation Manager. The complaints register will be developed in accordance with AS 4269: Complaints Handling.

In addition to this, ARTC's Communication Strategy (as required under CoA B1) contains the Complaints Management System (as required under CoA B6) for the N2NS Project. Both documents will be made publicly available (Inland Rail Project website - https://inlandrail.artc.com.au) under CoA B11(e).

5.12 Incidents, Emergencies and Non-Conformity

In the event of an environmental, social performance, sustainability heritage or other incident, an Incident and Emergency Response Plan will be implemented. Environmental incidents will be required to be reported to Inland Rail (Project Manager and Environment Manager) and managed in accordance with the Inland Rail event management system. Incidents, emergencies, response plans and non-conformities are discussed in detail in Section 8 of the CEMP.

5.13 EMP Review and Revision Process

This NVMP is a 'live' and 'working' document. As required by Trans4m Rail's EMS requirements, the Environment Manager will conduct regular reviews of the NVMP at intervals of not less than six months and ensure that the NVMP is formally reviewed and updated at least annually, or earlier as change requirements dictate. The CEMP and sub-plans review, and revision process is discussed in detail in Section 12 of the CEMP.

6 Noise and vibration sensitive receivers and existing noise environment

6.1 Sensitive receivers

Within the study area, residential sensitive receivers include dwellings located within towns and villages such as Moree, Narrabri, Gurley and Bellata or are scattered across large areas between the major towns. Noise sensitive receiver locations were identified using aerial imagery and geospatial information.

Identification of receivers in this plan was based principally on information provided by ARTC, the EIS and SPIR documents. A more detailed review will be undertaken when further information is available during the preparation of site specific CNVIS to verify the type and sensitivity of potentially affected receivers for consideration of mitigation and management measures. It remains an active part of the NVMP and will continue to be updated where land uses changes over the course of the Project.

In addition to the residential, commercial and industrial receivers, several other sensitive receivers (OSR) (including educational facilities, childcare centres and medical facilities) were identified as being potentially impacted by the Project.

Table 1 of the CSSI-7474 Infrastructure Approval defines 'sensitive receiver' as including:

Residence, educational institution (e.g. school, university, TAFE college), health care facility (e.g. nursing home, hospital), religious facility (e.g. church), child care centres, passive recreation areas (including outdoor grounds used for teaching), commercial premises (including film and television studios, research facilities, entertainment spaces, temporary accommodation such as caravan parks and camping grounds, restaurants, office premises, and retail spaces), and others as identified by the Planning Secretary.

The identification of these receiver locations is shown in the maps included in Appendix A. Sensitive receivers have been classified as identified in Figure 1.

Figure 1: Sensitive receiver identification classification

6.2 Existing acoustic environment

As part of the EIS process, noise monitoring was undertaken at 17 locations in the proposal area between 1 September 2015 and 7 April 2016 in order to quantify and characterise the existing ambient noise environment across the receivers potentially impacted by the Project.

As detailed in Section 11.3.1 and in Section 3.3.1 of the EIS noise and vibration impact assessment, the established Rating Background Noise Level (RBL) value for all noise monitoring locations was 30 dB(A) with the exception of locations L01NNS, L09NNS, L11NNS, L12NNS and L18NNS (refer to the EIS noise and vibration impact assessments for more detailed information about the baseline noise monitoring) for all of which extraneous noise sources were the reason for background noise levels higher than 30 dB(A).

As such, for all locations the project established an RBL value of 30 dB(A), in accordance with Section 3.3.1 of the EIS noise and vibration impact assessment.

6.3 Heritage items

Heritage buildings are to be considered on a case-by-case basis and detailed inspections of heritage listed structures should be undertaken for all potentially affected heritage structures prior to the commencement of works.

Heritage items relevant to the project based upon the EIS have also been included in Appendix A.

The Land Use Survey remains an active part of the CNVMP and will continue to be updated as additional items are identified during the CNVIS process, in consultation with the Project heritage consultants.

As part of the CNVIS process, heritage items would be considered during assessment and where the assessment identifies potential for vibration impacts, appropriate mitigation and management measures will be recommended, as detailed in Section 7.4.2.

7 Construction Noise and Vibration Management Criteria

7.1 Airborne Noise

7.1.1 Noise Management Levels - Residential receivers

Table 8 below (based upon Table 2 of the *NSW Interim Construction Noise Guideline* (DECC, 2009) (ICNG)) sets out the noise management levels and how they are to be applied to residential receivers.

Table 8: ICNG construction noise management levels at residential receivers

TIME OF DAY	NOISE MANAGEMENT LEVEL (NML) $L_{AEQ(15MIN)}$	HOW TO APPLY	PROJECT SPECIFIC NOISE MANAGEMENT LEVEL $L_{AEQ(15MIN)}$
Standard hours: **Monday to Saturday 7.00am to 6.00pm** **No work on Sundays or public holidays**	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.	40
Standard hours	Highly noise affected 75 dB(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, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, considering: ▸ times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences) ▸ if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times	75
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 5dB(A) above the noise affected level, the proponent should negotiate with the community. For guidance on negotiating agreements see section 7.2.2 of the ICNG.	35

7.1.2 Noise Management Levels - Other noise sensitive receivers

Table 9 sets out the noise management levels for various noise-sensitive land use developments, including commercial premises adopted from the ICNG. Internal (or indoor) noise management levels for land uses not identified in the ICNG are referenced to the 'maximum' internal noise levels presented in Australian Standard AS2107. The noise management levels presented in Table 9 are applicable where the premises are in use.

Table 9 presents a detailed, but not exhaustive list of typical 'other' land uses identified along the Project alignment. Where a land use has not been identified in Table 9, a suitable noise management level can be determined by taking guidance from Australian Standard AS2107.

As identified for residential receivers, where the predicted or measured $L_{Aeq(15\ min)}$ is greater than the noise management level, the proponent should apply all feasible and reasonable work practices to meet the noise management level. Trans4m Rail should also inform all potentially impacted receivers of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.

Table 9: Airborne construction noise management levels at other noise sensitive land uses

LAND USE	NOISE MANAGEMENT LEVEL $L_{AEQ(15MIN)}$	WHERE NML APPLIES	REFERENCED FROM:
Classrooms at schools and other educational institutions	45 dB(A)	Internal noise level	ICNG
Hospital wards and operating theatres	45 dB(A)	Internal noise level	ICNG
Places of worship	45 dB(A)	Internal noise level	ICNG
Library (reading areas)	45 dB(A)	Internal noise level	AS2107 'maximum'
Community centres – Municipal Buildings	50 dB(A)	Internal noise level	AS2107 'maximum'
Railway platform and concourse areas	55 dB(A)	Internal noise level	AS2107 'maximum'
Passive recreation areas (e.g. area used for reading, meditation)	60 dB(A)	External noise level	ICNG
Active recreation areas (e.g. sports fields)	65 dB(A)	External noise level	ICNG
Commercial premises (including offices and retail outlets)	70 dB(A)	External noise level	ICNG
Industrial premises	75 dB(A)	External noise level	ICNG

Note: * Outdoor noise level based on recommended maximum internal noise level in AS 2107 and assumes 10 dB loss through an open window

7.1.3 Sleep disturbance

The ICNG recommends that where construction works are planned to extend over more than two consecutive nights, maximum noise levels and the extent and frequency of maximum noise level events exceeding the RBL should be considered for residential receivers. In line with the ICNG, further guidance is taken from the *NSW Environmental Criteria for Road Traffic Noise* (ECRTN, EPA 1999) (ECRTN) (superseded by the RNP) and the EPA Noise Policy for Industry (NPFI) and as detailed in Section 6.4 of the EIS noise and vibration assessment.

To assess the likelihood of sleep disturbance, an initial screening level of L_{Amax} or $L_{A1(1min)} \leq L_{A90(15min)}$ + 15 dB(A) is used. As this value will be less than 52 dB(A) L_{Amax}, this has been set as the screening level (in accordance with Condition of Approval E3 (f)(i) and the NPFI. Where there are noise events found to exceed this 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_{Amax} (internal) that equates to an external Noise Management Level (NML) of 65 dB(A) L_{AMax} (assuming open windows).

The ICNG recommends that where construction works are planned to extend over more than two consecutive nights, maximum noise levels and the extent and frequency that maximum noise levels could exceed the NML should be analysed.

7.2 Construction traffic noise criteria

When trucks and other vehicles are operating within the boundary of a construction site, road vehicle noise contributions are included in the overall predicted LAeq(15minute) construction site noise emissions and assessed against the ICNG NMLs.

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 and are assessed under the NSW Road Noise Policy (RNP), which superseded the ECRTN referenced in the ICNG.

The RNP requires an initial screening test to be applied by evaluating whether noise levels would increase by more than 2 dB (an increase in the number of vehicles of approximately 60%) due to construction traffic or where road closure results in a temporary reroute of traffic. This represents a minor impact that is considered barely perceptible to the average person.

Where the road traffic noise levels are predicted to increase by more than 2 dB (i.e. 2.1 dB or greater) as a result of construction traffic, further assessment is required in using the criteria presented in the RNP, reproduced below in Table 10.

Table 10: RNP criteria for assessing construction vehicles on public roads.

ROAD CATEGORY	TYPE OF PROJECT/LAND USE	ASSESSMENT CRITERIA[1]	
		Day (7.00am-10.00pm)	Night (10.00pm-7.00am)
Freeway/ arterial/sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	60 (external) LAeq(15hour)	55 (external) LAeq(9hour)
Local roads	Existing residences affected by additional traffic on existing local roads generated by land use developments	55 (external) LAeq(1hour)	50 (external) LAeq(1hour)

Note 1: Criteria applies at 1 metre from the most affected facade.

7.3 Vibration criteria – disturbance to building occupants

As per CoA E10, assessment of potential disturbance from construction vibration on human occupants of buildings is made in accordance with the guideline 'Assessing Vibration; a technical guideline' (DECC, 2006). The guideline provides criteria which are based on the British Standard BS 6472-1992 'Guide to evaluation of human exposure to vibration in buildings (1-80Hz)'.

BS6472-1992 nominates guideline values for various categories of disturbance, the most stringent of which are the levels of building vibration associated with a "low probability of adverse comment" from occupants.

BS 6472-1992 was amended in 2008 to extend the use of the Vibration Dose Values (VDV) to all types of vibration (i.e. continuous, impulsive and intermittent). The vibration dose value is dependent upon the level and duration of the short-term vibration event, as well as the number of events occurring during the daytime or night-time period.

The vibration dose values recommended in BS 6472-1992 for which various levels of adverse comment from occupants may be expected are presented in Table 11.

Table 11: Vibration Dose Value ranges which might result in various probabilities of adverse comment within buildings

PLACE AND TIME	LOW PROBABILITY OF ADVERSE COMMENT ($M/S^{1.75}$)	ADVERSE COMMENT POSSIBLE ($M/S^{1.75}$)	ADVERSE COMMENT PROBABLE ($M/S^{1.75}$)
Critical areas[2] (day or night)	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8
Residential buildings 15 hr day[1]	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential buildings 9 hr night[1]	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8
Offices, schools, educational institutions and places of worship (day or night)	0.4 to 0.8	0.8 to 1.6	1.6 to 2.4
Workshops (day or night)	0.8 to 1.6	1.6 to 3.2	3.2 to 6.4

Notes:

1. Day is 7.00am to 10.00pm, and night is 10.00pm to 7.00am

2. Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. There may be cases where sensitive equipment or delicate tasks require more stringent criteria than the human comfort criteria specify above

Should vibration intensive works be proposed within the minimum working distances for specific equipment be required, the potential for vibration impact on human comfort will be assessed. An initial screening test will be done based on peak velocity units, as this metric is also used for the cosmetic 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 screening test will be based on the preferred peak values, as shown in Table 12, for pseudo-continuous work activities and on maximum peak values for surface construction works, which are intermittent in nature. This approach has been adopted so that the screening test is not unduly stringent.

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 12: Construction vibration disturbance – initial screening test

PLACE AND TIME	PREFERRED PEAK VELOCITY, MM/S (>8HZ)	MAXIMUM PEAK VELOCITY, MM/S (>8HZ)
Critical areas (day or night)	0.14	0.28
Residential buildings 15 hr day	0.28	0.56
Residential buildings 9 hr night	0.20	0.40
Offices, schools, educational institutions and places of worship (day or night)	0.56	1.10
Workshops (day or night)	1.10	2.20

7.4 Vibration criteria - structural damage to buildings

7.4.1 Cosmetic damage limits

Currently, there is no Australian Standard that sets criteria for the assessment of building damage caused by vibration. The EIS noise and vibration assessment and the Project conditions of approval identify the following standards as providing appropriate guidance for establishing vibration criteria for structural damage.

- BS 7385 Part 2-1993 “Evaluation and measurement for vibration in buildings Part 2”; and
- German Standard DIN 4150-3: Structural Vibration – Part 3: Effects of vibration on structures.

Potential structural damage of buildings caused by vibration is typically managed by ensuring vibration induced into the structure does not exceed certain limits and standards, such as British Standard 7385 Part 2 (1993) as identified by CoA E10(d).

BS7385 suggests levels at which ‘cosmetic’, ‘minor’ and ‘major’ categories of damage might occur.

The cosmetic damage levels set by BS 7385 are considered ‘safe limits’ up to which no damage due to vibration effects has been observed for certain particular building types. Damage comprises minor non-structural effects such as hairline cracks on drywall surfaces, hairline cracks in mortar joints and cement render, enlargement of existing cracks and separation of partitions or intermediate walls from load bearing walls. ‘Minor’ damage is considered possible at vibration magnitudes which are twice those given and ‘major’ damage to a building structure may occur at levels greater than four times those values.

Table 13 sets out the recommended limits from BS7385 for transient vibration to ensure minimal risk of cosmetic damage to residential, commercial and industrial buildings. This is shown graphically in Figure 2.

Table 13: Transient vibration guide values - minimal risk of cosmetic damage (BS 7385) - peak component particle velocity

LINE	TYPE OF STRUCTURE	FREQUENCY RANGE 4 TO 15 HZ	FREQUENCY RANGE 15 TO 40 HZ	FREQUENCY RANGE 40 HZ AND ABOVE
1	Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s	50 mm/s	50 mm/s
2	Unreinforced or light framed structures Residential or light commercial type buildings	15 mm/s at 4Hz, increasing to 20 mm/s at 15Hz	20 mm/s at 15Hz, increasing to 50 mm/s at 40Hz	50 mm/s

BS7385 states that the guide values in Figure 2 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, especially at the lower frequencies where lower guide values apply, then the guide values in Figure 2 may need to be reduced by up to 50%, as shown by Line 3 of Figure 2 for Residential Buildings.

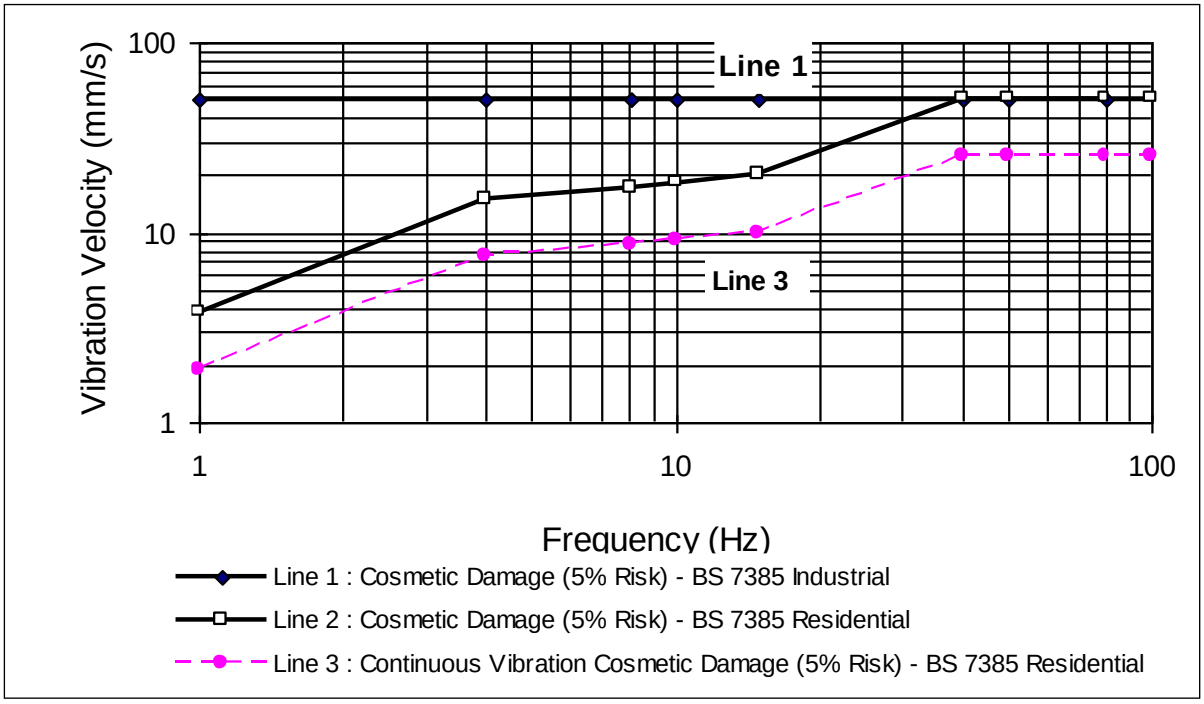


Figure 2: Graph of Transient Peak Component Particle Velocity Vibration Guide Values for Cosmetic Damage

Rock breaking / hammering and sheet and impact piling activities are considered to have the potential to cause dynamic loading in some structures (e.g. residences) and it may be appropriate to reduce the transient values by 50%. In addition, for most construction activities involving intermittent vibration sources such as rock breakers, piling rigs, vibratory rollers, excavators and the like, the predominant vibration energy occurs at frequencies greater than 4 Hz (and usually in the 10 Hz to 100 Hz range). On this basis, a conservative vibration damage screening level 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 vibration limit.

7.4.2 Damage to heritage items

The British Standard states:

"A building of historical value should not (unless it is structurally unsound) be assumed to be more sensitive."

Heritage buildings will be considered on a case-by-case basis and detailed inspections of heritage listed structures will be undertaken for all potentially affected heritage structures prior to the commencement of works.

In accordance with BS 7385, a heritage listed structure should not (unless it is structurally unsound) be assumed to be more sensitive to vibration resulting in application of the 7.5 mm/s screening criterion.

If a heritage building or structure however, is found to be structurally unsound and deemed to be sensitive to damage from vibration (following inspection), a more conservative cosmetic damage objective of 2.5 mm/s peak component particle velocity, which is based upon German Standard DIN 4150-3: Structural Vibration – Part 3: Effects of vibration on structures as identified by Project Planning Approval Condition E10(e). This approach is consistent with the EIS.

The approach to manage potential vibration impact shall be to:

1. Identify heritage items where the 2.5 mm/s peak component particle velocity objective may be exceeded during specific construction activities;
2. Undertake a structural engineering assessment on identified heritage items, to confirm structural integrity of the building and confirm if item is ‘structurally sound’;
3. If item confirmed as ‘structurally sound’, the screening criteria in Section 7.4.1 shall be adopted; or
4. If item confirmed as ‘structurally unsound’, the more conservative cosmetic damage objectives of 2.5 mm/s peak component particle velocity would be adopted.

8 Hours of work and construction activities

8.1 Construction hours of work

8.1.1 Hours of Works

The construction hours for N2NS are defined by CoA E1 to E7. The standard construction hours of work are defined in CoA E1. Works may be carried out outside standard construction hours under Project Planning Approval Conditions. Permitted exceptions are detailed in CoA E2 through to E6. Table 14 below consolidates the information provided in the CoA regarding construction working hours generally for the Project.

Table 14: Construction working hours

APPLICABLE CONSTRUCTION PERIOD	RELEVANT COA	WORKING HOURS APPLICABLE TO COA		
		Monday to Friday	Saturday	Sunday / Public holiday
Standard construction hours	E1	7:00am to 6:00pm	7:00am to 6:00pm	No work[1]
Out of hours work (OOHW)	E1	6:00pm to 10:00pm 10:00pm to 7:00am	6:00pm to 10:00pm 10:00pm to 8:00am	8:00am to 6:00pm 6:00pm to 10:00pm 10:00pm to 7:00am
Highly noise intensive works[5]	E7	8:00am to 6:00pm (+ respite[2])	8:00am to 1:00pm (+ respite[2])	No work[1]
Permitted hours CoA E2 period[4]	E2	6:00am/ 7.00am[3] to 6:00pm	6:00am to 6:00pm	No work[1]

Notes:

1. No work unless approved in accordance with the CoA / EPL.
2. Minimum respite from highly noise intensive works of not less than one (1) hour between each continuous block of works not exceeding three (3) hours. For works relating to this condition, 'continuous' includes any period during which there is less than a one-hour respite between ceasing and recommencing.
3. Works on Mondays are to commence 7.00am.
4. Notwithstanding Condition E1, works affecting any given receiver may be undertaken during the hours of 6.00am to 6.00pm each day over a three (3) month period provided that there is no work between the hours of 6:00pm on a Saturday and 7:00am on a Monday every second week.
5. Except where permitted by a negotiated agreement in accordance CoA E4 and E5, an EPL, or approved through an Out of Hours Works Protocol.

The standard hours and out-of-hours work (OOHW) periods are depicted in Figure 3 below. The OOHW periods are further defined as OOHW rest period and sleep period, with consideration of the ARTC's Inland Rail *NSW Construction Noise and Vibration Management Framework*. The Project Planning Approval construction hours differ from those in the Inland Rail *NSW Construction Noise and Vibration Management Framework.*

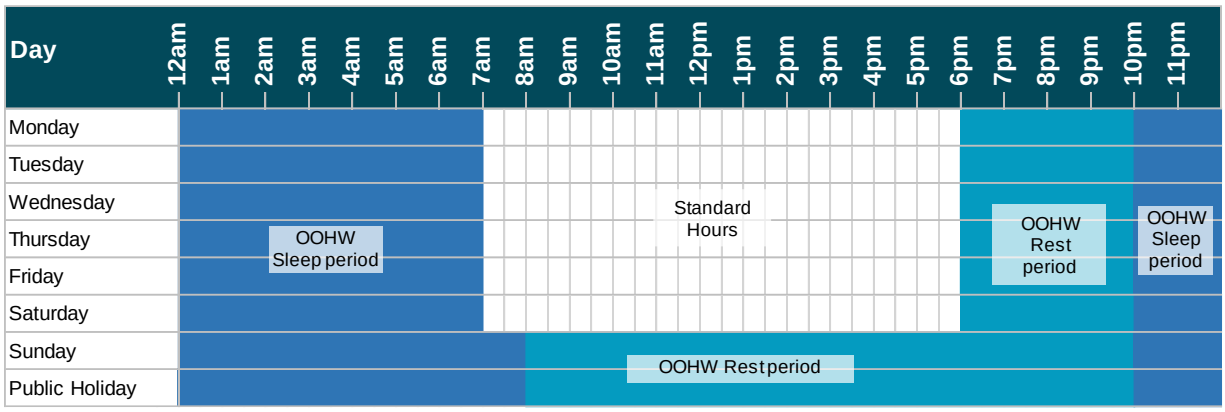


Figure 3: Construction working hours -- SSI 7474

Notwithstanding the construction hours presented in Table 14, for works undertaken in accordance with CoA E2, works are permitted to be undertaken during the following hours (considered to be outside standard construction hours).

- 6.00am to 7.00am Monday to Saturday
- 6.00pm Saturday to 7.00am Monday, every second week (over a three (3) month period).

8.1.2 Works Outside of Standard Hours (OOHW)

In accordance with CoAs E2 to E6, construction works outside of standard construction hours may be undertaken in the following circumstances:

- Construction works are being undertaken in accordance with CoA E2, which states:

  CoA E2 - Notwithstanding Condition E1, works affecting any given receiver may be undertaken during the hours of 6.00am to 6.00pm each day over a three (3) month period provided that there is no work between the hours of 6:00pm on a Saturday and 7:00am on a Monday every second week.

- Construction works that comply with CoA E3, which states:

  CoA E3 - Notwithstanding Conditions E1 and E2, works associated with the CSSI may be undertaken outside the hours specified under those conditions in the following circumstances:

  a. for the delivery of materials required by the NSW Police Force or other authority for safety reasons; or

  b. 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; or

  c. where different construction hours are permitted under an EPL in force in respect of the CSSI; or

  d. work approved under an Out-of-Hours Work Protocol for work not subject to an EPL as required by Condition E8; or

  e. where a negotiated agreement is in force, in accordance with Condition E4 and E5; or

  f. construction that causes LAeq(15 minute) noise levels:

  - *no more than 5 dB(A) above the rating background level at the façade of any residence in accordance with the Interim Construction Noise Guideline (DECC, 2009) or if between the hours of 10:00 pm and 7:00 am no more than 52 dB(A)LA(max) or more than 15 dB(A)LA(Max) above the rating background level whichever is the higher, and*
  - *no more than the noise management levels specified in Table 3 of the Interim Construction Noise Guideline (DECC, 2009) at other sensitive land uses, and*

- *continuous or impulsive vibration values, measured at the most affected residence are no more than those for human exposure to vibration, specified in Table 2.2 of Assessing Vibration: a technical guideline (DEC, 2006), and*
- *intermittent vibration values measured at the most affected residence are no more than those for human exposure to vibration, specified in Table 2.4 of Assessing Vibration: a technical guideline (DEC, 2006).*

- Construction works that comply with CoA E4 and E5, which state:

  CoA E4 - The Proponent may reach negotiated agreements with sensitive receivers (owners and occupiers) to carry out works in accordance with the hours and noise limits specified in the negotiated agreements.

  CoA E5 - All negotiated agreements must be in writing and finalised before the commencement of works.

- Emergency works that comply with CoA E6, which state;

  CoA E6 - On becoming aware of the need for emergency works in accordance with Condition E3(b), the Proponent must notify the Department in writing to compliance@planning.nsw.gov.au, the ER and the EPA of the need for that work. The Proponent must use best endeavours to notify all affected sensitive receivers of the likely impact and duration of those works.

Except for emergency works, Trans4m Rail's construction activities will not take place outside of standard hours without prior discussion with and / or notification of affected local residents and businesses. Out of hours works will be managed in accordance with the Out of Hours Work (OOHW) Protocol, as detailed in Appendix D (Note: this Protocol specifies the assessment and approval pathway for all OOHW works undertaken on the N2NS Project whether they be subject to an EPL or not subject to an EPL (in accordance with CoA E8)). The OOHW Protocol will be applied through a OOHW Application Form, which addresses elements including:

- A process for the consideration of the OOHW against the relevant noise and vibration criteria, including the determination of low and high-risk activities;
- A process for the identification and implementation of mitigation measures for residual impacts, including respite periods in consultation with the community at each affected location;
- Identifying procedures to facilitate the coordination of OOHW approved by an EPL to ensure appropriate respite is provided;
- An approval process that considers the risk of the activities, proposed mitigation, management and coordination, including where:

  (i) low risk activities can be approved by the ER (NOTE: ER Approval is not required for activities that comply with CoA E3(f)) or E4/E5, and

  (ii) high risk activities that are approved by the Planning Secretary; and
- Identify the DPE, EPA, Council, ER, ARTC and community notification or consultation arrangements for approved OOHW, which maybe detailed in the Communication Strategy.

In the case of emergency works, on becoming aware of the need for emergency works in accordance with Condition E3(b), Trans4M Rail will notify ARTC who will then inform DPE in writing to compliance@planning.nsw.gov.au. Trans4M Rail will notify the ER and the EPA of the need for that work. Trans4M Rail will use best endeavours to notify all potentially affected noise and/or vibration sensitive receivers of the likely impact and duration of those works.

8.1.3 Out of Hours Work Protocol

Appendix D details an OOHW Protocol and OOHW Application Forms that have been prepared for the Project which addresses how construction works outside of standard construction hours would be assessed, mitigated and managed. NOTE: This Protocol covers all works on the Project, whether the works be subject to an EPL or not.

All out of hours works on the N2NS Project, whether they be subject to an EPL or not will be assessed, approved, and managed in accordance with this protocol.

8.1.4 Out of hours work under Road Occupancy Licence

Utility and local area works will often be required to be completed under a Road Occupancy Licence (ROL). Where the ROL, due to the importance of the road to the functionality of the road network, precludes or restricts access to the work area before 10.00pm, construction works will have to be carried out during the 'night' period, or OOHW sleep period as indicated in Table 14.

8.1.5 Out of hours deliveries

Delivery of most plant and equipment to the N2NS worksites will be undertaken during standard construction hours. However, during the various stages of construction works, there will be instances where oversized deliveries are necessary. Oversized movements can cause disruptions to the existing traffic and can be a potential hazard for road users. Therefore, there is a requirement for these vehicles to move during off-peak hours when traffic volumes are typically at a minimum, thereby ensuring road user and public safety and minimising disruption to the road network.

The transportation of oversized equipment and machinery may require the occupation of more than one traffic lane. Where this occurs, all movements are to be strictly in accordance with TfNSW guidelines for oversized movements and where required the issuing of a Road Occupancy Licence (ROL).

8.2 Construction activities

The key noise and vibration generating construction activities which have the potential to impact upon nearby sensitive receivers are shown in Table 15, which are as follows:

- track works
- level crossing upgrades and consolidation
- culvert works
- bridge works
- crossing loops.

Activities such as pre-possession, skim track reconditioning, full depth reconditioning, and drainage and structure construction, are likely to impact the largest number of receivers due to the higher level of noise emitted by the anticipated equipment.

Table 15: Key noise and vibration generating construction activities

ACTIVITY	WORK TO BE UNDERTAKEN	CONSTRUCTION HOURS
Track upgrading – Skim reconditioning/ skim plus reconditioning and track reconstruction works	▸ Remove fastenings, rail and sleepers and stockpile to one side of the rail corridor ▸ Trim and level the existing ballast bed and compact ▸ Excavate the existing ballast and earth formation ▸ Place new earth and recycled ballast into the excavated area and compact ▸ Place new ballast on top of the earth formation and compact ▸ Skim plus reconditioning only - place new capping material on top of compacted ballast ▸ Place concrete sleepers and rail track on prepared ballast bed and weld up rails ▸ Place new ballast on top of the sleepers ▸ Tamp and profile the ballast around the sleepers and line to a smooth alignment	Primarily standard construction hours OOHW during possessions when connecting stage sections and during welding activities.

ACTIVITY	WORK TO BE UNDERTAKEN	CONSTRUCTION HOURS
Level Crossing upgrades and consolidation	▸ Remove existing controls, excavate to a suitable depth as required, place new pavements, formation material and ballast, replace track and surface panel as required ▸ Install new controls ▸ Provide standard road signs and road markings The pedestrian level crossing at Moree Station would be upgraded as follows: ▸ Remove existing pedestrian crossing ▸ Construct pedestrian footpath and pedestrian maze ▸ Install relevant track circuitry for active crossing control ▸ Line marking and installation of signage ▸ Complete road works and appropriate road signage to redirect traffic ▸ Remove level crossing signs and road markings ▸ Upgrade tracks	Primarily standard construction hours OOHW during possessions when connecting stage sections
Drainage construction	▸ Prepare survey control points for planned excavation of cess drains ▸ Excavate earth material from the side of the existing track formation, and trim and compact base and sides of the drain ▸ Form spoil mounds	Primarily standard construction hours
Culvert Works	▸ Remove existing culvert structure (either concrete or steel pipes) and in some instances, install at new location ▸ Excavate to the required depth ▸ Place and compact bedding material ▸ Install substructure as required ▸ Place pre-fabricated culvert structures on the new formation area and fasten together ▸ Place ballast, sleepers and rail on top of the culverts and tamp and profile the ballast under and around the sleepers and weld up tracks	Primarily standard construction hours OOHW may be required for large concrete pours in summer
Bridge Works	▸ Installation and setup of temporary works including piling/crane pads and falsework ▸ Install substructure components including driven / bored / precast concrete / steel piles alongside the existing underbridge or at the new location and scabbling and pile breakback works. ▸ Install any new substructure precast concrete components on the new substructure/piles ▸ Remove existing bridge superstructure and demolish the existing visible substructure as far as required ▸ Place new girders (concrete) on the new concrete substructures ▸ Construct new earth formation to connect between the existing track alignment and the new bridge alignment ▸ Place ballast, sleepers and rail on top of the new bridge and tamp and profile the ballast under and around the sleepers and weld up tracks ▸ Install guard rails/kerb as required Demolition of any existing bridges would generally involve the following: ▸ Establish a crane pad for an appropriately sized crane (probably at least one on each side of the riverbank)	Primarily standard construction hours OOHW may be required for large concrete pours in summer

ACTIVITY	WORK TO BE UNDERTAKEN	CONSTRUCTION HOURS
	▸ Demolish the steel superstructure (lifting sections onto trucks to be disposed of at nearby recycling facility) ▸ Demolish the visible existing brick or concrete piers, including jackhammering. ▸ Dispose of waste material offsite	
Crossing loops	▸ Excavate beside the existing track for the length of the crossing loop ▸ Place and compact formation material ▸ Place ballast, sleepers and rail tracks on top of the new formation ▸ Install signal equipment and associated equipment ▸ Testing and commissioning	Primarily standard construction hours

9 Construction noise and vibration management system

9.1 Overview

This Plan has been prepared to provide a framework for assessment of noise and vibration impacts and the identification of reasonable and feasible noise mitigation measures. Site specific Construction Noise and Vibration Impact Statements (CNVIS) will be progressively prepared to address:

- N2NS Worksite establishment;
- N2NS Worksite construction operations; and
- Other local area or utilities work associated with the N2NS Works.

The CNVIS will provide detailed construction noise and vibration prediction, assessment, mitigation design outcomes and discussion of management measures to limit impacts to sensitive receivers as detailed in Section 9.2.

The outcomes of the CNVIS feed into the Community and Stakeholder Engagement Management Strategy.

9.2 Construction noise and vibration impact statements

Trans4m Rail will develop CNVISs as key management tools providing clear instructions for managing each stage of works. In accordance with the Inland Rail *NSW Construction Noise and Vibration Management Framework*, each CNVIS will be prepared and implemented for each construction stage / site before construction noise and vibration impacts commence and include specific mitigation measures identified through consultation with affected sensitive receivers. The CNVIS will be progressively prepared.

This NVMP establishes the minimum requirement for mitigating and managing construction noise and vibration impacts from the project and how these will be addressed. The CNVIS will provide detailed construction noise and vibration prediction, assessment, mitigation design outcomes and discussion of management measures to limit impacts to sensitive receivers.

Each CNVIS will be prepared before works that generate noise and vibration impacts commence and will set out the mitigation and management measures required for the construction stage through consultation with affected sensitive receivers. They will address:

- Scope of construction work covered by CNVIS
  - ✓ Details of the proposed construction activities and methodology (including construction associated traffic)
  - ✓ Proposed hours for the construction works;
- Justification for OOHW (where required);
- More detailed understanding of the surrounding noise and vibration sensitive receivers, including particularly sensitive receivers such as heritage items, utilities, education and childcare facilities, vibration sensitive medical, imaging and scientific equipment;
- Construction noise and vibration objectives (outlined in Section 6);
- Construction noise and vibration assessment;
- Noise and vibration mitigation options and minimum preferred management measures (including community consultation or notification), and any additional mitigation or management measures that are to be implemented (detailed in Section 10.5);
- Internal noise audit systems including progressive impact assessments as work proceeds, providing active and communication links to Council and surrounding residents and sensitive receivers; and
- Noise and vibration monitoring requirements.

In high risk areas requiring noise and vibration monitoring, monitored noise and vibration levels will be analysed against the predictions made in the relevant CNVIS. This will allow for ongoing review and verification of the noise predictions.

Physical noise mitigation measures such as noise barriers, acoustic enclosures around fixed plant and acoustic sheds will be outlined in the CNVIS (or MAFs if required). Furthermore, alternative methods of construction will also be summarised and implemented.

The CNVIS will identify the sensitive receivers that Trans4m Rail is required to notify regarding upcoming works. 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.

The process of assessment of construction noise and vibration impacts is summarised in Figure 4. Site-specific or activity-specific noise assessments will be prepared to assess all construction works for the Project. The assessment will be incorporated into a CNVIS.

1. Determine noise and vibration objectives

For each key construction area:

- Identify noise sensitive receivers.
- Determine relevant noise and vibration objectives, with reference to Section 7.

Note: Assessment usually undertaken at locations considered to be representative of a group of receivers with a similar level of exposure to construction works.

2. Identify construction stages

For each key construction area:

- Identify construction aspects or stages and key activities for each stage.
- Include:
  - the site location;
  - times of operation;
  - processes involved;
  - plant & equipment (including size / type).
- Identify other construction works in the vicinity of the project. Liaise with Proponent to ensure concurrent noise & vibration impacts are managed, in particular in relation to OOHW.

3. Predict noise and vibration impacts

Assessment screening test	• Identify the loudest construction activities/equipment and most vibration intensive works to be covered by the CNVIS. • Identify the closest noise and vibration sensitive receivers/items to the construction works areas covered by the CNVIS. • Calculate the LAeq(15minute) noise level for the loudest construction activities/equipment at the nearest noise sensitive receiver to determine if it will exceed the NMLs presented in Section 7 subject to the time of day the works are to occur. If the NML is not predicted to be exceeded, then skip the "*Airborne construction noise*" step below. • Determine if the closest vibration sensitive items falls within the minimum working distance for the most vibration intensive construction activities/equipment to be used. If no vibration sensitive receivers/items are locations within the minimum working distance, then skip the "*Construction vibration*" step below.
Airborne construction noise	• Determine $L_{Aeq(15\ minute)}$ sound power levels for plant and equipment based on operating scenarios to input into the noise model (see below). • Calculate the $L_{Aeq(15minute)}$ noise levels from the proposed construction activities at each receiver and compare these with the construction noise objectives. • For night-time activities, calculate the maximum (L_{Amax}) noise levels and compare with the sleep disturbance screening levels, applied at the external facade.
Construction vibration	• Determine the location of each plant or equipment item in relation to each receiver. • Where vibration intensive equipment could potentially be operating in close proximity to receivers, determine whether this is within the minimum working distances (Section 10.3). Minimum working distances may differ for heritage items, buildings or utilities that contain equipment particularly sensitive to vibration; • Where plant & equipment may operate within minimum working distances: ◦ Use vibration level vs distance prediction curves for each plant item ◦ Determine the vibration likely to occur at each building location

Construction related road traffic noise	• Identify truck haulage routes to be used to access site and confirm hourly construction traffic volumes (light and heavy vehicles) for day (7am to 10pm) and night (10pm to 7am). • Confirm existing traffic volumes on public roads accessed for truck haulage. • Predict traffic noise levels on public roads used by construction vehicles, both with and without construction traffic, for comparison against road traffic noise management levels. • Review and confirm sleep disturbance impacts from truck entry/ egress points and on public roads where movements occurring during the night (10pm to 7am).

4. Assess noise and vibration impacts

Where predicted noise and vibration exceeds the objectives identified in Step 1:	• Identifying key hours of impact for affected sensitive receivers (see Section 8.1). • Implement appropriate reasonable and feasible standard mitigation measures (see Section 10). • Review the potential for concurrent noise impacts other construction works in the vicinity of the project and any implications for the adopted reasonable and feasible mitigation measures. • Predict noise / vibration levels at receivers, incorporating nominated mitigation measures, based on the expected noise reduction from mitigation measures. • Additional mitigation measures may need to be considered. *Note: Assessment usually undertaken at locations considered to be representative of a group of receivers with a similar level of exposure to construction works.*

Figure 4: Process for assessing construction noise and vibration.

10 Noise and vibration mitigation and management

10.1 Project noise and vibration mitigation and management measures

In accordance with CoA E10, reasonable and feasible noise mitigation measures (such as those listed within Chapter 6 of the ICNG and Section 3 of the *Inland Rail NSW Construction Noise and Vibration Management Framework*) will be implemented with the aim of achieving the noise and vibration criteria specified in Section 7 of this NVMP, as part of the CNVIS process.

Construction stage and / or activity specific mitigation measures are documented in construction noise and vibration assessments (CNVIS), as outlined in Section 9.2. If required, the NVMP will be progressively updated to account for changes in noise and vibration management issues and strategies.

This information may be developed as design and construction planning progresses. The noise and vibration assessments will be document controlled separately from this NVMP. Therefore, an update to these plans will not require this NVMP to be updated.

Specific measures and requirements to address contract specifications, CoA and RMMs in relation to impacts from noise and vibration are outlined in Table 16.

Table 16: Noise and Vibration Mitigation Measures

ID	DETAILS	RESOURCES	WHEN TO IMPLEMENT	RESPONSIBILITY
CONSTRUCTION PLANNING				
NV1	The CNVMP must be prepared prior to the commencement of construction and regularly updated to account for changes in noise management issues and strategies.	CNVMP	Prior to / during construction	Construction Manager Environment Manager
NV2	Ancillary facilities including lunch sheds, office sheds, material lay down sites, stockpile areas, areas used to assemble infrastructure and portable toilet facilities will be: ‣ Located within the construction boundary; and ‣ Determined by the ER to have: - Low amenity impacts to surrounding residences and businesses, after consideration of matters such as compliance with the Interim Construction Noise Guideline (DECC, 2009), traffic and access impacts, dust and odour impacts, and visual (including light spill) impacts; and	Minor Ancillary Facility Checklist	Prior to construction Construction	Construction Managers Site Engineers Site Supervisors Environment Manager

ID	DETAILS	RESOURCES	WHEN TO IMPLEMENT	RESPONSIBILITY
	- Low environmental impact with respect to waste management and flooding, and - No impacts on biodiversity, soil and water, and heritage items beyond those already approved under other terms of this approval.			
NV3	Training will be provided to relevant Project personnel, including relevant sub-contractors on noise and vibration requirements from this NVMP through inductions, toolboxes, Site Environmental Plans (SEP), Environmental Control Maps (ECM) or targeted training.	Training materials Project Induction Toolbox Talks CNVIS SEPs	Prior to construction Construction	Environment Manager
NV4	Site inductions for all employees and contractors will address: ▸ environmental aspects and impacts ▸ proposal specific and standard noise and vibration management measures ▸ licence and approval conditions ▸ hours of work ▸ environmental incident reporting and management procedures ▸ complaint management ▸ Construction induced vibration	Induction materials, toolbox or specific training ECMs	Construction	Environment Manager Environment Coordinators
NV5	Site-specific briefings for all employees and contractors will include: ▸ site specific noise and vibration management measures ▸ location of nearest noise sensitive receivers ▸ construction employee parking areas ▸ behavioural practices (e.g. avoid swearing, shouting, dropping materials from heights) ▸ designated loading/unloading areas and procedures	Induction materials, toolbox or specific training CNVIS ECMs	Construction	Environment Coordinators Site Supervisors

ID	DETAILS	RESOURCES	WHEN TO IMPLEMENT	RESPONSIBILITY
NV6	Where possible, construction compounds should be located a minimum of 1km from the nearest resident or noise sensitive receiver.	-	Prior to construction Design	Construction Managers Project Engineers Site Engineers Site Supervisors Environment Coordinator Environment Manager
NV7	Feasible and reasonable steps will be carried out to consult and coordinate with other construction projects that the Project is aware of and have the potential to impact the same receivers concurrently.	CNVIS	Construction	Environment Manager Environment Coordinators
NV8	Blasting will not be undertaken at any time.	No blasting is proposed.	Construction	n/a
NV9	In addition to the measures set out in this table, any project specific mitigation measures identified in the environmental assessment documentation (e.g. EA, EIS, submissions or representations report) or approval or licence conditions must be implemented. Project specific measures will be determined on a site by site basis and outlined in the CNVISs.	CNVIS	Prior to construction	Construction Managers Project Engineers Site Engineers Site Supervisors Environment Coordinator Environment Manager
GENERAL CONSTRUCTION HOURS				
NV10	Construction activities associated with the Project will be carried out in accordance with the hours in Section 8.1 of this NVMP. Where feasible and reasonable, noise or vibration generating construction works will be carried out during these hours.	CNVIS Induction	Construction	Construction Managers
NV11	Where works are being carried out in accordance with the permitted construction hours in CoA E2, any construction works proposed to be carried out during the respite period of 6:00 pm Saturday to 7:00 am on a Monday every second week, would take place so that any receiver noise or vibration impacted outside of the hours would not be noise or vibration impacted.	CNVIS OOHW	Construction	Construction Managers

ID	DETAILS	RESOURCES	WHEN TO IMPLEMENT	RESPONSIBILITY
NV12	Except as permitted by an EPL, negotiated agreement, or through the Out-of-Hours Work Protocol, Highly Noise Intensive Works (as defined by the CoA) that result in an exceedance of the applicable NML at the same sensitive receiver must only be undertaken: ▸ between the hours of 8:00 am to 6:00 pm Monday to Friday; ▸ between the hours of 8:00 am to 1:00 pm Saturday; and ▸ in continuous blocks not exceeding three (3) hours each with a minimum respite from those activities and works of not less than one (1) hour between each block.	CNVIS	Construction	Construction Managers Environment Manager
NV13	Where works result in noise levels above the highly affected noise level of 75dB(A) LAeq 15minute works would be carried out as follows to provide respite to the impacted receivers: ▸ In continuous blocks not exceeding three (3) hours each with a minimum respite from those activities and works of not less than one (1) hour between each block. ▸ No more than four consecutive nights where works result in highly noise affected levels over any seven day period, unless otherwise approved by ARTC.	CNVIS OOHW Protocol	Construction	Construction Managers Environment Manager
NV14	OOHW is to be carried out in accordance with: ▸ The Project's Out-of-Hours-Works Protocol (Appendix D); and ▸ The Project's EPL	OOHW Protocol Project EPL	Construction	Construction Managers Environment Manager
CONSULTATION AND COMPLAINTS MANAGEMENT				
NV15	A telephone, email and web based community information service will be established to allow the community to obtain additional information on construction activities, provide feedback or make a complaint.	Community and Stakeholder Engagement Management Plan (CSEMP) CEMP	Prior to construction Construction	Construction Managers Environment Manager

ID	DETAILS	RESOURCES	WHEN TO IMPLEMENT	RESPONSIBILITY
NV16	Regular communications on the activities and progress of the proposal will be provided to the community (e.g. via newsletter, email and/or website). Periodic notification (monthly letterbox drop and website notification) detailing all upcoming construction activities delivered to sensitive receivers at least 7 days prior to commencement of relevant works in addition to a range of additional communication and consultation measures which are further detailed in Section 2.	CSEMP CEMP	Prior to construction Construction	Construction Managers Environment Manager
NV17	Notification undertaken during construction would inform relevant stakeholders of the work locations and timing, and the potential for noise impacts.	CSEMP CEMP	Prior to construction Construction	Construction Managers Environment Manager
NV18	Where a CNVIS identifies that vibration sensitive structures are located within the minimum working distance for cosmetic damage, if the vibration intensive works could potentially result in vibration levels above the relevant cosmetic damage potential exceedance more than once or for a period of more than 24 hours, the owner and occupiers will be provided with a schedule of the vibration intensive activities with the potential to be above the relevant cosmetic damage detailing when they are likely to take place.	CNVIS CSEMP CEMP	Prior to construction Construction	Stakeholder & Community Relations Manager Construction Managers Environment Manager
NV19	In the case of emergency works, on becoming aware of the need for emergency works in accordance with Condition E3(b), Trans4M Rail will notify DPIE in writing to compliance@planning.nsw.gov.au, the ER and the EPA of the need for that work. Trans4M Rail will use best endeavours to notify all potentially affected noise and/or vibration sensitive receivers of the likely impact and duration of those works.	-	Construction	Construction Managers Environment Manager
NV20	Consultation will be carried out with the following noise sensitive receivers where there is potential for noise intensive works to be above the relevant noise management level, to determine periods of use of these facilities that would be particularly sensitive to noise or vibration impacts in order to program works to away from	CNVIS NVMP Sections 2.1 and 6.1 RMM C4.1	Construction	Stakeholder & Community Relations Manager Environment Manager Environmental Advisor

ID	DETAILS	RESOURCES	WHEN TO IMPLEMENT	RESPONSIBILITY
	sensitive time periods and ensure impacts are minimised during these sensitive periods. ▸ places of worship ▸ educational institutions (e.g. school exam periods) ▸ childcare centres (rest periods) (where possible) ▸ noise and vibration-sensitive businesses and critical working areas (such as theatres, laboratories, operating theatres, and mental health services)			Construction Project Managers
CONSTRUCTION TRAFFIC NOISE				
NV21	The number of vehicle trips to and from site will be optimised to reduce noise impacts and occur during less sensitive time periods for the receiver adjacent to the Project traffic routes.	CNVIS	Prior to construction	Construction Managers Site Supervisors Environment Coordinator
SOURCE AND PATH CONTROLS				
NV22	Construction sites, work compounds, storage areas, parking areas, unloading/loading areas and other semi-permanent construction sites should be located away from noise sensitive receivers. Where this is not possible the site would be designed to minimise noise impacts on nearby sensitive receivers, this would include considering the orientation and layout of the work site, incorporating the use of site buildings, stockpiles, fences and site topography to provide acoustic shielding to nearby receivers.	CNVIS Minor Ancillary Facility Checklist	Prior to construction	Construction Managers Project Engineers Site Engineers Site Supervisors Environment Coordinator Environment Manager
NV23	Construction sites and compounds located within 200 metres of sensitive receivers and incorporate site management measures to avoid unnecessary shouting, loud stereos/radios, dropping of materials from height, throwing of metal items, and slamming of doors, particularly at the start and finish of shifts.	CNVIS Minor Ancillary Facility Checklist	Construction	Environment Manager Site Supervisor
NV24	Where available, feasible and reasonable, equipment selection will favour the use of quieter and less vibration emitting construction methods, for example, wherever practicable use excavator with pulveriser instead of	CNVIS	Construction	Environment Manager Site Supervisor

ID	DETAILS	RESOURCES	WHEN TO IMPLEMENT	RESPONSIBILITY
	rockhammer; operate vibratory rollers with the vibratory mode switched off to reduce vibration impact.			
NV25	Equipment that is used intermittently is to be shut down when not in use.	CNVIS	Construction	Environmental Coordinator Site Supervisor
NV26	The off-set distance between noisy plant and noise sensitive receivers will be maximised as far as practicable.	CNVIS	Construction	Environmental Coordinator Site Supervisor
NV27	Directional noise-emitting plant to be directed away from sensitive receivers where feasible and reasonable.	CNVIS	Construction	Environmental Coordinator Site Supervisor
NV28	Non-tonal (broadband) movement alarms (or equivalent warning mechanism) must be used in place of traditional, tonal reversing alarms for all Trans4m Rail owned plant, light vehicles, and subcontractor plant when: ▸ Used anytime at night or during OOHW works; or ▸ When used on the Project for periods of 2 weeks or more.	CNVIS	Construction	Environment Manager Site Supervisor
NV29	Avoid the simultaneous operation of noisy plant within discernible range of noise sensitive receivers where possible.	CNVIS	Construction	Environmental Coordinator Site Supervisor
NV30	Regularly inspect and maintain equipment to ensure it is operating correctly.	CNVIS	Construction	Environmental Coordinator Site Supervisor
NV31	Where stationary noise sources (such as pumps, compressors, fans etc.) could result in noise impacts on sensitive receivers, where feasible and reasonable enclosures or acoustic barriers should be incorporated to reduce noise emissions in the direction of the sensitive receivers.	CNVIS	Construction	Environmental Coordinator Site Supervisor
NV32	Loading and unloading of materials/deliveries is to occur as far as possible from noise sensitive receivers. Select site access points and roads as far as possible away from noise sensitive receivers.	CNVIS	Construction	Environmental Coordinator Site Supervisor

ID	DETAILS	RESOURCES	WHEN TO IMPLEMENT	RESPONSIBILITY
	Dedicated loading/unloading areas to be shielded if close to noise sensitive receivers. Delivery vehicles to be fitted with or use straps rather than chains for unloading, wherever feasible and reasonable.			
NV33	Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site.	CNVIS	Construction	Environmental Coordinator Site Supervisor
SENSITIVE RECEIVERS				
NV34	As part of the CNVIS process, where noise levels are still predicted to exceed the applicable noise or vibration management levels at sensitive receivers the additional mitigation measures detailed in the Inland Rail NSW Construction Noise and Vibration Management Framework will be implemented, as detailed in Section 10.5.	CNVIS	Construction	Environment Manager Site Supervisor
SURVEY, MONITORING AND REPORTING				
NV35	Noise and vibration monitoring will be carried out in accordance with the Project's Construction Noise and Vibration Monitoring Program, as described in Section 11 and detailed in the Noise and Vibration Monitoring program.	Monitoring Plan (Section 11)	Construction	Environment Manager
NV36	Where vibration levels are predicted to approach the criteria for cosmetic building damage or limits for critical or sensitive areas, test vibration measurements should be undertaken at the commencement of vibration generating activities to confirm that vibration levels are within the acceptable range and determine the site specific 'minimum working distances'. Where vibration levels are found to exceed acceptable levels, then alternative construction methodologies would be considered that would result in lower vibration levels. Where activities are still required to take place within the within the site specific 'minimum working distances' ongoing noise monitoring and verification would be undertaken during construction to ensure that levels are	Monitoring Plan (Section 11) Section 10.3	Construction	Environment Manager Construction Manager Project Engineers

ID	DETAILS	RESOURCES	WHEN TO IMPLEMENT	RESPONSIBILITY
	managed so as to be below the cosmetic damage criterion during the works.			
NV37	Where vibration from construction activities are predicted to approach the cosmetic damage limits, dilapidation surveys on potentially affected building/structure/item will be undertaken. Dilapidation surveys would be completed, where necessary with the consideration of the minimum safe working distances for vibration intensive activities for cosmetic damage, both before and after the works to identify existing damage and any damage due to the works. Results of the survey would be provided to the owners of the surface or sub-surface structure surveyed.	CNVIS Monitoring Plan (Section 11) Section 10.4	Construction	Construction Manager Environment Manager
NV38	Where any physical property damage determined to be caused by the Project construction works Trans4m Rail will carry out rectification works along with any reasonable requirements of the structure or sub-surface structure owner within three (3) months of the completion of the post-dilapidation survey.	Monitoring Plan (Section 11) Section 10.4	Construction	Construction Managers Project Engineers Site Engineers Site Supervisors Environment Coordinator Environment Manager
NV39	Noise or vibration monitoring in response to complaints will be undertaken where the results or the process assist in resolving or understanding the receiver's issue.	Monitoring Plan (Section 11)	Construction	Environmental Coordinator
NV40	At no time can noise generated by construction 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,8hour, of 85 dB(A) for any employee working at a location near the Project construction works.	CNVIS	Construction	Environmental Coordinator

10.2 Coordination with other construction works

There is potential for other construction projects to be active along the Project alignment concurrently with the Project construction works (e.g. the Newell Highway upgrade). Grain and cotton harvest seasons also involve increased rail traffic along the rail alignment.

In accordance with CoA C5(d), Trans4m Rail will take feasible and reasonable steps to consult and coordinate with other construction projects when they become aware of them and they have the potential to impact the same receivers concurrently, to minimise cumulative impacts of noise and vibration and maximise respite for affected sensitive receivers.

The level of coordination required to manage cumulative impacts will be dependent on the level of concurrent works for specific construction works areas. When concurrent works are occurring where there is potential for concurrent impacts, Trans4m Rail will coordinate information sharing and sharing of construction schedules, sharing stakeholder information (sensitivity awareness) and coordinating community notifications.

Measures to coordinate the Trans4m Rail works with other construction projects will be included in the CNVIS. Where relevant, the activities of other contractors that will be known to be working concurrently with in the same precinct will be addressed in CNVISs and or the programming of works.

10.3 Vibration impacts screening

Indicative minimum working distances for typical items of vibration-intensive plant and equipment will be identified in detail as part of the CNVIS and vibration management process, based on the vibration screening criterion outlined in Section 7.3. These are aimed at reducing the risk of cosmetic damage (as per BS 7385:1993).

Potential vibration generated to receivers is dependent on separation distances, construction equipment proposed to be used, the intervening soil and rock strata, dominant frequencies of vibration and the receiver structure. Where the vibration generating plant/activity are to occur within the indicative minimum working distances, site specific minimum working distances will be measured on site to confirm the likelihood of the plant/activity exceeding the vibration screening criterion.

As required by CoA E10 and in accordance with RMM C4.1 and D4.2, further investigation, including vibration monitoring and trials would be considered to ensure that levels remain below the require vibration limits. Where vibration monitoring identifies works may exceed the required vibration levels then further mitigation and management measures will be implemented.

This process would also be followed for vibration sensitive heritage items.

Before the vibration generating plant/activity can proceed:

- 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;
- Construction methodology will be reviewed and where reasonable and feasible an alternative construction method developed that satisfies the structural damage vibration limits; and
- Vibration monitoring will be undertaken during vibration intensive construction works as defined in the CNVIS.

Where the vibration generating plant/activity are to occur within the detailed site-specific minimum working distances, owners of properties within the minimum working distance and therefore at risk of exceeding the criteria for cosmetic damage, will be notified before any works involving vibration-generating plant and equipment.

As required by CoA E11, the vibration sensitive structures that are located within the minimum working distance for cosmetic damage are to be identified in this plan. The following minimum working distances are based upon the vibration objectives Section 7.4.1 for “sound structures” being 7.5mm/s peak component particle velocity assuming unreinforced or light framed structures and Section 7.4.2 for “unsound structures” (i.e. unsound heritage building) 2.5mm/s peak component particle velocity:

- **Along the entire alignment -** 32 tonne compactor, with an indicative minimum working distance of 10 metres for sound structures and 20 m for unsound structures; and

- **Bridge piling works -** Impact pile driver, with an indicative minimum working distance of 70 metres for sound structures and 160 m for unsound structures.

As part of the CNVIS, prepared as detailed in Section 9.2, the potential for vibration sensitive structures to fall within the vibration minimum working distances will be further reviewed when the specific details for the construction activities, including location and vibration intensive plant and equipment have been determined.

The CNVIS will detail any required further mitigation or management that would be required, including any vibration monitoring required prior to or during the works.

If the vibration intensive works could potentially result in vibration levels above the relevant cosmetic damage limits, with potential exceedance of more than once over a period of 24 hours, the owner and occupiers are to be provided with a schedule of the vibration intensive activities with the potential to be above the relevant cosmetic damage detailing when they are likely to take place.

10.4 Property surveys and issues rectification

Trans4m Rail will offer and undertake dilapidation surveys prior to the commencement of any construction, and with the agreement of the landowners on all buildings identified as being at risk of cosmetic damage from construction vibration impacts. This will be undertaken by a suitably qualified structural engineer in accordance with AS 4349.0 Inspection of buildings – General requirements. Buildings will be considered as being at risk of vibration damage and would qualify for a building survey if they are located within the minimum safe working distances for vibration intensive activities for cosmetic damage considering the structural integrity of the building/structure/item.

In accordance with CoA E73 and E74, the results of the surveys will be documented in a Dilapidation Survey Report for each structure surveyed. Copies of the reports will be provided to the relevant owners of the surface or sub-surface structure surveyed.

Non-heritage buildings will be identified as being at risk of cosmetic damage if they are located inside the recommended minimum safe working distances for vibration intensive plant (based on BS7385:2 Evaluation and Measurement for Vibration in Buildings Part 2: Guide to Damage Levels from Ground-borne Vibration, 1993). For most sources of intermittent vibration during construction, such as rock breakers, the predominant vibration energy occurs at frequencies usually in the 10 Hz to 100 Hz range. On this basis, and with reference to BS7385:2, a vibration damage screening level of 7.5 mm/s has been adopted for assessing potential impacts from continuous vibration. Heritage buildings will undertake the process identified in Section 7.4.2 to determine the suitable vibration limits for the structure, and the minimum working distance will be based upon that vibration level.

In accordance with CoA E75, subsequent dilapidation surveys must be undertaken to assess damage to the surface and sub-surface structures that may have resulted from the construction of the CSSI within three months of the completion of construction, unless otherwise agreed by the Secretary. These surveys must be undertaken with the agreement of the owners and by a suitably qualified structural engineer.

The results of the surveys will be documented in a Dilapidation Survey Report for each structure surveyed. As per CoA E76, copies of Dilapidation Survey Reports will be provided to the owners of the surface or sub-surface structure surveyed, no later than one (1) month following the completion of construction (unless otherwise agreed by the Planning Secretary).

In the case that issues are identified through these surveys, Trans4m Rail will review the pre-construction and post-construction Dilapidation Survey Reports and prepare a root cause analysis for each damage claim received.

As per CoA E77, Trans4m Rail will be responsible for rectification and to the reasonable requirements of the structure or sub-surface structure owner for any physical property damage determined to be caused by the Project construction works. Repair or compensation shall occur within three (3) months of the completion of the post-dilapidation survey, or in accordance with a timeframe agreed to by the owner of the structure or sub-surface structure with the costs borne by Trans4m Rail.

10.5 Additional noise and vibration management measures

The Inland Rail NSW Construction Noise and Vibration Management Framework (provided in the EIS) has been developed to outline how construction noise and vibration will be managed for Inland Rail in NSW. It

provides a framework for managing construction noise and vibration impacts in accordance with the ICNG, to provide a consistent approach to management and mitigation across the Project.

Additional reasonable and feasible measures will be implemented, where necessary, to reduce the noise and vibration levels at sensitive receivers. Trans4m Rail personnel will determine what measures are considered reasonable and feasible by assessing the proposed measure/s against the following criteria:

- The current and projected noise impacts and the number of sensitive receivers impacted or anticipated to be impacted by the works.
- The amount of noise reduction expected from the implementation of the measure, including the cumulative effectiveness of all proposed work practices and abatement measures.
- Safety issues and / or concerns associated with the implementation of the mitigation measure/s.
- Life-cycle cost analysis, including maintenance requirements. The costs associated with the implementation and maintenance of the mitigation measure will be assessed against the total cost of the Project.
- Resource consumption (i.e. energy, water, etc) and waste generation.
- Duration of the works.
- Views of the community and affected stakeholders.
- An assessment of the proposed mitigation measure against those applied on other similar projects.
- Other Project constraints i.e. availability of resources or necessary equipment, technical ability and requirements, program, site footprint and layout.

Where works conducted outside of Standard Construction Hours result in exceedance of noise or vibration management levels, Trans4m Rail will implement the measures described above as well as additional measures based on impact that are described below. Additional measures to manage noise and vibration where construction noise assessments identify exceedances of the relevant management levels derived in Section 7, are presented below.

10.5.1 Additional management measures

10.5.1.1 Communication (CO)

Measures have been developed to manage communication with receivers affected by works undertaken outside of the primary proposal construction hours. Two categories of communication have been developed commensurate with the scale of the impact. The purpose of the communication is described below:

- **Category 1 CO1:** Communication should be personalised (e.g. door knock, meeting, telephone call). Contact with these residents should commence early to enable feedback to be considered by the proposal; and
- **Category 2 CO2:** Communication to provide information on the proposal via letter box drop, email, newsletter, media advertisements and/or website a minimum of five days prior to the works commencing.

At minimum the information provided to stakeholders (CO1 or CO2) will include:

- the reason the work is required to be undertaken outside of the primary proposal construction hours;
- a diagram that identifies the location of the proposed works in relation to nearby cross streets and local landmarks;
- the nature, scope and duration of the works, including start and finish times;
- the expected noise impacts on receivers; and
- information on how to obtain further information or make a complaint, including an afterhours number and Programme website.

10.5.1.2 Respite Offer (RO)

Residents subjected to lengthy periods of noise or vibration may be eligible for a respite offer. The purpose of such an offer is to provide residents with respite from an ongoing impact across more than two consecutive evening periods. The offer could comprise pre-purchased movie tickets or similar offer.

10.5.1.3 Alternate Accommodation (AA)

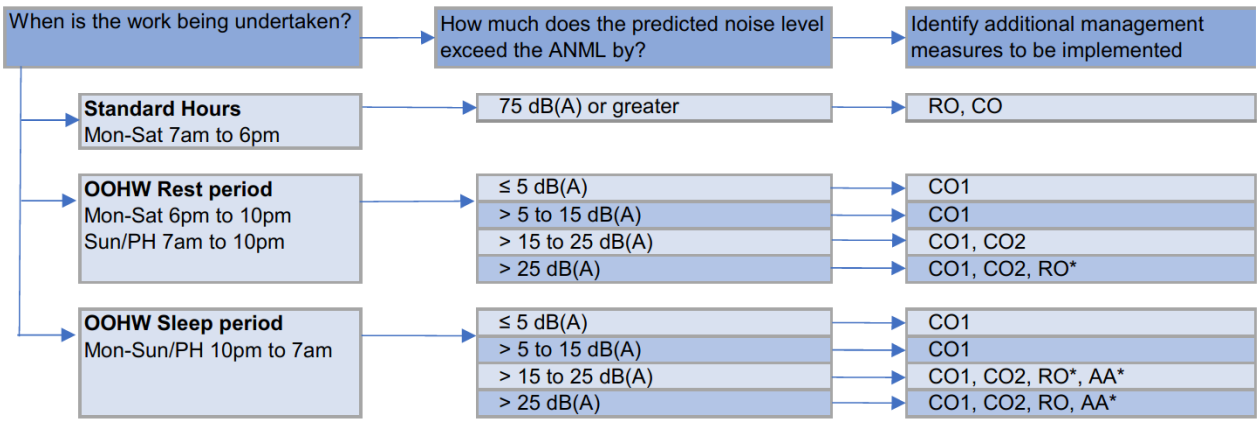
Alternate accommodation options (i.e. accommodation in motels away from the worksite) may be provided to residents living in close proximity to construction sites that are likely to incur noise levels significantly above the applicable level across two or more consecutive sleep periods.

10.5.2 Implementation of additional management measures

The implementation of the above measures is determined by matching the predicted exceedance to the appropriate mitigation measures as detailed in Figure 5 and Figure 6 below.

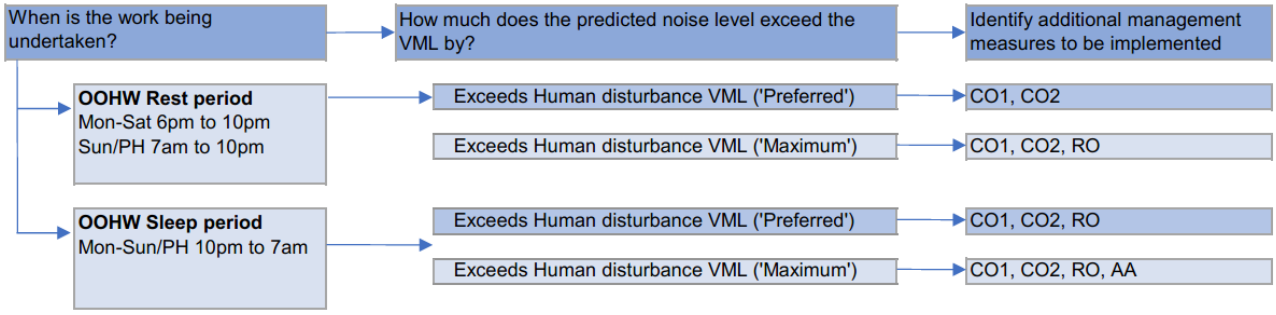
The standard hours and OOHW periods are depicted in Figure 3. The OOHW periods have further been divided into two periods (rest and sleep) to recognise the different impact that works can have at those times.

Figure 5 and Figure 6 detail the additional mitigation measures for airborne noise and vibration respectively, as recommended in the CNVIS, for standard hours and OOHW. Where feasible and reasonable, this approach will be implemented.



Notes: Use the abbreviation codes in the table above to confirm management measures required
CO1= Communication Category 1 RO = Respite offer PH = Public Holiday
CO2= Communication Category 2 AA = Alternative accommodation
* This is only applicable when works occur for more than 2 consecutive days with this works period

Figure 5: Triggers for Additional Mitigation Measures – Airborne Noise



Notes: Use the abbreviation codes in the table above to confirm management measures required
CO1= Communication Category 1 RO = Respite offer PH = Public Holiday
CO2= Communication Category 2 AA = Alternative accommodation

Figure 6: Triggers for Additional Mitigation Measures – Vibration

11 Construction noise and vibration monitoring program

11.1 Overview

11.1.1 Context

This Construction Noise and Vibration Monitoring Program describes how Trans4m Rail will monitor and compare actual performance for noise and vibration during all N2NS construction works.

11.1.2 Purpose

This Program has been prepared to address the requirements of the Conditions of Approval (CoA) for the Project Infrastructure Approval and the EPL. The requirements of the Program related CoA and RMM are listed in Table 17. This program will also cover the requirement detailed in Section 5.1.1 of the Inland Rail NSW Construction Noise and Vibration Management Framework for a track possession monitoring programme.

Table 17: Conditions applicable to the Noise and Vibration Monitoring Program

COA NO.	CONDITION REQUIREMENTS	DOCUMENT REFERENCE	HOW ADDRESSED
Conditions of Approval			
A1	The CSSI may only be carried out in accordance with the terms of this approval and generally in accordance with the description of the CSSI in the Inland Rail – Narrabri to North Star Environmental Impact Statement, Volumes 1-7 (prepared by GHD and dated November 2017), the Inland Rail – Narrabri to North Star Submissions Preferred Infrastructure Report (ARTC, dated December 2019) and (updated BDAR, RtS on the SPIR and RFI responses).	-	Relevant documents for the monitoring program to compare actual performance of construction noise and vibration impacts against.
C9	The following Construction Monitoring Programs must be prepared in consultation with the relevant government agencies and relevant councils identified for the Construction Monitoring Programs to compare actual performance of construction of the CSSI against performance predicted in the documents specified in Condition A1. Noise and vibration Relevant government agencies to be consulted: Nil	This document (Section 11)	The Program has been prepared for the Project to monitor and compare actual performance of construction of the CSSI against performance predicted in the documents specified in CoA A1.
C15	The Construction Monitoring Program must provide: (a) details of baseline data available	Section 11.3.1	Details of baseline noise monitoring provided in Section 11.3.1
	(b) details of baseline data to be obtained and when	Section 11.3.1 Section 11.4.1	Relevant baseline noise and vibration monitoring presented in EIS noise and vibration impact assessment as discussed in Section 1. No further additional baseline monitoring is anticipated prior to

COA NO.	CONDITION REQUIREMENTS	DOCUMENT REFERENCE	HOW ADDRESSED
			construction as noted in Section 11.3.1. Vibration monitoring would be carried out at the commencement of any construction works likely to impact on vibration sensitive structures as noted in Section 11.4
	(c) details of all monitoring of the CSSI to be undertaken	Section 11.2 and Section 11.4	The construction noise and vibration monitoring to be undertaken is outlined in Section 11.2 and 11.4.
	(d) the parameters of the CSSI to be monitored	Section 11.3.3 and Section 11.4.2.3	The parameters to be measured during noise and vibration monitoring are noted in Sections 11.3.3 and Section 11.4.2.3 respectively.
	(e) the frequency of monitoring to be undertaken	Section 11.3.2 and Section 11.4.2	Section 11.3.2 and Section 11.4.2 outline timing and frequency of the noise and vibration monitoring (respectively).
	(f) the location of monitoring	Section 11.3.2 and Section 11.4.2	Section 11.3.2 and Section 11.4.2 outline the location of the noise and vibration monitoring (respectively).
	(g) the reporting of monitoring results against relevant criteria	Sections 5.6 and 5.8	Sections 5.6 and 5.8 details the reporting requirements for noise and vibration monitoring.
	(h) procedures to identify and implement additional mitigation measures where results of monitoring are unsatisfactory; and	Section 11.6	Section 11.6 details the process to implement when the monitored results are not in line with the expected noise levels.
	(i) any consultation to be undertaken in relation to the monitoring programs.	Section 11.2	The consultation requirements and process are presented in Section 11.2
C16	The Construction Monitoring Programs must be developed in consultation with relevant government agencies and Relevant Council(s) as identified in Condition C14 of this approval and must include, information requested by an agency to be included in a Construction Monitoring Programs during such consultation. Details of all information requested by an agency, including copies of all correspondence from those agencies, must be provided with the relevant Construction Monitoring Program.	Section 11.2	As detailed in Section 11.2, no additional consultation for this monitoring program is required with relevant government authorities in line with CoA C15 (i).
C17	The Construction Monitoring Programs must be endorsed by the ER and submitted to the Secretary for information at least one month before the commencement of construction.	Section 11.2	The Program would be endorsed by the ER and submitted to DPIE for information before commencement of construction.
C18	Construction must not commence until the Planning Secretary has approved all the required Construction Monitoring Programs, and all relevant baseline data	Section 11.2 Section 11.3.1 Section 11.4.1	Construction would not commence until the Program has been endorsed by the ER and submitted to DPIE. Baseline data can be found in Section 11.3.1.

COA NO.	CONDITION REQUIREMENTS	DOCUMENT REFERENCE	HOW ADDRESSED
	for the specific construction activity has been collected.		
C19	The Construction Monitoring Programs, as approved by the Planning Secretary including any minor amendments approved by the ER must be implemented for the duration of construction and for any longer period set out in the monitoring program or specified by the Planning Secretary, whichever is the greater.	Section 11.2	The Program would be implemented for the duration of construction, and for any longer period set out in this monitoring program or specified by the Planning Secretary, whichever is the greater.
C20	The results of the Construction Monitoring Programs must be submitted to the Planning Secretary, and relevant regulatory agencies, for information in the form of a Construction Monitoring Report at the frequency identified in the relevant Construction Monitoring Program.	Sections 5.6	A monthly Construction Monitoring Report containing the noise and vibration monitoring data collected during Project works will be submitted to ARTC on a monthly basis and to the Planning Secretary on a six-monthly basis, as detailed in Section 5.6.
C20	Where a relevant CEMP Sub-plan exists, the relevant Construction Monitoring Program may be incorporated into that CEMP Sub-plan.	This document (Section 11)	The monitoring program has been included as Section 11 of this plan.
E73	The Proponent must undertake dilapidation surveys on the current condition of surface and subsurface structures owned by third parties and identified at risk from vibration. The dilapidation surveys must be prepared by a suitably qualified and experienced person(s).	Section 11.4.2.2	Building Condition Surveys are to be undertaken prior to construction as per the monitoring protocol for structural damage as presented in Section 11.4.2.2.
E74	The results of the dilapidation surveys must be provided to the relevant owners of surface and sub-surface structures for review prior to the commencement of potentially impacting works.	Section 11.4.2.2	Building Condition Surveys are to be undertaken prior to construction as per the monitoring protocol for structural damage as presented in Section 11.4.2.2, the details of which will be provided to the relevant owners of surface and sub-surface structures
E75	Subsequent dilapidation surveys must be undertaken to assess damage to the surface and subsurface structures that may have resulted from the construction of the CSSI within three months of the completion of construction, unless otherwise agreed by the Secretary.	Section 11.4.2.2	Building Condition Survey Reports will be undertaken after construction where required as detailed in Section 10.4. Structures at risk of damage requiring pre-construction inspections were identified as per Section 11.4.2.2.
E76	The results of the subsequent dilapidation surveys for each surface and sub-surface structure surveyed must be provided to the relevant owners of the structures within one (1) month of undertaking the surveys.	Section 11.4.2.2	Building Condition Surveys will be undertaken following construction, the details of which will be provided to the relevant owners of surface and sub-surface structures within one month of undertaking the survey.
E77	The Proponent must carry out rectification at its expense and to the reasonable requirements of the surface and sub-surface structure owner(s) within three (3)	Section 10.1	Where any physical property damage determined to be caused by the Project construction works Trans4m Rail will carry out rectification works as per mitigation measure NV38.

COA NO.	CONDITION REQUIREMENTS	DOCUMENT REFERENCE	HOW ADDRESSED
	months of completion of the post-dilapidation surveys unless otherwise agreed with the owner of the affected surface and subsurface structure.		
Revised Environmental Mitigation Measures (RMM)			
RMM D4.2	Where vibration levels are predicted to exceed the screening criteria, a more detailed assessment of the structure and vibration monitoring would be carried out in accordance with the Inland Rail NSW Construction Noise and Vibration Management Framework, to ensure vibration levels remain below appropriate limits for that structure.	Section 10.1	The construction noise and vibration monitoring to be undertaken is outlined in Section 11.2 and 11.4.

11.2 Consultation Requirements under the Conditions of Approval

This Monitoring Program will be endorsed by the Environment Representative (ER) as per CoA C17, and then submitted to the Secretary for information no later than one month prior to the commencement of construction. The Program, as submitted to the Secretary, including any minor amendments approved by the ER, will be implemented for the duration of construction and for any longer period set out in this monitoring program or specified by the Secretary, whichever is the greater.

No additional consultation for this monitoring program is required with relevant government authorities in line with CoA C15 (i).

11.3 Noise monitoring

11.3.1 Baseline noise monitoring data

As part of the EIS process, baseline noise monitoring was undertaken at 17 locations in the proposal area between 1 September 2015 and 7 April 2016. Logger locations were selected to capture noise characteristics at a variety of locations throughout the study area. Logger locations included sites within the existing rail corridor, residential locations and commercial locations. Selection considerations included land topography, distance from rail activities and contribution from other noise activities, such as road noise. The logger locations used for the assessment were considered to be representative of the existing background and ambient noise environment in the study area.

As detailed in Section 3.3.1 of the EIS noise and vibration impact assessment, the established RBL value for all noise monitoring locations was 30 dB(A) with the exception of locations L01NNS, L09NNS, L11NNS, L12NNS and L18NNS (refer to the EIS noise and vibration impact assessments for more detailed information about the baseline noise monitoring) for all of which extraneous noise sources were the reason for background noise levels higher than 30 dB(A).

As such, for all locations the project established an RBL value of 30 dB(A), in accordance with Section 3.3.1 of the EIS noise and vibration impact assessment.

No further additional baseline monitoring is anticipated, however, if required, it will be undertaken in accordance with the relevant guidance and the NVMP will be updated as necessary and issued to NSW Department of Planning, Industry and Environment (DPIE) for approval.

11.3.2 Attended and unattended airborne noise monitoring

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

- Attended construction-phase noise monitoring will be carried out (6 monthly during possession) during activities for which a location and activity specific noise impact assessment has been prepared to confirm that actual noise levels are consistent with noise impact predictions and that the management measures that have been implemented are appropriate;
- Prior to the applicable construction works, the noise levels of typical plant and equipment, including rental equipment, would be checked against the levels included in the CNVIS to ensure that equipment will operate at or below the assumed noise levels;
- To verify high noise impact works (above 75 dB(A)) at the nearest sensitive receiver noted in the Land Use Survey in the NVMP to confirm if respite periods are required;
- Where appropriate, in response to a noise related complaint(s) (determined on a case-by-case basis) and in accordance with the OOHW Protocol or EPL;
- As directed by an authorised officer of the EPA;
- As otherwise required by the CNVIS, OOHW Protocol or EPL;
- Following the implementation of mitigation measures or noise attenuation as a result of an exceedance of predicted noise levels; and

- 12 monthly spot checks for noise intensive plant and equipment will be undertaken throughout construction to ensure compliance with the assumed noise levels in the applicable CNVIS.

In addition to the above list, noise monitoring can also be undertaken to assist in identifying and/or managing high risk noise events, such as during school examination periods, or as required by an EPL.

Unattended airborne noise monitoring may also be undertaken, with a noise logger(s) deployed to obtain noise results over longer periods. 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 will be determined on a case-by-case basis, as appropriate by the Environment Manager, and will be subject to any access approvals.

Attended and unattended noise monitoring locations will vary and be determined on a case-by-case basis by a CNVIS or in response to complaints.

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

Where possible, monitoring will be undertaken at the most affected noise sensitive receiver location in proximity to the Project's construction activities. The selection of appropriate 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.

11.3.3 Parameters to be monitored

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

- Time Constant: Fast (i.e. 125 milliseconds);
- Frequency Weightings: A-weighting; and
- Sample period: 15 minutes. NOTE: shorter sample periods may be used depending on the intent of the monitoring i.e. plant and equipment monitoring.

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 of the construction activity being monitored has been obtained. A representative sample will be determined by the operator, who will be competent, suitability trained and experienced in undertaking noise measurements and familiar with the relevant Australian Standards (as detailed in Section 6). 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}, $L_{A1(1min)}$ and L_{Amax}.

For spot checks of noise intensive plant and equipment, the 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 delivery truck load cycle.

11.3.4 Calibration, QA and competency

All monitoring and data assessment activities will be performed by suitably trained and experienced personnel or consultants. This would typically include the following:

- A suitably qualified and experienced Acoustic or Environmental Consultant; or

- A suitably trained and experienced member of the Trans4m Rail Environment and Sustainability Team; or
- A suitably trained and experienced member of the Project Team acting under close supervision of one of the above.

The monitoring equipment to be used will be at least Class 2 instruments and calibrated in accordance with manufacturer specifications or relevant Australian Standards. All instrumentation should comply with IEC 61672 (parts 1-3) 'Electroacoustics – Sound Level Meters' and IEC 60942 'Electroacoustics – Sound calibrators'.

All noise monitoring equipment used must be checked for accuracy (to manufacturer's specification) at least every two years [reference: NATA General Accreditation Guidance – General Equipment – Calibration and Checks, General Equipment Table (January 2018)] (or if less than 2 years old, manufacturers certification).

The calibration of the monitoring equipment will be checked in the field before and after the noise measurement period. Records of monitoring equipment calibration will be maintained throughout the delivery of the Project.

All monitoring records will be retained throughout the delivery of the Project. Noise monitoring records will be completed to record the following information:

- date and time of measurement;
- name of person undertaking the measurement;
- class and model number of monitoring instrumentation;
- results of field calibration checks;
- time of day, length of measurement and any measurement time intervals;
- monitoring location (including a sketched map of area);
- measurement location details and number of measurements at each location;
- weather conditions during measurements, including wind velocity, wind direction, temperature, relative humidity and cloud cover;
- details of the operation and activities of the noise sources under investigation, with specific details of what occurred during the monitored period;
- estimated contribution of the project's activities;
- noise due to other extraneous and environmental sources (e.g. traffic, aircraft, trains, dogs barking, insects);
- location of the nearest sensitive receiver to the construction works relative to the monitoring location; and
- details of any adjustments required or applied to the monitored noise data (ie. if noise events were excluded through pausing, adjustments are required due to the proximity of reflective surfaces).

Noise monitoring will be undertaken and recorded in accordance with the relevant noise measurement requirements in the reference standards and documents in Section 3.3.

All outdoor noise measurements will be undertaken with a windscreen over the microphone.

Measurements should be undertaken when conditions are suitable and not be undertaken when there is weather related influence, such as when it is raining and/or the wind speed is greater than 5 m/s (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/or 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 metres from any reflective surface other than the ground and the preferred microphone/measurement height is 1.2-1.5 metres above the ground.

Where it is not possible to measure more than 3.5 m from any reflective structure or wall, adjustments may be required for presence or absence of nearby reflecting surfaces, with any adjustment recorded with justifications considering the site specific circumstances.

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.

11.4 Vibration monitoring

11.4.1 Baseline vibration monitoring

11.4.1.1 Heritage-listed structures

As part of managing potential vibration impacts on heritage listed items (non-aboriginal and aboriginal), the project may be required to undertake vibration monitoring of heritage listed structures.

Vibration monitoring requirements will be identified in the CNVIS/s prepared for the Project.

Vibration monitoring would be carried out at the commencement of construction works likely to impact on the heritage item. At all locations, care will be taken to minimise any damage from the installation of the vibration monitoring equipment. The final installation method at each location will depend upon the measurement surface and connection between the equipment and that surface and may require consultation with a heritage specialist.

Monitoring will be carried out in accordance with Section 11.4.2 and 11.4.3.

11.4.2 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 and reported in the CNVIS;
- At the commencement of vibration generating activities that have the potential to impact on heritage items to confirm/identify the site specific 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 vibration sensitive locations are determined to fall within the site specific 'minimum working distances' to ensure that levels are managed so as to be below the cosmetic damage criterion during the works;
- Where appropriate in response to a vibration related complaint(s) (determined on a case-by-case basis) and in accordance with the OOHW Protocol or EPL (once approved for commencement of signalling works); 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 3.3.

11.4.2.1 Vibration monitoring procedure for human annoyance

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.

Figure 7 below shows the procedure to manage and minimise potential human annoyance vibration impacts through vibration monitoring.

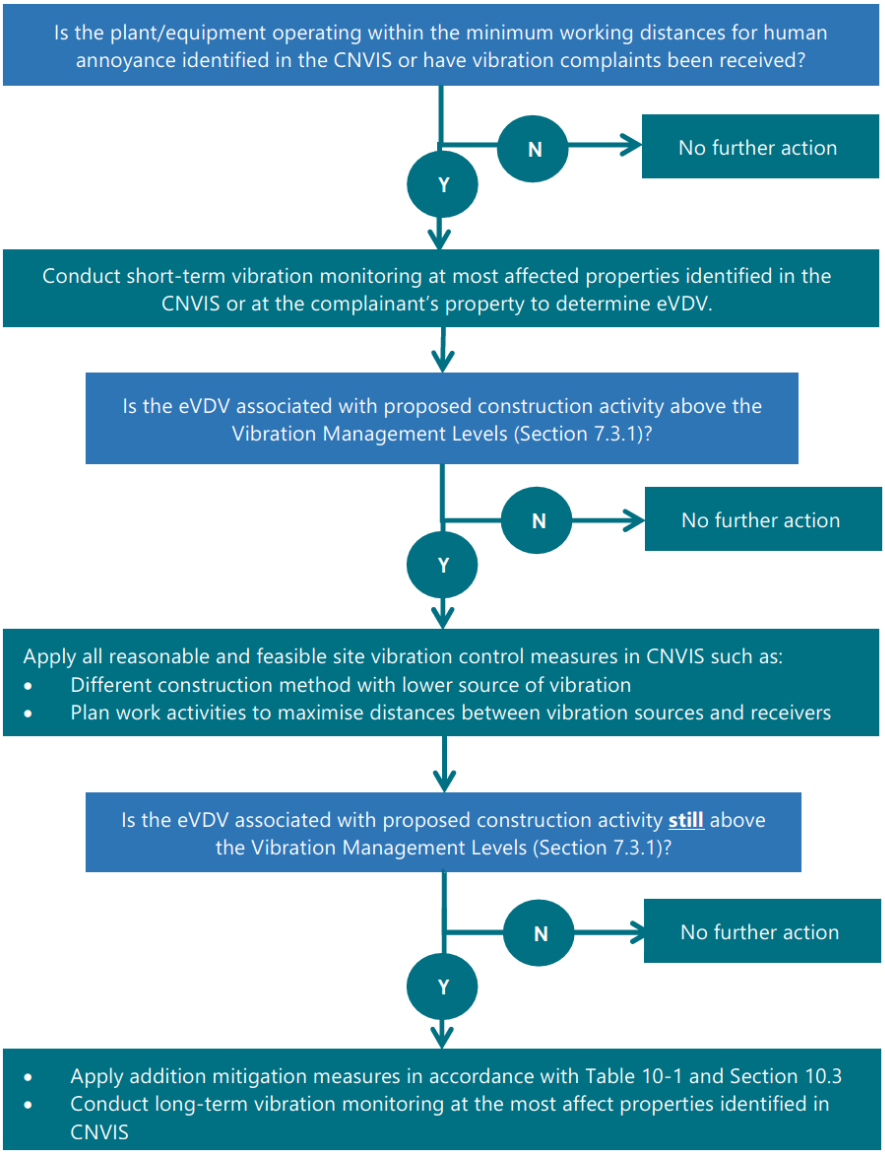


Figure 7: Monitoring protocol for human annoyance impact

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.

11.4.2.2 Vibration monitoring procedure for structural damage

Where property damage is a concern, vibration monitoring results will be assessed and reported against the vibration levels from the British Standard 7385, as presented in Section 7.4. 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 7.4.2. The procedure to manage and minimise potential structural damage impacts is presented in Figure 8.

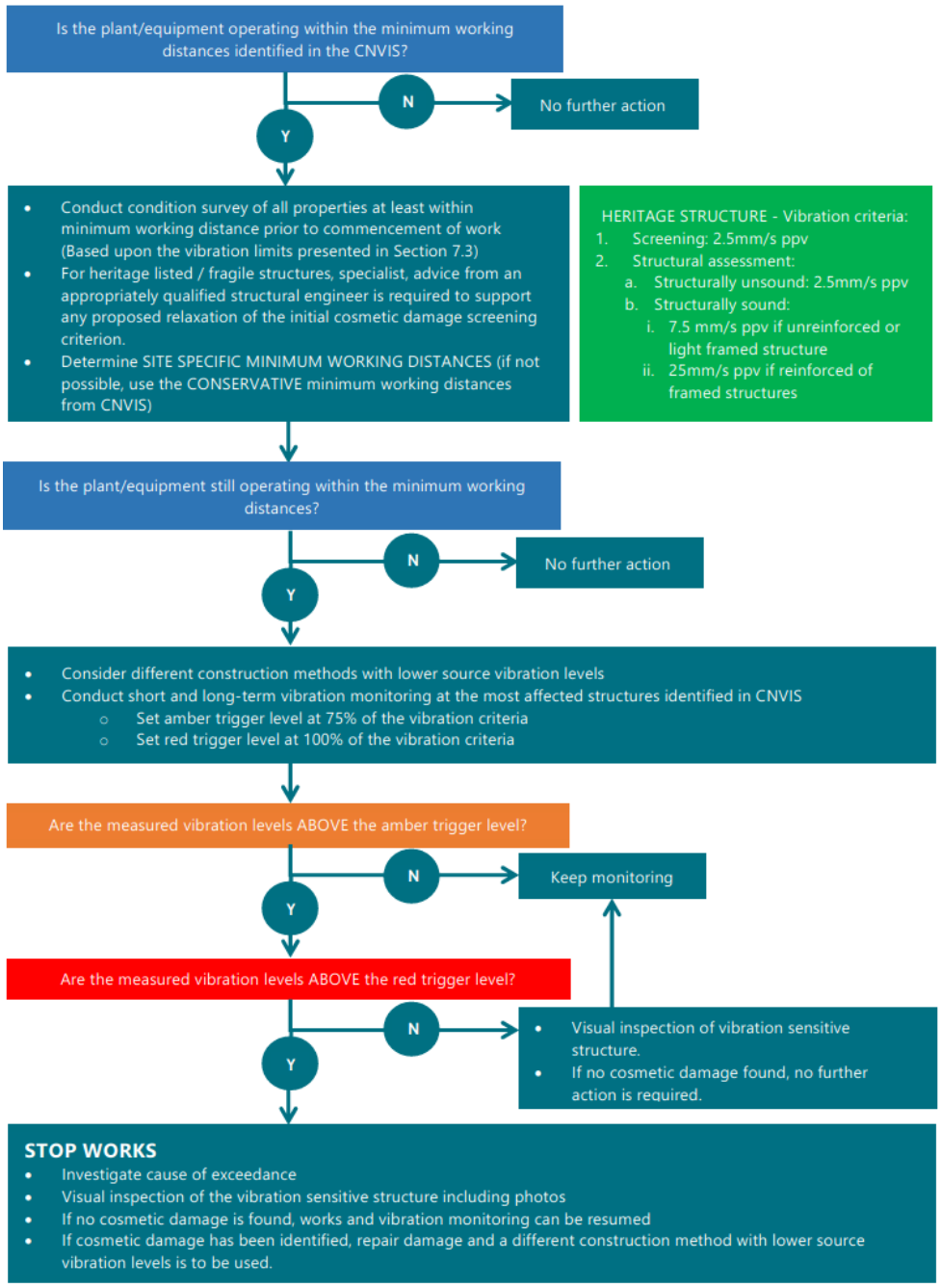


Figure 8: Monitoring protocol for structural damage

Vibration monitoring shall be undertaken in accordance with the vibration measurement requirements stipulated in the reference standards and documents listed in Section 3.3. The following important notes in regard to vibration monitoring are:

- Vibration monitoring equipment shall be placed outside at the footings or foundations of the building of interest, on the side of the building that is 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 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 mechanically 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 attended vibration monitoring is not feasible, due to extended periods of vibration intensive works, an unattended vibration monitoring system will be installed where initial monitoring to establish safe buffer zones 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.

11.4.2.3 Parameters to be monitored

The device will be set to continuously record vibration levels appropriate to assessing the vibration intensive activity under investigation. If required for human annoyance, the duration of vibration events will also be recorded, either as part of the measurement, or separately for later analysis.

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

- Root-Mean-Square acceleration (rms); or
- 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 Attachment A.

11.4.3 Calibration and QA

All vibration monitoring and data assessment activities will be performed by suitably trained and experienced personnel or consultants. This would typically include the following:

- A suitably qualified and experienced Acoustic or Environmental Consultant; or
- A suitably trained and experienced member of the Trans4m Rail Environment and Sustainability Team.

All vibration monitoring equipment used must be checked for accuracy (to manufacturer’s specification) against a reference vibration transducer that is calibrated at least every three years [reference: NATA General Accreditation Guidance – General Equipment – Calibration and Checks, General Equipment Table (January 2018)].

Records of monitoring equipment calibration and monitoring events will be maintained throughout the delivery of the Project.

All monitoring records will be retained throughout the delivery of the Project by Trans4M Rail. Vibration monitoring records will be completed to record the following:

- 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 of area);
- measurement location details and number of measurements at each location;
- type of measurement (unattended or attended);
- location details of the vibrating plant under investigation relative to the measurement locations, and the building or facade of interest (if this is at a different location or a range of distances);
- 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.)

11.5 Heritage-listed structures

The project will conduct vibration monitoring during vibration generating activities that have the potential to impact on heritage items (e.g. Moree Railway Station), to identify the site specific minimum working distances to prevent cosmetic damage. Should vibration testing and monitoring show that the preferred values for vibration are likely to be exceeded, the project will follow the process in Section 11.6.

CNVIS prepared for the Project works under this NVMP would identify the minimum working distances for heritage buildings/items, noting that these may be item or location specific, during vibration intensive activities and identify where monitoring should be conducted at heritage items.

The project will seek the advice of the heritage and noise and vibration specialists engaged, on methods and locations for installing equipment used for vibration, movement and noise monitoring of heritage-listed structures.

11.6 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 noise and vibration management tools. Where monitored construction noise levels are found to be above modelling predictions or vibration goals are exceeded, the following actions will be undertaken:

- Cease the noise generating source which causes the exceeded predictions;
- Confirm the monitored levels are not being impacted by other noise or vibration source;
- 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 or noise/vibration intensity, modifying time of works, changing operational settings (such as turning off the vibratory function of the machine), and utilising alternative construction methodology or a combination of these;
- Review work practices to ensure compliance with the ICNG;
- 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 continue to review until they are consistent with the modelling predictions or vibration goals;
- Communicate lessons learnt to relevant personnel; and
- Investigation of additional noise reduction measures such as; providing periods of respite, alternative accommodation, temporary noise barriers, etc.

Trans4m Rail will review the work or activity or combination of simultaneous works or activities and where possible, modify the work or activity to prevent any recurrence. Lessons learnt will be communicated to relevant personnel in toolbox talks.

Where a complaint relating to human comfort is received, the project 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, the project will offer additional monitoring following the process defined in Section 11.3.2 and Section 11.4.2.

12 Sustainability

The N2NS Project will pursue an Infrastructure Sustainability Council of Australia (ISCA) rating under the IS Rating Scheme V1.2. This plan relates to Dis-2 Noise and Dis-3 Vibration. Trans4m Rail will be aiming for a credit response Level 3 for Dis-2 and Level 2 for DIS-3. ISCA benchmarks are provided in the table below.

Table 18: ISCA Scorecard Receiving Water Quality Benchmarks

BENCHMARK	LEVEL 1	LEVEL 2	LEVEL 3
	DIS-2 NOISE		
	Measures to mitigate noise during construction and operation have been identified and implemented. AND	The requirements for Level 1 are achieved. AND	The requirements for Level 2 are achieved. AND
	Monitoring of noise is undertaken at appropriate intervals and in response to complaints during construction.	For construction, modelling and monitoring demonstrates no recurring or major divergences from the noise management process in ISCA approved noise guidelines.	For construction, modelling and monitoring demonstrates no divergence from the noise management process in ISCA approved noise guidelines.
	DIS-3 VIBRATION		
	Measures to mitigate vibration during construction and operation have been identified and implemented. AND	The requirements for Level 1 are achieved AND	NA
	Monitoring of vibration is undertaken at appropriate intervals and in response to complaints during construction.	For construction, modelling and monitoring demonstrates no exceedances of vibration goals for structural damage to buildings and structures. AND	NA
		No physical damage has been caused to any buildings or structures by vibration caused by construction.	NA

Appendix A Sensitive Receiver identification

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INLAND RAIL ARTC

NARRABRI TO NORTH STAR

Noise Sensitive Receivers

LEGEND

- Project track alignment
- Cadastre

Construction Footprint
- Construction Footprint

Sensitive Receivers
- Education
- Childcare
- Hospital Ward
- Active Recreation
- Passive Recreation
- Residential
- Place of Worship

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Coordinate System: GDA 1994 MGA Zone 55

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Author: MS

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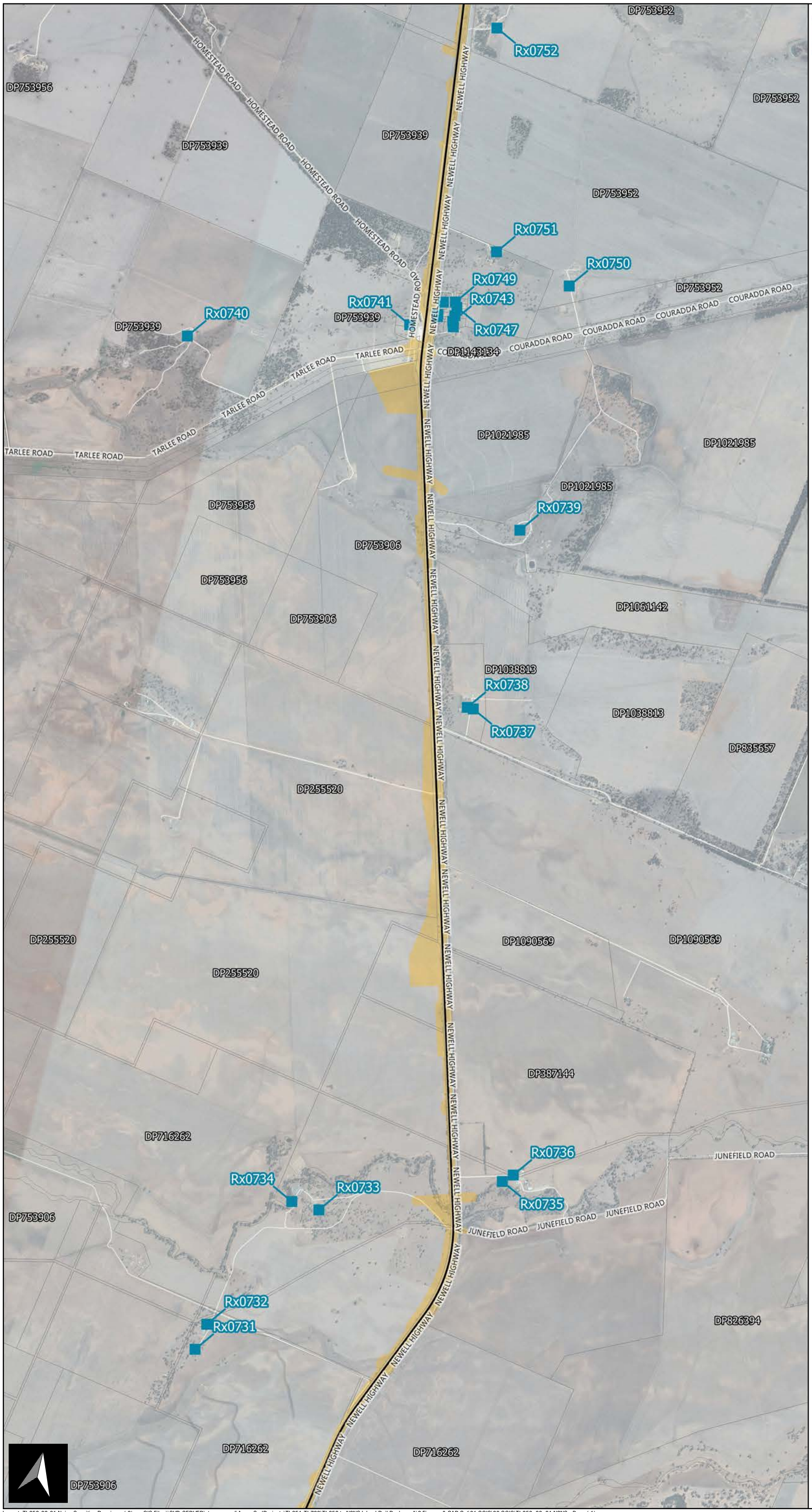

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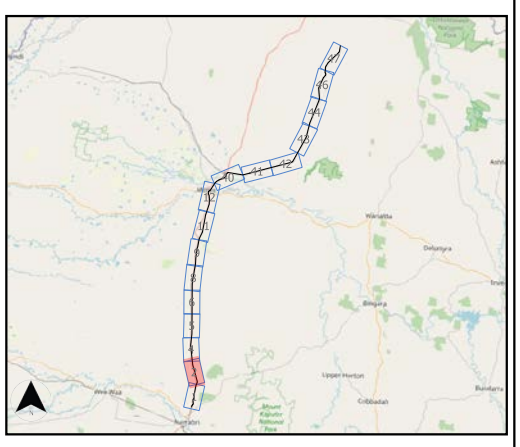

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NARRABRI TO NORTH STAR

Noise Sensitive Receivers - Queen St area

Sheet 3 of 48

LEGEND

- Project track alignment
- Cadastre

Construction Footprint
- Construction Footprint

Sensitive Receivers
- Education
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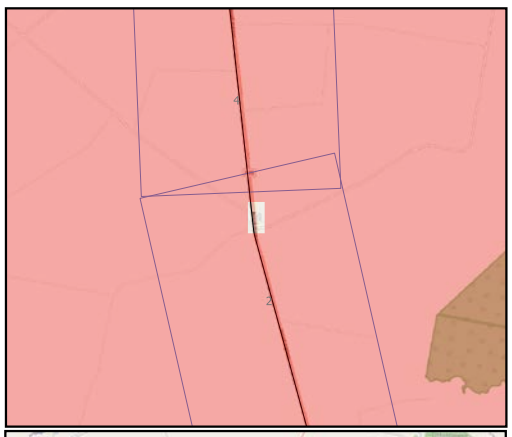

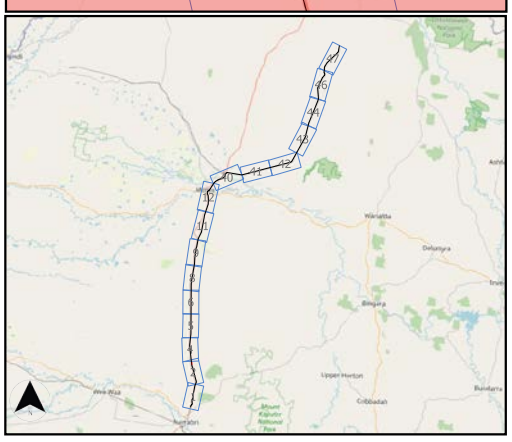

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NARRABRI TO NORTH STAR

Noise Sensitive Receivers

Sheet 4 of 48

LEGEND

- Project track alignment
- Cadastre

Construction Footprint
- Construction Footprint

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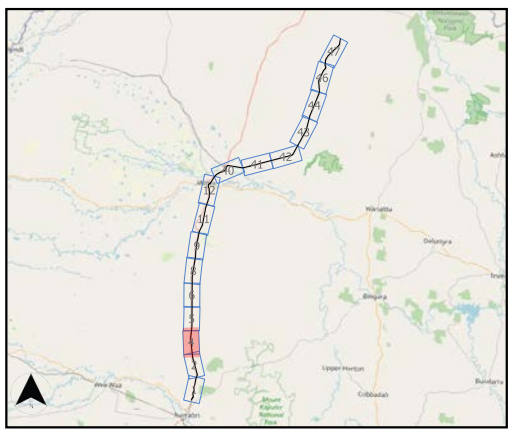

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NARRABRI TO NORTH STAR

Noise Sensitive Receivers

Sheet 5 of 48

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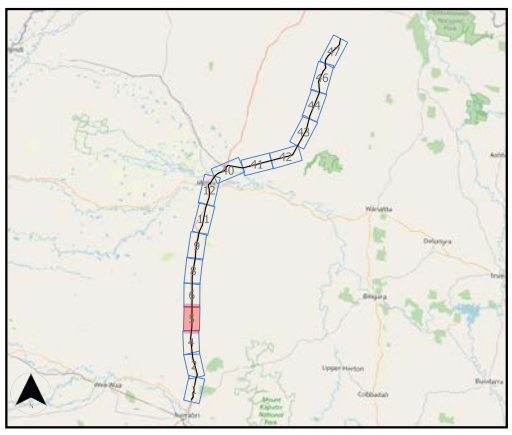

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Noise Sensitive Receivers

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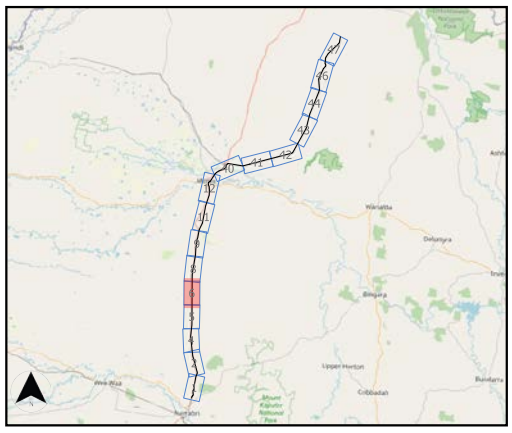
- Passive Recreation
- Residential
- Place of Worship



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0 0.8 1.6 km

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INLAND RAIL ARTC

NARRABRI TO NORTH STAR

Noise Sensitive Receivers - Wilga St area

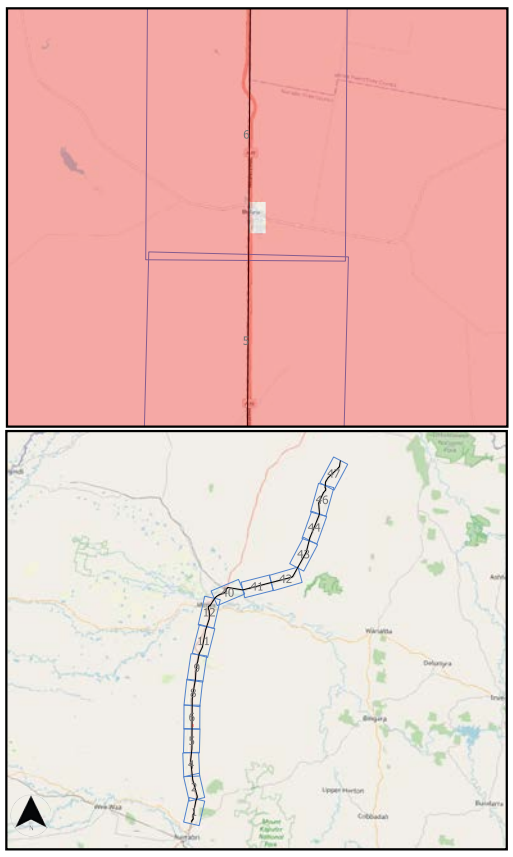
Sheet 7 of 48

LEGEND

- Project track alignment
- Cadastre

Construction Footprint
- Construction Footprint

Sensitive Receivers
- Education
- Childcare
- Hospital Ward
- Active Recreation
- Passive Recreation
- Residential
- Place of Worship



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Paper: A3
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NARRABRI TO NORTH STAR

Noise Sensitive Receivers

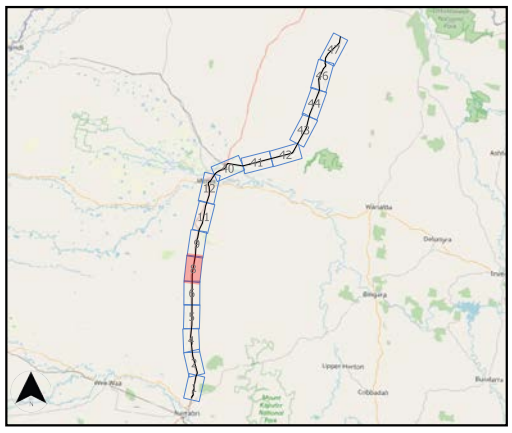
Sheet 8 of 48

LEGEND

- Project track alignment
- Cadastre

Construction Footprint
- Construction Footprint

Sensitive Receivers
- Education
- Childcare
- Hospital Ward
- Active Recreation
- Passive Recreation
- Residential
- Place of Worship



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NARRABRI TO NORTH STAR

Noise Sensitive Receivers

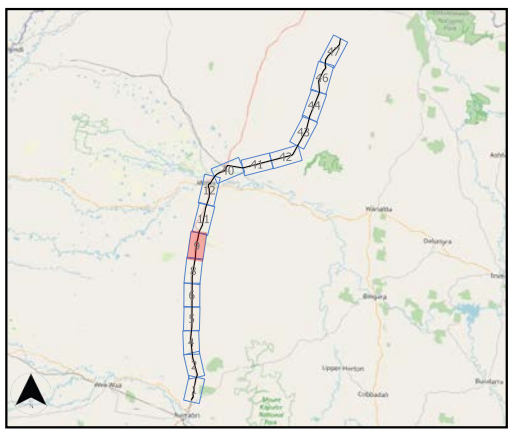
Sheet 9 of 48

LEGEND

- Project track alignment
- Cadastre

Construction Footprint
- Construction Footprint

Sensitive Receivers
- Education
- Childcare
- Hospital Ward
- Active Recreation
- Passive Recreation
- Residential
- Place of Worship



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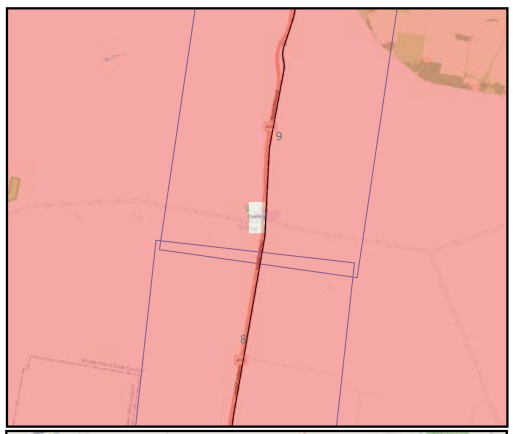
Noise Sensitive Receivers - Glenroy St area

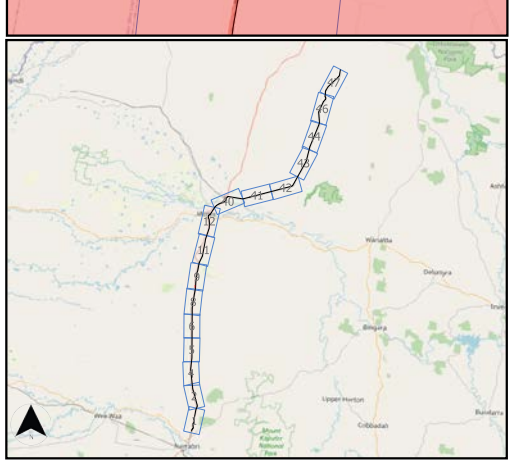
LEGEND

- Project track alignment
- Cadastre

Construction Footprint
- Construction Footprint

Sensitive Receivers
- Education
- Childcare
- Hospital Ward
- Active Recreation
- Passive Recreation
- Residential
- Place of Worship





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NARRABRI TO NORTH STAR

Noise Sensitive Receivers

Sheet 11 of 48

LEGEND

- Project track alignment
- Cadastre

Construction Footprint
- Construction Footprint

Sensitive Receivers
- Education
- Childcare
- Hospital Ward
- Active Recreation
- Passive Recreation
- Residential
- Place of Worship

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NARRABRI TO NORTH STAR

Noise Sensitive Receivers

Sheet 12 of 48

LEGEND

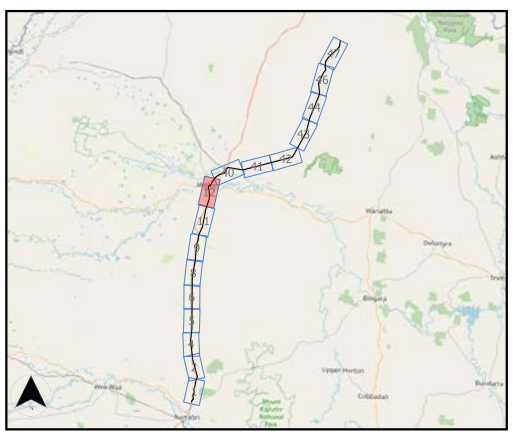
- Project track alignment
- Cadastre

Construction Footprint

- Construction Footprint

Sensitive Receivers

- Education
- Childcare
- Hospital Ward
- Active Recreation
- Passive Recreation
- Residential
- Place of Worship



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NARRABRI TO NORTH STAR

Noise Sensitive Receivers - Burrington Rd area

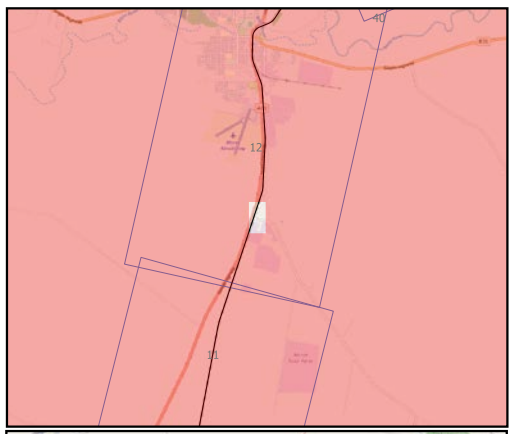
Sheet 13 of 48

LEGEND

- Project track alignment
- Cadastre

Construction Footprint
- Construction Footprint

Sensitive Receivers
- Education
- Childcare
- Hospital Ward
- Active Recreation
- Passive Recreation
- Residential
- Place of Worship



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NARRABRI TO NORTH STAR

Noise Sensitive Receivers - Moree area

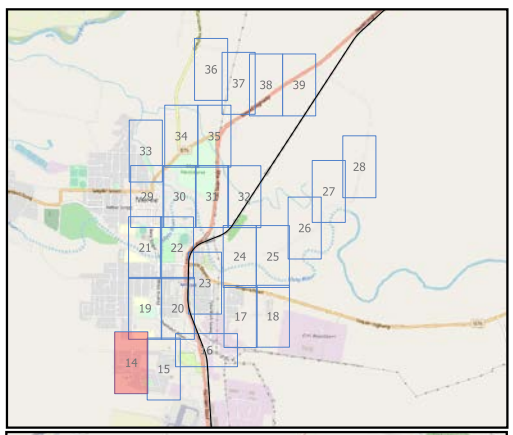
Sheet 14 of 48

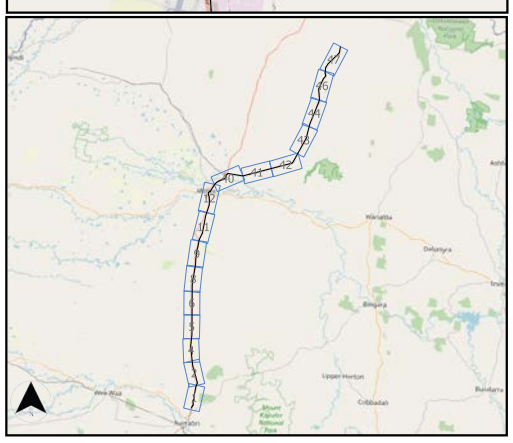
LEGEND

- Project track alignment
- Cadastre

Construction Footprint
- Construction Footprint

Sensitive Receivers
- Education
- Childcare
- Hospital Ward
- Active Recreation
- Passive Recreation
- Residential
- Place of Worship





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NARRABRI TO NORTH STAR

Noise Sensitive Receivers - Moree area

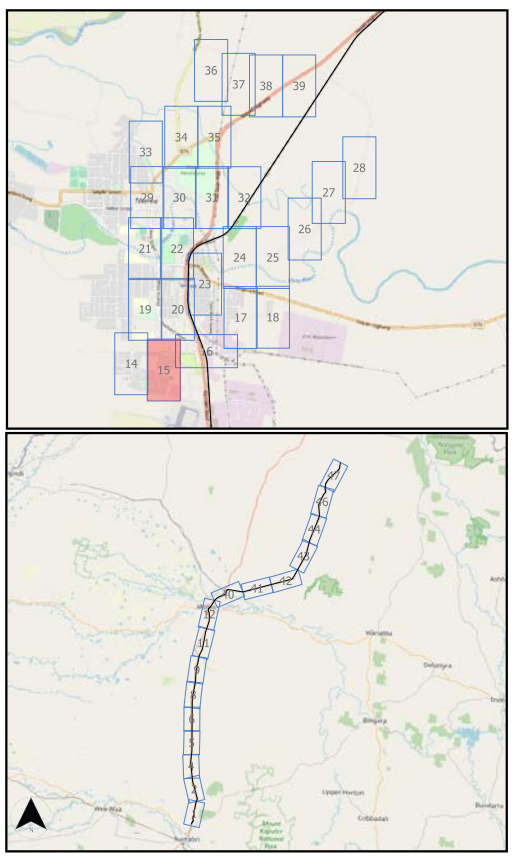
Sheet 15 of 48

LEGEND

- Project track alignment
- Cadastre

Construction Footprint
- Construction Footprint

Sensitive Receivers
- Education
- Childcare
- Hospital Ward
- Active Recreation
- Passive Recreation
- Residential
- Place of Worship



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NARRABRI TO NORTH STAR

Noise Sensitive Receivers - Moree area

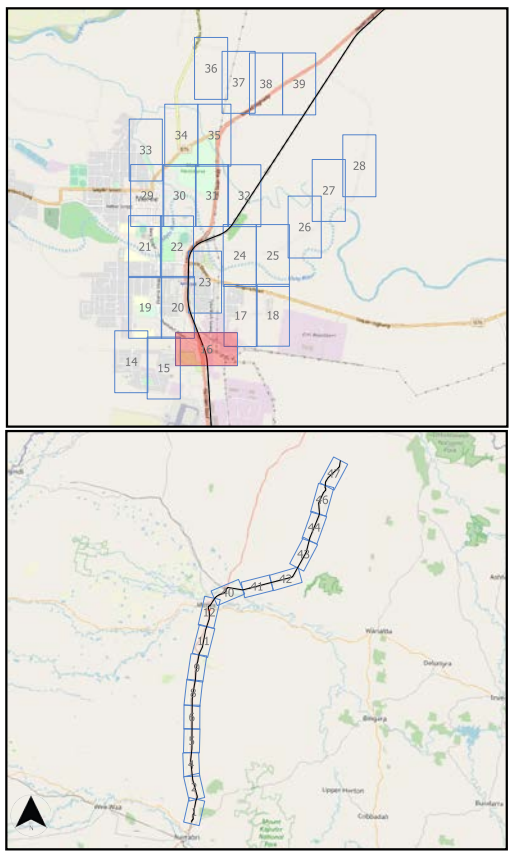
Sheet 16 of 48

LEGEND

- Project track alignment
- Cadastre

Construction Footprint
- Construction Footprint

Sensitive Receivers
- Education
- Childcare
- Hospital Ward
- Active Recreation
- Passive Recreation
- Residential
- Place of Worship



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NARRABRI TO NORTH STAR

Noise Sensitive Receivers - Moree area

Sheet 17 of 48

LEGEND

- Project track alignment
- Cadastre

Construction Footprint
- Construction Footprint

Sensitive Receivers
- Education
- Childcare
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- Active Recreation
- Passive Recreation
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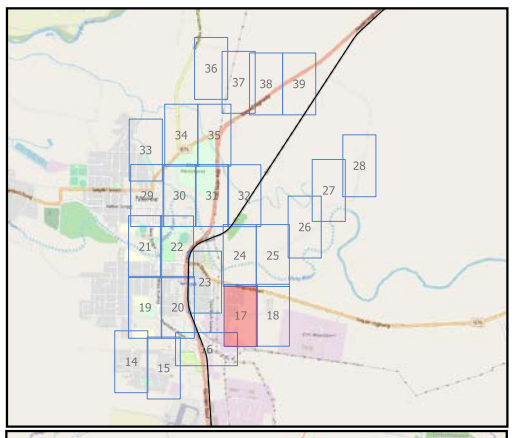

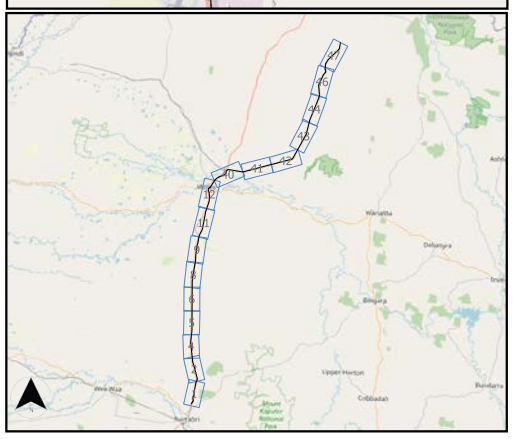

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NARRABRI TO NORTH STAR

Noise Sensitive Receivers - Moree area

Sheet 18 of 48

LEGEND

- Project track alignment
- Cadastre

Construction Footprint
- Construction Footprint

Sensitive Receivers
- Education
- Childcare
- Hospital Ward
- Active Recreation
- Passive Recreation
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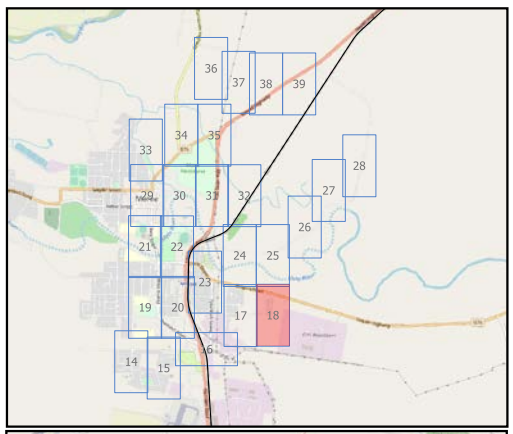

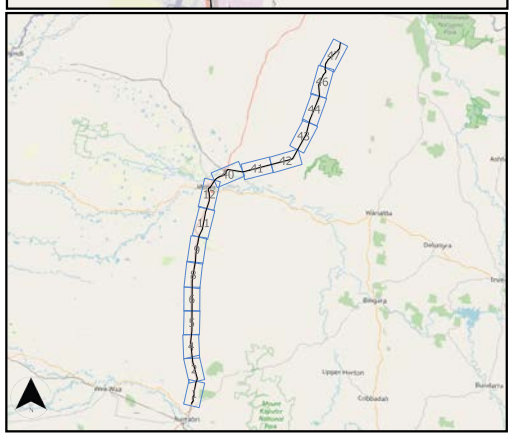

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NARRABRI TO NORTH STAR

Noise Sensitive Receivers - Moree area

LEGEND

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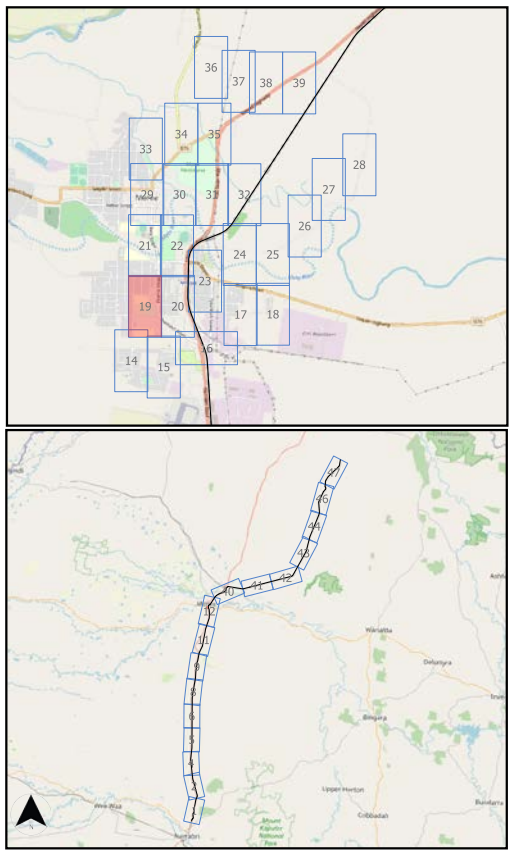

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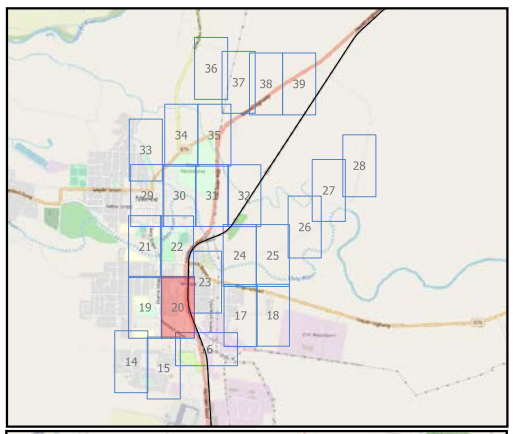

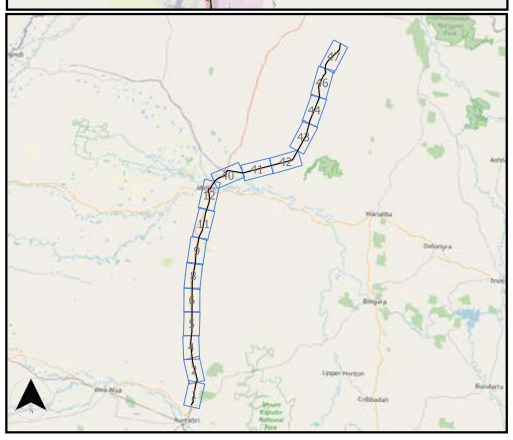

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Noise Sensitive Receivers - Moree area

LEGEND

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- Construction Footprint

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- Childcare
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- Residential
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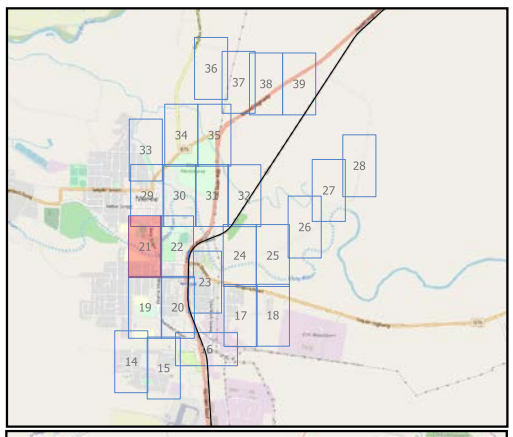

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NARRABRI TO NORTH STAR

Noise Sensitive Receivers - Moree area

Sheet 22 of 48

LEGEND

- Project track alignment
- Cadastre

Construction Footprint
- Construction Footprint

Sensitive Receivers
- Education
- Childcare
- Hospital Ward
- Active Recreation
- Passive Recreation
- Residential
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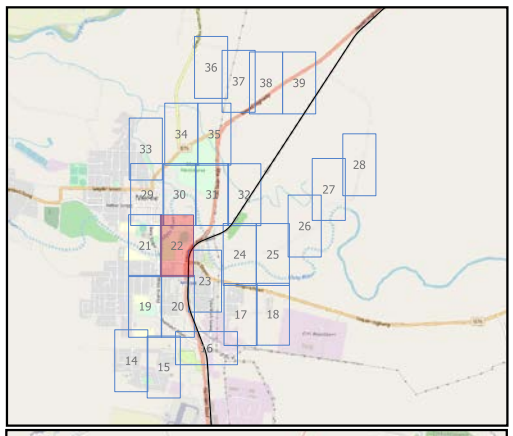

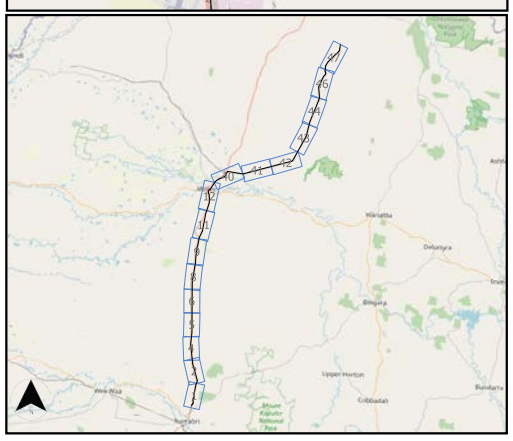

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NARRABRI TO NORTH STAR

Noise Sensitive Receivers - Moree area

Sheet 23 of 48

LEGEND

- Project track alignment
- Cadastre

Construction Footprint
- Construction Footprint

Sensitive Receivers
- Education
- Childcare
- Hospital Ward
- Active Recreation
- Passive Recreation
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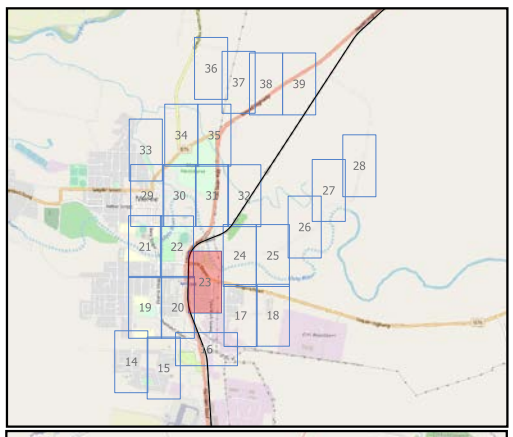

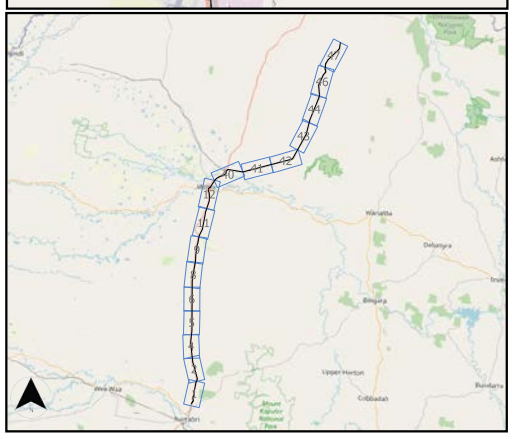

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NARRABRI TO NORTH STAR

Noise Sensitive Receivers - Moree area

Sheet 24 of 48

LEGEND

- Project track alignment
- Cadastre

Construction Footprint
- Construction Footprint

Sensitive Receivers
- Education
- Childcare
- Hospital Ward
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- Passive Recreation
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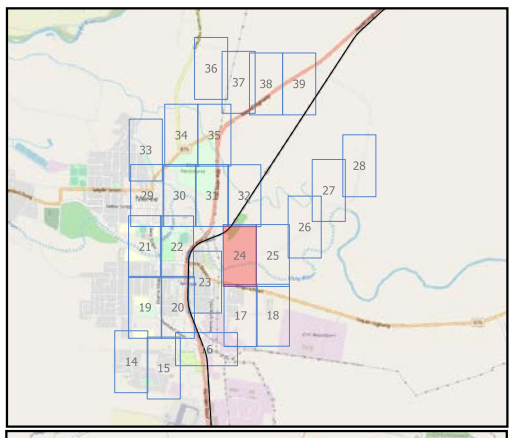

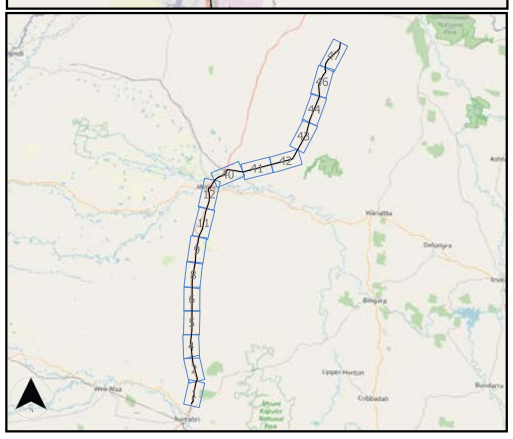

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NARRABRI TO NORTH STAR

Noise Sensitive Receivers - Moree area

Sheet 25 of 48

LEGEND

- Project track alignment
- Cadastre

Construction Footprint
- Construction Footprint

Sensitive Receivers
- Education
- Childcare
- Hospital Ward
- Active Recreation
- Passive Recreation
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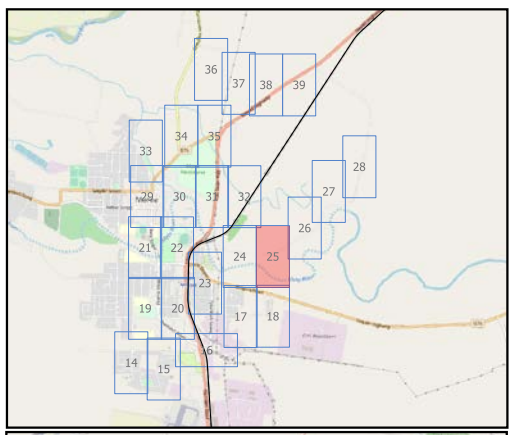

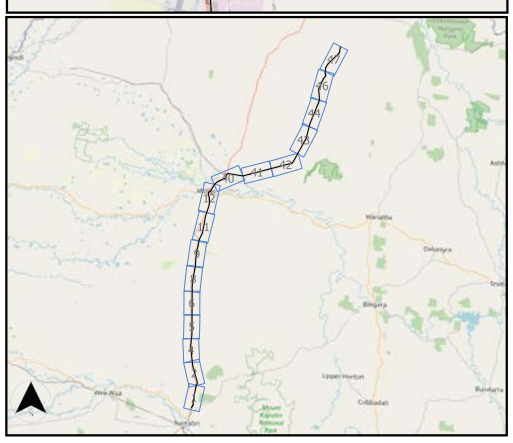

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NARRABRI TO NORTH STAR

Noise Sensitive Receivers - Moree area

Sheet 26 of 48

LEGEND

- Project track alignment
- Cadastre

Construction Footprint
- Construction Footprint

Sensitive Receivers
- Education
- Childcare
- Hospital Ward
- Active Recreation
- Passive Recreation
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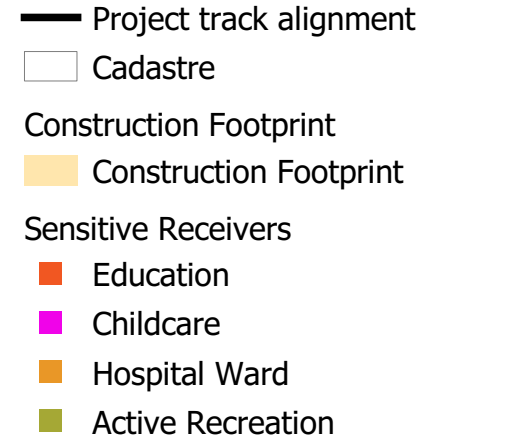

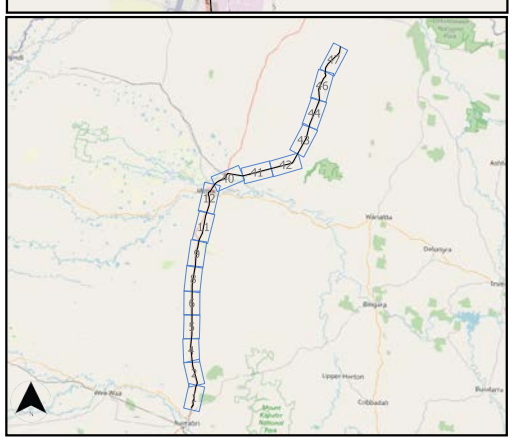

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Noise Sensitive Receivers - Moree area

Sheet 27 of 48

LEGEND

- Project track alignment
- Cadastre

Construction Footprint

- Construction Footprint

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- Childcare
- Hospital Ward
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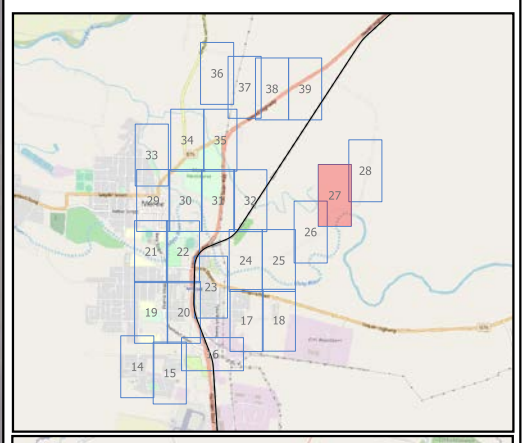

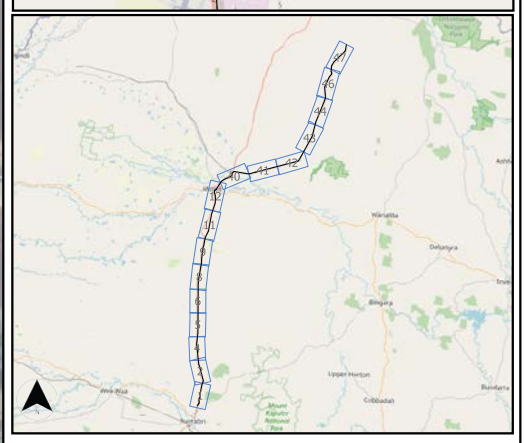

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NARRABRI TO NORTH STAR

Noise Sensitive Receivers - Moree area

Sheet 28 of 48

LEGEND

- Project track alignment
- Cadastre

Construction Footprint
- Construction Footprint

Sensitive Receivers
- Education
- Childcare
- Hospital Ward
- Active Recreation
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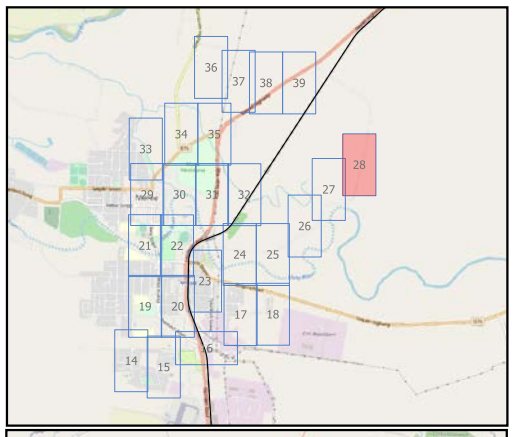

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NARRABRI TO NORTH STAR

Noise Sensitive Receivers - Moree area

Sheet 29 of 48

LEGEND

- Project track alignment
- Cadastre

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- Childcare
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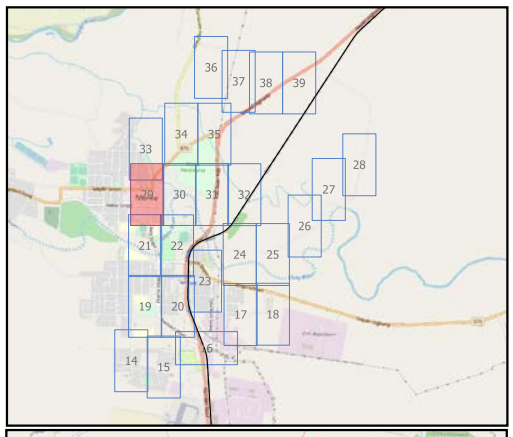

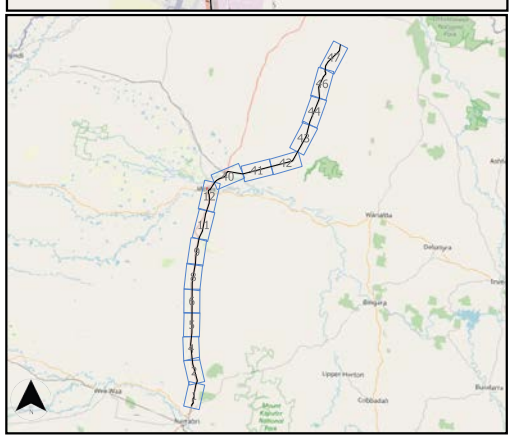

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NARRABRI TO NORTH STAR

Noise Sensitive Receivers - Moree area

Sheet 30 of 48

LEGEND

- Project track alignment
- Cadastre

Construction Footprint
- Construction Footprint

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- Education
- Childcare
- Hospital Ward
- Active Recreation
- Passive Recreation
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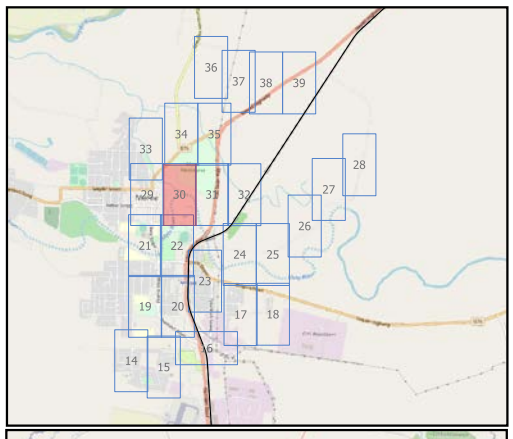

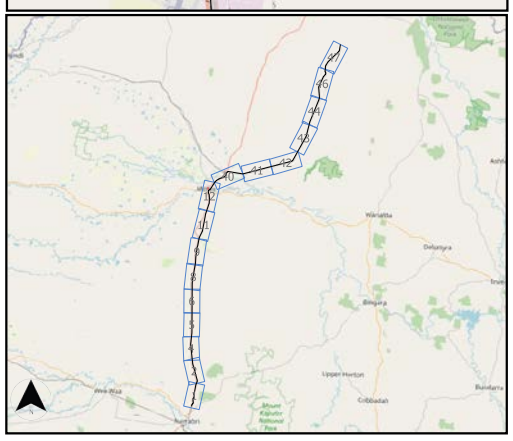

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NARRABRI TO NORTH STAR

Noise Sensitive Receivers - Moree area

Sheet 31 of 48

LEGEND

- Project track alignment
- Cadastre

Construction Footprint
- Construction Footprint

Sensitive Receivers
- Education
- Childcare
- Hospital Ward
- Active Recreation
- Passive Recreation
- Residential
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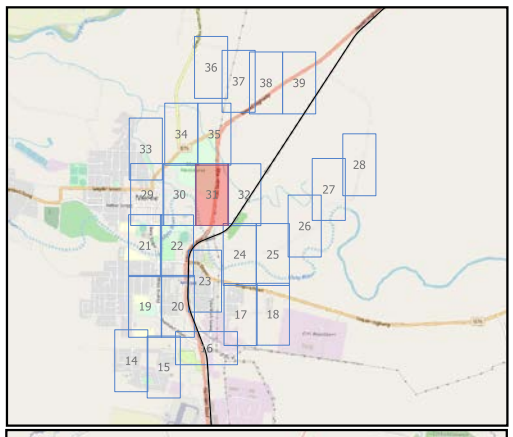

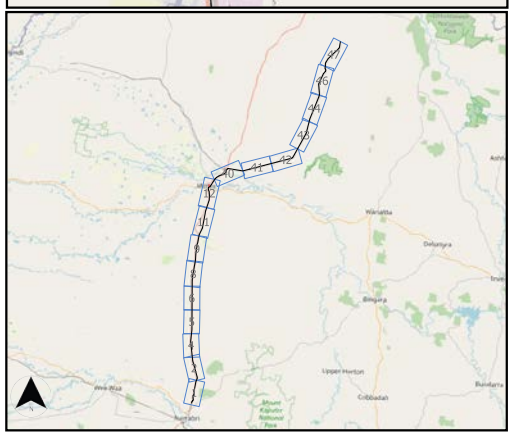

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NARRABRI TO NORTH STAR

Noise Sensitive Receivers - Moree area

Sheet 32 of 48

LEGEND

- Project track alignment
- Cadastre

Construction Footprint
- Construction Footprint

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- Education
- Childcare
- Hospital Ward
- Active Recreation
- Passive Recreation
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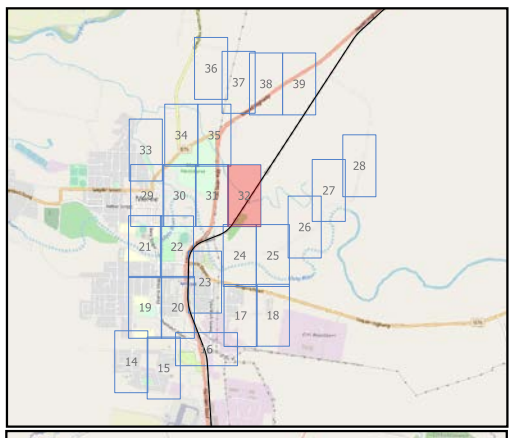

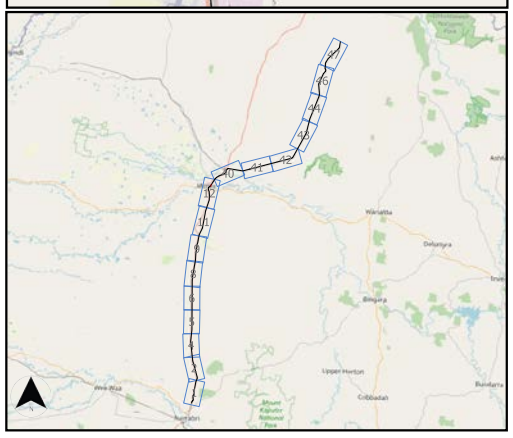

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NARRABRI TO NORTH STAR

Noise Sensitive Receivers - Moree area

Sheet 33 of 48

LEGEND

- Project track alignment
- Cadastre

Construction Footprint
- Construction Footprint

Sensitive Receivers
- Education
- Childcare
- Hospital Ward
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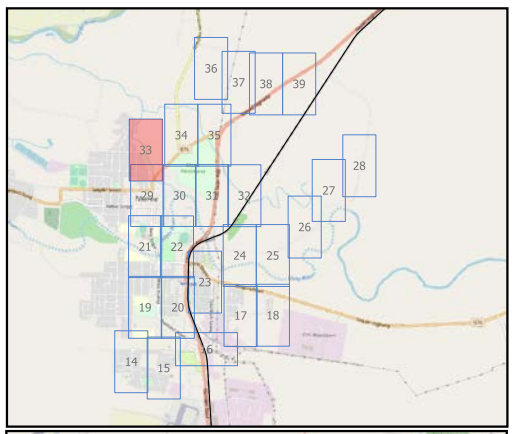

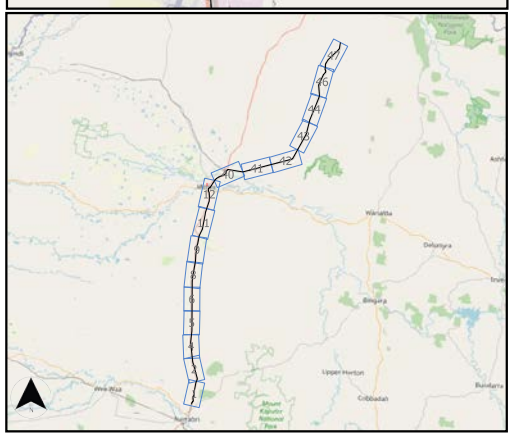

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NARRABRI TO NORTH STAR

Noise Sensitive Receivers - Moree area

Sheet 34 of 48

LEGEND

- Project track alignment
- Cadastre

Construction Footprint
- Construction Footprint

Sensitive Receivers
- Education
- Childcare
- Hospital Ward
- Active Recreation
- Passive Recreation
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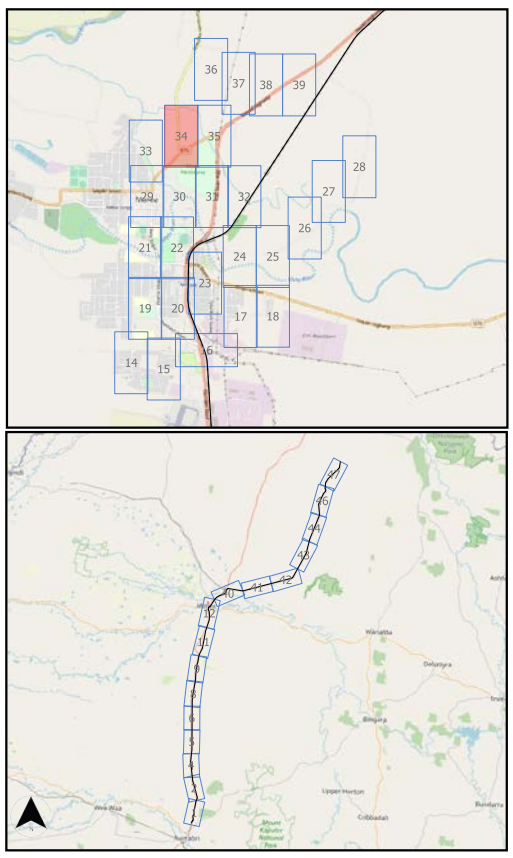

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NARRABRI TO NORTH STAR

Noise Sensitive Receivers - Moree area

Sheet 35 of 48

LEGEND

- Project track alignment
- Cadastre

Construction Footprint
- Construction Footprint

Sensitive Receivers
- Education
- Childcare
- Hospital Ward
- Active Recreation
- Passive Recreation
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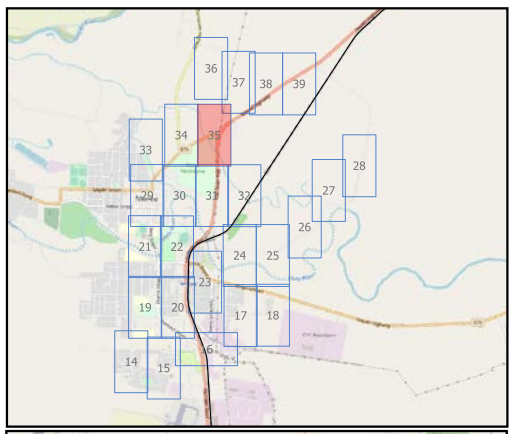

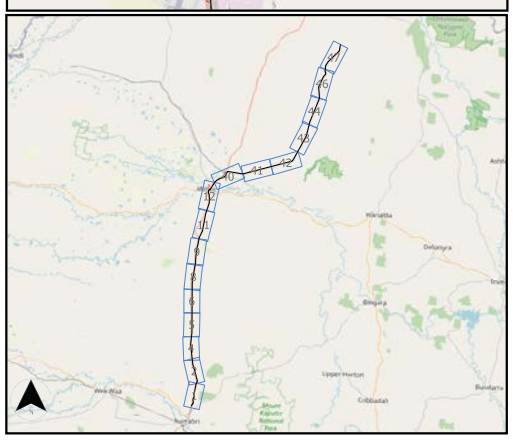

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NARRABRI TO NORTH STAR

Noise Sensitive Receivers - Moree area

Sheet 36 of 48

DP1163153
DP1129075
ALABAR ROAD
Rx2250
Rx2249
Rx2248
Rx2247
DP822888
DP751780
DP751780
DP561632
DP606310
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- Project track alignment
- Cadastre

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- Construction Footprint

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- Education
- Childcare
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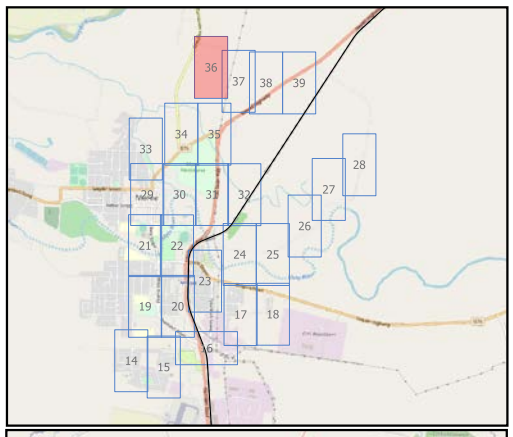

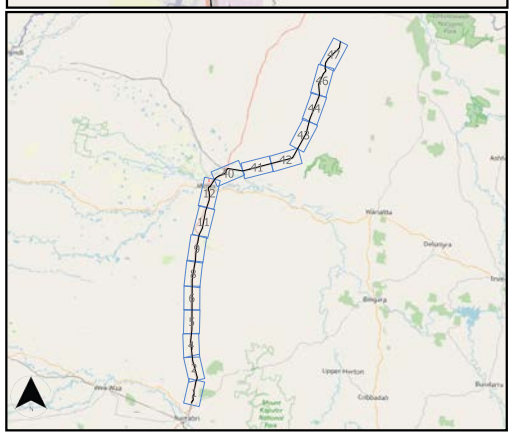

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Noise Sensitive Receivers - Moree area

Sheet 37 of 48

LEGEND

- Project track alignment
- Cadastre

Construction Footprint

- Construction Footprint

Sensitive Receivers

- Education
- Childcare
- Hospital Ward
- Active Recreation
- Passive Recreation
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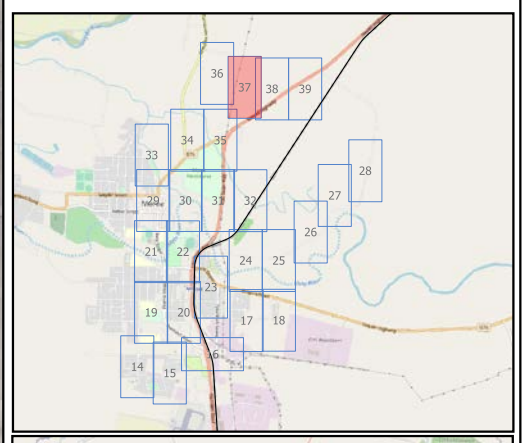

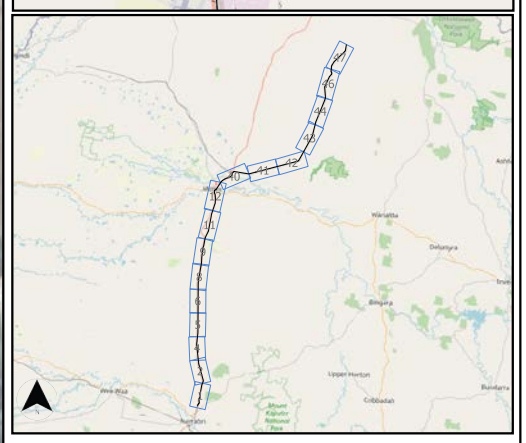

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Noise Sensitive Receivers - Moree area

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- Cadastre

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- Construction Footprint

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- Childcare
- Hospital Ward
- Active Recreation
- Passive Recreation
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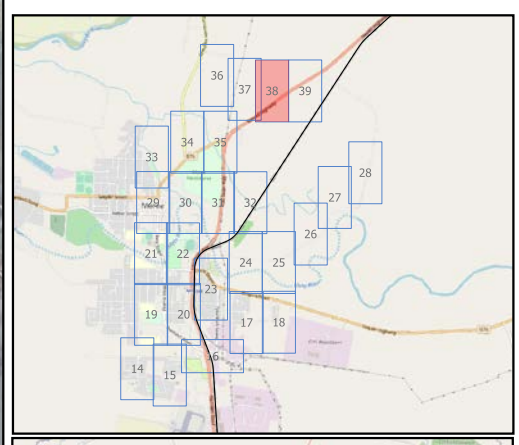

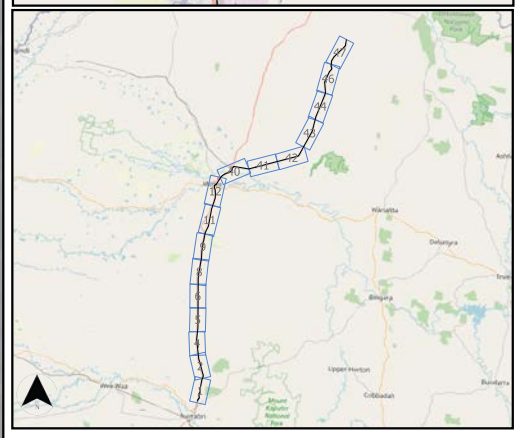

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Sheet 39 of 48

LEGEND

- Project track alignment
- Cadastre

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- Construction Footprint

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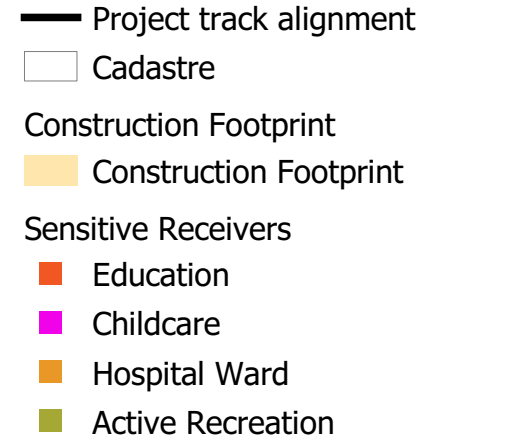

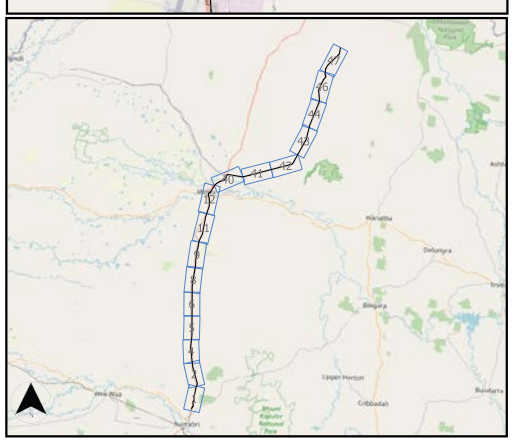

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INLAND RAIL ARTC

NARRABRI TO NORTH STAR

Noise Sensitive Receivers

Sheet 40 of 48

LEGEND

- Project track alignment
- Cadastre

Construction Footprint
- Construction Footprint

Sensitive Receivers
- Education
- Childcare
- Hospital Ward
- Active Recreation
- Passive Recreation
- Residential
- Place of Worship

NOT FOR PUBLICATION. FOR CONSULTATION PURPOSES ONLY.

0 0.8 1.6 km

Coordinate System: GDA 1994 MGA Zone 55

Paper: A3
Date: 02/10/2020
Author: MS

Scale:
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INLAND RAIL ARTC

NARRABRI TO NORTH STAR

Noise Sensitive Receivers

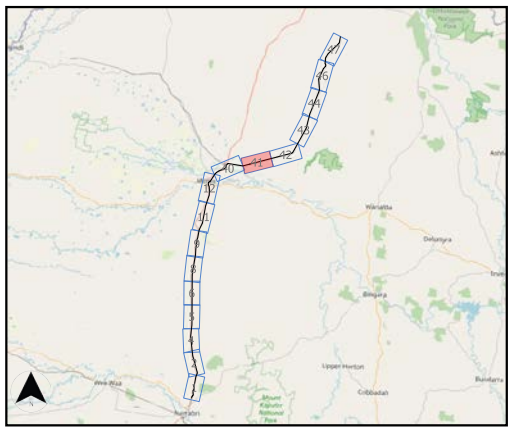
Sheet 41 of 48

LEGEND

- Project track alignment
- Cadastre

Construction Footprint
- Construction Footprint

Sensitive Receivers
- Education
- Childcare
- Hospital Ward
- Active Recreation
- Passive Recreation
- Residential
- Place of Worship



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NARRABRI TO NORTH STAR

Noise Sensitive Receivers

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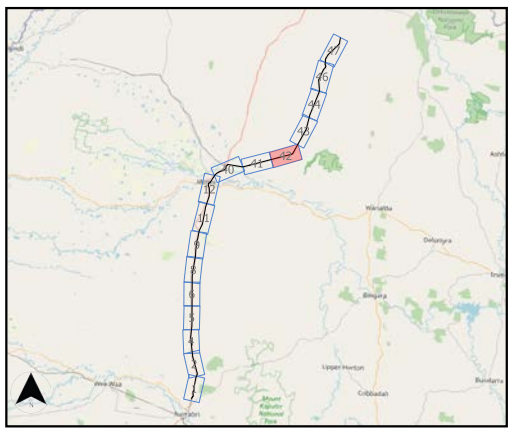

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INLAND RAIL ARTC

NARRABRI TO NORTH STAR

Noise Sensitive Receivers

Sheet 43 of 48

LEGEND

- Project track alignment
- Cadastre

Construction Footprint
- Construction Footprint

Sensitive Receivers
- Education
- Childcare
- Hospital Ward
- Active Recreation
- Passive Recreation
- Residential
- Place of Worship

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INLAND RAIL ARTC

NARRABRI TO NORTH STAR

Noise Sensitive Receivers

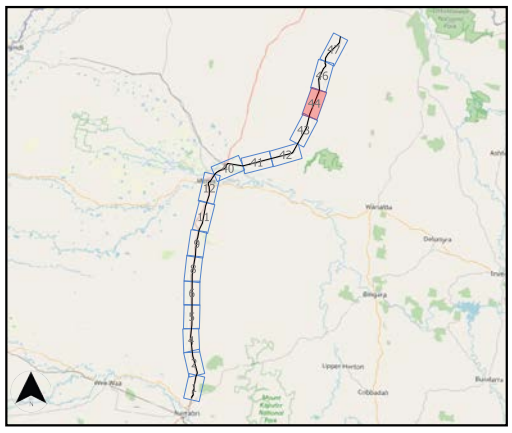
Sheet 44 of 48

LEGEND

- Project track alignment
- Cadastre

Construction Footprint
- Construction Footprint

Sensitive Receivers
- Education
- Childcare
- Hospital Ward
- Active Recreation
- Passive Recreation
- Residential
- Place of Worship



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INLAND RAIL ARTC

NARRABRI TO NORTH STAR

Noise Sensitive Receivers - Croppa Creek area

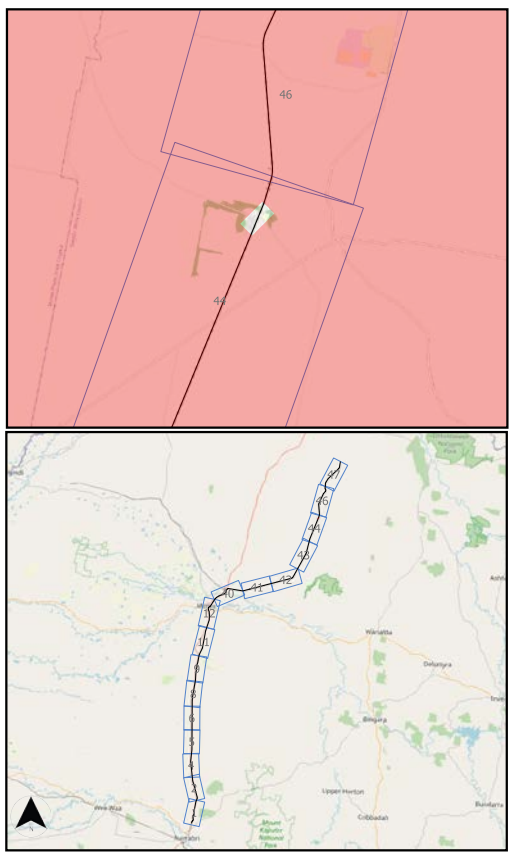
Sheet 45 of 48

LEGEND

- Project track alignment
- Cadastre

Construction Footprint
- Construction Footprint

Sensitive Receivers
- Education
- Childcare
- Hospital Ward
- Active Recreation
- Passive Recreation
- Residential
- Place of Worship



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0 0.06 0.12 km

Coordinate System: GDA 1994 MGA Zone 55

Paper: A3 Scale: 1:2500
Date: 02/10/2020
Author: MS

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INLAND RAIL ARTC

NARRABRI TO NORTH STAR

Noise Sensitive Receivers

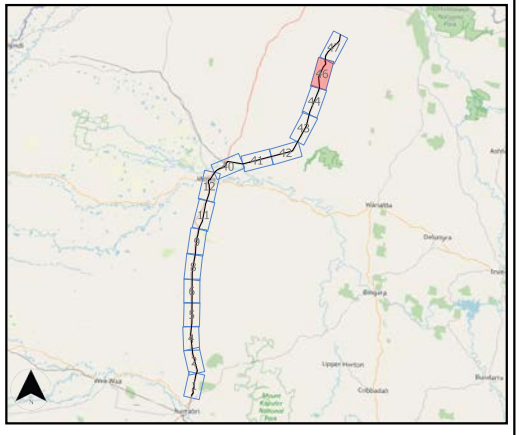
Sheet 46 of 48

LEGEND

- Project track alignment
- Cadastre

Construction Footprint
- Construction Footprint

Sensitive Receivers
- Education
- Childcare
- Hospital Ward
- Active Recreation
- Passive Recreation
- Residential
- Place of Worship



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NARRABRI TO NORTH STAR

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INLAND RAIL ARTC

NARRABRI TO NORTH STAR

Noise Sensitive Receivers - North Star area

LEGEND

- Project track alignment
- Cadastre

Construction Footprint
- Construction Footprint

Sensitive Receivers
- Education
- Childcare
- Hospital Ward
- Active Recreation
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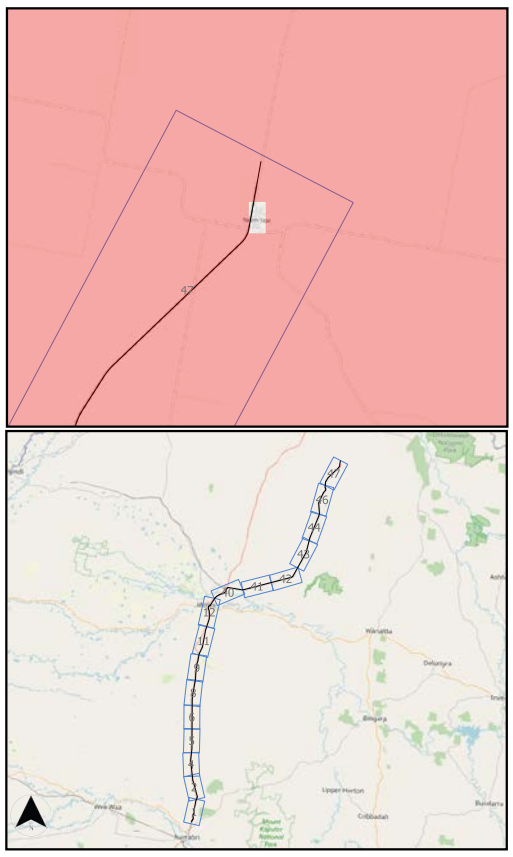

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0 0.06 0.12 km

Coordinate System: GDA 1994 MGA Zone 55

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Author: MS

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Appendix B Heritage Receiver items

B.1 Non-aboriginal heritage items

As presented in the EIS, based upon the heritage report undertaken for the EIS (refer Umwelt, 2017, Australian Rail Track Corporation *Inland Rail – Narrabri to North Star Non-Aboriginal Heritage Impact Statement*) the following list of non-aboriginal heritage items within 180 metres of the proposed construction footprint are identified as to be considered by the projects for potential vibration impacts.

Table 19: Identified non-aboriginal heritage listed items

ITEM NAME	LOCATION	DISTANCE TO CORRIDOR/TRACK
Moree Railway Station*	As listed in LEP: Gosport Street, Moree Adjacent to Lot 158, DP 1157018 As listed on S170: Morton Street	On alignment/immediately adjacent
Victoria Hotel*	339 Gosport Street, Moree	Approximately 100 metres to west
Moree Baths and swimming pool*	Corner of Anne and Warialda Street, Moree	Approximately 100 metres to west
Moree Showground*	Warialda St, Moree	Approximately 100 metres to northwest (Pavilion mentioned in listing, approximately 270 metres to the northwest)
Gwydir River Underbridge, Camurra*	Camurra – Mungindi Line 676.220 kilometres from Sydney	Approximately 180 metres west of alignment (different bridge to above)
A.B. Meppem and Co.	30 Railway Pde (Newell Highway), Bellata	Approximately 80 metres to east
Bellata Police Station and Official Residence	24 Railway Pde (Newell Highway), Bellata	Approximately 80 metres to east
Oldhams Smallgoods	26 Railway Pde (Newell Highway), Bellata	Approximately 80 metres to east
Post Office	28 Railway Pde (Newell Highway), Bellata	Approximately 80 metres to east
LS Rowe Stock and Station Agents	40 Railway Pde (Newell Highway), Bellata	Approximately 80 metres to east
Nandewar Hotel	Lot 1 Railway Pde (Newell Highway), Bellata	Approximately 80 metres to east
The rail line (including underbridges and associated rail infrastructure)	-	Variable
Former Edgeroi railway station**	-	On alignment/immediately adjacent
Former Woolenget railway station	-	On alignment/immediately adjacent
Existing Bellata railway station	-	On alignment/immediately adjacent
Former Kilgowla railway station	-	On alignment/immediately adjacent
Former Gurley railway station**	-	On alignment/immediately adjacent
Former Camurra railway station	-	TBC
Former Wongabinda railway station	-	On alignment/immediately adjacent
Former Calimpa railway station	-	On alignment/immediately adjacent

ITEM NAME	LOCATION	DISTANCE TO CORRIDOR/TRACK
Former Milguy railway station	-	On alignment/immediately adjacent
Former Crooble railway station	-	On alignment/immediately adjacent
Former Croppa Creek railway station	-	On alignment/immediately adjacent
Former North Star railway station	-	On alignment/immediately adjacent
North Star (timber and corrugated Iron buildings fronting Edward Street)	Edward Street (the main street of North Star)	Approximately 65 metres from the proposal site
Edgeroi Woolshed	Located adjacent to the rail line near the site of the former Woolenget Station, about 10 metres from the fence marking the edge of the rail corridor.	Approximately 20 metres from the proposal site (CIZ).

NOTE:

***The upgrade of the Moree Railway Station and surrounding works have been descoped from the current Project. These sensitive receivers no longer need to be considered by the Project for vibration impacts.**

****To be demolished as part of the works.**

B.2 Aboriginal heritage items

As presented in the EIS, based upon the heritage report undertaken for the EIS (refer Umwelt, 2017, Australian Rail Track Corporation *Inland Rail – Narrabri to North Star Aboriginal Cultural Heritage and Archaeological Assessment).*

No items were identified as potentially impacted by vibration from the project works.

For items where there is an archaeological recommendation to avoid impacts, such as site 10-6-0048, consideration as to if the item would be considered vibration sensitive should be considered in the relevant CNVIS.

Appendix C Cosmetic damage minimum working distance screening maps

Appendix D Out of Hours Work Protocol and Application Form

OUT OF HOURS WORKS PROTOCOL

Are the works required to be undertaken outside the Standard Construction Hours (CoA E1 and EPL Condition L6.1)? If yes, please proceed with this protocol. If no, NO OOHW APPROVAL REQUIRED.

NOTE: This Protocol covers ALL Out of Hours Works proposed on the N2NS Project, including those not subject to an EPL.

Do the proposed OOHW comply with any of the circumstances detailed in CoA E2 or E3(a, b, e or f) and EPL Condition L6.2 or L6.3 (a, b, d or e)?

No

T4M Project Director (or delegate) to grant approval to proceed with OOHW Application

Are the proposed OOHW considered by the ER to be of *low environmental risk*?
NOTE: This decision must be informed and based on a documented noise assessment. A risk assessment must be undertaken to determine activities that are of *low environmental risk.*

Yes

OOHW Application Form (Low Risk Activity)
The Application Form must be supported by the following:
1. A documented Noise Assessment – **T4M Env. Man.**
2. A risk assessment must be undertaken by the **T4M Env. Man.** to demonstrate the works are considered low risk and the application may proceed under the **OOHW Application Form (Low Risk Activity)**.
3. Reasonable and feasible mitigation measures (Section 10, Table 16) – **T4M Env. Man.**
4. Notification (Communication Category 1 or suitable alternative) to all potentially affected sensitive receivers - **T4M Comms. Man, T4M Env. Man, ER.**
5. Approval from relevant **T4M Discipline Leads** and **T4M Project Director**
6. Approval from the N2NS **Project ER**.
7. All potentially affected receivers / communities must be notified of the OOHW prior to the works commencing.

No

All other OOHW are considered to be High Risk Activities and require DPIE Approval.
NOTE: Allow 1 month for approval.

OOHW Application Form (High Risk Activity)
The Application Form must be supported by the following:
1. A documented Noise Assessment – **T4M Env. Man.**
2. A documented Risk Assessment – **T4M Env. Man.**
3. Reasonable and feasible (and additional) mitigation measures – **T4M Env. Man.**
4. Notification (Communication Category 1 and / or 2, as determined by the risk assessment) to all potentially affected sensitive receivers - **T4M Comms. Man**.
5. A Sleep Disturbance Assessment must be undertaken in accordance with ICNG for OOHW that occur from 10pm – 7am for more than 2 consecutive nights.
6. Approval from relevant **T4M Discipline Leads** and **T4M Project Director**
7. Documented consultation with the **NSW EPA** and the N2NS **Project ER.**

A risk assessment must be undertaken by the **T4M Env. Man.** to confirm the risk level (and additional mitigation measures) of the proposed OOHW:
<u>High Risk Levels include</u>:

High Day 1 = CO1
High Day 2 = CO1 and CO2
High Day 3 = CO1, CO2 and RO*

High Rest 1 = CO1
High Rest 2 = CO1 and CO2
High Rest 3 = CO1, CO2 and RO*.

High Sleep 1 = CO1
High Sleep 2 = CO1, CO2, RO* and AA*.
High Sleep 3 = CO1, CO2, RO and AA*.

*Where works are proposed for >2 nights

All high risk OOHW must include consultation with the NSW EPA.

OOHW may proceed following ER Approval and notification as detailed in Item 7 above.

Submit to DP&E for approval

Out of hours works approved by the Secretary of DPIE.

No

OOHW MAY NOT PROCEED

Yes

Workforce to be toolboxed to introduce / reinforce works restrictions, management measures and expected workforce behaviour.
NOTE: DPIE, the NSW EPA, Local Council and all potentially affected receivers / communities must be notified of the OOHW prior to the works commencing.

OOHW may proceed, ensuring any mitigation measures, conditions or approval, supplementary notification of works and / or noise or vibration monitoring is undertaken.

Where a non-conformance is recorded or a noise complaint is received, the OOHW activity responsible must stop, the issue investigated and actions immediately taken to mitigate the non-compliance or complaint.

In the event of a complaint, consultation must occur with the complainant to discuss any additional measures taken; or
In the event of a non-compliance, suitable rectification works have occurred to address the non-compliance to the satisfaction of the ER.

WORKS MAY PROCEED

Works to be assessed and approved by the T4MR Project Director (or delegate), T4MR Environment Manager and the T4MR Community & Stakeholder Engagement Manager. ARTC and the ER must be notified in writing prior to the works commencing – **T4M Env Man**. Where possible, all potentially affected sensitive receivers must be notified – **T4M Comms. Man**.

<u>Additional Mitigation Measures</u>

Category 1 CO1: Communication should be personalised (e.g. door knock, meeting, telephone call). Contact with these residents should commence early to enable feedback to be considered by the proposal; and

Category 2 CO2: Communication to provide information on the proposal via letter box drop, email, newsletter, media advertisements and/or website a minimum of five days prior to the works commencing.

Respite Offer: Residents subjected to lengthy periods of noise or vibration may be eligible for a respite offer. The purpose of such an offer is to provide residents with respite from an ongoing impact across more than two consecutive evening periods.

Alternative Accommodation: Alternate accommodation options (i.e. accommodation in motels away from the worksite) may be provided to residents living in close proximity to construction sites that are likely to incur noise levels significantly above the applicable level across two or more consecutive sleep periods.

Standard Construction Hours:
<u>CoA E1:</u>

Works must be undertaken during the following hours:

a) 7:00 am to 6:00 pm Mondays to Fridays;

b) 7:00 am to 6:00 pm Saturdays; and

at no time on Sundays or public holidays.

<u>CoA E2:</u>
Notwithstanding Condition E1, works affecting any given receiver may be undertaken during the hours of 6.00 am to 6.00 pm each day over a three (3) month period provided that there is no work between the hours of 6:00 pm on a Saturday and 7:00 am on a Monday every second week.

<u>Negotiated Agreements</u>
In accordance with CoA E4 and E5, works may be carried out in accordance with the hours and noise limits specified in a negotiated agreement with a sensitive receiver. Negotiated agreements must be in writing and finalised prior to works commencing.

Appendix E Monitoring Specifications

E.1 Specification for Determining the Sound Power of Construction Plant and Equipment

E.1.1 Scope

This document specifies methods for determination of sound power levels for construction plant including earthmoving equipment and other ancillary plant and equipment used during construction.

E.1.2 Referenced Standards

- AS IEC 61672.1 – Electroacoustic - Sound Level Meters – Specifications
- AS 2012.1 – Acoustics - Measurement of airborne noise emitted by earth-moving machinery and agricultural tractors - Stationary test condition - Determination of compliance with limits for exterior noise
- ISO 3744 – Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Engineering methods for an essentially free field over a reflecting plane
- ISO 3746 – Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Survey method using an enveloping measurement surface over a reflecting plane
- ISO 6393 – Earth-moving machinery - Determination of sound power level - Stationary test conditions
- ISO 6395 – Earth-moving machinery - Determination of sound power level - Dynamic test conditions.

E.1.3 Testing Procedures – Earthmoving Machinery

The following procedures are to be followed by personnel suitably qualified and experienced in undertaking acoustic measurements.

Each acoustically significant plant item identified in the CNVIS shall be tested in terms of both the ‘stationary’ and the ‘dynamic’ testing procedures detailed below.

All sound level meters used must be Type 1 or 2 instruments as described in AS IEC 61672.1 “Electroacoustic - Sound Level Meters” and calibrated to standards that are traceable to Australian Physical Standards held by the National Measurement Laboratory (CSIRO Division of Applied Physics). The calibration of the meters shall be checked in the field before and after the noise measurement period.

E.1.4 Stationary Testing

Stationary measurements shall be performed on all earthmoving plant according to the method of AS 2012.1 and/or ISO 6393.

In addition to measuring overall A-weighted noise levels, octave band frequency $L_{Aeq,T}$ noise levels shall also be measured at each measurement location from 63Hz to 8kHz inclusive. Background noise shall also be recorded in the same octave band frequency range, and corrections to measured octave-band noise levels shall be applied as described in Table 1 of AS2012.1.

Each plant item should be tested in isolation, without any other noisy plant on site operating. Where this cannot be done for practical reasons, then the noise of the plant being tested shall be at least 5dB greater than the background noise from other nearby plant, both in terms of the overall A-weighted level and in all octave band frequencies.

Measured octave-band $L_{Aeq,T}$ noise levels shall also be processed as described in the Standard to establish octave-band sound power levels.

The overall A-weighted sound power levels to be determined shall be in terms of both the $L_{Aeq,T}$ and $L_{A1,(1min)}$ noise metrics. The measurement sample time shall be selected so that it is representative of the operating cycle/s of the plant being tested.

Where the plant tested or noise measurements are taken within 3.5 metres of large walls or cliffs, then a reflection correction of up to -2.5dB(A) shall be applied to remove the effect of increased noise due to sound reflections from such structures.

All measured noise level data and determined sound power levels shall be included in the test reports.

E.1.5 Dynamic Testing

Details of equipment operation during testing will vary depending on the equipment type. Dynamic measurements shall be performed on all earthmoving plant according to the method in International Standard ISO 6395.

In addition to measuring overall A-weighted noise levels, octave band frequency $L_{Aeq,T}$ noise levels shall also be measured at each measurement location from 63Hz to 8kHz inclusive. Background noise shall also be recorded in the same octave band frequency range, and corrections to measured octave-band noise levels shall be applied as described in International Standard ISO 6395.

Each plant item should be tested in isolation, without any other noisy plant on site operating. Where this cannot be done for practical reasons, then the noise of the plant being tested shall be at least 5dB greater than the background noise from other nearby plant, both in terms of the overall A-weighted level and in all octave band frequencies.

Measured octave-band $L_{Aeq,T}$ noise levels shall also be processed to establish octave-band sound power levels.

Where the plant tested or noise measurements are taken within 3.5 metres of large walls or cliffs, then a reflection correction of up to -2.5dB(A) shall be applied to remove the effect of increased noise due to sound reflections from such structures.

The overall A-weighted sound power levels to be determined shall be in terms of the $L_{Aeq,T}$ and $L_{A1,(1min)}$ noise metrics. The measurement sample time shall be selected so that it is representative of the operating cycle/s of the plant being tested.

All measured noise level data and determined sound power levels shall be included in the test reports.

E.1.6 Testing Procedures – Other Construction Plant

The following procedures are to be followed by personnel suitably qualified and experienced in undertaking acoustic measurements.

All sound level meters used must be Type 1 or 2 instruments as described in AS IEC 61672.1 ‘Electroacoustic - Sound Level Meters’. The calibration of the meters shall be checked in the field before and after the noise measurement period.

Noise measurements shall be performed on all acoustically significant non-earthmoving construction plant identified in the CNVIS according to the methods of either ISO 3744 or ISO 3746, whichever is applicable to the items of plant being tested.

Machinery shall be operated at high idle speed. In the case of drilling, boring and rock-breaking machines, the testing location shall allow for these machines to be operated in rock of characteristics that are typical for the project site.

In addition to measuring overall A-weighted noise levels, octave band frequency $L_{Aeq,T}$ noise levels shall also be measured at each measurement location from 63Hz to 8kHz inclusive. Background noise shall also be recorded in the same octave band frequency range, and corrections to measured octave-band noise levels shall be applied as described in Table 1 of AS2012.1.

Each plant item should be tested in isolation, without any other noisy plant on site operating. Where this cannot be done for practical reasons, then the noise of the plant being tested shall be at least 5dB greater than the background noise from other nearby plant, both in terms of the overall A-weighted level and in all octave band frequencies.

Measured octave-band $L_{Aeq,T}$ noise levels shall also be processed as described in Section 8 of that Standard to establish octave-band sound power levels.

The overall A-weighted sound power levels to be determined shall be in terms of both the $L_{Aeq,T}$ and $L_{A1,(1min)}$ noise metrics. The measurement sample time shall be selected so that it is representative of the operating cycle/s of the plant being tested.

Where the plant tested or noise measurements are taken within 3.5 metres of large walls or cliffs, then a reflection correction of up to -2.5dB(A) shall be applied to remove the effect of increased noise due to sound reflections from such structures. All measured noise level data and determined sound power levels shall be included in the test reports.

E.2 Specification for Construction Noise Monitoring

E.2.1 Scope

This document specifies methods for undertaking noise monitoring during the construction phase of the project.

E.2.2 Referenced Standards & Guidelines

- AS 2659.1 Guide to the use of sound measuring equipment – portable sound level meters
- AS IEC 61672.1 Electroacoustic - Sound Level Meters – Specifications;
- AS 1055 Acoustics - Description and Measurement of Environmental Noise;
- DECCW NSW Interim Construction Noise Guideline 2009; and
- EPA NSW Noise Policy for Industry 2017.

E.2.3 Testing Procedures

The following procedures are to be followed by personnel suitably qualified and experienced in undertaking acoustic measurements.

All noise monitoring equipment used must be at least Type 2 instruments as described in AS IEC 61672.1 ‘Electroacoustic - Sound Level Meters - Specifications’ and calibrated to standards that are traceable to Australian Physical Standards held by the National Measurement Laboratory (CSIRO Division of Applied Physics). The calibration of the monitoring equipment shall also be checked in the field before and after the noise measurement period, and in the case of long-term noise monitoring, calibration levels shall be checked at minimum weekly intervals.

Long-term noise monitoring equipment or Noise Loggers, consist of sound level meters and computers housed in weather resistant enclosures. The operator may either retrieve the data at the conclusion of each monitoring period either in person or via a telephone modem if the logger is fitted with a mobile phone option.

All environmental noise measurements shall be taken with the following meter settings:

- Time Constant - FAST (i.e. 125 milliseconds)
- Frequency Weightings - A-weighting
- Sample Period - 15 minutes

All outdoor noise measurements shall be undertaken with a windscreen over the microphone. Windscreens reduce wind noise at the microphones.

Measurements of noise should be disregarded when it is raining and/or the wind speed is greater than 5 m/s (18 km/h).

E.2.4 Long-term (unattended) Monitoring

Noise monitoring shall be undertaken in accordance with the environmental noise measurement requirements stipulated in the reference standards and documents listed above.

Noise monitoring equipment shall be placed at positions which have unobstructed views of general site activities, whilst shielded as much as possible from non-construction site noise (e.g. road traffic, rail noise and other surrounding noise).

Every 15 minutes, the data is to be processed statistically and stored in memory. The minimum range of noise metrics to be stored in memory for later retrieval is the following A-weighted noise levels: L90, Leq, and Lmax.

Where the noise monitors are placed within 3.5 metres of building facades, walls or cliffs, then a reflection correction of up to -2.5dB(A) shall be applied to remove the effect of increased noise due to sound reflections from such structures.

Meteorological conditions such as wind velocity, wind direction and rainfall shall also be either monitored on site or recorded from the nearest weather station to the project site, over the entire noise monitoring period.

E.2.5 Short-term (attended) Monitoring

All attended short-term noise monitoring shall be recorded over 15-minute sample intervals. Every 15 minutes, the data is to be processed statistically and stored in memory. The minimum range of noise metrics to be stored in memory and reported are the following A-weighted noise levels: L_{90}, L_{eq}, and L_{max}.

In addition to measuring and reporting overall A-weighted noise levels, statistical L_{90}, L_{eq}, L_{10} noise levels shall also be measured and reported in third-octave band frequencies from 31.5Hz to 8kHz.

Outdoor noise monitoring is to be undertaken at least 3.5m from any reflecting structure other than the ground. The preferred measurement height is 1.2-1.5m above the ground. Where the noise monitors are placed within 3.5 metres of building facades, walls or cliffs, then a reflection correction of up to -2.5dB(A) shall be applied to remove the effect of increased noise due to sound reflections from such structures.

Measurements inside buildings should be at least 1m from the walls or other major reflecting surfaces, 1.2 m to 1.5m above the floor, and about 1.5m from windows.

Conditions such as wind velocity, wind direction, temperature, relative humidity and cloud cover shall also be recorded during short-term noise monitoring.

Noise monitoring shall be undertaken in accordance with the environmental noise measurement requirements stipulated in the reference standards and documents listed above.

The following information shall be recorded:

- date and time of measurements
- name of person undertaking the measurements
- type and model number of instrumentation
- results of field calibration checks before and after measurements
- description of the time aspects of each measurement (i.e. sample times, measurement time intervals and time of day)
- sketch map of area and monitoring location
- measurement location details and number of measurements at each location
- weather conditions during measurements

- operation and load conditions of the noise sources under investigation
- any adjustment made for presence or absence of nearby reflecting surfaces
- noise due to other sources (e.g. traffic, aircraft, trains, dogs barking, insects etc.).

E.3 Specification for Construction Vibration Monitoring

E.3.1 Scope

This document specifies methods for undertaking vibration monitoring during the construction phase of the project.

E.3.2 Referenced Standards and Guidelines

- AS 2775 Mechanical Mounting of Accelerometers
- AS 2670.2 Evaluation of human exposure to whole body vibration
- NSW Assessing Vibration: a technical guideline (AVTG) (DEC, 2006)
- DIN 4150.3 Structural Vibration in Buildings – Effects on Structures
- BS 7385:1 Evaluation and Measurement for Vibration in Buildings – Part 1: Guide for measurement of vibrations and evaluation of their effects on buildings
- BS 7385:2 Evaluation and Measurement for Vibration in Buildings – Part 2: Guide to Damage Levels from Ground-borne Vibration
- ISO 4866 Mechanical Vibration & Shock – Vibration of Buildings – Guidelines for the Management of the Vibrations and Evaluation of their Effects on Buildings.

E.3.3 Testing Procedures

The following procedures are to be followed by personnel suitably qualified and experienced in undertaking vibration measurements.

All vibration monitoring equipment used must be calibrated at least once every two years to standards that are traceable to Australian Physical Standards held by the National Measurement Laboratory (CSIRO Division of Applied Physics). The monitoring system should also have a measurement frequency range down to 1Hz.

E.3.4 Short-Term (Attended) Monitoring

Vibration monitoring shall be undertaken at the following locations:

- at the commencement of operation for each plant or activity on site, which has the potential to generate significant vibration levels, so to refine the indicative minimum working distances and provide a site-specific table of minimum working distances
- vibration sensitive locations determined to fall within the ‘vibration screening criteria’ established for each item of plant. Areas likely to require vibration monitoring are identified in the CNVIS reports prepared for the LWW; and
- where vibration complaints or requests from relevant authorities, at the requested location and at any other relevant vibration receiver location with closest proximity to the construction activities;
- where required to determine ground-borne noise levels from tunnelling or excavation works.

Vibration monitoring shall be undertaken over the following period(s):

- for plant operating within the ‘minimum working distances’, during the commencement of use of each plant on site until site-specific minimum working distances are established; and

- for complaints or requests from relevant authorities, during the of use of requested plant until site-specific minimum working distances are established.

All attended short-term vibration monitoring shall be recorded over 15 minute sample intervals. The following minimum range of vibration metrics should be stored in memory and reported:

- Vibration Dose Values (VDVs)
- root-mean-square (rms) – maximums and statistical levels
- peak-particle velocity (ppv) – maximums and statistical levels.

In addition to measuring and reporting overall vibration, statistical vibration shall also be measured and reported in third-octave band frequencies from 1Hz to 250Hz.

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

The following information shall be recorded:

- date and time of measurements;
- name of person undertaking the measurements
- type and model number of instrumentation;
- description of the time aspects of each measurement (i.e. sample times, measurement time intervals and time of day);
- sketch 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.).

E.3.5 Long-Term (Unattended) Monitoring

Vibration monitoring shall be undertaken at vibration sensitive locations determined to fall within the 'minimum working distances' established for each item of plant during the commencement of use of each plant on site.

Vibration monitoring shall be undertaken over the following period(s):

- continuously whilst the vibrating plant is operational within the pre-determined ‘minimum working distance’ from the potentially affected building.

Vibration monitoring equipment shall be placed outside at the footings or foundations of the building of interest, closest to the vibrating plant.

The data is to be processed statistically and stored in memory. The minimum range of vibration metrics to be stored in memory for later retrieval is the following:

- vector-sum root-mean-square (rms) – maximums and statistical metrics; or
- vector-sum peak-particle velocity (ppv) – maximums and statistical metrics.

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 outside-to-inside vibration transfer function shall be measured, whenever practicable, to assess the potential for humane annoyance inside buildings;
- the surface should be solid and rigid to best represent the vibration entering the structure of the building under investigation;
- the vibration sensor or transducer shall not be mounted on loose tiles, loose gravel or other resilient surfaces;
- the vibration sensor or transducer shall be directly mounted to the vibrating surface using bees wax or a magnetic mounting plate onto a steel plate or bracket either fastened or glued to the surface of interest;
- 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.; and
- a flashing light alarm should be attached in a visible position from the construction work area. When vibration exceeds the set threshold, the light will flash notifying the operator that works in that area should cease immediately.

Appendix F Stakeholder Comments

Gwydir Shire Council				
1	"No Comment" received from Gwydir Shire Council on the 03/02/2021			
Moree Plains Shire Council				
1	1. At *Section 5.6 Compliance Monitoring and Reporting* it is suggested that the "*Six monthly independent audits by a suitably qualified professional*" results should be publically available on the Inland Rail website and notified to Council.	27	Yes	Section 5.6 amended. The Independent Audit Report and response will be made publicly available in accordance with CoA A38(c).
2	2. At Section *5.11 Communication and Complaints Management* it is suggested that the register of complaints (minus **any** information about the complainant) should be publically available on the Inland Rail website.	n/a	No	The Project's Complaints Register will be managed and made available in accordance with CoA B9 and B10.
3	3. A *Complaints Procedure* is referenced in Table 6: Noise and Vibration Risk Assessment. This should also be publically available and Council would be happy to review.	28	Yes	Section 5.11 updated - ARTC's Communication Strategy (as required under CoA B1) contains the Complaints Management System (as required under CoA B6) for the N2NS Project. Both documents are required to be publicly available (Inland Rail Project website - https://inlandrail.artc.com.au/building-inland-rail/environmental-approvals/) under CoA B11(e).
4	4. At *Section 11.3.2 Attended and unattended airborne noise monitoring* it is stated "*Where appropriate, in response to a noise related complaint(s) (determined on a case-by- case basis) and in accordance with the OOHW Protocol or EPL*." a. OOWH Protocol (Appendix D) triggers mitigation works at 2 noise complaints or a non-conformance. Relying on 2 complaints is not considered appropriate in rural areas. 1 receiver could be significantly affected long before others are impacted along the corridor.	80	Yes	Appendix D Out of Hours Protocol amended to "Where a non-conformance is recorded or a genuine noise complaint is received, undertake immediate mitigation and implement any required corrective action"
5	5. The vibration assessment does not refer to damage to utilities. This may be because all utilities are located outside the zone of influence. This requires clarification.	Figure 4 Appendix G	Yes	Figure 4 and Appendix G (CNVIS Template) amended to include the assessment of the impact to remaining utilities within proximity of the work site. NOTE: Utilities directly conflicting with the construction (or operational) activities will be relocated prior to construction works commencing.
NSW EPA				
1	The protocol relates to the Narrabri to North Star Inland Rail Project – Separable Portion 1 and is required to be developed in consultation with the EPA in accordance with Condition of Approval (CoA) E8 of Critical State Significant Infrastructure Approval 7474 (the CSSI). CoA E8 applies to any works that are not the subject of an Environment Protection Licence (EPL). The intent is to provide a process for the assessment and approval of out-of hours works that are carried out as part of the approved CSSI but are not works regulated by the CSSI's EPL(s). CoA E8 does not provide for out-of-hours works for activities subject to an EPL to be conducted outside the EPL hours through the protocol. Out-of-hours works for activities subject to an EPL must be considered through a variation to that EPL. The EPA has confirmed that this is the intent of CoA E8 with DPIE Infrastructure Management Planning Services.	N/A	N/A	NOTED. As most works undertaken on the Project will be subject to an EPL, this Protocol may be / will be updated once the EPL for construction has been received.
2	The protocol should identify a process to consult with impacted sensitive receivers about mitigation measures for residual impacts. Especially, where respite periods may apply.	App D	Yes	The amended OOHW Protocol and 2 new OOHW Application Forms (2) provides a process to consult with impacted sensitive receivers.

3	The protocol should include a process to identify mitigation measures for residual impacts and their implementation. The EPA understands this may be addressed through the Construction Noise and Vibration Impact assessment. If so, this should be reflected in the protocol.	App D	Yes	The amended OOHW Protocol and 2 new OOHW Application Forms (2) provides a process to identify both standard mitigation measures to be applied and additional measures as described in Section 10.5 of the CNVMP.
4	The protocol provides discretion to the Environmental Representative to determine if an activity is high or low risk. The EPA is of the opinion that the risk rating of an activity should be determined through a documented risk assessment process clearly identified within the protocol. The risk assessment methodology should give regard to criteria such as the level of noise and/or vibration impact, the duration of works and the number of impacted receivers. The risk assessment process should also be applied to any pre-determined low risk activities listed within the protocol to verify their low risk status.	App D	Yes	The amended OOHW and 2 new OOHW Application Forms provides a risk matrix to determine what OOHW are considered low risk and what are considered high risk. The risk matrix also includes additional mitigation measures for both low and high risk OOHW activities.
5	The protocol should identify procedures to facilitate the coordination of out-of-hours work approved by an EPL to ensure appropriate respite is provided. This is required by CoA E8(c).	App D	Yes	As per CoA E8, this protocol has been developed specifically for works not subject to an EPL. The Protocol identifies that works subject to an EPL must be undertaken in accordance with any relevant CoA and the conditions of the EPL. Once the EPL has been received (depending on the Conditions) this OOHW Protocol will be updated to include ALL works (both those subject and not subject to an EPL) in consultation with the ER and the NSW EPA. The amended OOHW Protocol and Application Forms include a risk assessment which determines the level of risk and corresponding mitigation measures. This includes identifying when respite must be offered.
6	The EPA requests that the protocol include processes to: a. Notify the EPA of any approved out-of-hours works carried out under the protocol. b. Consult with the EPA about any high-risk activities prior to the proponent seeking approval from the Planning Secretary.	App D	Yes	The amended OOHW Protocol and 2 new OOHW Application Forms (2) provides a process to notify or consult with the EPA.
Narrabri Shire Council (05/02/2021)				
1	The proposal will allow activities of high impact of both noise and vibration to continue through the night period for intervals of 3-days or potentially more. However, in the case of a resident or local community being significantly affected by high noise or vibration, the NVMP has options for relief of this impact such as alternative accommodation for the period of impact. The NVMP does not appear to include an option for a resident to refuse this work to occur outside of agreed hours and potentially the work being restricted to more practical hours such as 8am to 5pm. This option may be included in a community consultation plan linked to the NVMP.	App D	Yes	As per the OOHW Protocol (App. D) and Application Forms, where a resident is highly noise affected, respite and alternative accommodation will be offered. In the event that this is not accepted and / or the works refused the EPA and DPIE will be consulted regarding whether the works can commence, noting that the EPA and DPIE have approval authority for such applications. Sleep disturbance will also be considered for any OOHW works activities occurring for >2 consecutive nights (as per ICNG).
2	No specific scheduling of works on the Newell Highway and the Inland Rail appear to be identified within the NVMP.	N/A	N/A	T4M Rail will be in regular contact (monthly) with TfNSW to discuss many things, including upcoming IR works and upgrades to the Newell Hwy occurring concurrently. This will allow both parties to plan their works and minimise noise and vibration impacts to sensitive receivers and the community. In addition to this, the N2NS OOHW Protocol (and application forms) include an assessment for cumulative impacts.
3	We suggest that Environmental Control maps are made available for community consultation on a progressive basis as part of the community consultation process.	N/A	N/A	These ECMs are designed for internal use only and not for consultation purposes.

4	Table 14 includes references to a wide range of approval conditions (CoA) making it complex to understand. The Notes state: "works affecting any given receiver may be undertaken during the hours of 6am to 6pm each day over a three-month period, provided there is no work between the hours of 6pm Saturday and 7am Monday", which aims to provide some relief for impacted receptors.	N/A	N/A	This Table has been developed based on the requirements of the CoA. In summary CoA E1, is the standard construction hours for the Project, whilst E2 and E3 allows for works to occur outside of these hours, in the given situation. CoA E7 restricts when High Noise Impact Works may be undertaken.
5	The process outlined in Figure 2 does not refer to community consultation. This appears to be an internal process. It does not appear to include any direct reference to the Proponent of the noise or vibration impact being required to undertake community consultation prior to the event. If this section is read alone, the Proponent of the noise may not be aware of responsibilities outlined in other parts of the document which require community consultation.	N/A	N/A	Correct, this process includes the assessment of noise and / or vibration impact only and does not detail the consultation requirements. This is provided in Section 2.1, 10.1, 10.5 and the OOHW Protocol.
6	The only short-coming in the document relates to high impact noise and vibration activities. The proposal will allow such activities to continue through the night period for intervals of 3-days or potentially more. However, in the case of a resident or local community being significantly affected by high noise or vibration, the NVMP has options for relief of this impact such as alternative accommodation for the period of impact. The NVMP does not appear to include an option for a resident to refuse this work to occur outside of agreed hours and potentially the work being restricted to more practical hours such as 8am to 5pm. This option may be included in a community consultation plan linked to the NVMP. It is suggested that such a link is outlined to Council.	App D	Yes	The OOHW Protocol has been completely re-written to include the consultation requirements of OOHW, based on risk and may include additional mitigation measures i.e. respite and / or offer of alternative accommodation. In the event that a sensitive receiver is highly impacted by the works and won't take up the offer of respite and / or alternative accommodation and the works are technically justified, the situation will be assessed and may / may not be approved by the EPA / DPIE.
7	The NSW Resource and Conservation Assessment Council commissioned Pauline Curby and Andrea Humphreys to undertake a Non-Indigenous Cultural Heritage Study for Stage 2 of the Brigalow Belt South Bioregion in 2002 (Curby and Humphreys, 2002). Categorised into forestry areas, the study found a total of 188 heritage items.	N/A	N/A	General observation, no changes required. An exhaustive and detailed Heritage Study was undertaken as part of the Project EIS and SPIR. This CNVMP has been based on the findings of this document.
8	Trans4m Rail are obligated to remain in direct consultation with Councils during the works program. Any correspondence from Councils needs to form part of the overall CEMP as a record of dialogue. Trans4m Rail indicate that they need to remain in contact with the "Community and other Stakeholders". This will include Transport for NSW, potentially involving a monthly meeting as there will be Newell Highway upgrades occurring at the same time as the rail project is occurring, thus creating cumulative works. No specific scheduling of works on the Newell Highway and the Inland Rail appear to be identified within the NVMP. It is assumed that this will be an ongoing matter for adaption of variations to the project scheduling.	Section 2 App D	Yes	Council's (and other Stakeholders) comments will be considered and where necessary incorporated into future revisions of the CNVMP. T4M Rail will be in regular contact (monthly) with TfNSW to discuss many things, including upcoming IR works and upgrades to the Newell Hwy occurring concurrently. This will allow both parties to plan their works and minimise noise and vibration impacts to sensitive receivers and the community. In addition to this, the N2NS OOHW Protocol (and application forms) include an assessment for cumulative impacts and contact with Council. Consultation with affected receivers is detailed in various sections of the CNVMP - Section 2.1, 10.1, 10.5 and the OOHW Protocol.
9	Trans4m Rail are required to consult with potential receivers of noise and vibration. The NVMP does not appear to quantify who these residents, property owners, businesses and community facilities are. The question is therefore raised as to whether such receivers are within a specific distance from the rail line or other activities such as haul roads, services roads, or villages along the route. The EIS should have informed this section of the NVMP and provided a map of a potential impact zone, thus making	App A	Yes	Appendix A identifies the location and type of receivers that are potentially impacted by the works. These maps are indicative only based on EIS information. This is likely to change as mobilisation and works commence and Project personnel discover that a nominated sensitive receiver is not there or that a new sensitive receivers are identified. Consultation efforts with these receivers will be tracked via Consultation Manager.

	these receivers aware of potential consultation with Trans4m Rail prior to project commencement.			
10	Section 2.1 of the NVMP provides four (4) simple descriptions of potential impacts for receptors, being: o Noticeable o Clearly Audible o Moderately Intrusive o Highly Intrusive This is considered preferable to keep the understanding of the impacts in plain English as against decibels or vibration levels.	N/A	N/A	When describing the potential impact to sensitive receivers a combination of qualitative and quantitative descriptions will be used. This flexibility will allow Project Personnel to describe the anticipated impact to receivers of all levels of understanding. Quantitative assessment and monitoring is required to demonstrate compliance (or non-compliance) the project specific noise criteria.
11	Trans4m Rail has identified the potential for “out-of-hours” work. The proposed construction hours are 6am to 6pm (Section 4, page 22). It is noted that notice of such work must be provided to NSW EPA and DPIE prior to this work occurring. This should provide a third-party review process to ensure that appropriate notification procedures have occurred.	N/A	N/A	General observation, no changes required. All OOHW will be assessed and approved in accordance with App D of the CVNMP, the Out of Hours Works Protocol. This includes consultation, dependant of risk, with DPIE, the NSW EPA, Local Council and all potentially affected receivers.
12	Section 4 of the NVMP outlines the potential for noise exceedances relating to specific works that may impact receptors at a distance of up to 1,500m from the work. For general construction works, the sensitive receiver Zone (referred to as a Heat Map) is identified to be at a distance of up to 700m. For bridge replacement works, this zone extends to 1,500m. This relates to travel of mainly noise impacts.	N/A	N/A	This heat map referred to informed the locations of potentially affected receivers. Prior to OOHW commencing or as part of the CNVIS a noise assessment (noise model) will be undertaken to determine the level of impact at each affected sensitive receiver, which will inform the consultation (and mitigation) required.
13	Calculations undertaken as part of the EIS indicate an impact distance of 18m for ground vibration. It is noted that no structural damage from vibration is predicted if equipment operates at distances of greater than 35m from heritage buildings. It is assumed that the description of heritage buildings includes old buildings.	N/A	N/A	To clarify, heritage buildings are those identified within the CHMP and App B ofg this CNVMP.
14	Section 4 Table 4 includes a Risk Assessment process to be followed for works. This presents procedures for minimising noise. The procedures presented include all practical means of reducing noise and training procedures to ensure that workers are aware of their obligations. It is noted that high noise and vibration activity that would affect receivers is limited to 3-hour blocks. Such activity is listed to occur during the day and night, however for night time activity, the NVMP indicates that this can only occur for 4-consecutive nights over any consecutive days. This would provide 3-nights with no high noise. Night time activity would need to be approved by NSW EPA and DPIE and therefore the community/receivers would have a third-party arbitrator in such circumstances.	App D	Yes	The OOHW Protocol has been re-written to address this comment and many others. In accordance with the Project's OOHW Protocol; Consultation, Respite and Alternative Accommodation with be offered dependant on risk and predicted impact. The NSW EPA, ER are also consulated and the works are approved by DPIE in high impact situations.
15	Vibration management procedures are highly detailed within the procedures. The important matter related to monitoring and dilapidation assessment before and after the works are undertaken. This appears to be a satisfactory process with the suggestion of compensation if damage occurs as a result of vibration.	N/A	N/A	Noted, general observation
16	Section 5 of the NVMP presents the overall environmental management system (EMS) framework. The document indicates that the EMS is certified to ISO standards, which means that it has been independently assessed and meets an international standard. This is considered standard practice. The document indicates that a specialist noise and vibration consultant has been contracted to undertake comprehensive noise and vibration testing during the project	N/A	N/A	Noted, general observation

	which should result in ongoing assessment for specific parts of the project where noise and vibration exceedances have been predicted to occur.			
17	It is noted (in Section 5.4) that the NVMP has "Hold Points" based on environmental risk of the works. Such hold points, it is assumed, will mean that specific work that is identified as having the potential to cause noise and vibration exceedances is reviewed before proceeding. This may involve a review of the procedures and components within that procedure that can be proactively managed to minimise the level of exceedances. Specific hold points are not identified in the document other than a Schedule of Inspections listed in Table 7. It is noted that the inspections will result in documentation of procedures and impacts as outlined in Section 5.6 of the NVMP.	N/A	N/A	Noted, general observation
18	Section 5.9 indicates that Environmental Control Maps will be prepared. It is assumed that these will be prepared prior to work commencing and therefore available to inform the work schedule of sites or activities that could potentially cause exceedances and environmental impact that needs to be managed. Council suggests that such maps are made available for community consultation on a progressive basis as part of the community consultation process.	N/A	N/A	Correct, these ECMs will be prepared by the Environmental Co-ordinator/s prior to works commencing and will guide the Project Team as to the details of the surrounding sensitive receivers and environmentally sensitive areas. These ECMs are designed for internal use only and not for consultation purposes.
19	Sections 5.10 to 5.13 outline the required documentation and processes of reporting and modifying the CEMP, EMP and NVMP to allow updating of procedures as a result of either procedural changes to prevent an incident or the investigation of an incident.	N/A	N/A	Noted, general observation
20	This section defines the potential receptors and existing background levels of noise. Appendix A of the NVMP has a map showing the location of sensitive receivers that has been mapped from aerial images. It is noted that the Map is not included in the document provided by Council. However, the NVMP includes an active process that is to identify receptors during the works program and therefore if receptors have not been identified on the map, they will be identified prior to potential impacts occurring.	N/A	N/A	Noted, general observation.
21	Section 6.2 presents the results of noise investigations from the EIS. It is noted that the rating background noise level (RBL) is set at 30 dB(A). This is low but reflective of a rural region with minimal extraneous noise. This is normally set at 35 dB(A) as a minimum. By establishing a very low RBL, there will be constraints on the project which will trigger more detailed investigations prior to work occurring. This will be beneficial to receptors.	N/A	N/A	Noted, general observation.
22	Section 7 of the NVMP establishes the noise and vibration criteria for the project. Table 8 specifies standard and non-standard hours of work as well as high noise levels. The criteria of applying an additional 10 dB(A) to the RBL can be questionable but is part of NSW Guidelines. In this case the intent is to keep noise levels at receptors at or below 40 dB(A). This is considered relatively acceptable and should not cause significant disturbance to the general amenity of a sensitive receiver.	N/A	N/A	Noted, general observation.
23	For loud noise, the level of 75 dB(A) should be compared to a moving truck or tractor which will generate up to 110 dB(A) when measured at a distance of 10m. It is assumed that the loud noise level of 75 dB(A) is the noise at the receptor. By reverse calculation, the attenuation (noise reduction) is therefore in the order of 35 dB(A) from the emission point. If the emission point consists of heavy	N/A	N/A	For clarity, prior to works commencing, noise will be assessed using an approved method (attenuation over distance noise model). This noise assessment will be undertaken by experienced environmental personnel. Depending on the findings of this assessment i.e. the anticipated level of impact, this will inform what consultation

	machinery generating 110 dB(A), the separation distance between the receptor and the point of noise emission is approximately 450m. In such circumstances where such a noise level is predicted at a receiver, the NVMP would require consultation with the receiver and a process of limiting the noise emission period or altering the noise emission source. The document includes instruction to the project to restrict hours of operation at this noise level. It also would require a submission to NSW EPA and DPIE prior to these exceedances occurring. Such noise levels will occur during the project and will impact receptors that are located within 450m of the rail line. However, procedures are in place to minimise the period of impact after consultation with the receptor. This would be considered as best practice and provide the opportunity to allow the receptor to provide input prior to the inconvenience.			and mitigation is required at each receiver. This assessment (i.e. noise model) assumes worst case scenario (cumulative operation of plant operating at the closest boundary) and is considered a suitable approach.
24	The issue of sleep disturbance is analysed in detail in Section 7.1.3 in relation to night works. Again, the community and receptors should be made aware of this activity prior to the night works commencing and therefore would have the opportunity to move or make arrangements if possible, to minimise the potential disturbance pattern. Community consultation prior to such events will be essential. Specific places where this will be important along the route of the rail line include residents within 450m of the rail within Narrabri, and farm residences within approximately 450m of the rail line at Edgeroi and Bellata.	App D	Yes	Section 10.1, Section 10.5 and the OOHW Protocol details the consultation requirements for OOH works. The OOHW Protocol has been re-written to clarify this. Consultation will occur prior to the works occurring and depending on risk may include respite and / or offer of alternative accommodation.
25	Sections 7.3 to 7.4.2 present an outline of definitions, guidelines and criteria for vibration impact and avoidance of such. It is noted that this will be combined with dilapidation studies prior to works proceeding for buildings close to the rail line. The vibration criteria are set by guidelines and therefore established for NSW and as international standards. It is noted that vibration impacts are relatively short-term in one location, and that only structures, such as buildings, in addition to people are mentioned. The issue of vibration impacts on the environment and biodiversity are difficult to quantify and therefore not assessed.	N/A	N/A	Correct, there are no published guidelines for accepted vibration levels on biodiversity matters. The standards / guidelines includes: -British Standard BS 6472-2008 Evaluation of human exposure to vibration in buildings (1-80Hz) -British Standard 7385: Part 2 Evaluation and Measurement of Vibration in Buildings -German Standard DIN4150-3:2016 Vibration in buildings – Part 3: Effects on structures -German DIN 4150: Part 3 – 1999 Effects of Vibration on Structure (DIN 1999).
26	Table 14 presents the standard working hours. These are relatively consistent being 7am to 6pm Monday to Saturday. No work is allowed on Sundays or public holidays unless approval is obtained from potentially NSW EPA and DPIE.	N/A	N/A	These are the Standard Construction Hours from the CoA.
27	For out of normal hours work activity or highly noise intensive works, permission is required through a negotiated agreement. This would need to include community consultation. Table 14 includes references to a wide range of approval conditions (CoA) making it complex to understand. The Notes state: “works affecting any given receiver may be undertaken during the hours of 6am to 6pm each day over a three-month period, provided there is no work between the hours of 6pm Saturday and 7am Monday”, which aims to provide some relief for impacted receptors.	App D	Yes	The OOHW Protocol has been re-written to clarify this. Consultation will occur prior to the works occurring and depending on risk may include respite and / or offer of alternative accommodation.
28	Section 8.1.3 provides extensive detail of work outside of standard hours. The important parameter is that a condition is included to ensure a “negotiated agreement has been reached with affected receivers.” This appears to be a firm condition that can only be overridden under emergency or special conditions; however, the receiver would need to be notified in	App D	Yes	The OOHW Protocol has been re-written to clarify this. Consultation will occur prior to the works occurring and depending on risk. In accordance with CoA E4 and E5, works may be carried out in accordance with the hours and noise limits specified in a negotiated agreement with a sensitive

	accordance with the remainder of the NVMP.			receiver. Negotiated agreements must be in writing and finalised prior to works commencing.
29	Table 15 provides a description of specific activities and comments on when these activities would generally occur, which are based on potential impact risks. The Construction hours recommended for these activities are listed in the table. All activities are listed for standard hours.	N/A	N/A	Noted, general observation
30	Section 9 provides details of planning prior to work being undertaken in relation to noise and vibration. The key point relates to the preparation of impact statements for noise and vibration of each construction stage prior to work commencing. This would therefore suggest that such plans are available when community consultation occurs if noise or vibration is predicted to exceed acceptable criteria. Figure 2 provided the process which is to occur. The process outlined in Figure 2 does not refer to community consultation. This appears to be an internal process. It does not appear to include any direct reference to the Proponent of the noise or vibration impact being required to undertake community consultation prior to the event. If this section is read alone, the Proponent of the noise may not be aware of responsibilities outlined in other parts of the document which require community consultation.	N/A	N/A	Correct, this process includes the assessment of noise and / or vibration impacts only and does not detail the consultation requirements. This is provided in Section 2.1, 10.1, 10.5 and the OOHW Protocol. The findings of the assessment (i.e. the anticipated level of noise and vibration) will inform the consultation that's undertaken with potentially affected receivers.
31	The important part of Section 10 is identification of a responsibility chain. Under NV20 which is an activity that may create noise exceedances, it is noted that the Stakeholder and Community Relations Manager is part of the responsibility team. The remainder of the works generally include activity which would comply with noise and vibration impacts.	N/A	N/A	Noted, general observation
32	Section 10.1 outlines the requirement for a construction noise and vibration management plan which will be an adaptive document covering all activities ranging from construction to operations at lunch sheds. The document would need updating throughout the project to reflect changes, work activities and potentially community input once work starts.	N/A	N/A	Correct, this plan will be produced prior to works commencing and be updated in the event that the scope of works, equipment used or work site changes. Any community complaints or feedback will also be considered and where relevant, incorporated into future revisions of the plan.
33	Section 10.2 refers to cumulative impacts and seasonal impacts related to agricultural activities such as grain harvest. This section therefore recognises assessment of issues relating to cumulative impacts and a requirement to coordinate or alter Trans4m Rail activity as a result of these cumulative impacts. The project is anticipated to take 2 or 3 years, and therefore extend over 2 or 3 cotton and grain harvest periods. It is also noted that works will be occurring on upgrades of the Newell Highway which will result in increases in truck traffic for gravel deliveries and construction machinery.	N/A	N/A	T4M Rail will be in regular contact (monthly) with TfNSW to discuss many things, including upcoming IR works and upgrades to the Newell Hwy occurring concurrently. This will allow both parties to plan their works and minimise noise and vibration impacts to sensitive receivers and the community. In addition to this, the N2NS OOHW Protocol (and application forms) include an assessment for cumulative impacts.
34	Section 10.4 outlines the requirements for dilapidation surveys prior to commencement of work and during work. This mainly refers to structures such as houses and other buildings. This would result in direct contact and discussion to form agreements with the community that may potentially be impacted by the project. An alternative accommodation measure is identified at Section 10.5.1.3 for residents who may receive significant impact such as extended periods of noise and vibration.	N/A	N/A	Noted, general observation

35	Section 11 outlines the monitoring program requirements. This is prepared in accordance with the overall approval conditions for the development and therefore is a compulsory process. Council will be included in the formation of the monitoring programs in addition to relevant government agencies such as NSW EPA.	N/A	N/A	Noted, general observation
36	Section 11.2 outlines the requirement to obtain the approval from the Secretary of Planning for the monitoring program. This provides a third-party review of the intended program.	N/A	N/A	Noted, general observation
37	Appendix A was not included in the documentation available from Council for review purposes. Appendix B provides a list of heritage buildings. It is noted that one archaeological site is listed but identified not to be impacted by vibration. The NVMP does not identify any specific heritage or archaeological items that would require removal or destruction. On this basis, the project indicates that all items close to the construction work will be preserved or repaired if damage occurs.			The Project's Heritage Management Plan identifies that the Moree, Edgeroi, Bellata and Gurley railway Stations were identified as having historic heritage significance associated with specific elements that are to be protected during the construction programme. Bellata, Gurley and Edgeroi's Stations are to have their platforms and associated building and station signs retained in situ as intact examples of station buildings constructed as part of the rail line. Ongoing input from heritage specialists is required during detailed design to ensure the sympathetic treatment of the proposed safety fence and new platform awnings. In terms of indirect vibration, the potential for impacts resulting from exceedances of appropriate structural vibration values will be managed in accordance with Section 10 with monitoring occurring in accordance with Section 11 of the Trans4m Rail's Noise and Vibration Management Plan.
38	The NVMP is extensive and highly detailed. The document is specifically prepared for professionals within the industry of noise and vibration management. The noise monitoring requirements for the project will include pre-construction and during construction stages. For vibration assessment, postconstruction dilapidation assessment will occur in addition to monitoring prior to and during works.	N/A	N/A	Noted, general observation

Appendix G Construction Noise and Vibration Impact Statement (Template)

N2NS Construction Noise and Vibration Impact Statement – "*Insert Site Name*"

1. Purpose of the Construction Noise and Vibration Impact Statement

This Construction Noise and Vibration Impact Statement (CNVIS) forms part of the Construction Noise and Vibration Sub-Plan (CNVMP) for the N2NS Project. The purpose of the CNVIS is to determine the potential impact resulting from undertaking a particular construction activity at a particular site location. This CNVIS may be used in the following situations:

- To determine the noise impact associated with construction activities to sensitive receivers during the standard construction hours i.e. those detailed in CoA E1.
- To determine the noise impact associated with construction activities to sensitive receivers proposed to be undertaken outside the standard construction hours i.e. to support an Out of Hours Application request.
- To determine the vibration impact associated with construction activities to sensitive receivers (i.e. heritage items, structures, utilities, etc).
- To support an investigation in the event of a noise or vibration related incident.

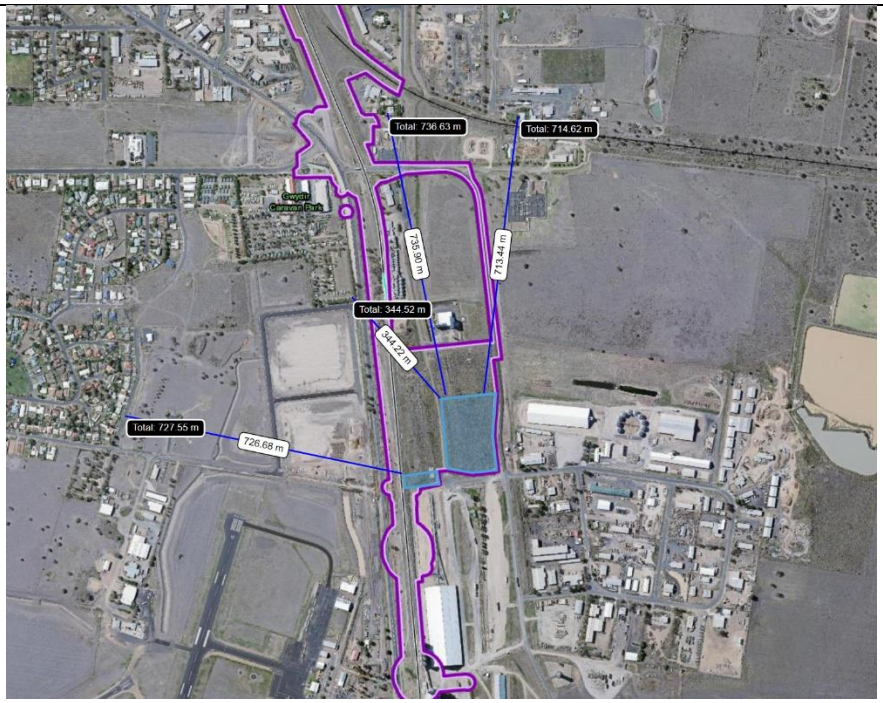
In consultation with the Trans4m Rail Community and Stakeholder Engagement Manager, the CNVIS also confirms the consultation requirements prior to or during works.

The CNVIS also identifies a suite of reasonable and feasible noise and vibration mitigation measures (and monitoring requirements) that will be implemented prior to or during the works to ensure the impacts to sensitive receivers is as low as reasonably possible.

Table 1: Site Details & Works Description *(Insert)*

Site Name:	
Location:	
Chainage:	
Program / Duration:	
Description of Works / Activity / Use:	
Plant / Equipment Required:	
Site Access Requirements:	

Site Surroundings:	*The site is surrounded by:* ▪ *North:* ▪ *East:* ▪ *South:* ▪ *West:* *Insert a list and / or map of residential (or other) receivers within 2km of the works. This may include a map showing any vibration sensitive receivers within 100m of the works, where high vibration generating activities (i.e. dynamic compaction, piling, etc) are proposed.* *Identify the distances to the nearest sensitive receivers, residential or otherwise.* *Example -*  *Example -*

	
OOHW Description	*Insert - If the works are proposed to be undertaken outside the standard construction hours detailed in CoA E1, then the following details are required:* - *Days / evenings / nights and times to be worked (times / dates)* - *Duration of the works* - *Justification why the works must be undertaken out of hours.* - *Potential impacts from the OOHW*

2. Noise and / or Vibration Assessment Findings

Include the following:

1. *A description of the noise and / or vibration assessment/s that's been undertaken (i.e. methodology, model used, equipment modelled, assumptions made, scenarios modelled, etc)*
2. *List the noise and / or vibration criteria applied (refer to CNVMP).*
3. *A description of the findings / outcome of the assessment.*
4. *Identify any non-compliances or exceedances of the Noise Management Levels or Project Specific Noise Criteria detailed in the ICNG or CNVMP.*

3. Consultation Requirements

Include the following:

1. *A description of the Community / Stakeholder consultation thats been undertaken or required.*

4. Mitigation Measures

Based on the site details and environmental constraints identified above, the key environmental risks associated with the works have been identified to be:

- *Insert specific noise and / or vibration impacts to sensitive receivers, heritage items, structures, utilities, etc.*

With the implementation of the mitigation measures detailed in Table 2 below, these impacts are considered to be (*low / high*) and (*consistent / not consistent*) with those impacts assessed and approved under CSSI 7474.

Table 2: Noise and Vibration Mitigation Measures

(*Insert any mitigation measures over and above those detailed in the N2NS CEMP, CNVMP or the Noise and Vibration ECM*).

	Measure/Requirement	Responsibility	Timing/ frequency

5. Monitoring Requirements

Insert a description of any noise or vibration monitoring requirements.

6. Certification

This Construction Noise and Vibration Impact Statement provides a true and fair assessment of the noise and / or vibration impacts associated with the abovementioned works.

With the implementation of the mitigation measures detailed in this CNVIS, the impacts associated with the works are considered to be (*low / high*) and (*consistent / not consistent*) with those impacts assessed and approved under CSSI 7474.

Signed:_____

Name:_____

Position: Trans4m Rail - Environment Manager Date: _____

Signed:_____

Name:_____

Position: Tran4m Rail – Construction Manager Date:_____

Signed:_____

Name:_____

Position: Tran4m Rail – Community & Stakeholder Engagement Manager Date:_____

Attachment A: Site Location (incl. Environmental Constraints)

Insert

Attachment B: Noise Assessment/s

(Add the noise assessment/s for all scenarios i.e. site establishment, construction, traffic noise, etc)

Insert

Attachment C: Vibration Assessment/s

(Add the vibration assessment/s for all scenarios i.e. site establishment, construction, etc)

Insert

ABOUT THE ARTIST:

ANN JOHNSON

I am Ann Johnson, I am a Gamilaroi woman. I am the Eldest of ten children and the mother of four. A grandmother too.

I have always loved art. When I left school I did a Ticket writing traineeship in Newcastle and worked a David Jones. Soon after that I got married and had a family. We moved back to Moree in the early 1980s.

In the early 1990s I did an art course at Moree, which lead to a group of us setting up the Yurundiali Aboriginal Corporation. Janelle Boyd played a pivotal role in the setting up of Yurundiali, which designed and printed fabrics with Aboriginal designs.

In 1993 Janelle and I started 'Spirit Lines', we designed and printed them on t-shirts, tights, towels, ironing boards, and cooking mits, these were sold through Amnesty International. In 1995 we had a big exhibition in Moree called 'Sisters under the Skins', we also had an exhibition and fashion parade with Ken Done in Moree.

I produce art most days and if I am not practicing my art I am tossing around design ideas in my head. I like all types of art; I produce a variety of designs, do screen printing, make jewellery and sculpture amongst other things. At the moment I am exploring digitising my designs and then hand painting them using mixed media.

BEYOND THE TRACK: FOR OUR COVER ARTWORK, TRANS4M RAIL IS SUPPORTING AND FEATURING LOCAL MOREE ARTISTS