



A2I | Albury to Illabo – Wagga Wagga Traffic Mitigation

Construction Noise and Vibration Impact Statement

Martinus Rail

1/23-27 Waratah Street, Kirrawee, NSW 2232

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SLR Project No.: 610.031317.00001

Client Reference No.: R29

30 July 2025

Revision: v1.0

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
v1.0	30 July 2025	Nicholas Vandenberg	Steven Luzuriaga	

Basis of Report

This report has been prepared by SLR Consulting Australia (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Martinus Rail (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

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Acronyms and Abbreviations

AA	The Acoustics Advisor for the CSSI approved by the Planning Secretary
A2I	Albury to Illabo section of the Inland Rail project
ARTC	Australian Rail Track Corporation
AS	Australian Standard
AV:ATG	Assessing Vibration: a technical guideline (DEC, 2006)
BS	British Standard
dBA	A-weighted decibel (referenced 20 µPa)
DPHI	Department of Planning, Housing and Infrastructure
CCHMP	Construction Cultural Heritage Management Plan
CEMP	Construction Environmental Management Plan
CNVF	Inland Rail NSW Construction Noise and Vibration Framework
CNVIS	Construction Noise and Vibration Impact Statement
CNVMP	Construction Noise and Vibration Management Plan
CSSI	Critical Stage Significant Infrastructure
DEC	Department of Environment and Conservation
DECC	Department of Environment and Climate Change (now NSW EPA)
DIN	Deutsches Institut für Normung (German Institute for Standardisation)
EIS	Environmental Impact Statement
EP&A Act	Environmental Planning and Assessment Act 1979
EPA	Environment Protection Authority
EPL	Environmental Protection Licence
ER	The Environmental Representative(s) for CSSI approved by the Planning Secretary.
HNA	Highly Noise Affected
Hz	Hertz
ICNG	Interim Construction Noise Guideline (DECC, 2009)
IR	Inland Rail
ISO	International Standards Organisation
km	Kilometres
km/h	Kilometres per hour
LAeq	Equivalent continuous noise level, providing a representation of the cumulative level of noise exposure over a defined period.
LAeq(15hour)	The equivalent continuous noise level for the 15-hour daytime period of 7.00 am to 10.00 pm
LAeq(9hour)	The equivalent continuous noise for the 9-hour night-time period of 10.00 pm to 7.00 am



LAeq(1hour)	The equivalent continuous noise for the 1-hour daytime or night-time period that has the potential to result in the greatest noise impact to sensitive receivers.
L _{Amax}	The maximum noise level during the measurement or assessment period. The L _{AFmax} or Fast is averaged over 0.125 of a second and the L _{ASmax} or Slow is averaged over 1-second.
m	Metres
mm	Millimetres
mm/s	Millimetres per second
m/s	Metres per second
MR	Martinus Rail
NCA	Noise Catchment Area
NML	Noise Management Level
NSW	New South Wales
NPfl	Noise Policy for Industry
OOHW	Out of hours work
PPV	Peak Particle Velocity
RBL	Rating Background Level
TfNSW	Transport for New South Wales
VDV	Vibration Dose Value



Compliance Table

CoA	Requirement	Reference
A1	<p>The Proponent must carry out the CSSI in accordance with the terms of this approval and generally in accordance with the:</p> <ul style="list-style-type: none"> a) Inland Rail – Albury to Illabo Environmental Impact Statement (ARTC, August 2022) b) Albury to Illabo Response to Submissions (ARTC, November 2023) c) Albury to Illabo Preferred Infrastructure Report (ARTC, November 2023) d) Albury to Illabo Preferred Infrastructure Report Response to Submissions (ARTC, February 2024) e) Inland Rail – Albury to Illabo (SSI-10055) Response to request for additional information – Air Quality Assessment (letter dated 1 May 2024) f) Part 1 - Revised Technical Paper 8: Biodiversity Development Assessment Report (WSP, February 2024) g) Part 2 - Revised Technical Paper 8: Biodiversity Development Assessment Report (WSP, February 2024) 	The CNVMP
A2	The CSSI must only be carried out in accordance with all procedures, commitments, preventative actions, performance criteria and mitigation measures set out in the documents listed in Condition A1 unless otherwise specified in, or required under, this approval.	The CNVMP
C9	<p>The Construction Noise and Vibration Sub-plan must include, but not limited to:</p> <ul style="list-style-type: none"> a) measures to reduce construction to standard ICNG hours where sensitive land uses are likely to be noise affected for more than 3 months; b) an approach to assess and manage construction fatigue from noise impacts on sensitive receivers on an ongoing basis; c) noise sensitive periods identified by the community, religious, educational institutions, noise and vibration-sensitive businesses and critical working areas and measures to ensure noise levels above the NMLs do not occur during sensitive periods in accordance with Condition E76; d) mitigation for construction traffic noise impacts from additional construction traffic and road diversions; e) the location of all heritage items, non-heritage structures and infrastructure likely to be impacted by vibration and measures to manage vibration impacts at those items and structures; and f) vibration levels at a range of distances from vibration intensive equipment such as excavators and vibratory rollers before undertaking works with the specific type and size of equipment. 	The CNVMP
E68	A detailed land use survey must be undertaken to confirm sensitive land use(s) (including critical working areas such as operating theatres and precision laboratories) potentially exposed to construction noise and vibration, construction ground-borne noise and operational noise. The survey may be undertaken on a progressive basis but must be undertaken in any one area before the commencement of work which generates construction or operational noise, vibration or ground-borne noise in that area. The results of the survey must be included in the Noise and Vibration CEMP sub-plan required by Condition C8.	The CNVMP, Section 3.0, Figure 1 Figure 2
E69	<p>Work must be undertaken during the following hours:</p> <ul style="list-style-type: none"> a) 7:00am to 6:00pm Mondays to Fridays, inclusive; b) 7:00am to 6:00pm Saturdays; and c) at no time on Sundays or public holidays. 	Section 2.2



CoA	Requirement	Reference
E70	<p>Except as permitted by an EPL, highly noise intensive works that result in an exceedance of the applicable NML at the same receiver must only be undertaken:</p> <ol style="list-style-type: none"> 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 if continuously, then not exceeding three (3) hours, with a minimum cessation of work of not less than one hour. <p>For the purposes of this condition, 'continuously' includes any period during which there is less than one hour between ceasing and recommencing any of the work.</p>	Section 2.2.1
E71	<p>Notwithstanding Conditions E69 and E70, work may be undertaken outside the hours specified in the following circumstances (a, b, or c):</p> <ol style="list-style-type: none"> Safety and Emergencies, including: <ol style="list-style-type: none"> for the delivery of materials required by the NSW Police Force or other authority for safety reasons; or where it is required in an emergency to avoid injury or the loss of life, to avoid damage or loss of property or to prevent environmental harm. <p>On becoming aware of the need for emergency work in accordance with Condition E71(a), the AA, the ER, the Planning Secretary and the EPA must be notified of the reasons for such work. Best endeavours must be used to notify all noise and/or vibration affected residents and owners/occupiers of properties identified sensitive land use(s) of the likely impact and duration of those work.</p> Work, that meets the following criteria: <ol style="list-style-type: none"> construction that causes LAeq(15 minute) noise levels: <ul style="list-style-type: none"> no more than 5 dB(A) above the rating background level at any residence in accordance with the ICNG, and no more than the 'Noise affected' NMLs specified in Table 3 of the ICNG at other sensitive land use(s); and construction that causes LAFmax noise levels no more than 15 dB above the rating background level at any residence during the night period as defined in the ICNG. and construction that causes: <ul style="list-style-type: none"> continuous or impulsive vibration values, measured at the most affected residence no more than the preferred values for human exposure to vibration, specified in Table 2.2 of <i>Assessing Vibration: a technical guideline</i> (DEC, 2006), or intermittent vibration values measured at the most affected residence no more than the preferred values for human exposure to vibration, specified in Table 2.4 of <i>Assessing Vibration: a technical guideline</i> (DEC, 2006). By Approval, including: <ol style="list-style-type: none"> where different construction hours, such as those for a rail possession, are permitted under an EPL in force in respect of the CSSI; or works which are not subject to an EPL that are approved under an Out-of-Hours Work Protocol as required by Condition E72; or negotiated agreements with directly affected residents and sensitive land use(s). 	Section 2.3
E72	<p>An Out-of-Hours Work Protocol must be prepared to identify a process for the consideration, management and approval of work which is outside the hours defined in Conditions E69, and that are not subject to an EPL. The Protocol must be approved by the Planning Secretary before commencement of the Out-of-Hours Work. The Protocol must be prepared in consultation with the ER, AA and EPA.</p>	The CNVMP, Section 2.4



CoA	Requirement	Reference
	<p>The Protocol must include:</p> <ul style="list-style-type: none"> a) identification of low and high-risk activities and an approval process that considers the risk of activities, proposed mitigation, management, and coordination, including where: <ul style="list-style-type: none"> i. the ER and AA review all proposed out-of-hours activities and confirm their risk levels, ii. low risk activities can be approved by the ER in consultation with the AA, and iii. high risk activities that are approved by the Planning Secretary; b) a process for the consideration of out-of-hours work against the relevant NML and vibration criteria; c) a process for selecting and implementing mitigation measures for residual impacts in consultation with the community at each affected location, including respite periods. The measures must take into account the predicted noise levels and the likely frequency and duration of the out-of-hours works that sensitive land use(s) would be exposed to, including the number of noise awakening events; d) procedures to facilitate the coordination of out-of-hours work including those approved by an EPL or undertaken by a third party, to ensure appropriate respite is provided; and e) notification arrangements for affected receivers for approved out-of-hours work and notification to the Planning Secretary of approved low risk out-of-hours works. <p>This condition does not apply if the requirements of Condition E71 are met.</p>	
E73	<p>Except as permitted by an EPL, out-of-hours work that may be regulated through the Out-of-Hours Work Protocol as per Condition E72, but is not limited to:</p> <ul style="list-style-type: none"> a) Carrying out work that if carried out during standard hours would result in a high risk to construction personnel or public safety based on a risk assessment carried out in accordance with AS/NZS ISO 31000:2009: "Risk management; or b) where the relevant roads authority has advised the Proponent in writing that carrying out the work during standard hours would result in a high risk to road network performance and a road occupancy licence will not be issued; or c) where the relevant utility service operator has advised the Proponent in writing that carrying out the work during standard hours would result in a high risk to the operation and integrity of the utility network; or d) work undertaken in a rail possession for operational or safety reasons. <p><i>Note: Other out-of-hours works can be undertaken with the approval of an EPL, or through the project's Out-of-Hours Work Protocol for works not subject to an EPL.</i></p>	Section 2.3
E74	<p>Mitigation measures must be implemented with the aim of achieving the following construction noise management levels and vibration objectives:</p> <ul style="list-style-type: none"> a) construction 'Noise affected' NMLs established using the Interim Construction Noise Guideline (DECC, 2009); b) vibration criteria established using <i>the Assessing vibration: a technical guideline</i> (DEC, 2006) (for human exposure); c) Australian Standard AS 2187.2 - 2006 "<i>Explosives - Storage and Use - Use of Explosives</i>"; d) BS 7385 Part 2-1993 "<i>Evaluation and measurement for vibration in buildings Part 2</i>" as they are "applicable to Australian conditions"; and e) the vibration limits set out in the <i>German Standard DIN 4150-3: Structural Vibration- effects of vibration on structures</i> (for structural damage). 	The CNVMP, Section 4.0, Section 7.0



CoA	Requirement	Reference
	Work that exceeds the noise management levels and/or vibration criteria must be managed in accordance with the Noise and Vibration CEMP sub-plan. <i>Note: The ICNG identifies 'particularly annoying' activities that require the addition of 5 dB(A) to the predicted level before comparing to the construction NML.</i>	
E75	Mitigation measures must be applied when the following residential ground-borne noise levels are exceeded: a) evening (6:00 pm to 10:00 pm) — internal LAeq(15 minute): 40 dB(A); and b) night (10:00 pm to 7:00 am) — internal LAeq(15 minute): 35 dB(A). The mitigation measures must be outlined in the Noise and Vibration CEMP sub-plan, including in any Out-of-Hours Work Protocol, required by Condition E72.	Section 4.2.3
E76	Noise generating work in the vicinity of community, religious, educational institutions, noise and vibration-sensitive businesses and critical working areas (such as exam halls, theatres, laboratories and operating theatres) resulting in noise levels above the NMLs must not be timetabled during sensitive periods, unless other reasonable arrangements with the affected institutions are made at no cost to the affected institution.	Section 7.0
E77	At no time can noise generated by construction exceed the National Standard for exposure to noise in the occupational environment of an eight-hour (8hr) equivalent continuous A-weighted sound pressure level of LAeq,8h of 85 dB(A) for any employee working at a location near the CSSI.	Section 7.6
E78	Construction Noise and Vibration Impact Statements (CNVIS) must be prepared for work that may exceed the noise management levels, vibration criteria and/or ground-borne noise levels specified in Condition E74 and Condition E75 at any residence outside construction hours identified in Condition E69, or where receivers will be highly noise affected. The CNVIS must include specific mitigation measures identified through consultation with affected sensitive land use(s) and the mitigation measures must be implemented for the duration of the works. A copy of the CNVIS must be provided to the AA and ER prior to the commencement of the associated works. The Planning Secretary may request a copy/ies of CNVIS.	This report, Section 7.5
E79	Owners and occupiers of properties at risk of exceeding the screening criteria for cosmetic damage must be notified before work that generates vibration commences in the vicinity of those properties. If the potential exceedance is to occur more than once or extend over a period of 24 hours, owners and occupiers are to be provided a schedule of potential exceedances on a monthly basis for the duration of the potential exceedances, unless otherwise agreed by the owner and occupier. These properties must be identified and considered in the Noise and Vibration CEMP Sub-plan required by Condition C8 and the Community Communication Strategy required by Condition B1.	Section 7.0
E80	Vibration testing must be undertaken before and during vibration generating activities that have the potential to impact on heritage items to identify minimum working distances to prevent cosmetic damage. In the event that the vibration testing and attended monitoring shows that the preferred values for vibration are likely to be exceeded, the construction methodology must be reviewed and, if necessary, additional mitigation measures implemented.	Section 6.1, Section 7.0
E81	Advice from an independent heritage specialist must be sought on methods and locations for installing equipment used for vibration, movement and noise monitoring at heritage-listed structures. <i>Note: The heritage specialist is to provide advice prior to installing equipment that may impact the heritage significance or structural integrity of the heritage listed structures.</i>	Section 7.0
E83	All work undertaken for the delivery of the CSSI, including those undertaken by third parties (such as utility relocations), must be coordinated to ensure respite periods are provided. This must include:	Section 7.0



CoA	Requirement	Reference
	<ul style="list-style-type: none"> a) rescheduling work to provide respite to impacted noise sensitive land use(s) so that the respite is achieved; or b) the provision of alternative respite or mitigation to impacted noise sensitive land use(s); and c) the provision of documentary evidence to the AA in support of any decision made in relation to respite or mitigation. <p>The consideration of respite must also include all other CSSI, SSI and SSD projects which may cause cumulative and/or consecutive impacts at receivers affected by the delivery of the CSSI.</p>	
E119	The Proponent must coordinate Work with adjoining Inland Rail Projects, including any work to relocate or connect utilities, to minimise cumulative and consecutive noise and vibration impacts and maximise respite for affected sensitive land uses. Coordination and mitigation measures must be detailed in the Construction Noise and Vibration management Sub-plan required by Condition C9.	Section 7.0, Section 8.0
E122	Property damage caused directly or indirectly (for example from vibration or from groundwater change) by the construction or operation must be rectified at no cost to the owner. Alternatively, compensation may be provided for the property damage as agreed with the property owner.	Section 6.1



1.0 Introduction

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Martinus Rail (MR) to prepare a construction noise and vibration impact statement (CNVIS) for the construction activities associated with the installation of traffic mitigation measures to support the closure of Edmondson Bridge in Wagga Wagga, NSW. These sites form part of the Albury to Illabo (A2I) section of Inland Rail (the Project).

This assessment has been prepared in accordance with the Construction Noise and Vibration Management Plan (CNVMP) for the A2I section of the Project.

This report assesses the potential construction noise and vibration impacts for the construction works associated with traffic switch for the closure of Edmondson Bridge. An explanation of the specialist acoustic terminology used in this report is provided in **Appendix A**.

2.0 Project Description

Inland Rail is an approximate 1,600 kilometres (km) freight rail network that will connect Beveridge and Kagaru via regional Victoria, New South Wales and Queensland. The Inland Rail route would involve using approximately 1,000 km of existing track (with enhancements and upgrades where necessary) and 600 km of new track, passing through 30 local government areas. Inland Rail will accommodate double-stacked freight trains up to 1,800 metres (m) long and 6.5 m high.

The Albury to Illabo (A2I) section (the Project) forms a key component of the Inland Rail program. It is a 185 km section of existing rail corridor located in regional NSW between the towns of Albury and Illabo. Works would include track realignment, lowering and/or modification within the existing rail corridor, modification, removal or replacement of bridge structures (rail, road and/or pedestrian bridges), raising or replacing signal gantries, level-crossing modifications and other associated works. This CNVIS is associated with the construction activities required for the traffic switch as a result of Edmondson Bridge Closure.

Relevant noise and vibration conditions from the Conditions of Approval (CoA) are detailed within the compliance table at the beginning of this document and will be complied with during the work.

2.1 Scope of this CNVIS

The focus of this CNVIS is the construction activities for the traffic switch associated with the closure of the Edmondson Street Bridge. These works include:

- Signage works and Line Marking at Docker Street, Railway Parade, Fernleigh Road, Macleay Street and Edmondson Street/Sturt Highway.
- Klem-flex installation in sections along Edward Street, Bourke Street and Docker Street.
- Median Demo at Docker Street.
- Kiss and Ride facility on Railway Street.
- Temporary Roundabout at Coleman Street and Macleay Street.

Further details of work activities are outlined in **Section 5.1**. The work areas are surrounded by a combination of urban and suburban residential, commercial, industrial, educational and medical receivers. Additionally, there are several childcare centres, places of worship, hotels, libraries and public buildings at various setbacks from the main areas of work. The Project location, work areas and surrounding receivers are shown in **Figure 1** and **Figure 2**.



2.2 Hours of work

In accordance with the Construction Noise and Vibration Management Plan (CNVMP) and CoA E69 construction work must be undertaken within the approved standard construction hours:

- a) 7:00am to 6:00pm Monday to Friday, inclusive;
- b) 7:00am to 6:00pm Saturday and
- c) At no time on Sundays or public holidays.

2.2.1 Highly Noise Intensive Work

As outlined in the CoA E70, any highly noise intensive works that result in an exceedance of the applicable NML at the same receiver must only be undertaken:

- a) Between 08:00am – 06:00pm Monday to Friday;
- b) Between 08:00am – 01:00pm Saturday; and
- c) If continuously, then not exceeding (3) hours, with a maximum cessation of work of not less than one hour.

The CoA defines ‘highly noise intensive works’ as those identified as annoying under the Interim Construction Noise Guideline (ICNG) and include:

- Use of power saws, such as used for cutting timber, rail lines, masonry, road pavement or steel work;
- Grinding metal, concrete or masonry;
- Rock drilling;
- Line drilling;
- Vibratory rolling;
- Bitumen milling or profiling;
- Jackhammering, rock hammering or rock breaking;
- Impact piling; and
- Tamping (for rail projects).

2.3 Variation to hours of work

Notwithstanding CoA E69 and E70, work may be undertaken outside the hours specified in the CoA E71 circumstances (a, b, or c):

- a) Safety and Emergencies
- b) Work, that meets specific criteria
- c) By Approval

Note: refer to **Compliance Table** for further detail.

2.4 Justification of Out of Hours Work (OOHW)

Work activities that may be required or proposed to be undertaken outside of standard working hours will be managed in accordance with the OOHW Protocol as defined in CoA E72 and E73, unless the work is regulated by an EPL.



All work on or adjacent to roads would be carried out in accordance with a relevant Traffic Control Plan (TCP), Road Occupancy Licence (ROL) and/or rail possession to facilitate safe work near live road/rail traffic. Where an ROL/rail possession cannot be obtained for the approved project hours and/or proposed works cannot be undertaken safely during these hours, some works will be required to be undertaken outside of standard hours (ie Out of Hours Work, OOHW).

As outlined in the ICNG, work undertaken on public infrastructure may need to be undertaken outside the recommended standard hours. For this project the need is based on a requirement to sustain the operational integrity of public infrastructure, as works to restore operation of the infrastructure provide benefit to the greater community (ie more than just local residents).

Further detail around the specific work tasks, duration and justification of OOHW must be identified in the OOHW permit, required by the OOHW Protocol or EPL.

3.0 Existing Environment

The existing ambient noise environment was described in Environmental Impact Statement (EIS), Technical Paper 6 – Noise and Vibration (Non-Rail) for the Albury to Illabo project. This section provides details of the existing ambient noise environment relevant to the Wagga Wagga traffic switch work.

The noise catchment areas (NCAs) used are consistent with the NCAs described in the EIS and are shown in **Figure 1** and **Figure 2** with the receiver classifications and approximate noise monitoring locations. Sensitive land uses and receiver classifications within the project area were confirmed through a detailed land use survey undertaken in August 2024. Results of the land use survey have been incorporated into the receiver classifications shown in **Figure 1** and **Figure 2**.

3.1 Background Noise Levels

Background noise levels have been referenced from the baseline noise survey undertaken as part of the EIS and reproduced in the CNVMP. The background noise levels relevant to the Wagga Wagga traffic switch are summarised in **Table 1**.

Table 1 Background Noise Levels

Noise Monitoring Location	NCA	Rating background Level (RBL) dBA NPfI defined time periods ¹		
		Daytime period	Evening period	Night-time period
11	10	46	45	38
12	11	48	47	37

Note 1: The assessment periods are the daytime which is 7 am to 6 pm Monday to Saturday and 8 am to 6 pm on Sundays and public holidays, the evening which is 6 pm to 10 pm, and the night-time which is 10 pm to 7 am on Monday to Saturday and 10 pm to 8 am on Sunday and public holidays. See the NSW EPA Noise Policy for Industry (NPfI).



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Receiver Classification and Noise Monitoring Locations

FIGURE 1

H:\Projects-SLR\610-Sydney\610-31317-00001 Inland Rail A2P Enhancement\06 CNVIS\02 A2I\07 Analysis\09 CNVIS\02 A2I\07 Analysis\09 CNVIS - Wagga Traffic.qgz



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Receiver Classification and Noise Monitoring Locations

FIGURE 2

4.0 Assessment Criteria

4.1 Construction Noise and Vibration Guidelines

The standards and guidelines relevant to the Project are listed in **Table 2**. These guidelines aim to protect the community and environment from excessive noise and vibration impacts during construction of projects.

Table 2 Construction Noise and Vibration Standards and Guidelines

Guideline/Policy Name	Where Guideline Used
<i>Inland Rail NSW Construction Noise and Vibration Framework</i> (CNVF)	Assessment and management protocols for airborne noise, ground-borne noise and vibration impacts for construction of NSW Inland Rail projects
<i>Interim Construction Noise Guideline</i> (ICNG) (DECC, 2009)	Assessment of airborne noise impacts on sensitive receivers
<i>Environmental Criteria for Road Traffic Noise</i> (ECRTN) (EPA, 1999)	Contains guidance for assessing potential sleep disturbance impacts
<i>Road Noise Policy</i> (RNP) (DECCW, 2011)	Assessment of construction traffic impacts
<i>BS 7385 Part 2-1993 Evaluation and measurement for vibration in buildings Part 2</i> , BSI, 1993	Assessment of vibration impacts (structural damage) to non-heritage sensitive structures
<i>DIN 4150:Part 3-2016 Structural vibration – Effects of vibration on structures</i> , Deutsches Institut für Normung, 2016	Screening assessment of vibration impacts (structural damage) to heritage sensitive structures, where the structure is found to be unsound
<i>Assessing Vibration: a technical guideline</i> (DEC, 2006)	Assessment of vibration impacts on sensitive receivers
<i>AS2187.2:2006 Explosives – Storage and use Part 2: Use of explosives</i>	Assessment of impacts from blasting activities
<i>Construction Noise and Vibration Guideline (Public Transport Infrastructure)</i> (CNVG-PTI) (Transport for NSW, 2023)	Utilised for minimum working distances for vibration intensive work.

4.2 Noise Management Levels

The noise management levels (NMLs) for residential and other sensitive receivers have been adopted from the CNVMP, as determined in the EIS. Receiver types and locations are shown **Figure 1** and **Figure 2**.

4.2.1 Residential Receivers

Project-specific NMLs for residential receivers were determined by adopting the lowest RBL for simplicity given the minor nature of the assessment. NMLs for other sensitive receivers are fixed values adopted from the Interim Construction Noise Guideline (ICNG) (DECC, 2009) and outlined in the CNVMP. Residential NMLs for NCAs surrounding the traffic switch sites are shown in **Table 3**.



Table 3 Residential Noise Management Levels

NCA	Noise Management Level (LAeq(15minute) - dB)				Sleep disturbance Screening Level Level (RBL +15dB or 52 dB)	Sleep Awakening Reaction Level
	Approved Hours (RBL +10dB)	Out of Hours ^{1,2}				
		Daytime (RBL +5dB)	Evening (RBL +5dB)	Night-time (RBL +5dB)		
All NCAs	56	51	50	42	52	65

Note 1: Approved Construction Hours are Monday to Saturday 7 am to 6 pm, as defined in CoA E69.

Note 2: Work outside of the Approved Hours is defined as OOHW = Out of Hours Work. Daytime out of hours is Sunday and public holidays between 8 am to 6 pm. Evening is 6pm to 10pm Monday – Sunday (including public holidays). Night-time is 10pm to 7am Monday – Saturday and 10pm to 8am Sunday (including public holidays).

Highly Noise Affected

In addition to the NMLs presented above, the ICNG highly noise affected level (>75 dBA) represents the point above which there may be strong community reaction to noise and is applicable to all residential receivers during approved project hours as outlined in the CNVMP and the ICNG.

Sleep Disturbance

Where the sleep disturbance screening level (RBL + 15 dB or 52 dB LA_{max}, whichever is greater, see **Table 3**) is exceeded, further assessment is required to determine whether the 'awakening reaction' level of LA_{max} 65 dBA (external) would be exceeded and the likely number of these events. The awakening reaction level is the level above which residents are likely to be awoken from sleep.

4.2.2 Other Sensitive Land Uses and Commercial Receivers

The ICNG NMLs for 'other sensitive' non-residential land uses are shown in **Table 4**.

The ICNG references *AS2107:2016 Acoustics – Recommended design sound levels and reverberation times for building interiors* for criteria for 'other sensitive' receivers which are not listed in the guideline. Neither the ICNG nor AS2107 provide criteria for childcare centres so the Association of Australian Acoustical Consultants *Guideline for Child Care Centre Acoustic Assessment* (GCCCAA) has been referenced.

Table 4 NMLs for 'Other Sensitive' Receivers

Land Use	Noise Management Level LAeq(15minute) (dB) (Applied when the property is in use)	
	Internal	External
ICNG 'Other Sensitive' Receivers		
Classrooms at schools and other educational institutions	45	55 ^{1,5}
Hospital wards and operating theatres	45	65 ²
Places of worship	45	55 ¹
Active recreation areas (characterised by sporting activities which generate noise)	-	65
Passive recreation areas (characterised by contemplative activities that generate little noise)	-	60
Commercial	-	70



Land Use	Noise Management Level LAeq(15minute) (dB) (Applied when the property is in use)	
	Internal	External
Industrial	-	75
Non-ICNG 'Other Sensitive' Receivers		
Hotel – daytime & evening ³	50	60 ^{1,5}
Hotel – night-time ³	35	45 ^{1,5}
Child care centres – activity areas ⁴	40	50 ^{1,5}
Child care centres – sleeping areas ⁴	35	45 ^{1,5}
Library ³	45	55 ¹
Public Building ³	50	60 ¹
Aged Care	Considered as Residential	

- Note 1: It is assumed that these receivers have windows partially open for ventilation which results in internal noise levels being around 10 dB lower than the external noise level.
- Note 2: It is assumed that these receivers have fixed windows which conservatively results in internal noise levels being around 20 dB lower than the external noise level.
- Note 3: Criteria taken from AS2107.
- Note 4: Criteria taken from Association of Australian Acoustical Consultants Guideline for Child Care Centre Acoustic Assessment.
- Note 5: Some receivers near highways or rail lines may have building façade mitigation and air-conditioning. Where evidence is provided a 20dB reduction from external to internal may be adopted.

4.2.3 Ground-borne Noise

Construction work can cause ground-borne (structure-borne or regenerated) noise impacts in nearby buildings when vibration intensive equipment is in use, such as during tunnelling or excavation work using tunnel boring machines, roadheaders or rockbreakers. Vibration can be transmitted through the ground and into nearby buildings, which can then create audible noise impacts inside the building.

Ground-borne noise NMLs are applicable where ground-borne noise levels are likely to be higher than airborne noise levels, which can occur where work is underground or where surface work is shielded by noise barriers, other structures or façade mitigation at the receiver. Ground-borne noise is generally found to generate impacts during the evening and night-time periods when ambient noise levels are often much lower, and ground-borne noise is more prominent.

The internal ground-borne noise NMLs for residential receivers are shown in **Table 5**.

Table 5 Internal ground-borne NMLs

Receiver Type	Noise Management Level (LAeq(15minute) – dBA)		
	Daytime ¹	Evening ²	Night-time ²
Residential	n/a	40	35

- Note 1: Daytime ground-borne noise NMLs are not specified in the ICNG of CoA.
- Note 2: Specified in the ICNG and CoA E75.

For other sensitive receivers, the ICNG does not provide guidance in relation to acceptable ground-borne noise levels. For the purpose of this CNVIS, the internal airborne NMLs presented in **Table 4** will also be adopted for ground-borne noise.



4.3 Vibration Criteria

The effects of vibration from construction work can be divided into three categories:

- Those in which the occupants of buildings are disturbed (**human comfort**). People can sometimes perceive vibration impacts when vibration generating construction work is located close to occupied buildings. Vibration from construction work tends to be intermittent in nature and the EPA's Assessing Vibration: a technical guideline (2006) (AV:ATG) provides criteria for intermittent vibration based on the Vibration Dose Value (VDV), as shown in **Table 6**. While the construction activities for the proposal are generally not expected to result in continuous or impulsive vibration impacts, corresponding criteria are provided in **Table 7**.
- Those where building contents may be affected (**building contents**). People perceive vibration at levels well below those likely to cause damage to building contents. For most receivers, the human comfort vibration criteria are the most stringent and it is generally not necessary to set separate criteria for vibration effects on typical building contents. Exceptions to this can occur when vibration sensitive equipment, such as electron microscopes or medical imaging equipment, are in buildings near to construction work. No such equipment has been identified in the study area.
- Those where the integrity of the building may be compromised (**structural/cosmetic damage**). If vibration from construction work is sufficiently high it can cause cosmetic damage to elements of affected buildings. Industry standard cosmetic damage vibration limits are specified in British Standard BS 7385 and German Standard DIN 4150. The limits are shown in **Table 8** and **Table 9**.

Table 6 Human Comfort Vibration – Vibration Dose Values for Intermittent Vibration

Building Type	Assessment Period	Vibration Dose Value ¹ (m/s ^{1.75})	
		Preferred	Maximum
Critical Working Areas (eg operating theatres or laboratories)	Day or night-time	0.10	0.20
Residential	Daytime	0.20	0.40
	Night-time	0.13	0.26
Offices, schools, educational institutions and places of worship	Day or night-time	0.40	0.80
Workshops	Day or night-time	0.80	1.60

Note 1: The VDV accumulates vibration energy over the daytime and night-time assessment periods, and is dependent on the level of vibration as well as the duration.



Table 7 Human Comfort Vibration – Preferred and Maximum Weighted Root Mean Square Values for Continuous and Impulsive Vibration Acceleration (m/s²) 1–80 Hz

Location	Assessment period	Preferred values		Maximum values	
		z-axis	x- and y-axis	z-axis	x- and y-axis
Continuous vibration					
Residential	Daytime	0.010	0.0071	0.020	0.014
	Night-time	0.007	0.005	0.014	0.010
Offices, schools, educational institutions and places of worship	Day or night-time	0.020	0.014	0.040	0.028
Workshops	Day or night-time	0.04	0.029	0.080	0.058
Impulsive vibration					
Residential	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.10	0.071	0.20	0.14
Offices, schools, educational institutions and places of worship	Day or night-time	0.64	0.46	1.28	0.92
Workshops	Day or night-time	0.64	0.46	1.28	0.92

Table 8 Cosmetic Damage – BS 7385 Transient Vibration Values for Minimal Risk of Damage

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

Note 1: Where the dynamic loading caused by continuous vibration may give rise to dynamic magnification due to resonance, especially at the lower frequencies where lower guide values apply, then the guide values may need to be reduced by up to 50%.

Table 9 Cosmetic Damage – DIN 4150 Guideline Values for Short-term Vibration on Structures

Group	Type of Structure	Guideline Values Vibration Velocity (mm/s)				
		Foundation, All Directions at a Frequency of			Topmost Floor, Horizontal	Floor Slabs, Vertical
		1 to 10 Hz	10 to 50 Hz	50 to 100 Hz	All frequencies	All frequencies
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40	20
2	Residential buildings and buildings of similar design and/or occupancy	5	5 to 15	15 to 20	15	20



Group	Type of Structure	Guideline Values Vibration Velocity (mm/s)				
		Foundation, All Directions at a Frequency of			Topmost Floor, Horizontal	Floor Slabs, Vertical
		1 to 10 Hz	10 to 50 Hz	50 to 100 Hz	All frequencies	All frequencies
3	Structures that, because of their particular sensitivity to vibration, cannot be classified as Group 1 or 2 and are of great intrinsic value (eg heritage listed buildings)	3	3 to 8	8 to 10	8	20 ¹

Note 1: It may be necessary to lower the relevant guideline value markedly to prevent minor damage.

4.3.1 Minimum Working Distances for Vibration Intensive Work

Minimum working distances for typical vibration intensive construction equipment have been sourced from the Transport for NSW (TfNSW) Construction Noise and Vibration Guideline (Public Transport Infrastructure) (CNVG-PTI) and are shown in **Table 10**. The minimum working distances are for both cosmetic damage (from BS 7385 and DIN 4150) and human comfort (from the NSW EPA Assessing Vibration: a technical guideline). They are calculated from empirical data which suggests that where work is further from receivers than the quoted minimum distances then impacts are not considered likely.

The minimum working distances listed in the CNVG were used to derive the minimum working distances required for cosmetic damage to industrial and heavy commercial buildings (also reinforced or framed structures). The following pseudo-power law relationship has been used in the derivations:

$$V_2 = V_1 \times \left(\frac{D_1}{D_2} \right)^B$$

where a site exponent value of B = 1.6 is adopted for the calculations, as per AS2187.2:2006

Table 10 Recommended Minimum Working Distances from Vibration Intensive Equipment

Plant Item	Rating/Description	Minimum Distance			
		Cosmetic Damage			Human Response (NSW EPA Guideline) ²
		Residential and Light Commercial (BS 7385)	Heritage Items ¹ (DIN 4150, Group 3)	Industrial and Heavy Commercial (BS 7385)	
Vibratory Roller	<50 kN (1–2 tonne)	5 m	11 m	3 m	15 m to 20 m
	<100 kN (2–4 tonne)	6 m	13 m	3 m	20 m
	<200 kN (4–6 tonne)	12 m	25 m	6 m	40 m
	<300 kN (7–13 tonne)	15 m	31 m	8 m	100 m
	>300 kN (13–18 tonne)	20 m	40 m	10 m	100 m
	>300 kN (>18 tonne)	25 m	50 m	12 m	100 m
Small Hydraulic Hammer	300 kg (5 to 12 t excavator)	2 m	5 m	1 m	7 m



Plant Item	Rating/Description	Minimum Distance			
		Cosmetic Damage			Human Response (NSW EPA Guideline) ²
		Residential and Light Commercial (BS 7385)	Heritage Items ¹ (DIN 4150, Group 3)	Industrial and Heavy Commercial (BS 7385)	
Medium Hydraulic Hammer	900 kg (12 to 18 t excavator)	7 m	15 m	4 m	23 m
Large Hydraulic Hammer	1,600 kg (18 to 34 t excavator)	22 m	44 m	11 m	73 m
Vibratory Pile Driver	Sheet piles	2 m to 20 m	5 m to 40 m	1 to 10 m	20 m
Piling Rig – Bored	≤ 800 mm	2 m (nominal)	5 m	1 m	4 m
Jackhammer	Hand held	1 m (nominal)	3 m	1 m	2 m
Ballast Tamping ²	N/A	5 m	10 m	3 m	30 m

Note 1: Minimum working distances for heritage items that have been identified as structurally unsound or otherwise particularly sensitive to vibration. These distances have been calculated based on the 2.5 mm/s PPV criteria from DIN 4150 and the cosmetic damage minimum working distances presented in the CNVG-PTI with reference to BS 7385.

Note 2: Based on SLR measurement data. The human response minimum working distance for Ballast Tamping is determined based on a residential night-time preferred VDV criterion.

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

5.0 Noise Assessment

The potential construction noise levels from the Project have been qualitatively assessed by considering the distance from the works locations against the proposed construction activities to determine the appropriate level of mitigation required.

5.1 Work Scenarios

Noise scenarios have been determined based on key Project noise generating stages, supplied by the Project team. A detailed description of each work scenario and the total sound power levels (Lw) are provided in **Table 11**. A summary of construction work periods and schedule required for each scenario is shown in **Table 12**, as per the working hours defined in the CNVMP. The locations of the various work scenarios are shown in **Figure 3**.

It should be noted that all the work scenarios are based on the 'base' traffic mitigation measures as identified in the Construction Traffic, Transport and Access Mitigation Report (Revision B) 6-0052-210-PMA-00-PL-0011. These mitigation measures are subject to change as a result of further consultation with Transport for NSW (TfNSW) and Wagga Wagga City Council. For this reason, this CNVIS is considering these mitigation measures as indicative and that any alteration of these mitigation measures could be carried out by using this CNVIS as a representative qualitative assessment in accordance with the ICNG.



Table 11 Work Scenario Descriptions

ID	Scenario	Description	Total Lw
W.001	Sign Installation	<ul style="list-style-type: none"> Install new signage including sign posts. 	110
W.002	Sign Installation (Hand tools only)	<ul style="list-style-type: none"> Install new signage on existing sign posts. 	103
W.003	Line Marking	<ul style="list-style-type: none"> Removal of existing road lines, and painting of new road lines. 	110
W.004	Klem-flex installation	<ul style="list-style-type: none"> Installation of klem-flex bollards. 	104
W.005	Temporary roundabout installation	<ul style="list-style-type: none"> Installation of temporary roundabout. 	111
W.006	Docker Street - Median Demolition	<ul style="list-style-type: none"> Demolition of the median strip on Docker Street. 	120
W.007	General	<ul style="list-style-type: none"> General activities including traffic control vehicles and construction vehicles. 	103
W.008	Kiss and Ride	<ul style="list-style-type: none"> Installation of a Kiss and Ride facility on Railway Street. 	114

Table 12 Scenarios and Periods of Work

ID	Scenario	Hours of Work				Indicative Start Date	Likely Duration ⁵
		Approved Hours	Out-of-Hours Work ⁴				
			Day OOH ¹	Evening ²	Night ³		
W.001	Sign Installation	✓	-	✓	✓	Early August or around 5 days prior to the closure.	Less than one day/night in each location.
W.002	Sign Installation (Hand tools only – Edmondson Street)	-	-	✓	✓	Early August or around 5 days prior to the closure.	Less than one day/night in each location.
W.003	Line Marking	-	-	✓	✓	Early August or around 5 days prior to the closure.	Less than one night in each location.
W.004	Klem-flex installation	-	-	✓	✓	Early August or around 5 days prior to the closure.	Less than one night in each location.
W.005	Temporary roundabout installation	-	-	✓	✓	Early August or around 5 days prior to the closure.	Less than one night
W.006	Docker Street - Median Demolition	-	-	✓	✓	Early August or around 5 days prior to the closure.	Less than one night
W.007	General	✓	-	✓	✓	Early August or around 5 days prior to the closure.	Less than one night in each location.
W.008	Kiss and Ride	✓	-	-	-	Early August or around 5 days prior to the closure.	Approximately 2 daytime shifts

Note 1: Daytime out of hours is 8 am to 6 pm on Sunday and public holidays.

Note 2: Evening is 6 pm to 10 pm Monday – Sunday (including public holidays).

Note 3: Night is 10 pm to 7 am Monday – Saturday and 10pm to 8am Sunday (including public holidays).

Note 4: Where works are expected to occur outside of the standard working hours, further detail around the specific work tasks, duration and justification of OOHW must be identified in the OOHW permit, required by the OOHW Protocol or EPL.

Note 5: Program is indicative and is intended to occur over five shifts. There is the potential that some mitigation measures may need to be installed outside of this period as required, or where additional measures are needed throughout the Edmondson Street closure.



Figure 3 Construction Work Locations (Lake Albert and Railway)



Figure 4 Construction Work Locations (Coleman/Macleay Intersection and Edward Steet/Edmondson Street Intersection)



Figure 5 Construction Works Location (Urana and Bourke)



Figure 6 Construction Works Location (Docker Street)





The assessment uses 'realistic worst-case' scenarios to determine the impacts from the noisiest 15-minute period that is likely to occur for each work scenario, as required by the ICNG. Sound power levels (Lw) for the construction equipment used in the modelling are listed in **Appendix B**.

The following overview is based on the construction scenarios outlined in Section 5.1 and details the distance at which receivers may be impacted based on the level of exceedance of the noise management levels, as per the categories in **Table 13**. The mitigation and management measures adopted for this CNVIS are provided in **Section 7.0**.

Subjective Classification	Exceedance of Noise Management Level		Impact Colouring
	Daytime	Out of Hours	
Negligible	No exceedance	No exceedance	
Noticeable	-	1 to 5 dB	
Clearly Audible	1 to 10 dB	6 to 15 dB	
Moderately Intrusive	11 to 20 dB	16 to 25 dB	
Highly Intrusive	> 20 dB	> 25 dB	

A summary of the distance where NML exceedances are likely for the various work scenarios is shown in **Table 14**. Maps of the predicted worst-case noise impacts are presented in **Appendix C**.

The assessment is generally considered conservative as the calculations assume several items of construction equipment are in use at the same time within individual scenarios and do not include any attenuation due to buildings, etc. As outlined in **Section 5.1.1**, the assessment uses ‘realistic worst-case’ scenarios to determine the impacts from the noisiest 15-minute period that is likely to occur for each work scenario.

The distances shown in **Table 14** are representative of a ‘worst-case’ 15-minute period, and are unlikely to occur for extended periods of time throughout the entire construction period at any given receiver.

The indicative work durations presented in **Table 12** represent a window of time where the scenarios could occur, and does not represent the entire duration of the exceedances shown in **Table 14**.

In reality, there would frequently be periods when construction noise levels are much lower than the worst-case levels predicted as well as times when no equipment is in use and no noise impacts occur.

Noise levels at the distances below are likely to be significantly lower due to shielding from surrounding buildings and structures, unless there is direct line of site to the works area.



Table 14 Distance of Predicted NML Exceedances

ID	Scenario	HNA ¹	Distance (m) to comply with NML																
			With NML exceedance (dB) ²																
			Approved Daytime			Out of Hours													
						Daytime OOH				Evening				Night-time				Sleep Disturbance	Sleep Awakening
			1-10	11-20	>20	1-5	6-15	16-25	>25	1-5	6-15	16-25	>25	1-5	6-15	16-25	>25	>Screening Level 52 dBA	>65 dB
Based on lowest NML																			
W.001	Sign Installation	20 m	175 m	55 m	20 m	315 m	175 m	55 m	20 m	355 m	200 m	65 m	20 m	890 m	500 m	160 m	55 m	710 m	160 m
W.002	Sign Installation (Hand tools only – Edmondson Street)	10 m	80 m	25 m	10 m	140 m	80 m	25 m	10 m	155 m	90 m	25 m	10 m	395 m	225 m	70 m	25 m	710 m	160 m
W.003	Line Marking	20 m	n/a	n/a	n/a	n/a	n/a	n/a	n/a	355 m	200 m	65 m	20 m	890 m	500 m	160 m	55 m	630 m	140 m
W.004	Klem-flex installation	10 m	n/a	n/a	n/a	n/a	n/a	n/a	n/a	200 m	110 m	35 m	10 m	500 m	280 m	90 m	30 m	400 m	90 m
W.005	Temporary roundabout installation	25 m	n/a	n/a	n/a	n/a	n/a	n/a	n/a	395 m	225 m	70 m	25 m	1000 m	560 m	180 m	60 m	710 m	160 m
W.006	Docker Street - Median Demolition	70 m	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1120 m	630 m	200 m	70 m	2815 m	1585 m	500 m	170 m	1995 m	450 m
W.007	General	10 m	80 m	25 m	10 m	140 m	80 m	25 m	10 m	155 m	90 m	25 m	10 m	395 m	225 m	70 m	25 m	200 m	45 m
W.008	Kiss and Ride	35 m	280 m	90 m	30 m	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a



A summary of the predicted worst-case noise levels is shown below for each work area:

- Most activities will occur over a very short time period and expected to be completed in less than one shift (either day or night shift).
- Sign installation and line marking will be undertaken across various locations and is anticipated to be less than 15 minutes per discreet location.
- The highest impact is expected to be associated with the Docker Street Median Demolition due to the use of the hydraulic hammer and vibratory roller. Residential receivers within 70 m have the potential to be Highly Noise Affected.
 - It should be noted that there is a medical centre (Docker Medical Building) located directly adjacent to this works area. Notification will be provided to this receiver prior to works. Further consultation with the Docker Street Medical Centre will be undertaken if impacts are identified to occur within operating hours.
- Noise impacts are likely to be significantly less due to shielding from surrounding buildings and structures, unless there is direct line of site to the works area.

The receivers which would potentially be affected by sleep awakening impacts are generally the same receivers where 'moderately intrusive' and 'highly intrusive' night-time impacts have been predicted (refer to **Appendix C**). These receivers may be eligible for respite offers (RO), agreements with owners (AO) or alternative accommodation (AltA), refer **Section 7.3**.

All appropriate feasible and reasonable construction noise mitigation measures will be applied to work as outlined in **Section 7.0** and **Section 7.1**.

5.3 Ground-borne Noise

Ground-borne construction noise impacts from the Project are not anticipated as vibration intensive work with the potential to generate perceptible ground-borne noise, is not included in the scope of work. Vibration intensive work for the Project will be completed outdoors meaning airborne noise levels at the nearest receivers are expected to be higher than the corresponding internal ground-borne noise levels.

Where airborne noise levels are higher than ground-borne noise levels it is not necessary to evaluate potential ground-borne noise impacts and as such, they have not been considered further for this assessment.



6.0 Vibration Assessment

Vibration intensive items of equipment that would be required during work assessed in this CNVIS include a medium hydraulic hammer (12-18t) and a vibratory roller (7-13T). These items of equipment are required during the work as shown in **Table 15**.

The potential impacts during vibration intensive work have been assessed using the Transport CNVG-PTI minimum working distances for cosmetic damage and human response shown in **Table 15**.

Table 15 Vibration Intensive Equipment

ID	Scenario	Rating/ Description	Minimum Distance			
			Cosmetic Damage			Human Response (NSW EPA Guideline)
			Residential and Light Commercial (BS 7385)	Heritage Items (DIN 4150, Group 3)	Industrial and Heavy Commercial (BS 7385)	
W.006	Docker Street – Median Demolition	Medium Hydraulic Hammer: 900 kg (12 to 18 t excavator)	7 m	15 m	4 m	23 m
W.006	Docker Street – Median Demolition	Vibratory Roller <100 kN (2–4 tonne)	6 m	13 m	3 m	20 m

Vibration offset distances have been determined from the TfNSW CNVG-PTI minimum working distances for cosmetic damage and human comfort (see **Table 10** and the assessment is summarised in **Figure 8** to **Figure 9**). The offset distances are representative of the highest vibration levels that would likely be experienced by the nearest receivers when work occurs nearby.

For most construction activities, vibration emissions are intermittent in nature and for this reason, higher vibration levels occurring over shorter time periods are allowed.

In the event that additional work is undertaken which requires the use of other items of plant identified than those identified in **Table 15**, a vibration impact assessment must be conducted prior to the commencement of work.



Figure 8 Medium Hydraulic Hammer (12-18t) - Minimum Working Distances



Figure 9 Vibratory Roller (2-4t) - Minimum Working Distances



6.1 Cosmetic Damage Assessment

Figure 8 and **Figure 9** show that no buildings have the potential to fall within the cosmetic damage minimum working distance for residential structures during *W.006* when the medium hydraulic hammer (12-18t) or vibratory roller <300 kN (2–4t) is in use.

Offset distances from specific vibration intensive plant to the nearest receivers and building construction should be confirmed before commencing vibration intensive work during construction.

Before commencement of any work, a structural engineer must undertake condition surveys of all building, structures, utilities and the like identified as being at risk of damage. Based on the assessment above, conditions surveys are not required for this CNVIS.

After completion of construction, condition surveys must be undertaken by a structural engineer of all items for which pre-condition surveys were undertaken.

The results of the surveys must be documented in a Condition Survey Report for each item surveyed. Copies of Condition Survey Reports must be provided to the landowners of the items surveyed, and no later than one month before the commencement of construction and three months following the completion of construction.

Feasible and reasonable construction vibration mitigation measures should be applied where vibration intensive work is required within the minimum working distances. Construction vibration mitigation and management measures are discussed in **Section 7.1**.

In accordance with CoA E122, property damage caused directly or indirectly by the construction or operation must be rectified at no cost to the owner. Alternatively, compensation may be provided for the property damage as agreed with the property owner.

Heritage Structures

Nearby structures within the Wagga Wagga Conservation Area and heritage listed structures (ie Former Docker Street Railway Gate House and 20 Docker Street), are beyond the relevant minimum working distances for a medium hydraulic hammer and/or a vibratory roller as identified in **Figure 8** to **Figure 9**. Therefore, vibration impacts to heritage structures are not expected as a result of these works.

If other vibration intensive activities are required within minimum working distances to heritage structures, a building condition assessment should be undertaken of the heritage item/s to assess if they are considered to be sensitive to vibration prior to vibration work commencing.

As per CoA E80, vibration testing must be undertaken before and during vibration generating activities that have the potential to impact on heritage items to identify minimum working distances to prevent cosmetic damage. Advice must be sought on methods and locations for installing equipment as per CoA E81.

6.2 Human Comfort Assessment

Figure 8 and **Figure 9** show that four residential receivers and the Docker Medical Building have the potential to fall within the human comfort minimum working distances when the medium hydraulic hammer and/or vibratory roller is in use.

Occupants of the buildings identified above may be able to perceive vibration impacts at times when hydraulic hammers and vibratory rollers are in use nearby. Where impacts are perceptible, they would likely only be apparent for relatively short durations when vibration intensive equipment is in use nearby noting that the expected duration of use is expected to be minimal.



Feasible and reasonable construction vibration mitigation measures should be applied where vibration intensive work is required within the minimum working distances. Construction vibration mitigation and management measures are discussed in **Section 7.1**.

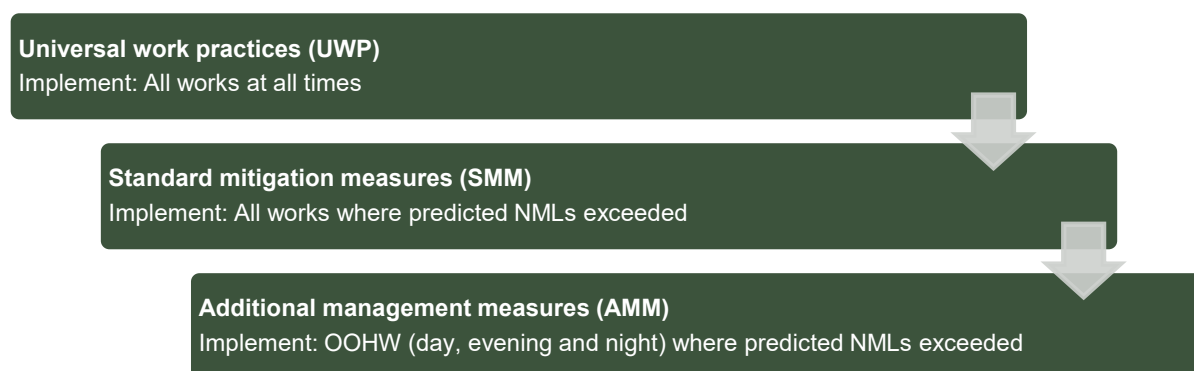
7.0 Mitigation and Management Measures

Noise from the Project may be apparent at the nearest receivers at certain times during construction. The Project should apply all feasible and reasonable mitigation measures to minimise the impacts.

In accordance with CoA E74, works that exceed the noise management levels and/or vibration criteria must be managed in accordance with the CNVMP.

The Inland Rail NSW Construction Noise and Vibration Framework (CNVF) has been adopted as a guideline for this project and outlines a hierarchy of work practices and mitigation measures to minimise the impact of construction noise and vibration on the community. This hierarchy is shown in **Figure 10**.

Figure 10 Hierarchy of Work Practices and Mitigation Measures



The universal work practices (UWP) and standard mitigation measures (SMM) for the overall A2I project are outlined in the CNVMP. All mitigation and management measures outlined in the CNVMP will be adopted in accordance with CoA E74. Site specific mitigation measures are also outlined below in **Section 7.1**. These measures have been incorporated into the noise modelling assessment to provide mitigated results. Additional Management Measures (AMM) are outlined in **Section 7.3**.

7.1 Site Specific Mitigation Measures

Table 16 outlines the mitigation and management measures that will be adopted to minimise potential noise and vibration impacts associated with this CNVIS at surrounding sensitive receivers. These measures have been considered in noise modelling based on the total scenario sound power levels, refer **Appendix B**.

Table 16 Site Specific Mitigation Measures

Measure	Reference / Notes
Project Planning	
Use quieter and less vibration emitting construction methods where feasible and reasonable.	Best practice
Works will be completed during the approved daytime construction hours where possible, as outlined in Section 2.2 .	Best practice CoA E69 CoA E71



Measure	Reference / Notes
Some unavoidable OOHW will be required due to road and rail traffic management restrictions, as outlined in Section 2.3 .	
Where OOHW is required, an OOHW Permit will be prepared, as required by the OOHW Protocol or EPL. Further detail around the specific work tasks, duration and justification of OOHW must be identified in the OOHW permit.	Best practice CoA E71 CoA E72 CoA E73
Scheduling	
Highly noise intensive works that result in an exceedance of the applicable NML at the same receiver must only be undertaken: a) Between 08:00am – 06:00pm Monday to Friday; b) Between 08:00am – 01:00pm Saturday; and c) if continuously, then not exceeding three (3) hours, with a minimum cessation of work of not less than one hour. Refer to	Best practice CoA E70
Noise generating work in the vicinity of community, religious, educational institutions, noise and vibration-sensitive businesses and critical working areas (such as exam halls, theatres, laboratories and operating theatres) resulting in noise levels above the NMLs will not be timetabled during sensitive periods, unless other reasonable arrangements with the affected institutions can be made at no cost to the affected institution. Refer to Community Consultation in Section 7.5 .	Best practice CoA E76
Where feasible: <ul style="list-style-type: none">Limit noise generating work outside of standard construction hours as much as possibleLimit noise generating work on the weekends as much as possibleConstruction works should be completed as soon as possible. Refer to Community Consultation in Section 7.5	Best practice, CoA E78
Training	
Training will be provided to all personnel on noise and vibration requirements for the project. Inductions and toolbox talks to be used to inform personnel of the location and sensitivity of surrounding receivers.	Best practice
The induction protocols must include awareness of noise generating activities and mitigation measures and techniques that should be implemented.	
Training must be conducted for appropriate community behaviours when access/egress the Site.	
Plant and Equipment Source Mitigation	
All plant and equipment must be maintained in a proper and efficient condition, operated in a proper and efficient manner, and feature standard noise reduction measures where applicable.	Best practice CNVF
Plant and equipment must be selected with options to minimise noise such as covers, mufflers, shrouds and other noise suppression equipment. Low noise emission plant and equipment must be selected where available.	
Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out-of-hours work, including delivery vehicles.	
Noise generating equipment will be regularly checked and effectively maintained, including checking of hatches/enclosures regularly to ensure that seals are in good condition and doors close properly against seals.	
Noise monitoring spot checks of equipment will be completed to ensure individual items are operating as expected	



Measure	Reference / Notes
Dropping materials from a height will be avoided.	Best practice
Loading and unloading will be carried out as far as possible from noise sensitive areas.	
Alternative methods will be considered for hydraulic hammers/vibratory rollers (eg smaller sized equipment, refer Section 6.0). Use of these methods will depend on the specific circumstances and therefore the worst-case scenario is included for the purpose of this CNVIS.	
Community Consultation	
Regular communications on the activities and progress of the proposal shall be provided to the community (eg via newsletter, email and/or website).	Best practice CNVF
A telephone, email and web-based community information service shall be established to allow the community to obtain additional information on construction activities, provide feedback or make a complaint.	Best practice CNVF
Owners and occupiers of properties at risk of exceeding the screening criteria for cosmetic damage (and/or human comfort) must be notified before work that generates vibration commences in the vicinity of those properties. If the potential exceedance is to occur more than once or extend over a period of 24 hours, owners and occupiers are to be provided a schedule of potential exceedances on a monthly basis for the duration of the potential exceedances, unless otherwise agreed by the owner and occupier.	Best practice CoA E79
Notification will be provided to all receivers that are predicted to be highly noise affected (HNA).	Best practice
Where complaints are received, work practices will be reviewed and feasible and reasonable practices applied to minimise any further impacts.	Best practice
Monitoring	
Noise and/or vibration monitoring will be conducted (as appropriate) when noise/vibration intensive works are being undertaken in close proximity to sensitive receivers.	Best practice CNVF CoA E80
Noise and vibration monitoring will be undertaken in accordance with the CNVMP and Monitoring Program.	
See Section 7.7 for details of monitoring requirements.	
Vibration	
Vibration intensive works required within the minimum working distance at the same receiver must only be undertaken: a) Between 08:00am – 06:00pm Monday to Friday; b) Between 08:00am – 01:00pm Saturday; and c) if continuously, then not exceeding three (3) hours, with a minimum cessation of work of not less than one hour. Refer to Section 2.2.1 .	Best practice CoA E70



7.2 Respite

In accordance with CoA E70, except as permitted by an EPL, highly noise intensive works that result in an exceedance of the applicable NML at the same receiver must only be undertaken:

- a) *Between 08:00am – 06:00pm Monday to Friday;*
- b) *Between 08:00am – 01:00pm Saturday; and*
- c) *if continuously, then not exceeding three (3) hours, with a minimum cessation of work of not less than one hour.*

For the purposes of this condition, ‘continuously’ includes any period during which there is less than one hour between ceasing and recommencing any of the work.

In accordance with CoA E72 and E83, the procedure outlined in the OOHV Protocol must be implemented to coordinate OOHV (including those approved by an EPL or undertaken by a third party), to ensure appropriate respite is provided. This coordination must include:

- a) rescheduling work to provide respite to impacted noise sensitive land use(s) so that the respite is achieved; or
- b) the provision of alternative respite or mitigation to impacted noise sensitive land use(s); and
- c) the provision of documentary evidence to the AA in support of any decision made in relation to respite or mitigation.

The consideration of respite must also include all other CSSI, SSI and SSD projects which may cause cumulative and/or consecutive impacts at receivers affected by the delivery of the CSSI.

Highly noise intensive works (as defined in **Section 2.2.1**) are required in various work scenarios. As outlined above, highly noise intensive work that results in an exceedance of the applicable NML is restricted to the hours shown above and must have respite periods as defined above.

CoA E70 applies to W.006 Docker Street - Median Demolition where highly noise intensive works are proposed and the NML is predicted to be exceeded.

In accordance with CoA E71, all scenarios require approval through the OOHV Protocol or an EPL to occur outside the hours listed above from CoA E70.

Respite offers are also required where works occur for more than two consecutive rest/sleep periods as part of the additional mitigation measured outlined in **Section 7.3**.

7.3 Additional Mitigation and Management Measures for Out of Hours Work

Where the ‘mitigated’ construction noise levels remain above the NMLs, the Additional Mitigation Measures Matrix (AMMM) adapted from in the CNVF and CNVMP is to be implemented. The approach, guided by the AMMM, is primarily aimed at pro-active engagement with affected sensitive receptors rather than additional noise reducing mitigation. OOHV has been divided into three periods (Day, Evening and Night) as adapted from the CNVF around the approved project hours (CoA E69).

Additional mitigation measures described in the CNVF and CNVMP are listed in **Table 17**. The additional mitigation measures for airborne noise are shown in **Table 18**. The additional mitigation measures for construction vibration are shown in **Table 19**.



Table 17 Additional Mitigation Measures

Mitigation/Management Measure	Abbreviation
Communication (Category 1) ¹	CO1
Communication (Category 2) ²	CO2
Respite Offer ³	RO
Alternative Accommodation	AltA
Agreement with Owners	AO

Note 1: As outlined in the CNVF, Communication to provide information on the OOHV via methods such as letter box drop, email, newsletter, media advertisements and/ or website prior to the works commencing.

Note 2: As outlined in the CNVF, 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.

Note 3: As outlined in the CNVF, RO are not applicable to non-residential receivers. RO may comprise of pre-purchased movie tickets, dinner vouchers or similar. RO can also be provided by limiting high noise generating works and allowing at least a one-hour respite period between blocks of work. Where possible, the timing of this respite should be discussed with the impacted community.



Table 18 Airborne Noise – Additional Mitigation Measures Matrix

Time Period		Exceedance of NML	Perception	Duration	Communication Category/ Management Measure
OOHW Daytime Period	Sunday 8am – 6pm (including public holidays)	<5	Noticeable	Any	CO1
		5-15	Clearly audible	Any	CO1
		16-25	Moderately intrusive	Any	CO1, CO2
		>25	Highly intrusive	Any	CO1, CO2
OOHW Evening Period	Monday – Sunday 6pm – 10pm (including public holidays)	<5	Noticeable	Any	CO1
		5-15	Clearly audible	Any	CO1
		16-25	Moderately intrusive	Any	CO1, CO2
		>25	Highly intrusive	Any	CO1, CO2
				>2 consecutive rest periods ¹	CO1, CO2, RO
OOHW Night Period	Monday – Saturday 10pm – 7am Sunday 10pm – 8am (including public holidays)	<5	Noticeable	Any	CO1
		5-15	Clearly audible	Any	CO1
		16-25	Moderately intrusive	Any	CO1, CO2
				>2 consecutive sleep periods ¹	CO1, CO2, RO, AO
		>25	Highly intrusive	Any	CO1, CO2, RO
				>2 consecutive sleep periods ¹	CO1, CO2, RO, AO, AltA

Note 1: Where the duration exceeds 2 consecutive rest/sleep periods, the corresponding additional mitigation measures will be provided for all periods where construction exceedances are expected to occur.



Table 19 Vibration – Additional Mitigation Measures Matrix

Time Period		Duration	Exceedance of 'preferred' value	Exceedance of 'maximum' value
OOHW Daytime Period	Sunday 8am – 6pm (including public holidays)	Any	CO1, CO2	CO1, CO2, RO
OOHW Evening Period	Monday – Sunday 6pm – 10pm (including public holidays)	Any	CO1, CO2	CO1, CO2, RO
OOHW Night Period	Monday – Saturday 10pm – 7am Sunday 10pm – 8am (including public holidays)	Any	CO1, CO2, RO	CO1, CO2, RO, AltA

7.3.1 Receivers Eligible for Additional Mitigation Measures - Noise

The receivers eligible for additional mitigation and management measures due to construction noise from the project work are presented in **Appendix C**. Where work occurs for greater than two consecutive evening or nights, receivers may be eligible for respite offers (RO), agreements with owners (AO) or alternative accommodation (AltA) depending on the exceedance level and works period as detailed in **Table 18**. For this CNVIS, works are expected to be completed in one night in each location and therefore not anticipated to be required.

As outlined in **Section 5.2**, 'highly intrusive' impacts are predicted at residential receivers within the distances outlined in **Table 14**.

Work scenarios that are scheduled for OOHW are likely to create highly intrusive noise levels at residential receivers. Should these works occur for more than two consecutive sleep periods in a row, additional mitigation measures as outlined in as in **Table 18** must be provided to affected sensitive receivers. Where possible, work would be scheduled to avoid impacting the same receivers for more than two consecutive sleep periods. Receivers that would be impacted for more than two consecutive sleep periods must be identified in the OOHW permit.

7.3.2 Receivers Eligible for Additional Mitigation Measures - Vibration

Figure 8 identifies four residential receivers and the Docker Medical Building with the potential to fall within the minimum working distances for Human Comfort.

Figure 9 identifies 26 residential receivers, two medical buildings and two commercial building with the potential to fall within the minimum working distances for Human Comfort.

Construction vibration mitigation and management measures are discussed in **Section 7.0**. Any proposed works outside of the approved daytime hours will need to be assessed as part of the OOHW permit preparation discussed in **Section 2.4**. Any additional mitigation required (from **Table 19**) for vibration activities must be identified in the OOHW permit.

7.4 Community Notification

As detailed in the standard management measures outlined in the CNVF.

- 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.



- Regular communications on the activities and progress of the proposal shall be provided to the community (e.g. via newsletter, email and/or website).

7.5 Consultation with Affected Receivers

In accordance with CoA E78, the CNVIS must include specific mitigation measures identified through consultation with affected sensitive land user(s) and the mitigation measures must be implemented for the duration of the Work. Details of this consultation are provided below.

7.5.1 Consultation approach

This section discusses the consultation approach that has been undertaken for the purposes of the work subject to this CNVIS. It is noted that consultation with affected sensitive land users on what specific mitigation measures they may require is considered to be an ongoing and live process and as such, measures that are personal to individual affected sensitive land user(s) will not be regularly documented in this CNVIS. Consultation records will be made available to the AA upon request.

The purpose of this consultation is to identify receivers who have specific circumstances that need further consideration during construction – for example, households who have children undertaking exams (HSC or similar), households who have vulnerable persons with disabilities or medical conditions, shift workers, etc.

The consultation approach utilised by Martinus Rail is in accordance with the Community Communications Strategy (CCS). The approach involved directly contacting the affected sensitive land user identified by this CNVIS through one or more of the following methods:

- Surveys distributed by email and paper notifications
- Door-knocks with a 'Sorry we missed you' card for those who were not at home
- Notifications
- Phone calls
- Emails
- Community briefings / group meetings.

Affected sensitive land users contacted by Martinus Rail have been made aware of the anticipated duration and nature of construction works that may affect them, as well as mitigation measures that will be implemented in accordance with the CEMP and CNVMP. Contact information for Martinus Rail's Community Team have been provided to assist with ongoing consultation during construction.

Depending on individual needs and circumstances, specific mitigation measures offered by Martinus Rail could include but are not limited to:

- Offers of individually agreed respite to highly noise affected sensitive land users (standard construction hours)
- Consultation on timetabling of highly noise intensive works to avoid sensitive periods
- Offers of attended noise monitoring at the premises to confirm actual levels of impact
- Offers of temporary alternative accommodation or work space
- Individual briefings.

Specific mitigation measures identified in consultation with individual affected sensitive land users will be implemented during works subject to this CNVIS. Further mitigation measures



may be identified by the affected community as construction progresses and these will be assessed where reasonable and feasible and on a case by-case basis.

7.5.2 Consultation for this CNVIS

The project website includes the following key information:

- Latest approvals
- All management plans, including the CNVMP and the Construction Environmental Management Plan (CEMP), which provide information on the relevant environmental management measures
- Notifications, including three-month lookaheads, monthly updates and specific OOHW notifications
- Contact mechanisms, including requests for feedback and/or complaints on individual circumstances.

As part of the project's program of regular notifications, the following notifications have included information on the OOHW requirements subject to this CNVIS:

- Project-wide monthly notifications distributed to over 25,000 properties
- Work specific notifications
- Three-month lookahead notifications distributed to over 25,000 properties
- Regular email with details of upcoming work or changes.

All notifications include the following:

- Link to project website
- 24/7 phone number and email address for enquiries, complaints or comments
- Requests for the community to provide feedback on their individual needs and circumstances.

Prior to commencement of works subject to this CNVIS, targeted consultation occurred with a total of approximately 7,127 residential properties across the entire project alignment, approximately 3,081 of which were in the Wagga Wagga precinct. These properties received targeted letterbox drops, emails and newspaper adverts from the Community Team and feedback was sought across (3) three weeks, from 7 August to 28 August 2024.

The team requested feedback from the affected community on their individual needs during this targeted consultation.

7.5.3 Consultation outcomes

Feedback received during this consultation was primarily related to the existing operational train line and the disturbance the trains cause.

In Wagga Wagga, no additional management measures relating to construction noise were identified during this consultation (as required by CoA E78); however, the following general sentiments were noted from respondents:

- Limit noise generating work outside of standard construction hours as much as possible
- Limit noise generating work on the weekends as much as possible
- Construction works should be completed as soon as possible.



The CNVIS documents the need to limit noise generating work as much as possible and this will be achieved through the implementation of existing mitigation measures listed in this CNVIS.

Nevertheless, regular consultation with the community will continue throughout construction in accordance with the Community Communications Strategy and the Community Action Plan prepared for the relevant activities. A list of key stakeholders relevant to this CNVIS are included in **Table 20** below.

Table 20 Key Stakeholders for this CNVIS

Precinct Area	Receiver Type	Level of Engagement	Distance from Work Site (m)
Wagga Wagga Precinct			
Wagga Wagga City Council	Council	Consult	Various
Wagga Wagga Base Hospital	Health	Consult	50
Calvary Riverina Hospital (private)	Health	Consult	400
Pearson Street bridge			
Wagga Show Campground and Wagga & District Greyhound Club	Active Recreation	Consult	10
Peacock Drive, Bulolo Street, Gallop Avenue and Wade Street	Residential	Consult	Various
Docker Street			
Urana, Docker and Chaston Streets	Residential	Consult	Various
Docker Street Medical Centre	Health	Consult	15
Mary Potter Nursing Home	Residential	Consult	100
Edmondson Street Bridge and Cassidy Parade Bridge			
Kildare Catholic College	Educational / Residential	Consult	200
South Wagga Public School	Educational	Consult	5
Edmonson, Edward, Erin, Railway, Coleman and Macleay Streets	Residential	Consult	Various
The Penthouse	Residential	Consult	Various
Erin Earth	Educational	Consult	200
Wagga Wagga High School	Educational	Consult	20
TAFE Riverina Institute	Educational	Consult	40

7.6 Occupational Noise Exposure

In accordance with CoA E77, worksites will be managed to ensure that noise generated by construction will not exceed the National Standard for exposure to noise in the occupational



environment of an eight-hour equivalent continuous A-weighted sound pressure level of LAeq,8h of 85 dBA for any employee working at a location near the project.

It is not anticipated that an exceedance will occur at any point during the project, however occupational exposure to noise will primarily be managed under the Work Health and Safety Management Plan.

7.7 Monitoring

Noise and vibration monitoring will be undertaken in accordance with the CNVMP (including monitoring program) and the CNVF.

CoA E81 requires that advice from an independent heritage specialist must be sought on methods and locations for installing equipment used for vibration, movement and noise monitoring at heritage-listed structures prior to the installation of the equipment.

Construction Noise Monitoring

Construction noise monitoring will be carried out at the commencement of activities to confirm that actual noise levels are consistent with the predictions presented in this CNVIS, and that the management measures that have been implemented are effective or as per the CNVMP.

Given the short duration of activities covered under this CNVIS. It is proposed to only monitor for the median demolition along Docker Street, due to the use of medium hydraulic hammers and vibratory rollers. Indicative locations are identified in **Table 21**, however, these will be subject to provision of safe access and the specific location of work being undertaken at the time of monitoring.

Noise monitoring will, where practicable, be in a position with 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). The preferred measurement height is 1.2-1.5m above the ground. In accordance with *Australian Standard AS1055:2018*, outdoor noise monitoring is to be undertaken at least 3.5m from any reflecting structure other than the ground.

Noise monitoring will be carried out on or near the property boundary at the locations representative of the nominated receivers in **Table 21** (i.e. in publicly accessible areas near the nominated receivers, if it is safe to do so). Noise monitoring results will be assessed against the noise management levels (NMLs) and exceedance category identified based on the distances outlined in **Table 14** for each scenario.

The results will be documented with discussion about the details of work underway at the time and mitigation in place. Noise monitoring results will be recorded on the MR Noise Monitoring Form in Procore. Noise monitoring data will be made available to the AA and ER for information, upon request.

Construction Vibration monitoring

Attended or unattended vibration monitoring will be undertaken as required. Monitoring locations may vary as work progresses and will be determined on a case-by-case basis or in response to complaints. The focus of monitoring will be at risk buildings, structures and sensitive receivers as identified in **Section 6.0**. If other vibration intensive activities are required, an assessment of their potential impact is required as per the CNVMP.

Vibration monitoring is proposed to occur at Docker Medical building during vibration intensive activities in consultation with the stakeholder and subject to provision of safe access and the specific location of work being undertaken at the time of monitoring.



Vibration monitoring data will be made available to the AA and ER for information, upon request.

Table 21 Indicative Monitoring Locations

Location	Type	Monitoring	Timing
Noise Monitoring			
<ul style="list-style-type: none"> 5 Docker Street Docker Medical Building (10 Docker Street – when in use) 	Activities based noise monitoring	<ul style="list-style-type: none"> Confirming that actual noise levels are consistent with predicted noise impacts and that the effectiveness of actions and mitigation measures implemented are satisfactory In response to a noise related complaint(s) (determined on a case-by-case basis) Following implementation of mitigation measures or noise attenuation because of exceedance of predicted noise levels 	At the commencement of the activities being undertaken
	Out of Hours Work	Attended monitoring as required by the Out of Hours Work (OOHW) plan to validate noise levels are consistent with predicted noise impacts and that the effectiveness of actions and mitigation measures implemented are satisfactory	At the commencement of activities involving a hydraulic hammer and/or vibratory roller.
	Plant / Equipment Checks	Spot checks would be carried out as required on a case-by-case basis, such as <ul style="list-style-type: none"> In response to a specific noise related complaint and During noise verification monitoring when it is possible to isolate the noise from one piece of plant or equipment. 	case-by-case basis
Vibration Monitoring			
<ul style="list-style-type: none"> Docker Medical Building (when in use) 	Activities based vibration monitoring	<ul style="list-style-type: none"> Confirming that vibration levels are below criteria and that the effectiveness of actions and mitigation measures implemented are satisfactory In response to a vibration related complaint(s) (determined on a case-by-case basis) 	Throughout vibration generating activities being undertaken within minimum working distances to nearby receivers.



8.0 Cumulative Impacts

Cumulative construction noise impacts can occur where multiple work activities are being completed near to a particular receiver at the same time. There is potential for cumulative construction impacts from multiple construction activities being completed in different areas of the project (ie Line Marking and Signage works).

Since the construction scenarios required for various stages of the project would generally require similar items of equipment, concurrent construction work being completed near to a particular area could theoretically increase the worst-case noise levels in this report by around 3 dB (ie a logarithmic adding of two sources of noise at the same level).

The likelihood of worst-case noise levels being generated by two different work activities at the same time is, however, considered low and rather than increase construction noise levels, the impact of concurrent work would generally be a limited to a potential increase in the duration, and annoyance, of noise impacts on the affected receivers.

In practice, construction noise levels in any one location would vary and would be frequently much lower than the worst-case scenario assessed due to construction staging moving work around within the study area and, in many cases, only a few items of equipment being used at any one time.

Martinus Rail will take feasible and reasonable steps to consult and coordinate with other construction projects when they become aware of them and if 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 (in accordance with CoA E72 and E83).





Appendix A Acoustic Terminology

A2I | Albury to Illabo – Wagga Wagga Traffic Mitigation

Construction Noise and Vibration Impact Statement

Martinus Rail

SLR Project No.: 610.031317.00001

30 July 2025

1. Sound Level or Noise Level

The terms 'sound' and 'noise' are almost interchangeable, except that 'noise' often refers to unwanted sound.

Sound (or noise) consists of minute fluctuations in atmospheric pressure. The human ear responds to changes in sound pressure over a very wide range with the loudest sound pressure to which the human ear can respond being ten million times greater than the softest. The decibel (abbreviated as dB) scale reduces this ratio to a more manageable size by the use of logarithms.

The symbols SPL, L or LP are commonly used to represent Sound Pressure Level. The symbol LA represents A-weighted Sound Pressure Level. The standard reference unit for Sound Pressure Levels expressed in decibels is 2×10^{-5} Pa.

2. 'A' Weighted Sound Pressure Level

The overall level of a sound is usually expressed in terms of dBA, which is measured using a sound level meter with an 'A-weighting' filter. This is an electronic filter having a frequency response corresponding approximately to that of human hearing.

People's hearing is most sensitive to sounds at mid frequencies (500 Hz to 4,000 Hz), and less sensitive at lower and higher frequencies. Different sources having the same dBA level generally sound about equally loud.

A change of 1 dB or 2 dB in the level of a sound is difficult for most people to detect, whilst a 3 dB to 5 dB change corresponds to a small but noticeable change in loudness. A 10 dB change corresponds to an approximate doubling or halving in loudness. The table below lists examples of typical noise levels.

Sound Pressure Level (dBA)	Typical Source	Subjective Evaluation
130	Threshold of pain	Intolerable
120	Heavy rock concert	Extremely noisy
110	Grinding on steel	
100	Loud car horn at 3 m	Very noisy
90	Construction site with pneumatic hammering	Loud
80	Kerbside of busy street	
70	Loud radio or television	
60	Department store	Moderate to quiet
50	General Office	
40	Inside private office	Quiet to very quiet
30	Inside bedroom	
20	Recording studio	Almost silent

Other weightings (eg B, C and D) are less commonly used than A-weighting. Sound Levels measured without any weighting are referred to as 'linear', and the units are expressed as dB(lin) or dB.

3. Sound Power Level

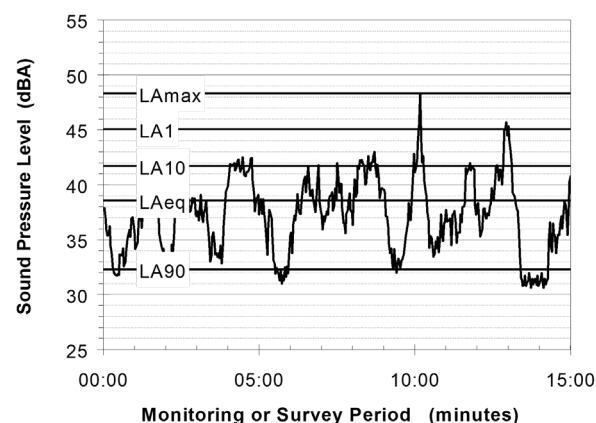
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or LW, or by the reference unit 10^{-12} W.

The relationship between Sound Power and Sound Pressure is similar to the effect of an electric radiator, which is characterised by a power rating but has an effect on the surrounding environment that can be measured in terms of a different parameter, temperature.

4. Statistical Noise Levels

Sounds that vary in level over time, such as road traffic noise and most community noise, are commonly described in terms of the statistical exceedance levels LAN, where LAN is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the LA1 is the noise level exceeded for 1% of the time, LA10 the noise exceeded for 10% of the time, and so on.

The following figure presents a hypothetical 15 minute noise survey, illustrating various common statistical indices of interest.



Of particular relevance, are:

- LA1 The noise level exceeded for 1% of the 15 minute interval.
- LA10 The noise level exceeded for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.
- LA90 The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.
- LAeq The A-weighted equivalent noise level (basically, the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.
- LAmax The A-weighted maximum sound pressure level of an event measured with a sound level meter.

5. Frequency Analysis

Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal.

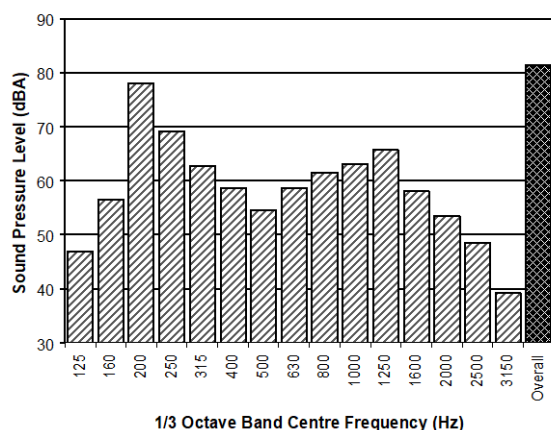
The units for frequency are Hertz (Hz), which represent the number of cycles per second.

Frequency analysis can be in:

- Octave bands (where the centre frequency and width of each band is double the previous band)
- 1/3 octave bands (three bands in each octave band)
- Narrow band (where the spectrum is divided into 400 or more bands of equal width)



The following figure shows a 1/3 octave band frequency analysis where the noise is dominated by the 200 Hz band. Note that the indicated level of each individual band is less than the overall level, which is the logarithmic sum of the bands.



6. Annoying Noise (Special Audible Characteristics)

A louder noise will generally be more annoying to nearby receivers than a quieter one. However, noise is often also found to be more annoying and result in larger impacts where the following characteristics are apparent:

- **Tonality** - tonal noise contains one or more prominent tones (ie differences in distinct frequency components between adjoining octave or 1/3 octave bands), and is normally regarded as more annoying than 'broad band' noise.
- **Impulsiveness** - an impulsive noise is characterised by one or more short sharp peaks in the time domain, such as occurs during hammering.
- **Intermittency** - intermittent noise varies in level with the change in level being clearly audible. An example would include mechanical plant cycling on and off.
- **Low Frequency Noise** - low frequency noise contains significant energy in the lower frequency bands, which are typically taken to be in the 10 to 160 Hz region.

7. Vibration

Vibration may be defined as cyclic or transient motion. This motion can be measured in terms of its displacement, velocity or acceleration. Most assessments of human response to vibration or the risk of damage to buildings use measurements of vibration velocity. These may be expressed in terms of 'peak' velocity or 'rms' velocity.

The former is the maximum instantaneous velocity, without any averaging, and is sometimes referred to as 'peak particle velocity', or PPV. The latter incorporates 'root mean squared' averaging over some defined time period.

Vibration measurements may be carried out in a single axis or alternatively as triaxial measurements (ie vertical, longitudinal and transverse).

The common units for velocity are millimetres per second (mm/s). As with noise, decibel units can also be used, in which case the reference level should always be stated. A vibration level V , expressed in mm/s can be converted to decibels by the formula $20 \log (V/V_0)$, where V_0 is the reference level (10^{-9} m/s). Care is required in this regard, as other reference levels may be used.

8. Human Perception of Vibration

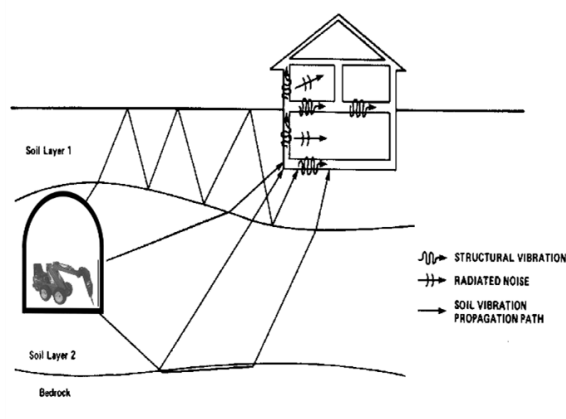
People are able to 'feel' vibration at levels lower than those required to cause even superficial damage to the most susceptible classes of building (even though they may not be disturbed by the motion). An individual's perception of motion or response to vibration depends very strongly on previous experience and expectations, and on other connotations associated with the perceived source of the vibration. For example, the vibration that a person responds to as 'normal' in a car, bus or train is considerably higher than what is perceived as 'normal' in a shop, office or dwelling.

9. Ground-borne Noise, Structure-borne Noise and Regenerated Noise

Noise that propagates through a structure as vibration and is radiated by vibrating wall and floor surfaces is termed 'structure-borne noise', 'ground-borne noise' or 'regenerated noise'. This noise originates as vibration and propagates between the source and receiver through the ground and/or building structural elements, rather than through the air.

Typical sources of ground-borne or structure-borne noise include tunnelling works, underground railways, excavation plant (eg rockbreakers), and building services plant (eg fans, compressors and generators).

The following figure presents an example of the various paths by which vibration and ground-borne noise may be transmitted between a source and receiver for construction activities occurring within a tunnel.



The term 'regenerated noise' is also used in other instances where energy is converted to noise away from the primary source. One example would be a fan blowing air through a discharge grill. The fan is the energy source and primary noise source. Additional noise may be created by the aerodynamic effect of the discharge grill in the airstream. This secondary noise is referred to as regenerated noise.





Appendix B Modelling Scenarios and Equipment

A2I | Albury to Illabo – Wagga Wagga Traffic Mitigation

Construction Noise and Vibration Impact Statement

Martinus Rail

SLR Project No.: 610.031317.00001

30 July 2025

Equipment		Total Lw (dBA)	Concrete agitator truck	Excavator - Tracked (3-5 t)	Excavator 10-15T + Hammer ¹	Grinder	Hand tools (electric)	Light Vehicle	Lighting - Daymaker	Line Marking Truck	Plate Compactor	Rattle Gun (hand held)	Roller – Vibratory ¹	Truck - Medium Rigid (20 t)	Truck - Vacuum (NDD or non-destructive digger)	Truck (flatbed)
Sound Power Level (Lw) ²			109	90	118	105	102	95	98	108	104	104	109	103	109	95
Estimated utilisation (%)			100	50	30	30	75	25	100	100	100	30	100	25	100	25
ID	Construction Scenario															
W.001	Sign Installation	110					1	2	1					1	1	1
W.002	Sign Installation (Hand tools only)	103					1	2	1							
W.003	Line Marking	110					1	4	1	1				2		1
W.004	Klem-flex installation	104					1	2	1			1				1
W.005	Temporary roundabout installation	111	1				1	10	1			1				1
W.006	Docker Street - Median Demolition	120	1		1		1		3		1		1	1		1
W.007	General	103						2	3							1
W.008	Kiss and Ride	114	1	1		1	1	3			1			1	1	1

Note 1: Equipment classed as 'annoying' in the ICNG and requires a 5 dB correction.
Note 2: Sound power level data is taken from the DEFRA Noise Database, AS2436 and TfNSW Construction Noise and Vibration Guideline.





Appendix C Noise Impact Maps

A2I | Albury to Illabo – Wagga Wagga Traffic Mitigation

Construction Noise and Vibration Impact Statement

Martinus Rail

SLR Project No.: 610.031317.00001

30 July 2025

Figure C-1 Noise Impact Map – W.001 Signage (Night-time)

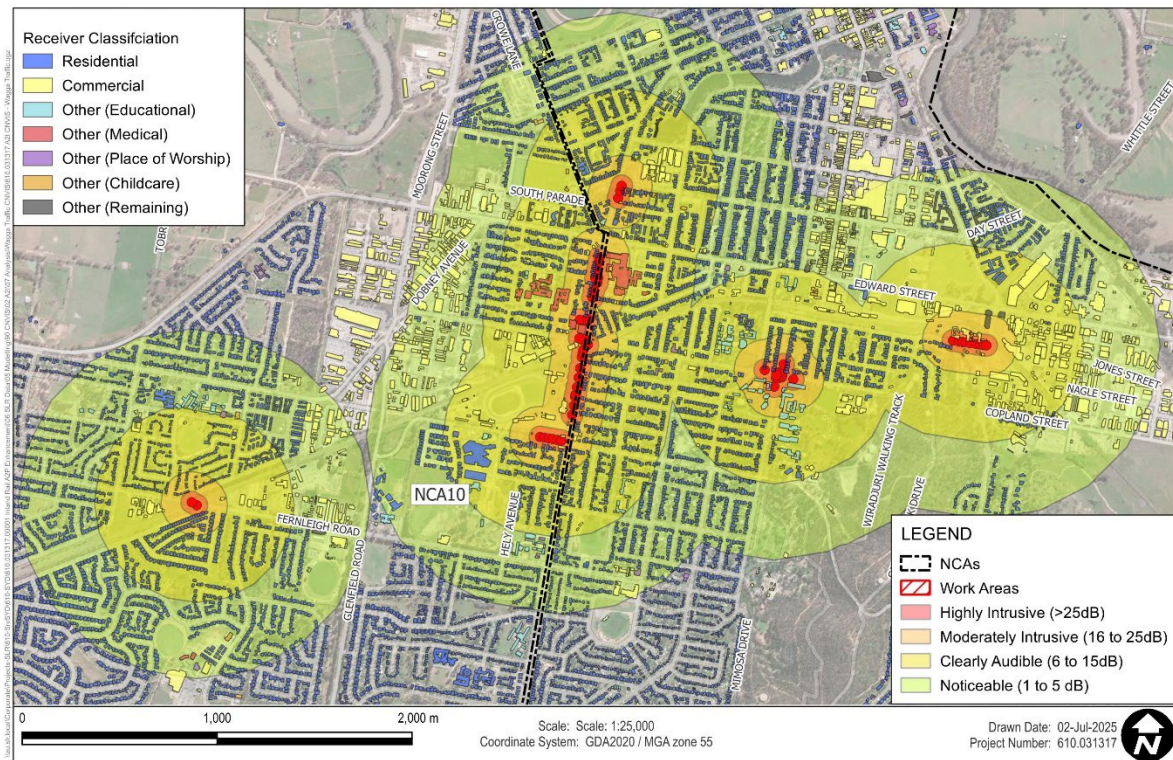


Figure C-2 Noise Impact Map – W.002 Signage – Handtools only (Night-time)



Figure C-3 Noise Impact Map – W.003 Line Marking (Night-time)

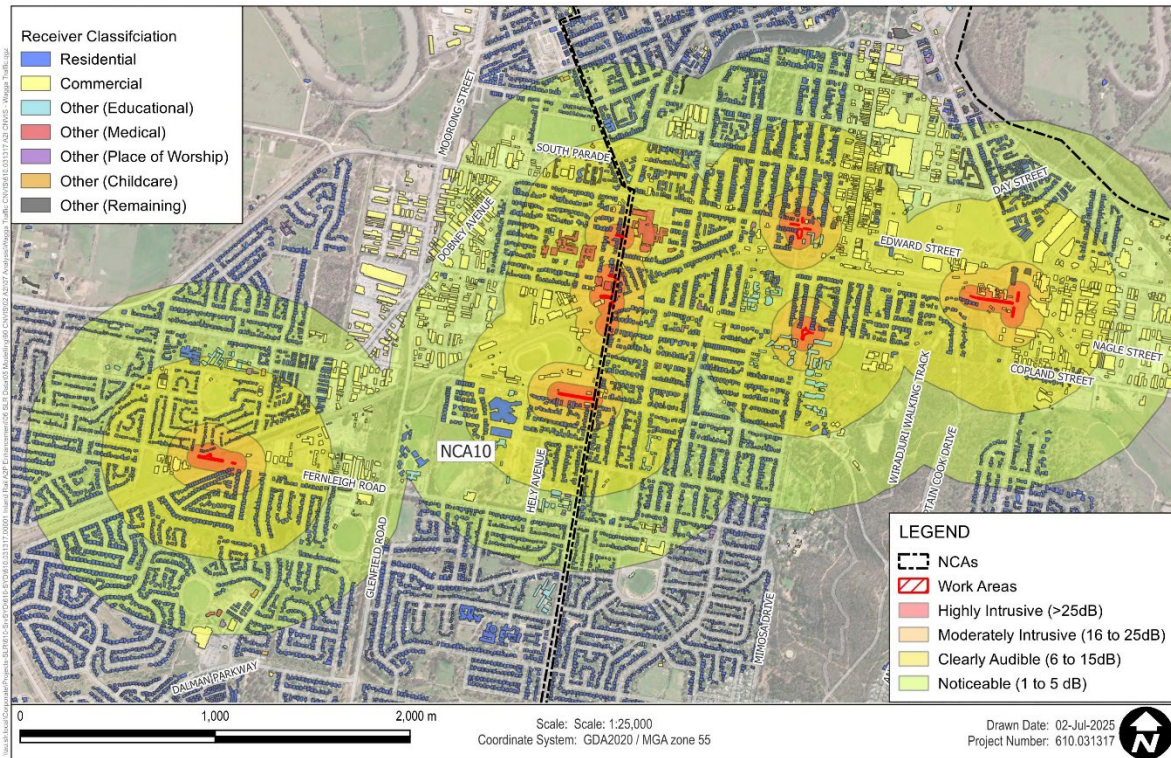


Figure C-4 Noise Impact Map – W.004 Klem-Flex Installation (Night-time)

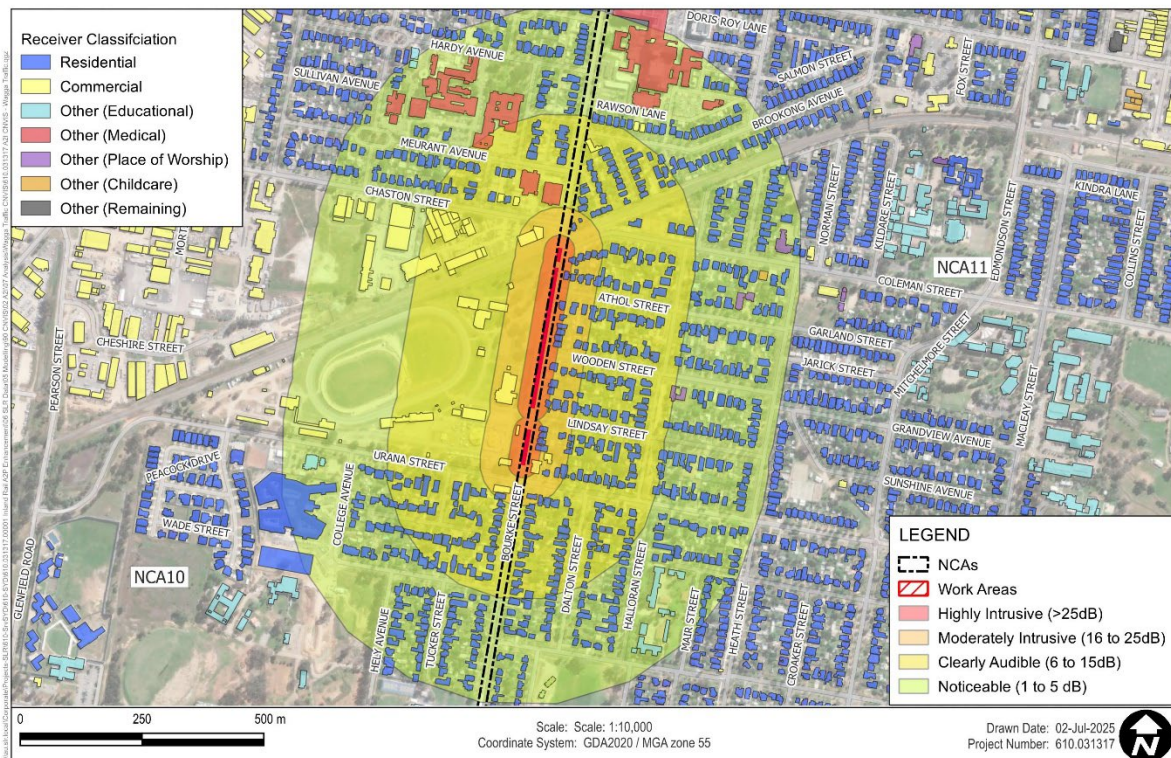


Figure C-5 Noise Impact Map – W.005 Temporary Roundabout Installation (Night-time)

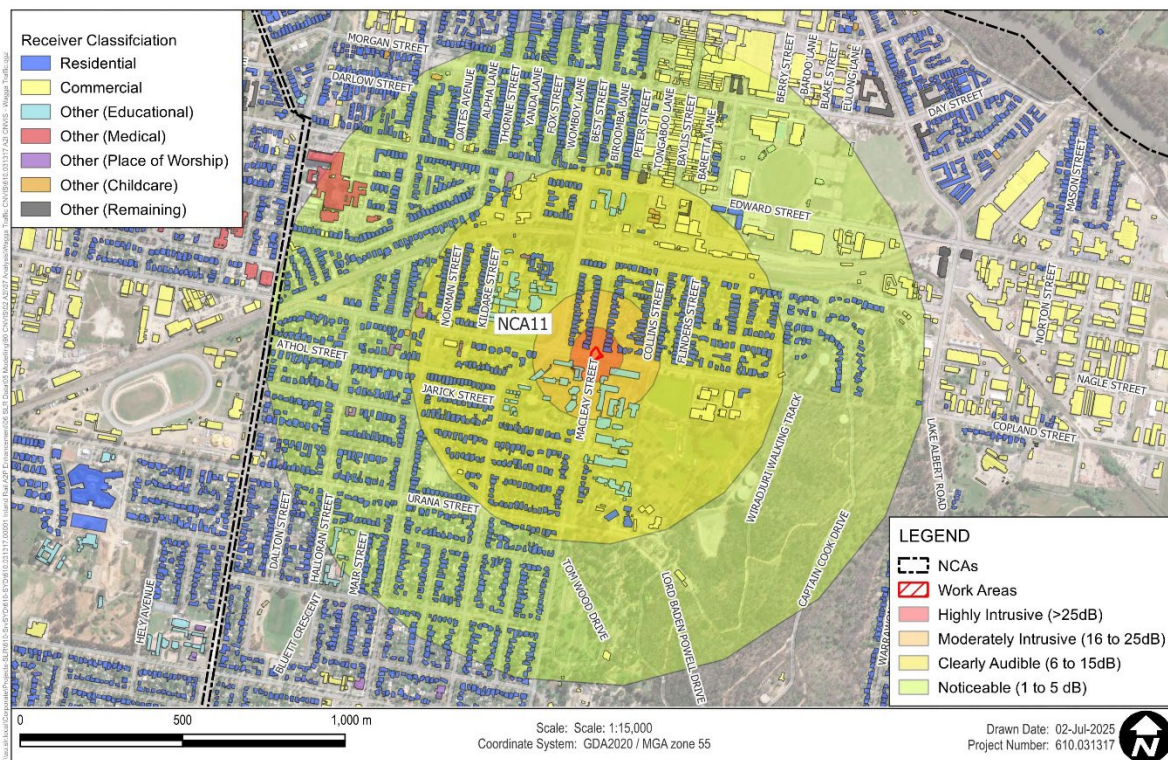


Figure C-6 Noise Impact Map – W.006 Median Demolition (Night-time)

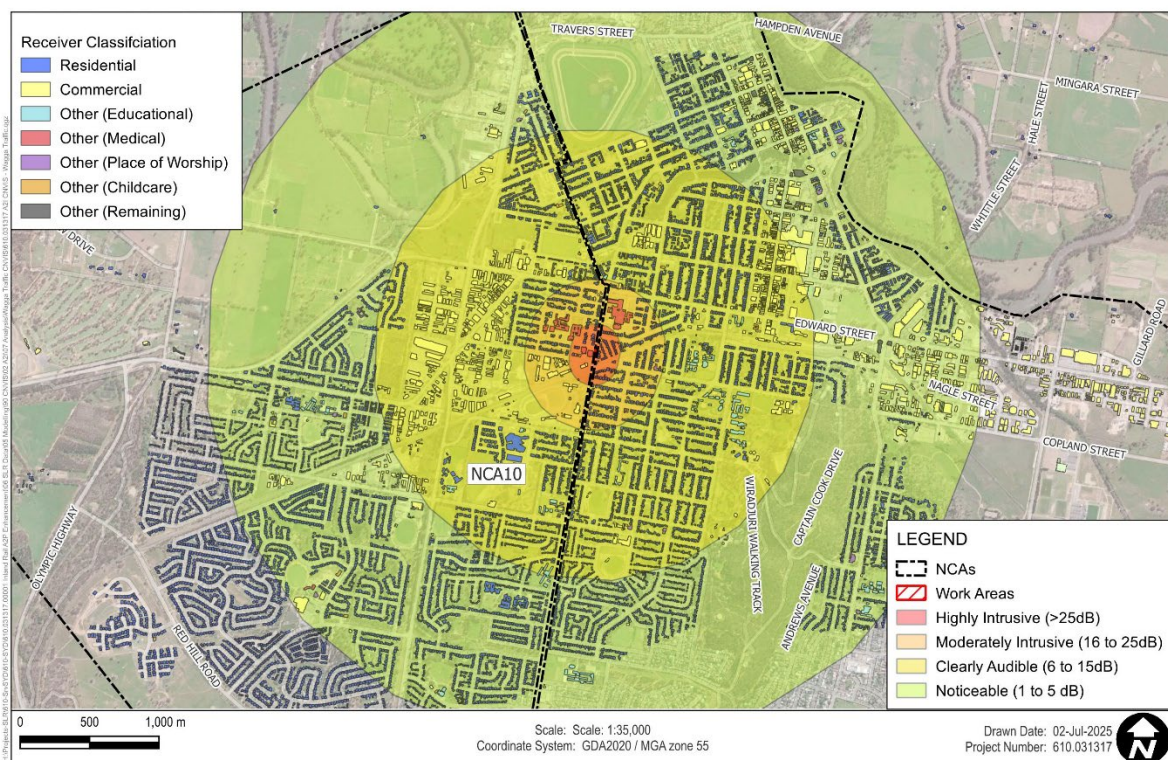


Figure C-7 Noise Impact Map – W.007 General (Night-time)

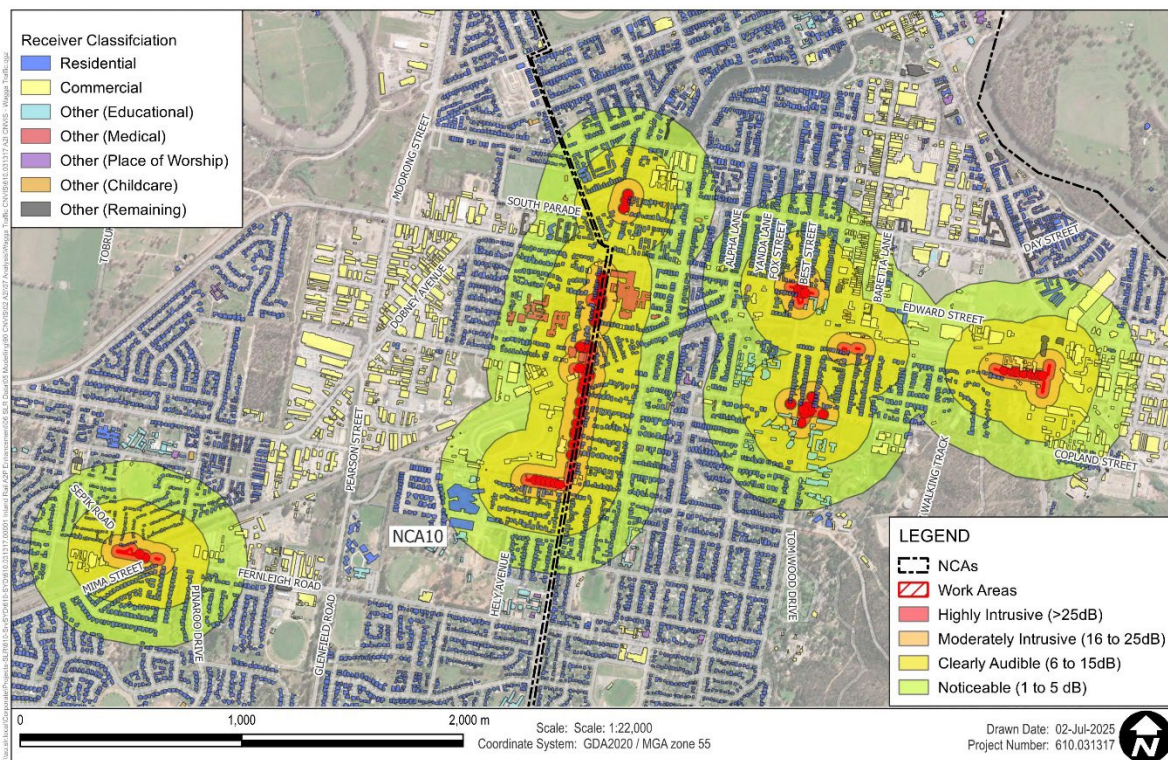
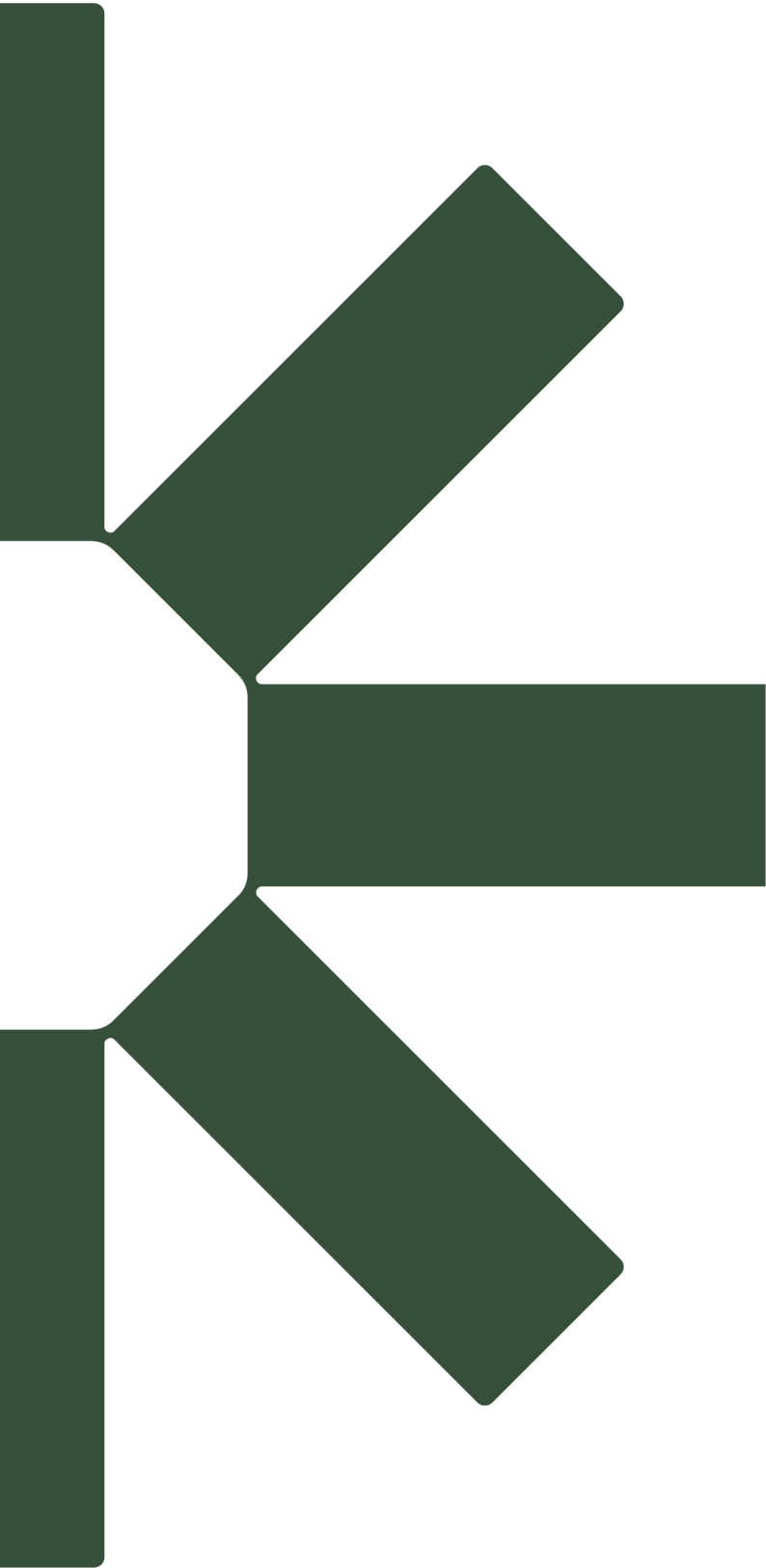


Figure C-8 Noise Impact Map – W.008 Kiss and Ride (Daytime)





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