The Northern Road and Bringelly Road Stage 2 Upgrade

Addendum review of environmental factors – Concrete and Asphalt Batch Plants

March 2018

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Roads and Maritime Services

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Prepared by Lendlease Engineering and Roads and Maritime Services

Document controls

Approval and authorisation

Title	The Northern Road and Bringelly Road Stage 2 Upgrade Addendum review of environmental factors – Concrete and Asphalt Batch Plants
Accepted on behalf of NSW Roads and Maritime Services by:	P. Nicholls
Signed:	P. Nicholls
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Document status	Date	Prepared by	Reviewed by
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Rev 1	12/03/18	Chris Churcher	Chris Churcher

Contents

Appendices

1 Introduction

1.1 Proposed modification overview

Roads and Maritime Services (Roads and Maritime) proposes to modify The Northern Road and Bringelly Road Stage 2 Upgrade project (the Project) by undertaking concrete and asphalt batching activities at the Belmore Road Compound (proposed modification). Key features of the establishment and operation of the proposed modification would include:

- Earthworks and foundation preparation
- Establishment of stabilised site access from Belmore Rd
- Connection of services
- Installation and commissioning of concrete and asphalt batch plants
- Delivery of raw materials
- Batching of concrete and asphalt
- Demobilisation of concrete and asphalt batch plants.

The location of the proposed modification is shown in Figure 1.1 and the proposed modification is shown in Figure 1.2. Chapter 3 describes the proposed modification in more detail.

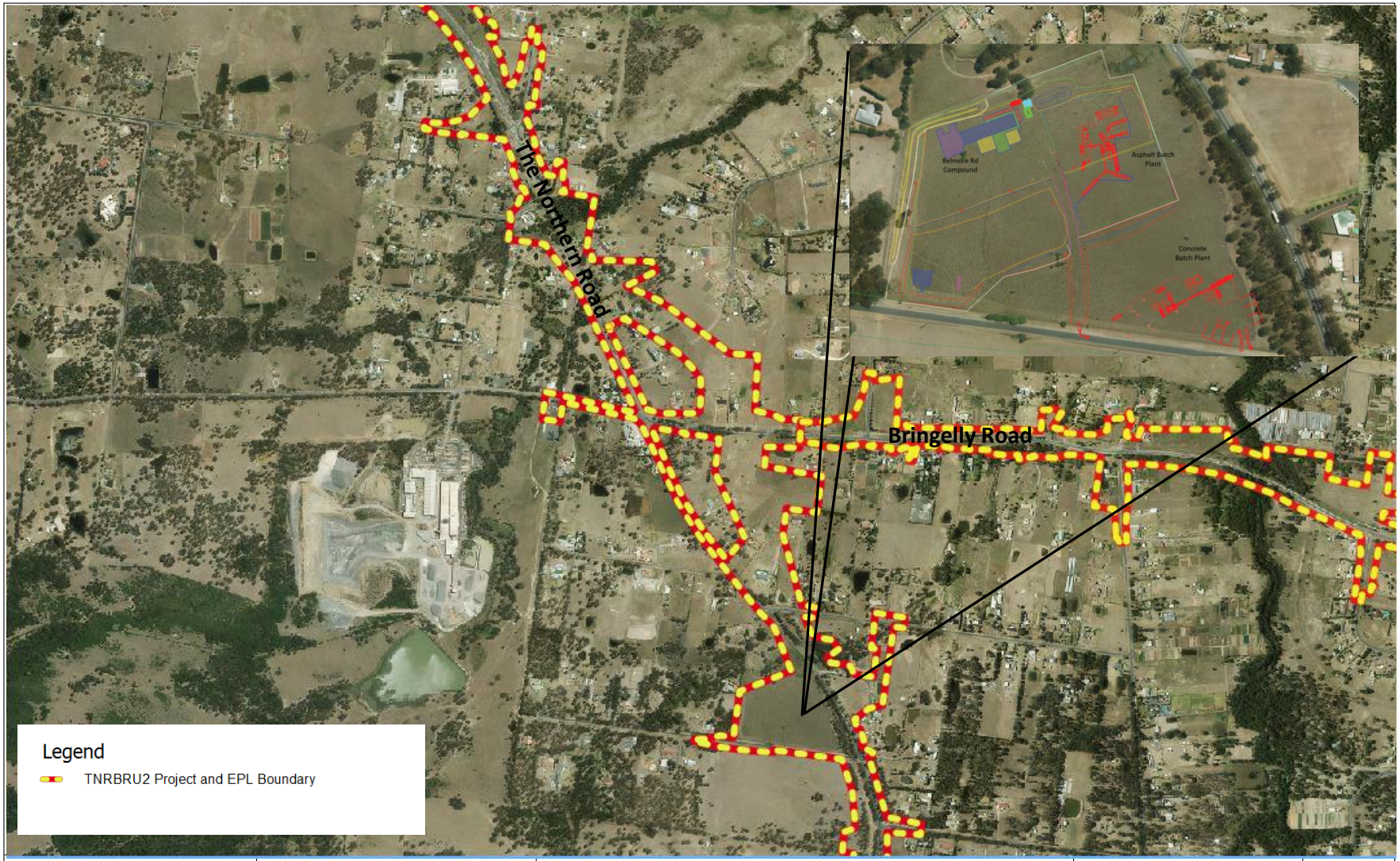
The Project is subject to three Review of Environmental Factors (REF):

- The Northern Road Upgrade – Narellan to Bringelly REF (October 2012)
- Bringelly Road Upgrade – Camden Valley Way to The Northern Road REF (November 2011)
- The Northern Road / Bringelly Road Grade Separated Interchange REF (November 2015).

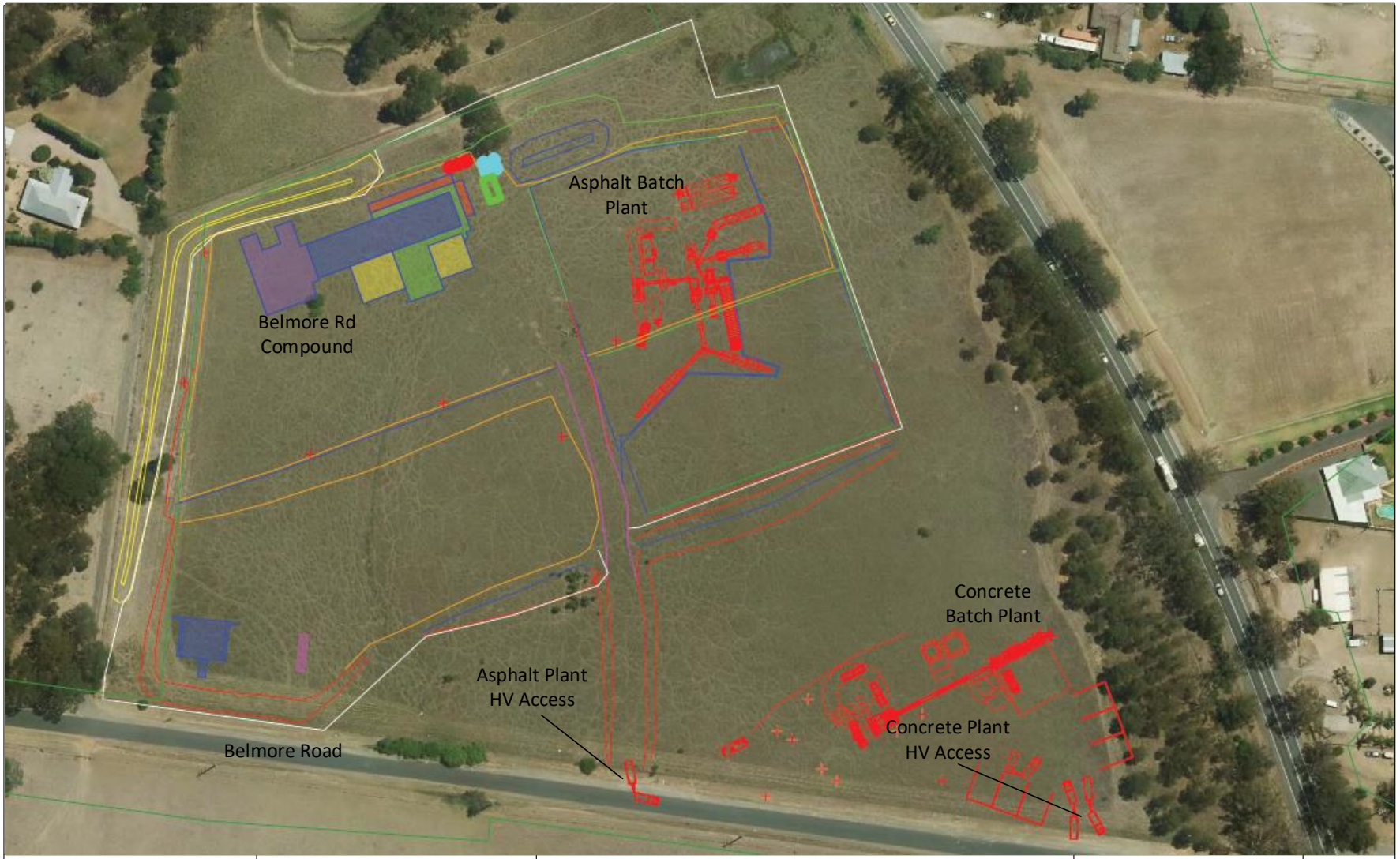
This document has been prepared as an Addendum REF to The Northern Road Upgrade – Narellan to Bringelly REF that was prepared in October 2012 (referred to in this addendum REF as the project REF). The project REF was placed on public display between October 2013 and November 2013 for community and stakeholder comment. A submissions report, dated March 2014 was prepared to respond to issues raised.

In addition, the following addendum REFs for the determined Project have been prepared:

- The Northern Road Upgrade Stage 2 – Upgrade of transmission line Addendum Review of Environmental Factors (GHD, 2016)
- The Northern Road Upgrade Stage 2 - Addendum Review of Environmental Factors (GHD, January 2017).



	Map Source: Google Earth, 2016	The Northern Road and Bringelly Road Stage 2 Upgrade	Plan No: AREF003 TNRBRU2 Drawn By: CC Date: 20/02/2018
	Scale 0 500 (metres)	**Addendum Review of Environmental Factors** **Figure 1.1** Location of Proposed Modification	N



	Map Source: Google Earth, 2016	The Northern Road and Bringelly Road Stage 2 Upgrade	Plan No: AREF003 TNR2BRU Drawn By: CC Date: 20/02/2018
	0 Scale 50 (metres)	**Addendum Review of Environmental Factors** **Figure 1.2** Batch Plants Layout	N

1.2 Purpose of the report

This addendum review of environmental factors (REF) has been prepared by Lendlease Engineering on behalf of Roads and Maritime. For the purposes of these works, Roads and Maritime is the proponent and the determining authority under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

This addendum REF is to be read in conjunction with the project REF, submissions report and previous addendum REFs for the Project. The purpose of this addendum REF is to describe the proposed modification, to document and assess the likely impacts of the proposed modification on the environment, and to detail protective measures to be implemented.

The description of the proposed work and associated environmental impacts have been undertaken in context of clause 228 of the Environmental Planning and Assessment Regulation 2000, the *Threatened Species Conservation Act 1995* (TSC Act), the *Fisheries Management Act 1994* (FM Act), and the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

In doing so, the addendum REF helps to fulfil the requirements of:

- Section 111 of the EP&A Act that Roads and Maritime examine and take into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity.

The findings of the addendum REF would be considered when assessing:

- Whether the proposed modification is likely to result in a significant impact on the environment and therefore the necessity for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning under Part 5.1 of the EP&A Act.
- The significance of any impact on threatened species as defined by the TSC Act and/or FM Act, in section 5A of the EP&A Act and therefore the requirement for a Species Impact Statement.
- The significance of any impact on nationally listed biodiversity matters under the EPBC Act, including whether there is a real possibility that the activity may threaten long-term survival of these matters, and whether offsets are required and able to be secured.
- The potential for the proposed modification to significantly impact any other matters of national environmental significance or Commonwealth land and therefore the need to make a referral to the Australian Government Department of the Environment for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the EPBC Act.

2 Need and options considered

2.1 Strategic need for the proposed modification

Chapter 2 of the project REF addresses the strategic need for the Project, the project objectives and the options that were considered. The proposed modification described and assessed in this addendum REF is consistent with the strategic need for the Project.

The Project requires approximately 200,000t of asphalt and 150,000m^3 of concrete to carry out construction. The proposed modification would also provide these construction materials to the adjacent The Northern Road Upgrade Stages 2 and 3 and Bringelly Road Upgrade projects. This would also provide benefit to the wider community and road network by reducing construction material delivery routes for these other projects.
To facilitate production of the materials the proposed modification would include the construction of concrete and asphalt batch plants within the Belmore Road Site Compound. The Belmore Site Compound was chosen as the location following rigorous assessment of alternative options. The asphalt plant would be located within the compound itself and the concrete plant will be located between the existing and new Belmore Road alignments.

2.2 Proposal objectives and development criteria

The strategic objective of The Northern Road upgrade is to support the development of the South West Growth Centre. The main objectives of the proposal are:

- Improve the accessibility of The Northern Road to accommodate for the future traffic growth generated from the South West Growth Centres.
- Reduce future traffic congestion.
- Minimise the impact on the environment along the route.
- Improve accessibility and efficiency for public transport.
- Improve safety for pedestrians, cyclists and motorists.
- Minimise the project 'whole of life cost'.

Specifically, the proposed modification aims to provide a reliable and close source of concrete and asphalt material require to carry out the construction of the Approved Project. The proposal will ensure that these materials do not have to be delivered to site from off-site producers, reducing the distance construction vehicles are required to travel to deliver these materials to site. Additionally, this will ensure construction vehicles associated with the delivery of these materials are constrained to the immediate area surrounding the Project. On site production of concrete and asphalt will ensure the Project is not relying on these materials from a third party produces, thus providing a reliable source of materials and reducing project costs.

The proposed modification would also provide these construction materials to the adjacent The Northern Road Upgrade Stages 2 and 3 and Bringelly Road Upgrade projects. This would also provide benefit to the wider community and road network by reducing construction material delivery routes for these other projects.

2.3 Alternatives and options considered

2.3.1 Identified options

Option 1: Off-site supply
This option would require the Project to source concrete and asphalt from external suppliers beyond the Project area. Under this option asphalt would be required to be sourced from Enfield at a distance of approximately 48 kilometres from the furthest extent of the Project. Concrete would

be required to be sourced from Prestons at approximately 25 kilometres from the furthest extent of the project boundary.

Option 1 not only has the potential to increase traffic impacts on the wider road network but also introduces potential impacts to the quality of construction materials arriving to site. Potential traffic delays would lead to increased delivery times which may affect the quality of the materials. This may in turn lead to impacts to quality of structures and pavements which may in turn lead to increased re-work on site.

Option 2: On-site production
This option would require the construction, commissioning and operation of concrete and asphalt batch plants on site, as assessed in the project REF and The Northern Rd Upgrade Stage 2 Addendum Review of Environmental Factors (February 2017). On-site production of these materials would have the following project benefits:

- Local source of guaranteed supply of construction material for the Project and adjacent Roads and Maritime projects
- Project control over the quality of material being produced
- Reduced travel time of materials ensuring higher quality product
- Reduced travel time of materials reducing the overall carbon footprint of the Project via reduced fuel use
- Reduced construction vehicles on the wider road network
- Allows for the recycling of up to 25,000t of existing road pavement.

The following criteria were considered when identifying an on-site location for the concrete and asphalt batch plant facility:

- Appropriate land size to allow for safe operation
- Distance from waterways
- Distance from residents and sensitive receivers
- Centrality of location to reduce haul routes
- Minimal environmental impacts
- Proximity to services for mains connections.

Following a review of the Project construction areas and consideration of the above factors, Belmore Road Compound was considered the most suitable location to establish the concrete and asphalt batch plants.

2.3.2 Analysis of options

An analysis of the three options is presented in Table 2-1 below.

Table 2-1 Analysis of options

	Option 1	Option 2
Does this align with the Project Objectives?	No	Yes
Does this reduce the number of construction vehicles on the wider road network?	No – this option would require off-site supply of construction materials creating greater pressure on the wider road network.	Yes – on-site production of construction material would reduce the number of construction vehicles on the wider road network.

	Option 1	Option 2
Does this provide a reliable source of construction materials?	Yes – construction materials would still be able to be reliably sourced from other sources further from the Project area.	Yes – this option would ensure the Project and adjacent projects would have a close and reliable source of construction materials.
Does this reduce Project costs?	No – this option would not allow for a reduction in Project costs.	Yes – this option would allow the Project to reduce costs through on-site production of construction materials.
Does this create significant additional environmental impacts?	No – this option is consistent with the impacts presented in the project REF.	No – this option is consistent with the impacts presented in the project REF.

2.4 Preferred option

Option 2, the on-site production of concrete and asphalt, is the preferred option to meet project objectives while providing a cost effective solution and reducing environmental impacts.

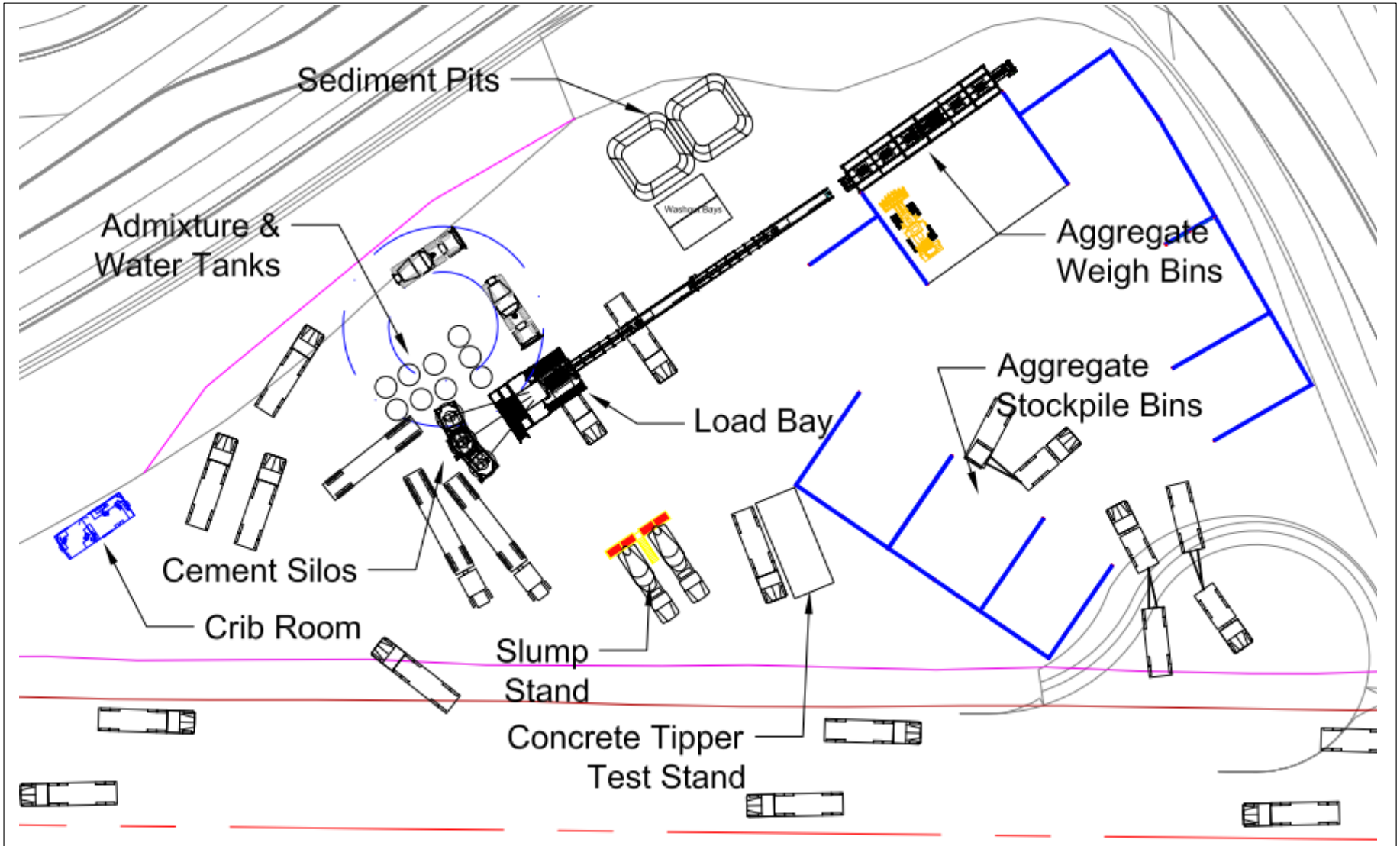
3 Description of the proposed modification

3.1 The proposed modification

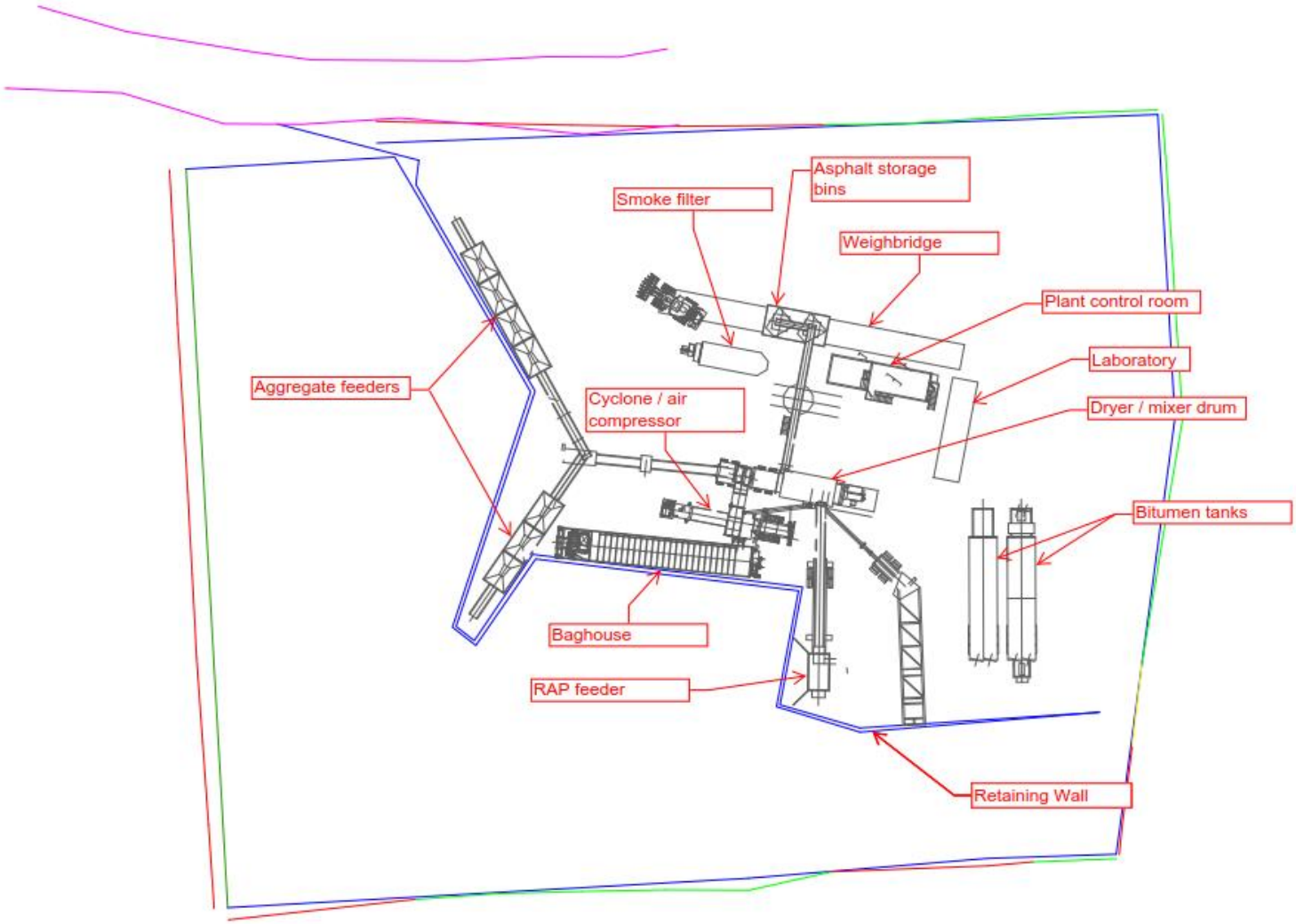
Roads and Maritime proposes to modify The Northern Road and Bringelly Road Stage 2 Upgrade project by undertaking concrete and asphalt batching activities at the Belmore Road compound. The proposed modification is shown in Figure 1.1 and in greater detail in Figure 3-1 and Figure 3-2.

Key features of the proposed modification would include:

- Earthworks and foundation preparation
- Installation of block retaining wall for asphalt batch plant
- Installation of 2 additional site access points from Belmore Rd
- Connection of services
- Installation and commissioning of concrete and asphalt batch plants
- Delivery of raw materials
- Batching of concrete and asphalt
- Demobilisation of concrete and asphalt batch plants.



Concrete Batch Plant	Map Source: Google Earth, 2016 0 Scale 15 (metres)	The Northern Road and Bringelly Road Stage 2 Upgrade **Addendum Review of Environmental Factors** **Figure 3.1** Concrete Batch Plant Layout	Plan No: AREF003 TNR2BRU Drawn By: CC Date: 20/02/2018



Asphalt Plant	Map Source: Lend Lease Engineering	The Northern Road and Bringelly Road Stage 2 Upgrade	Plan No: AREF003 TNR2BRU Drawn By: CC Date: 20/02/2018	N
	0 Scale 15 (metres)	**Addendum Review of Environmental Factors** **Figure 3.2** Asphalt Batch Plant Layout		

3.2 Construction activities

3.2.1 Work methodology

Establishment of the proposed modification would involve the following activities:

- Site establishment including fencing and installation of erosion and sediment controls
- Earthworks to level the site to allow drainage and establish hardstand including modifications to the existing hardstands within the Belmore Road Site Compound
- Concrete works for footings and paths
- Construction of retaining wall
- Installation of conduits for service connections
- Placement of prefabricated structures and connection to mains water and temporary generators.

As detailed above, establishment of the batch plant site would require earthworks. Total earthworks volumes are estimated to be approximately 6,000m3. Erosion and sediment controls would be established prior to commencement of disturbance of topsoil associated with the establishment of the proposed facility to prevent erosion of exposed earth.

Concrete batching methodology:

- Load materials into batch plant
- Produce Concrete
- Load Concrete into Truck
- Test Concrete and add water and admixtures (where required)
- Deliver Concrete to work site
- Truck returns to batch plant and reloads
- At end of shift concrete truck washes out at the washdown bay feeds into first flush

Asphalt batching methodology:

- Load materials into batch plant
- Produce Asphalt
- Load Asphalt into Truck
- Test Asphalt temperature profiles
- Deliver Asphalt to work site
- Truck returns to batch plant and reloads

3.2.2 Construction hours and duration

The proposed modification would be carried out during standard construction hours. These are:

- Monday to Friday: 7am to 6pm
- Saturday: 8am to 1pm
- Sunday and Public Holidays: no work.

At times of peak production and in order to reduce the number of truck movements at the plants during the day, heavy vehicles would deliver raw materials between 6pm and 10pm on weeknights. Any deliveries undertaken outside standard construction hours would be undertaken in accordance with the Approved Construction Environmental Management Plan, movements

Prior to permanent connection to mains power, a small 60kVA generator will be required to operate overnight and on weekends to maintain the temperature of the bitumen stored in tanks on site. This is purposely run on its own generator instead off the main 1100kVa generator to reduce noise impacts. Following installation, the Project would review the location of any equipment required to run outside of standard construction hours and investigate the potential for shielding/hoarding solutions to further reduce noise and visual impacts.

The concrete batch plant will be required to operate between 6pm and 6am on several occasions to service the Bringelly Interchange Voided Slab Concrete Pour. The asphalt batch plant will be required to operate between 6pm and 6am for in the order of 100 shifts to complete the Asphalt Wearing Course on the Main Carriageway prior to the completion of the project. To complete these works one carriageway of the road must be closed and traffic temporarily diverted to the second carriageway so works can be completed. To minimise disruption and ensure safety of road users this work must be undertaken outside standard construction hours. The asphalt batch plant may also be required to operate on nightshift to assist in temporary traffic switches where asphalt must be placed to tie in to existing road during the traffic switch.

All works outside of standard construction hours will be undertaken in accordance with the project Noise and Vibration Management Plan, the conditions of EPL#20864 and the Approved Out of Hours Work Protocol. This is discussed further in section 6.2.

It is intended that both batch plants will be fully operational by May 2018 and would cease operation immediately upon fulfilling the requirements of Stage 2 of the Northern Rd and Stage 2 of the Bringelly Rd Upgrade Projects.

3.2.3 Plant and equipment

The establishment of the concrete and asphalt batch plants would incorporate the following elements:

- D9 tracked bulldozer
- 25t excavator
- Grader
- Water cart
- 25t articulated dump truck
- Bogie tipper
- 18t smooth/pad drum roller
- 20t pick and carry mobile crane
- 200t Slew Crane
- Concrete Agitators
- Spray Trucks.

The concrete batch plant would incorporate the following elements:

- Twin drum mixer with incline conveyor overhead aggregate storage and feeder bins
- Up to 3 no. silos for cement, fly ash and Slag storage
- Up to 2 no. cement supertankers for additional cement storage
- Batching hut
- Electrical switch room container
- 2 x 500 kVA Generators (self-bunded), (temporary only until permanent power connection is made)
- Small generator
- Air compressors
- Up to 8 no. bunded admixture tanks
- 3 x 300,000 litre water tanks
- Testing laboratory
- Containers for general storage of batch plant spare parts where required
- Front end loaders to feed materials into plant
- First flush system
- Slump stands
- Ground storage bins for aggregates and sands
- Truck wash bays
- Concrete drying bed.

The asphalt batch plant would incorporate the following elements:

- T400 asphalt plant with double barrel mixer/dryer with feeder bins incline conveyors
- Up to 8 no storage silos/tankers for bitumen, fuel, lime
- Control Room
- 1 x 1100 kVA & 1 x 60 kVA Generators (self-bunded), (temporary only until permanent power connection is made)
- Air compressors
- Small water tanks
- Testing laboratory
- Containers for general storage of batch plant spare parts where required
- Front end loaders to feed materials into plant
- Ground storage bins for aggregates and sands
- Truck wash bays
- Weighbridge.

3.2.4 Earthworks

As detailed in Section 3.3.1, establishment of the batch plant site would require earthworks. Total earthworks volumes are estimated to be approximately 6,000m3. Erosion and sediment controls would be established prior to commencement of disturbance of topsoil associated with the establishment of the proposed facility to prevent erosion of exposed earth.

3.2.5 Source and quantity of materials

The raw material required for asphalt production, lean mix concrete, and other concrete products are presented in Table 3-1, Table 3-2 and Table 3-3 respectively below.

Table 3-1 Raw material required for asphalt production

Material	Source	Estimated quantity (tonnes)
Aggregate	Peppertree Quarry	155,000t
Sand	Peppertree Quarry	51,000t
Hydrated lime	Boral Cement	4,500t
Bitumen	Bitumen Importers Australia	7,500t
Bitumen – PMB	SAMI Bitumen	7,500t
Reclaimed asphalt product	Project site	25,000t

NB: Based on 300,000t of asphalt to be produced on site

Table 3-2 Raw material required for lean mix concrete production

Material	Source	Estimated quantity
Aggregate	Dunmore Quarry	109,000t
Coarse sand	Peppertree Quarry	66,000t
Fine sand	Dunmore Quarry	17,000t
Cement	Boral Cement	9,500t
Fly ash	Flyash Australia	16,00t
Water	Mains water	15,300kL
Admixtures	Boral Australia	As required by specification

NB: Based on 100,000m^3 of lean mix concrete to be produced on site

Table 3-3 Raw material required for other concrete production

Material	Source	Estimated quantity
Aggregate	Dunmore Quarry	5,000t
Coarse sand	Peppertree Quarry	23,500t
Fine sand	Dunmore Quarry	12,000t
Cement	Boral Cement	12,5000t
Fly ash	Flyash Australia	5,750t
Slag	Boral Cement	4,750t
Water	Mains water	9,650kL
Admixtures	Boral Australia	As required by specification

NB: Based on 50,000m^3 of other concrete to be produced on site

3.2.6 Traffic management and access

The earthworks and site preparation for the batch plants includes the construction of two new stabilised access points from the existing compound onto Belmore Rd. These access points would provide for separation of heavy vehicles accessing the two batch plants and light vehicles accessing the existing site facilities and office space. A Traffic Control Plan would be prepared to address the vehicle movements and in accordance with the Project Traffic Management Plan.

No additional traffic management or access measures beyond those identified in the project REF would be required to carry out the proposed modification.

3.3 Ancillary facilities

No additional ancillary facilities would be required to carry out the proposed modification. The concrete and asphalt batch plants would be located within the existing Belmore Road ancillary facility.

3.4 Public utility adjustment

To carry out the proposed modification, the concrete and asphalt batch plants would require to be connected to the following services:

- Water to be connected to Sydney Water mains on Bringelly Road. Temporary pipe will be run through the project between the batch plants and Bringelly Road.
- Power will be temporarily supplied by generators until the connection to the mains power powerlines on Belmore Road is approved.

3.5 Property acquisition

No additional property acquisitions would be required to carry out the proposed modification.

4 Statutory and planning framework

4.1 Environmental Planning and Assessment Act 1979

Under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) (Sections 111(1)), all proposals must examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity. The project REF represented the fulfillment of this requirement and provided adequate environmental management measures to avoid or mitigate any adverse environmental impacts of the Project. This Addendum REF addresses this requirement under the EP&A Act for the proposed modification to the assessed project.

4.1.1 State Environmental Planning Policies

State Environmental Planning Policy (Infrastructure) 2007

State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) aims to facilitate the effective delivery of infrastructure across the State.

Clause 94 of ISEPP permits development on any land for the purpose of a road or road infrastructure facilities to be carried out by or on behalf of a public authority without consent.

As the proposed modification is for a road and is to be carried out on behalf of Roads and Maritime, it can be assessed under Part 5 of the *Environmental Planning and Assessment Act 1979*. Development consent from council is not required.

The proposed modification is not located on land reserved under the *National Parks and Wildlife Act 1974* and does not affect land or development regulated by *State Environmental Planning Policy No. 14 - Coastal Wetlands*, *State Environmental Planning Policy No. 26 - Littoral Rainforests*, *State Environmental Planning Policy (State and Regional Development) 2011* or *State Environmental Planning Policy (Major Development) 2005*.

Part 2 of the ISEPP contains provisions for public authorities to consult with local councils and other public authorities prior to the commencement of certain types of development. Consultation, including consultation as required by ISEPP (where applicable), is discussed in chapter 5 of this addendum REF.

State Environmental Planning Policy (Sydney Region Growth Centres) 2006

The site for the proposed modification (the proposal site) is located within land subject to *State Environment Planning Policy (Sydney Region Growth Centres) 2006* (the Growth Centres SEPP). The Growth Centres SEPP establishes the broad framework for development of the North West and South West.

Clause 18A(1) of the Growth Centres SEPP relates to public utility undertakings and states that 'Development for public utility undertakings (other than electricity generating works or water recycling facilities) may be carried out without consent on land to which this Policy applies'. As the proposal is a public utility undertaking, it is permissible without consent under the Growth Centres SEPP.

An order conferring biodiversity certification on the Growth Centres SEPP was made in December 2007 under section 126G of the Threatened Species and Conservation Act 1995 (TSC Act). In July 2008, the certification was validated by the Threatened Species Conservation Amendment (Special Provisions) Act 2008. The amendment is now incorporated into Part 7 of Schedule 7 of the TSC Act. Certification applies to all proposed developments and activities carried out under the Growth Centres SEPP or other environmental planning instruments such as LEPs or other SEPPs.
The majority of the modification site is located within the biodiversity certified land. Areas not on

certified land are discussed in section 6.2. In relation to Part 5 activities undertaken on biodiversity certified land, sections 126I(4) and (5) of the TSC Act provide that:

- Activities are taken to be not likely to significantly affect any threatened species, population or ecological community
- A determining authority is not required to consider the effect on biodiversity values of the activity (despite section 111 of the EP&A Act).

The proposal would not trigger consultation requirements under clause 18A as it would not involve clearing of native vegetation on land that is not subject land.

State Regional Environmental Plan No 20 – Hawkesbury-Nepean River (No 2 – 1997) (now deemed a SEPP)

The proposal is located on land to which the deemed SEPP, *Sydney Regional Environmental Plan No. 20 – Hawkesbury Nepean River* (No.2 – 1997) (SREP 20) applies. The proposal does not require consent under SREP 20.

Clauses 5 of SREP 20 outlines general planning considerations and Clause 6 outlines specific planning policies and recommended strategies that must be considered when determining activities under Part 5 of the EP&A Act. The Northern Road Upgrade REF demonstrated that the determined project is consistent with SREP 20. The Proposed Modification is consistent with this assessment.

The proposal does not require consent under SREP 20 by virtue of the ISEPP. However, a public authority that is proposing to carry out development that is permitted without consent must take into consideration matters listed under clauses 5 and 6 or SREP 20. Table 4-1 addresses these matter as they apply to the proposed modification.

Table 4-1 Matters for consideration – SREP 20 Hawkesbury Nepean River

Consideration	Comment
Clause 5	
5(a) The aim of this plan, which is to protect the environment of the Hawkesbury-Nepean River system by ensuring that the impacts of future land uses are considered in a regional context.	The Addendum REF assesses the impacts of the proposed modification and considers the regional impacts. The proposal is not anticipated to have any major and/or regional level impacts on the Hawkesbury-Nepean River system.
5(b) The strategies listed in the Action Plan of the Hawkesbury Nepean Environmental Planning Strategy.	The proposed modification is not inconsistent with any of the strategies listed in the Action Plan.
5(c) Whether there are any feasible alternatives to the development or any other proposal concerned.	The project REF has already considered this and deemed that the Project was the preferred option.
5(d) The relationship between the different impacts of the development or other proposal and the environment, and how those impacts would be addressed and monitored.	Chapter 6 provides an assessment of the potential impacts of the proposed modification including cumulative impacts and identifies mitigation measures to minimise these impacts.
Clause 6	
6(1) Total catchment management is to be integrated with environmental planning for the catchment.	Chapter 6 provides an assessment of the potential impacts of the proposed modification. The proposal would not result in any major impacts on the catchment.
6(2) The environmental quality of environmentally sensitive areas must be protected and enhanced through careful control of future land use changes and through management and (where necessary)	The proposed modification would not result in any major impacts on any environmentally sensitive areas.

Consideration	Comment
remediation of existing uses.	
6(3) Future development must not prejudice the achievement of the goals of use of the river for primary contact recreation (being recreational activities involving direct water contact such as swimming) and aquatic ecosystem protection in the river system.	The proposed modification would not have any direct effect on the Nepean River and would not affect the use of the river for primary contact recreation, nor have a direct impact on the river's water quality or aquatic ecosystem. Mitigation measures and environmentally management plans, listed in Chapters 6 and 7, would be implemented to minimise impacts on water quality.
6(4) Aquatic ecosystems must not be adversely affected by development which changes the flow characteristics of surface or groundwater in the catchment.	The proposed modification will not have any direct impact on flow characteristics of surface or groundwater.
6(5) The importance of the river in contributing to the significance of items and places of cultural heritage significance should be recognised, and these items and places should be protected and sensitively managed and, if appropriate, enhanced.	The proposed modification would not have any impact on the cultural heritage significance of the river. The three items on Non-Aboriginal heritage significance listed in SREP 20 would not be impacted.
6(6) Manage flora and fauna communities so that the diversity of species and genetics within the catchment is conserved and enhanced.	The proposed modification will be carried out in an ancillary facility assessed in the project REF. No additional clearing of vegetation will be required. Impacts to flora as a result of the proposal are not anticipated.
6(7) The scenic quality of the riverine corridor must be protected.	The proposed modification will not fall within the riverine corridor. Accordingly, no impacts are expected.
6(8) Agriculture must be planned and managed to minimise adverse environmental impacts and be protected from adverse impacts of other forms of development.	The proposed modification does not involve any agricultural activity and would not directly impact on any land associated with agricultural use. The project REF assessed impacts to land use. No additional impacts are anticipated as a result of the proposed modification.
6(9) Rural residential development should not reduce agricultural sustainability, contribute to urban sprawl, or have adverse environmental impacts.	This clause is not applicable to the proposed modification.
6(10) All potential adverse environmental impacts or urban development must be assessed and controlled.	This Addendum REF assesses potential impacts of the proposed modification and provides measures to avoid or mitigate potential impacts.
6(11) The value of the riverine corridor as a significant recreational and tourist asset must be protected.	The proposed modification would not impact on any recreation land or tourism operations.
6(12) Development should complement the vision, goal, key principles and action plan of the Metropolitan Strategy.	The proposed modification is consistent with the Metropolitan Strategy.

4.1.2 Local Environmental Plans

Camden Local Environmental Plan 2010

The Camden Local Environmental Plan 2010 (the Camden LEP) applies to land within the

Camden local government area. The proposal area falls within land zoned as RU4 in the Camden LEP. The land use objectives for each zone under the LEP, the proposal's consistency with those objectives, are detailed in Table 4-2.

As the proposal is permitted without consent under ISEPP as discussed in section 4.1.1 the consent requirements of the local LEP do not apply.

Table 4-2 Camden LEP 2010 zones relevant to the proposed modification

Zone	Objective	Consistency of the proposal with the zone objective
RU4 Primary Production Small Lots	• To enable sustainable primary industry and other compatible land uses. • To encourage and promote diversity and employment opportunities in relation to primary industry enterprises, particularly those that require smaller lots or that are more intensive in nature. • To minimise conflict between land uses within this zone and land uses within adjoining zones. • To ensure land uses are of a scale and nature that is compatible with the environmental capabilities of the land. • To preserve and improve natural resources through appropriate land management practices. • To maintain the rural landscape character of the land. • To ensure that development does not unreasonably increase the demand for public services or facilities.	The proposed modification is generally consistent with the objectives of this zone and would not compromise or conflict with the use of land for small lot primary production.

4.2 Other relevant NSW legislation

4.2.1 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) provides the legal framework for the management of air, noise, water and waste pollution. Under Part 3.2 of the POEO Act, the carrying out of scheduled development work as defined in Schedule 1 – road construction (meaning the construction, widening, or re-routing of roads) is relevant to the proposal.

Road construction is a scheduled activity under Schedule 1 of the POEO Act if it results in four or more traffic lanes (not including bicycle lanes or lanes used for entry or exit), where the road is classified or proposed to be classified as a main road for at least three kilometres of its length in the metropolitan area

The Project is a scheduled activity as it would involve widening about four kilometres of The Northern Road from a four-lane to six-lane divided road. An environmental protection licence has been obtained by the Project (number 20864).

4.2.2 Biodiversity Conservation Act 2016

The purpose of the *Biodiversity Conservation Act 2016* (BC Act) is to maintain a healthy, productive and resilient environment for the greatest well-being of the community. This is achieved through consistency with the principles of ecologically sustainable development. The initial

proposal was assessed under the *Threatened Species Conservation Act 1995* (TSC Act) which has now been replaced by the BC Act.

No additional clearing would be required as a result of carrying out the proposed modification. All locations are located within existing cleared locations. Accordingly, the proposal would not result in significant impacts to any listed flora, fauna or communities. Therefore, a Species Impact Statement would not be required. Further information is provided in Section 6.

4.2.3 Heritage Act 1977

The *Heritage Act 1977* aims to provide for the identification, registration and conservation of items of State heritage significance. The project REF found that no impacts to State significant heritage would not occur as a result of the proposal. As such, no legislative permits or approvals would be required for the Project.

The proposed modification is not anticipated to result in any impacts to State significant heritage items (refer to Section 6 for more details). However, should any unexpected finds be encountered while carrying out the activity, the Roads and Maritime Standard Management Procedure – Unexpected Heritage Items (March 2015) would be implemented.

4.2.4 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NPW Act) is the primary piece of legislation dealing with Aboriginal cultural heritage items in NSW. Items of Aboriginal cultural heritage (Aboriginal objects) or Aboriginal places (declared under section 84) are protected and regulated under the NPW Act. Aboriginal objects are protected under section 86 of the Act. Under section 90(1) of the Act the Director-General may issue an Aboriginal heritage impact permit (AHIP) for an activity which will harm an Aboriginal object.

An assessment of the potential impacts on Aboriginal cultural heritage is provided in Section 6.3 of the project REF. The Belmore Road Compound area does not contain any known Aboriginal heritage items. As the proposed modification fall within this previously established compound, and as no further ground disturbance beyond that assessed the Project REF and Addendum REF (February 2017) would be required no impacts to Aboriginal heritage would be anticipated as a result.

4.3 Commonwealth legislation

4.3.1 Environment Protection and Biodiversity Conservation Act 1999

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) a referral is required to the Australian Government for proposed ‘actions that have the potential to significantly impact on matters of national environmental significance or the environment of Commonwealth land. These are considered in Appendix B and Chapter 6 of this addendum REF.

A referral is not required for proposed road actions that may affect nationally listed threatened species, populations, endangered ecological communities and migratory species. This is because requirements for considering impacts to these biodiversity matters are the subject of a strategic assessment approval granted under the EPBC Act by the Australian Government in September 2015.

Findings – matters of national environmental significance (other than biodiversity matters)

The assessment of the proposed modification’s impact on matters of national environmental significance and the environment of Commonwealth land found that there would be no change to the findings of the determined activity and would be unlikely to cause a significant impact on

matters of national environmental significance or the environment of Commonwealth land. A referral to the Australian Department of the Environment is not required.

4.4 Confirmation of statutory position

The proposed modification is categorised as development for the purpose of a road upgrade and is being carried out by or on behalf of a public authority. Under clause 94 of the ISEPP the proposed modification is permissible without consent. The proposed modification is not State significant infrastructure or State significant development. The proposed modification can be assessed under Part 5 of the EP&A Act. Consent from Council is not required.

5 Consultation

5.1 Consultation strategy

Consultation with all relevant stakeholders was undertaken during preparation of the Project REF, as detailed in Section 5 of the Project REF.

Further consultation was undertaken during February and March 2018. The Construction Noise and Vibration Impact Statement (CNVIS) identified that during standard hours of construction, noise impacts from the operation of the batch plants would not cause exceedance of the daytime noise management levels by greater than 5dBA. The Project identified that the batch plants have the potential for temporary visual impacts for residents on The Northern Rd and Belmore Rd Bringelly. These residents have been consulted regarding the proposal.

Further community consultation will be undertaken with noise affected residential receivers prior to the commencement of any out of hours activities.

5.2 Consultation outcomes

Consultation with Camden City Council and Liverpool City Council was carried out as part of the determined REF in accordance with the requirements of clause 13 and clause 15 of the ISEPP. A due diligence exercise was carried out as part of this Addendum REF to ensure that the consultation undertaken in accordance with ISEPP as part of the determined REF is adequate, and that no specific, additional consultation with councils and planning authorities is required by the ISEPP.

The additional consultation undertaken with residents located on The Northern Rd and Belmore Rd, Bringelly raised concerns about dust, noise and lighting. Additional mitigation measures addressing these impacts have been proposed to minimise any potential impacts as outlined in Table 7.1.

The revised proposal as described in Chapter 3 of this Addendum REF is consistent with the consultation carried out in accordance with the requirements of ISEPP as part of the determined REF. No additional ISEPP consultation is considered necessary.

5.3 Other Government agency and stakeholder involvement

As part of the Project REF, Roads and Maritime consulted the following stakeholders:

- Western Sydney Parklands.
- Water NSW (formerly Sydney Catchment Authority).
- Transport for NSW.

Given the minor changes presented by the proposed modification to the project REF and the outcome of the due diligence exercise (refer to Appendix B), further consultation with these stakeholders is not considered necessary.

6 Environmental assessment

This section of the addendum REF provides a detailed description of the potential environmental impacts associated with the construction and operation of the proposed modification of the Bringelly Road Upgrade, Stage 2. All aspects of the environment potentially impacted upon by the proposed modification are considered. This includes consideration of the factors specified in the guidelines *Roads and Related Facilities* (DUAP 1996) and *Is an EIS required?* (DUAP 1999) as required under clause 228(1) of the Environmental Planning and Assessment Regulation 2000. The factors specified in clause 228(2) of the Environmental Planning and Assessment Regulation 2000 are also considered in Appendix C.

This assessment is limited to the revised proposal as detailed in Chapter 3 and only addresses the notable changes in potential impacts resulting from the proposed works. Table 6.1 outlines the environmental aspects that are at risk of being impacted by the proposed modification, and that have therefore been further assessed. Where assessments are considered consistent with those presented in the determined REF, an additional assessment has not been provided within this Addendum REF.

All safeguards and management measures were considered to be consistent with the determined REF unless otherwise specified in this assessment.

Table 6-1 Applicable environmental factors

Environmental Factor	Comments	Detailed Assessment in addendum REF?	
Traffic and Transport	The proposed modification would temporarily increase the number of construction trucks hauling raw materials required for concrete and asphalt batching. Haul routes and truck movements identified and assessed in Section 6.1 of the project REF would be used. Concrete agitator and asphalt delivery truck movements would be significantly reduced within the project and surrounding area. The location of the batch plants would reduce the haul length of these trucks delivering materials to the point of placement. Further, during some phases of construction, delivery trucks have direct access to the Northern Road Alignment not open to the public. This will eliminate the need to use the public road network for some deliveries from the batch plants to the point of placement.	Yes	☐
		No	☒
Noise and Vibration	The proposed modification would increase noise impacts to adjacent receivers. Activities would be temporary in nature and limited to the duration of the construction requirements Stage 2 of The Northern Road Upgrade and Stage 2 of the Bringelly Road Upgrade. Noise impacts would be further reduced following commissioning of the plant and installation of mains power supply, whereby generators would only be required for backup power. Noise and vibration was assessed in Section 6.5 of the project REF. Additional noise and vibration impacts to those identified in the project REF would be expected as a result of the proposed modification.	Yes	☒
		No	☐
Biodiversity	Biodiversity impacts of the Project were assessed in Section 6.2 of the project REF. As the proposed modification would be contained to the existing Belmore Road Compound, no additional vegetation clearing would be required.	Yes	☐
		No	☒

Environmental Factor	Comments	Detailed Assessment in addendum REF?	
Hydrology and flooding	Hydrology and flooding was assessed in Section 6.7 of the project REF. The operation of batching plants is consistent with the assessment undertaken in the project REF. No additional impacts to hydrology and flooding are anticipated as a result of the proposed modification.	Yes	☐
		No	☒
Topography, geology and soils	Topography, geology and soils was assessed in Section 6.6 of the project REF. No additional impacts to topography, geology and soils are anticipated as a result of the proposed modification.	Yes	☐
		No	☒
Contaminated land	Contaminated land was assessed in Section 6.6 of the project REF. No additional impacts to contaminated land is anticipated as a result of the proposed modification.	Yes	☐
		No	☒
Surface and groundwater quality	Surface and groundwater quality was assessed in Section 6.6 of the project REF. It is not anticipated that the proposed modification would result in and additional adverse impacts to surface and groundwater quality following the implementation of all identified control measures.	Yes	☐
		No	☒
Air quality	Air quality was assessed in Section 6.11 of the project REF. The batch plants would be fitted with dust suppression systems to minimise any fugitive dust emissions. No additional adverse impacts to air quality are expected following the implementation of all identified control measures.	Yes	☐
		No	☒
Aboriginal heritage	Aboriginal heritage was assessed in	Yes	☐

Environmental Factor	Comments	Detailed Assessment in addendum REF?	
	Section 6.3 of the project REF. Existing areas having the potential to contain Aboriginal heritage items do not fall within the proposed modification area. An assessment of the potential impacts on Aboriginal cultural heritage is provided in Section 6.3 of the project REF. The Belmore Road Compound area does not contain any known Aboriginal heritage items. As the proposed modification fall within this previously established compound, and as no further ground disturbance would be required no impacts to Aboriginal heritage would be anticipated as a result.	No	☒
Non-Aboriginal heritage	Non-Aboriginal heritage was assessed in Section 6.4 of the project REF. As no items of non-Aboriginal heritage were identified in the proposed modification area no further impacts are anticipated.	Yes	☐
		No	☒
Landscape character and visual impacts	Landscape character and visual impact was assessed in Section 6.10 of the project REF. During installation of the batch plants, consideration would be given to light spill and positioning of lighting systems to minimise potential impacts to surrounding residents. As the proposed modification is contained within an existing ancillary facility no additional landscape character and visual impacts are anticipated.	Yes	☐
		No	☒
Socio-economic	Socio-economic impacts were assessed in Section 6.9 of the project REF. The proposed modification would be restricted to an existing ancillary facility. No additional land acquisitions would be required to carry out the proposed modification. Outcomes of additional community consultation associated with the proposed modification is located in Section 5 of this addendum REF. No additional socio-economic impacts are anticipated as a result of the proposed modification.	Yes	☐
		No	☒
Property and land	Property and land use was assessed in	Yes	☐

Environmental Factor	Comments	Detailed Assessment in addendum REF?	
use	Section 6.8 of the project REF. The proposed modification would be restricted to an existing ancillary facility. No additional land acquisitions would be required to carry out the proposed modification. No additional impacts to property and land use are anticipated.	No	☒
Waste and resource use	Resource and waste management was assessed in Section 6.12 of the project REF. No further impacts to waste and resource use would be expected as a result of the proposed modification.	Yes	☐
		No	☒
Sustainability, climate change and greenhouse gases	Greenhouse gas, energy use and climate change was assessed in Sections 6.13 and 6.14 of the project REF. No additional impacts to climate change or greenhouse gases area anticipated as a result of the proposed modification.	Yes	☐
		No	☒

6.1 Noise and Vibration

6.1.1 Assessment framework

The project REF assessed noise and vibration impacts associated with the approved Project. Following detail design and subsequent methodology refinement post-contract award a Construction Noise and Vibration Impact Statement (CNVIS) has been developed (Hutchison Weller, January 2018) (Appendix D). This also assessed the noise and vibration impacts of concrete and asphalt batching activities for the Project which had not previously been assessed in the project REF.

The CNVIS was developed in accordance with the following assessment framework:

- RMS QA Specification G36 Clause 4.6:
  - Identify potential sources/activities that could cause noise impacts/risks
  - Conduct quantitative noise assessment for all works in accordance with the 'Interim Construction Noise Guidelines' (DECCW, 2009)
  - Identify measures to minimise the potential noise impacts as identified in the quantitative noise assessment.
- Environmental Protection Licence (EPL) 20864.

As the CNVIS found that there would be no vibration impacts from the operation of construction compounds and the subsequent proposed modification, vibration related components of the CNVIS are not presented in this addendum REF.

6.1.2 Existing environment

The Project extends over a large area between Bringelly in the north and Oran Park in the South and Rossmore to the east. The area surrounding the Project can be broken into several major land uses, as can be seen in Figure 1-1 of Appendix D:

- At the southern extent of the Project is primarily suburban land use, with new residential estates under construction
- North of Oran Park up to Bringelly, the land use is primarily rural and sparsely populated.
- In Bringelly and to the northern extent of the Project, land use us semi-rural with low density lifestyle / residential blocks.
- Along Bringelly Road, to the eastern extent of the Project, similar semi-rural land uses are dominant, with low density, larger blocks.

6.1.3 Noise Catchment Areas

Noise catchment areas (NCAs) that reflect similar land uses and groups of receivers who experience a similar level of existing noise, have been established for the Project and are illustrated in Figure 1-1 of Appendix D. A summary of these NCAs is present in Table 6-2. NCAs have been divided into three sub-NCAs to accommodate the reduction in influence of road traffic noise on the ambient noise level further from the main road.

Table 6-2 Noise catchment areas

NCA	Description
NCA-01	Northern extent of the Project, north of Badgery's Creek Road
NCA-02	Bringelly Road intersection with The Northern Road
NCA-03	Rural area south of Belmore Road to 900 The Northern Road
NCA-04	Rural area south of 900 The Northern Road to the northern extent of Oran Park estate
NCA-05	Oran Park estate
NCA-06	Bringelly Road east of Jersey Road to Church Street
NCA-07	East of Church Street to eastern extent of Project at King Street

Residential receivers likely to experience noise and vibration impacts as a result of the proposed modification are located within NCA02 and NCA03.

6.1.4 Assessment criteria

EPL Condition L3.2 requires that requires that all feasible and reasonable noise mitigation measures be implemented with the aim of achieving the construction noise management levels detailed in the Interim Construction Noise Guideline (ICNG) (DECC, 2009) during construction activities.

The ICNG describes that noise in excess of the background noise level may result in adverse impact and increased likelihood of complaint. During standard hours, where construction noise is within 10 dB(A) of the RBL, the impacts are considered to be acceptable.

Where construction noise is more than 10 dB(A) above the RBL, a residential receiver is taken to be noise affected and the proponent should undertake all reasonable and feasible steps necessary to manage the impact and consult with the affected community. Above a $L_{Aeq,\ 15\ minute}$ noise level of 75 dB(A), a receiver is considered to be highly noise affected, requiring respite to be given in consultation with the regulatory authority and the community.

At night, or outside approved construction hours, construction noise at a residential receiver more than 5 dB(A) above the RBL is taken to be noise affected.

In addition, annoying noise such as rock hammers, impact piling, or other impulsive noise sources usually result in greater annoyance than continuous construction noise. A 5 dB(A) penalty is applicable to such activities prior to comparison with the NMLs. The NML relevant to each NCA is summarised in Table 3-3 of Appendix D, based on the RBLs in Table 3-2 of Appendix D.

Where a commercial property is affected by noise, a level above $L_{Aeq,\ 15min}$ 70 dB(A) is considered to warrant noise mitigation. Similarly, an industrial facility would warrant noise mitigation at LAeq 15 minute noise levels above 75 dB(A).

Other sensitive land uses, such as schools will only find noise from construction to be disruptive when the properties are being used. Table 3-4 of Appendix D presents management levels for noise at other sensitive land uses based on the principle that the characteristic activities for each of these land uses should not be unduly disturbed.

Internal noise levels are assessed at the centre of the occupied room. Where internal noise levels cannot be measured, external noise levels may be used. A conservative estimate of the difference between internal and external noise levels is 10dB for buildings other than residences.

6.1.5 Potential impacts

Predicted noise impacts of the operation of the proposed modification are presented in Figure 6-1.

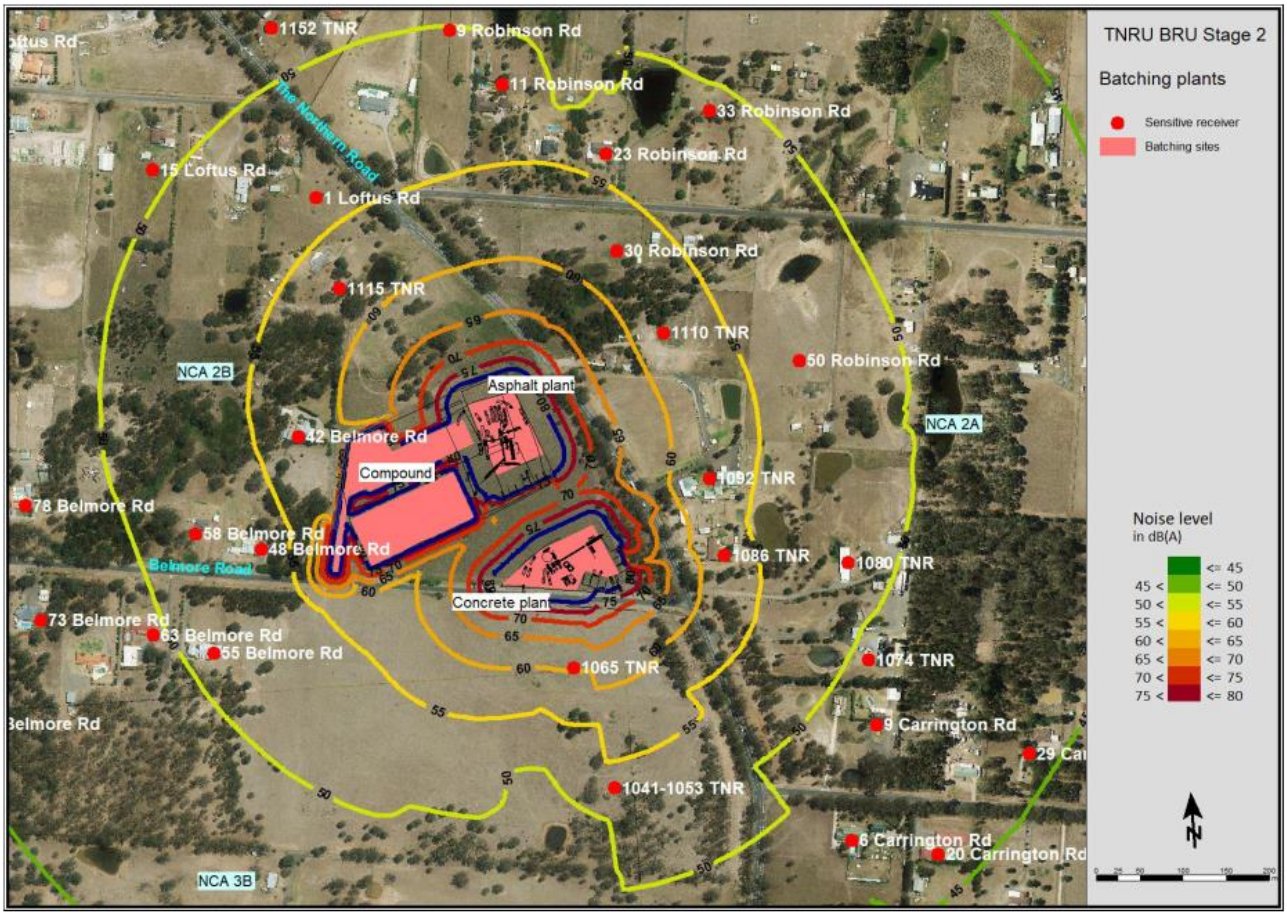


Figure 6-1 Predicted noise levels of the proposed modification (taken from project CNVIS presented in Appendix D)

The batch plants are located on Belmore Road, with the asphalt batch plant situated on the northern side and concrete batch plant on the southern side within the 2B noise catchment. The

nearest receivers to the batching plants are approximately 100 metres to the south and east of the concrete plant and 200 metres to the north of the asphalt plant. Batching operations do not represent a high risk of impact during the day, with only a small number, three in total, of receivers likely to experience minor exceedances of the NML (refer to Appendix D Table 4-4 for detailed noise impacts results).

Out of hours operation of the concrete and asphalt batching plants will occur over the life of the Project. During night time operation, batching is likely to impact on greater numbers of residential receivers, with minor exceedances of the night NML. Three receivers are predicted to experience noise levels more than 10 dB above the NML during concrete and asphalt batching. Table 6-3 briefly summarises the evening and night time exceedances of the NML as a result of the proposed modification, which are presented in greater detail in Appendix D.

Table 6-3 Evening and night time exceedance of NML

Exceedance	Asphalt Batching	Concrete Batching	Deliveries
Evening NML	14	11	3
Evening NML 20+ dB	0	0	0
Night time NML	23	20	12
Night time NML 20+ dB	1	2	0

The implementation of measures identified in the CEMP, Noise and Vibration Management Plan (NVMP), Community Involvement Plan (CIP), EPL and Out of Hours Work (OOHW) Protocol will mitigate any impacts associated with any outside of standard construction hours works to residential receivers.

6.1.6 Safeguards and management measures

Table 6-4 Noise and vibration safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Community	Potentially affected receivers will be notified of OOHW in accordance with the requirements of the EPL, and community consultation program. Where necessary, implement the additional noise mitigation measures from the OOHW Protocol, as referenced in Section 3.5 of the CNVIS and indicated for each receiver.	Construction contractor	Pre-construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Community	Once established, the batch plants would be assessed for light spill impacts on nearby residences and modifications or additional mitigation measures adopted if required to minimise impacts	Construction contractor	Post-commissioning of batch plants	Additional safeguard
Noise	Once commissioned, stationary sources such as the batching plants should be reviewed to confirm the assumptions of this CNVIS and to identify appropriate mitigation options. These may include selection of quieter equipment, acoustic screening/enclosure of noisy items, modified operational procedures.	Construction contractor	Construction	Additional safeguard
Noise	Scheduling should allow for operations to occur in the earliest part of the night.	Construction contractor	Construction	Additional safeguard
Noise	Priority will be given to the use of quieter and less vibration emitting construction methods and plant alternatives where feasible and reasonable.	Construction contractor	Construction	Additional safeguard
Noise	Strategically utilise stockpiles/bunding as noise screens to the extent practicable. Plant used intermittently to be throttled down or shut down. Noise-emitting plant to be directed away from sensitive receivers where possible. Stationary plant should be located behind a structure or enclosed if practicable.	Construction contractor	Construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Noise	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.	Construction contractor	Construction	Additional safeguard
Noise	Monitoring of activities should be undertaken where indicated by a Class D or greater impact in the CNVIS. In addition, monitoring should be completed to verify the assumptions of this CNVIS regarding estimated equipment noise emissions.	Construction contractor	Construction	Additional safeguard

6.2 Cumulative impacts

6.2.1 Other projects and developments

Projects within proximity to the Project include:

- The Northern Road Upgrade Stage 3, Glenmore Parkway to Jamison Road which is located directly north of the Project.
- M4 Smart Motorway: The M4 Motorway would be upgraded to provide a managed motorway system between the Pitt Street overbridge at Parramatta and the connection to the Great Western Highway at Lapstone, to form the M4 Smart Motorway. Construction for the M4 Smart Motorway would involve the installation of Intelligent Traffic System (ITS) infrastructure and minor upgrades to interchanges, including the interchange with The Northern Road. The proposal would tie into the M4 Smart Motorway infrastructure at the M4 Motorway interchange, and is likely to be constructed simultaneously.
- Planned Western Sydney Airport at Badgerys Creek: The planned western Sydney airport at Badgerys Creek is a major strategic driver of many of the developments and land use changes being planned for western Sydney. The planned airport's development is a long-term commitment of the NSW and Australian governments.
  The planned western Sydney airport is not likely to be operational until the latter half of the next decade, at the earliest, and no construction start date has yet been agreed. Although the airport has been the subject of an environmental impact statement, and has been formally endorsed by all levels of government, there is still much planning to do before construction can start.
- M12 Motorway proposal: While its timing is not yet known, the proposed construction of the M12 Motorway (east–west along an alignment near Elizabeth Drive between Cecil Hills and Luddenham) is likely to start after 2020, meaning it is unlikely to coincide with the construction of sections of The Northern Road upgrade.
- Urban growth areas in western Sydney: Section 2.1 of the project REF established the proposal in the context of a number of government strategic plans that provide an overall framework to guide long-term developments in western Sydney and other parts of the metropolitan area. While these strategic plans do not contemplate individual projects, they place a heavy emphasis on the future development of western Sydney, and herald major changes for the western Sydney region in coming years.
- Mulgoa Road / Castlereagh Road Corridor Upgrade: While timing is not yet confirmed, Roads and Maritime is considering different options for a planned upgrade of the Mulgoa Road / Castlereagh Road corridor between Glenmore Parkway, Glenmore Park and Andrews Road, Penrith. This planned upgrade would be delivered in stages, and is subject to ongoing design development and environmental assessment. At the time of preparing this REF, no funding has yet been made available for these works, with the exception of planned infrastructure upgrades at Mulgoa Road and Jane Street (Great Western Highway) in the Penrith CBD, which is due to commence construction in mid-2018. Apart from Mulgoa Road / Jane Street, it is unlikely that the planned corridor upgrade works would overlap with the proposal.
- Local developments: A search of the development application tracking database for Penrith City Council was undertaken on 10 May 2016 during the development of the project REF. Applications in the study area relate mainly to residential modifications. The Glenmore Park Stage 2 release area is located to the west of the proposal, which aims to deliver 344 new residential lots. This development has a similar construction timeframe to the proposal.

6.2.2 Potential impacts

As discussed in Section 6, only noise impacts are expected to occur undertaking the proposed modification. As this impact is restricted to the immediate area surrounding the Belmore Road Compound and restricted to the construction phase of the approved project this is expected to have negligible cumulative impacts when considering the other projects within close proximity to the Project.

7 Environmental management

7.1 Environmental management plans

A number of safeguards and management measures have been identified to minimise adverse environmental impacts, including social impacts, which could potentially arise as a result of the proposed modification. Should the proposed modification proceed, these management measures would be addressed if required during detailed design and incorporated into the Construction Environmental Management Plan (CEMP) and applied during the construction and operation of the proposed modification.

7.2 Summary of safeguards and management measures

Additional safeguards and management measures identified in this addendum REF are summarised in Table 7-1. Should the proposed modification proceed, the safeguards and management measures will be incorporated into the detailed design phase of the proposed modification and the CEMP, and implemented during construction and operation of the proposed modification, should it proceed. These safeguards and management measures will minimise any potential adverse impacts arising from the proposed works on the surrounding environment.

Table 7-1 Summary of additional safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
1	Community	Potentially affected receivers will be notified of OOHW in accordance with the requirements of the EPL, and community consultation program. Where necessary, implement the additional noise mitigation measures from the OOHW Protocol, as referenced in Section 3.5 of the CNVIS and indicated for each receiver.	Construction contractor	Pre-construction	Additional safeguard
2	Community	Once established, the batch plants would be assessed for light spill impacts on nearby residences and modifications or additional mitigation measures adopted if required to minimise impacts	Construction contractor	Post-commissioning of batch plants	Additional safeguard
3	Noise	Once commissioned, stationary sources such as the batching plants should be reviewed to confirm the assumptions of this CNVIS and to identify appropriate mitigation options. These may include selection of quieter equipment, acoustic screening/enclosure of noisy items, modified operational procedures.	Construction contractor	Construction	Additional safeguard
4	Noise	Scheduling should allow for operations to occur in the earliest part of the night.	Construction contractor	Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
5	Noise	Priority will be given to the use of quieter and less vibration emitting construction methods and plant alternatives where feasible and reasonable.	Construction contractor	Construction	Additional safeguard
6	Noise	Strategically utilise stockpiles/bunding as noise screens to the extent practicable. Plant used intermittently to be throttled down or shut down. Noise-emitting plant to be directed away from sensitive receivers where possible. Stationary plant should be located behind a structure or enclosed if practicable.	Construction contractor	Construction	Additional safeguard
7	Noise	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.	Construction contractor	Construction	Additional safeguard
8	Noise	Monitoring of activities should be undertaken where indicated by a Class D or greater impact in the CNVIS. In addition, monitoring should be completed to verify the assumptions of this CNVIS regarding estimated equipment noise emissions.	Construction contractor	Construction	Additional safeguard

7.3 Licensing and approvals

All relevant licenses, permits, notifications and approvals needed for The Northern Road Upgrade Stage 2 and when they need to be obtained are listed in Table 7-2. Additional or changed licenses and approval requirements identified in this addendum REF are indicated by underlined and/or struck out font.

Table 7-2 Summary of licensing and approval required

Instrument	Requirement	Timing
Protection of the Environment Operations Act 1997	The project is a scheduled activity as defined in the POEO Act, and an Environmental Protection License is therefore required.	Obtained.
National Parks and Wildlife Act 1977	A section 90 AHIP would be obtained for impacts on all Aboriginal sites within the design corridor that cannot be conserved, and for any required salvage excavations or surface collections.	Obtained.

8 Conclusion

8.1 Justification

The proposed modification would result in environmental benefits due to a reduction of impacts on traffic and access, greenhouse gasses and climate change. Temporary noise impacts would be experienced by adjacent residential receivers during the construction phase of the approved project. These impacts would be mitigated through the implementation of safeguards and management measures identified in this addendum REF. No significant additional environmental or social impacts would be expected. Accordingly, the proposed modification is considered justified as it would not result in any significant additional impacts to the environment or the community.

8.2 Objects of the Environmental Planning and Assessment Act 1979

Table 8-1 Objects of the EP&A Act

Object	Comment
5(a)(i) To encourage the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment.	The proposal promotes the minimisation of environmental impacts on during construction of the Project.
5(a)(ii) To encourage the promotion and co-ordination of the orderly economic use and development of land.	The proposed modification achieves consistent objectives to those assessed in the project REF.
5(a)(iii) To encourage the protection, provision and co-ordination of communication and utility services.	The proposed modification achieves consistent objectives to those assessed in the project REF.
5(a)(iv) To encourage the provision of land for public purposes.	The proposed modification achieves consistent objectives to those assessed in the project REF.
5(a)(v) To encourage the provision and co-ordination of community services and facilities.	The proposed modification achieves consistent objectives to those assessed in the project REF.
5(a)(vi) To encourage the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats.	The proposed modification achieves consistent objectives to those assessed in the project REF.
5(a)(vii) To encourage ecologically sustainable development.	Ecologically sustainable development is considered in Sections 8.2.1 to 8.2.4 below.
5(a)(viii) To encourage the provision and maintenance of affordable housing.	Not relevant to the Project.
5(b) To promote the sharing of the responsibility for environmental planning between different levels of government in the State.	Not relevant to the Project.

Object	Comment
5(c) To provide increased opportunity for public involvement and participation in environmental planning and assessment.	The proposed modification achieves consistent objectives to those assessed in the project REF.

8.2.1 The precautionary principle

This principle states: “if there are threats of serious or irreversible damage, lack of scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation”. Evaluation and assessment of alternatives and options have aimed to reduce the risk of serious and irreversible impacts on the environment.

The Project Construction Environmental Management Plan would be updated to include the management measures required to undertake the proposed modification prior to commencement of the material processing activities. This requirement would ensure the proposed modification achieves a high level of environmental performance. No mitigation measures or management mechanisms would be postponed because of a lack of information.

8.2.2 Intergenerational equity

The principle states: “the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations”. The proposed modification would not result in any impacts that are likely to adversely impact on the health, diversity or productivity of the environment for future generations.

8.2.3 Conservation of biological diversity and ecological integrity

This principle states: “the diversity of genes, species, populations and communities, as well as the ecosystems and habitats to which they belong, must be maintained and improved to ensure their survival”.

The environment in which the proposed modification would be undertaken is a modified semi-rural and urban environment. A thorough assessment of the existing local environment was undertaken to identify and manage any potential impacts of the proposed modification on local biodiversity. With implementation of the recommended management measures and safeguards the proposed modification would not have a significant impact on biological diversity and ecological integrity.

8.2.4 Improved valuation, pricing and incentive mechanisms

This principle is defined as:
improved valuation, pricing and incentive mechanisms, namely, that environmental factors should be included in the valuation of assets and services, such as:

(i) polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,
(ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,
(iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.

This Addendum REF has examined the environmental consequences of the proposed modification and identified mitigation measures to manage the potential for adverse impacts. The requirement to implement these mitigation measures would result in an economic cost to Roads and Maritime,

and would increase the capital and operating costs of the proposal. The costs of the generation and management of waste and pollution would be captured in any waste disposal charges. This signifies that environmental resources have been given appropriate valuation. The proposed modification has also been developed with the objective of reducing the social capital cost of construction for the Project.

8.3 Conclusion

This addendum REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed activity.

This has included consideration where relevant, of conservation agreements and plans of management under the NPW Act, joint management and biobanking agreements under the TSC Act, wilderness areas, critical habitat, impacts on threatened species, populations and ecological communities and their habitats and other protected fauna and native plants. It has also considered potential impacts to matters of national environmental significance listed under the Federal EPBC Act.

A number of potential environmental impacts from the proposed modification have been avoided or reduced during the design development and options assessment. The proposed modification as described in the addendum REF best meets the Project objectives, but would still result in some impacts on associated with noise generated by the batch plants and experienced by adjacent residential receivers. Safeguards and management measures as detailed in this addendum REF would ameliorate or minimise these expected impacts. The proposed modification would also reduce haul routes associated with concrete and asphalt deliveries to construction sites and reduce costs to the Project as a whole by being able to produce these construction products on site. On balance, the proposed modification is considered justified and the following conclusions are made.

Significance of impact under NSW legislation
The proposed modification would not result in a change to the findings of the project REF, submission report and subsequent addendum REFs and would be unlikely to cause a significant impact on the environment. Therefore it is not necessary for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning under Part 5.1 of the EP&A Act. A Species Impact Statement is not required. The proposed modification is subject to assessment under Part 5 of the EP&A Act. Consent from Council is not required.

Significance of impact under Australian legislation
The proposed modification would not likely cause a significant impact on matters of national environmental significance or the environment of Commonwealth land within the meaning of the E*nvironment Protection and Biodiversity Conservation Act 1999.* A referral to the Australian Department of the Environment is not required.

9 Certification

This addendum review of environmental factors provides a true and fair review of the proposed modification in relation to its potential effects on the environment. It addresses to the fullest extent possible all matters affecting or likely to affect the environment as a result of the proposed modification.

Chris Churcher
Environmental Manager
Lendlease Engineering
Date: 12/03/2018

I have examined this addendum review of environmental factors and accept it on behalf of Roads and Maritime Services.

P. Nicholls

Date: 23.03.18

10 References

Bringelly Road Upgrade – Camden Valley Way to The Northern Road REF (November 2011)

Department of Environment and Climate Change. 2009. *Interim Construction Noise Guideline.*

Department of Urban Affairs and Planning. 1996. *Roads and Related Facilities*

Department of Urban Affairs and Planning. 1999. *Is an EIS Required?*

Roads and Maritime Standard Management Procedure – Unexpected Heritage Items (March 2015)

The Northern Road / Bringelly Road Grade Separated Interchange REF (November 2015).

The Northern Road Upgrade – Narellan to Bringelly REF (October 2012)

The Northern Road Upgrade Stage 2 – Upgrade of transmission line Addendum Review of Environmental Factors (GHD, 2016)

The Northern Road Upgrade Stage 2 - Addendum Review of Environmental Factors (GHD, January 2017).

11 Terms and acronyms used in this addendum REF

Term / Acronym	Description
BC Act	*Biodiversity Conservation Act 2016* (NSW)
CEMP	Construction / Contractor's environmental management plan
EIA	Environmental impact assessment
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW). Provides the legislative framework for land use planning and development assessment in NSW
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth). Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process.
ESD	Ecologically sustainable development. Development which uses, conserves and enhances the resources of the community so that ecological processes on which life depends, are maintained and the total quality of life, now and in the future, can be increased
FM Act	*Fisheries Management Act 1994* (NSW)
Heritage Act	*Heritage Act 1977* (NSW)
ISEPP	State Environmental Planning Policy (Infrastructure) 2007
LEP	Local Environmental Plan. A type of planning instrument made under Part 3 of the EP&A Act.
MNES	Matters of national environmental significance under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.
NPW Act	*National Parks and Wildlife Act 1974* (NSW)
NVMP	Noise and Vibration Management Plan
OOHW	Out of Hours Work
Roads and Maritime	NSW Roads and Maritime Services
SEPP	State Environmental Planning Policy. A type of planning instrument made under Part 3 of the EP&A Act.
TSC Act	*Threatened Species Conservation Act 1995* (NSW)
QA Specifications	Specifications developed by Roads and Maritime Services for use with road work and bridge work contracts let by Roads and Maritime Services.

Appendix A – Consideration of Matters of National Environmental Significance

Matters of National Environmental Significance

Under the environmental assessment provisions of the *Environment Protection and Biodiversity Conservation Act 1999*, the following matters of national environmental significance and impacts on Commonwealth land are required to be considered to assist in determining whether the proposed modification should be referred to the Australian Government Department of the Environment.

Under the EPBC Act strategic assessment approval a referral is not required for proposed road actions that may affect nationally listed threatened species, populations, endangered ecological communities and migratory species. Impacts on these matters are assessed in detail as part of this addendum REF in accordance with Australian Government significant impact criteria and taking into account relevant guidelines and policies.

Factor	Impact
a. Any impact on a World Heritage property? The proposed modification will not be undertaken on any land falling within a World Heritage property.	Nil
b. Any impact on a National Heritage place? The proposed modification will not be undertaken on any land falling within a National Heritage place.	Nil
c. Any impact on a wetland of international importance? The proposed modification will not be undertaken on any land falling within a wetland of international importance.	Nil
d. Any impact on a listed threatened species or communities? The proposed modification will not impact on any listed threatened species or communities.	Nil
e. Any impacts on listed migratory species? The proposed modification will not impact on any listed migratory species.	Nil
f. Any impact on a Commonwealth marine area? The proposed modification will not be undertaken on any land falling within a Commonwealth marine area.	Nil
g. Does the proposed modification involve a nuclear action (including uranium mining)? The proposed modification will not be undertaken on any land falling within a nuclear action (including uranium mining) area.	Nil
Additionally, any impact (direct or indirect) on Commonwealth land? The proposed modification will not result in any direct or indirect impacts to Commonwealth land.	Nil

Appendix B – Statutory Consultation Checklists

Infrastructure SEPP

Council related infrastructure or services

Issue	Potential impact	Yes / No	If 'yes' consult with the relevant local council(s).	ISEPP clause
Stormwater	Are the works likely to have a *substantial* impact on the stormwater management services which are provided by council?	No	n/a	ISEPP cl.13(1)(a)
Traffic	Are the works likely to generate traffic to an extent that will *strain* the existing road system in a local government area?	No	n/a	ISEPP cl.13(1)(b)
Sewerage system	Will the works involve connection to a council owned sewerage system? If so, will this connection have a *substantial* impact on the capacity of any part of the system?	No	n/a	ISEPP cl.13(1)(c)
Water usage	Will the works involve connection to a council owned water supply system? If so, will this require the use of a *substantial* volume of water?	No	n/a	ISEPP cl.13(1)(d)
Temporary structures	Will the works involve the installation of a temporary structure on, or the enclosing of, a public place which is under local council management or control? If so, will this cause more than a *minor* or *inconsequential* disruption to pedestrian or vehicular flow?	No	n/a	ISEPP cl.13(1)(e)
Road & footpath excavation	Will the works involve more than *minor* or *inconsequential* excavation of a road or adjacent footpath for which council is the roads authority and responsible for maintenance?	No	n/a	ISEPP cl.13(1)(f)

Local heritage items

Issue	Potential impact	Yes / No	If 'yes' consult with the relevant local council(s)	ISEPP clause

Issue	Potential impact	Yes / No	If 'yes' consult with the relevant local council(s)	ISEPP clause
Local heritage	Is there is a local heritage item (that is not also a State heritage item) or a heritage conservation area in the study area for the works? If yes, does a heritage assessment indicate that the potential impacts to the item/area are more than *minor* or *inconsequential*?	No	n/a	ISEPP cl.14

Flood liable land

Issue	Potential impact	Yes / No	If 'yes' consult with local Council(s)	ISEPP clause
Flood liable land	Are the works located on flood liable land? If so, will the works change flood patterns to more than a *minor* extent?	No	n/a	ISEPP cl.15

Public authorities other than councils

Issue	Potential impact	Yes / No	If 'yes' consult with	ISEPP clause
National parks and reserves	Are the works adjacent to a national park or nature reserve, or other area reserved under the *National Parks and Wildlife Act 1974*?	No	Office of Environment and Heritage	ISEPP cl.16(2)(a)
Marine parks	Are the works adjacent to a declared marine park under the *Marine Parks Act 1997*?	No	Department of Primary Industries	ISEPP cl.16(2)(b)
Aquatic reserves	Are the works adjacent to a declared aquatic reserve under the *Fisheries Management Act 1994*?	No	Department of Primary Industries	ISEPP cl.16(2)(c)
Sydney Harbour foreshore	Are the works in the Sydney Harbour Foreshore Area as defined by the *Sydney Harbour Foreshore Authority Act 1998*?	No	Sydney Harbour Foreshore Authority	ISEPP cl.16(2)(d)
Bush fire prone land	Are the works for the purpose of residential development, an educational establishment, a health services facility, a correctional centre or group home in bush fire prone land?	No	Rural Fire Service	ISEPP cl.16(2)(f)

Growth Centres SEPP

Issue	Potential impact	Yes / No	If 'yes' consult with	ISEPP clause
Clearing native vegetation	Do the works involve clearing native vegetation (as defined in the *Native Vegetation Act 2003*) on land that is not ***subject land*** (as defined in cl 17 of schedule 7 of the *Threatened Species Conservation Act 1995*)?	No	Department of Planning and Environment	SEPP 18A

Appendix C – Consideration of clause 228(2) factors

Clause 228(2) Checklist

In addition to the requirements of the *Is an EIS required?* (1995/1996) guideline and the *Roads and Related Facilities EIS Guideline* (DUAP 1996) as detailed in the addendum REF, the following factors, listed in clause 228(2) of the *Environmental Planning and Assessment Regulation 2000*, have also been considered to assess the likely impacts of the proposed modification on the natural and built environment.

Factor	Impact
h. Any environmental impact on a community? Temporary noise impacts are anticipated from the operation of the concrete and asphalt batch plants during required night works. These impacts will be managed and mitigated through the OOHW Protocol	Short term: Minor Long term: Nil
i. Any transformation of a locality? The establishment and operation of concrete and asphalting batch plants will be temporary in nature. Following completion of construction activities the area consisting of Belmore Road Compound will be re-established as detailed in the project REF. Accordingly there will be short term impacts to the immediate locality surrounding Belmore Road Compound. No long term impacts are anticipated.	Short term: Negligible Long term: Nil
j. Any environmental impact on the ecosystems of the locality? The concrete and asphalt batch plant operation will be contained within the established Belmore Road Compound. No additional clearing of vegetation will be required to carry out this activity. Appropriate mitigation measures detailed in Section 7.2 of this addendum REF would be implemented.	Nil
k. Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality? No reduction in aesthetic, recreational, scientific or other environmental quality or value of a locality as a result of the proposed modification is anticipated.	Nil
l. Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations? No impacts to a locality, place or building having anthropological, archaeological, architectural, cultural, historical, scientific or social significance is anticipated.	Nil
m. Any impact on the habitat of protected fauna (within the meaning of the *National Parks and Wildlife Act* 1974)? No clearing of any vegetation would be required to carry out the proposed modification. As such, no impacts to fauna habitat would be expected.	Nil

Factor	Impact
n. Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air? No clearing of any vegetation that would be required to carry out the proposed modification. As such, no impacts to fauna habitat would be expected. Additionally, the proposed modification would not impact any endangered species living in water or in the air.	Nil
o. Any long-term effects on the environment? No long term affects to the environment associated with the proposed modification would be expected. Appropriate mitigation measures identified in Section 7.2 would be implemented.	Nil
p. Any degradation of the quality of the environment? Any potential degradation of the quality of the environment would be minimised through implementation of appropriate control measures, as prescribed in the CEMP. The batch plants will be contained within the existing Belmore Road Compound. Potential impacts to water quality will be managed and mitigated through the implementation and maintenance of erosion and sediment control measures.	Short term: Negligible Long term: Nil
q. Any risk to the safety of the environment? Due to the temporary nature, and implementation of appropriate mitigation measures identified in Section 7.2, no risk to the safety of the environment would be expected as a result of the proposed modification.	Nil
r. Any reduction in the range of beneficial uses of the environment? The proposed modification will not result in any reduction in the range of beneficial uses of the environment.	Nil
s. Any pollution of the environment? Potential impacts to water quality will be managed and mitigated through the implementation and maintenance of erosion and sediment control measures as per the Progressive Erosion and Sediment Control Plan (PESCP).	Short term: Negligible Long term: Nil
t. Any environmental problems associated with the disposal of waste? The proposed modification would not result in any problems associated with the disposal of waste.	Short term: Negligible Long term: Nil
u. Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply? The proposed modification will not increase the demands on resources (natural or otherwise).	Nil

Factor	Impact
v. Any cumulative environmental effect with other existing or likely future activities? The proposed modification would result in the additional noise impacts to adjacent receivers as identified in Section 6.1 of this addendum REF. However, as these impacts will be restricted to the construction phase of the approved project, and as these noise impacts will be contained to the immediate area surrounding Belmore Road Compound, these impacts would not constitute a significant cumulative effect.	Negligible
w. Any impact on coastal processes and coastal hazards, including those under projected climate change conditions? The proposed modification will not be carried out on land impacted by coastal processes, coastal hazards or those under projected climate change conditions.	Nil

Appendix D – Construction Noise and Vibration Impact Statement

hutchison weller

Stage 2 Upgrade of the Northern Road and Bringelly Road

Construction noise and vibration impact statement

January 2018

Doc no. 17011-NV-RP-1-3

Stage 2 Upgrade of the Northern Road and Bringelly Road

Title	Construction noise and vibration impact statement
Document no.	Doc No. 17011-NV-RP-1-3
Revision	Rev 3
Date	23 January 2018
Author	John Hutchison
Reviewer	Scott Hughes
File path	I:\PROJECTS\17011 - LL TNRU2 BRU2\02 Deliverables\021 Reports\17011-NV-RP-1-3 TNRU BRU CNVIS_C.docx

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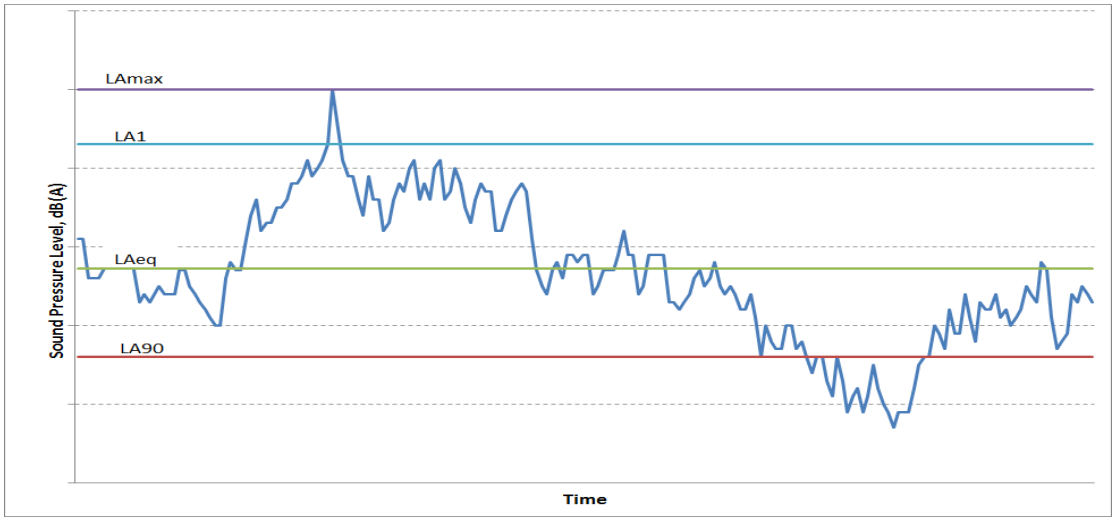
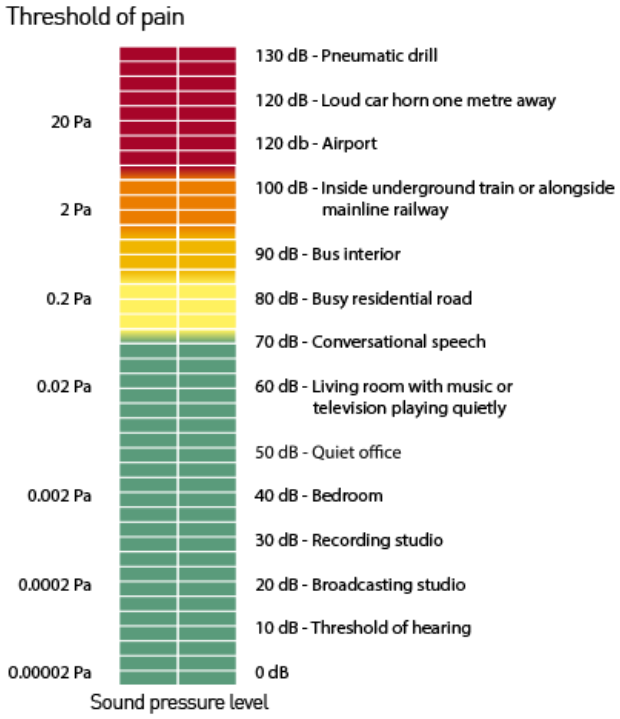
Definition of terms

Assessment period	The period in a day over which assessments are made.
Background noise	The underlying level of noise present in the ambient noise, excluding the noise source under investigation.
Decibel (dB)	A measure of sound equivalent to 20 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure, and 10 times the logarithm (to base 10) of the ratio of a given sound power to a reference power.
dB(A)	Unit used to measure 'A-weighted' sound pressure levels. A-weighting is an adjustment made to sound-level measurement to approximate the response of the human ear.
dB(C)	Unit used to measure 'C-weighted' sound pressure levels, an adjustment made to sound level to approximate low frequency noise between 10 Hz and 200 Hz.
Extraneous noise	Noise resulting from activities that are not typical of the area such as construction, and traffic generated by holiday periods or special events such as concerts or sporting events. Normal daily traffic is not considered to be extraneous.
Noise assessment criteria	A standard rule or test by which the acceptability of the nature and characteristics of noise may be judged or evaluated. Criteria are generally based on guidelines or standards developed by Government agencies (eg EPA) to protect the majority of people for the majority of the time from adverse impacts.
Noise level statistics	L_{A90} - The A-weighted sound pressure level exceeded 90% of the monitoring period. This is considered to represent the background noise. L_{Aeq} - The equivalent continuous A-weighted noise level—the level of noise equivalent to the energy average of noise levels occurring over a measurement period. L_{A1} – The A-weighted sound pressure level exceeded 1% of the monitoring period. L_{Amax} – The maximum A-weighted noise level associated with the measurement period. 
Sound Power Level (SWL)	The A-weighted sound power level is a logarithmic ratio of the acoustic power output of a source relative to 10^{-12} watts and expressed in decibels. Sound power level is calculated from measured sound pressure levels and represents the level of total sound power radiated by a sound source.

Sound Pressure Level (SPL)	This is the level of noise, usually expressed in dB(A), as measured by a standard sound level meter with a pressure microphone. The sound pressure level in dB(A) gives a close indication of the subjective loudness of noise. A technical definition for the sound pressure level, in decibels, is 20 times the logarithm (base 10) of the ratio of any two quantities related to a given sound pressure to a reference pressure (typically 20 µPa equivalent to 0 dB). Examples of typical sound pressure levels are shown below.  Source: https://www.osha.gov/dts/osta/otm/noise/health_effects/soundpropagation.html
Tonal noise	Noise with perceptible and definite pitch or tone

1. Introduction

1.1 Overview

Roads and Maritime Services (Roads and Maritime) is upgrading around 11.5 kilometers of The Northern Road between Peter Brock Drive and Mersey Road, and around 4.3 kilometers of Bringelly Road between the Northern Road and King Street (the Project). The Project is located around 45 kilometers west of the Sydney CBD and an illustration of its location and scale is provided in Figure 1-1.

Lendlease has been engaged by Roads and Maritime to construct the Project, which will include:

- Widening the Northern Road to a four-lane divided road (allowing for future upgrade to six lanes)
- Widening Bringelly Road to a four-lane divided road
- Constructing associated slip lanes and intersection upgrades.
- Demolition and construction of a new bridge
- Establishment and operation of support sites such as compound, asphalt and concrete batching plants at Belmore Road.

During construction, there is potential for nearby sensitive receivers to experience adverse impacts relating to noise and vibration and Lendlease is developing a construction noise and vibration management plan (CNVMP) to proactively and appropriately address these impacts, in line with relevant guidelines and the project Environment Protection Licence.

This construction noise and vibration impact statement supports the CNVMP, providing a summary of the existing environment, relevant noise and vibration management goals, results of the impact assessment and appropriate controls and safeguards.

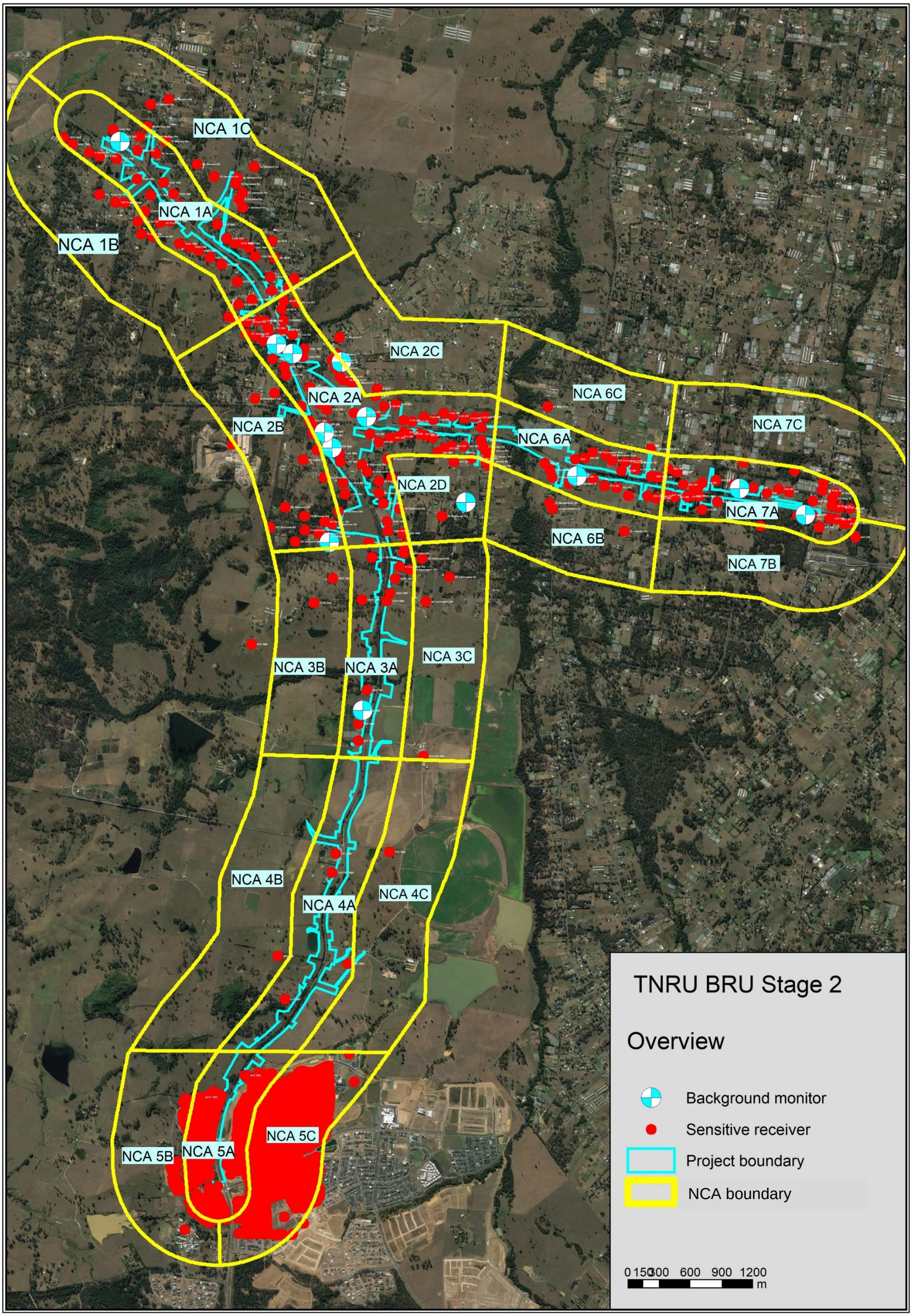


Figure 1-1 Location map

2. Assessment framework

2.1 QA Specification G36

The Project was assessed under Part 5 of the Environmental Planning and Assessment Act 1979 (EP&A Act) through preparation of Review of Environmental Factors (REF) reports.

Roads and Maritime was the determining authority for the Project, with approval based on implementation of the requirements of recommendations within the REF reports and the Roads and Maritime QA Specification G36.

Relevant to this CNVIS, Clause 4.6 of QA Specification G36 requires the preparation of a CNVMP, which provides proposed environmental control measures for all significant noise generating activities and shows the locations of all occupied noise sensitive premises on a map. The CNVMP must also:

- identify potential sources/activities that could cause noise impacts/risks;
- conduct a quantitative noise assessment for all works in accordance with the 'Interim Construction Noise Guidelines' (DECCW, 2009); and
- identify measures to minimise the potential noise impacts as identified in the quantitative noise assessment.

2.2 Environment Protection Licence

Environment Protection Licence (EPL) 20864 outlines Lendlease's responsibilities for management of noise and vibration. Conditions relevant to noise and vibration are as follows.

L3 Noise limits

L3.1 All works and activities must be undertaken in a manner that will minimise noise and vibration impacts on sensitive receivers.

L3.2 The licensee must ensure that all feasible and reasonable noise and vibration mitigation and management measures are implemented during construction work authorised by this licence in accordance with the Interim Construction Noise Guideline (DECC, 2009).

L4 Hours of operation

L4.1 Unless otherwise specified by any other condition of this licence, construction work is:
(a) restricted to between the hours of 7:00 am and 6:00 pm Monday to Friday;
(b) restricted to between the hours of 8:00 am and 1:00 pm Saturday; and
(c) not to be undertaken on Sundays or Public Holidays.

L4.2 Work generating high noise impact

Any work generating high noise impact must only be undertaken:
a) between the hours of 8:00am and 6:00pm Monday to Friday;
b) between the hours of 8:00am and 1:00pm Saturday; and
c) in continuous blocks of no more than 3 hours, with at least a 1 hour respite between each block of work generating high noise impact, where the location of the work is likely to impact the same receivers; except as expressly permitted by another condition of this licence. For the purposes of this Condition 'continuous' includes any period during which there is less than a 1 hour respite between ceasing and recommencing any of the work the subject of this Condition.

L4.3 The licensee may undertake construction work out of hours if that work does not cause;
a) LAeq(15 minute) noise levels no more than 5 dB(A) above rating background level at any residence in accordance with the Interim Construction Noise Guideline (Department of Environment and Climate Change, 2009);

b) LAeq(15 minute) noise levels no more than the noise management levels specified in Table 3 of the Interim Construction Noise Guideline (Department of Environment and Climate Change, 2009) at other sensitive receivers;
(c) continuous or impulsive vibration values, measured at the most affected residence, greater than those for human exposure to vibration, set out for residences in Table 2.2 to the technical guideline 'Environmental Noise Management Assessing Vibration' published by the Department of Environment and Conservation in February 2006, and
(d) intermittent vibration values, measured at the most affected residence, greater than those for human exposure to vibration, set out for residences in Table 2.4 to the technical guideline Environmental Noise Management

L4.4 The licensee may undertake works outside of standard construction hours if:

(i) agreement between the licensee and a substantial majority of potentially affected noise sensitive receivers has been reached.

L4.5 Any agreement(s) between the licensee and the potentially affected noise sensitive receivers referred to in Condition L4.4 must be recorded in writing and a copy of the agreement(s) kept on the premises by the licensee for the duration of this licence.

L4.6 Works Approved Outside of Standard Construction Hours
(a) Activities and works may be undertaken outside of standard construction hours specified in L4.1 but only if one or more of the following applies:
(i) carrying on those works and activities during the hours specified in Condition L4.1 would cause unacceptable risks to one or more of the following:
(1) construction personnel safety;
(2) road user and public safety;
(3) road network operational performance as may be notified from time to time by the Roads and Maritime Services; and/or
(4) essential utility services; and/or

(ii) the TfNSW Transport Management Centre (or other road authority) refuse to issue a road occupancy licence for the works or activities during the hours specified in Condition L4.1.

L4.7 The licensee may undertake works outside of standard construction hours if:
(i) the delivery of oversized plant or structures has been determined by the police or other authorized authorities to require special arrangements to transport along public roads; or
(ii) emergency work is required to avoid the loss of lives or property, or to prevent environmental harm.

L4.8 In undertaking any works or activities under Condition L4.6 the licensee must:
(i) comply with the requirements of the Out of Hours Work Protocol (Revision C) The Northern Road & Bringelly Road Upgrade Stage 2 project; and
(ii) implement noise and vibration mitigation detailed in the Interim Construction Noise Guidelines (DECC 2009).

L4.9 A copy of the out of hours protocol must be available for public access on the project website.

L4.10 Notification of works approved outside of standard construction hours
a) The licensee must notify potentially affected noise sensitive receivers of works approved outside of standard construction hours not less than 5 days and not more than 14 days before those works are to be undertaken,

b) The notification must be:
• by letterbox drop or email; and
• be detailed on the project website,

c) The notification required by paragraphs (a) and (b) of this condition must:
• clearly outline the reason that the work is required to be undertaken outside the hours specified in Condition L4.1;
• include a diagram that clearly identifies the location of the proposed works in relation to nearby cross streets and local landmarks;
• include details of relevant time restrictions that apply to the proposed works;
• clearly outline, in plain English, the location, nature, scope and duration of the proposed works;
• detail the expected noise impact of the works on noise sensitive receivers;
• clearly state how complaints may be made and additional information obtained; and
• include the number of the telephone complaints line required by Condition M7.1, an after hours contact phone number specific to the works undertaken outside the hours specified in Condition L4.1, and the project website address.
Note: For the avoidance of doubt condition L4.10 does not apply to works undertaken pursuant to condition L4.3 or L4.7 a) or b).

3. Existing environment and assessment criteria

3.1 Existing environment

The Project extends over a large area between Bringelly in the north and Oran Park in the South and Rossmore to the east. The area surrounding the project can be broken into several major land uses, as can be seen in Figure 1-1:

- At the southern extent of the Project is primarily suburban land use, with new residential estates under construction
- North of Oran Park up to Bringelly , the land use is primarily rural and sparsely populated.
- In Bringelly and to the northern extent of the project, land use us semi-rural with low density lifestyle / residential blocks.
- Along Bringelly Road, to the eastern extent of the project, similar semi-rural land uses are dominant, with low density, larger blocks.

3.2 Noise catchment areas

Noise catchment areas (NCAs) that reflect similar land uses and reflect groups of receivers who experience a similar level of existing noise, have been established for the Project and are illustrated in Figure 1-1. A summary of these NCAs is present in Table 3-1. NCAs have been divided into three sub-NCAs to accommodate the reduction in influence of road traffic noise on the ambient noise level further from the main road.

Higher detail maps of receiver locations and NCAs are provided in Appendix A.

Table 3-1 Noise catchment areas (NCAs)

NCA	Description
NCA-01	Northern extent of the project, north of Badgerys Creek Road.
NCA-02	Bringelly Road intersection with The Northern Road
NCA-03	Rural area south of Belmore Road to 900 The Northern Road
NCA-04	Rural area south of 900 The Northern Road to northern extent of Oran Park estate
NCA-05	Oran Park estate
NCA-06	Bringelly Road east of Jersey Road to Church Street
NCA-07	East of Church Street to eastern extent of project at King Street.

3.3 Background noise levels

Baseline noise levels were established as part of the REF through background noise monitoring at locations shown in Figure 1-1 as well as in further detail in Appendix A. Noise measurements were taken in 2011 and 2015 to determine the existing noise levels, including the Rating Background Level (RBL), which represents the average minimum background sound level which is the measured 10th percentile LA90 noise level for each measurement period, averaged over the measurement days.

Not all NCAs were represented during the monitoring; however, representative locations have been selected considering similar land uses and distances from The Northern Road and Bringelly Road. A summary of RBLs for each NCA is provided in Table 3-2.

Table 3-2 Background noise levels for each NCA

NCA	Representative monitoring location	Rating background level (RBL)		
		Day (7am to 6pm)	Evening (6pm to 10pm)	Night (10pm to 7am)**
1A	L12	44	41	32
1B	L4	40	40	33
1C	L4	40	40	33
2A	L1	50	44	33
2B	L4	40	40	33
2C	L5	43	41	36
2D	L6	39	39	34
3A	L9	47	43	30
3B	L5	43	41	36
3C	L6	39	39	34
4A	L9	47	43	30
4B	L5	43	41	36
4C	L5	43	41	36
5A	L8	46	39	30
5B	L5	43	41	36
5C	L5	43	41	36
6A	L14	41	37	30
6B	L6	39	39	34
6C	L6	39	39	34
7A	L13	44	38	34
7B	L6	39	39	34
7C	L6	39	39	34

3.4 Assessment criteria

EPL Condition L3.2 requires that requires that all feasible and reasonable noise mitigation measures be implemented with the aim of achieving the construction noise management levels detailed in the *Interim Construction Noise Guideline* (ICNG) (DECC, 2009) during construction activities.

The ICNG describes that noise in excess of the background noise level may result in adverse impact and increased likelihood of complaint. During standard hours, where construction noise is within 10 dB(A) of the RBL, the impacts are considered to be acceptable.

Where construction noise is more than 10 dB(A) above the RBL, a residential receiver is taken to be noise affected and the proponent should undertake all reasonable and feasible steps necessary to manage the impact and consult with the affected community. Above a $L_{Aeq,\ 15\ minute}$ noise level of 75 dB(A), a receiver is considered to be highly noise affected, requiring respite to be given in consultation with the regulatory authority and the community.

At night, or outside approved construction hours, construction noise at a residential receiver more than 5 dB(A) above the RBL is taken to be noise affected.

In addition, annoying noise such as rock hammers, impact piling, or other impulsive noise sources usually result in greater annoyance than continuous construction noise. A 5 dB(A) penalty is applicable to such activities prior to comparison with the NMLs.

The NML relevant to each NCA is summarised in Table 3-3, based on the RBLs in Table 3-2.

Table 3-3 Summary of project-specific noise assessment criteria

NCA	Construction noise management levels, $L_{Aeq,\ 15\ minute}$		
	Daytime (7 am to 6 pm)	Evening (6 pm to 10 pm)	Night (10 pm to 7 am)
1A	54	49	46
1B	50	45	45
1C	50	45	45
2A	60	55	49
2B	50	45	45
2C	53	48	46
2D	49	44	44
3A	57	52	48
3B	53	48	46
3C	49	44	44
4A	57	52	48
4B	53	48	46
4C	53	48	46
5A	56	51	44
5B	53	48	46
5C	53	48	46
6A	51	46	42
6B	49	44	44
6C	49	44	44
7A	54	49	43
7B	49	44	44
7C	49	44	44

Where a commercial property is affected by noise, a level above $L_{Aeq\ 15min}$ 70 dB(A) is considered to warrant noise mitigation. Similarly, an industrial facility would warrant noise mitigation at $L_{Aeq\ 15\ minute}$ noise levels above 75 dB(A).

Other sensitive land uses, such as schools will only find noise from construction to be disruptive when the properties are being used. Table 3-4 presents management levels for noise at other sensitive land uses based on the principle that the characteristic activities for each of these land uses should not be unduly disturbed.

Internal noise levels are assessed at the centre of the occupied room. Where internal noise levels cannot be measured, external noise levels may be used. A conservative estimate of the difference between internal and external noise levels is 10dB for buildings other than residences.

Table 3-4 NMLs for non-residential sensitive receivers

Receiver type	NML applicable when in use, LAeq, 15 min
Classrooms at schools and other educational institutions	Internal noise level 45 dB(A)
Hospital wards and operating theatres	
Places of worship	
Active recreation areas (characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion)	External noise level 65 dB(A)
Passive recreation areas (characterised by contemplative activities that generate little noise and where benfefits are compromised by external noise intrusion, for example, reading, meditation)	External noise level 60 dB(A)
Community centres	Depends on the intended use of the centre. Refer to the recommended 'maximum' internal levels in AS2107 for specific uses.

3.5 Out of hours work

Lendlease has prepared an out of hours work protocol for works planned to be undertaken outside standard construction hours. As part of this assessment process, Lendlease would consider options such as programming of work, alternative construction techniques and substitution of equipment to reduce impacts where possible. Once potential noise levels have been predicted, their impact on sensitive receivers will be assessed against the classifications outlined in Table 3-5 to determine appropriate mitigation measures. Management measures applicable to each impact classification are summarised in Table 3-5.

Table 3-5 Impact classification for out of hours work

Impact classification	LAeq, 15 minute exceedance of RBL
A	1 – 5
B	6 – 10
C	11 – 20
D	21 – 30
E	>30

Table 3-6 management for OOHW noise impact classification

Management measure	Impact classification				
	A	B	C	D	E
Programming / schedule of works	✓	✓	✓	✓	✓
Alternative construction techniques/scheduling	✓	✓	✓	✓	✓
Alternative plant and equipment	✓	✓	✓	✓	✓
Community consultation (i.e. letter box drops, etc)		✓	✓	✓	✓
Receiver Specific Notifications (Phone Call)			✓	✓	✓
Provision for respite periods for high level noise activities				✓	✓
Receiver Specific Contact (i.e. Face to Face Consultation)				✓	✓
Good will offer					✓
Reasonable temporary relocation offer1					✓
Negotiated agreement					✓

Note 1: Temporary relocation to be offered where construction works are planned to extend over more than two consecutive nights at that impact classification

3.6 Sleep disturbance

The ICNG recommends that, where works are likely to occur over more than two consecutive nights, maximum noise levels should be analysed in terms of the extent and number of times the maximum noise exceeds the RBL. Additionally, the DECCW (2011) Road Noise Policy discusses a guideline aimed at limiting the level of sleep disturbance due to environmental noise: a $L_{A1,\ 1\ minute}$ level of any noise should not exceed the ambient LA90 noise level by more than 15 dB(A).

In addition, the Road Noise Policy suggests that maximum internal noise levels below 50-55 dB(A) are unlikely to awaken people from sleep and one or two noise events per night, with maximum internal noise levels of 65-70 dB(A) are not likely to affect health and wellbeing significantly.

Based on this guidance, a sleep awakening criterion of 55 dB(A) (internal) has been adopted for the works. Given that noise attenuation of 10 dB(A) is typically provided by an open window, a sleep awakening criterion of 65 dB(A) (external) has been applied to residential bedroom façades.

Hence, a screening criterion for sleep disturbance of RBL + 15 dB(A), measured as $L_{A1,\ 1\ minute}$, and an awakening criterion of 65 dB(A) will be applied in this assessment. While not mandatory, the screening criterion should trigger additional consideration of the nature and frequency of disturbances whilst the awakening criterion should act as a maximum noise goal not to be exceeded on more than a couple of occasions.

3.7 Vibration management levels

When assessing human exposure to construction-related vibration, EPL Conditions L3.4 and L4.3 require vibration criteria established using *Assessing vibration – a technical guideline* (DECC 2006), which provides criteria for the assessment of vibration impacts on humans. Construction activities typically generate vibration of an intermittent nature, which is assessed using a Vibration Dose Value (VDV) as presented in Table 3-7.

Table 3-7 : VDV Vibration criteria

Receiver type	Time period	Intermittent Vibration Dose Value (VDV $ms^{-1.75}$)	
		Preferred	Maximum
Critical areas	When in Use	0.1	0.2
Residential	Day (7am to 10pm)	0.2	0.4
	Night (10pm to 7am)	0.13	0.26
Office, schools, educational institutions and places of worship	When in use	0.4	0.8

Guidance for the consideration of potential building damage as a result of construction vibration is in line with the criteria in BS 7385-1 *Evaluation and measurement for vibration in buildings - Guide for measurement of vibration and evaluation of their effects on buildings*. These guideline values are presented in Table 3-8.

Table 3-8 Building damage vibration guidelines (BS 7385-1)

Type of building	Guideline values for vibration (PPV mm/s)		
	4Hz to 15Hz	15Hz to 40Hz	40Hz and above
Reinforced or framed structures / Industrial and heavy commercial buildings	50		
Un-reinforced or light framed structures / Residential or light commercial type buildings	15 - 20	20 - 50	50

For heritage structures, criteria are in line with the German Standard *DIN 4150-3: Structural Vibration- effects of vibration on structures,* as summarised in Table 3-9.

Table 3-9 Guideline values for vibration velocity to be used when evaluating the effects of short-term vibration on structures (DIN 4150-3).

Line	Type of building	Guideline values for vibration (PPV mm/s)			
		1 Hz to 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz	Vibration at horizontal plane of highest floor at all frequencies
1	Buildings used for commercial purposes, industrial buildings, and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or occupancy	5	5 to 15	15 to 20	15
3	Structures that, because of their particular sensitivity to vibration, cannot be classified under lines 1 and 2 and are of great intrinsic value (e.g. listed buildings under preservation order)	3	3 to 8	8 to 10	8

The safe working distances presented in Table 3-10 are indicative and will vary depending on the item of plant and local geotechnical conditions. The cosmetic damage thresholds apply to typical buildings under typical geotechnical conditions and vibration monitoring is recommended at specific sites. Where structures are more sensitive, such as heritage items, more stringent conditions are applicable and should be considered individually.

In relation to human response, the safe working distances relate to continuous vibration. For most construction activities, vibration emissions are intermittent and higher vibration levels over shorter periods are acceptable. Additional assessment should be undertaken where the human response criteria are exceeded.

Table 3-10 Safe working distances for vibration intensive plant

Plant item	Rating/description	Safe working distance	
		Cosmetic damage (BS 7385-1)	Human response (DECCW)
Vibratory roller	<50 kN (typically 1-2 t) <100 kN (typically 2-4 t) <200 kN (typically 4-6 t) <300 kN (typically 7-13 t) >300 kN (typically 13-18 t) >300 kN (> 18 t)	5 m 6 m 12 m 15 m 20 m 25 m	15 m to 20 m 20 m 40 m 100 m 100 m 100 m
Small hydraulic hammer	300 kg – 5 to 12 t excavator	2 m	7 m
Medium hydraulic hammer	900 kg – 12 to 18t excavator	7 m	23 m
Large hydraulic hammer	1600 kg – 18 to 34 t excavator	22 m	73 m
Vibratory pile driver	Sheet piles	2 m to 20 m	20 m
Pile boring	≤800 mm	2 m	n/a
Jackhammer	Hand held	1 m	Avoid contact with structure

4. Impact assessment

4.1 Construction activity and source noise levels

Proposed activities and equipment are summarised in Table 4-1. Anticipated overall unmitigated $L_{Aeq,\ 15\ minute}$ sound power levels from all equipment working at the same time during each activity are also presented in the table.

Sound power levels and ultimate predicted noise levels will depend on the number of plant items operating at any one time and their precise location relative to a sensitive receiver. Equipment was assumed to be working at the worst-case location relative to each receiver and represents a worst-case assessment. Where activity moves away from each receiver, or less equipment is operating, predicted levels will decrease.

4.2 Modelling

SoundPlan, widely used noise modelling software, was used to calculate noise impacts in accordance with the ISO9613 prediction method, at all identified noise-sensitive receivers. The following components were incorporated in the model:

- Topography – 1 metre DEM based on LPI Lidar data captured in 2015
- Individual sensitive receivers – One receiver location representing each residential dwelling and located at 1.5 metres height up to 1,000 metres from the works.
- Construction noise sources –Activities and equipment provided by Lendlease were included in the noise model as area sources across the project. Sound power levels as per Table 4-1. Noise sources are assumed to be present at any point within the project boundary. The maximum predicted LAeq noise level within each work area was identified for each receiver.
- Meteorology –worst-case conditions (gentle breeze from source to receiver and stable conditions).

Table 4-1 Summary of proposed works

Scenario ref	Scenario	Location	Activity ref	Activity	Equipment	$L_{Aeq, 15 minute}$ Activity SWL
A	Service Relocations	All Areas	A.1	Service Locating	Suction Truck	112
			A.2	Pavement Cutting	Concrete Saw (Std)*	112
					Bogies idling	
			A.3	Excavation	Excavator 8 t (400 kg Breaker)*	110
					Bogies idling	
			A.4	Install Conduits and Backfill	Excavator 8 t (400 kg Breaker)*	112
					Wacker Packer*	
					Vibratory Roller (10 tonne)*	
			A.5	Cutover	Concrete Saw (Std)*	116
					Excavator 8 t (400 kg Breaker)*	
					Bogies idling	
			A.6	Reinstate pavement	Bogies idling	107
					Wacker Packer*	
					Vibratory Roller (10 tonne)*	
B	Clearing and Grubbing	All Areas	B.1	Vegetation Clearing and Mulching	Excavator (20 tonne)	112
					Truck and dog (moving)	
					Chipper (15"-20")	
					Elevated Working Platform	
					Chain saw	
			B.2	Grubbing	Excavator (20 tonne)	111
					Chipper (15"-20")	
					Stump grinder 20 kW	
C	Topsoil Stripping	All Areas	C.1	Remove topsoil	Excavator (20 tonne)	113
					Scraper 657G	
					Compactor 825	
					Grader 24H/M	
					Bogies moving	
D	Placing Concrete Barriers	All Areas	D.1	Barrier Placement	Truck (road) idle	97
					Franna Crane	
					Hand tools	
					Ute	
E	Road Profiling	All Areas	E.1	Road Profiling	Bogies idling	111
					Road Profiler	
					Bobcat	
					Street sweeper	
					Ute	
F	Earthworks	All areas	F.1	Moving	Excavator (30 tonne)	115
					Dozer D6	
					Scraper 657G	
					Bogies moving	
					Grader 24H/M	
			F.2	Compacting	Vibratory Roller (20 tonne)*	113
					Truck (25t)	
					Compactor 825	
					Bogies moving	
					Bobcat	
					Water Tanker (8000 litre)	
G	Drainage Works	All Areas	G.1	Box Culvert excavate	Excavator (30 tonne)	107
					Truck (25t)	
			G.2	Box culvert pour	Concrete Truck / Agitator - discharging	106
					Concrete Pump	
					Concrete Vibrator- Compressed air poker	

Scenario ref	Scenario	Location	Activity ref	Activity	Equipment	$L_{Aeq, 15 minute}$ Activity SWL
			G.3	Box culvert install	Franna Crane	106
					Mobile Crane (50 tonne)	
					Truck (road) idle	
			G.4	Subsurface trenching	Excavator (20 tonne)	105
					Trencher (Ditch Witch)	
					Bogies idling	
			G.5	Install RCP	Franna Crane	94
			G.6	Backfill	Wacker Packer*	107
					Trench roller	
			G.7	Cutting RCP	Concrete Saw (Std)*	112
					Grinder 4 inch	
H	Bridge Demolition	Thompsons Creek	H.1	Demolition	Excavator 30 t (pulveriser attachment)	118
					Excavator 30 t (2200 kg Breaker)*	
					Franna Crane	
					Grinder 4 inch	
I	Bridge Construction	Bringelly/Thompsons Creek	I.1	Piling (bored)	Piling Rig (Impact)*	115
			I.2	Concrete pours	Concrete Truck / Agitator - discharging	107
					Concrete Pump	
					Concrete Vibrator- Compressed air poker	
					Grinder 4 inch	
J	Concrete Paving	All Areas	J.1	Lean Mix Concrete	Paving Machine	113
					Concrete Vibrator- Compressed air poker	
					Concrete screed - walk behind petrol	
					Bogies idling	
					Grinder 4 inch	
					Concrete Truck / Agitator - discharging	
			J.2	Culverts and Bridges	Concrete Truck / Agitator - discharging	106
					Concrete Pump	
					Grinder 4 inch	
					Concrete Vibrator- Compressed air poker	
K	Asphalt Paving	All Areas	K.1	Placement of Asphalt	Paving Machine	116
					Vibratory Roller (20 tonne)*	
					Bogies idling	
					Paving shuttle buggy	
			K.2	Milling	Road Profiler	111
					Bogies idling	
					Bobcat	
L	General Compound & Workshop Operation (exc. Batch)	Belmore Road compound	L.1	Compound Use	Generator 200 KVA silenced	96
					Ute	
			L.2	Deliveries	Truck (road) idle	96
					Franna Crane	
M	With Batch Plant (Day and Night time operation)	Belmore Road compound	M.1	Asphalt batching	Front end loader	116
					Air compressor	
					Raw materials conveyors	
					Vibratory hopper	
					Drying drum	
					Baghouse fan and motor	

Scenario ref	Scenario	Location	Activity ref	Activity	Equipment	$L_{Aeq, 15 minute}$ Activity SWL
					Baghouse exhaust	
					Generator 1100kVA	
					Generator 60kVA	
					Haul truck	
			M.2	Concrete batching	Water Cooler	112
					Water Pump	
					Air compressor	
					Conveyer	
					Haul truck	
					Gravel hopper	
			M.3	Deliveries	Truck (road) idle	103
					Truck and dog (moving)	
N	Compound & Batch Setup	Belmore Road compound	N.1	Earthworks	Excavator (30 tonne)	115
					Moxy (idle)	
					Dozer D6	
					Ute	
			N.2	Building & Concrete Works	Concrete Truck / Agitator - discharging	107
					Concrete Pump	
					Hand Tools (electric)	
					Ute	
			N.3	Spray Seal	Tipper Truck	97
					Spray truck (bitumen)	
					Vibratory Roller (20 tonne)*	
					Ute	
			N.4	Batch Erection	Crawler Crane (100 tonne)	109
					Excavator (30 tonne)	
					Concrete Truck / Agitator - discharging	
					Truck (road) idle	
					Concrete Pump	

* includes 5 dB adjustment for annoying characteristics as recommended in the ICNG

4.3 Predicted noise levels

4.3.1 Mobile activity

Estimated maximum (worst-case) noise levels for each assessed scenario are summarised in Table 4-2 to Table 4-4 for the closest location of construction activity relative to each identified receiver. Noise levels are assessed against the day, evening and night time NMLs of the ICNG. Individual predictions for all assessed receivers are provided in Appendix B.

The nature of the works means that noise poses a high risk of adverse impact on nearby receivers, particularly those close to or adjacent the project boundary.

Results demonstrate that activities posing the greatest risk of impact on receivers include the following, with numerous residences likely to be highly noise affected (>75 dB) at some time.

- Rock breaking during service relocation
- Vegetation clearing / mulching and grubbing
- Bulk earthworks with scrapers and heavy rollers
- Compacting with heavy rollers
- Paving

For out of hours activities the risk of impact increases significantly, and construction should be restricted to standard construction hours where practicable. Out of hours works would be assessed in line with the OOHW protocol and additional mitigation measures implemented as appropriate.

4.3.2 Stationary operations

The batch plants are located on Belmore Road, with the asphalt batch plant situated on the northern side and concrete batch plant on the southern side within the 2B noise catchment. The nearest receivers to the batching plants are around 100 metres to the south of the concrete plant and 200 metres to the north of the asphalt plant.

Batching operations do not represent a high risk of impact during the day, with only a small number of receivers likely to experience minor exceedances of the NML (1 – 5 dB).

Out of hours operation of the concrete and asphalt batching plants will occur over the life of the project. During night time operation, batching is likely to impact on a larger group, with exceedances of up to 10 dB of the night NML expected at around 22 residences during asphalt batching and 12 residences during concrete batching. Up to 17 receivers are predicted to experience noise levels between 10 and 20 dB above the NML, with one receiver predicted to experience noise levels more than 20 dB above the NML during asphalt batching and two during concrete batching.

Contours showing the predicted noise levels for both batching plants operating are shown in Figure 2. It is evident that nearby homes may experience elevated noise levels from operation of the plants.

Recommendations for controls and safeguards while batching (particularly at night) are provided in Section 5.

4.3.3 Sleep disturbance

During night operations after 10 pm, the sleep disturbance screening criterion is likely to be exceeded at the nearest residences depending on the location and type of activity within the site. As outlined in Section 3.6, further consideration of any proposed OOHW would be necessary to minimise impacts on sleep.

Table 4-2 Summary of predicted noise levels – Activity A - E

Construction phase	A. Service Relocations						B. Clearing and grubbing		C. Topsoil	D. Concrete barriers	E. Road profiling
	Service Locating	Pavement Cutting	Excavation	Install Conduits and Backfill	Cutover	Reinstate pavement	Vegetation Clearing and Mulching	Grubbing	Stripping	Placement	Profiling
Maximum predicted $L_{Aeq,\ 15\ minute}$ noise level	94	94	92	94	103	89	94	93	95	79	93
Number of highly noise affected receivers (>75 dB)	73	74	61	72	153	37	71	67	81	3	69
Number of exceedances of day NML											
1 – 5 dB above NML	219	225	160	218	381	115	200	190	268	36	197
6 - 10 dB above NML	108	109	84	102	194	55	103	96	129	41	98
10 – 20 dB above NML	92	94	80	92	146	82	85	82	102	20	82
20+ dB above NML	63	63	49	63	94	22	62	60	71	1	62
Number of exceedances of weekend day NML											
1 – 5 dB above NML	435	437	328	417	678	227	404	379	497	54	384
6 - 10 dB above NML	216	222	160	215	379	114	197	189	266	35	195
10 – 20 dB above NML	164	164	128	158	290	93	154	143	189	58	147
20+ dB above NML	97	100	82	97	141	65	94	93	110	4	93
Number of exceedances of evening NML											
1 – 5 dB above NML	436	440	373	429	602	320	412	399	480	118	408
6 - 10 dB above NML	322	322	321	324	403	264	325	330	345	55	325
10 – 20 dB above NML	376	382	282	367	544	188	353	321	421	77	335
20+ dB above NML	155	157	121	148	253	96	145	140	176	15	141
Number of exceedances of night NML											
1 – 5 dB above NML	589	590	528	592	503	350	590	571	590	289	581
6 - 10 dB above NML	327	334	238	319	575	240	299	272	398	198	283
10 – 20 dB above NML	534	532	550	533	544	502	542	547	524	140	548
20+ dB above NML	442	448	344	432	679	243	413	393	503	86	399

Table 4-3 Summary of predicted noise levels – Activity F - I

Construction phase	F. Earthworks		G. Drainage works							H. Bridge demolition	I. Bridge construction	
	Moving	Compacting	Box Culvert excavate	Box culvert pour	Box culvert install	Subsurface trenching	Install RCP	Backfill	Cutting RCP	Demolition	Piling (bored)	Concrete pours
Maximum predicted $L_{Aeq,\ 15\ minute}$ noise level	97	96	89	88	88	87	76	89	94	67	64	56
Number of highly noise affected receivers (>75 dB)	94	81	16	14	14	12	1	31	74	0	0	0
Number of exceedances of day NML												
1 – 5 dB above NML	327	276	103	98	93	83	48	109	219	14	5	1
6 - 10 dB above NML	169	129	54	48	46	44	16	56	108	4	3	0
10 – 20 dB above NML	130	107	77	76	78	70	9	80	92	2	1	0
20+ dB above NML	84	71	21	18	13	12	1	21	63	0	0	0
Number of exceedances of weekend day NML												
1 – 5 dB above NML	622	516	207	193	178	155	44	222	435	29	27	4
6 - 10 dB above NML	325	274	102	97	92	80	48	108	216	14	5	1
10 – 20 dB above NML	250	192	89	80	79	79	24	93	164	5	4	0
20+ dB above NML	130	112	62	61	57	47	2	63	97	1	0	0
Number of exceedances of evening NML												
1 – 5 dB above NML	570	488	324	325	329	312	89	322	436	31	26	7
6 - 10 dB above NML	374	347	245	219	200	178	37	261	322	22	17	3
10 – 20 dB above NML	507	428	173	164	154	136	66	183	376	14	6	0
20+ dB above NML	223	183	92	89	86	81	8	95	155	1	0	0
Number of exceedances of night NML												
1 – 5 dB above NML	561	589	313	281	262	236	246	334	589	12	31	20
6 - 10 dB above NML	531	412	250	263	271	282	132	243	327	39	40	12
10 – 20 dB above NML	523	526	487	466	450	417	101	496	534	41	31	12
20+ dB above NML	616	511	226	213	203	186	65	241	442	17	6	0

Table 4-4 Summary of predicted noise levels – Activity J - N

Construction phase	J. Concrete paving		K. Asphalt paving		L. General compound and workshop		M. Compound and batching			N. Compound and batch establish			
	Lean Mix Concrete	Culverts and Bridges	Placement of Asphalt	Milling	Compoun d Use	Deliveries	Asphalt batching	Concrete batching	Deliveries	Earthworks	Building & Concrete Works	Spray Seal	Batch Erection
Maximum predicted $L_{Aeq,\ 15\ minute}$ noise level	95	88	98	93	45	45	58	61	51	64	56	46	58
Number of highly noise affected receivers (>75 dB)	81	15	107	65	0	0	0	0	0	0	0	0	0
Number of exceedances of day NML													
1 – 5 dB above NML	268	98	384	179	0	0	3	0	0	5	1	0	3
6 - 10 dB above NML	129	50	197	93	0	0	0	0	0	3	0	0	1
10 – 20 dB above NML	102	74	148	80	0	0	0	0	0	1	0	0	0
20+ dB above NML	71	20	94	57	0	0	0	0	0	0	0	0	0
Number of exceedances of weekend day NML													
1 – 5 dB above NML	497	195	683	366	0	0	12	8	1	24	4	0	2
6 - 10 dB above NML	266	97	384	178	0	0	3	0	0	5	1	0	3
10 – 20 dB above NML	189	81	292	138	0	0	0	0	0	4	0	0	1
20+ dB above NML	110	62	143	90	0	0	0	0	0	0	0	0	0
Number of exceedances of evening NML													
1 – 5 dB above NML	480	325	605	391	0	0	14	11	3	25	7	0	11
6 - 10 dB above NML	345	221	408	329	0	0	8	2	0	17	3	0	4
10 – 20 dB above NML	421	166	546	308	0	0	1	1	0	6	0	0	1
20+ dB above NML	176	89	255	132	0	0	0	0	0	0	0	0	0
Number of exceedances of night NML													
1 – 5 dB above NML	590	283	490	559	10	10	23	20	12	32	20	13	31
6 - 10 dB above NML	398	260	581	262	1	1	22	12	11	39	12	2	13
10 – 20 dB above NML	524	471	543	542	0	0	17	8	1	31	12	0	19
20+ dB above NML	503	216	687	382	0	0	1	2	0	6	0	0	0

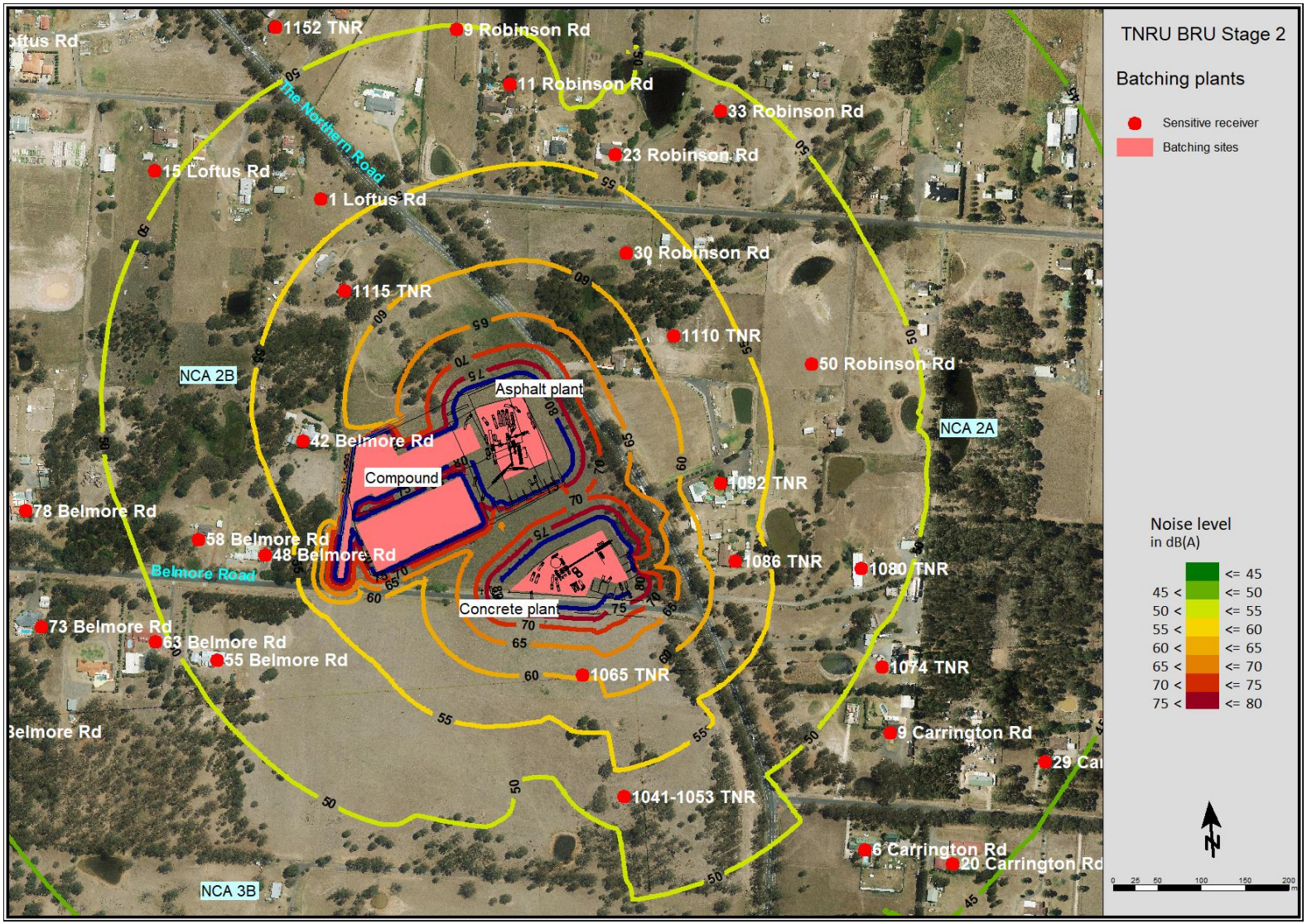


Figure 2 Predicted noise contours for operation of both batching plants.

4.4 Vibration

Vibration intensive activities are proposed throughout the construction project. Equipment including vibratory rollers and rock breakers are likely to be used within the safe working distances described in Table 3-10, particularly for human comfort impacts.

The potential for building damage should be considered where rolling with a heavy roller is undertaken within 25 metres of a dwelling.

Residential buildings are located within about 5-10 metres of the site boundary, which may require the use of vibratory or static rollers for the compaction of the hardstand. At these distances, care should be taken with equipment selection to minimise vibration emissions and to avoid exceeding the recommended safe working distances for plant outlined in Table 3-10. This may require the use of non-vibratory or manual compaction for areas where residences are closer than about 25 metres.

5. Controls and safeguards

5.1 Summary

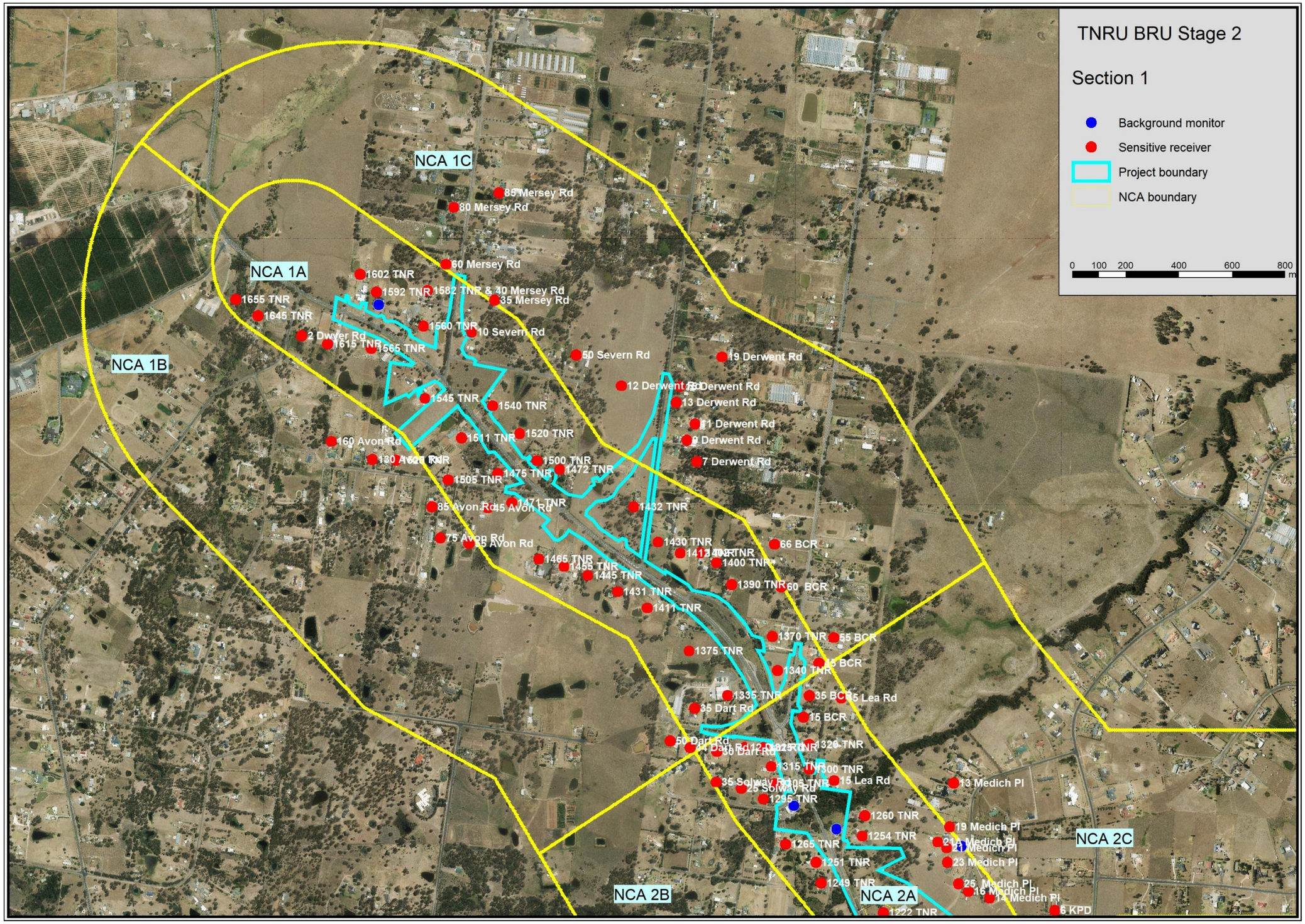
The Project represents a risk of adverse impacts on sensitive receivers, particularly when working close to the project boundary. These impacts carry a higher risk when activities are conducted during the night period. No stockpiling or other continuous construction activities should be undertaken out of standard construction hours.

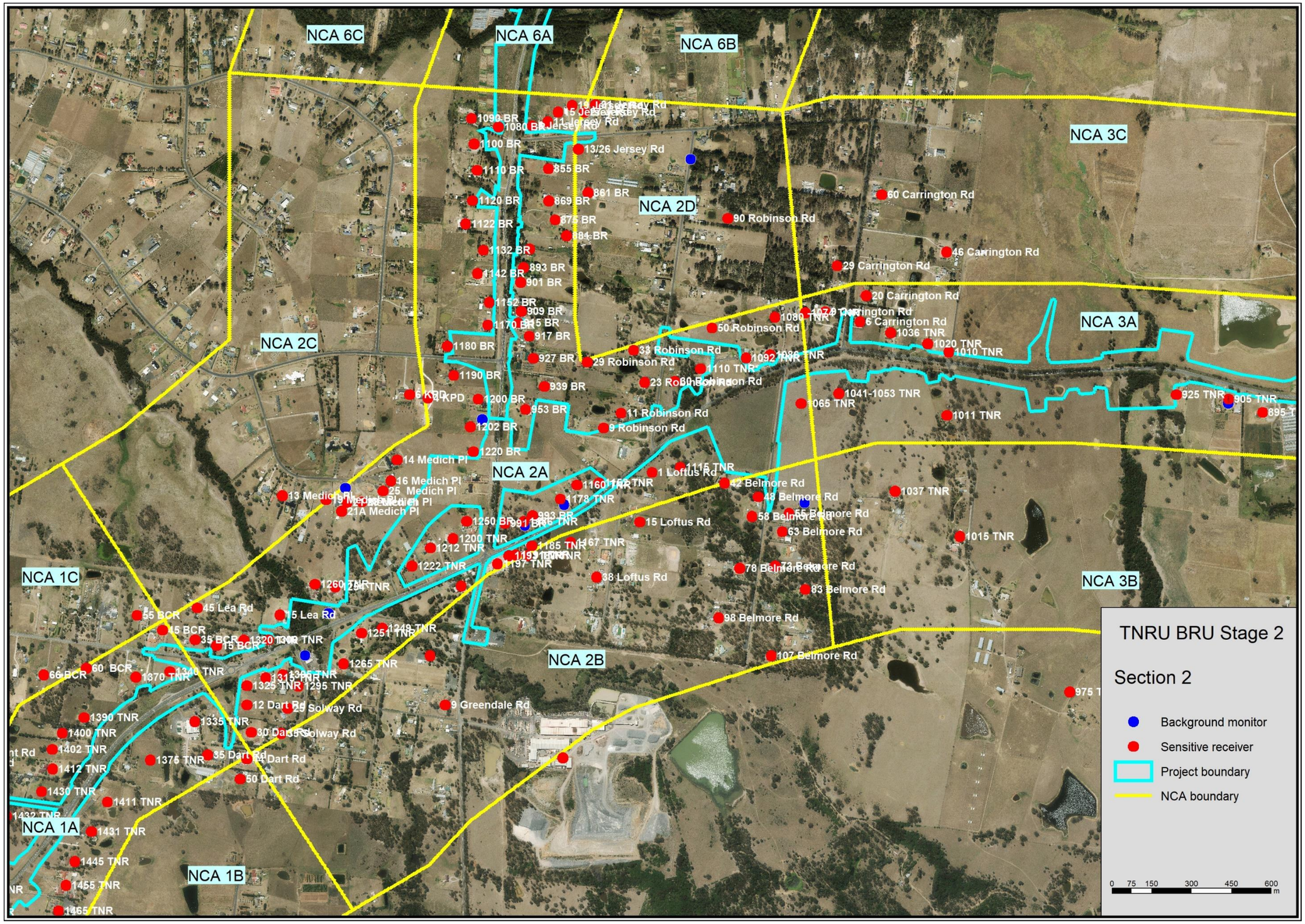
Where short term noise impacts are unavoidable, mitigation measures described in the project construction noise and vibration management plan should be implemented together with the recommendations in Table 5-1 and OOHW mitigation measures for each receiver identified in Appendix B and summarised in Section 3.5.

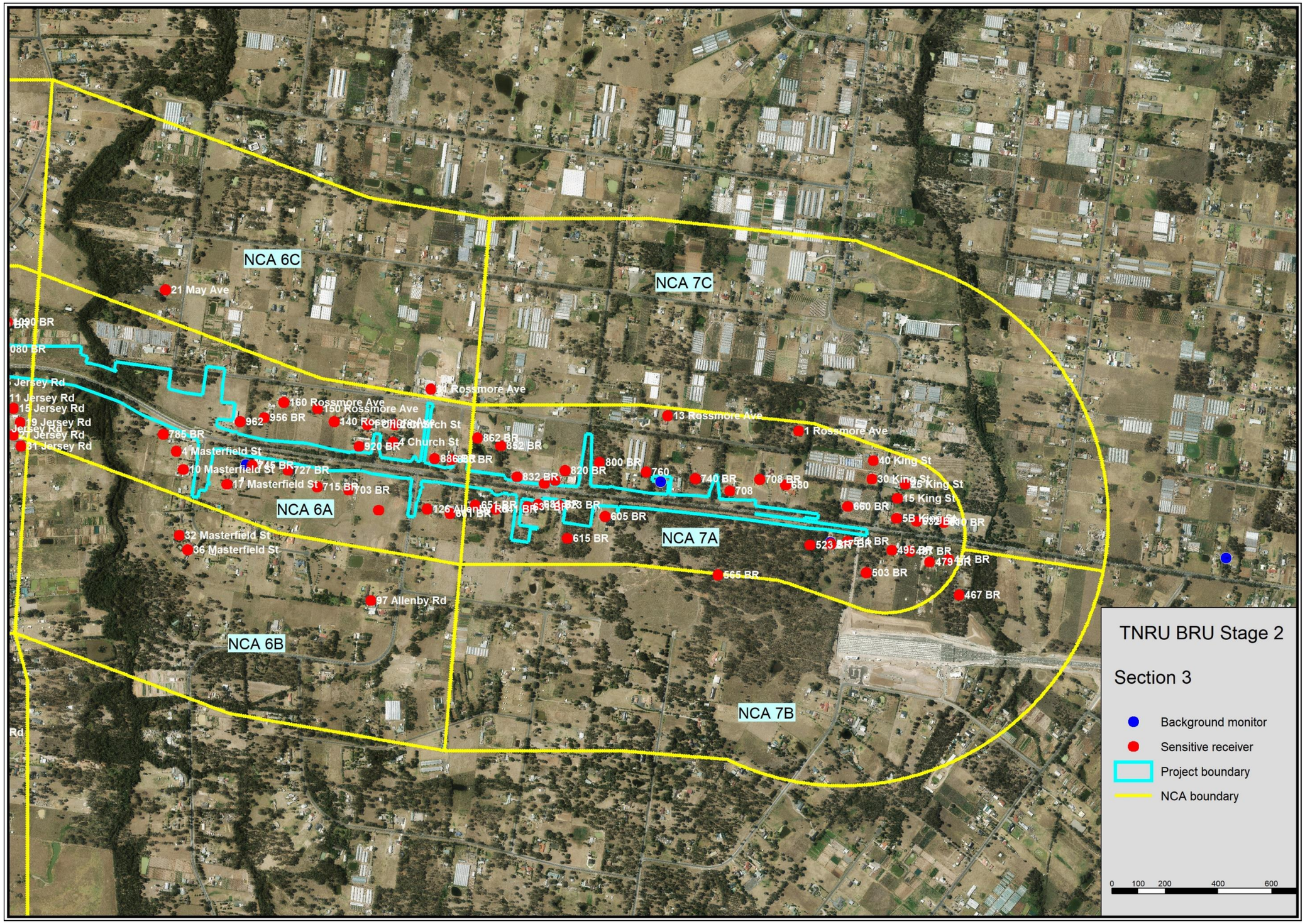
Table 5-1 Standard mitigation measures

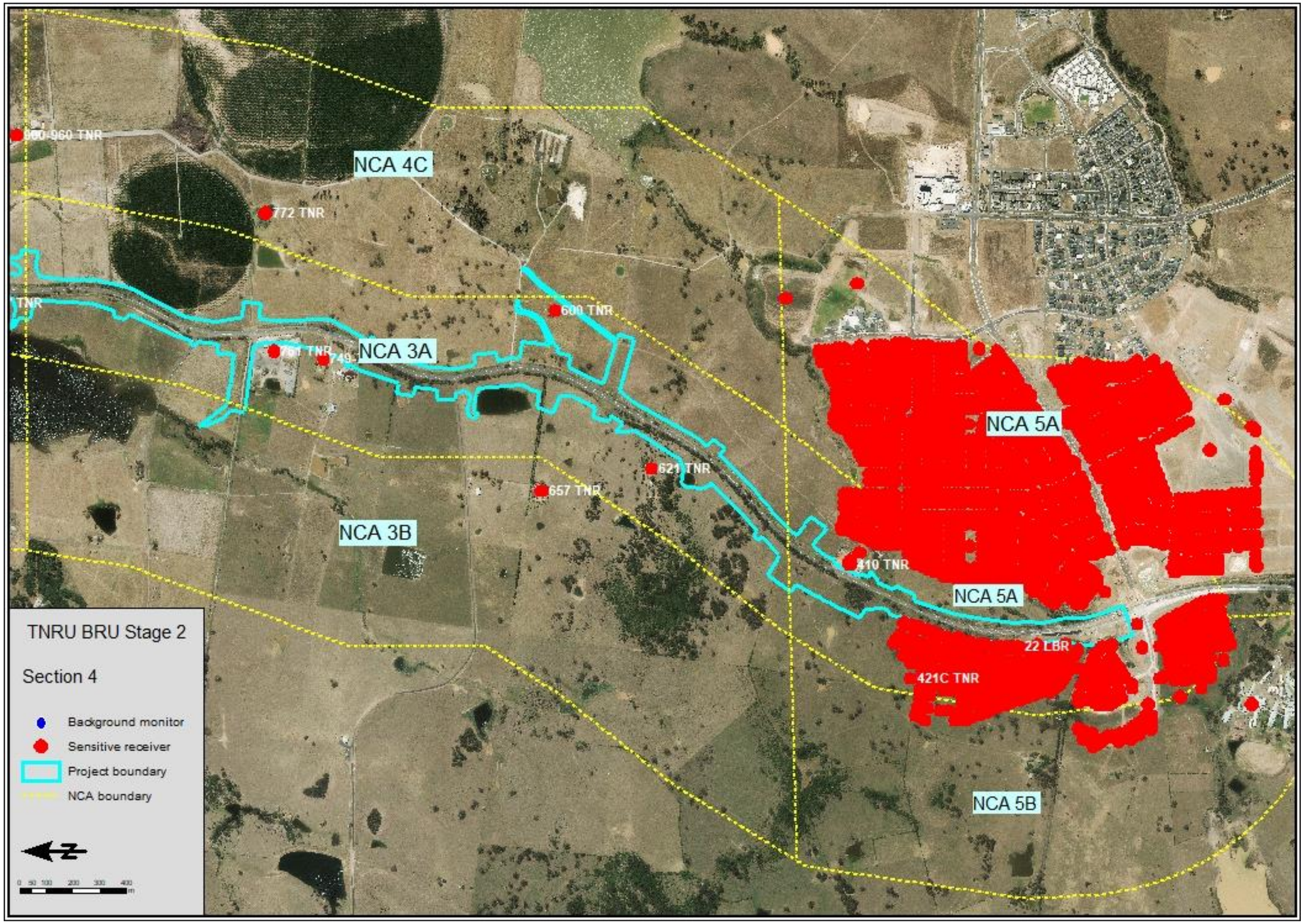
Administrative	
Community consultation	Potentially affected receivers will be notified of OOH works in accordance with the requirements of the EPL, and community consultation program. Where necessary, implement the additional noise mitigation measures from the OOHW Protocol, as referenced in Section 3.5 and indicated for each receiver in Appendix A.
Site induction	The site Environmental Induction will be delivered by the Environmental Team in accordance with the CNVMP.
Auditing	Once commissioned, stationary sources such as the batching plants should be reviewed to confirm the assumptions of this CNVIS and to identify appropriate mitigation options. These may include selection of quieter equipment, acoustic screening/enclosure of noisy items, modified operational procedures.
Noise control	
Construction activities scheduling	Scheduling should allow for operations to occur in the earliest part of the night.
Equipment selection	Priority will be given to the use of quieter and less vibration emitting construction methods and plant alternatives where feasible and reasonable.
Use and siting of plant	Strategically utilise stockpiles/bunding as noise screens to the extent practicable. Plant used intermittently to be throttled down or shut down. Noise-emitting plant to be directed away from sensitive receivers where possible. Stationary plant should be located behind a structure or enclosed if practicable.
Non-tonal reversing alarms.	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.
Monitoring	
Noise monitoring Vibration monitoring	Monitoring of activities should be undertaken where indicated by a Class 4 or greater impact in this assessment. In addition, monitoring should be completed to verify the assumptions of this CNVIS regarding estimated equipment noise emissions. Where heavy rolling is required while the church or school are in use, monitoring should be undertaken upon receipt of a complaint.

Appendix A. Maps of receiver locations


TNRU BRU Stage 2
Section 1
Background monitor
Sensitive receiver
Project boundary
NCA boundary
0 100 200 400 600 800 m
NCA 1A
NCA 1B
NCA 1C
NCA 2A
NCA 2B
NCA 2C
85 Mersey Rd
80 Mersey Rd
60 Mersey Rd
1602 TNR
1592 TNR
1582 TNR & 40 Mersey Rd
35 Mersey Rd
1655 TNR
1645 TNR
2 Dwyer Rd
1615 TNR
1565 TNR
1560 TNR
10 Severn Rd
50 Severn Rd
19 Derwent Rd
12 Derwent Rd
13 Derwent Rd
11 Derwent Rd
9 Derwent Rd
7 Derwent Rd
1545 TNR
1540 TNR
1520 TNR
1511 TNR
160 Avon Rd
130 Avon Rd
1500 TNR
1472 TNR
1475 TNR
1505 TNR
1471 TNR
85 Avon Rd
45 Avon Rd
1432 TNR
75 Avon Rd
55 Avon Rd
1430 TNR
66 BCR
1465 TNR
1455 TNR
1445 TNR
1400 TNR
1390 TNR
60 BCR
1431 TNR
1411 TNR
1370 TNR
55 BCR
1375 TNR
45 BCR
1340 TNR
1335 TNR
35 BCR
15 Lea Rd
35 Dart Rd
15 BCR
50 Dart Rd
1320 TNR
1315 TNR
1300 TNR
35 Solway Rd
25 Solway Rd
15 Lea Rd
13 Medich Pl
1295 TNR
1260 TNR
19 Medich Pl
1254 TNR
21a Medich Pl
21 Medich Pl
1265 TNR
23 Medich Pl
1251 TNR
1249 TNR
25 Medich Pl
16 Medich Pl
14 Medich Pl
6 KPD
1222 TNR


NCA 6C
NCA 6A
NCA 6B
NCA 3C
NCA 2D
NCA 2C
NCA 3A
NCA 2A
NCA 1C
NCA 3B
NCA 2B
NCA 1A
NCA 1B
TNRU BRU Stage 2
Section 2
Background monitor
Sensitive receiver
Project boundary
NCA boundary
0 75 150 300 450 600 m


NCA 6C
NCA 7C
NCA 6A
NCA 7A
NCA 6B
NCA 7B
21 May Ave
Jersey Rd
11 Jersey Rd
15 Jersey Rd
19 Jersey Rd
31 Jersey Rd
160 Rossmore Ave
150 Rossmore Ave
140 Rossmore Ave
13 Rossmore Ave
1 Rossmore Ave
4 Church St
4 Masterfield St
10 Masterfield St
17 Masterfield St
32 Masterfield St
36 Masterfield St
97 Allenby Rd
40 King St
30 King St
25 King St
15 King St
5B King St
TNRU BRU Stage 2
Section 3
Background monitor
Sensitive receiver
Project boundary
NCA boundary
0 100 200 400 600


NCA 4C
772 TNR
600 TNR
NCA 3A
NCA 5A
621 TNR
657 TNR
NCA 3B
NCA 5A
22 LBR
421C TNR
NCA 5B
TNRU BRU Stage 2
Section 4
Background monitor
Sensitive receiver
Project boundary
NCA boundary

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