Newell and Mitchell Highways Intersection Upgrade

Review of Environmental Factors

Roads and Maritime Services | April 2019

NSW GOVERNMENT

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Prepared by GHD Pty Ltd and Roads and Maritime Services

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Approval and authorisation

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Accepted on behalf of NSW Roads and Maritime Services by:	Bobby Yazdani Project Development Manager Regional Project Office
Signed:	
Dated:	17/04/2019

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Draft	2 July 2018	Ben James	Aryel Pyliotis
Final	16 April 2019	Ben James	Daniel Mees

Executive summary

The proposal

Roads and Maritime Services (Roads and Maritime) proposes to upgrade the intersection of the Newell and Mitchell highways in Dubbo. Key features of the proposal would include:

- Removing the existing roundabout and installation of new signalised intersection (including signalised pedestrian crossings) with the intersection shifted two metres south
- Providing dual right turn lanes on the southern approach of the intersection on the Newell Highway
- Providing a new separated left turn slip land from Mitchell Highway westbound to Newell Highway southbound to replace the existing separated left turn slip lane
- Providing two 3.5 metre wide through lanes on all approaches to the intersection
- Providing new pavement for the rest of the proposal site
- Providing new concrete medians on all approaches
- Relocating existing utilities within the proposal site
- Providing new pedestrian and cyclist facilities on all adjusted approaches including signalised crossing at the intersection
- Removing existing on-street parking on all approaches to the intersection due to provision of additional lanes
- Providing adjusted property access due to changes in levels at some property access locations
- Establishing a mobile batching plant at Dubbo Regional Airport for the supply of asphalt to the proposal
- Establishing construction compound and stockpile sites.

Need for the proposal

The Newell Highway through Dubbo currently operates at a level of service C and is expected to deteriorate to level of service F during the morning peak hour. The roundabout currently experiences very long queues for right turning traffic on the southern approach (ie Newell Highway northbound). The roundabout is approaching the end of its effective design life and requires an upgrade to maintain traffic efficiency.

Traffic volumes on the State road network in Dubbo have been steadily increasing due to population growth and industry. As traffic volumes have increased, traffic efficiency and road safety have decreased at various intersections throughout the city and are expected to decrease further in the future.

The existing roundabout has also been subject to increased crashes as a result of this increased congestion.

Proposal objectives

The objectives of the proposal are to:

- Upgrade the intersection of Newell and Mitchell highways to maintain a minimum level of service C or better with a minimum 20 year design life
- Reduce traffic congestion
- Improve traffic safety.

Options considered

Two options were considered for the proposal, being the ‘do nothing’ option and the upgrade of the intersection from a roundabout to traffic signals. The upgrade option was considered the preferred option

as it best met the objectives of the proposal, and has the highest benefit to traffic movements and safety at the intersection.

Statutory and planning framework

The proposal is categorised as development for the purpose of a road and road infrastructure facilities, and is being carried out by, or on behalf of a public authority. Under clause 94 of the *State Environmental Planning Policy (Infrastructure) 2007* the proposal is permissible without consent. The proposal is not State significant infrastructure or State significant development. The proposal can be assessed under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Roads and Maritime is the determining authority for the proposal. This review of environmental factors (REF) fulfils Roads and Maritime's obligation under section 5.5 of the EP&A Act, including to examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the activity.

No additional licences, approvals or permits are required for the proposal.

Community and stakeholder consultation

Community consultation for the proposal has been undertaken as part of the Dubbo Project Launch package which includes consultation for a number of significant projects within Dubbo. Consultation has been undertaken with the local community located in close proximity to the proposal including consultation directly with potentially impacted properties. Consultation undertaken to date has generally resulted in limited issue being raised with car parking along the Mitchell Highway (western approach) being the primary issue raised. This issue has largely been resolved through changes in the design meaning the majority of the space to be impact are now being retained.

Agency consultation for the proposal has largely been limited to Dubbo Regional Council who are supportive of the proposal.

Environmental impacts

The environmental impacts of the proposal are not likely to be significant and therefore it is not necessary for an environmental impact statement to be prepared and approval sought for the proposal from the Minister for Planning under Division 5.1 of the EP&A Act.

The proposal would have short term noise and traffic impacts as a result of construction equipment and potential partial road closures or road adjustments.

The safeguards and management measures detailed in this REF would minimise potential impacts. The proposal would also reduce congestion, improve safety for road users, and improve intersection performance. On balance the proposal is justified.

Justification and conclusion

The proposal is considered to be justified due to the traffic benefits which it provides outweighing any adverse impacts to occur primarily during construction. Construction impacts would be minimised where possible through the implementation of safeguards and management measures outlined in Section 7.2.

The 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. The proposal 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 Division 5.2 of the EP&A Act. A Biodiversity Development Assessment Report or Species Impact Statement is not required. The proposal is subject to assessment under Division 5.1 of the EP&A Act. Consent from Council is not required.

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1. Introduction

1.1 Proposal identification

Roads and Maritime Services NSW (Roads and Maritime) proposes to upgrade the intersection of the Newell Highway (also known as Whylandra Street) and the Mitchell Highway (also known as Victoria Street) in Dubbo. Key features of the proposal would include:

- Removing the existing roundabout and installation of new signalised intersection (including signalised pedestrian crossings) with the intersection shifted two metres south
- Providing dual right turn lanes on the southern approach of the intersection on the Newell Highway
- Providing a new separated left turn slip land from Mitchell Highway westbound to Newell Highway southbound to replace the existing separated left turn slip lane
- Providing two 3.5 metre wide through lanes on all approaches to the intersection
- Providing new pavement for the rest of the proposal site
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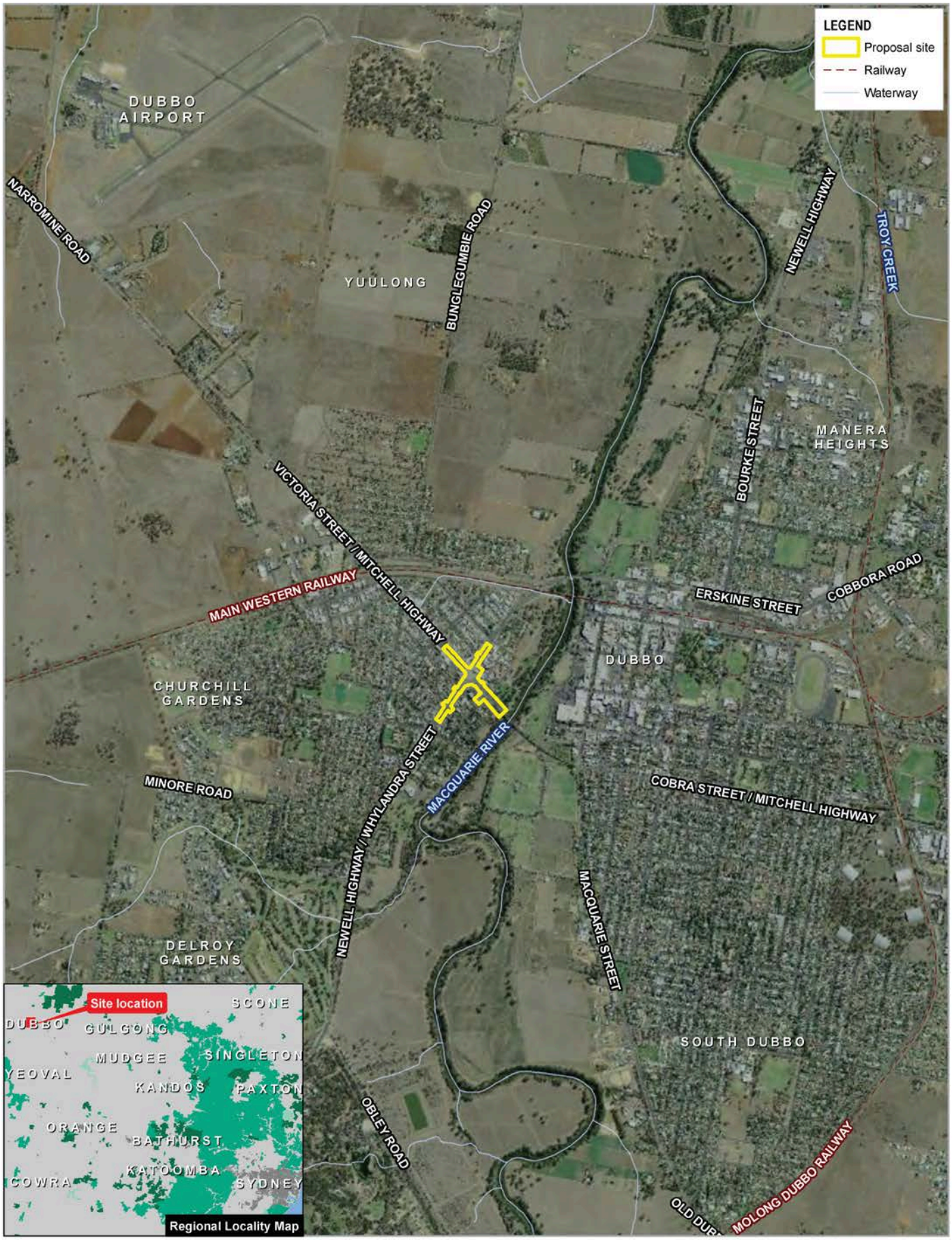
- Providing adjusted property access due to changes in levels at some property access locations
- Establishing a mobile batching plant at Dubbo Regional Airport for the supply of asphalt to the proposal
- Establishing construction compound and stockpile sites.

The location of the proposal is shown in Figure 1.1 and an overview of the proposal is provided in Figure 1.2. Chapter 3 describes the proposal in more detail.



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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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Roads and Maritime
Newell & Mitchell Highway
Intersection Upgrade REF

Project No. **21-27258**
Revision No. **-**
Date **16/04/2019**

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Figure 1.1 Location of the proposal

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Metres

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Figure 1.2 The proposal

1.2 Purpose of the report

This review of environmental factors (REF) has been prepared by GHD Pty Ltd (GHD) on behalf of Roads and Maritime – Regional Project Office. For the purposes of these works, Roads and Maritime is the proponent and the determining authority under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The purpose of the REF is to describe the proposal, to document the likely impacts of the proposal on the environment, and to detail safeguard and management measures to be implemented.

The description of the proposed work and assessment of associated environmental impacts has been undertaken in the context of clause 228 of the Environmental Planning and Assessment Regulation 2000, the factors in *Is an EIS Required? Best Practice Guidelines for Part 5 of the Environmental Planning and Assessment Act 1979* (Is an EIS required? guidelines) (DUAP, 1995/1996), *Roads and Related Facilities EIS Guideline (DUAP 1996)*, the *Biodiversity Conservation Act 2016 (BC 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 REF helps to fulfil the requirements of:

- Section 5.5 of the EP&A Act including 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 REF would be considered when assessing:

- Whether the proposal is likely to have 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 Division 5.2 of the EP&A Act
- The significance of any impact on threatened species as defined by the *Biodiversity Conservation Act 2016* (BC Act) and/or *Fisheries Management Act 1994* (FM Act), in section 1.7 of the EP&A Act and therefore the requirement for a Species Impact Statement or a Biodiversity Development Assessment Report
- The significance of any impact on nationally listed biodiversity matters under the *Environment Protection and Biodiversity Conservation Act 1999* (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 proposal to significantly impact any other matters of national environmental significance or Commonwealth land and the need, subject to the EPBC Act strategic assessment approval, to make a referral to the Australian Government Department of the Environment and Energy 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 proposal

An intersection upgrade of the Newell Highway and Mitchell Highway is identified as a short-term investment priority in the *Newell Highway Corridor Strategy* (Transport for NSW, 2015). Further discussion of the Newell Highway Corridor Strategy is located in Section 2.1.1. The Newell Highway through Dubbo currently operates at a level of service C and is expected to deteriorate to level of service F during the morning peak hour. The roundabout currently experiences very long queues for right turning traffic on the southern approach (ie Newell Highway northbound). The roundabout is approaching the end of its effective design life and requires an upgrade to maintain traffic efficiency.

Traffic volumes on the State road network in Dubbo have been steadily increasing due to population growth and industry. As traffic volumes have increased, traffic efficiency and road safety have decreased at various intersections throughout the city.

The existing roundabout has been subject to increased crashes as a result of this increased congestion. In the five year period between July 2012 and July 2016 there were 54 crashes within 500 metres of the proposal site. Further discussion regarding these crashes is located in Section 6.2.1.

Consistency of the proposal against a number of strategic documents is discussed in Sections 2.1.1 to 2.1.7.

2.1.1 Newell Highway Corridor Strategy

The Newell Highway Corridor Strategy aims to improve road safety, transport efficiency and asset maintenance on the Newell Highway over a 20 year timeframe. Localised traffic volumes have increased in town centres situated on the Newell Highway. This has forced an increased interaction with inter-regional traffic, in turn creating a negative impact on the highway's efficiency and safety.

The strategy recognises the growth in heavy vehicle volumes due to freight demand in regional NSW. This increase brings with it inherent greater congestion and road safety risks in regional transport hubs like Dubbo.

The strategy identifies short-term investment priorities as a response to improve road safety, promote economic benefit and increase productivity along the Newell Highway. An action stated in the short-term investments is to replace the Newell Highway and Mitchell Highway roundabout in Dubbo with traffic signals.

Upgrade of the intersection would help achieve the Newell Highway Corridor Strategy, by reducing traffic congestion and creating a safer road for users.

2.1.2 Premiers Priorities

The Premier has developed 18 state priorities which aim to make the state of NSW better. One of these priorities is to improve road travel reliability and to ensure that 90 per cent of peak travel on key road routes is on time.

The proposal to upgrade the existing roundabout at the intersection of the Newell and Mitchell highways is considered to be consistent with this priority as it would seek to improve

movements and increase capacity through the intersection by providing a signalised intersection. The proposal would remove the impacts associated with the dominant movement through the roundabout (ie Newell Highway northbound to Mitchell Highway eastbound) which is currently resulting in delays to other roundabout movements.

2.1.3 State Infrastructure Strategy 2018-2038

The NSW government has devised a 20-year strategy to improve the current state of NSW's infrastructure. The *State Infrastructure Strategy* (Infrastructure NSW 2018) identifies policies and strategies for infrastructure needed to meet the demands of a growing population and economy.

The State Infrastructure Strategy identifies a vision to provide a more efficient transport network model between growing regional centres, to reduce road trauma and ensure the efficient movement of freight in key corridors.

The strategy targets freight productivity upgrades on key routes of the National Land Transport Network, which includes the Newell Highway. The proposal is considered to be consistent with this priority as it would seek to improve freight transport through the regional centre of Dubbo by providing more efficient traffic movement through the highways' intersection.

2.1.4 Future Transport Strategy 2056

Future Transport 2056 (Transport for NSW 2018a) is an overarching strategy that ensures transport in NSW is prepared for rapid changes in technology and innovation to create and maintain a world class, safe, efficient and reliable transport system over the next 40 years.

Future Transport 2056 aims to optimise the movement of people along transport corridors. A priority of the strategy is to improve the customer experience by providing greater levels of responsiveness and safety and helping reduce congestion. Newell Highway improvements has been defined as a Regional NSW initiative for investigation.

The proposal to upgrade the existing roundabout at the highways' intersection is considered to be consistent with this priority as it would seek to reduce congestion by providing more efficient traffic movements through the intersection.

2.1.5 Regional NSW Services and Infrastructure Plan

The *Regional Services and Infrastructure Plan* (Transport for NSW 2018b) is the NSW Government's blueprint for transport in regional NSW from now until 2056 and sits under the Future Transport Strategy 2056. It sets out the Government's thinking on the big trends, issues, services and infrastructure needs which currently or in the future will shape transport in regional NSW.

The plan identifies areas to improve key drivers of economic growth by considering the needs of improved road infrastructure in regional NSW.

The freight industry is one of these key drivers of economic growth in regional NSW, with freight numbers expected to increase along the Newell Highway over the next 20 years. The proposal is considered to be consistent with this priority as it would help improve the movement of freight along the Newell Highway to other regional transport hubs.

2.1.6 Central West Regional Transport Plan

The *Central West Regional Transport Plan* (Transport for NSW 2013) is built on the strategic direction, initiatives and state-wide context set by the NSW Long Term Transport Master Plan.

The Central West Plan identifies specific challenges the region's transport networks faces and prioritises actions to address these challenges. The broad actions are under three themes: better transport services; ensuring effective regulation; and improving transport infrastructure. The plan provides a detailed analysis of local transport needs and priorities and responds to issues raised during regional consultation to develop the NSW Long Term Transport Master Plan.

The Central West Regional Transport Plan targets opportunities to improve the road network and maintain road freight efficiency. In particular in Dubbo, work to improve journey reliability is identified by the plan on a variety of roads and intersections, including "*roundabout upgrades on the Newell Highway and the Mitchell Highway*".

2.1.7 Central West and Orana Regional Plan 2036

The *Central West and Orana Regional Plan 2036* (NSW Government 2017) is a 20-year blueprint for the future of the Central West and Orana region that aims at creating a leading diverse regional economy in NSW. A key goal is to deliver quality freight, transport and infrastructure networks in the Central West and Orana region.

Direction 18 of the goal targets improving freight connections to markets and global gateways, by enhancing the capacity and efficiency of freight transport. Direction 19 looks at enhancing road freight links in regional NSW by prioritising projects that recognise impediments to the regional freight network.

The proposal is considered to be consistent with this priority as it would assist in reducing congestion along both the Newell and Mitchell highways, thereby increasing freight volumes.

2.2 Existing infrastructure

The below sections provide descriptions of the Newell and Mitchell highways in the vicinity of the proposal. Further details of the transport environment in the vicinity of the proposal is located in Section 6.2.1.

2.2.1 Newell Highway (Whylandra Street)

The Newell Highway is a four lane road (two lanes in each direction) travelling through the study area. The two lanes in each direction double as both turn and through lanes.

A median, located between Alum Street and midway between Elizabeth Street/Lane and Baird Street, separates eastbound traffic (travelling north-east), from westbound traffic (travelling south-west). There are gaps in the median at Elizabeth Street and Elizabeth Lane.

On-street parking is available in the following locations:

- Northbound
  - South of Baird Street to just south-west of the roundabout
- Southbound
  - South-west of Elizabeth Lane to the extent of the works
  - North-east of roundabout to extent of works near Alam Street.

Baird, Elizabeth and Alam streets, and Elizabeth Lane are accessible from the Newell Highway.

Traffic data for the Newell Highway at the intersection is outlined in Table 6.16.

Figure 2.1 Newell Highway looking north-east towards existing roundabout

2.2.2 Mitchell Highway (Victoria Street)

In the study area the Mitchell Highway is a four lane road (two lanes in each direction), primarily travelling in a north-west to south-east direction. The western approach of the roundabout is subject to long queues during the morning peak. This is a result of high volume traffic movements approaching the intersection north along the Newell Highway. This high number of vehicles results in a relatively continuous traffic flow on the roundabout which prevents traffic from entering the roundabout from the western approach.

A separated left turn slip lane is provided from the Mitchell Highway on to the Newell Highway southbound. The lane is separated by a grassed median adjacent to the slip lane, as shown on Figure 2.2. All other lanes are both through and turning lanes.

Median are provided between the east and westbound lanes in close proximity to the intersection.

On-street parking is available in the following locations:

- Eastbound
  - Limited spaces between Newell Highway and Beni Street

  - Between Newell Highway and the extent of the works (near laneway between Mitchell Highway and Alam Street)
- Westbound
  - Between Newell Highway and the extent of the works (near laneway between Mitchell Highway and Alam Street).

Traffic data for the Mitchell Highway at the intersection is outlined in Table 6.16.

Figure 2.2 Slip lane looking north-west (from Mitchell Highway to Newell Highway)

2.3 Proposal objectives and development criteria

2.3.1 Proposal objectives

The primary objectives of the proposal are to:

- Improve the level of service for all vehicles during periods to a minimum level of service of “C” or better on all legs for the 20 year design life
- Provide a highway intersection that’s supports safe and efficient movement of high productivity vehicles up to 36.5 metres to the north, south and west
- Improve safety by reducing conflict between local and through traffic and between vehicles and vulnerable road users.

In addition to the above proposal specific objectives, the proposal would also seek to meet the following Dubbo road upgrade program objectives:

- Support key freight movements along the corridor
- Improve freight productivity and support industry to adopt modern vehicles through the extension of areas that are accessible by B-Triple heavy vehicles
- Maintain and improve asset condition through progressive upgrading to heavy duty pavement
- Improve travel efficiency for local and regional road users through catering for the corridor's mix of vehicles
- Minimise disruption to road users from road closures, recognising the particular needs of isolated communities and those sections of the route with no alternative access
- Maintain adequate access for emergency service during major flooding events and natural disasters, supporting local Emergency Management Plans
- Enhance road safety for all road users over the length of the corridor by implementing a safe systems approach to road design and management, progressively implementing the wide centreline treatments
- Minimise the impact on the environment
- Minimise the project 'whole of life cost'.

2.3.2 Urban design objectives

The urban design and landscape objectives of the proposal are to:

- Define effective links to cycle routes defined by Dubbo Regional Council
- Where possible retain and reinforce the vegetated character of the area
- Deliver an integrated approach to traffic (including pedestrians and cyclists), public transport and land use
- Retain the privacy and amenity of residents in the local streets in the immediate area and provide opportunities for urban restructuring and redevelopment
- Design integrated urban infrastructure/landscape design elements that allow the landscape to dominate and built form to recede.

2.4 Alternatives and options considered

2.4.1 Methodology for selection of preferred option

An options report was developed in July 2018 to outline the options which were considered for the development of the preferred option.

The options report outlines four options which were assessed against the following criteria:

- Improved traffic efficiency (with a 20 year design life)
- Allowed for road safety improvements
- Required minimal utility adjustment and property adjustment
- Was value for money.

Each option was assessed for its ability to meet the criteria (i.e. whether it met or didn't meet the criteria).

2.4.2 Identified options

Option 1 – Do nothing

This option would involve not undertaking any works at the existing intersection. This would result in the intersection continuing to operate as a roundabout. This option would also not change any of the lane arrangements on the approaches to the roundabout.

Option 2 – Geometric improvements

This option would involve the provision of an additional lane on the southern approach to the intersection on the Newell Highway.

Option 3 – Roundabout metering

This option would involve the installation of traffic signals at the roundabout which can be turned on when required to control the flow of traffic into the intersection. These signals would be provided on all approaches to the intersection.

Option 4 – Removal of roundabout and installation of traffic signals

This option would involve removing the existing roundabout and replacing it with a new signalised intersection. Additional works would also be undertaken to provide additional turning lanes on some of the approaches, with a focus on providing an additional right-turn lane from the Newell Highway northbound into the Mitchell Highway eastbound.

2.4.3 Analysis of options

Option 1 – Do nothing

The do nothing option was discounted because it did not offer any road safety or traffic efficiency benefits. It was not considered to be good value for money because, even though no capital expenditure would be required, the travelling public would bear the costs of localised congestion and the increased risk of crashes. The existing congestion would also continue to get worse due to the forecast increase in vehicle movements through the intersection into the future.

Option 2 – Geometric improvements

Option 2 was discounted because it would have some minor traffic efficiency benefits in the short to medium term, but would not achieve a 20 year design life and would require further works in the future. Road safety impacts were also expected as a result of the operation of

three circulating lanes on the roundabout. This option would also would require widening on the roundabout and additional width for deflection. These increased widths would result in a larger footprint including some acquisition of private properties.

Option 3 – Roundabout metering

Option 3 was discounted because it would perform worse than the “do nothing” option in the year of construction and would not achieve a 20 year design life. Metered roundabouts do result in some efficiency issues in that they reduce the amount of effective time that vehicles can enter and circulate the intersection which results in long queues.

This option would also result in the potential increase of rear-end crashes as a result of traffic queues. Overall this option would result in increased costs while not providing any notable benefits.

Option 4 - Removal of roundabout and installation of traffic signals

This option would involve a larger footprint in order to implement the proposed changes. This would include some acquisition of adjacent properties due to inadequate space within the existing road reserve. Regardless of the additional footprint, this option would achieve the objectives of the proposal through:

- Ensuring that the level of service at the intersection is maintain at a level of service C
- Ensuring the intersection has a minimum of a 20 year design life to allow it to manage any growth during this period
- Providing additional capacity at the intersection and allow for a reduction in congestion particularly during the morning peak when congestion is at its worst
- Improving the nature of movements through the intersection to remove the potential conflicts between vehicles.

The abovementioned benefits of the proposal are considered to outweigh any additional environmental impacts (in particularly impacts to property due to acquisition).

2.5 Preferred option

As outlined in the options report completed in 2018, Option 4 was selected as the preferred option. Generally, this option was selected because it achieved the objectives of the proposal, and has the highest benefit to traffic movements and safety at the intersection.

The inclusion of traffic control signals at the intersection would also provide additional benefits in that the timing of the lights at the intersection could be adjusted when required to better manage traffic. The ability to make such changes make Option 4 more beneficial than other options as the existing roundabout or a modified roundabout do not have any capacity to manage traffic in real-time.

Based on the benefits of Option 4, it is considered to be the preferred option and therefore the subject of this REF. A more detailed description of the proposal is located in Section 3.

2.6 Design refinements

During the development of the concept design, constraints associated with the underground storage tanks within the BP service station located on the corner of the southern Newell Highway approach and western Mitchell Highway approach where identified. Due to the

presence of these tanks and a complicated networks of utilities the alignment of the new intersection has been required to be shifted south by about two metres to avoid any conflicts with these tanks and to reduce the complexity of utility adjustments.

The shift of the alignment south has also reduced the number of properties which would require acquisition to occur.

3. Description of the proposal

3.1 The proposal

Roads and Maritime proposes to upgrade the intersection of the Newell and Mitchell highways in Dubbo. The proposal is shown in Figure 1.2 and Figure 3.1.

Key features of the proposal would include:

- Removing the existing roundabout and installation of new signalised intersection (including signalised pedestrian crossings) with the intersection shifted two metres south
- Providing dual right turn lanes on the southern approach of the intersection on the Newell Highway
- Providing a new separated left turn slip land from Mitchell Highway westbound to Newell Highway southbound, to replace the existing separated left turn slip lane
- Providing two 3.5 metre wide through lanes on all approaches to the intersection
- Providing new pavement for the rest of the proposal site
- Providing new concrete medians on all approaches
- Relocating existing utilities within the proposal site
- Providing new pedestrian and cyclist facilities on all adjusted approaches including signalised crossings at the intersection
- Removing existing on-street parking on all approaches to the intersection due to provision of additional lanes
- Providing adjusted property access due to changes in levels at some property access locations
- Establishing a mobile batching plant at Dubbo Regional Airport for the supply of asphalt to the proposal
- Establishing construction compound and stockpile sites including demolition of existing structure located at 13 Victoria Street.

In order to build the proposal the strip acquisition of six properties adjacent to the existing roadways is required. One property would also be full acquired as part of the project. Further temporary leases would also potentially be required for ancillary construction facilities such as compounds, stockpiles areas and the mobile batching plant. Property acquisition and other land requirements are discussed in Section 3.6.

Detailed design drawings are included in Appendix C.

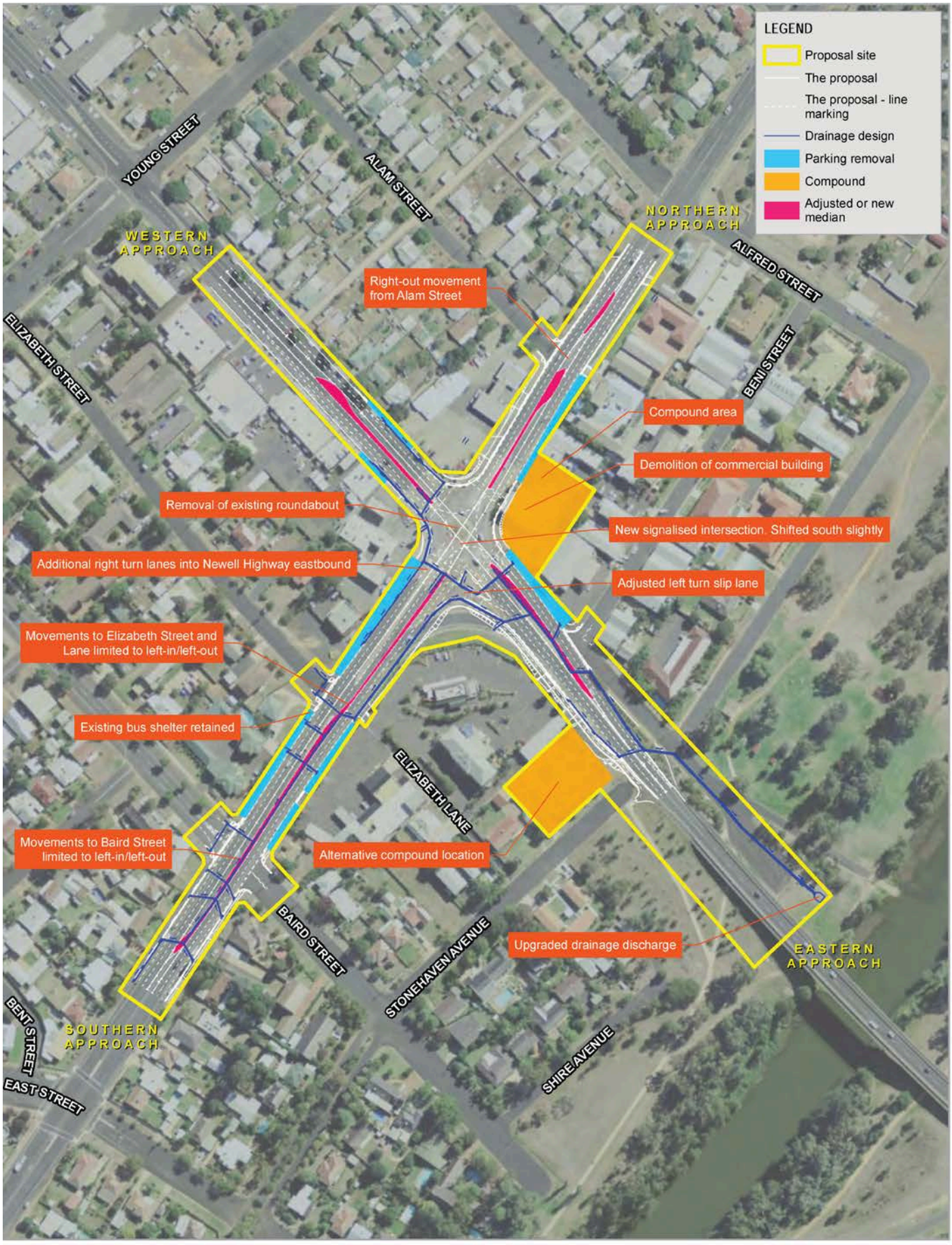

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Figure 3.1 Key features of the proposal

3.2 Design

The design of the proposal has been based on the 100 per cent detailed design which would be further developed during ongoing detailed design development.

The current detailed design drawings for the proposal are located in Appendix C.

3.2.1 Design criteria

The design of the proposal has been prepared in accordance with a Design Management System certified under *AS/NZS ISO 9001:2008 Quality Management Systems – requirements*, and with reference to:

- Guide to Road Design (Austroads 2015) including Roads and Maritime Supplements
- Roads and Maritime design guidelines
- Relevant Australian Standards
- Local Council Guidelines.

Consideration of the above guidelines and standards was undertaken in the order outlined above, with the Guide to Road Design (and Roads and Maritime Supplements) used where possible. Where a particular criteria was not available in this document the remaining guidelines and standards were referenced.

Table 3.1 summarises the key design criteria which were used for the development of the detailed design. These criteria would continue to form the guide for any further detailed design development for the proposal.

Table 3.1 Design criteria for the proposal

Criteria	Description
Main carriageway	
Design speed limit	70 km/h
Posted speed limit	60 km/h
Lane widths	3.5 metres
Median widths	As required
Turning lane widths	3.5 metres
Shoulder widths (both kerbside and median side)	As required
Design/Checking Vehicle type	B-Triple (35.4 metres) Passenger car (5.2 metres)
Side roads	
Design speed limit	60 km/h
Posted speed limit	50 km/h
Lane widths	3.5 metres
Median widths	As required

Criteria	Description
Turning lane widths	3.5 metres
Shoulder widths (both kerbside and median side)	As required
Design/Checking Vehicle type (for movement from main carriageway to local road)	B-Double (26 metres)

Figure 3.2 outlines the typical cross section for both the Newell and Mitchell highways near the intersection. Further cross sections are shown in the design drawings located in Appendix C.

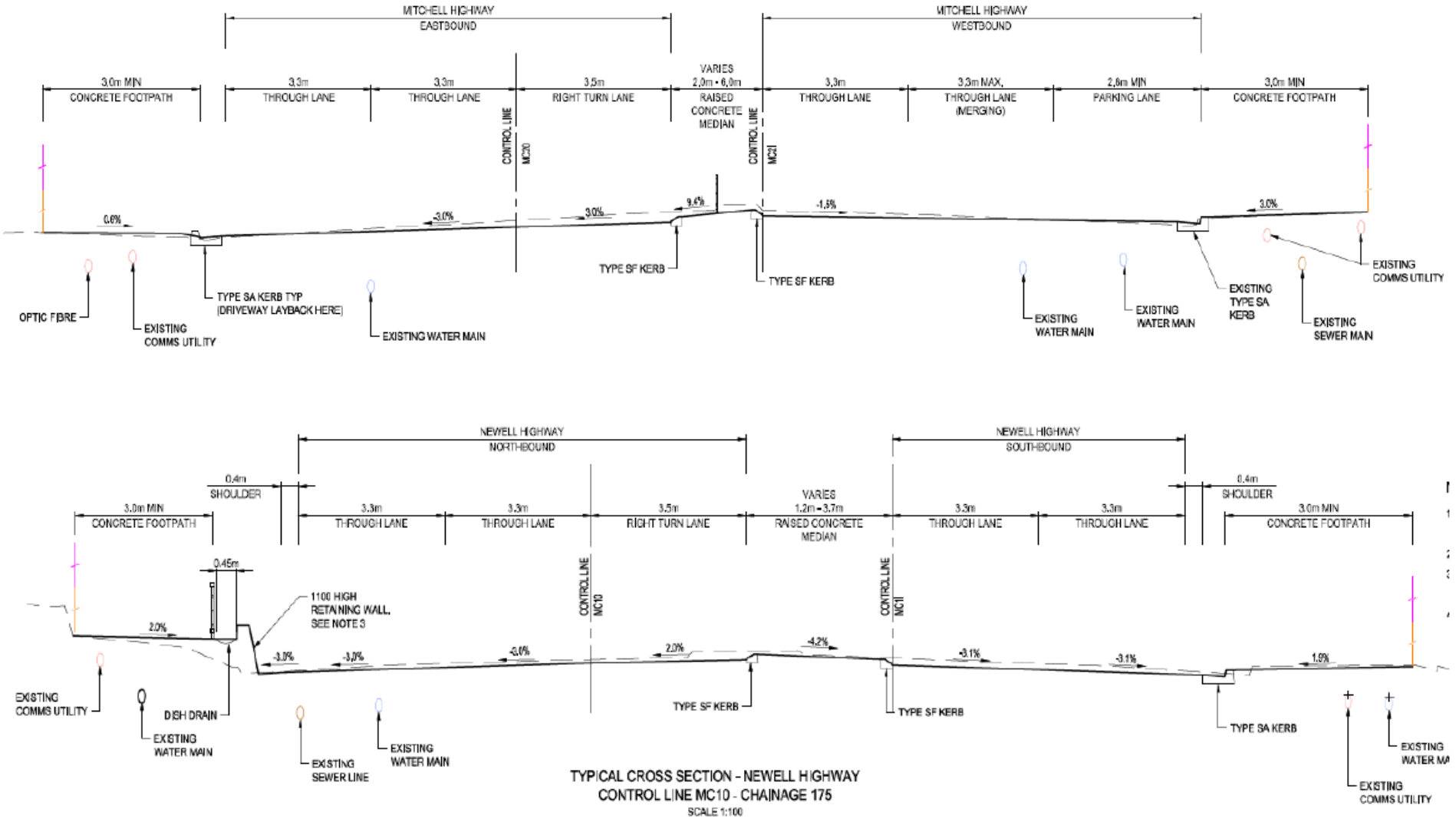

Figure 3.2 Typical cross sections of the Newell and Mitchell highways

3.2.2 Engineering constraints

The engineering constraints for the design and construction of the proposal are as follows:

- The width of the existing road reserve limits works which can be undertaken and therefore property acquisition needs to be considered.
- Some adjacent properties have structures close to the boundary, limiting any potential property acquisition.
- Limited space is available within the road reserve to relocate utilities.
- The need to maintain traffic flows for the majority of the construction period
- Underground fuel tank at the BP Service Station and the conflicts with under and above ground services
- Subgrade conditions suggesting high swells and low load bearing capacity to support the road.

3.2.3 Major design features

The major design features of the proposal are described in the below sections.

Horizontal alignment of new intersection and approaches

The horizontal alignment of the proposal would be similar to the existing Newell and Mitchell highways due to the need for the new upgraded intersection to tie in with in the existing sections of the two highways (including kerb lines and existing lanes). Changes in the horizontal alignment of the highways are also limited due to the presence of adjacent properties including structures. The proposal would result in the existing intersection shifting south about two metres at the intersection. The shifting of the intersection results in only road corridor widening on all four corners of the intersection as well as along the Newell Highway westbound east of the intersection. In all other areas the proposal is contained to within the existing road corridor.

The key change to the horizontal alignment from the existing intersection is the removal of the existing roundabout which would be replaced with a four leg signalized intersection centred to just south of the existing roundabout location. The lane layout for each of the four legs is outlined in the section below (lane layout heading). The layout of the new intersection and the associated approaches is shown in Figure 3.1.

The existing left turn slip lane provided from the Mitchell Highway westbound to the Newell Highway southbound would be removed and replaced with a new left turn lane which would be located closer to the new intersection. This lane would however still be separated from the other Newell Highway lanes. The positioning of the new left turn slip lane is shown in Figure 3.1.

Vertical alignment of new intersection and approaches

The vertical alignment of the new intersection and associated changes to the approaches would be largely unchanged from the existing alignment due to the need for tie in with those sections of the existing highways that do not form part of the proposal. In general, the Newell Highway falls towards the north-east at a grade of about 1.3 to 2.2 per cent, while the Mitchell Highway falls towards the south-east at a grade of about one to three per cent. The proposal would result in a consistent grade through the intersection on both highways whereas the existing grades head up towards the existing roundabout.

Crossfalls associated with the proposal would be similar to the existing roadways where possible. Where existing non-compliant crossfalls are present, crossfalls would be made to be compliant where possible as part of the ongoing detailed design.

Lane layout

The below sections outline the proposed lane arrangements for each of the approaches to the new signalised intersection.

Southern approach of intersection (Newell Highway)

At the new intersection the following lane arrangement would be provided on this approach:

- Northbound direction:
  - Two through lanes from the extent of the works south-west of Baird Street (existing dual lanes) through to the intersection. At the intersection one of these lanes would also be used for left turn movements on to Mitchell Highway westbound
  - Right turn slip lane commencing about 35 metres south-west of Baird Street before diverging into two right turn lanes about 135 metres south-west of the new intersection, these lanes would then continue through to the intersection
- Southbound direction:
  - Two through lanes from the new intersection to the extent of the works south-west of Baird Street.

A new central median would be provided between the intersection and about 65 metres south-west of Baird Street. This new median would remove all right-in and right-out movements from Baird Street (both sides of the highway), Elizabeth Street and Elizabeth Lane.

The layout of this approach to the intersection is shown in Figure 3.1.

Northern approach of intersection (Newell Highway)

At the new intersection the following lane arrangement would be provided on this approach:

- Northbound direction:
  - Two through lanes from the new intersection to the extent of the works north-east of Alam Street
- Southbound direction:
  - Two through lanes from the extent of the works north-east of Alam Street (existing dual lanes) through to the intersection. At the intersection one of these lanes would also be used for left turn movements on to the Mitchell Highway eastbound
  - Right turn slip lane commencing about 15 metres south-east of Alam Street and running to the intersection (as per existing situation).

A new central median would be provided between the intersection and Alam Street (similar extent to existing median). As part of the proposal the existing right turn slip lane into Alam Street would be retained, however right-turn movement out of Alam Street would be removed.

The layout of this approach to the intersection is shown in Figure 3.1.

Eastern approach of intersection (Mitchell Highway)

At the new intersection the following arrangement would be provided on this approach:

- Westbound direction:
  - Two through lanes from the extent of the works at Stonehaven Avenue (includes some diverging lanes from one lane section of highway across the LH Ford bridge located to the south of the proposal) through to the intersection
  - Left turn slip lane commencing north-west of Stonehaven Avenue to the new dedicated left turn lane which provides access to the Newell Highway southbound
  - Right turn slip lane commencing at Beni Street to the intersection

- Eastbound direction:
  - Two through lanes from the intersection through to Beni Street. At Beni Street the lanes merge to a single lane at the extent of works near Stonehaven Avenue to tie in with the existing single lane over the LH Ford bridge, located to the south-east of the proposal.

A new central median would be provided between the intersection and a location south-east of Beni Street which would be similar in extent to the existing median in this location. This new median would not result in any changes to access to any side roads.

The layout of this approach to the intersection is shown in Figure 3.1.

Western approach of intersection (Mitchell Highway)

At the new intersection the following arrangement would be provided on this approach:

- Westbound direction:
  - Two through lanes at the intersection which merge into a single lane just north-west of the intersection to tie in with the existing single lane
- Eastbound direction:
  - Single through lane at the north-west extent of the works with an additional through lane commencing about 50 metres north-west of the intersection. This additional lane would also be used for right turn movements on to the Newell Highway northbound
  - Left turn slip lane commencing about 80 metres north-west of the intersection.

A new central median would be provided between the intersection and a location about 120 metres north-west of the intersection. This new median would not impact on access to any local roads, however it would impact on some access to existing shop front parking from the eastbound lanes.

The layout of this approach to the intersection is shown in Figure 3.1.

Pedestrian, cyclist and bus infrastructure

Pedestrian facilities

As part of the new intersection signal controlled pedestrian crossing would be provided on all approaches. All crossings would be set back from the intersection to ensure the distance to cross the highways is no greater than 25 metres.

Adjustments to all pedestrian paths along the sections of highway are to occur on the outside of the realigned roadways. These paths are to have a minimum width of 3.5 metres from the kerb to the edge of the road corridor (including where adjusted).

Cyclist facilities

Provision of cyclist facilities would be provided at the intersection and the associated approaches. The exact location and nature (ie on-road or off-road facilities) would be confirmed during ongoing detailed design development.

Bus facilities

An existing bus stop, currently located on the Newell Highway northbound just to the south of Elizabeth Street, would be positioned within the new through lane. This stop would be retained in its current position. The location of this existing bus stop is shown in Figure 3.1.

Car parking

Due to the widening of the roadway in many sections of both highways and the limited road reserve available for any additional lanes, impacts to existing car parking are expected. Table 3.2 outlines the indicative number of parking spaces impacted by the proposal.

Table 3.2 Indicative parking loss due to proposal

Section of road	Indicative number of spaces lost
Newell Highway	
Northern approach – northbound	0
Northern approach – southbound	7
Southern approach – northbound	24
Southern approach – southbound	5
Mitchell Highway	
Western approach – westbound	2
Western approach – eastbound	5
Eastern approach – westbound	0
Eastern approach – eastbound	5

Property access adjustment

Due to changes in kerb alignments and/or road levels along the Newell Highway and Mitchell Highway, access points to existing properties would potentially be impacted and would require some adjustment to ensure access is maintained to the revised conditions.

Drainage infrastructure

Upgraded road drainage would be installed along the Newell and Mitchell highways. Stormwater in the northern approach would largely connect to the existing drainage systems which drain towards the north. The rest of the upgrade intersection would drain towards the eastern approach of the intersection where it would discharge to the Macquarie River. The discharge location is an existing discharge point however it would be upgrade to cater for the increase in volumes which would be required to be managed. The outlet would include the installation of gross pollutant trap to ensure discharges do not impact upon water quality within the Macquarie River.

The location of drainage infrastructure is shown on Figure 3.1.

3.3 Construction activities

3.3.1 Work methodology

Indicative construction methodology

Construction activities would be guided by a construction environmental management plan (CEMP) to ensure work is carried out to Roads and Maritime specifications and that all safeguards and management

measures described in this REF are implemented (refer to Section 7.2 for a consolidated list of safeguards and management measures). Detailed work methodologies would be determined during construction planning. An indicative construction methodology for the proposal is provided below.

Early works and site establishment

- Early work
  - Demolition of building at 13 Victoria Street (refer to Section 3.6)
  - Property adjustments (as required), including any new fences or boundary structures
  - Relocate and/or adjust affected utilities, services and signage (as required throughout construction staging)
- Site establishment:
  - Establish permanent and temporary fencing, work compounds and stockpile sites
  - Install traffic management measures including temporary traffic signs, roadside safety barriers (where required)
  - Implement pre-construction safeguards and management measures outlined in the CEMP, such as installing erosion, sediment and water quality controls
  - Remove vegetation within the proposal site
  - Works associated with the adjustment of adjacent properties entrance points
  - Footpath or nature strip work associated with utility relocation
- Establishment of mobile asphalt batching plant (refer to Section 3.4.2).

It is noted that due to the staged nature of construction of the proposal some of the activities would occur multiple times during construction as the locations of the work area shift around the proposal site.

Intersection works

To facilitate construction of the proposal while also maintaining traffic movement through the proposal site construction would be staged. The staging of construction would result in particularly sections of road to be constructed which would allow traffic to be maintained on other sections of road. The inactive staging of traffic required for the proposal is outlined in section 3.3.6. The staging of the works would be further considered as part of construction planning and would be subject to change.

During each stage of the works the following indicative methodology would generally be followed:

- Traffic switches to new traffic lanes
- Excavate, remove and replace unsuitable material from the road reserve
- Protect drainage infrastructure
- Place and compact selected material zone or heavily stabilised subgrade, and compact base layer
- Place full depth of asphalt concrete layer (at intersection) and wearing surface across full proposal site
- Install kerb and guttering where required
- Install medians and traffic islands where required
- Install traffic signals including control box and posts and lanterns
- Install final line marking, signage and other street furniture.

Demobilisation of construction site

- Decommissioning site
  - Rehabilitate disturbed areas (as required)
  - Decommissioning stockpile and compound sites

– Final site clean up.

3.3.2 Construction hours and duration

Construction hours

Where possible, construction would be undertaken during recommended standard hours as outlined in the *Interim Construction Noise Guideline* (DECC 2009). The recommended standard hours for construction are:

- Monday to Friday: 7am to 6pm
- Saturday: 8am to 1pm
- No work on Sundays and public holidays.

There are however specified curfew hours within Dubbo which are designed to minimise impacts on roads during the peak periods. Due to this curfew, works during the daytime would generally occur between 9.30am and 3.30pm Monday to Friday.

However due to the importance of the intersection for the movement of vehicles, works would also be required to be undertaken at night when traffic numbers are lower, in order to minimise impacts on road users.

Night work would occur (ie outside the above standard hours) potentially seven days per week. This would potentially result in works occurring 24 hours. These works would be completed in accordance with the *Interim Construction Noise Guideline* (DECC 2009) and the Roads and Maritime Services' *Environmental Noise Management Manual 2001 - Practice Note 7.* This would include notifying the local community in advance of any work planned to be undertaken outside of standard construction hours. Notices would be placed in the local papers as well as mobile signage boards.

Construction duration

Construction of the proposal is expected to commence in mid-2019 for the required utilities works. Once utilities works are completed construction is expected to commence in late 2018 and take about 35 weeks.

3.3.3 Plant and equipment

The plant and equipment required for construction of the proposal would be determined during construction planning. The following equipment is anticipated to be required during construction:

- Excavators
- Backhoe
- Watercarts
- Hand tools
- Saw-cutting
- Profiler for milling
- Asphalt paver
- Shuttle buggy
- Rollers/compactors
- Grader
- Spray seal rig
- Tipper trucks
- Kerb machine
- Road sweepers
- Generators
- Trenching machine
- Under boring rig
- Line marking truck
- Concrete trucks
- Mobile asphalt batching plant.

3.3.4 Earthworks

Due to the proposal involving the upgrade of an existing intersection which would connect to the existing adjacent section of roads, levels are not expected to be dramatically changed. Therefore, limited earthworks would be required for the proposal.

3.3.5 Source and quantity of materials

The majority of materials would be sourced from a licensed supplier within, or near Dubbo. Exact material quantities are unknown at this stage but would include sand, select material, road base, backfill, topsoil, surplus pavement and concrete. These materials would be sourced from local quarries and commercial suppliers.

Asphalt would be sourced from the mobile asphalt batching plant which would be established near Dubbo Regional Airport. Further details of this batching plant are discussed in Section 3.4.2.

3.3.6 Traffic management and access

Traffic generation due to the proposal

Construction of the proposal would require heavy vehicle movements for the transport of construction machinery and equipment, and the import and movement of materials. Around 16 heavy vehicle movements are anticipated each day. Further light vehicle movements would be required to allow for staff accessing the proposal site. Light vehicle movements are anticipated to be about 30 movements per day.

Traffic management

A traffic management plan would be prepared in accordance with Roads and Maritime' *Traffic Control at Work Sites* (RTA, 2010a) and Roads and Maritime Specification *G10 - Control of Traffic* (RTA, 2006). The traffic management plan would provide details of the traffic management to be implemented during construction, to ensure that traffic flow on the surrounding network is maintained where possible. The traffic management plan would also ensure the safe separation of workers on site from vehicles on surrounding streets. Traffic impacts and safeguards and management measures are discussed in Section 6.2.2 and 6.2.3 respectively.

Access through the proposal site is to be maintained at all times, however movements for the majority of the works would be undertaken under traffic control and contra flow.

Staging

A high-level overview of the traffic stages associated with the construction of the proposal is provided below. This staging allows for the movement of vehicles through the intersection throughout construction. The staging of the works would be further considered as part of construction planning and would be subject to change.

- Stage 1: Enabling works which do not result in any impacts on the operation of the existing road including the following:
  - Demolition of buildings and structures to be acquired
  - Remove concrete blisters, medians and roundabout island
  - Utility relocations, Telstra, power and water
  - Install median stormwater drainage
  - Implement heavy vehicle detour through the intersection on the Mitchell Highway, limit some movements to the Newell Highway from properties and businesses
- Stage 2a: Traffic along the Newell highway will utilise the existing northbound and southbound pavements on the Newell Highway.
- Stage 2b: Access to Mitchell Highway westbound to be closed to all traffic with Newell Highway traffic to be on existing pavement, however limited to one lane in each direction.
- Stage 2c: Newell Highway northbound shifted to central lane with Mitchell Highway eastbound onto Newell Highway access available in all directions except for heavy vehicles. Alam Street movements limited to left in, left out movements.
- Stage 2d: All traffic shifted to new shoulders of roadways constructed as part of earlier stages. All movements available with the exception of right turn from Newell Highway northbound to Mitchell Highway eastbound and left turn from Newell Highway northbound to Mitchell Highway westbound.
- Stage 2e: Newell Highway northbound movement shifted to western side of roadway for through and left-turn movements. Mitchell Highway movements shifted to the southern lanes on the eastern approach. All turns onto the Newell Highway and eastern approach of Mitchell Highway.
- Stage 3a: No changes to how traffic moves through the roundabout, however two lanes would be provided in each direct.
- Stage 3b: Access to Mitchell Highway westbound (on western approach) to be closed. Newell Highway movements switched to the western carriageway of highway, while all movements along the Mitchell Highway eastbound (eastern approach) switched to northern carriageway.
- Stage 3c: Newell Highway movements shifted to eastern carriageway, while all Mitchell Highway movement shifted to the southern carriageway.
- Stage 4: Traffic remains as per Stage 3c.
- Stage 5: Mitchell Highway (eastern approach) opened to two way traffic along final configuration allowing vehicles to access the Newell Highway (southbound) via left turn lane and traffic exiting the Mitchell Highway westbound to turn into the Newell Highway (southbound).

Detours

While access through the proposal site would be maintained throughout construction, the capacity of the intersection would be reduced due to the reduction in open lanes. No formal detours are to be put in place however motorists are expected to use alternate routes to avoid the congestion which is caused by movements through the proposal site being constrained due to lower speeds and lane reductions.

Some traffic modelling has been undertaken as part of the detailed design to consider the impacts on the surrounding road network as a result of potential staging of the works. Modelling has indicated that some

intersections (eg Mitchell Highway and Thompson Street) would potential require some traffic management such as temporary traffic lights to appropriately manage traffic. The need for such management would be confirmed as part of construction planning following confirmation of the staging of the works. The need for such management would be detailed in the traffic management plan.

Access

Access to proposal site

Access to the proposal site would be via the existing road network, in particular the Newell and Mitchell highways.

Access to the proposal site and the identification of any designated heavy vehicle routes would be outlined in the traffic management plan.

Access to adjacent properties

Access to adjacent properties would be maintained where possible during construction. This may include access under traffic control or, potentially, alternate access routes. All changes, including temporary loss of access, would be discussed with the relevant property owners and occupants to confirm their access requirements. This will particularly be the case for access to the two service stations located at the intersection, residential dwellings and hotels/motels and restaurants.

Notification of works and any pending road closures would be undertaken by Roads and Maritime in accordance with the traffic management plan and communications and stakeholder management plan prepared for the proposal.

3.4 Ancillary facilities

3.4.1 Construction compound and stockpile sites

Construction compounds and stockpile sites would be determined by the contractor during construction planning. The selection of compound and stockpile sites would be undertaken with consideration of the following criteria:

- Not prone to flash flooding and more than 40 metres from a watercourse, where possible
- Distance between compound and nearby residential receivers is to be maximised where possible with a distance of 50 metres considered optimal where possible
- In previously disturbed areas that do not require the clearing of native vegetation
- In plain view of the public to deter theft and illegal dumping
- Outside the drip line of trees and on level ground wherever possible
- Away from areas of heritage conservation value.

Once the location of the site compound and any stockpile areas are confirmed by the contractor, consultation with the Roads and Maritime Senior Environment Officer would be undertaken to confirm the suitability of the locations and whether any additional environmental assessment is required.

Initial investigations into the potential location of construction compound and stockpile sites has occurred, with the below sites being identified in close proximity to the proposal. The use of the below sites has been considered as part of this REF.

In addition to the below two sites, existing Roads and Maritime depots and Council depots would be considered as potential compound and stockpile sites, however these would be located away from the proposal site and their availability required to be confirmed with the relevant owners.

All compounds and stockpile sites would be established in accordance with all relevant Roads and Maritime guidelines.

Compound/stockpile site

The primary compound and stockpile site would be positioned within the Dubbo Building and Renovation Centre site located at 13 Victoria Street (Lot 1 DP 122959) on the eastern corner of the intersection. This site is to be acquired as part of the proposal (refer to Section 3.6). The structure on this property would be demolished as part to the early works and therefore would be vacant for use as a compound/stockpile site. The site is accessible from both the Newell Highway and Victoria Street.

This site would be the site office and amenities for the proposal, however it would also potentially be used for the storage of equipment and materials and for construction worker parking.

The location of this compound is shown on Figure 3.1.

Alternative compound/stockpile site

A potential alternative compound and stockpile site has been identified directly adjacent to the Newell Highway at 10 Victoria Street (Lot 1 DP 795554). This site is currently vacant and has been cleared for a previously commercial development. The site can be accessed from Victoria Street (Newell Highway) and also from Stonehaven Avenue, however access to this site would primarily be from Victoria Street, particularly for heavy vehicles.

This site would primarily be used for the storage of equipment and materials and for construction worker parking.

The location of this compound is shown on Figure 3.1.

Figure 3.3 shows the potential alternative compound location from the Newell Highway.

Figure 3.3 Potential compound and stockpile site

3.4.2 Mobile asphalt batching plant

As part of the proposal there is potential for the need to establish a mobile asphalt batching plant to supply asphalt to the construction of the proposal.

It is proposed to position a mobile batching plant within the Dubbo Regional Airport, located off Arthur Butler Drive. The location of this plant is shown in Figure 1.1. The positioning of the batching plant has been selected as this area has previously been used for the operation of such a plant by Dubbo Regional Council for the resurfacing of the airport runways.

The proposed batching plant would, where possible, be operated during standard construction hours. However, due to the need for the plant to support roadworks occurring at night, there is potential for operation of the plant at night. The operation of the previous plant in this location also occurred during the night time period.

Consultation with Dubbo Regional Council would be undertaken to confirm the use of this land and any approvals required to be obtained for the operation of a mobile batching plant in this location.

3.5 Public utility adjustment

Consultation with public utility authorities is being undertaken as part of the design process to identify and locate existing utilities, and incorporate utility authority requirements for relocations and/or adjustments.

Preliminary investigations have indicated that a number of utilities would need to be relocated or adjusted as part of the proposal. This would be undertaken in consultation with the utility authorities during the ongoing detailed design. Consultation with the Roads and Maritime Senior Environmental Officer would be undertaken to seek advice regarding further assessment requirements should the design (ie utility relocation works) be located outside the proposal site assessed as part of this REF.

The following utilities are currently known as being required to be relocated as part of the proposal:

- Dubbo Regional Council water mains
- Dubbo Regional Council stormwater infrastructure
- Gas mains
- NBN communication cables and fibres
- Telstra communication cables.

3.6 Property acquisition

The proposal would largely be contained within the existing road reserve. There is however a need for some property acquisition to occur to accommodate the additional lanes for the intersection and the adjustment of the intersection itself. Properties that would potentially need to be acquired are listed in Table 3.3. At this stage of the design process it is estimated that land acquisition would partially affect a total of 15 privately owned properties. The extent of property impacts would be refined and confirmed following ongoing detailed design. The location of the indicative property acquisition is shown in Figure 3.4.

Property acquisition would be undertaken in accordance with Roads and Maritimes land acquisition requirements and the *Land Acquisition (Just Terms Compensation) Act 1991*. As the proposal entails partial rather than full acquisition of properties, property adjustment plans would be developed in consultation with the property owner.

Table 3.3 Indicative property acquisition

Lot/DP	Property type	Acquisition type	Indicative area of acquisition (m^2)
Lot 10 DP 830339	Service station	Partial	28.5
Lot 11 DP 787825	Service station	Partial	75
Lot 1 DP 122959	Commercial	Full	595
Lot 101 DP 875089	Commercial	Partial	81 (along Mitchell Highway) 126 (along Newell Highway) 207 (total)
Lot 102 DP 875089	Hotel/Motel	Partial	195
Lot 103 DP 875089	Electrical substation	Partial	78
Lot 1 DP 875089	Vacant lot	Partial	305

The alternative construction compound and stockpile area or any other identified would be leased for the duration of construction of the proposal. Land for the proposed mobile asphalt batching plant would also be leased. Details of these leases would be confirmed following confirmation of the location of compound and stockpile sites.

Following operation, the land not required within 13 Victoria Street (Lot 1 DP 122959) for the operational footprint would be surplus land. This land would remain vacant with Roads and Maritime to consider the sale of this property as part of a separate process.

Paper Size ISO A4

0 20 40

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Roads and Maritime
Newell & Mitchell Highway
Intersection Upgrade REF

Project No. 21-27258
Revision No. -
Date 16/04/2019

N:\AU\Orange\Projects\21\27258\GIS\Maps\Deliverables\REF\21_27258_Z004_REF_PropertyAquisition.mxd Data source: Aerial imagery - Sixmaps 2019 ( ); General topo - NSW LPI DTDB 2018, 2015 & 2012; Design data - RMS. Created by: jrprice© © 2019.
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Figure 3.4 Proposed property acquisition

4. Statutory and planning framework

4.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) and its associated regulation provide the framework for assessing the environmental impacts of proposed developments in NSW. The EP&A Act allows for the creation of environmental planning instruments (EPIs) including local environmental plans (LEPs) and state environmental planning policies (SEPPs). Presented below is a discussion on the approval process under the EP&A Act and the relevance of specific EPIs. Also discussed below are other legislative requirements of relevance to the proposal.

As outlined in Chapter 1, Roads and Maritime is the determining authority under Division 5.1 of the EP&A Act. This REF has been prepared by GHD Pty Ltd on behalf of Roads and Maritime. The purpose of the REF is to describe the proposal, to document the likely impacts of the proposal on the environment, and to detail protective measures to be implemented.

The description of the proposal and associated environmental impacts has been carried out in context of clause 228 of the Environmental Planning and Assessment Regulation 2000 (summarised in Appendix A), the BC Act, the FM Act, and the EPBC Act. In doing so, the REF helps to fulfil the requirements of section 5.5 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 REF would be considered when assessing:

- Whether the proposal is likely to have 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 and Infrastructure under Division 5.2 of the EP&A Act
- The significance of any impact on threatened species as defined by the BC Act and/or FM Act, in section 1.7 of the EP&A Act and therefore the requirement for a Species Impact Statement or a BDAR.

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 proposal is for a road and road infrastructure facilities and is to be carried out by or on behalf of Roads and Maritime, it can be assessed under Division 5.1 of the EP&A Act. Development consent from council is not required.

The proposal 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 (Coastal Management) 2018*, *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 REF.

4.1.2 Local Environmental Plans

Dubbo Local Environmental Plan 2011

The proposal is located within the Dubbo local government area and therefore the *Dubbo Local Environmental Plan 2011* (Dubbo LEP) applies to the proposal site.

Table 4.1 outlines the land use zones under the Dubbo LEP which the proposal site is within.

Due to the application of Clause 94 of ISEPP (refer to Section 4.1.1), the permissibility requirements under the Dubbo LEP are removed. Regardless, the consistency of the proposal against the zone objectives is outlined in Table 4.1.

Table 4.1 Consistency of proposal against land zoning objectives

Zoning	Objectives	Proposal's consistency against objectives
SP2 - Infrastructure (Classified Road)	• To provide for infrastructure and related uses. • To prevent development that is not compatible with or that may detract from the provision of infrastructure.	The proposal would be for the purpose of road infrastructure which would improve traffic flows both within the intersection and the surrounding areas.
SP3 - Tourist	• To provide for a variety of tourist-oriented development and related uses. • To recognise the importance of the Taronga Western Plains Zoo as a key tourist facility with the area of the City of Dubbo. • To facilitate tourist-oriented development along major transport corridors and at key nodes throughout the City of Dubbo. • To ensure that further tourism related development in the Cobra Street and Whylandra Street precincts will not interfere with established uses on adjoining residentially zoned land. • To ensure that development in the Camp Road precinct will not interfere with the continued operation of the Taronga Western Plains Zoo.	The proposal would only result in minor impacts to this zone, however the upgrade of the intersection is considered to benefit these SP3 zones and others within the Dubbo area as it would improve the operation of this intersection and therefore improve access to key tourist areas within Dubbo. The works would not result in any impacts on the operation of tourist-oriented development (eg hotels and Hungry Jacks) as only small parts of these properties would be acquired. The potential site of the construction compound is located within this zone, however its use would be short term and not prevent the use of this land for any tourist-oriented development.
R2 - Low Density Residential	• To provide for the housing needs of the community within a low density residential environment. • To enable other land uses that provide facilities or services to meet the day to day needs of residents. • To ensure development is consistent with the character of the immediate locality. • To encourage low density housing within a landscaped setting on the fringe of the Dubbo urban area.	The proposal would only result in minor impacts to this zone in the form of some strip acquisition along the front of properties fronting the Newell Highway. The loss of this land would not prevent this land from meeting the zone objectives should any future development occur in this location.

4.2 Other relevant NSW legislation

With the exception of the *Biosecurity Act 2015*, described below no other NSW legislation is considered relevant for the proposal.

4.2.1 Biosecurity Act 2015

The NSW *Biosecurity Act 2015* regulates pests, diseases and weeds in NSW. The primary object of the Act is to provide a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers.

In NSW, all plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.

Weeds would potentially be required to be removed as part of the proposal and would be done in accordance with the safeguards and management measures outlined in Section 6.3.3.

4.3 Commonwealth legislation

4.3.1 Environment Protection and Biodiversity Conservation Act 1999

Under the 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 A and Chapter 6 of the REF.

A referral is not required for this proposal for proposed actions that may affect nationally listed threatened species, 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.

The assessment of the proposal on matters of national environmental significance, and the environment of Commonwealth land is presented in Appendix A and summarised below.

Findings – matters of national environmental significance

The assessment of the proposal's impact on matters of national environmental significance and the environment of Commonwealth land found that there is unlikely to be a significant impact on relevant matters of national environmental significance or on Commonwealth land. Accordingly, the proposal has not been referred to the Australian Government Department of the Environment and Energy under the EPBC Act.

Findings – nationally listed biodiversity matters (where the strategic assessment applies)

The assessment of the proposal's impact on nationally listed threatened species, endangered ecological communities and migratory species found that there is unlikely to be a significant impact on relevant matters of national environmental significance. Chapter 6 of the REF describes the safeguards and management measures to be applied.

4.4 Confirmation of statutory position

The proposal is categorised as development for the purpose of a road and road infrastructure facilities and is being carried out by or on behalf of a public authority. Under clause 94 of the ISEPP the proposal is permissible without consent. The proposal is not State significant infrastructure or State significant development. The proposal can be assessed under Division 5.1 of the EP&A Act.

Roads and Maritime is the determining authority for the proposal. This REF fulfils Roads and Maritime's obligation under section 5.5 of the EP&A Act including to examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the activity.

No additional licences, approvals or permits are required for the proposal.

5. Consultation

5.1 Consultation strategy

This proposal forms part of the Dubbo Project Launch package which includes a number of other significant projects in Dubbo. The proposal forms part of an overarching communications campaign developed for all projects designed to provide continued community awareness. This will include an additional website and communications covering all projects, which will be distributed to Dubbo and the surrounding communities. Consultation with affected property owners (by means of acquisition, access or identified potential disturbance) has commenced, which includes a presentation of the proposed design and corridor alignment to affected owners prior to public proposal display.

A Communication Plan has been prepared for the program of works being undertaken by Roads and Maritime in the Dubbo urban area (including the proposal). The plan would be reviewed and updated by the Roads and Maritime Project Officer as required. The plan provides details about:

- Key issues for community involvement
- Aspects of the proposal that would impact the community and stakeholders
- Communication objectives of the proposal
- Key messages and target audience
- Identified stakeholder groups.

The communication objectives for the proposal would be to:

- Create awareness of the proposed changes at the intersection of Cobra Street and Fitzroy Street, Dubbo
- Make sure that customers (the travelling public) are aware of any road network changes or traffic delays during construction
- Make sure that local residents and business owners are aware of any changes to access that might be experienced during construction.

5.2 Community involvement

The following consultation activities were undertaken by Roads and Maritime during the preparation of the REF:

- A letterbox drop including the community notification
- Drop-in sessions at Orana Mall, Dubbo City Centre, the Rotunda and the Farmers Markets
- Dubbo roads projects page on the Roads and Maritime website including details of the proposal along with other road projects within Dubbo
- Print and radio ads to notify the community of project within Dubbo (including the proposal)
- Meetings with any affected landowners or landowner located adjacent to the proposed works in mid 2018 and early 2019.

Table 5.1 provides an overview of the issues which have been raised as part of the consultation undertaken for the proposal.

Table 5.1 Summary of issues raised by the community

Issue raised	Response/where addressed in REF
Loss of parking along shops on western approach would result in impacts on businesses as customers currently rely on these spaces. This include impacts to deliveries and garbage removal. Why can't all spaces be retained?	The design has been refined to ensure that the majority of spaces (15 out of 17) have been retained to ensure businesses are not impacted. Discussion about impacts on parking are outlined in section 6.2.2. The retention of all spaces is not feasible due to the need to accommodate the movement of heavy vehicles as Victoria Street is a designated heavy vehicle route.
Will retained parking on western approach be safe or will it be deemed unsafe and removed at a later date.	The proposed retention of existing parking has been determined based on ensuring the parking lanes meet the requirement (ie width) as outlined in all relevant standards.
Any loss of parking on eastern side of northern approach will impact business as these parking spaces are used.	Retention of parking in this location has been considered where possible. Parking loss in this location is discussed and assessed in section 6.2.2.
Can parking metre marked out and timed or metered?	Roads and Maritime will retain the spaces in their current form with consideration of line marking and timed parking to be raised with Council.
Concerned above noise impacts of proposal	Adjacent properties would be subject to some construction noise impacts however these would be short-term in nature. Further discussion about noise and vibration impacts are outlined in section 6.1.3. During operation of the new intersection some properties would be located closer to the operational lanes and therefore be subject to an increase in noise levels. Overall the minor change in distance from the operational lanes is not considered to result in any noticeable changes in noise. Further discussion about noise and vibration impacts are outlined in section 6.1.3.
Impacts on existing signage located at service station sites where acquisition is required.	Any adjustment to existing signage as a result of the proposal would be undertaken at the cost of Roads and Maritime as part of the proposal. Ongoing consultation regarding any impacts would be undertaken with the owners.
Would like to see a ring road provided as an alternative to the new Dubbo bridge	Consideration of a ring road does not form part of the scope of the proposal.
Require access to be maintained to properties	Access to all properties would be maintained throughout construction, however in the event access is lost consultation would be undertaken to confirm access requirements and develop alternate access arrangement if required. No long term impacts to access as all access points are to be retained or modified as required in consultation with the owners.
Concerns with loss business due to introduction of medians and removal of roundabout.	Movements into Elizabeth Street/Lane and Baird Street would potentially be removed and therefore impact on access. Alternate access to these businesses are available intersection at East Street with access to the abovementioned road available via back streets to these roads.

5.3 Aboriginal community involvement

Stage 2 of PACHI was undertaken as part of the New Dubbo Bridge project. The proposal site was inspected as part of this assessment. The Dubbo Local Aboriginal Land Council attended this site inspection.

Further details about impacts to Aboriginal heritage are located in section 6.8.

5.4 ISEPP consultation

Dubbo Regional Council have been consulted about the proposal as per the requirements of clause 13 of the ISEPP due to potential impacts on the road network and council stormwater and sewerage infrastructure. Appendix B contains an ISEPP consultation checklist that documents how ISEPP consultation requirements have been considered.

To date no response has been received from Dubbo Regional Council in regards to the ISEPP consultation. Dubbo Regional Council has however been involved throughout the development of the design of the proposal as a key stakeholder.

5.5 Government agency and stakeholder involvement

Government agency and stakeholder involvement to date for the proposal has been limited to consultation undertaken as part of the detailed design including Dubbo Regional Council, who support the proposal.

5.6 Ongoing or future consultation

Future community consultation is expected to occur prior to construction starting on the proposal. This would occur in the form of letter box drops, community updates, door knocking and advertising the proposal in the local newspaper. A Roads and Maritime contact number would be available for the community throughout the construction period, to ensure any construction issues can be raised. Roads and Maritime (and the contractor) would continue to consult both the community and any affected landowners as soon as practicable regarding the start date of work, alternative parking, property and business access arrangements, and (if required) proposed detour routes. Regional bus and truck companies would be contacted as soon as practicable to notify them of the proposed timing of work including any detours or times when the intersection is to be under traffic control.

6. Environmental assessment

6.1 Noise and vibration

GHD carried out a construction noise and vibration assessment in March 2019. The below section provides a summary of the assessment which is located in Appendix D.

6.1.1 Existing environment

Sensitive receivers

Noise sensitive receives have been identified in the vicinity of the proposal both at the intersection and also in the vicinity of proposed asphalt plant near Dubbo Regional Airport.

The majority of these receivers consist of residential dwellings, however a number of non-residential sensitive receivers are also located in the vicinity of the proposal. These are summarised in Table 6.1.

The positioning of all sensitive receivers identified for the proposal are shown in Figures 2-1 and 2-2 of Appendix D. Further details of these receivers are outlined in section 2.2.1 and 2.2.2 of Appendix D.

Table 6.1 Non-residential sensitive receivers

Receiver type	Address
Commercial	26 – 46 Victoria Street
Commercial	33-49 Whylandra Street
Place of worship	Bent Street and Stuart Street
Industrial	56 – 72 Victoria Street
Industrial	Mansour Street
Educational institute	Corner East and North Street
Educational institute	30 East Street
Place of worship	103 North Street
Industrial	Howard Avenue Depot Road
Industrial	31L Narromine Road
Industrial	22R Narromine Road

Existing noise environment

Intersection site

Monitoring was undertaken at two locations in the vicinity of the proposal:

- 89 Whylandra Street, Dubbo
- 52 Victoria Street, Dubbo.

Noise monitoring results, as well as site observations, indicate that the existing noise environment is dominated by noise sources typical of a suburban environment located adjacent to a major highway. The measured noise levels are shown in Table 6.2.

Table 6.2 Measured RBL L_{A90} and Ambient Noise Level L_{Aeq}

Monitoring location	Rating Background Level, LA90			Ambient Noise Level, LAeq		
	Day 7 am to 6 pm	Evening 6 pm to 10 pm	Night 10 pm to 7 am	Day 7 am to 6 pm	Evening 6 pm to 10 pm	Night 10 pm to 7 am
Whylandra Street	55	50	38	68	63	71
Victoria Street	52	47	38	67	60	69

Mobile asphalt plant site

Monitoring was undertaken at 7L Cooreena Road, Dubbo by GHD in 2018. Noise monitoring results, as well as site observations, indicate that the existing noise environment is dominated by road traffic along the Mitchell Highway and Dubbo City Regional Airport operations (including some construction activities at the airport). The measured noise levels are shown in Table 6.3.

Table 6.3 Measured RBL L_{A90} and Ambient Noise Level L_{Aeq}

Rating Background Level, LA90			Ambient Noise Level, LAeq		
Day 7 am to 6 pm	Evening 6 pm to 10 pm	Night 10 pm to 7 am	Day 7 am to 6 pm	Evening 6 pm to 10 pm	Night 10 pm to 7 am
37	30	25	52	46	45

6.1.2 Criteria

Construction noise management levels

Proposal specific construction noise management levels (refer to Table 6.4) were developed in accordance with the *Interim Construction Noise Guideline* (ICNG) (DECC, 2009) for each identified sensitive receiver.

For work during recommended standard hours:

- The ‘noise affected level’ represents the point above which there may be some community reaction to noise. The noise affected level is calculated by adding 10 dB(A) to the rating background level
- The ‘highly noise affected level’ represents the point above which there may be strong community reaction to noise. The ICNG specifies that the highly noise affected level is 75 dB(A).

For work outside recommended standard hours:

- A strong justification would typically be required for works outside the recommended standard hours
- The proponent should apply all feasible and reasonable work practices to meet the noise affected level
- Where all feasible and reasonable practices have been applied and noise is more than five dB(A) above the noise affected level, the proponent should negotiate with the community.

For work outside recommended standard hours, the construction noise management level is calculated by adding five dB(A) to the rating background level.

The INP application notes regarding sleep disturbance recommend that where the $L_{A1(1min)}$ or L_{Amax} exceeds the $L_{A90(15min)}$ by more than 15 dB(A) outside the bedroom window, a more detailed analysis is required.

The *Road Noise Policy* provides further guidance, which indicates that:

- Maximum internal noise levels below 50 to 55 dB(A) are unlikely to cause awakening reactions
- One or two noise events per night with maximum internal noise levels of 65–70 dB(A) are not likely to significantly affect health and wellbeing.

For this assessment the background level plus 15 dB(A) criteria has been used as a screening level assessment of sleep disturbance which is consistent with the *Industrial Noise Policy* application notes.

Table 6.4 Proposal specific construction noise management levels

Receiver	Construction noise management levels, LAeq(15 min)				
	Standard construction hours		Outside standard construction hours1		
	Noise affected	Highly noise affected	Day	Evening	Night
NCA01 – Location A	62	75	57	52	43
NCA02 – Location A	62	75	57	52	43
NCA03 – Location A	65	75	60	55	43
NCA04 – Location A	65	75	60	55	43
Location B	47	75	42	35	352
Commercial	70	-	70	70	-
Industrial	75	-	-	-	-
Educational institute	553	-	-	-	-
Places of worship	553	-	553	553	-

Note 1: The *Noise Policy for Industry* (EPA, 2017) defines day, evening and night time periods as:

- Day: the period from 7.00 am to 6.00 pm Monday to Saturday or 8.00 am to 6.00 pm on Sundays and public holidays.
- Evening: the period from 6.00 pm to 10.00 pm.
- Night: the remaining period.

Note 2: The minimum NPI background noise level of 30 dBA has been used for the night-time period

Note 3: A 10 dBA addition has been applied to account for the difference between internal and external noise levels

Construction traffic

The *Road Noise Policy* (RNP) (DECCW, 2011) provides road traffic noise criteria for residential land uses affected by construction traffic on the public road network. The CNVG states that construction traffic noise should be assessed using an initial screening test which determines if noise levels increase by more than 2 dBA due to construction traffic or a temporary reroute due to a road closure. No further assessment is required if the noise level increase is limited to 2 dBA or less.

Where construction traffic increases the existing road traffic noise levels by more than 2 dBA then further assessment is required using the road traffic noise criteria in the Roads and Maritime *Noise Criteria Guideline*.

Construction vibration criteria

Human comfort criteria

Human comfort vibration criteria have been set with consideration to *Assessing Vibration: A Technical Guideline* and British Standard (BS) 6472 – 1992, *Guide to Evaluation of Human Exposure to Vibration in Buildings (1 Hz to 80 Hz)* which is recognised by the Office of Environment and Heritage as the preferred standard for assessing the 'human comfort to vibration'. Table 6.5 summarises the BS 6472 human comfort peak vibration criteria and intermittent vibration dose values for the frequency range of 1 Hz to 80 Hz.

British Standard (BS) 5228.2 – 2009, Code of Practice for noise and vibration control on construction and open sites: Part 2 Vibration, recognises that higher vibration levels are tolerable for short-term construction projects as undue restriction on vibration levels can substantially prolong construction works and result in greater annoyance. The guidance values recommended by BS 5228.2 are presented in Table 6.6.

Table 6.5 Human comfort intermittent vibration limits (BS 6472-1992)

Receiver type	Period	Intermittent vibration doe value ($m/s^{1.75}$)	
		Preferred value	Maximum value
Residential	Day	0.2	0.4
	Night	0.13	0.26
Educational institutes	When in use	0.4	0.8

Note 1: Day is between 7 am and 10 pm and night is between 10 pm and 7 am

Table 6.6 Guidance on effects of vibration levels for human comfort (BS 5228.2 – 2009)

Vibration level	Effect
0.14 mm/s	Vibration might just be perceptible in most sensitive situations for most vibration frequencies associated with construction
0.3 mm/s	Vibration might be just perceptible in residential environments.
1.0 mm/s	It is likely that vibration at this level in residential environments will cause complaints, but can be tolerated if prior warning and explanation has been given to residents.
10 mm/s	Vibration is likely to be intolerable for any more than a very brief exposure.

Structure damage criteria

Table 6.7 presents the German Standard *DIN 4150-3: 1999 Structural Vibration – Part 3: Effects of vibration on structures* minimum safe levels of vibration at different frequencies for commercial, residential buildings.

Based on DIN 4150-3, a measured value exceeding those listed in Table 6.7 "…*does not necessarily lead to damage; should they be significantly exceeded, however, further investigations are necessary."*

Table 6.7 Guideline values for short-term vibration on structures

Type of structure	Guideline values for velocity, (mm/s)		
	1 Hz to 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz[1]
Buildings used for commercial purposes, industrial buildings, and buildings of similar design.	20	20 to 40	40 to 50
Dwellings and buildings of similar design and/or occupancy.	5	5 to 15	15 to 20
Structures that, because of their particular sensitivity to vibration, cannot be classified under lines 1 and 2 and are of great intrinsic value (eg listed buildings under preservation order).	3	3 to 8	8 to 10

Note: 1. At frequencies above 100 Hz the values given in this column may be used as minimum values.

Operational criteria

Road traffic noise criteria

Minor works are defined in the NCG and include minor straightening of curves, installing traffic control devices, intersection widening and turning bay extensions or making minor road realignments. Minor works are not considered to be redeveloped or new road projects as they are not intended to increase the traffic carrying capacity of the overall road or accommodate a significant increase in heavy vehicle traffic.

The NCG applies the existing road criteria where minor works increase the noises levels at sensitive receivers by more than 2.0 dBA. This has been used to identify potential impacts as a result of the noise produced from the increased road traffic due to the operation of the proposed intersection upgrade, and these noise abatement levels are outlined below in Table 6.8.

Table 6.8 Road traffic noise criteria, dBA

Type of development	Target noise level, dBA	
	Day (7 am to 10 pm)	Night (10 pm to 7 am)
Freeway/arterial/sub-arterial road	$L_{Aeq(15\ hour)}$ 60 (external)	$L_{Aeq(9\ hour)}$ 55 (external)
Local road	$L_{Aeq(1\ hour)}$ 55 (external)	$L_{Aeq(1\ hour)}$ 50 (external)

The proposal is considered to be a redevelopment of an existing arterial road with the capacity of the road not to be increased. Based on this the arterial road criteria outlined above is to be used.

Maximum noise level events

The NPI recommends a maximum noise level assessment to assess the potential for sleep disturbance impacts which include awakenings and disturbance to sleep stages. An initial screening test for the maximum noise levels events should be assessed to the following levels:

- $L_{Aeq(15\ min)}$ 40 dBA or the prevailing RBL plus 5 dB, whichever is greater, and/or
- L_{AFmax} 52 dBA or the prevailing RBL plus 15 dB, whichever is greater.

If the screening test indicates there is a potential for sleep disturbance then a detailed maximum noise level assessment should be undertaken.

6.1.3 Potential impacts

Construction noise

Intersection site

Construction activities would result in a short-term increase in localised noise levels, particularly for sensitive receivers close to the proposal site. Noise impacts may be associated with the construction activities and equipment outlined in Table 4-2 of Appendix D.

As noted in section 3.3.2, the construction activities would also potentially be undertaken outside the recommended standard hours. Under the *Interim Construction Noise Guideline* (DECC, 2009), the works are classified as 'works for which it can be demonstrated that there is a need to operate outside the recommended standard hours'.

Noise levels have been predicted for the worst-case construction scenario at the most-affected receiver location and are provided in Appendix D.

It should be noted that during any given period, equipment would operate at maximum sound power levels for only brief periods. At other times, the machinery may produce lower sound levels while carrying out activities not requiring full power. It is likely that certain types of construction machinery would be present within the proposal site for only brief periods during construction. Therefore, noise predictions are considered to be worst case.

Safeguards and management measures detailed in section 6.1.4 would be implemented where feasible and reasonable to reduce noise impacts outlined in the below sections.

During standard construction hours

The results indicate that, without mitigation, construction noise may exceed the noise management levels at residential sensitive receivers. Figure 6.1 outlines the number of exceedances for each of the construction scenarios (outlined in Appendix D). Exceedances are only expected to occur in NCA02 and NCA03 with the highest exceedances occurring during intersection demolition (CS03) and intersection approach works (CS04) construction scenarios.

The highly noise affected level of 75 dBA is expected to be exceeded at 42 residential receivers. This exceedance is due to the receivers' proximity to the proposed construction works and the source noise levels of the construction equipment.

Noise levels at some receivers would be considered 'highly intrusive' based on the perception categories provided in the CNVG. The additional mitigation measures discussed in section 6.1.4 should be implemented where feasible and reasonable.

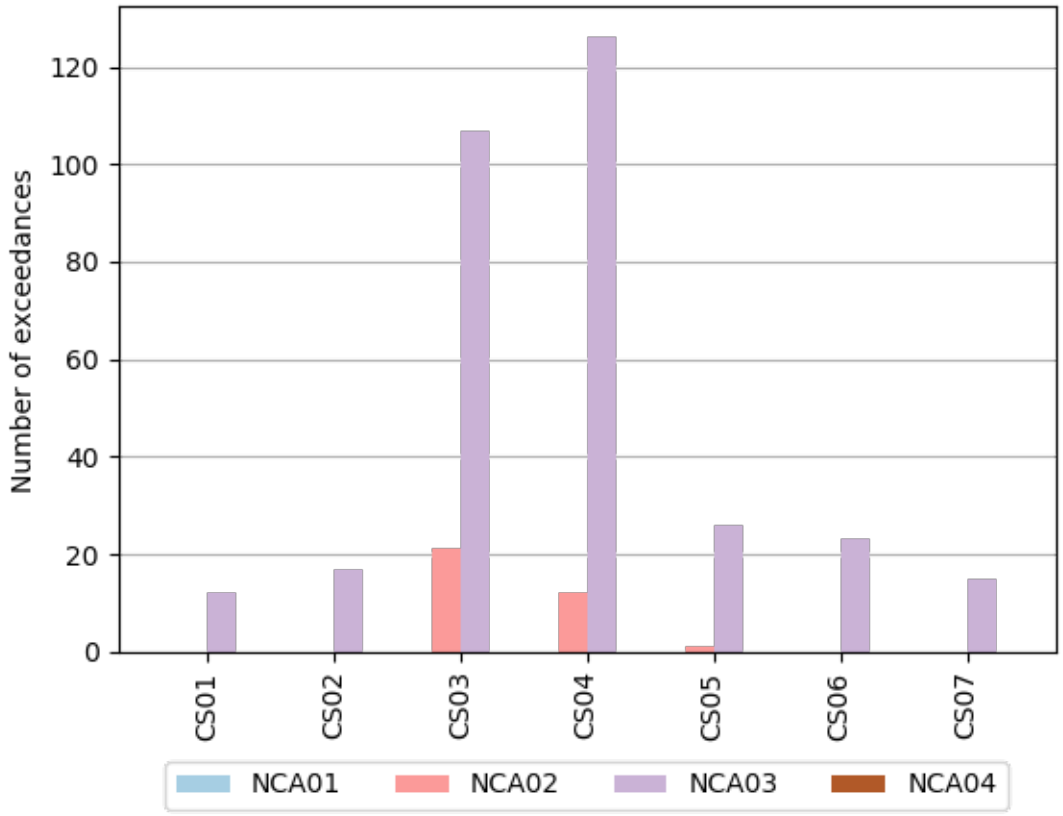

Figure 6.1 Number of exceedances during standard hours

Outside standard construction hours

The number of residential receivers that exceed the NMLs for works outside standard construction hours are shown on Figure 6.2, Figure 6.3 and Figure 6.4.

As with impacts during the standard construction hours, exceedances are most expected during the intersection demolition (CS03) and intersection approach works (CS04) construction scenarios particular during the day and evening periods. Such impacts are generally limited to NCA02 and NCA03, however some exceedances within NCA02 would occur during both periods.

During the night period, exceedances are expected for most NCAs and for the majority of construction scenarios.

Overall construction noise impacts for receivers in NCA01, NCA02 and NCA03 would be considered minor to moderate as the majority of NML exceedances are between 1 dBA to 15 dBA. Some receivers in NCA03 located closer to the proposed works would experience high impacts with exceedances above 20 dBA.

No exceedances are expected in NCA04.

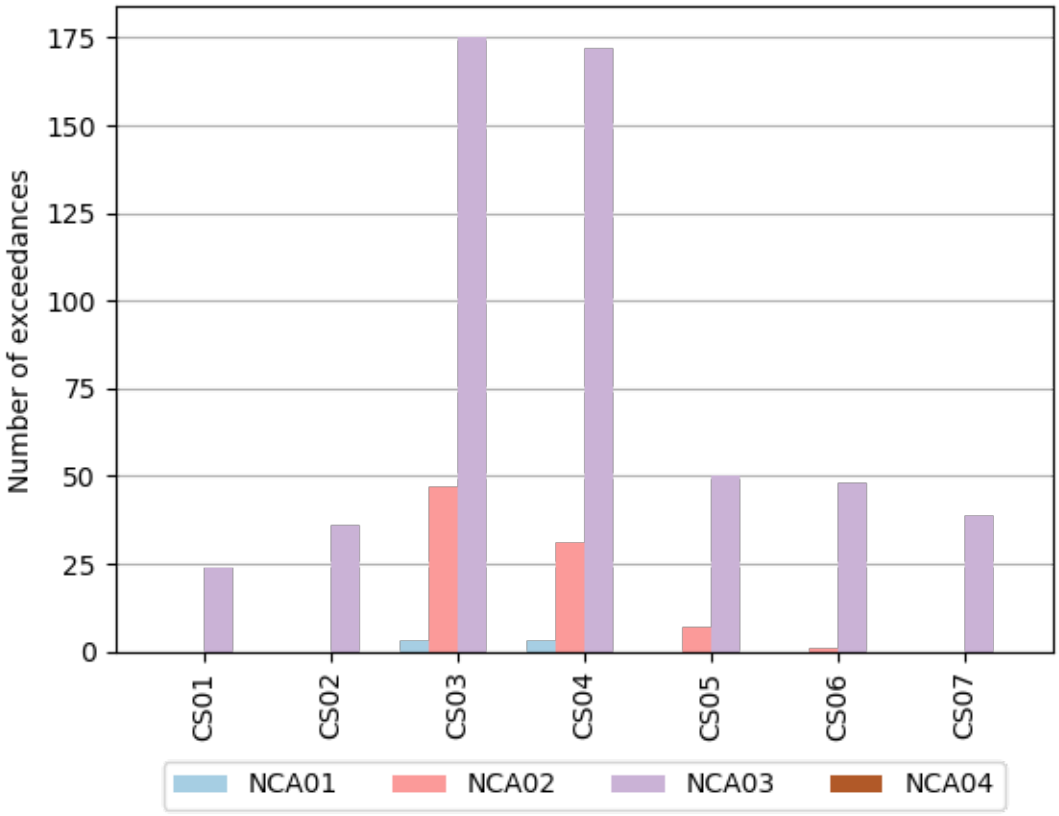

Figure 6.2 Number of exceedances, OOHW (day)

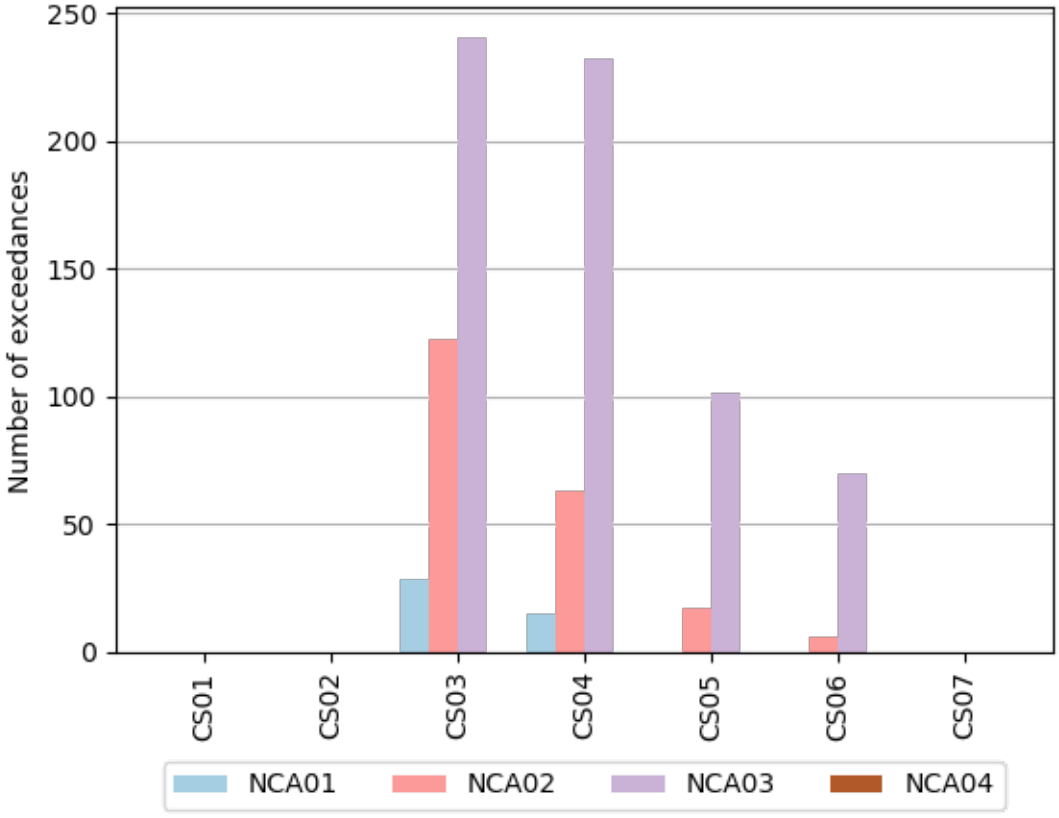

Figure 6.3 Number of exceedances, OOHW (evening)

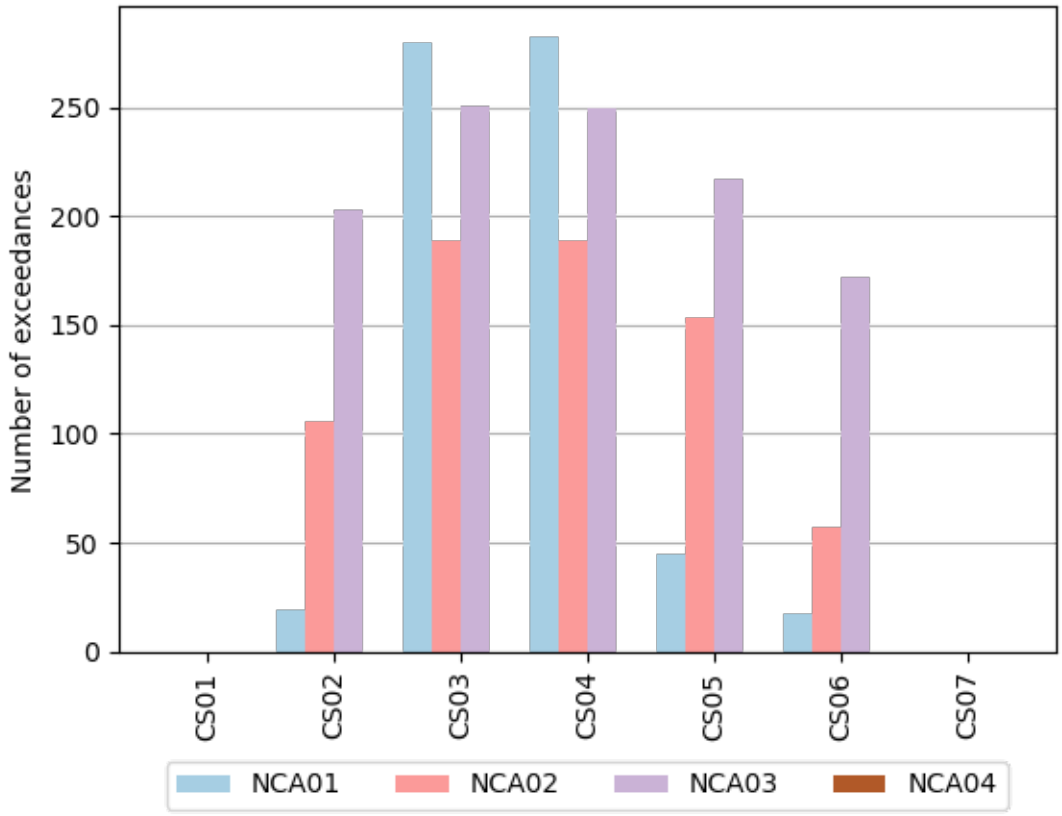

Figure 6.4 Number of exceedances, OOHW (night)

Non-residential receivers

Table 6.9 outlines the maximum number of exceedance modelled for each land use type. These exceedances are expected during the intersection approach and intersection demolition construction scenarios.

Table 6.9 Maximum number of exceedances

Land use type	Maximum number of exceedances
Commercial	15
Industrial	8
Educational institute	2
Place of worship	1

Further detail of these exceedances is outlined in section 4.3.4 of Appendix D.

Sleep disturbance

The maximum sleep disturbance affected distance would be during asphalting works. Receivers located within 270 m of the construction works are anticipated to experience maximum external noise levels above 65 dBA and have the potential to experience sleep disturbance events.

Mobile asphalt plant site

Noise impacts may be associated with the construction activities and equipment outlined in Table 4-10 of Appendix D.

The operation of the mobile asphalt plant would primarily operation outside of the recommended standard hours, due to the need for the plant to support other works being undertaken outside of the recommended standard hours. However the below assessment has considered daytime operation as well.

Noise levels have been predicted for the worst-case construction scenario at the most-affected receiver location.

Safeguards and management measures detailed in section 6.2.3 would be implemented where feasible and reasonable to reduce noise impacts outlined in the below sections.

During standard construction hours

The results indicate that, without mitigation, the operation of the mobile asphalt plant during standard construction hours would not result in any exceedances of the criteria at any residential receivers) as outlined in Table 6.10. No exceedance of the industrial criteria are expected at any of the nearby receivers. No management measures are recommended for operations during standard hours.

Table 6.10 Predicted asphalt plant levels at residential receivers

Receiver	**Predicted $L_{Aeq(15\ min)}$ noise level, dBA**			
	Standard hours	Outside standard hours		
	Day	Day	Evening	Night
NML	*47*	*42*	*35*	*35*
4L Cooreena Road	43	**43 (1)**	**43 (8)**	**43 (8)**
7L Cooreena Road	40	40	**40 (5)**	**40 (5)**
8L Cooreena Road	37	37	**37 (2)**	**37 (2)**

Note: Exceedances in **bold** with level of exceedance in brackets

Outside standard construction hours

The potential asphalt plant noise impacts have been assessed for out-of-hours works during the day, evening and night-time periods. The predicted noise levels indicates that operations are likely to exceed the noise management levels during all OOHW time periods.

The predicted exceedance of the OOHW noise management levels are provided in Table 6.10. Additional mitigation measures have been recommended and are based on the level of exceedance above the noise management level.

Sleep disturbance

Sleep disturbance is only considered to be an issue for the proposed plant where residences are located within 170 metres of a rural property (as detailed in the Construction Noise and Vibration Guideline (Roads and Maritime, 2016)). The nearest residential receivers are located over 400 metres from the plant site and therefore sleep disturbance is not considered to be an issue.

Construction traffic noise

A significant increase in traffic volumes would be needed in order to increase road traffic noise by 2 dBA (as an example a doubling in traffic corresponds to an approximate 3 dBA increase). The majority of construction traffic movements would be during standard construction hours and unlikely to be significant when compared with the existing vehicle numbers in the area. As a result, no noise impacts from construction traffic movements are expected.

It is recommended that a traffic management plan be prepared by the contractor which detail specific routes that construction traffic and local traffic would follow throughout the construction phase and where feasible and reasonable, avoid the use of local roads.

Construction vibration

Safe working buffer distances to comply with the human comfort, cosmetic damage and heritage structural damage criteria were taken from the CNVG are provided in Table 6.11. Safe working buffer distances for heritage buildings were estimated by doubling the buffer distance for standard structures.

Table 6.11 Vibration safe working buffer distances

Activity	Human comfort	Structural damage	
		Heritage building/structure	Standard structures
Vibratory roller (>18 tonnes)	100 m	50 m	25 m
Vibratory roller (13-18 tonnes)	100 m	40 m	20 m
Vibratory roller (7-13 tonnes)	100 m	30 m	15 m
Vibratory roller (4-6 tonnes)	40 m	24 m	12 m
Vibratory roller (2-4 tonnes)	20 m	12 m	6 m
Vibratory roller (1-2 tonnes)	15 m	10 m	5 m
Small hydraulic hammer 5-12 tonne excavator	7 m	4 m	2 m
Medium hydraulic hammer 12-18 tonne excavator	23 m	14 m	7 m
Large hydraulic hammer 18-34 tonne excavator	73 m	44 m	22 m

The CNVG specifies a safe working buffer distance of 15 metres for standard structures for a 10-tonne roller. No standard structures have been identified within 15 metres of the construction area.

Residential premises located along Whylandra Street and Victoria Street have the potential to experience human comfort impacts during use of a vibratory roller.

No heritage structures were identified within the proposal area.

Operational noise

Predicted noise levels

The opening year no-build and build road traffic noise levels were assessed at the worst-affected receiver along Newell Highway/Whylandra Street and Mitchell Highway/Victoria Street. The worst-affected receiver has been identified as the residential receiver that is located closest to the proposed intersection. The noise level increase at the worst-affected receiver along both streets are provided in Table 6.12.

Table 6.12 Predicted noise levels, dBA

Receiver address	Day (7 am to 10 pm)			Night (10 pm to 7 am)		
	No-build	Build	Difference	No-build	Build	Difference
R588 73 Whylandra Street	69	70	0.9	62	63	1.1
R651 25 Victoria Street	69	70	1.6	60	62	1.9

The noise level increase at the worst-affected receivers are below 2.0 dBA. This increase can be attributed primarily to heavy vehicles accelerating from rest due to the signalised intersection. Receivers located closer to the intersection would be subjected to higher degrees of heavy vehicle engine noise as it accelerates up to the sign posted speed. Heavy vehicle braking may also result in noise level increases however this is considered unlikely as heavy vehicles are currently required to decelerate whilst approaching the roundabout.

No further assessment is required as the noise level increase is below 2.0 dBA.

Maximum noise level assessment

The *Road Noise Policy* provides a literature review for the assessment of sleep disturbance impacts due to road traffic noise. Sleep disturbance impacts are likely to be dependent on the following:

- Maximum noise level of an event
- Number of occurrences
- Durant of the event
- Level above background or ambient noise levels.

For continuous rather than intermittent traffic flow the Environmental Noise Management Manual (ENMM) (RTA, 2001) suggests that maximum noise (LAmax) pass-by events may lead to sleep disturbance if the maximum noise levels are greater than 65 dBA.

The ENMM advises that the maximum noise level can be used as a tool to prioritise and rank mitigation strategies but should not be applied as a decisive noise criterion for the selection of mitigation treatments.

The measured LAmax and LAeq(1 hour) noise levels during the night-time period (10 pm to 7 am) at the two roadside monitoring locations are summarised in Table 6-13. Detailed hourly noise levels during the night-time period are provided in Appendix D.

Maximum noise level events due to the intersection upgrade have the potential to increase. These events would be a result of heavy vehicles accelerating from rest up to the sign posted speed. Additional maximum noise level events are not expected as a result of heavy vehicle engine compression braking as this source of noise is existing.

Table 6-13 Maximum noise level assessment summary, dBA

Location ID	$L_{Amax(1\ hour)}$ range	$L_{Aeq(1\ hour)}$	Highest L_{Amax} – $L_{Aeq(1\ hour)}$	Average L_{Amax} – $L_{Aeq(1\ hour)}$	Number of maximum noise level events
M1	47-90	53-70	29	20	35
M2	54-93	50-67	30	22	35

Signalised intersection noise

Noise levels are predicted to exceed the 38 dBA night-time noise criteria at the seven residential receivers listed in Table 6-14. These exceedances are due to the low background noise levels and the receivers distance relative to the intersection.

The source noise level of the pedestrian push-button assembly is adaptive and is adjusted based on the ambient noise levels. Therefore, predicted noise levels are considered conservative as the source noise level of the push-button has been based on the day-time ambient noise level. Night-time ambient noise levels are 7 dBA lower than day-time ambient levels. Impacts would be considered unlikely if an adaptive push-button assembly is used.

Table 6-14 Predicted exceedances

Receiver	Receiver address	Noise criteria	Predicted noise level, dBA
R615	31 Victoria Street	38 dBA $L_{Aeq(15min),\ night}$	39
R628	29 Victoria Street		41
R635	27 Victoria Street		42
R651	25 Victoria Street		46
R718	12 Whylandra Street		46
R743	8 Whylandra Street		39
R747	15 Beni Street		43

6.1.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Pre-construction			
Construction noise and vibration	A construction noise and vibration management plan would be prepared as part of the construction environmental management plan. This plan would include, but not be limited to: • A map indicating the locations of sensitive receivers including residential properties • Management measures to minimise the potential noise impacts from the quantitative noise assessment and for potential works outside of standard working hours (including implementation of *Interim Construction Noise Guidelines* (DECC, 2009) • A risk assessment to determine potential risk for activities likely to affect receivers (for activities undertaken during and outside of standard working hours) • Mitigation measures to avoid noise and vibration impacts during construction activities including those associated with truck movements • A process for assessing the performance of the implemented mitigation measures • A process for documenting and resolving issues and complaints • A process for updating the plan when activities affecting construction noise and vibration change • Identify in toolbox talks where noise and vibration management is required • An out of hours works procedure in accordance with the requirements of the *Interim Construction Noise Guideline* (DECC, 2009) and the *Environmental Noise Management Manual Practice* (RTA, 2001a) • Restrictions on construction delivery times to minimise noise impacts to receivers near the compound site • Scheduling works to complete noisiest activities during the day wherever possible (i.e. concrete saw cutting).	Construction contractor	Pre-construction and construction
	The out of hours procedure would as a minimum include: • Background levels for noise criteria in accordance with the Interim Construction Noise Guideline (DECC, 2009) • Locations of the works • Locations of sensitive receivers • Predicted noise levels • Communications plan • Triggers for the provision of respite and a respite schedule. Management measures where works are unable to comply with *Interim Construction Noise Guideline* (DECC, 2009) and the *Environmental Noise Management Manual Practice* (RTA, 2001a).	Construction contractor	Pre-construction and construction

Impact	Environmental safeguards	Responsibility	Timing
Construction			
Construction noise	Noise impacts would be minimised in accordance with Practice Note 7 in Roads and Maritime Services' *Environmental Noise Management Manual* and *Environmental fact sheet No. 2- Noise management and Night Works*.	Construction contractor	Construction
	Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods.	Construction contractor	Construction
	As a guide high noise and vibration generating activities near receivers should be carried out in continuous blocks that do not exceed 3 hours each, with a minimum respite period of one hour between each block. The duration of each block of work and respite should be flexible to accommodate the usage and amenity at nearby receivers. Unless negotiated with the community with consultation documented and approved by RMS project manager or permitted under the licence there should be no more: • 2 consecutive evenings or nights per week; and • 3 evenings or nights per week; and • 6 evenings or nights per month. For night work these periods of work should be separated by not less than one week.	Construction contractor	Construction
Construction noise from machinery and equipment	All plant and equipment would be appropriately maintained to ensure optimum running conditions, with periodic monitoring.	Construction contractor	Construction
	Noise-emitting plant would be directed away from sensitive receivers where possible.	Construction contractor	Construction
	Traffic flow, parking and loading and unloading areas would be planned to minimise reversing movements within the proposal site.	Construction contractor	Construction
	Reversing alarms that have a tonal noise character are to be avoided during out of hours activities. Quacker style or 'smart' reversing alarms are to be used during night time activities (pending safety approvals).	Construction contractor	Construction
Construction noise from construction compound	Temporary hoarding would be erected around the selected construction compound where deemed required.	Construction contractor	Construction
	Loading and unloading of materials/deliveries is to occur as far as possible from sensitive receivers. Select site access points and roads as far as possible away from sensitive receivers. Dedicated loading/unloading areas to be shielded if close to sensitive receivers. Delivery vehicles to be fitted with straps rather than chains for unloading, wherever possible. Avoid or minimise out of hours movements where possible.	Construction contractor	Construction

Impact	Environmental safeguards	Responsibility	Timing
Mobile asphalt plant	Investigate the use of a 2 to 3 metre acoustic screen around the asphalt burner unit.	Construction contractor	Construction
	Position aggregate stockpile areas to shield noise between the asphalt plant equipment and the residential receivers to the north-west.	Construction contractor	Construction
	The front-end loaders on site should be fitted with exhaust mufflers.	Construction contractor	Construction
Construction noise from inappropriate practices	Site inductions would be provided to train staff on ways to minimise construction noise impacts on-site. Responsible working practices include: • Avoid the use of outdoor radios during the night-time period • Avoid shouting and slamming of doors • Where practical, operate machines at low speed or power and switched off when not being used rather than left idling for prolonged periods • Minimise reversing • Avoid dropping materials from height and avoid metal to metal contact on material.	Construction contractor	Construction
Construction vibration	Quieter and less noise/vibration emitting construction methods would be used where feasible and reasonable.	Construction contractor	Construction
	Compliance vibration monitoring would be undertaken in response to complaints or when vibration generating activities occur within the structural damage buffer distances. The results of the vibration monitoring would be compared to the structural damage criteria presented in Table 6.7 considering frequency content.	Construction contractor	Construction
	Building condition surveys would be undertaken when vibration generating activities occur within the structural damage buffer distances. The properties to be assessed are to be confirmed in consultation with Roads and Maritime Services.	Construction contractor	Construction
Noise and vibration impacts and appropriate complaints handling	The local community would be contacted and informed of the proposed work, location, duration of work, and hours involved. The contact would be made a minimum five days before work starts as per RMS ENMM Practice Note 7 requirements.	Construction contractor and Roads and Maritime	Construction
	Communications material such as the project website and community notification would include a contact person and phone number to enable complaints to be received and responded to.	Construction contractor	Construction
Operation			
Road noise	A post-construction noise monitoring program should be undertaken within 12 months of opening once traffic flows have stabilised to compare the measures noise levels with the levels in the assessment in Appendix D. Where changes are identified the need for further mitigation would be required.	Roads and Maritime	Post-construction

Additional mitigation measures

In circumstances where the noise levels are predicted to exceed construction noise management levels after implementation of the general work practices, the relevant additional mitigation measures detailed in Table 6.15 should be considered where feasible and reasonable. Based on the predicted noise levels, additional mitigation measures are likely to be required for works during standard construction hours and outside of standard construction hours. Houses identified as Moderately Intrusive or Highly Intrusive (detailed list located in Appendix D) during the day time would be eligible for letter box drops or compliance noise monitoring as per the table below. Additional mitigation measures would be required for any night time works where feasible and reasonable.

Table 6.15 Additional mitigation measures

Criteria	Time period	LAeq(15 min) noise level above rating background level			
		0 to 10 dBA	10 to 20 dBA	20 to 30 dBA	>30 dBA
		Noticeable[1]	Clearly audible	Moderately intrusive	Highly intrusive
Standard	Weekday (7 am– 6 pm)	-	-	LB, M	LB, M
	Saturday (8 am – 1 pm)				
OOHW Period 1	Weekday (6 pm–10 pm)	-	LB	M, LB	M, IB, LB, PC, SN
	Saturday (1 pm – 10 pm)				
	Sunday (8 am – 6 pm)				
OOHW Period 2	Weekday (10 pm–7 am)	LB[1]	M, LB	M, IB, LB, PC, SN	AA, M, IB, LB, PC, SN
	Saturday (10 pm – 8 am)				
	Sunday (6 pm – 7 am)				

Monitoring (M): Compliance noise monitoring

Individual Briefings (IB): Individual briefings are used to inform stakeholders about the impacts of high noise activities and mitigation measures that will be implemented. Communications representatives from the contractor would visit identified stakeholders at least 48 hours ahead of potentially disturbing construction activities. Individual briefings provide affected stakeholders with personalised contact and tailored advice, with the opportunity to comment on the Proposal.

Letter box drops (LB): Letter box drops or media advertisements.

Phone Calls (PC): Phone calls detailing relevant information would be made to identified/affected stakeholders within seven days of proposed work. Phone calls provide affected stakeholders with personalised contact and tailored advice, with the opportunity to provide comments on the proposed work and specific needs.

Specific Notifications (SN): Specific notifications are letterbox dropped or hand distributed to identified stakeholders no later than seven days ahead of construction activities that are likely to exceed the noise objectives. This form of communication is used to support periodic notifications.

Alternative accommodation (AA): Alternative accommodation options would be offered to residents.

Source: *Construction Noise Strategy (Rail Projects),* (TfNSW, 2012)

Note 1: A minimum of 5 dBA exceedance above the background level was used for determining the 'Noticeable' level.

6.2 Traffic and access

6.2.1 Existing environment

Descriptions of the Newell and Mitchell highways are located in Section 2.2.

Traffic volumes

Traffic counts were undertaken at the intersection during the development of the design. Table 6.16 outlines the result of traffic counts undertaken at the intersection during the morning and afternoon peaks.

Table 6.16 Existing traffic volumes

Movement	Morning peak					Afternoon peak				
	Light vehicles	Rigid	Semi-trailer	B-Double	Total	Light vehicles	Rigid	Semi-trailer	B-Double	Total
Newell Highway										
Southbound – right turn	93	4	2	2	101	121	2	2	0	125
Southbound – through	205	16	4	6	231	408	10	4	5	427
Southbound – left turn	47	0	3	0	50	46	1	0	0	47
Northbound – right turn	559	16	1	0	576	463	7	1	1	472
Northbound – through	453	13	1	10	477	198	6	7	8	219
Northbound – left turn	13	0	0	0	13	43	1	0	1	45
Mitchell Highway										
Westbound – right turn	72	2	0	0	74	115	3	0	0	118
Westbound – through	387	23	2	0	412	362	5	4	0	371
Westbound – left turn	288	14	4	0	306	573	3	0	1	577
Eastbound – right turn	18	2	0	0	21	93	2	0	1	96
Eastbound – through	369	11	4	0	384	293	5	1	0	299
Eastbound – left turn	59	2	0	0	61	58	4	0	0	62
Total movements through intersection	***2563***	***104***	***21***	***18***	***2706***	***2773***	***49***	***19***	***17***	***2858***

Note: * movements using the roundabout were not counted as part of the traffic counts

As shown in Table 6.16 the dominant movements at the intersection during the morning peak are the following:

- northbound Newell Highway turning right into the eastbound Mitchell Highway
- northbound Newell Highway through the intersection to continue along the Newell Highway.

The dominant movements during the afternoon are then the opposite of the abovementioned movements.

It is noted that heavy vehicle movements (ie semi-trailers and B-Doubles) are consistent between the two peaks, however twice as many rigid vehicles utilise the intersection during the morning peak.

Crash history

An increase in congestion at the existing roundabout has led to an increase in the number of crashes, largely as a result of queue at the intersection. In the five year period between July 2012 and July 2016 there were 54 crashes within 500 metres of the intersection. About 44 per cent of all crashes at the intersection involved rear end type crashes while 40 per cent of the crashes resulted in injuries. No fatal crashes have been recorded.

About 87 per cent of crashes at the intersection involved light vehicles while the remaining 13 per cent involved heavy vehicles (including buses, trucks, semi-trailers and B-doubles).

With an increase in usage of the intersection, it is predicted that an increase in crashes is also likely to be expected.

Public transport

Dubbo Buslines is the main public transport provider in Dubbo. Two bus routes, 572 and 572A travel through the proposal site. Route 572 travels from the south-west along the Newell Highway, turning right on to the Mitchell Highway. This route then makes its way east through the Dubbo central business district before heading north, west and returning to the study area on its original route. Route 572A travels from the study area, then north-west through the northern streets of Dubbo, west, before rejoining the study area via the Newell Highway. Route 572 service operates on average every 45 minutes, while the 572A service operates every two hours. School buses also travel through the intersection during morning and afternoon periods.

Pedestrian and cyclist access

Pedestrian footpaths are located adjacent to the road reserve along the boundary of the site. As outlined in Dubbo Regional Councils “Popular routes in Dubbo”, one cycle route, the Rawsonville to Minore Loop uses the Newell Highway (Whylandra Street) within the proposal site.

During traffic counts undertaken on 15 March 2018, it was observed that no pedestrians cross the street in the vicinity of the intersection. This is largely a result of there being no crossing facilities.

6.2.2 Potential impacts

Construction

Impacts on the operation of the Newell and Mitchell highways

During construction, two way access along the Newell and Mitchell highways would be maintained at all times, albeit it under contraflow conditions (i.e. on one side of the highway). No formal detours are proposed to be put in place particularly for heavy vehicles who do not have a destination within Dubbo (i.e. are through traffic). Overall the operation of the two roadways under contraflows would result in some

additional congestion due to the reduced capacity of the roads and the reduced travel speeds through the proposal site. These disruptions would be short-term, with minor impacts on road users expected. Alternative routes, while not formally installed as part of the proposal, are readily available. This would allow some vehicles to avoid the area during construction thus potentially reducing the volumes of vehicles travelling through the proposal site.

The proposal would not prevent the movement of heavy vehicles through the proposal site at any stage as traffic control would allow for the movement of larger vehicles including B-Doubles.

Details of the traffic management to be put in place would be outlined in the traffic management plan to be developed as part of the proposal.

Impacts on access to adjacent properties and streets

Access to adjacent properties would be maintained throughout the construction period. Where impacts cannot be avoided, consultation would be undertaken with the impacted landowner to confirm their access requirements.

Impacts on access to adjacent streets (eg Baird Street, Alam Street and Elizabeth Street) would be minimized, where possible. In the event that access to these roads is impacted, alternative access routes are available via East Street, Alfred Street and Young Street. Such detours would result in a minor, short-term increase in travel times. The community would be notified of any potential loss of access to nearby streets prior to the closure occurring.

Construction traffic generation

As outlined in Section 3.3.6, the proposal would result in an additional 23 vehicles (eight heavy vehicles and 15 light vehicles) accessing the road network. The increase in vehicles using the Newell and Mitchell Highway as a result of the proposal are considered to not result in any substantial reduction in the operation of these roads or any surrounding roads.

The increase in heavy vehicles on the road network resulting from the proposal is not considered to result in any impacts on the operation of the road network as both the Newell Highway and Mitchell Highway are designated heavy vehicle routes.

To minimise any potential impacts on the road network vehicle movements would be scheduled to avoid peak periods where possible.

The movement of asphalt from the proposed asphalt plant location (described in Section 3.4.2) would result in an increase in the number of vehicles travelling along the Mitchell Highway from the airport about four kilometres to the north of the proposal. This increase in vehicles is not considered to impact the operation of the road network as the Mitchell Highway is a high volume road which already has a large number of heavy vehicles using it. The use of this route would also be short term in nature and would only be used when asphalt is required to be delivered to the proposal site. Deliveries would also likely be at night when traffic volumes are lower due to the need for asphalting works at the proposal site to occur at night when weather conditions a cooler.

Public transport impacts

Existing bus services may experience a minor increase in travel times and potential detours during the day time period. As night work is proposed to reduce traffic impacts, impacts to bus services would not occur as these services do not operate during the proposed night construction hours.

The existing bus stop on Newell Highway northbound, south of Elizabeth Street, would potentially be relocated as part of the proposal. Therefore, there would be some minor impacts to bus users at this location while construction is being undertaken. An alternative bus stop location would be provided during construction (where required) in consultation with bus companies.

Pedestrian and cyclist access

Pedestrian access would be retained during construction, where possible. Any closures of pedestrian paths would be signposted with an alternate route provided. Cyclist access would be retained during construction, where possible. Any closures to cycle loops would be signposted with an alternative loop provided. The Rosedale Loop is available to be used as a detour and joins the Rawsonville to Minore Loop at a distance from the intersection.

Operation

Future intersection performance

Table 6.17 outlines the modelled operation of the intersection in 2039 under two different scenarios.

The first modelled scenario considered the intersection in 2039 if the proposal was not to proceed, taking into account the predicted growth in movements through the intersection. As shown in Table 6.17, without the proposal in 2039 the intersection is predicted to operate at a level of service of F during both the morning and afternoon peaks. Under this scenario the majority of movements at the intersection would be operating over capacity (i.e. level of service E or F). In particular, Mitchell Highway eastbound movement would be heavily impacted, with delays of over 33 minutes and queues of about 1.9 kilometres. This is as a result of the inability of vehicles to enter the roundabout because of the number of vehicles accessing the intersection from the Newell Highway northbound (as per the current situation). This is considered to be a worst-case scenario as vehicles from this direction would seek alternate routes to avoid the congestion. However, even with vehicles seeking alternative routes Mitchell Highway eastbound would be likely to operate over capacity.

The second modelled scenario considered the intersection in 2039 with the proposal in operation. As shown in Table 6.17, the proposal would result in an overall improvement in the operation of the intersection, so that it operates at a level of service of C. A level of service of C is considered to be acceptable as the intersection would not be at capacity and would allow a steady through-flow of vehicles. At this level of service there would be, however, some restrictions on the ability of vehicles to select their desired speed and to maneuver within traffic. With the proposal in place there would also be an improvement in level of service at the majority of approaches, with the exception of the Mitchell Highway westbound (morning and evening) and Newell Highway southbound (morning). However, despite these reductions traffic flow at these approaches would remain acceptable to tolerable.

As shown in Table 6.17, with the proposal in place the intersection would operate at an improved level of service which is consistent with the objectives of the proposal. Additionally, modelling of queuing at the intersection in 2039 indicates that while some queuing would be present, it would not result in any impacts on any movements at the intersection.

Table 6.17 Future intersection performance in 2039

Approach	2039 (no proposal)			2039 (with proposal)		
	DoS	Average delay	LoS	DoS	Average delay	LoS
Morning peak						
Mitchell Highway westbound	0.53	8.0	A	0.75	27.3	B
Newell Highway southbound	0.66	31.2	C	0.88	54.8	D
Mitchell Highway eastbound	2.07	2007.3	F	0.89	46.1	D

Approach	2039 (no proposal)			2039 (with proposal)		
Newell Highway northbound	1.27	515.1	F	0.86	37.4	C
Intersection	2.07	585.0	F	0.89	38.8	C
Afternoon peak						
Mitchell Highway westbound	0.73	12.9	A	0.91	27.4	B
Newell Highway southbound	0.66	438.4	F	0.86	43.6	D
Mitchell Highway eastbound	2.07	614.1	F	0.92	41.9	C
Newell Highway northbound	1.27	63.7	E	0.89	41.7	C
Intersection	2.07	216.0	F	0.92	37.6	C

Parking impacts

The proposal would result in the loss of parking on all approaches to the intersection. On most approaches the loss of parking is not considered to result in any impacts on business as the majority of business have off-street car parking or parking available on nearby side streets.

Parking loss on the Mitchell Highway westbound (west of intersection) includes the loss of two parking spaces which are located outside commercial properties. The loss of parking along this section of the Mitchell Highway would reduce the amount of parking outside some businesses which would potentially impact on patronage for some businesses. Some off-street parking is also available behind the businesses which is considered to assist in offsetting the loss of these two spaces. Overall the loss of spaces while potentially being an inconvenience to some is not considered to likely impact on businesses longer term due to remaining street parking, availability of off street parking.

The impacts to parking for residential properties located along the two highways is considered to be minor as most properties have off-street parking or the ability to park in nearby side streets.

Loss of access to side roads

During operation, movement in and out of Baird Street (on both sides of the Newell Highway), Elizabeth Street and Elizabeth Lane would be restricted due to the installation of a new concrete median on Newell Highway across these intersections. While this may result in some road users travelling further distances the increase in distance would likely be minor, causing only minor increases in travel times. In general any vehicles currently using these intersections would be required to use the Newell Highway/East Street intersection which provides access to either side of the Newell Highway. Currently there are traffic issues along the Newell Highway south of this intersection, including queuing back across Elizabeth and Baird streets. Therefore with the proposal in place the need to use the signalised intersection at East Street would in some cases improve access to these streets.

The proposal would also restrict the right out movements from Alam Street, while the existing right-in movement would be retained. The removal of this movement has the potential to increase trip distances and times, however alternate routes to the Newell Highway southbound would be available via either Alfred Street or Young Street/Mitchell Highway.

Road user safety

The safety of all road users would be improved during operation of the proposal. The proposal would reduce the incidence of rear-end crash incidents by removing the complexity of using a roundabout intersection.

Pedestrians and cyclists

The upgrade of the intersection to a signalised intersection would include signalised pedestrian crossings on all approaches to the intersection. As witnessed by the lack of pedestrians crossing the intersection, noted during the traffic counts, the intersection is currently not pedestrian friendly as there are no suitable existing crossing points. Therefore the inclusion of signalised pedestrian crossings would result in an improvement to pedestrian safety and usability.

Cyclist's facilities would be provided as part of the proposal. The nature of these facilities would be confirmed during ongoing detailed design but would ensure connection to the existing and future cyclist routes outlined in Dubbo Regional Councils bike plan.

6.2.3 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
General traffic management	A Traffic Management Plan (TMP) will be prepared and implemented as part of the CEMP. The TMP will be prepared in accordance with the Roads and Maritime *Traffic Control at Work Sites Manual* (RTA, 2010) and *QA Specification G10 Control of Traffic* (Roads and Maritime, 2008). The TMP will include: • confirmation of haulage routes • measures to maintain access to local roads and properties • site specific traffic control measures (including signage) to manage and regulate traffic movement • measures to maintain pedestrian and cyclist access • requirements and methods to consult and inform the local community of impacts on the local road network • access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads. • a response plan for any construction traffic incident • consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic • monitoring, review and amendment mechanisms.	Contractor	Pre-construction
Vehicle generation	Where possible vehicle movements (in particularly heavy vehicles) to the proposal site will be avoided during the morning and afternoon peaks and during school finishing times.	Contractor	Construction
Heavy vehicles management	Haulage routes to the proposal site and construction compound/stockpile site and also to the asphalt plant will be identified and included within the traffic management plan.	Contractor	Pre-construction

Impact	Environmental safeguards	Responsibility	Timing
Road and lane closures	Where possible, partial road closures will occur at night, when traffic volumes are at a minimum.	Contractor	Construction
Road and lane closures	Access to side streets will be maintained where possible throughout construction.	Contractor	Construction
Road and lane closures	Ongoing consultation will be undertaken with Dubbo Regional Council, to ensure road closures and detours do not coincide with major events in the town.	Contractor	Construction
Road and lane closures	The community will be kept informed about upcoming interruptions to the road network (including closure of road access), through letter box drops, community updates, door knocking and electronic signage on site.	Contractor	Construction
Public transport impacts	Bus companies will be consulted with before works, to inform them of road conditions (including partial closures) and the need to change the location of the bus stop located on the Newell Highway northbound (south of Elizabeth Street)	Contractor	Construction
Pedestrian access	Pedestrian access will be maintained at all times throughout construction. Where access cannot be maintained alternate routes will be identified and notified to the community.	Contractor	Construction
Property access impacts	Access to adjacent service stations and commercial properties will be available throughout construction to avoid economic impacts and general access impacts. Where impacts are required consultation will be undertaken with the affect property owner to confirm any access requirements.	Contractor	Construction

6.3 Biodiversity

6.3.1 Existing environment

The proposal site consists of an existing road corridor which is largely void of vegetation. Some isolated street trees are located along the roadway and there are landscaped areas within the roundabout and the island created by the existing left turn lane from the Mitchell Highway westbound to Newell Highway southbound.

A desktop assessment was undertaken to identify threatened flora and fauna species, and communities listed under the BC Act and EPBC Act. No site surveys have been undertaken.

A search of the NSW OEH BioNet database was undertaken on 25 May 2018 for endangered and critically endangered species listed under the BC Act. A search of a 10 kilometre was completed and identified:

- 23 threatened fauna species including 18 bird species, four bat species and Koalas
- One threatened flora species.

These species are unlikely to be found within the works area, due to the highly disturbed nature of the study area and lack of potential habitat.

A 10 kilometres search of the Department of Environment Protected Matters Online Search Tool for matters of national environmental significance (MNES) listed under the EPBC Act was undertaken on the 25 May

2018. The search identified five listed threatened ecological communities, 26 listed threatened species, 14 listed migratory species and 22 listed marine species. These species are unlikely to be found within the works area, due to the highly disturbed nature of the study area and lack of potential habitat.

6.3.2 Potential impacts

Construction

The proposal would result in some minor vegetation clearance with any clearance limited to planted landscaping within the roundabout and island adjacent to the slip lane and within areas of properties to be acquired. No threatened vegetation would be cleared during construction.

Due to presence of limited habitat within the proposal site and the sites use as a busy intersection, impacts on fauna would be minor and would be limited to common urban species which are generally highly mobile and have suitable alternate habitat located in the surrounding areas.

There is potential for priority weeds to occur in the proposal site due to its highly disturbed nature. Any impacts on priority weeds would be management in line with *Roads and Maritimes Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).

Operation

Operation of the proposal would not result in any biodiversity impacts as the operation of the intersection would be similar to the existing situation (in terms of vehicle movements) and therefore the risk to any fauna would not increase.

Conclusion on significance of impacts

The proposal is not likely to significantly impact threatened species or ecological communities or their habitats, within the meaning of the *Biodiversity Conservation Act 2016* or *Fisheries Management Act 1994* and therefore a Species Impact Statement or Biodiversity Development Assessment Report is not required.

The proposal is not likely to significantly impact threatened species, ecological communities or migratory species, within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999* and therefore a strategic assessment would not be required.

6.3.3 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
General biodiversity management	The CEMP will vegetation that will be impacted. Laydown and stockpile areas, worker amenities, equipment and vehicles will be located outside of vegetation drip lines.	Contractor	Construction
General biodiversity management	If any damage occurs to vegetation outside of the nominated work area (as shown in the CEMP), the project manager and environmental representative will be notified to determine a suitable course of action.	Contractor	Construction
Weed management (if encountered)	Should priority weeds be encountered, weeds will be controlled in accordance with contemporary bush regeneration principles and practices, the *Biosecurity Act 2015*, the NSW Department of Primary Industries noxious and environmental weed control handbook, and	Contractor	Construction

Impact	Environmental safeguards	Responsibility	Timing
	Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA 2011), to ensure construction does not promote the spread of weeds. Any weeds encountered in the study area will be stockpiled separately and disposed of at an appropriate waste facility.		

6.4 Landform, soils and water quality

6.4.1 Existing environment

Topography

The proposal site is relatively flat at the intersection, however the landscape does slope down towards the Macquarie River which is located about 320 metres south-east of the intersection.

Soil landscapes

The Department of Land and Water Conservation *1:250,000, Soil Landscape Series Sheet SI55-4* (Murphy and Lawrie 1998) indicates the study area is underlain by soils of Bunglegumbie origin. The landscape is characterised by level to slightly undulating plains on red-brown earths. Soils are red chromosols, yellow chromosols, red kandosols and black vertosols. The soils are limited to moderate fertility, weakly structured surface soils and moderate to high water holding capacity.

Geology

The *Dubbo 1:100,000 Geological Sheet (2000)* (Raymond et al 1999) indicates the study area is underlain by Napperby formation from the Gunnedah Basin. This formation consists of siltstone which is interbedded with sandstone.

Contamination

Registered contaminated land sites

A search of the Contaminated Land Records undertaken on the 20 June 2018 identified no contaminated sites are located within or directly adjacent to the proposal site. Two sites are located about one kilometre east of the proposal site. These sites are unlikely to result in any impacts on the proposal site.

Areas of potential contamination

A contamination assessment undertaken during the design process (SMEC 2018) identified a number of potential contamination sources in the vicinity of the proposal site. These are detailed in Table 6.18.

Table 6.18 Potential contamination in the vicinity of the proposal

Potential contamination source	Likelihood of contamination	Potential contaminants of concern	Source of contamination
Service stations at intersection including Shell service station on northern corner and BP on western corner of the intersection	Medium	Total petroleum hydrocarbon (TPH), BTEX (benzene, toluene, ethylbenzene and xylene), polycyclic aromatic hydrocarbons (PAHs), Heavy Metals, volatile organic compounds (VOCs), Solvents	Leaks and spills associated with fuel storage systems and underground storage tanks (USTs).
Industrial and commercial buildings including former service station and workshops	Medium	Heavy metals, PAHs, TPH, BTEX, VOCs and asbestos	Unknown redundant USTs associated with former service station and workshops.
Uncontrolled fill	Low	Heavy metals, PAHs, TPH, BTEX, asbestos containing materials (ACM)	Potentially contaminated heterogeneous fill material within the proposal alignment

A limited number of shallow test pits (less than one metre depth) were excavated across the proposal site and soil samples were collected from within the test pits.

The purpose of the sampling was to determine the presence of gross contamination within the proposal site rather than assess contamination levels in soil across the proposal site.

Soil testing undertaken in the vicinity of the contamination sources in Table 6.18, concluded the following:

- No hydrocarbon impacted soils, seepage waters, or hydrocarbon odours were encountered within the test pits
- No exceedances of the adopted criteria were reported in soil samples collected during the assessment.

In addition to the potential sources of contamination outlined in Table 6.18, the following general sources of potential contamination have been identified:

- Any sections of road bitumen constructed prior to 1987 potentially containing coal tar
- Redundant and active below ground services (e.g. conduits) which were potentially constructed from asbestos containing materials (ACM)
- Areas near older structures (e.g. older fibro houses or shops) which may have construction materials with ACM and/or lead based paints.

Surface water

The study area is drained by the public stormwater network. The closest water course is the Macquarie River which is located about 120 metres south-east of the proposal site. This Macquarie River is part of the Macquarie-Barwon catchment within the Murray-Darling basin.

The study area is not identified by Dubbo LEP mapping as being subject to flooding, due largely to the elevation of the proposal site above the Macquarie River.

6.4.2 Potential impacts

Construction

Erosion and sedimentation

The proposal would involve excavation and ground surface disturbance during construction. Excavation and stockpiling activities, if not adequately managed, may result in the following impacts:

- Erosion of exposed soil and stockpiled materials
- Dust generation from excavation, backfilling and vehicle movements over exposed soil
- An increase in sediment loads entering the stormwater system and/or local runoff, and therefore nearby receiving waterways including Macquarie River.

Such impacts would generally occur in areas which have been disturbed previously due to the past construction of the existing road and adjacent developments. The proposal would not require any substantial excavations, with impacts generally limited to milling of the existing pavement and, in some locations, excavations to alter the level of the ground or for foundation for infrastructure (such as traffic signals). Overall ground disturbance and stockpiling for the proposal would be minimal and the footprint of excavation and/or ground disturbance would be minimised, where possible. Any potential impacts would be minimised through implementation of the safeguards and management measures outlined in Section 6.4.3.

Upon completion of the works, all disturbed areas would be restored to their pre-works condition or better, and in accordance with the Blue Book requirements, thereby negating the risk of long term erosion impacts.

Landform

The proposal would generally be undertaken at the existing ground level, however some localised changes in ground level would occur. These changes are considered minimal and would not result in any impacts on landform in the vicinity of the proposal as the proposal site has been subject to past landform change.

Contamination

As outlined in Section 6.4.1, no gross contamination was identified within the vicinity of the proposal site during assessment works undertaken as part of the design. Investigations where undertaken at locations along both the Newell and Mitchell highways to a depth of about two metres. Regardless, the presence of contamination is largely unknown across the site particularly in areas within the existing service station sites. Overall the majority of excavation would be shallow (less than one metre) with some deeper excavations required for the construction of footings traffic signals or for the relocated service station signs. Spoil excavated within the proposal site would be managed in accordance with the soil and water management plan and the contamination land management plan.

Soil contamination could occur as a result of any accidental spills or leaks of fuels, oils and other chemicals from equipment and vehicles during construction. To avoid this potential impact, fuels and chemicals would be managed in accordance with the safeguards and management measures provided in Section 6.4.3.

Water quality

Pollutants such as sediment and construction waste have the potential to mobilise and enter drainage lines, particularly during high rainfall events.

Water quality impacts could also potentially occur from fuel or chemical spills from construction equipment. Such impacts are considered minimal as the facilities would be positioned to ensure that any potential leaks would not impact on downstream waters.

The risk of water quality impacts, and the significance of any impacts that may occur, would be minimised by implementing the safeguards and management measures provided in Section 6.4.3.

Surface water

The proposal would result in some short-term changes to existing surface water movements, due to the proposed earthworks and stockpiling. Any changes to surface water flows during construction would be minor and short-term only and flows would be redirected around the proposal site where possible. Additionally, existing stormwater infrastructure would be retained during construction where possible to appropriately manage any surface water within the proposal site. Any dirty surface water flow would however be redirected away from existing stormwater infrastructure. These diversions would be detailed in the soil and water management plan.

Operation

Operation of the proposal would not result in significant impacts on landform or soils. The risk of soil erosion during operation would be minimal as all areas impacted during construction would be stabilised and covered with hardstand or vegetated (landscaped) area which would prevent soil erosion from occurring.

The proposal has, and will continue to be designed to appropriately manage surface water flow within the proposal site. All surface water would be collected by the existing or upgraded/adjusted stormwater systems which currently are within the proposal site. The proposal includes the upgrade of an existing discharge to the Macquarie River. The upgrade would include the installation of a gross pollutant trap which would ensure that the discharge of water would not impact on water quality. The proposed discharge as also been designed to ensure scour impacts within the river. Overall discharges to the river while slightly increased in volume are not expected to result in any substantial changes from the existing discharges.

6.4.3 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Erosion and sedimentation	A soil and water management plan (SWMP) will be prepared as part of the CEMP in accordance with the requirements of Roads and Maritime Services contract specification G38 before the commencement of construction. The SWMP will also address the following: • Roads and Maritime Services Code of Practice for Water Management, the Roads and Maritime Services' Erosion and Sedimentation Procedure • The NSW Soils and Construction – Managing Urban Stormwater Volume 1 "the Blue Book" (Landcom, 2004) and Volume 2D (DECC, 2008) • Roads and Maritime Services Technical Guideline: Temporary Stormwater Drainage for Road Construction, 2011 • Roads and Maritime Services Technical Guideline: Environmental Management of Construction Site Dewatering, 2011	Contractor	Pre-construction

Impact	Environmental safeguards	Responsibility	Timing
Contamination of soils	The CEMP is to include a Contaminated Land Management Plan, which must comply with the *Contaminated Land Management Act 1997* (NSW), Road and Maritime publication *Contaminated Land Management Guideline*, Roads and Maritime *Environmental Incident Classification and Reporting Procedure*, and EPA guidelines on contaminated land management. The Contaminated Land Management Plan will provide for dealing with: • Areas of known contamination (if any) • Unexpected contamination finds • Any land contamination caused during construction.	Contractor	Pre-construction
Contamination of soils	Further contamination assessment will be undertaken in the vicinity of the proposal site by a suitably qualified consultant. The assessment will consider those areas that have the potential to be contaminated that were not assessed as part of the previous investigation, particularly land that's existing or former use was for service station operations, which is proposed to be acquired or temporarily leased for the proposal.	Roads and Maritime Contractor	Pre-construction
Contamination of soils and waterways	An incident emergency spill plan will be developed and incorporated into the CEMP. The plan will include measures to avoid and manage spillages of fuels, chemicals, and fluids onto any surfaces or into stormwater inlets and an emergency response procedure.	Contractor	Pre-construction
Erosion and sedimentation	All stockpiles will be designed, established, operated and decommissioned in accordance with Roads and Maritime Services' Stockpile Management Procedures.	Contractor	Pre-construction
Contamination of soils and waterways	In the event that indicators of contamination are encountered during construction (such as odours or visually contaminated materials), work in the area will cease until an environmental consultant can advise on the need for remediation or other action.	Contractor	Construction
Contamination of soils and waterways	Vehicle wash downs and/or concrete truck washouts will be undertaken within a designated bunded area on an impervious surface or undertaken off-site.	Contractor	Construction
Contamination of soils and waterways	Machinery will be checked daily to ensure there are no oil, fuels or other liquids leaking from the machinery.	Contractor	Construction
Contamination of soils and waterways	There is to be no release of dirty water into drainage lines and/or waterways.	Contractor	Construction
Contamination of soils and waterways	The refuelling of plant and maintenance of machinery will be undertaken in impervious bunded areas in the designated compound area.	Contractor	Construction
Sediment transported off site	All stockpiles will be designed, established, operated and decommissioned in accordance with the RTA's Stockpile Management Procedures.	Contractor	Construction
Heavy rainfall	Weather conditions will be monitored daily, and no	Contractor	Construction

Impact	Environmental safeguards	Responsibility	Timing
management	works will be conducted if there is an imminent threat of a heavy rainfall event. In the event of a rainfall event, works will cease if there is a risk of sediment loss off site or ground disturbance due to waterlogged conditions		

6.5 Air quality

6.5.1 Existing environment

Air quality in the vicinity of the proposal is considered to be typical of an urban area located within a rural setting (ie no extensive development and a relatively low population). Local air emissions are dominated by motor vehicles along both the Newell and Mitchell highways, as well as other roads in the study area. A search of the National Pollution Inventory (2016/2017 period) in February 2019 for postcode 2830 (Dubbo) indicated that there are a total of 12 facilities, emitting 37 substances. The nearest of these facilities are located about one kilometres north-west of the intersection off the Mitchell Highway on Depot Road. This facility results in the emission of Total Volatile Organic Compounds associated with the storage of gas at the SuperGas Dubbo depot. Due to the distance of all these facilities from the site the emissions are not expected to directly impact the proposal site with any emission to dissipate into the surrounding environment and therefore contribute to background air quality.

6.5.2 Potential impacts

Construction

During construction the following activities would potentially result in air quality impacts:

- Earthworks, particularly excavation of existing road surface
- Road sub-grade preparation and road pavement works
- Transport and handling of spoil and materials
- Use of construction vehicles leading to the creation of exhaust fumes.

Potential air quality impacts during construction would predominately be associated with the generation of dust associated with excavation activities, movements of trucks on any exposed surfaces and any other activities that involve disturbance of the road. Air quality impacts due to dust generation would be minor as the ground-disturbance area is limited and dust-generating activities would be short-term. Any potential impacts would be minimised through the implementation of the safeguards and management measures outlined in Section 6.5.3.

Machinery and other construction vehicles would emit exhaust fumes. The impact of these emissions would be temporary in nature and limited to the construction phase only. Such impacts would not differ substantially from the emissions experienced from vehicles (in particular heavy vehicles) along the Newell and Mitchell highways.

Odours may be generated during the application of asphalt and line marking. This may affect nearby receivers during construction. These impacts are considered to be relatively short term in nature and would be limited to a few days when such works are occurring.

Overall, potential air quality impacts during construction would be short-term in nature and are considered to be manageable with the implementation of safeguards and management measures.

Operation

The proposal is not expected to directly result in an increase in traffic along the Newell and Mitchell highways, and therefore the proposal is not anticipated to increase emissions in this area. During operation, the proposal may potentially improve air quality by reducing queuing and idling of vehicles, which occurs at the existing roundabout.

6.5.3 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
General air quality	Works will not be carried out during strong winds or in weather conditions where high levels of dust or air borne particulates are likely.	Contractor	Construction
Airborne dust	Exposed surfaces will be watered regularly to minimise dust emissions.	Contractor	Construction
Airborne dust	Stabilisation of disturbed surfaces will take place as soon as practicable.	Contractor	Construction
General air quality	All construction plant and machinery will be fitted with emission control devices complying with Australian design standards.	Contractor	Construction
General air quality	Construction plant and equipment will be maintained in a good working condition in order to limit impacts on air quality.	Contractor	Construction
General air quality	Plant and machinery will be turned off when not in use.	Contractor	Construction
Airborne dust	Stockpiled materials will be covered or stored in areas not subject to high wind.	Contractor	Construction
General air quality	All trucks will be covered when transporting material to and from the study area.	Contractor	Construction
General air quality	Local residents will be advised of hours of operation and duration of works and supplied with a contact name and number for queries regarding air quality.	Contractor	Construction

6.6 Visual and landscape character

6.6.1 Existing environment

The study area can generally be described as an urban landscape which is intersected by major transport corridor. The visual environment is dominated by the Newell and Mitchell highways with the roundabout at the intersection also providing a key visual focus in the area. The visual environment is also characterised by the businesses located along the road reserve and Lions Park which is located adjacent to the Macquarie River. Petrol stations are located to the west and north of the roundabout, a retail outlet to the east and a fast food restaurant to the south of the slipway.

Due to the flat gentle topography of the study area views are generally limited from both the Newell and Mitchell highways to the neighbouring properties, however looking south-east along the Newell Highway some view are available of the Macquarie River.

The proposal site is largely void of any vegetation, with some street trees along the roads and also within the median adjacent to the slip lane next to Hungry Jacks.

6.6.2 Potential impacts

Construction

Construction of the proposal would result in views within the proposal site changing from roadways and adjacent development to the include construction areas including compounds, work areas and construction equipment. Further discussion of the impacts of these changes are outlined below.

Construction of the proposal would result in construction areas being highly visible from adjacent land uses including some residential dwellings and hotels located adjacent to the proposal site. These impacts would include primarily the presence of plant and equipment within the road reserve, as works required within the proposal site would not result in any substantial earthworks or changes to the existing landscape.

The preferred construction compound would be visible from nearby residential properties and hotels. The use this site would result in some impact, however due to the existing land use, a building supply store, visual impacts of the construction compound are considered to be similar.

The potential compound/stockpile site located at 10 Victoria Street (subject to further investigation) would be located adjacent to a number of residential properties, which will have some views of this site. This includes properties located on the northern side of the Mitchell Highway.

Overall any impacts are considered to be minimal due to the relatively short construction period and the fact that intense periods of construction would be undertaken in short periods.

In addition to the above impacts, as the proposal is to involve night works in order to minimise impacts to the operation of the existing road, impacts due to lighting of the construction area are expected. These impacts would include light spill on to adjacent properties which has the potential to result in disruption to the occupants of these properties in particular residential dwellings or hotels. Overall any potential impacts due to light spill would be minor and short-term and would be further minimised through the implementation of the safeguards and management measures outlined in Section 6.6.3.

Operation

The proposal would generally result in limited change to the visual landscape as it would continue to be used as a roadway. The proposal would however slightly widen the road corridor visual and would include the introduction of additional aboveground infrastructure in the form of traffic lights. The proposal would also remove an existing commercial building on the corner of the northern and western approaches of the intersection. Further discussion on the impacts of these changes are outlined below.

Operational visual impacts are considered to be limited as the proposal would be constructed in an existing road reserve. The proposal would result in the widening of the existing road reserve, however the increased width of the corridor would not be substantial. Therefore, the proposal would be consistent in character with the existing road reserve.

The proposal would include the installation of traffic signals at the intersection to replace the existing roundabout. This would result in the introduction of additional infrastructure into the visual landscape at the intersection. The introduction of these new above ground features, while being visible to surrounding land

uses, are considered to be in character with a major road reserve and therefore are not considered to result in any visual impacts.

The proposal would involve the removal of the existing commercial building at 13 Victoria Street at the eastern corner of the intersection. The removal of this building would increase the views from some surrounding properties in particular some buildings within the Cattleman's Country Motor Inn. Existing views from this location are of the adjacent commercial property including storage areas. The removal of this building and the associated business would result in increased views to the intersection. Due to the positioning of the motel adjacent to a major highway such views are considered to be expected. Impacts to specific users of this motel would also be short term in nature due to the turnover of guests at the motel. This means impacts to users would be limited to a short period of time. Longer terms should Roads and Maritime sell the property in the future any new development would assist in once again screening the motel from the intersection.

There would be limited space for the inclusion of substantial landscaping in the proposal site. Therefore the majority of the proposal site would include the provision of grassed areas in the verge of the road. These areas would assist in softening the road corridor. The land currently occupied by the left-turn lane from the Mitchell Highway westbound to the Newell Highway southbound has been identified as a potential location for some featured planting which would act as a gateway to Dubbo. The exact nature of this planting would be confirmed during further design development and would be required to meet any Roads and Maritime guidelines to ensure it does not impact on the operation of the road corridor. The establishment of such an area would ensure the level of landscaping associated with the proposal is generally consistent with that within the existing intersection (which is to be removed) and would ensure it integrates with the surrounding landscape where possible. Depending on the nature of this landscaped area there is potential for an improvement in the visual environment at the intersection.

6.6.3 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Visually intrusive works	The footprint of the proposal will be minimised where possible to minimise the dominance of the works.	Contractor	Construction
Compound management	The construction compound will be left in a clean and tidy state at the end of each working day.	Contractor	Construction
Long term visual amenity	The study area will be returned to its current state after construction to ensure the visual landscape is similar to the existing intersection.	Contractor	Operation
Light spill	Positioning of any lighting during night works will consider light spill on adjacent properties. Lighting selected will seek to minimise light spill on adjacent properties. Where possible existing street lighting will be utilised as the preferred light source.	Contractor	Construction

6.7 Waste management

6.7.1 Existing environment

Roads and Maritime is committed to the responsible management of unavoidable waste and promotes the reuse of such waste in accordance with the resource management hierarchy principles outlined in the

Waste Avoidance and Resource Recovery Act 2000. These resource management hierarchy principles, in order of priority are:

- Avoidance of unnecessary resource consumption
- Resource recovery (including reuse, reprocessing, recycling and energy recovery)
- Disposal.

By adopting the above principles, Roads and Maritime aims to efficiently reduce resource use, reduce costs, and reduce environmental harm in accordance with the principles of ecologically sustainable development.

6.7.2 Potential impacts

Construction

Waste streams likely to be generated during construction of the proposal include:

- Excess spoil and pavement materials
- Green waste as result of vegetation removal
- Packaging and general waste from staff (lunch packaging, portable toilets etc)
- Chemicals and oils
- Redundant erosion and sediment controls.

Waste quantities are not likely to be significant due to the small scale of the proposal.

Waste would be managed in accordance with the resource management hierarchy and safeguards and management measures provided in Section 6.7.3.

Operation

Operation of the new intersection is not expected to result in any changes to the waste management of the existing intersection.

6.7.3 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Waste minimisation	A waste management plan will be prepared, which will include: • Identification of all potential waste streams associated with the work • Opportunities to minimise the use of resources, and to reuse and recycle materials • Methods of disposal of waste that cannot be reused or recycled at appropriately licensed facilities • Methods of containment for waste streams to prevent escape to the environment.	Contractor	Pre-construction
Waste management	The following resource management hierarchy principles will be followed: • Avoid unnecessary resource consumption as a priority • Avoidance is followed by resource recovery (including reuse of materials, reprocessing, recycling and energy	Contractor	Construction

Impact	Environmental safeguards	Responsibility	Timing
	recovery) • Disposal is undertaken as a last resort (in accordance with the Waste Avoidance and Resource Recovery Act 2001).		
Waste management	Waste bins will be provided and recycling of materials encouraged. Waste will be transported to an appropriate waste disposal facility.	Contractor	Construction
Waste management	There will be no disposal or re-use of construction waste on other land.	Contractor	Construction
Waste management	Waste will not be burnt on site.	Contractor	Construction
Waste management	Waste material, other than vegetation and tree mulch, is not to be left on site once the works have been completed.	Contractor	Construction
Waste management	Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day	Contractor	Construction

6.8 Aboriginal heritage

6.8.1 Existing environment

A search of the Aboriginal Heritage Information Management System (AHIMS) database maintained by OEH was undertaken on 1 February 2019. The search indicated no Aboriginal heritage items have previously been listed within 200 metres of the study area.

Stage 1 of PACHCI has been completed for the proposal with the conclusion of this assessment being that the presence of any Aboriginal objects or places is considered to be unlikely. This is a result of past development in the study area and the lack of any landscape features that indicate the potential presence of Aboriginal objects. A copy of the Stage 1 PACHCI letter is also found in Appendix F.

6.8.2 Potential impacts

Construction

The proposal site is located within an area that has been subject to extensive ground disturbance associated with the construction of roads, utilities, commercial and residential premises. All of the proposed excavation work would be carried out in previously disturbed areas.

As per above no Aboriginal sites were previously recorded within the study area. Additionally, the study area does not contain any landscape features that could indicate the likely existence of Aboriginal objects.

The potential for unidentified archaeological deposits to exist within areas with low archaeological potential is negligible and the proposal is unlikely to result in harm to Aboriginal objects during construction. Appropriate safeguards and management measures are proposed in the case of unexpected finds during construction works (refer to Section 6.8.3).

Operation

No impacts on Aboriginal heritage are anticipated during operation.

6.8.3 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Discovery of heritage	If Aboriginal heritage items are uncovered during the works, all works in the vicinity of the find must cease and Roads and Maritime's Aboriginal cultural heritage advisor and the Senior Regional Environmental Officer contacted immediately. Steps in Roads and Maritime's Standard Management Procedure: Unexpected Heritage Finds must be followed.	Contractor	Construction
General construction management	Construction activities and machinery will be restricted to designated work areas.	Contractor	Construction

6.9 Non-Aboriginal heritage

6.9.1 Existing environment

A desktop assessment was undertaken in May 2018 which included searches of the following databases, heritage lists and registers:

- Australian Heritage database (National Heritage List and Commonwealth Heritage List)
- NSW State Heritage Inventory
- State authority Section 170 registers
- Dubbo Local Environmental Plan 2011 (LEP).

No listed items are located near the study area. The closest item is 400 metres west of the study area.

The proposed mobile asphalt plant is however to be positioned within the curtilage of the 'Dubbo City Airport' heritage listed item which is listed under the Dubbo LEP.

6.9.2 Potential impacts

Construction

The works at the intersection would not result in any direct impacts on any non-Aboriginal heritage items as none are located within, or near to the proposal site. Indirect impacts on heritage items would also be negligible as no items are located close enough to the proposal to be impacted by vibration or visual impacts.

Due to the disturbed nature of the proposal site due to past road development and adjacent development the likelihood of any archaeological remains is considered to be minimal. A safeguard and management measure is outlined in Section 6.9.3 to minimise any impacts of any unexpected finds.

The proposed mobile asphalt plant would be positioned within the curtilage of the heritage listed Dubbo Regional Airport. While within the curtilage of this item, the proposed plant would be located in vacant land which is not considered to contribute to the significance of the item. The positioning of the plant would potentially result in some visual impacts on the adjacent items of significance, however these impacts would be short term in nature and would only occur while the plant is in operation and on site. It is noted that Dubbo Regional Council have recently used this area for the establishment of a mobile batching plant. The use of this land would therefore result in similar impacts to those associated with the operation of the plant installed by Dubbo Regional Council.

Operation

No impacts on non-Aboriginal heritage are anticipated during operation.

6.9.3 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Discovery of heritage items	If non-Aboriginal heritage items are uncovered during the works, all works in the vicinity of the find must cease and Roads and Maritime's non-Aboriginal cultural heritage advisor and the Senior Regional Environmental Officer contacted immediately. Steps in Roads and Maritime's Standard Management Procedure: Unexpected Heritage Finds must be followed.	Contractor	Construction

6.10 Property, land use and socio-economic impacts

6.10.1 Existing environment

Land use

The proposal is located within the Dubbo local government area. The study area includes a mix of transport corridor, residential and commercial land uses. These are discussion further in the below sections.

Transport corridor

The proposal site consists primarily of the roadways for the Newell and Mitchell highways. Further descriptions of these roadways is located in section 2.2.

Residential

Residential land uses in the study area are generally located away from the roundabout with land uses near the roundabout consisting of land uses which complement the transport corridor land use. These land uses are described in the below section.

East of the existing intersection (area bound by the eastern and northern approaches to the intersection) there are limited residential dwellings with only one residential dwelling with frontage to either of the highways. Some further residential dwellings are located along Stonehaven Avenue, Beni Street and Alfred Street.

South of the existing intersection (area bound by the eastern and southern approaches to the intersection) residential land uses front the Newell Highway south-west of Baird Street. There are not residential dwelling along the Mitchell Highway frontage. Residential dwellings are located away from the highway along Baird Street, Stonehaven Avenue, Shire Avenue and East Street.

West of the existing intersection (area bound by the western and southern approaches to the intersection), residential dwellings are the dominant land uses, with the exception of some non-residential land uses located along the Newell and Mitchell highways.

North of the existing intersection (area bound by the western and northern approaches to the intersection), residential dwellings are the dominant land use with some commercial developments along the Mitchell Highway.

Non-residential land uses

As outlined in the above section land uses in the vicinity of the proposal are dominated by residential dwellings, however the frontages to the Newell and Mitchell highways consists predominantly of non-residential land uses. This is particularly the case in the vicinity of the intersection.

The majority of these non-residential land uses that support the use of the Newell and Mitchell highways as key transport routes.

Table 6.19 outlines the non-residential land uses which are located in the vicinity of the proposal.

Table 6.19 Non-residential land uses with frontage to highways

Address	Lot/DP	Property name	Type
Newell Highway northern approach (northbound)			
45-49 Whylandra Street (corner of intersection)	Lot 11 DP787825	Shell service station	Commercial
33-43 Whylandra Street	Lot 100 DP 1155431	Urban Village	Commercial (mixture of retail spaces including a number of food outlets)
Newell Highway northern approach (southbound)			
13 Victoria Street (corner of intersection)	Lot 1 DP 122959	Dubbo Building and Renovation Centre	Commercial
6-8 Whylandra Street	Lot 6200 DP 1227770	Cattleman's Country Motor Inn	Accommodation
2 Whylandra Street	Lot 2 DP 1208699	Dubbo City Holiday Park	Accommodation
Mitchell Highway eastern approach (eastbound)			
9-11 Victoria Street	Lot 3 DP 514834	Dubbo City Motorcycles	Commercial
7 Victoria Street	Lot 4 DP 28841	Vacant	Commercial
17-19 Stonehaven Avenue	Lot 12 DP 555662	Tallarook Motor Inn	Accommodation

Address	Lot/DP	Property name	Type
Stonehaven Road (between Stonehaven Road and Macquarie River)	Lot 1 DP 1114367	Lions Park	Open space
Mitchell Highway eastern approach (westbound)			
18 Victoria Street (corner of intersection)	Lot 101 DP 875089	Hungry Jacks	Commercial
14 Victoria Street	Lot 102 DP 875089	Ibis Budget	Accommodation
12 Victoria Street	Lot 103 DP 875089	Electrical substation	Electrical infrastructure
10 Victoria Street	Lot 1 DP 795554	Vacant	Commercial
Newell Highway southern approach (southbound)			
22-30 Whylandra Street	Lot 1 DP 1182346	Westside Hotel	Commercial
Newell Highway southern approach (northbound)			
51-63 Whylandra Street	Lot 10 DP 830339	BP Service Station	Commercial
65 Whylandra Street	Lot 23 DP 540626	Paint Horse	Commercial
85 Whylandra Street	Lot 101 DP 580418	Across Country Motel and Serviced Apartments	Accommodation
Mitchell Highway western approach (westbound)			
26 Victoria Street	Lot A DP 374474	Citywest Plaza – various businesses	Retail
28 Victoria Street	Lot 10 DP 531339	Citywest Plaza – various businesses	Retail
30 Victoria Street	Lot D DP 398321	Citywest Plaza – various businesses	Retail
32 Victoria Street	Lot C DP 398321	Citywest Plaza – various businesses	Retail
34 Victoria Street	Lot 181 DP 586137	Citywest Plaza – various businesses	Retail
36 Victoria Street	Lot 1 DP 549268	Citywest Plaza – various businesses	Retail
38-40 Victoria Street	Lot 11 DP 1106925	IGA	Retail
42 Victoria Street	Lot 7 DP 533804	Various	Retail
44 Victoria Street	Lot 6 DP 539691	Various	Retail
46 to 50 Victoria Street	Lot 1 DP 233954 Lot 2 DP 233954 Lot A DP 405996	Various	Retail

In addition to the non-residential land uses outlined in Table 6.19, a number of commercial properties are located along Beni Street east of the intersection.

Socio-economic

The population of the Dubbo local government area in 2016 was 38,943 (ABS 2016). The area has had an increase in population of 0.36 per cent from 38,805 in 2011. Dubbo has a slightly younger population with the median age being 36 compared to the national median of 38. The majority of the population work full-time or part-time, comprising 62.7 per cent and 26.8 per cent of the population, respectively. In addition, 73.8 per cent of the population drive to work and 37.0 per cent of dwellings have two registered motor vehicles.

The Newell and Mitchell highways are both part of the freight network and therefore provide great economic benefit for both the regional, NSW and Australia due to their role in the movement of freight.

6.10.2 Potential impacts

Construction

Direct impacts to land use and property

The proposal would result in the partial acquisition of six properties located along both the Newell and Mitchell highways. In general this acquisition would be limited to a narrow strip along the frontage to the highways. **Table 6.20** outlines the existing uses located within the area of acquired land and the nature of these impacts to land use and business impacts.

Table 6.20 Impacts on acquired properties

Lot/DP	Use of land to be acquired	Nature of impact (including business impacts)
Lot 10 DP 830339	Property access, landscaping, business signage, car parking	Access to this property would potentially be impacted during any adjustments to the existing access points. As there are multiple access points available any impacts are considered to be minimal and access would be able to be maintained at all times to this property, ensuring continued trade for the service station. Loss of landscaping and signage on this property would not impact upon the use of the land, as alternate landscaping and signage would be provided in consultation with the property owner. There would be impacts on parking provided within the proposal site (i.e. off-street), however this would be short-term in nature with alternate parking to be provided to ensure no loss (to be confirmed with property owner) during both construction and operation of the intersection.
Lot 11 DP 787825	Property access, landscaping, business signage, car parking	Impacts to this property would be similar to the impacts outlined above in Lot 10 DP 830339 as both properties are of a similar nature.
Lot 101 DP 875089	Landscaping and property access	Impacts on access to this property would be short-term and minimal. Alternative access points would be made available if required. The above impacts are not expected to result in any impacts on land use, businesses and the community.
Lot 102 DP 875089	Property access, landscaping, business signage, car parking	The proposal would result in an adjustment to the existing property access and existing parking located adjacent to the Mitchell Highway. Short-term impacts to access and parking would occur while adjustments are made. No long-term parking loss is proposed, however this would be confirmed during consultation with the property owner. Alternative access and parking areas are also available, if required.

Lot/DP	Use of land to be acquired	Nature of impact (including business impacts)
Lot 103 DP 875089	Property access	The proposal would require an adjustment of the existing property access. This would not result in any impacts to the existing land use as the property is also accessible from Elizabeth Lane.
Lot 1 DP 875089	Property access	The proposal would require an adjustment of the existing property access. This property is currently vacant and therefore any adjustments to the property access would not impact on land use, businesses or the community. This property would also be potentially utilised as a construction compound/stockpile area, however its use for construction would not result in any long term land use impacts.

Overall direct impacts to properties subject to partial acquisition are not considered to be substantial as they would generally be limited to the construction period only. Once adjustments are made, properties are expected to be able to largely operate as they currently do.

The proposal would result in the full acquisition of the existing commercial business located at 13 Victoria Street on the eastern corner of the intersection. This would result in a reduction of commercial land uses in the vicinity of the proposal. The acquisition of this property would also result in some business impacts to the existing business. These impacts are considered to be relatively low as suitable compensation would be provided. It is also considered that alternative locations are readily available with Dubbo to allow the business to relocate should that be the preference of the existing business. Longer term impacts on this land use are discussed below under operation.

Direct impacts to utilities

As discussed in Section 3.5, a number of existing utilities would potentially be impacted during construction of the proposal. Impacts would be limited to the construction phase of the proposal with any impacted utilities to be relocated prior to construction commencing.

During relocation activities there is potential for some interruptions to the service of utilities (ie no power). Any potential impacts to utilities would have the potential to impact surrounding land uses including business. Such impacts are considered to be minimal due to their likely short duration. Consultation would be undertaken with any affected landowners in conjunction with utility providers to determine any specific requirements for utilities in order to minimise any impacts.

Impacts of diversions or traffic control

No formal diversions of heavy vehicles around the proposal site are currently proposed. Heavy vehicles would be able to utilise the intersection as movements in all directions would be maintained (albeit with reduced lanes). There may be a slight reduction in traffic volumes through the intersection due to vehicles potentially bypassing the intersection during construction. This may result in less vehicles accessing businesses such as the service stations located adjacent to the intersection. However, as through-traffic flow would be maintained for the duration of the construction, any impacts would be minor and short-term only.

Indirect amenity impacts

A number of sensitive receivers located within proximity to the proposal site, such as residential dwellings and hotels, would potentially experience amenity impacts during construction such as noise, traffic and air quality impacts. This may result in a reduction in people choosing to stay at hotels located near the proposal site. However, such amenity impacts would be minor and short-term only. Potential impacts would be minimised through the safeguards and management measures provided in Sections 6.2.3, 6.1.4, 6.2.3, 6.5.3 and 6.6.3.

Operation

Land use impacts

The acquisition and demolition of the property at 13 Victoria Street would result in a long term reduction in commercial land uses within Dubbo. Overall the loss of this one property is not considered to result any noticeable reduction in the availability of commercial land.

In the event Roads and Maritime sell off or lease the surplus land there would be an opportunity to introduce similar commercial businesses or business which service the two main road corridor (similar to other businesses located at the intersection).

Other impacts

Besides the impacts noted above, the proposal is not considered to result in any impacts to land use, the community or business beyond those which are currently experienced. This is largely due to the fact that these land uses are already located on existing major highways and the proposal would not result in an increase in the number of vehicles using these roads.

Car parking loss impacts

The proposal would result in the loss of up to two spaces located outside existing businesses on the western approach. The loss of this parking is assessed in 6.2.2. The loss of these spaces is not considered to result in any major loss of business to any business due to the remaining spaces coupled with existing off street parking available.

6.10.3 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
General land use impacts	Complaints received will be recorded and attended to promptly in accordance with the Roads and Maritime *Community Involvement Practice Notes and Resource Manual*.	Contractor	Pre-construction
General land use impacts	Nearby by local residents will be notified before work starts.	Contractor	Pre-construction
General land use impacts	During construction, road users will be informed of any changed conditions.	Contractor	Construction
General land use impacts	Consultation with adjacent businesses and residents will be undertaken before construction to ensure landowners are aware of any short term changes (including access).	Contractor	Construction
General land use impacts	The CEMP will describe processes for liaison with the community and must be in accordance with the requirements of Roads and Maritime specification G36.	Contractor	Construction
Property acquisition	Roads and Maritime will liaise and consult with any landowners where land acquisitions are required. Acquisition will be finalised during the detailed design phase.	Roads and Maritime Project Manager	Pre-construction
Adjacent land use impacts	Roads and Maritime will consult with potentially affected landholders before and during construction to minimise the potential for impacts on land use including access impacts, signage impacts and impacts to any businesses.	Roads and Maritime	Detailed design
Impacts to utilities	Roads and Maritime will consult with utility providers and potentially affected landholders to ensure that impacts on	Roads and Maritime	Pre-construction

Impact	Environmental safeguards	Responsibility	Timing
	utilities are minimised where possible. Consultation will include confirmation of utility access requirements.		Construction
Impacts to utilities	If the scope or location of proposed utility relocation works falls outside of the assessed proposal scope and footprint, further assessment will be undertaken.	Roads and Maritime Contractor	Pre-construction

6.11 Climate change

6.11.1 Existing environment

Climate change refers to the warming temperatures and altered climate conditions associated with the concentration of greenhouse gases in the atmosphere. These changes to future climatic conditions have the potential to impact existing and new road infrastructure.

In 2014 the NSW Department of Environment and Heritage (OEH, 2014) published climate change snapshots for various regions throughout NSW. The snapshots identify projected changes in temperature, rainfall and fire probability. The snap shots are based on long term observation in weather between 1910 and 2011.

The Central West and Orana region is projected to continue to warm during the near future (2020–2039) and far future (2060–2079), compared to recent years (1990–2009). The warming is projected to be on average about 0.7°C in the near future, increasing to about 2.1°C in the far future. The number of hot days is projected to increase and the number of cold nights is projected to decrease.

The warming trend projected for the region is large when compared to natural variability in temperature and is of a similar order to the rate of warming projected for other regions of NSW. The Central West and Orana currently experiences considerable rainfall variability across regions, seasons and from year-to-year and this variability is also reflected in the projections.

6.11.2 Policy setting

In NSW, responses to climate change are provided in various policy and guideline documents including the *NSW Greenhouse Plan* (NSW Government, 2005), the *NSW Sea Level Rise Policy Statement* (NSW Government, 2009) and the *NSW Coastal Planning Guideline: Adapting to sea level rise* (DoP, 2010).

To address the challenge of climate change, Roads and Maritime has developed a climate change plan which includes actions to:

- Reduce Roads and Maritime's carbon footprint
- Help reduce the carbon footprint of NSW road transport
- Adapt the Road and Maritime road transport system to the impacts of climate change
- Manage Road and Maritime's transition to a low carbon economy.

6.11.3 Potential impacts

Construction

Construction of the proposal would result in greenhouse gas emissions being produced, including:

- Carbon dioxide and nitrous oxide from liquid fuel use in plant and vehicles (diesel, petrol) during construction, disposal and transport of materials
- Use of materials such as concrete that have high embodied energy content.

It is anticipated that operation of construction equipment would be the main emissions source during construction.

The proposal is not considered to result in any substantial greenhouse gas emissions that would differ from any other similar sized road project.

Operation

The proposal would not directly alter traffic volumes. Any climate change impacts associated with the proposal are considered to be minor.

6.11.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Greenhouse gas emissions	The use of alternative fuels and power sources for construction plant and equipment will be investigated and implemented, where appropriate.	Contractor	Pre-construction
Greenhouse gas emissions	Materials will be delivered as full loads and local suppliers will be used where possible.	Contractor	Construction
Greenhouse gas emissions	Construction equipment, plant and vehicles will be appropriately sized for the task.	Contractor	Construction

6.12 Cumulative impacts

6.12.1 Study area

For the purpose of this assessment the study area is considered to encompass any major works occurring within the Dubbo CBD.

6.12.2 Broader program of work

Including the proposal Roads and Maritime are currently undertaking five projects within the Dubbo urban area which seek to improve traffic flow through the town, with a focus on through traffic including heavy vehicles. These projects include the following in addition to the proposal:

- New Dubbo Bridge: Construction of a third high level river crossing to improve freight efficiency and productivity for movements through and around Dubbo. These works are proposed to commence in about 2022.
- Mitchell Highway (Cobra Street) intersection with Fitzroy Street: Upgrade of the existing intersection from a roundabout to a signalised intersection. These works are proposed to commence in mid-2019 and are programed to be complete early 2020.
- Newell Highway Upgrade West Dubbo: Upgrade of pavement (to heavy duty pavement) along the Newell Highway between Golf Links Road and Baird Street: These works are currently underway with utility relocations currently being undertaken and major work to be undertaken in two stages in August to October 2018 and 2019.
- LH Ford Bridge Improvements: Maintenance works will be undertaken on the existing bridge to maintain the design life of the bridge. The works include the construction of two new piers. These works are to be undertaken between late 2018 and late 2019.

6.12.3 Other projects and developments

The only other major project located within the Dubbo CBD is the redevelopment of Dubbo Base Hospital which is located off the Golden Highway at Myall Street. This project is in the late stages with some redevelopment of an existing area of the hospital currently underway.

6.12.4 Potential impacts

A review of all the existing and future projects was undertaken and the below sections outline the key cumulative impacts to be experienced. All other environmental issues are considered to not result in any noticeable cumulative impacts.

Construction

Cumulative impacts of the above mentioned projects are considered to be relatively minor as not all projects would be occurring simultaneously and the distance between some of the projects also reduces the likelihood of any cumulative impacts. Traffic and noise impacts are considered to be the key cumulative impacts to be experienced due to the construction of the above mentioned projects.

Traffic, transport and access

The construction of the proposal in parallel with any of the above projects would result in some cumulative impacts associated with the implementation of diversions. The proposal is not proposed to implement any formal diversions, however the community (in particularly heavy vehicles) are expect to generate their own diversions in order to avoid any congestion. Cumulative impacts would generally be experienced where diversions for each of the projects are not considered as a whole resulting in a diversion which then rejoins the highways to then just be diverted at the next project. Such actions would result in increased travel times for the community and in many instances one single diversion maybe the preferred option particularly for traffic travelling through Dubbo. To minimise these impacts, discussion between all concurrent projects should occur to ensure that the number of diversions put in place is minimized. Consideration should be given to implementing a small number of diversions which could service a number of the projects. This would also limit the extent of impacts on the road network to a small number of roads.

The projects (if undertaken in parallel or sequentially) would result in increased congestion around works sites and increased travel times due to reduced speeds through construction areas. These impacts would either be amplified due to parallel projects or prolonged due to sequential works. Overall these impacts are not considered to be substantial as traffic would be appropriately managed on all projects.

The construction of a number of projects would also increase the number of vehicles using the road network, in particular heavy vehicles. This increase is not considered to be substantial as the majority of movement would be via main roads like the Newell and Mitchell highways. These roads are generally considered to have the capacity to handle the increase, and any increase in traffic would only be short-term.

Noise and air

In general the construction of the multiple projects in Dubbo are not considered to result in noise and vibration impacts due to the distances between projects. Works required at the eastern edge of the proposal would however be located in close proximity to the works at the LH Ford. While the proposal would generally be undertaken during the night, and the LH Ford during the day there is the potential for cumulative impacts due to surrounding receivers experience impacts over a 24 hour period. Potential cumulative noise impacts would be short term in nature and would be mitigated through the implementation of safeguards and management measures at an individual project level.

Operation

During operation of the proposal, cumulative impacts would be negligible. The proposal as part of a broader program of upgrades would have positive cumulative effects in terms of improved road safety and reduced traffic delays.

6.12.5 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Cumulative impacts	Consultation between Roads and Maritime and contractors for each projects is to be undertaken to ensure that any cumulative impacts are considered and minimised where possible. This would include programming of works to minimise day and night works at any one location due to separate project and establishment of diversions which where possible can service multiple projects to minimise the number of roads impacts by the projects.	Roads and Maritime Contractor	Construction

7. Environmental management

7.1 Environmental management plans (or system)

A number of safeguards and management measures have been identified in the REF in order to minimise adverse environmental impacts, including social impacts, which could potentially arise as a result of the proposal. Should the proposal proceed, these safeguards and management measures would be incorporated into the detailed design and applied during the construction and operation of the proposal.

A Construction Environmental Management Plan (CEMP) will be prepared to describe the safeguards and management measures identified. The CEMP will provide a framework for establishing how these measures will be implemented and who would be responsible for their implementation.

The CEMP will be prepared prior to construction of the proposal and must be reviewed and certified by the Roads and Maritime Environment Officer, Regional Project Office, prior to the commencement of any on-site works. The CEMP will be a working document, subject to ongoing change and updated as necessary to respond to specific requirements. The CEMP would be developed in accordance with the specifications set out in the QA Specification *G36 – Environmental Protection (Management System)*, QA Specification *G38 – Soil and Water Management (Soil and Water Plan)* and QA Specification *G10 – Traffic Management.*

7.2 Summary of safeguards and management measures

Environmental safeguards and management measures outlined in this REF will be incorporated into the detailed design phase of the proposal and during construction and operation of the proposal, should it proceed. These safeguards and management measures will minimise any potential adverse impacts arising from the proposed works on the surrounding environment. The safeguards and management measures are summarised in **Table 7.1**.

7.3 Licensing and approvals

No additional licences or approvals are required for the proposal with the exception of the environmental approval under Division 5.1 of EP&A Act.

Table 7.1 Summary of safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing
GEN1	General - minimise environmental impacts during construction	A CEMP will be prepared and submitted for review and endorsement of the Roads and Maritime Environment Manager prior to commencement of the activity. As a minimum, the CEMP will address the following: • any requirements associated with statutory approvals • details of how the project will implement the identified safeguards and management measures outlined in the REF • issue-specific environmental management plans • roles and responsibilities • communication requirements • induction and training requirements • procedures for monitoring and evaluating environmental performance, and for corrective action • reporting requirements and record-keeping • procedures for emergency and incident management • procedures for audit and review. The endorsed CEMP will be implemented during the undertaking of the activity.	Contractor / Roads and Maritime project manager	Pre-construction / detailed design
GEN2	General - notification	All businesses, residential properties and other key stakeholders (eg schools, local councils) affected by the activity will be notified at least five days prior to commencement of the activity.	Contractor / Roads and Maritime project manager	Pre-construction
GEN3	General – environmental awareness	All personnel working on site will receive training to ensure awareness of environment protection requirements to be implemented during the project. This will include up-front site induction and regular "toolbox" style briefings.	Contractor / Roads and Maritime project manager	Pre-construction / detailed design

No.	Impact	Environmental safeguards	Responsibility	Timing
NV1	Construction noise and vibration	A construction noise and vibration management plan would be prepared as part of the construction environmental management plan. This plan would include, but not be limited to: • A map indicating the locations of sensitive receivers including residential properties • Management measures to minimise the potential noise impacts from the quantitative noise assessment and for potential works outside of standard working hours (including implementation of *Interim Construction Noise Guidelines* (DECC, 2009) • A risk assessment to determine potential risk for activities likely to affect receivers (for activities undertaken during and outside of standard working hours) • Mitigation measures to avoid noise and vibration impacts during construction activities including those associated with truck movements • A process for assessing the performance of the implemented mitigation measures • A process for documenting and resolving issues and complaints • A process for updating the plan when activities affecting construction noise and vibration change • Identify in toolbox talks where noise and vibration management is required • An out of hours works procedure in accordance with the requirements of the *Interim Construction Noise Guideline* (DECC, 2009) and the *Environmental Noise Management Manual Practice* (RTA, 2001a) • Restrictions on construction delivery times to minimise noise impacts to receivers near the compound site Scheduling works to complete noisiest activities during the day wherever possible (i.e. concrete saw cutting).	Construction contractor	Pre-construction and construction

No.	Impact	Environmental safeguards	Responsibility	Timing
NV2	Construction noise and vibration	The out of hours procedure would as a minimum include: • Background levels for noise criteria in accordance with the Interim Construction Noise Guideline (DECC, 2009) • Locations of the works • Locations of sensitive receivers • Predicted noise levels • Communications plan • Triggers for the provision of respite and a respite schedule. Management measures where works are unable to comply with *Interim Construction Noise Guideline* (DECC, 2009) and the *Environmental Noise Management Manual Practice* (RTA, 2001a).	Construction contractor	Pre-construction and construction
NV3	Construction noise	Noise impacts would be minimised in accordance with Practice Note 7 in Roads and Maritime Services' *Environmental Noise Management Manual* and *Environmental fact sheet No. 2- Noise management and Night Works*.	Construction contractor	Construction
NV4	Construction noise	Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods.	Construction contractor	Construction
NV5	Construction noise	As a guide high noise and vibration generating activities near receivers should be carried out in continuous blocks that do not exceed 3 hours each, with a minimum respite period of one hour between each block. The duration of each block of work and respite should be flexible to accommodate the usage and amenity at nearby receivers. Unless negotiated with the community with consultation documented and approved by RMS project manager or permitted under the licence there should be no more: • 2 consecutive evenings or nights per week; and • 3 evenings or nights per week; and • 6 evenings or nights per month. For night work these periods of work should be separated by not less than one week.	Construction contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
NV6	Construction noise from machinery and equipment	All plant and equipment would be appropriately maintained to ensure optimum running conditions, with periodic monitoring.	Construction contractor	Construction
NV7	Construction noise from machinery and equipment	Noise-emitting plant would be directed away from sensitive receivers where possible.	Construction contractor	Construction
NV8	Construction noise from machinery and equipment	Traffic flow, parking and loading and unloading areas would be planned to minimise reversing movements within the proposal site.	Construction contractor	Construction
NV9	Construction noise from machinery and equipment	Reversing alarms that have a tonal noise character are to be avoided during out of hours activities. Quacker style or 'smart' reversing alarms are to be used during night time activities (pending safety approvals).	Construction contractor	Construction
NV10	Construction noise from construction compound	Temporary hoarding would be erected around the selected construction compound where deemed required.	Construction contractor	Construction
NV11	Construction noise from construction compound	Loading and unloading of materials/deliveries is to occur as far as possible from sensitive receivers. Select site access points and roads as far as possible away from sensitive receivers. Dedicated loading/unloading areas to be shielded if close to sensitive receivers. Delivery vehicles to be fitted with straps rather than chains for unloading, wherever possible. Avoid or minimise out of hours movements where possible.	Construction contractor	Construction
NV12	Mobile asphalt plant	Investigate the use of a 2 to 3 metre acoustic screen around the asphalt burner unit.	Construction contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
NV13	Mobile asphalt plant	Position aggregate stockpile areas to shield noise between the asphalt plant equipment and the residential receivers to the north-west.	Construction contractor	Construction
NV14	Mobile asphalt plant	The front-end loaders on site should be fitted with exhaust mufflers.	Construction contractor	Construction
NV15	Construction noise from inappropriate practices	Site inductions would be provided to train staff on ways to minimise construction noise impacts on-site. Responsible working practices include: • Avoid the use of outdoor radios during the night-time period • Avoid shouting and slamming of doors • Where practical, operate machines at low speed or power and switched off when not being used rather than left idling for prolonged periods • Minimise reversing Avoid dropping materials from height and avoid metal to metal contact on material.	Construction contractor	Construction
NV16	Construction vibration	Quieter and less noise/vibration emitting construction methods would be used where feasible and reasonable.	Construction contractor	Construction
NV17	Construction vibration	Compliance vibration monitoring would be undertaken in response to complaints or when vibration generating activities occur within the structural damage buffer distances. The results of the vibration monitoring would be compared to the structural damage criteria presented in Table 6.7 considering frequency content.	Construction contractor	Construction
NV18	Construction vibration	Building condition surveys would be undertaken when vibration generating activities occur within the structural damage buffer distances. The properties to be assessed are to be confirmed in consultation with Roads and Maritime Services.	Construction contractor	Construction
NV19	Noise and vibration impacts and appropriate complaints handling	The local community would be contacted and informed of the proposed work, location, duration of work, and hours involved. The contact would be made a minimum five days before work starts as per RMS ENMM Practice Note 7 requirements.	Construction contractor and Roads and Maritime	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
NV20	Noise and vibration impacts and appropriate complaints handling	Communications material such as the project website and community notification would include a contact person and phone number to enable complaints to be received and responded to.	Construction contractor	Construction
NV21	Road noise	A post-construction noise monitoring program should be undertaken within 12 months of opening once traffic flows have stabilised to compare the measures noise levels with the levels in the assessment in Appendix D. Where changes are identified the need for further mitigation would be required.	Roads and Maritime	Post-construction
TT1	General traffic management	A Traffic Management Plan (TMP) will be prepared and implemented as part of the CEMP. The TMP will be prepared in accordance with the Roads and Maritime *Traffic Control at Work Sites Manual* (RTA, 2010) and *QA Specification G10 Control of Traffic* (Roads and Maritime, 2008). The TMP will include: • confirmation of haulage routes • measures to maintain access to local roads and properties • site specific traffic control measures (including signage) to manage and regulate traffic movement • measures to maintain pedestrian and cyclist access • requirements and methods to consult and inform the local community of impacts on the local road network • access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads. • a response plan for any construction traffic incident • consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic monitoring, review and amendment mechanisms.	Contractor	Pre-construction
TT2	Vehicle generation	Where possible vehicle movements (in particularly heavy vehicles) to the proposal site will be avoided during the morning and afternoon peaks and during school finishing times.	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
TT3	Heavy vehicles management	Haulage routes to the proposal site and construction compound/stockpile site and also to the asphalt plant will be identified and included within the traffic management plan.	Contractor	Pre-construction
TT4	Road and lane closures	Where possible, partial road closures will occur at night, when traffic volumes are at a minimum.	Contractor	Construction
TT5	Road and lane closures	Access to side streets will be maintained where possible throughout construction.	Contractor	Construction
TT6	Road and lane closures	Ongoing consultation will be undertaken with Dubbo Regional Council, to ensure road closures and detours do not coincide with major events in the town.	Contractor	Construction
TT7	Road and lane closures	The community will be kept informed about upcoming interruptions to the road network (including closure of road access), through letter box drops, community updates, door knocking and electronic signage on site.	Contractor	Construction
TT8	Public transport impacts	Bus companies will be consulted with before works, to inform them of road conditions (including partial closures) and the need to change the location of the bus stop located on the Newell Highway northbound (south of Elizabeth Street)	Contractor	Construction
TT9	Pedestrian access	Pedestrian access will be maintained at all times throughout construction. Where access cannot be maintained alternate routes will be identified and notified to the community.	Contractor	Construction
TT10	Property access impacts	Access to adjacent service stations and commercial properties will be available throughout construction to avoid economic impacts and general access impacts. Where impacts are required consultation will be undertaken with the affect property owner to confirm any access requirements.	Contractor	Construction
BIO1	General biodiversity management	The CEMP will vegetation that will be impacted. Laydown and stockpile areas, worker amenities, equipment and vehicles will be located outside of vegetation drip lines.	Contractor	Construction
BIO2	General biodiversity management	If any damage occurs to vegetation outside of the nominated work area (as shown in the CEMP), the project manager and environmental representative will be notified to determine a suitable course of action.	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
BIO3	Weed management (if encountered)	Should priority weeds be encountered, weeds will be controlled in accordance with contemporary bush regeneration principles and practices, the *Biosecurity Act 2015*, the NSW Department of Primary Industries noxious and environmental weed control handbook, and *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011), to ensure construction does not promote the spread of weeds. Any weeds encountered in the study area will be stockpiled separately and disposed of at an appropriate waste facility.	Contractor	Construction
SW1	Erosion and sedimentation	A soil and water management plan (SWMP) will be prepared as part of the CEMP in accordance with the requirements of Roads and Maritime Services contract specification G38 before the commencement of construction. The SWMP will also address the following: • Roads and Maritime Services Code of Practice for Water Management, the Roads and Maritime Services' Erosion and Sedimentation Procedure • The NSW Soils and Construction – Managing Urban Stormwater Volume 1 "the Blue Book" (Landcom, 2004) and Volume 2D (DECC, 2008) • Roads and Maritime Services Technical Guideline: Temporary Stormwater Drainage for Road Construction, 2011 Roads and Maritime Services Technical Guideline: Environmental Management of Construction Site Dewatering, 2011	Contractor	Pre-construction
SW2	Contamination of soils	The CEMP is to include a Contaminated Land Management Plan, which must comply with the *Contaminated Land Management Act 1997* (NSW), Road and Maritime publication *Contaminated Land Management Guideline*, Roads and Maritime *Environmental Incident Classification and Reporting Procedure*, and EPA guidelines on contaminated land management. The Contaminated Land Management Plan will provide for dealing with: • Areas of known contamination (if any) • Unexpected contamination finds Any land contamination caused during construction.	Contractor	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
SW3	Contamination of soils	Further contamination assessment will be undertaken in the vicinity of the proposal site by a suitably qualified consultant. The assessment will consider those areas that have the potential to be contaminated that were not assessed as part of the previous investigation, particularly land that's existing or former use was for service station operations, which is proposed to be acquired or temporarily leased for the proposal.	Roads and Maritime Contractor	Pre-construction
SW4	Contamination of soils and waterways	An incident emergency spill plan will be developed and incorporated into the CEMP. The plan will include measures to avoid and manage spillages of fuels, chemicals, and fluids onto any surfaces or into stormwater inlets and an emergency response procedure.	Contractor	Pre-construction
SW5	Erosion and sedimentation	All stockpiles will be designed, established, operated and decommissioned in accordance with Roads and Maritime Services' Stockpile Management Procedures.	Contractor	Pre-construction
SW6	Contamination of soils and waterways	In the event that indicators of contamination are encountered during construction (such as odours or visually contaminated materials), work in the area will cease until an environmental consultant can advise on the need for remediation or other action.	Contractor	Construction
SW7	Contamination of soils and waterways	Vehicle wash downs and/or concrete truck washouts will be undertaken within a designated bunded area on an impervious surface or undertaken off-site.	Contractor	Construction
SW8	Contamination of soils and waterways	Machinery will be checked daily to ensure there are no oil, fuels or other liquids leaking from the machinery.	Contractor	Construction
SW9	Contamination of soils and waterways	There is to be no release of dirty water into drainage lines and/or waterways.	Contractor	Construction
SW10	Contamination of soils and waterways	The refuelling of plant and maintenance of machinery will be undertaken in impervious bunded areas in the designated compound area.	Contractor	Construction
SW11	Sediment transported off site	All stockpiles will be designed, established, operated and decommissioned in accordance with the RTA's Stockpile Management Procedures.	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
SW12	Heavy rainfall management	Weather conditions will be monitored daily, and no works will be conducted if there is an imminent threat of a heavy rainfall event. In the event of a rainfall event, works will cease if there is a risk of sediment loss off site or ground disturbance due to waterlogged conditions.	Contractor	Construction
AQ1	General air quality	Works will not be carried out during strong winds or in weather conditions where high levels of dust or air borne particulates are likely.	Contractor	Construction
AQ2	Airborne dust	Exposed surfaces will be watered regularly to minimise dust emissions.	Contractor	Construction
AQ3	Airborne dust	Stabilisation of disturbed surfaces will take place as soon as practicable.	Contractor	Construction
AQ4	General air quality	All construction plant and machinery will be fitted with emission control devices complying with Australian design standards.	Contractor	Construction
AQ5	General air quality	Construction plant and equipment will be maintained in a good working condition in order to limit impacts on air quality.	Contractor	Construction
AQ6	General air quality	Plant and machinery will be turned off when not in use.	Contractor	Construction
AQ7	Airborne dust	Stockpiled materials will be covered or stored in areas not subject to high wind.	Contractor	Construction
AQ8	General air quality	All trucks will be covered when transporting material to and from the study area.	Contractor	Construction
AQ9	General air quality	Local residents will be advised of hours of operation and duration of works and supplied with a contact name and number for queries regarding air quality.	Contractor	Construction
VL1	Visually intrusive works	The footprint of the proposal will be minimised where possible to minimise the dominance of the works.	Contractor	Construction
VL2	Compound management	The construction compound will be left in a clean and tidy state at the end of each working day.	Contractor	Construction
VL3	Long term visual amenity	The study area will be returned to its current state after construction to ensure the visual landscape is similar to the existing intersection.	Contractor	Operation

No.	Impact	Environmental safeguards	Responsibility	Timing
VL4	Light spill	Positioning of any lighting during night works will consider light spill on adjacent properties. Lighting selected will seek to minimise light spill on adjacent properties. Where possible existing street lighting will be utilised as the preferred light source.	Contractor	Construction
W1	Waste minimisation	A waste management plan will be prepared, which will include: • Identification of all potential waste streams associated with the work • Opportunities to minimise the use of resources, and to reuse and recycle materials • Methods of disposal of waste that cannot be reused or recycled at appropriately licensed facilities Methods of containment for waste streams to prevent escape to the environment.	Contractor	Pre-construction
W2	Waste management	The following resource management hierarchy principles will be followed: • Avoid unnecessary resource consumption as a priority • Avoidance is followed by resource recovery (including reuse of materials, reprocessing, recycling and energy recovery) Disposal is undertaken as a last resort (in accordance with the Waste Avoidance and Resource Recovery Act 2001).	Contractor	Construction
W3	Waste management	Waste bins will be provided and recycling of materials encouraged. Waste will be transported to an appropriate waste disposal facility.	Contractor	Construction
W4	Waste management	There will be no disposal or re-use of construction waste on other land.	Contractor	Construction
W5	Waste management	Waste will not be burnt on site.	Contractor	Construction
W6	Waste management	Waste material, other than vegetation and tree mulch, is not to be left on site once the works have been completed.	Contractor	Construction
W7	Waste management	Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
H1	Discovery of heritage	If Aboriginal heritage items are uncovered during the works, all works in the vicinity of the find must cease and Roads and Maritime's Aboriginal cultural heritage advisor and the Senior Regional Environmental Officer contacted immediately. Steps in Roads and Maritime's Standard Management Procedure: Unexpected Heritage Finds must be followed.	Contractor	Construction
H2	Discovery of heritage items	If non-Aboriginal heritage items are uncovered during the works, all works in the vicinity of the find must cease and Roads and Maritime's non-Aboriginal cultural heritage advisor and the Senior Regional Environmental Officer contacted immediately. Steps in Roads and Maritime's Standard Management Procedure: Unexpected Heritage Finds must be followed.	Contractor	Construction
LU1	General land use impacts	Complaints received will be recorded and attended to promptly in accordance with the Roads and Maritime *Community Involvement Practice Notes and Resource Manual*.	Contractor	Pre-construction
LU2	General land use impacts	Nearby by local residents will be notified before work starts.	Contractor	Pre-construction
LU3	General land use impacts	During construction, road users will be informed of any changed conditions.	Contractor	Construction
LU4	General land use impacts	Consultation with adjacent businesses and residents will be undertaken before construction to ensure landowners are aware of any short term changes (including access).	Contractor	Construction
LU5	General land use impacts	The CEMP will describe processes for liaison with the community and must be in accordance with the requirements of Roads and Maritime specification G36.	Contractor	Construction
LU6	Property acquisition	Roads and Maritime will liaise and consult with any landowners where land acquisitions are required. Acquisition will be finalised during the detailed design phase.	Roads and Maritime Project Manager	Pre-construction
LU7	Adjacent land use impacts	Roads and Maritime will consult with potentially affected landholders before and during construction to minimise the potential for impacts on land use including access impacts, signage impacts and impacts to any businesses.	Roads and Maritime	Detailed design

No.	Impact	Environmental safeguards	Responsibility	Timing
LU8	Impacts to utilities	Roads and Maritime will consult with utility providers and potentially affected landholders to ensure that impacts on utilities are minimised where possible. Consultation will include confirmation of utility access requirements.	Roads and Maritime	Pre-construction Construction
LU9	Impacts to utilities	If the scope or location of proposed utility relocation works falls outside of the assessed proposal scope and footprint, further assessment will be undertaken.	Roads and Maritime Contractor	Pre-construction
GG1	Greenhouse gas emissions	The use of alternative fuels and power sources for construction plant and equipment will be investigated and implemented, where appropriate.	Contractor	Pre-construction
GG2	Greenhouse gas emissions	Materials will be delivered as full loads and local suppliers will be used where possible.	Contractor	Construction
GG3	Greenhouse gas emissions	Construction equipment, plant and vehicles will be appropriately sized for the task.	Contractor	Construction
CU1	Cumulative impacts	Consultation between Roads and Maritime and contractors for each project is to be undertaken to ensure that any cumulative impacts are considered and minimised where possible. This would include programming of works to minimise day and night works at any one location due to separate project and establishment of diversions which where possible can service multiple projects to minimise the number of roads impacts by the projects.	Roads and Maritime Contractor	Construction

8. Conclusion

8.1 Justification

The Newell and Mitchell highways both form key roles in the National Road Network and also the National Freight Networks. The existing intersection results in congestion during the peaks (particularly the morning peak). These congestion issues would increase in the future as traffic volumes increase along both roads into the future. The upgrade of the intersection to include traffic signals would provide improved traffic flow through the intersection with the benefits being most visible in the future when traffic volumes increase. The upgrade intersection would also improve safety in the vicinity of the intersection and would improve pedestrian access across the two highways in the vicinity of the intersection.

While there would be some potential environmental impacts as a consequence of the proposal (which are not experienced with 'do nothing' option), they have been avoided or minimised wherever possible through design and the proposed specific safeguards and management measures summarised outlined in **Table 7.1**. These safeguards and management measures would be implemented to minimise any impacts. Overall the benefits of the proposal, in particular the traffic and safety benefits, are considered to outweigh any environmental impacts predicted to be experienced. The benefits of the proposal are most evident when comparing the future traffic conditions should the proposal not be undertaken.

Overall, the benefits would outweigh the environmental impacts predicted to be experienced. Therefore, the proposal is considered justified.

8.2 Objects of the EP&A Act

Table 8.1 outlines how the proposal is considered to be consistent with the objects of the EP&A Act.

Table 8.1 Objects of the EP&A Act

Object	Comment
1.3(a) To promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources.	The proposal is located within an existing road corridor and therefore results in limited impact on the surrounding environment and community. The proposal does however provide community benefits through improved traffic through the intersection.
1.3(b) To facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment.	Ecologically sustainable development is considered sections 8.2.1 to 8.2.4.
1.3(c) To promote the orderly and economic use and development of land.	The proposal would maximise the use of an existing road corridor and improve traffic conditions at the intersection. These benefits would be experienced by all road users. The proposal would also result in some benefits for pedestrian due to improved pedestrian facilities at the intersection. The proposal also minimises ongoing congestion and capacity issues associated with the future growth of the area.
1.3(d) To promote the delivery and maintenance of affordable housing.	Not relevant to the proposal.

Object	Comment
1.3(e) To protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats.	The proposal would be located on land which has been heavily disturbed due to the construction of the existing road and other nearby development. The proposal would result in the clearance of some vegetation however this is considered to be landscaping vegetation with no native vegetation present within the proposal site.
1.3(f) To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).	The proposal would be located on land which has been heavily disturbed due to the construction of the existing road and other nearby development. Due to this past development Aboriginal heritage items are not expected to be present on site and therefore would not be impacted.
1.3(g) To promote good design and amenity of the built environment.	The proposal seeks to ensure that urban design principles are factored into the design. Landscaping to be installed during the construction of the proposal would seek to be consistent with the surrounding areas while also generating a new gateway feature to Dubbo.
1.3(h) To promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants.	The proposal involves works for the purpose of a road. All construction would be undertaken in accordance with relevant Roads and Maritime guidelines and Australian Standards.
1.3(i) To promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State.	Not relevant to the proposal.
1.3(j) To provide increased opportunity for community participation in environmental planning and assessment.	Details of the consultation undertaken as part of the proposal is outlined in Section 5.

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’.

The design has sought to minimise impacts on the amenity of the study area while maintaining engineering feasibility and safety for all road users. A number of safeguards and management measures have been proposed to minimise potential impacts. These safeguards and management measures would be implemented during construction of the proposal. No safeguards and management measures have been postponed as a result of lack of scientific certainty.

A construction environment management plan would be prepared before construction starts. This requirement would ensure the proposal achieves a high-level of environmental performance. No safeguard or management mechanisms would be postponed as a result of a lack of information.

8.2.2 Intergenerational equity

This 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 proposal would not result in any impacts that are likely to adversely impact on the health, diversity or productivity of the environment for future generations. The proposal would benefit future generations by improving the operation of the intersection into the future and also improving road safety.

Should the proposal not proceed, the principle of intergenerational equity may be compromised, as future generations would inherit a lower level of service associated with the Newell and Mitchell highways intersection. Travel times and public safety may be affected by future traffic incidents within the corridor.

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 proposal would be undertaken is predominantly landscaped vegetation. The proposal would not result in the removal of any native vegetation with vegetation loss in general limited to landscaped areas.

The proposal would not have a significant impact on biological diversity and ecological integrity.

8.2.4 Improved valuation, pricing and incentive mechanisms

This principle requires 'costs to the environment should be factored into the economic costs of a project'.

The REF has examined the environmental consequences of the proposal and identified safeguards and management measures to manage the potential for adverse impacts. The requirement to implement these safeguards and management measures would result in an economic cost to Roads and Maritime. The implementation of safeguards and management measures would increase both the capital and operating costs of the proposal. This signifies that environmental resources have been given appropriate valuation.

The concept design has been developed with an objective of minimising potential impacts on the surrounding environment. This indicates that the proposal is being developed with an environmental objective in mind.

8.3 Conclusion

The proposed upgrade of the Newell Highway and Mitchell Highway intersection at Dubbo is subject to assessment under Division 5.1 of the EP&A Act. The 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, biodiversity stewardship sites under the BC Act, wilderness areas, areas of outstanding value, impacts on threatened species 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 proposal have been avoided or reduced during the concept design development and options assessment. The proposal as described in the REF best meets the project objectives but would still result in some impacts on traffic movements, property (acquisition and access impacts) and neighbouring properties (i.e. noise and vibration impacts and air quality impacts). Safeguards and management measures as detailed in this REF would ameliorate or minimise these expected impacts. The proposal would also result in improved operation of the intersection both now and in the future when traffic volumes are predicted to increase. The proposal would also result in safety benefits for both road users and pedestrians. On balance the proposal is considered justified and the following conclusions are made.

Significance of impact under NSW legislation

The proposal 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 Division 5.2 of the EP&A Act. A Biodiversity Development Assessment Report or Species Impact Statement is not required. The proposal is subject to assessment under Division 5.1 of the EP&A Act. Consent from Council is not required.

Significance of impact under Australian legislation

The proposal is not likely to have a significant impact on matters of national environmental significance or the environment of Commonwealth land within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999*. A referral to the Australian Department of the Environment and Energy is not required.

9. Certification

This review of environmental factors provides a true and fair review of the proposal 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 proposal.

Ben James

Senior Environmental Planner

GHD Pty Ltd

Date: 16/04/2019

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

Bobby Yazdani

Project Development Manager

Regional Project Office

Date:

10. References

ABS. 2016. 2016 Census Data. *http://www.abs.gov.au/websitedbs/censushome.nsf/home/2016*. Accessed 22 June 2018.

DECC. 2008. *Soils and Construction – Managing Urban Stormwater Volume 2D*.

DoP. 2010. *NSW Coastal Planning Guideline: Adapting to sea level rise.*

DUAP. 1995/1996. *Is an EIS Required? Best Practice Guidelines for Part 5 of the Environmental Planning and Assessment Act 1979*.

Infrastructure NSW. 2018. *Building Momentum: State Infrastructure Strategy 2018-2038*. February 2018.

Landcom. 2004. *NSW Soils and Construction – Managing Urban Stormwater Volume 1*.

Murphy and Lawrie. 1998. *1:250,000, Soil Landscape Series Sheet SI55-4*. For Department of Land and Water Conservation.

NSW Government. 2005. *NSW Greenhouse Plan*.

NSW Government. 2017. *Central West and Orana Regional Plan 2036*, June 2017.

OEH. 2014. *Central West and Orana: Climate change snapshot*. November 2014

Raymond et al. 1999. *Dubbo 1:100,000 Geological Sheet.*

Roads and Maritime. 2008. *QA Specification G10 Control of Traffic.*

RTA. 2010. *Traffic Control at Work Sites Manual.*

RTA. 2011. *RTA Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects*.

SMEC. 2018. Newell Highway and Mitchell Highway Intersection Upgrade: Preliminary Contamination Assessment Report. 1 June 2018. Prepared for Roads and Maritime Services.

Transport for NSW. 2013. *Central West Regional Transport Plan*. December 2013

Transport for NSW. 2015. *Newell Highway Corridor Strategy*. May 2015.

Transport for NSW. 2018a. *Future Transport Strategy 2056*. March 2018

Transport for NSW. 2018b. *Regional NSW Services and Infrastructure Plan*. March 2018

Terms and acronyms used in this REF

Term / Acronym	Description
BC Act	*Biodiversity Conservation Act 2016* (NSW)
CEMP	Construction environmental management plan
DECC	Department of Environment and Climate Change
EIS	Environmental Impact Statement
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)
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.
LoS	Level of Service. A qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers.
MNES	Matters of national environmental significance under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999.*
NSW	New South Wales
REF	Review of Environmental Factors
Roads and Maritime	NSW Roads and Maritime Services
RTA	Roads and Traffic Authority (now Roads and Maritime)
QA Specifications	Specifications developed by Roads and Maritime Services for use with road work and bridge work contracts let by Roads and Maritime Services.

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