

# REVIEW OF ENVIRONMENTAL FACTORS COWRA HEAVY VEHICLE BYPASS

PREPARED FOR COWRA SHIRE COUNCIL

DECEMBER 2016

FINAL



• Civil, Environmental & Structural Engineering • Surveying • Environmental • Planning • Architecture

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The preparation of this report has been in accordance with the project brief provided by the client and has relied upon the information, data and results provided or collected from the sources and under the conditions outlined in the report.

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#### Document control



# **Executive summary**

This Review of Environmental Factors (REF) has been prepared for Cowra Shire Council by Geolyse to meet the requirements of Part 5 of the NSW *Environmental Planning and Assessment Act 1979* for a proposed heavy vehicle bypass of the town of Cowra.

Cowra is located at the convergence of a number of major heavy vehicle routes, including the Mid-Western Highway (linking Hay in the west with Bathurst in the east), resulting in significant amounts of heavy vehicle traffic passing through the Central Business District (CBD).

The project has been conceived through a desire to improve the amenity of the town CBD by reducing the number of heavy vehicles that pass through. The number and size of heavy vehicles passing through the CBD was identified as exposing road users to the risk of injury and adding to congestion and delay for local vehicles (GHD, 2013). This situation has resulted in a decreasing level of amenity for local vehicle and pedestrians through this area. A bypass for heavy vehicles has long been considered a solution to this problem. It is gained impetus as a result of recent improvements works to the main street.

This project also supports a recent related project, funded by Roads and Maritime Services and undertaken in partnership with Cowra Shire Council, to upgrade the section of the Mid Western Highway (Kendal Street) that passes through the CBD. The particular elements of that project involved a reduction in dangerous crossfall, the installation of a central median to improve pedestrian safety and an upgrade of the pavement that had fallen in quality due to ad hoc improvement programs over many years. We understand a related project is also proposed to improve footpaths and kerbing however the status of this is to be confirmed.

The 2009 Cowra Land Use Strategy identified a number of options for a proposed bypass and community consultation was carried out by GHD in 2012/13 to consider these and other route options, including carrying out a cost/benefit analysis and recommending an appropriate route for adoption.

The following specific project objectives are identified by this project:

- Reduce the number of heavy vehicles travelling through the Cowra CBD;
- Improve the amenity of the CBD;
- Improve road user safety in the CBD; and
- Reduce traffic congestion and local traffic travel time through the CBD.

The GHD Cowra Heavy Vehicle Bypass Study Final Report (2013) (hereafter referred to as the GHD Bypass Study) considered a total of 10 standalone route options as well as 2 combined options identified through the consultation process. These options are discussed in more detail in **Section 2.4**.

Consultation has been carried out with regulatory stakeholders, servicing providers and the local community and is summarised in **Section 5**. This included holding two public meetings and providing two briefings to local Councillors.

Notwithstanding that the works do not require development consent, Cowra Shire Council, as the nominated determined authority remains obligated to consider the environmental impacts of the works pursuant to Part 5 of the EP&A Act.



Specifically, Cowra Shire Council, as the determining authority of the activity must:

Examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity (Section 111 of the Act).

Establish whether or not an environment impact statement, or a species impact statement, or both are required for the activity (Section 112 of the Act).

As the proponent and a determining authority, approval for the project is required to be issued by Cowra Shire Council as the nominated determining authority.

Quantitative assessments of noise and vibration, air quality, traffic impacts, hydrology, heritage and ecology have been completed and are summarised in this report, with the full assessment reports appended. Qualitative assessments of all other impacts have been completed within the body of the report. Potential impacts identified and considered via the assessment include the following:

- The possibility that the introduction of the proposed bridge would impact upon flood behaviour;
- Potential impacts to terrestrial and aquatic flora and fauna from the construction of the bypass;
- Potential impacts associated with operational noise from the bypass to nearby residential receivers;
- Potential impacts associated with traffic generation;
- Impacts to identified and unidentified items and sites of Aboriginal heritage significance including archaeological deposits within the alignment; and
- The potential for the proposed bridge to impact upon the heritage significance of the existing state heritage listed railway bridge over the Lachlan River.

There is confidence based on the assessment that each of these matters can be addressed such that impacts would not be significant. It is noted that some additional investigations would be required as detailed design progresses and it is possible that the conclusions of this REF may need to be revisited in the event detailed design proposes significant changes to either the alignment or the design of the bypass by reference to the concept alignment design, which has formed the basis of this assessment.

An Environmental Impact Statement (EIS) is required if the Review of Environmental Factors concludes the proposal is likely to have a significant effect on the environment. Clause 228 of the Environmental Planning and Assessment Regulation 2000 contains a detailed list of factors that must be taken into account when assessing the impact of an activity on the environment. A checklist of these matters is provided in **Appendix A**. The assessment demonstrates to the satisfaction of the nominated determination authority the proposal would not have a significant effect on the environment and as such an EIS is not required.

Part 5.1 of the EP&A Act identifies development which is state significant infrastructure or critical state significant infrastructure. *State Environmental Planning Policy (State and Regional Development) 2011* outlines the types of development that is categorised as such. The proposed activity does not fall into these definitions and so does not trigger assessment under Part 5.1 of the Act.

The proposal can therefore be assessed under Part 5 of the EP&A Act. Development consent from council is not required.



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# Introduction

# 1.1 BACKGROUND

This Review of Environmental Factors (REF) has been prepared for Cowra Shire Council by Geolyse to meet the requirements of Part 5 of the NSW *Environmental Planning and Assessment Act 1979* for a proposed heavy vehicle bypass of the town of Cowra.

Cowra is located at the convergence of a number of major heavy vehicle routes, including the Mid-Western Highway (linking Hay in the west with Bathurst in the east), resulting in significant amounts of heavy vehicle traffic passing through the Central Business District (CBD). This situation has resulted in a decreasing level of amenity for local vehicle and pedestrians through this area. A bypass for heavy vehicles has long been considered a solution to this problem. It has gained momentum as a result of recent improvements works to Kendal Street, both the main street and a section of the Mid-Western Highway.

The route for the bypass was selected as a result of specific analysis by GHD in 2013 in consultation with the community including a cost/benefit analysis – refer **Section 2.4**.

# 1.2 SCOPE OF THIS REPORT

This REF has been prepared to identify, scope, and evaluate the impacts of the proposal to:

- assist the determination of whether an activity should be approved taking into account, to the fullest extent possible, all matters affecting or likely to affect the environment; and
- determine whether the activity is likely to have a significant effect on the environment or significantly affect threatened species, populations or ecological communities or their habitats.

The REF is provided in the following format:

- Section 2 provides consideration of the needs and options for the proposal
- Section 3 provides a description of the proposal and the subject site.
- Section 4 details the planning framework applicable to the subject site and proposal.
- Section 5 details the consultation process
- Section 6 identifies and discusses the impacts of the proposal.
- Section 7 provides a summary of the mitigation measures required to ameliorate any adverse impacts
- Section 8 provides a conclusion to the REF.



# Need and options considered

# 2.1 NEED FOR THE PROPOSAL

The project has been conceived through a desire to improve the amenity of the town CBD by reducing the number of heavy vehicles that pass through. The number and size of heavy vehicles passing through the CBD was identified as exposing road users to the risk of injury and adding to congestion and delay for local vehicles (GHD, 2013). This project supports a recent related project, funded by Roads and Maritime Services and undertaken in partnership with Cowra Shire Council, to upgrade the section of the Mid Western Highway (Kendal Street) that passes through the CBD. The particular elements of that project involved a reduction in dangerous crossfall, the installation of a central median to improve pedestrian safety and an upgrade of the pavement that had fallen in quality due to ad hoc improvement programs over many years. A related project is also understood to be proposed to improvement footpaths and kerbing and the scope and status of this will be confirmed in the final REF.

The 2009 Cowra Land Use Strategy identified a number of options for a proposed bypass and community consultation was carried out by GHD in 2012/13 to consider the various route options, carry out a cost/benefit analysis and select an appropriate route.

The GHD Bypass Study considered a total of 10 standalone route options as well as 2 combined options identified through the consultation process. These options are discussed in more detail in **Section 2.4**.

# 2.2 EXISTING ROAD INFRASTRUCTURE

The proposed heavy vehicle bypass is located within the Cowra Local Government Area (LGA). The land associated with the project is in a number of land use zones as follows:

- R5 Large Lot Residential;
- RU4 Rural Small Holdings;
- E3 Environmental Management;
- W2 Recreational Waterways;
- IN2 Light Industrial;
- RU1 Primary Production;
- R1 General Residential; and
- RE1 Public Recreation.

Land use zoning is reflected in Figure 23 (page 111).

The adopted alignment consists of approximately 5 kilometres of existing roads and 3.4 kilometres of new road through a mixture of private and public land.

The alignment and existing road infrastructure is described from west to east as follows (refer **GHD Drawings C005-C016**):

 Airport Road – a two lane, two way road with a posted speed limit of 50km/hr running from north to south. Table drains with no kerb or guttering. Variable vertical elevation and a range of property access. Features a T-intersection with Waratah Street (east) at approximately chainage 550 and a T-intersection with Calare Street (east) at approximately chainage 930. Predominantly mature trees line the road on either side. The entrance to the Cowra airport is located at approximately chainage 1130. A 90 degree turn is located at approximately chainage 1340 at which point Airport Road becomes Boundary Road.



- 2. Boundary Road a two lane, two way road with a posted speed limit of 50km/hr. Features table drains with no kerb or guttering. Variable vertical elevation and a range of property access. A mixture of mature and younger trees line the road side on both sides. A T-intersection with Harley Street is located at approximately chainage 2460. Boundary Road meets the Young Road at approximately bypass chainage 2570.
- 3. The bypass alignment crosses Olympic Highway and proceeds east through private property. Briefly joins Fishburn Street at approximately chainage 2920 and leaves Fishburn Street alignment at approximately chainage 3200. Fishburn Street is a local two lane, two way road with a posted speed limit of 50 km/hr and features no kerb or guttering through this section. At the point of intersection the Olympic Highway is a two way, two lane road with a posted speed limit of 60km/hr and features kerb and guttering. An aboveground electricity transmission line (ETL) crosses the intersection from north-west to south-east.
- 4. The bypass alignment traverses undeveloped land to the north of the Blayney Demondrille Railway Line from approximately chainage 3200 to chainage 4200 at which point the alignment intersects with the Lachlan Valley Way. Lachlan Valley Way is a two lane, two way road in this location with a posted speed limit of 80 km/hr and features table drains with no kerb or guttering. The Blayney Demondrille Railway Line crosses the Lachlan River via a state significant heritage listed railway bridge (dating from 1886) which, due to the level change in this location, has an elevated approach that takes it over the Lachlan Valley Way. The concept alignment passes beneath the rail bridge approach at this location. The rail approach appears newer than the rail bridge although its precise age is not known.
- 5. The bypass alignment crosses the Lachlan River to the south of the rail bridge through public land on the west side of the river and across private land on the eastern side of the river. An old water tank is located within the bypass alignment on the western bank of the river which is understood to be an off-take point for the former Cowra power station.
- 6. From the Lachlan River the bypass alignment traverses private land in use for farming purposes and follows the alignment of the Blayney Demondrille Railway Line before joining Campbell Street at approximately chainage 5800. The southern end of Campbell Street is closed in this location with a set of locked gates located at approximately chainage 5895. The short section of Campbell Street south of the gates features kerb and guttering but none is noted north of the gates. There are no road markings in this locality. Campbell Street in this location is a two lane, two way road with a posted speed limit of 50 km/hr. An aboveground ETL runs adjacent to the constructed portion of Campbell Street from approximately chainage 5800 until chainage 6150 whereat the road turns away from the ETL to the north-west. The bypass alignment deviates slightly from the Campbell Street alignment at approximately chainage 6350 to provide a straighter alignment. The alignment intersects with Parkes Street at approximately chainage 6590 before re-joining Campbell Street immediately to the south of Brougham Street.
- 7. Campbell Street intersects with Brougham Street at approximately chainage 6680. Brougham Street becomes Darby Falls Road at the Campbell Street intersection. Brougham Street/Darby Falls Road is a two lane, two way road with a posted speed limit of 50km/hr in this location with a marked centre line. The road has kerb and guttering to the west of the intersection but to the east has only grass table drains. An aboveground ETL crosses Brougham Street on the western side of the intersection.
- 8. North of Brougham Street, Campbell Street has kerb and guttering on the western side but only grassed table drains on the eastern side. This arrangement continues to approximately chainage 6950 at which point both sides of the road feature grass table drains. An aboveground ETL



crosses Campbell Street at approximately chainage 6900. A sewerage pump station is located on the eastern side of the road at approximately chainage 7150.

- 9. The alignment follows Campbell Street with a slight deviation at approximately chainage 7500 where it passes to the rear of an existing dwelling and then re-joins Campbell Street at approximately chainage 7860. This northern section of Campbell Street remains a two lane, two way road with a posted speed limit of 50km/hr. Campbell Street intersects with Day Street and Pack Street at approximately chainages 7900 and 8100 respectively (both to the north).
- 10. The alignment crosses Waugoola Creek at approximately chainage 8200 via a low level bridge featuring a number of culverts before re-joining the Mid-Western Highway at chainage 8400.

## 2.3 **PROJECT OBJECTIVES**

The following specific project objectives are identified:

- Reduce the number of heavy vehicles travelling through the Cowra CBD;
- Improve the amenity of the CBD;
- Improve road user safety in the CBD; and
- Reduce traffic congestion and local traffic travel time through the CBD.

# 2.4 ALTERNATIVES AND OPTIONS CONSIDERED

#### 2.4.1 METHODOLOGY FOR SELECTION OF PREFERRED OPTION

On behalf of Cowra Shire Council, GHD was contracted in 2012 to identify and assess route options for the project and make recommendation as to a preferred alignment via the GHD Bypass Study. Each option was analysed against a set of adopted selection criteria (refer **Table 2.1**) and the option which best achieved these criteria, was the most cost effective and was the most popular with the general public, was identified as the preferred option. The GHD Bypass Study was issued as final in June 2013 and the preferred option adopted by Council at their Council meeting on the 22 July 2013. The adopted motion read as follows:

1. That Council adopts Option 3 – Southern Ring Road from the GHD Final Report as the preferred route for a heavy vehicle bypass of Cowra.

2. That Council does not pursue the short-term alternative route via the Canowindra rail corridor.

3. That the Director – Infrastructure & Operations prepare a report on the process to implement recommendation 1, including investigations into the viability of alleviating concerns of affected residents.

## 2.4.2 IDENTIFIED OPTIONS

The do nothing option is a default option that is always considered as a viable alternative. Options 1 - 4 were originally identified by Council in the 2009 Cowra Land Use Strategy. Options 5, 6 and 7 were identified as a result of community consultation and Options A, B and C were developed during stakeholder consultation sessions.

#### 2.4.2.1 Do Nothing

The 'do nothing' option would not meet the project objectives on the basis that heavy vehicles would not be removed from the CBD, amenity would not be improved and the current situation would not be altered.



## 2.4.2.2 Option 1

A Vaux/Brougham Street Link Road was identified as a short term, low cost solution to remove heavy vehicles from the main street (GHD, 2013).

#### 2.4.2.3 Option 2

A Northern Ring Road was proposed as a comprehensive long term strategy that linked industrial areas and surrounding regional destinations, connecting the Mid Western Highway and Grenfell Road to Binni Creek Road, Canowindra Road, Glenlogan Road and Killara Road (GHD, 2013).

#### 2.4.2.4 Option 3

A Southern Ring Road was proposed to reduce heavy vehicle traffic passing through Cowra by providing a route that linked the Mid Western Highway at Campbell Street, and following the railway and Boundary/Airport Roads to connect to Grenfell Road (GHD, 2013).

#### 2.4.2.5 Option 4

The Showground Link Road was proposed to connect Young Road with North Logan Road from the intersection of William Street – Young Road via William Street and Showground Lane (GHD, 2013).

#### 2.4.2.6 Option 5

A development of Option 3 to extend the option along Airport Road to connect with the Mid Western Highway (west) (GHD, 2013).

#### 2.4.2.7 Option 6

Option 6 proposed a short link road connecting Canowindra Road with Grenfell Road via a new river crossing (GHD, 2013).

#### 2.4.2.8 Option 7

A route along Campbell Street and utilising the disused railway corridor, connecting with Boorowa Road (GHD, 2013).

#### 2.4.2.9 Option A

This option combined elements of Option 2 and Option 3, and connected the north-south and east-west main roads (GHD, 2013).

#### 2.4.2.10 Option B

Similar to Option 3 but it does not extend to the west of Young Road. It proposed the use of Young Road and William Street to connect to Grenfell Road (GHD, 2013).

#### 2.4.2.11 Option C

Same as Option 7 (GHD, 2013).

#### 2.4.2.12 Option 3/5

Merged Option 3 and Option 5 (GHD, 2013).

#### 2.4.2.13 Option 7/C

Merged Option 7 and Option C (GHD, 2013).



## 2.4.3 ANALYSIS OF OPTIONS

Each of the above options was evaluated against a set of criteria prepared by the GHD study team. The selection criteria utilised in the GHD Bypass Study report are reproduced in **Table 2.1**.

#### Table 2.1 – Selection Criteria

Criteria	Weighting
Effectiveness in diverting unnecessary heavy vehicle traffic away from CBD	30
Effectiveness in reducing impact on residential amenity (noise, vibration, visual, odour, access, safety)	15
Effectiveness in addressing the long term transport needs of Cowra	20
Effectiveness in serving industrial and commercial areas as identified in the LEP	10
Potential to service a rail/road/air transport hub	15
Effectiveness in enhancing regional connectivity	10

#### Source: GHD, 2013

Each option was scored against the criteria with a score of 5 indicating an option that fully meets a criteria and a score of 1 indicating that an option does not satisfy the criteria.

As a result of the analysis against the selection criteria the following options were shortlisted for further analysis:

- Option A (amended);
- Option B; and
- Option 3.

Consideration of the three options as reflected by the GHD Bypass Study, together with the 'do nothing' option, is summarised in following sections.

#### 2.4.3.1 Do Nothing

The 'do nothing' option would not remove heavy vehicles from the main street nor improve amenity.

The 'do nothing' option would not meet the project objectives and was therefore not considered further.

Advantages of the 'do nothing' option include:

- No environmental impacts;
- No costs incurred by Cowra Shire Council; and
- No traffic delays due to no construction.

#### 2.4.3.2 Option 3 (preferred option)

A lower capital cost option which would involve the construction of a section of new road and the upgrade of existing roads.

## 2.4.3.3 Option A

A high capital cost option which would provide a comprehensive bypass route of Cowra.

#### 2.4.3.4 Option B

The construction of a portion of Option 3 and the connection to the existing road network at Young Road.

## 2.4.4 JUSTIFICATION FOR THE PREFERRED ROUTE

The GHD Bypass Study formed the following conclusions:

- 1. The results of the community consultation indicate that Option 3 is the most popular option.
- 2. Options A, 3 and B were the highest ranked options of the eight options considered.
- 3. The Benefit Cost Analysis (BCA) results show that Option 3 is the most cost-effective of the three highest ranked options.
- 4. The BCA results show that although Option B has a marginally lower cost than Option 3, it provides less benefits in terms of reductions in travel time and vehicle operating costs compared to Option 3.
- 5. The construction of a roundabout at Grenfell Road/ Boorowa Road would ease the traffic delays in Boorowa Road.

On the basis of the investigations completed by GHD, it is considered that the selection of Option 3 is justified.

The public consultation process detailed throughout **Section 5**, has identified levels of concern amongst the community about the route alignment, including (among other things) specific concerns about amenity impacts to residential properties. The alignment of the route has been the subject of a specifically scoped and engaged consultant study, which Council has reviewed, accepted and adopted the recommendations of. It is this adopted alignment which is the subject of this REF and detailed considerations of alternative routes is considered to have been satisfactorily addressed by that previous study.



# **Description of the Proposal**

# 3.1 THE PROPOSAL

The proposal involves the construction of an approximately 8.4 kilometre heavy vehicle bypass which would utilise approximately five kilometres of existing roads and require the development of approximately 3.4 kilometres of new roads through a mixture of private and public land.

The proposal would result in a two lane, two direction road that would be in both cut and fill through various areas of the adopted concept alignment providing a consistent vertical alignment.

The most significant engineering element of the project is the need to develop a new bridge to cross the Lachlan River. The GHD prepared adopted concept alignment design provides an estimated 100 metre bridge span with earthen abutments developed on either bank. The area of the bridge development is within an area affected by flooding in the 20 year, 50 year, 100 year and 200 year events. The concept alignment design does not include detailed design of the bridge to consider at this stage of the project however the concept design provides a proposed road level that matches the level of the existing Lachlan Valley Way to the west. The western approach to the proposed bridge would pass beneath the approach to the existing rail bridge at the location of its intersection with the Lachlan Valley Way and a roundabout is proposed in this location. This intersection is also a significant engineering feature of the alignment. Careful design would be required to ensure that the efficiency of both the bypass and the Lachlan Valley Way are maintained and detrimental impacts to the existing property access to the south (currently a protected right turn lane) and to the state heritage significance of the rail bridge do not result.

Weather permitting the works could be completed within six months. The project is not yet funded but initial cost estimates of the concept alignment as an element of the GHD Bypass Study identify an estimated budget of approximately \$20,761,606.00. It is acknowledged that this costing did not consider the cost of land acquisition. Once the project proceeds to detailed design a more detailed costing would be prepared.

# 3.2 PROPOSAL LOCATION

The bypass route adopted by Cowra Council is identified as Option C in the GHD Bypass Study. This route was adopted by Cowra Shire Council at its meeting on 22 July 2013.

The alignment for the proposed heavy vehicle bypass commences on the western side of Cowra at the intersection of Grenfell Road and Airport Road – refer **Figure 1** (page 9). The alignment is described in detail in **Section 2.2**.

**GHD Drawings C005-C016** (provided in the **Drawings** section of this report) show the adopted concept drawings of the proposed heavy vehicle bypass. **Figure 1** (page 9) provides an overview of the adopted concept alignment.





Figure 1: Proposed alignment

## 3.3 DESIGN

## 3.3.1 DESIGN CRITERIA

Whilst detailed design has not yet been completed it is understood the following guidelines and standards would be utilised:

- Austroads Guide to Road Design (Austroads 2009) and Roads and Maritime Services supplements to the Austroads Guide;
- Austroads Guide to Road Safety (Part 6: Road Safety Audit) (Austroads 2002);
- Roads and Maritime Services Road Design Guide (Roads and Maritime Services 1989);
- Roads and Maritime Services Delineation Guidelines (Roads and Maritime Services 2008); and
- Beyond the Pavement Urban Design Policy (RTA 2009).

The following design criteria were nominated at project inception:

- The signed posted speed will vary between 50km/hr and 80km/hr (refer **Section 3.3.2** and **Table** 3.1) however final speeds would be subject to authorisation by Roads and Maritime Services;
- The general roadway configuration along the bypass route will comprise a single 3.5m travel lane in each direction with a 2.0m shoulder that includes 1m of bitumen seal on the shoulder;
- Where the bypass route adjoins residential or industrial land uses, the bypass roadway adjacent to the residential or industrial land would incorporate a 3.0m wide parking lane outside the travel lane and concrete kerb and gutter would also be provided;
- The implementation of the heavy vehicle bypass shall not preclude maintaining vehicular access to the driveways of any of the properties at any location along the bypass route;



- The design vehicle for detailed design is likely to be a 26 metre long B-double;
- As per Section 6 of the GHD Bypass Study pavement construction is proposed as a 2 coat 10/14 seal with a 300mm base course, 300 mm sub base course and 300mm select material;
- Average height of cut and fill is one metre; and
- Bridge is to be 'Mid-level' design (as opposed to a high level bridge similar to the rail bridge or a low level bridge closer to the river level) this criteria has notably been amended due to the potential for impact to flood behaviour by virtue of development of a mid-level bridge, and the preference has been identified by Council for installation of a low-level bridge with a similar deck height to the existing low-level bridge to the north.

## 3.3.2 VEGETATION CLEARING

The key potential impacts to flora species associated with the project are identified as vegetation removal, impacts to threatened species and ecological communities and weed impacts. However the ecological assessment concludes that the clearing of vegetation would not lead to a significant impact - refer to **Section 6.2** and **Appendix J** for further details of vegetation clearing.

#### 3.3.3 LINE MARKING AND ROAD PAVEMENT MARKERS

For existing roads, existing line marking would be re-applied and new line marking would be applied in accordance with Roads and Maritime Services specification R141.

For new roads, new line marking would be provided in accordance with the Roads and Maritime Services delineation guidelines.

## 3.3.4 DRAINAGE

Various culverts would be required throughout the alignment to ensure the continued flow of surface of water. These would be sited and sized via detailed design.

## 3.3.5 WATER CROSSINGS

A significant element of the project would be provision of crossings of the Lachlan River and Waugoola Creek.

The GHD Bypass Study identified that the bridge over the river was to be a mid-level bridge, as opposed to a low level bridge close to the water or a high level bridge similar to the existing road bridge. The concept alignment set a road level for the bridge and identified the development of significant earthen support abutments but did not provide any detail of the cross section of the bridge, such as whether a super-structure is required or the extent of safety barriers, deck thickness or the like.

In preparing a hydrology analysis, assumed parameters for the bridge design were included within the model – refer **Section 6.7**. Due to probable impacts to flood levels and resulting potential impacts to residential properties, a several alternative, lower profile, bridge designs were modelled and this showed a lower level of impact to flood levels. It is therefore a recommendation of this REF that detailed design of the proposed Lachlan River bridge ensure that minimising the cross section of the bridge be a required outcome.

The concept alignment shows filling through the Waugoola Creek at approximately chainage 8200. The hydrology model was not able to consider this area of the alignment due to the lack of available surface data. It is therefore a recommendation of this REF that the crossing of Waugoola Creek ensure that post development flows are consistent with pre-development levels to ensure that impacts to flood levels and surrounding properties are limited – refer **Section 6.7**.

## 3.3.6 PROPERTY ACQUISITION

The extent of property acquisition is not yet confirmed due to the need to further develop the alignment design. Indicative acquisition amounts and locations are discussed in **Section 6.8**. It is considered that extensive opportunities exist to refine the alignment to minimise the extent of acquisition required.

All acquisition would be carried out in accordance with the Roads and Maritime Services Land Acquisition Information Guide and the *Land Acquisition (Just Terms Compensation) Act 1991* (LA Act). It is noted that, pursuant to Section 10 of the LA Act, the amount of compensation would not be less than the market value (assessed under the LA Act) unaffected by the proposal.

## 3.3.7 SPEED LIMITS

The sign posted speed limits proposed for the bypass are referenced from the GHD Bypass Study which identifies the following anticipated limits.

Chainage		Road Name/s	Proposed Speed Limit	
Start	End		Km/hr	
0	1350	Airport Road (Boundary Road to Grenfell Road)	50	
1350	2600	Boundary Road (Airport Road to Young Road)	50	
2600	2900	Fishburn Street west (Young Road to Fishburn Street)	60	
2900	3400	Fishburn Street central (Fishburn Street to Waratah Street)	70	
3400	4500	Fishburn Street east (Waratah Street to Lachlan River east)	70	
4500	8000	Campbell Street south (Lachlan River east to Pack Street)	80	
8000	8400	Campbell Street north (Pack Street to Mid Western Highway)	70	

Table 3.1 – Proposed speed limits

Source: GHD, 2013

Ultimately speed limits would be determined by Roads and Maritime Services in accordance with the provisions of the *Road Transport Act 2013* and the speed set 'should reflect the road safety risk to the road users while maintaining the ability of people to easily get to their destination' (RMS, 2011).

# 3.4 CONSTRUCTION ACTIVITIES

The below sub-sections provides a summary of the likely construction methodology, work hours, plant and equipment and associated activities that would be used to construct the proposal. For the purpose of this REF, an indicative construction plan and methodology are provided. Detailed construction plans and methods would be determined following completion of the detailed design. By reference to Roads and Maritime Services advice, it is proposed that concept design of intersections, including conducting a road safety audit, would form the initial step in the detailed design process. Once agreed by Roads and Maritime, concept design of the remainder of the alignment would occur. Once concept design has been agreed, detailed design would be carried out and detailed constructions plans and methods would be determined.



## 3.4.1 WORK METHODOLOGY

The work methodology for construction of the proposal (following completion of the stages of detailed design) would be indicatively staged as follows (subject to detailed design):

- Establish site compounds/ancillary facilities;
- Establishing erosion and sediment control;
- Marking and tree removal, and vegetation clearing;
- Establish and maintain traffic controls;
- Utility relocation activities if necessary (i.e. telecommunications);
- Bridge construction;
- Installation of subsoil drainage;
- Pavement construction and sealing;
- Line marking;
- General tidy up of the site including removal of site equipment; and
- Decommissioning of compound sites.

The above methodology would be refined as detailed design progresses. Construction activities would be managed via the preparation and adoption of a Construction Environmental Management Plan (CEMP) which would incorporate all mitigation measures identified within this REF.

## 3.4.2 CONSTRUCTION HOURS AND DURATION

The proposal would be completed over a period of not more than six months. There is sufficient contingency within the timeframe to compensate for bad weather or other unexpected delays.

Hours of work would be standard construction hours being 7am to 6pm Monday to Friday and 8am to 1pm on Saturdays with no work on Sundays or public holidays.

## 3.4.3 PLANT AND EQUIPMENT

The plant and equipment likely to be used during the work is listed below:

- Trucks;
- Rollers;
- Water cart;
- Compactor;
- Bulldozer;
- Excavator;
- Graders;
- Stabiliser;

## 3.4.4 EARTHWORKS

Volumes of earthworks would be determined through detailed design.

- Bitumen sprayer;
- Chainsaw;
- Mulcher;
- Generator;
- Bobcat;
- Road sweeper; and
- Fuel cart.



## 3.4.5 TERRITORIAL REINFORCEMENT

In areas where the proposed alignment adjoins the rail line, separation fencing or landscaping would be required to be installed or maintained to delineate the road and rail land. The details of the proposed reinforcement would be identified at detailed design stage and consultation would occur with the relevant Rail Infrastructure Manager through the construction approval process to ensure the proposed method is acceptable – refer **Table 5.1 (page 24)**.

## 3.4.6 TRAFFIC MANAGEMENT AND ACCESS

A Traffic Management Plan would be developed for the proposal in accordance with the *RTA Traffic Control at Worksites Manual* to be operational for the duration of the work and would be included in the project CEMP.

#### 3.4.7 ANCILLARY FACILITIES

Due to the proximity to Cowra, it is anticipated that work would be staged from the Cowra Shire Council depot with machinery moving with the construction focus. The depot would provide a location for a site office, amenities and parking. Construction material stockpiles would be provided in close proximity to the alignment corridor. Chemicals and fuels may be stored at these locations and would be stored in bunded areas. Materials stockpiled at the site would not be expected to contain acid sulphate soils. Contaminated soils, where encountered during construction, would be disposed of in accordance with the requirements of the Environment Protection Authority (EPA). All stockpiles would be managed in accordance with the Roads and Maritime Services *Stockpile Site Management Procedure* (RTA 2011) and the *QA Specification R44 – Earthworks*. The proposal does not involve longer-term temporary stockpiling of materials.

## 3.4.8 PUBLIC UTILITY ADJUSTMENT

A search of public utilities is to be carried out before the start of work to confirm whether services are located within the vicinity of the proposed work.

Correspondence seeking comment has been sent to a number of relevant service providers as an element of preparation of this REF (refer **Section 5**) however no responses from these utility providers has been received.

Proposed clearing, filling and excavation work may impact on any unknown underground services and before construction the contractor would be advised of the possibility of unknown services to prevent unnecessary disturbance.

Cowra Shire Council is to carry out further consultation with service providers (including but not limited to Essential Energy and Telstra) before beginning work to confirm any specific requirements that may apply when working near services.



# **Statutory Planning Framework**

This section provides the statutory planning context for the proposed upgrade and considers provisions of relevant state environmental planning policies (SEPPs), deemed SEPPs, local environmental plans and other legislation.

# 4.1 STATE ENVIRONMENTAL PLANNING POLICIES

## 4.1.1 STATE ENVIRONMENTAL PLANNING POLICY (INFRASTRUCTURE) 2007

#### 4.1.1.1 Permissibility

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

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

As the proposal is for a new road and road improvements and is to be carried out by or on behalf of Cowra Shire Council, it can be assessed under Part 5 of the *Environmental Planning and Assessment Act 1979*. By virtue of the prevailing status of the ISEPP, 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 No. 14 - Coastal Wetlands, State Environmental Planning Policy No. 26 - Littoral Rainforests or State Environmental Planning Policy (Major Projects) 2005.

#### 4.1.1.2 ISEPP Consultation

Clauses 13-15 of the ISEPP obligate consultation with the local Council where the proposal would impact on Council services or infrastructure, would impact on local heritage or impacts flood liable land. Clause 17 provides an exception to these requirements where the proponent is also the local council with whom consultation is required. The requirements of clauses 13-15 therefore do not apply to this project.

Clause 16(2) of the ISEPP obligates consultation with public authorities other than Councils in the following instances:

(a) development adjacent to land reserved under the National Parks and Wildlife Act 1974—the Department of Environment and Climate Change,

(b) development adjacent to a marine park declared under the Marine Parks Act 1997—the Marine Parks Authority,

(c) development adjacent to an aquatic reserve declared under the Fisheries Management Act 1994 the Department of Environment and Climate Change,

(d) development in the foreshore area within the meaning of the Sydney Harbour Foreshore Authority Act 1998—the Sydney Harbour Foreshore Authority,

(e) development comprising a fixed or floating structure in or over navigable waters—the Maritime Authority of NSW,



(f) development for the purposes of an educational establishment, health services facility, correctional centre or group home, or for residential purposes, in an area that is bush fire prone land (as defined by the Act)—the NSW Rural Fire Service.

Note. The Act defines bush fire prone land, in relation to an area, as land recorded for the time being as bush fire prone land on a map certified as referred to in section 146 (2) of the Act.

Note. When carrying out development of a kind referred to in paragraph (f), consideration should be given to the publication of the NSW Rural Fire Service Planning for Bush Fire Protection 2006.

(g) (Repealed)

The above provisions are not noted to apply to the subject site and therefore ISEPP consultation as required via Clause 16 does not apply to the project.

Notwithstanding, consultation has been undertaken with the local community, affected land owners and relevant regulatory stakeholders as set out in **Section 5**.

#### 4.1.2 STATE ENVIRONMENTAL PLANNING POLICY NO. 44 – KOALA HABITAT PROTECTION

State Environmental Planning Policy 44 - Koala Habitat Protection (SEPP44) aims to:

...encourage the proper conservation and management of areas of natural vegetation that provide habitat for Koalas, to ensure permanent free-living populations over their present range and to reverse the current trend of population decline...

SEPP 44 does not apply to assessments under Part 5 of the EP&A Act.

Nonetheless, it is common practice for Part 5 determining authorities to consider the subject of this SEPP. This policy applies to all LGAs within the known state wide distribution of the Koala listed in Schedule 1 of SEPP44. The Cowra LGA is not listed under Schedule 1, and therefore the policy does not apply and no further assessment of koala habitat is required.

# 4.1.3 STATE ENVIRONMENTAL PLANNING POLICY 55 – REMEDIATION OF LAND

Pursuant to clause 2 of the State Environmental Planning Policy 55 – Remediation of Land (SEPP55):

(1) The object of this Policy is to provide for a Statewide planning approach to the remediation of contaminated land.

- (2) In particular, this Policy aims to promote the remediation of contaminated land for the purpose of reducing the risk of harm to human health or any other aspect of the environment:
- (a) by specifying when consent is required, and when it is not required, for a remediation work, and

(b) by specifying certain considerations that are relevant in rezoning land and in determining development applications in general and development applications for consent to carry out a remediation work in particular, and

(c) by requiring that a remediation work meet certain standards and notification requirements.

Possible land contamination may have occurred in relation to the road use including fuel and oil spills from vehicle incidents.

SEPP55 has specific applicability to land that is to be rezoned (clause 6) or development that is the subject of a development application (clause 7). This proposal does not involve either of these types of development. Notwithstanding, the objects of the policy remain relevant in the consideration of potential contamination relating to the project.



A review of the *List of NSW contaminated sites notified to the EPA as of 6 March 2015* provided on the EPA website (EPA, 2015a) on Friday 24 April 2015 identified four sites within Cowra. One of these sites is located near the proposal area, namely the Shell Depot at 34 Brougham Street. The proposal that caused contamination at the site is recorded as 'other petroleum' and the site status is 'under assessment' (EPA, 2015a).

A search of the *EPA contaminated sites land record* (EPA, 2015b) on Friday 24 April 2015 identified two sites within the Cowra LGA, including the Shell Depot. The other site is not located within or near the proposal area. Two notices have been issued for the Shell Depot, including an 'Agreed Voluntary Remediation Proposal' (Notice No. 26091) issued on 20 Oct 2006, and a 'Declaration of Remediation Site' (Declaration No. 21076) issued on 16 May 2005 (EPA, 2015b).

Specific controls are identified in **Section 6.9.1** relating to the confirmed contamination status of this site and these controls are considered sufficient to achieve compliance with the intent of SEPP55.

# 4.2 LOCAL ENVIRONMENTAL PLANS

## 4.2.1 COWRA LOCAL ENVIRONMENTAL PLAN 2012

The proposed work is within the Cowra LGA. The land to which the proposal applies occurs in several zones as mapped in the *Cowra Local Environmental Plan 2012* (LEP); these zones include:

• R5 – Large Lot Residential. The objectives of the R5 zone are:

To provide residential housing in a rural setting while preserving, and minimising impacts on, environmentally sensitive locations and scenic quality.

To ensure that large residential lots do not hinder the proper and orderly development of urban areas in the future.

To ensure that development in the area does not unreasonably increase the demand for public services or public facilities.

To minimise conflict between land uses within this zone and land uses within adjoining zones.

• RU4 – Rural Small Holdings. The objectives of the RU4 zone are:

To enable sustainable primary industry and other compatible land uses.

To encourage and promote diversity and employment opportunities in relation to primary industry enterprises, particularly those that require smaller lots or that are more intensive in nature.

To minimise conflict between land uses within this zone and land uses within adjoining zones.

E3 – Environmental Management. The objectives of the E3 zone are:

To protect, manage and restore areas with special ecological, scientific, cultural or aesthetic values.

To provide for a limited range of development that does not have an adverse effect on those values.

W2 – Recreational Waterways. The objectives of the W2 zone are:

To protect the ecological, scenic and recreation values of recreational waterways.

To allow for water-based recreation and related uses.

To provide for sustainable fishing industries and recreational fishing.

• IN2 – Light Industrial. The objectives of the IN2 zone are:

To provide a wide range of light industrial, warehouse and related land uses.

To encourage employment opportunities and to support the viability of centres.

To minimise any adverse effect of industry on other land uses.



To enable other land uses that provide facilities or services to meet the day to day needs of workers in the area.

To support and protect industrial land for industrial uses.

RU1 – Primary Production. The objectives of the RU1 zone are:

To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.

To encourage diversity in primary industry enterprises and systems appropriate for the area.

To minimise the fragmentation and alienation of resource lands.

To minimise conflict between land uses within this zone and land uses within adjoining zones.

R1 – General Residential. The objectives of the R1 zone are:

To provide for the housing needs of the community.

To provide for a variety of housing types and densities.

To enable other land uses that provide facilities or services to meet the day to day needs of residents.

To provide attractive, affordable, well located and market-responsive residential land.

To ensure that any non-residential land uses permitted within the zone are compatible with the amenity of the area.

To ensure that housing densities are broadly concentrated in locations accessible to public transport, employment, services and facilities.

To maximise public transport patronage and encourage walking and cycling.

RE1 – Public Recreation. The objectives of the RE1 zone are:

To enable land to be used for public open space or recreational purposes.

To provide a range of recreational settings and activities and compatible land uses.

To protect and enhance the natural environment for recreational purposes.

To maximise public transport patronage and encourage walking and cycling.

The proposed works (roads) are permitted with consent in all of the above-listed zones. As stated in **Section 4.1.1** above, clause 94(1) of the ISEPP outlines development for the purpose or a road or road infrastructure may be carried out by, or on behalf of, a public authority without consent on any land and the ISEPP therefore prevails over any applicable provisions of the LEP.

#### 4.2.1.1 Heritage

Protection for items listed as part of Local Environment Plans is provided under the EP&A Act.

Schedule 5 of the LEP identifies Heritage Items within the Cowra LGA. Schedule 5 identifies 4 heritage items, of both local and state significance, being located within 500 metres of the proposed bypass route; refer **Section 6.5.2** and **Table 6.38**.

The project area is located adjacent to an item of state heritage significance identified as Item I8 (Rail bridge over Lachlan River) in Schedule 5 of the LEP, and on the LEP Heritage Map (refer – **Figure 12**).

Clause 5.10 of the LEP provides the framework for considering the impact associated with development on or near to heritage significant buildings. Due to the prevailing provisions of clause 8 of the ISEPP, the provisions of the LEP are overridden by clause 94 of the ISEPP and are not strictly applicable to the proposal. Notwithstanding this, an assessment the potential for impact to heritage items is provided in **Section 6.5**.



The proposed activities are limited to road improvement work including construction of a proposed road bridge. An assessment of non-indigenous heritage implications associated with the proposal is provided in **Section 6.5.2**. Consultation with the NSW Heritage Division has occurred and their comments are provided in **Section 5**.

#### 4.2.1.2 Sensitive Watercourses

Within the project area, the LEP Riparian Lands and Watercourses Map identifies the Lachlan River and Waugoola Creek as sensitive watercourses, refer – **Figure 16**. A detailed assessment of this matter is provided in **Sections 6.2 and 6.7**.

#### 4.2.1.3 Flood Planning Area

The LEP Flood Planning Map identifies sections of the alignment of the proposed heavy vehicle bypass route that are Flood Planning Areas - refer **Figure 17**, **page 102**. A detailed assessment of this matter is provided in **Section 6.7**.

#### 4.2.1.4 Groundwater Vulnerability

The LEP Groundwater Vulnerability Map confirms that most of the project area is identified as groundwater vulnerable - refer – **Figure 18**, **page 102**. A detailed assessment of this matter is provided in **Section 6.7**.

#### 4.2.1.5 Terrestrial Biodiversity

The LEP Terrestrial Biodiversity Map identifies confirms that terrestrial biodiversity occurs along the alignment of the proposed heavy vehicle bypass at riparian zones associated with the Lachlan River and Waugoola Creek, and at the intersection of Airport Road with Grenfell Road - refer **Figure 6**, page **47**).

A detailed assessment of this matter is provided in Section 6.2.

#### 4.2.1.6 Urban Release Area

Two areas identified via the LEP mapping as urban release areas are identified in the south eastern extent of the proposed alignment – refer **Figure 2**, **page 19**.

Part 6 of the LEP applies to land within an Urban Release Area and relates to the provision of designated state Public Infrastructure, public utility infrastructure and development control plan prior to subdivision, where the land is to be developed intensively for urban purposes. Minor subdivision is required to enable acquisition of impacted land in this area of the alignment however the land, once subdivided, is not proposed to be used intensively for urban purposes and as such the Urban Release Area provisions of the LEP are not considered to apply to this project.





Figure 2: Urban Release Areas (Source: Cowra LEP 2012)

## 4.3 ENVIRONMENTAL PLANNING & ASSESSMENT ACT 1979

## 4.3.1 PART 5 ASSESSMENT

Notwithstanding that the works do not require development consent, Cowra Shire Council remains obligated to consider the environmental impacts of the works pursuant to Part 5 of the EP&A Act.

Consideration under Part 5 is required as the project is defined as an 'activity' and requires 'approval' from Cowra Shire Council as the determining authority.

An approval is defined as:

- (a) a consent, licence or permission or any form of authorisation, and
- (b) a provision of financial accommodation by a determining authority to another person, not being a provision of such financial accommodation, or financial accommodation of such class or description, as may be prescribed for the purposes of this definition by a determining authority so prescribed.

A determining authority is defined by s.110 of the Act:

means a Minister or public authority and, in relation to any activity, means the Minister or public authority by or on whose behalf the activity is or is to be carried out or any Minister or public authority whose approval is required in order to enable the activity to be carried out.



Section 110A identifies the procedure to be followed where the approval of multiple determining authorities, such as the proponent, other local planning authorities or state level regulatory stakeholders, is necessary. The Minister for Planning issued a directive on 14 May 1999 that states, for the purposes of Section 110A of the EP&A Act, where multiple determining authorities are involved, the proponent of an activity is also the nominated determining authority.

A nominated determining authority is defined as:

in relation to an activity, means the determining authority nominated by the Minister in accordance with section 110A in relation to the activity.

This REF has been prepared to facilitate determination through consideration of the relevant factors specified in Sections 111 and 112 of the EP&A Act and Section 228 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation).

Cowra Shire Council, as the determining authority of the activity must:

Examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity (Section 111 of the Act).

Establish whether or not an environment impact statement, or a species impact statement, or both are required for the activity (Section 112 of the Act).

As the proponent and a determining authority, approval for the activity is required to be issued by Cowra Shire Council as the nominated determining authority.

# 4.4 OTHER RELEVANT LEGISLATION

Other legislation and its relevance to the proposal is summarised in **Table 4.1**.

Relevant Legislation	Summary of Relevant Legislation	Applicability to the Proposal
Heritage Act 1977 (The Heritage Division, under NSW Office of Environment and Heritage)	Approval must be obtained from the Heritage Council where the proposal affects a place listed on the State Heritage Register, or where excavation may affect an archaeological relic.	There are 2 identified significant heritage items, both are listed as state significant, being the railway bridge over the Lachlan River and the Cowra Railway Station and buildings.
		The proposal is physically separated from the railway station and buildings by the railway line/corridor (separation distance of approximately 60 metres) and the subject area is already in use as a road. It is therefore not anticipated that the project would effect this item and as such no consent is considered to be required under the Heritage Act.
		The proposed alignment would pass beneath the western approach to the railway bridge and potentially require changes to the approach support columns. The detailed design of this section of the road and bridge has not been completed and therefore the potential to minimise disturbance exists. In the event any works were proposed that would impact the bridge, a consent is likely to be required under the Heritage Act. This matter would need to be revisited once detailed design of this arrangement is progressed – refer <b>Section 6.5.2.</b>
		Despite the elevated nature of the bridge, there is the potential for the disturbance of

Table 4.1 – Summary of Relevant Legislation and Applicability to the Proposal



Table 4.1 – Summar	y of Relevant Le	gislation and	Applicability	to the Proposal
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Relevant Legislation	Summary of Relevant Legislation	Applicability to the Proposal		
		relics in its vicinity and therefore Part 6, Division 9 of the Heritage Act may be relevant – refer <b>Section 6.5.2</b> .		
Native Vegetation Act 2003 (Central West Local Land Service)	The Act requires development approval from Local Land Services for the clearing of any native vegetation. Approval may only be granted under the Act for proposals that improve or maintain environmental outcomes. Clause 25 of the NVA excludes any clearing carried out via a Part 5 assessment under the EP&A Act.	This Review of Environmental Factors represents an assessment under Part 5 of the EP&A Act and therefore the development does not require development approval as per Clause 25 of the NVA. Notwithstanding, the LLS have been consulted on this proposal but have not provided comment, refer <b>Section 5</b> .		
Protection of the Environment Operations Act 1997 (NSW Office of Environment & Heritage, Environment Protection Authority)	The Act enforces licences and approvals formerly required under separate Acts relating to air, water and noise pollution and waste management with a single licence. Development requires a licence under the Act, should it meet the assessment criteria outlines in Schedule 1 of the EPA licensed activities.	A licence is not considered necessary for the proposal as it does not constitute a scheduled activity by reference to clause 35, Part 1, Schedule 1 of the POEO Act on the basis that the proposed road does not involve the development of more than four travel lanes.		
Roads Act 1993 (Roads and Maritime Services)	Section 138 of the Act requires that a person obtain the consent of the appropriate roads authority for the erection of a structure, or the carrying out of work in, on or over a public road, or the digging up or disturbance of the surface of a public road. If the applicant is a public authority, the roads authority must consult with the applicant before deciding whether to grant consent. This section applies to a roads authority and any employee of a roads authority. Section 138(3) obligates a road authority to seek the concurrence of Roads and Maritime where the work relates to a classified road.	Cowra Shire Council is the applicable roads authority for all roads within the project alignment. However, concurrence from Roads and Maritime is required as the alignment intersects with classified roads in four locations – refer <b>Section 5</b> . The proposal would also require consent from Roads and Maritime Service's regional traffic management officer in the event that the proposed work to enable connection of the proposed bypass road to any of the classified roads would involve prolonged road closures or restrictions. It is anticipated that traffic would be managed under traffic control and prolonged closure would not be required. It is therefore understood that consent is not required in this regard.		
Road Transport Act 2013 (Roads and Maritime Services)	The Road Transport Act 2013 empowers Roads and Maritime Services to set speed limits via Regulations	Notwithstanding that the road is likely to remain a local road under the control and management of Cowra Shire Council, Roads and Maritime retain the authorisation role for the setting of speed limits. Authorisation would be required from Roads and Maritime Services for setting of limits prior to the road opening.		
Threatened Species Conservation Act 1995 (NSW Office of Environment and Heritage)	Section 5A of the EP&A Act outlines 7 factors that must be considered to determine the significance of the impact of a development or activity on threatened species, populations or endangered ecological communities (EEC) known or considered likely to occur in the study area and environs.	The ecological assessment completed concluded that the proposal would not significantly impact any habitat of threatened species, population or EEC in the site, refer <b>Section 6.2</b> . No further consideration of the Act is therefore necessary.		
Water Management Act 2000 (NSW Office of Water)	A controlled activity approval (CCA) is required for certain types of developments and activities that are carried out in or near a river, lake or estuary. An access licence is required before extraction identifying the volume of water to be used.	Public Authorities are exempt from the need to obtain a CAA. No water extraction is proposed.		
Fisheries Management Act 1994	Part 7 of the FM Act applies where dredging or reclamation work is proposed within water land (defined as the area	Work would occur within water land and therefore a dredging and reclamation permit (Part 7) would be required from		



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Relevant Legislation	Summary of Relevant Legislation	Applicability to the Proposal
(NSW Department of Primary Industries - Fisheries)	between the river banks) AND which constitutes key fish habitat.	NSW DPI (Fisheries) prior to work commencing – refer <b>Section 7.2</b> .

# 4.5 COMMONWEALTH LEGISLATION

#### 4.5.1 ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) a referral is required to the Australian Government for proposed 'actions' that have the potential to significantly impact on matters of national environmental significance or the environment of Commonwealth land. These are considered throughout **Section 6** and specifically in **Section 6.2** and **Appendix A**.

The assessment of the proposal's impact on matters of national environmental significance and the environment of Commonwealth land found that there would not be a significant impact on relevant matters of national environmental significance or the environment of Commonwealth land. Accordingly, the proposal has not been referred to the Australian Government Department of the Environment (DoE).

## 4.6 CONFIRMATION OF STATUTORY POSITION

An Environmental Impact Statement (EIS) is required if the Review of Environmental Factors concludes the proposal is likely to have a significant effect on the environment. Clause 228 of the Environmental Planning and Assessment Regulation 2000 contains a detailed list of factors that must be taken into account when assessing the impact of an activity on the environment. A checklist of these matters is provided in **Appendix A**. The assessment demonstrates to the satisfaction of the nominated determination authority the proposal would not have a significant effect on the environment and as such an EIS is not required.

Part 5.1 of the EP&A Act identifies development which is state significant infrastructure or critical state significant infrastructure. *State Environmental Planning Policy (State and Regional Development) 2011* outlines the types of development that is categorised as such. The proposed activity does not fall into these definitions and so does not trigger assessment under Part 5.1 of the Act.

The proposal can therefore be assessed under Part 5 of the EP&A Act. Development consent from Council is not required.



# Consultation

# 5.1 COWRA HEAVY VEHICLE BYPASS STUDY CONSULTATION

Community and stakeholder consultation was facilitated by GHD as part of the Cowra Heavy Vehicle Bypass Study between August and September 2012. The aim of consultation was to provide opportunities for the community to express their opinions about potential route options under consideration and to suggest alternative options.

Community consultation included one community drop-in session, a stand at Cowra Show, and advertising. The drop-in session and stand at the Cowra show both provided an opportunity for community feedback. Advertising included posters at the Council shop front, Council website advertising, and advertisements in the Cowra Guardian newspaper.

Stakeholder consultation included one meeting with key stakeholders and Roads and Maritime Services, and another with local Councillors. The meetings provided information on the study process and program, and discussed the four route options developed during the Land-Use Strategy study as well as other potential options. Key stakeholders identified included the following:

- Residents directly impacted by the proposed routes;
- Businesses with economic interest in the heavy vehicles that currently pass through the town;
- Commercial establishments on the proposed and the existing route;
- The general community impacted through changes to traffic movement in the town; and
- Service providers and service users of community facilities impacted.

There was a high level of community response to the consultation process, and as a result Option 3 was selected as the most popular route option.

## 5.2 ISEPP CONSULTATION

Consultation in accordance with the ISEPP provisions is not required for the project – refer to **Section 4.1.1.2** 

## 5.3 CONSULTATION

## 5.3.1 REGULATORY STAKEHOLDERS AND SERVICE PROVIDERS

Notwithstanding that there is no specific obligation to undertake consultation via the ISEPP, comment from the following service providers and regulatory authorities has been sought:

- NSW Office of Water;
- NSW Department of Fisheries and Aquaculture;
- Central West Local Land Services;
- NSW Office of Environment and Heritage, including the Environment Protection Authority and Heritage Council of NSW;
- Jemena Gas;
- NSW Roads and Maritime Services;
- Essential Energy;
- Local Land Services NSW; and



#### • John Holland Rail.

All responses provided are attached as **Appendix D** and a summary of responses is provided in **Table 5.1** together with the relevant section of the REF where matter raised are addressed.

Table 5.1 – Summary	v of consultation	responses from	service provider	s and regulator	v stakeholders
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Respondent	Summary of response	Section of the REF addressed
NSW Department of Primary Industries, Office of Water	<ul> <li>Key aspects relevant to Office of Water for the proposed bypass are likely to include:</li> <li>Construction within 40m of the Lachlan River and Waugoola Creek and resulting impacts to bank stability, water quality and the riparian vegetation. Cowra Shire Council as a public authority is exempt from requiring a Controlled Activity Approval under the Water Management</li> </ul>	Noted
	<ul> <li>Act 2000 for works within 40m of a watercourse.</li> <li>Construction of a new bridge over the Lachlan River and potential for an upgrade of the existing crossing of Waugoola Creek.</li> <li>Water demands and sources for dust suppression and road construction.</li> <li>Potential for groundwater interception due to potential excavation.</li> <li>It is recommended the REF include:</li> <li>Details of water proposed to be taken via groundwater interception or water supply sources.</li> <li>Concept design of watercourse crossings and works within 40m of the high bank of watercourses.</li> <li>Assessment of potential impacts on flooding due to the proposed road construction, particularly near the Lachlan River and Waugoola Creek.</li> <li>Assessment of impacts on surface and ground water sources (both quality and quantity), watercourses, riparian land, and groundwater dependent ecosystems, and measures proposed to reduce and mitigate these impacts.</li> <li>Management of erosion and sediment control to mitigate impacts on water sources.</li> <li>Assessment of any water licensing requirements.</li> <li>Consideration of relevant policies and guidelines such as the "Guidelines for Controlled Activities on Waterfront Land (2012)" and the "NSW Aguifer Interformere Policy"</li> </ul>	<ul> <li>Noted</li> <li>Noted</li> <li>Noted</li> <li>Section 6.7</li> <li>Drawings</li> <li>Section 6.7</li> <li>Sections 6.7 &amp; 6.2</li> <li>Sections 6.7 &amp; 6.10</li> <li>N/A</li> <li>Section 6.7</li> </ul>
NSW Department of Primary Industries, Department of Fisheries	The main items of interest in relation to the proposed project from a fisheries perspective relate to the crossings of the Lachlan River and Waugoola Creek. Both the Lachlan River and Waugoola Creek are considered to be Key Fish Habitat. See Cowra KFH map available at: http://www.dpi.nsw.gov.au/fisheries/habitat/publications/protection/key-fish-habitat-maps There is an existing crossing of Waugoola Creek (Campbell Street). The REF should explain whether this will be retained, upgraded or replaced. If the latter, the REF should provide details. Both the river and creek are within the geographic range of the Lower Lachlan Endangered Ecological Community. Information on this listing can be found at: http://www.dpi.nsw.gov.au/fisheries/species-protection/conservation/what-current/endangered/lachlan-river-eec As a result, the REF should include a Test of Significance for this EEC. The nature, quality and extent of riparian and instream habitats at the bridge site(s) should be detailed. The potential impact upon riparian and instream habitats resulting from the construction of the new bridge(s) should be detailed. Please forward the completed REF to the Huskisson office for review.	<ul> <li>Sections 6.7 and 6.2</li> <li>Section 3.3.5</li> <li>Section 6.2</li> </ul>
John Holland Rail on behalf of Transport for New South Wales (in their capacity as Rail Infrastructure Manager for the Country Regional Network) – 1st response	For any works on John Holland Land, you will need to submit an application form. Please use the link below: https://adobeformscentral.com/?f=BdUcAl0uf0KcRRjta3s0DA	Section 7.2



#### Table 5.1 – Summary of consultation responses from service providers and regulatory stakeholders

Respondent	Summary of response	Section of the REF addressed
John Holland Rail on behalf of Transport for New South Wales (in their capacity as Rail Infrastructure Manager for the Country Regional Network) – 2 <sup>nd</sup> response	<ol> <li>Approval process would be two part:         <ul> <li>Approval in Principle – approval of the concept</li> <li>Construction approval – final approval being granted with the issuing of legal agreements (Works Deed and Infrastructure licence)</li> </ul> </li> <li>The Road Rail Interface Agreement between JAR and Council would need to be updated.</li> <li>It is likely the Engineering Manager would require a structural assessment of the bridge (with the selected contractor requiring Engineering Authority to be granted by JHR Principal Structural Engineer prior to the assessment being carried out)</li> <li>If Council is planning on gazetting the road for heavy vehicles, JHR/TfNSW would need to be a stakeholder in the process, especially given the changes to the Heavy Vehicle National Law.</li> <li>JHR have an Environmental Protection Licence over the proposed area.</li> <li>Any encroachment on the corridor would need to be approved (if no fence – generally 15m from the outer face of the rail).</li> <li>Comments from JHR Environmental Manager:         <ul> <li>RING won't apply in this instance;</li> <li>Assume the soil is at least industrially contaminated unless tested otherwise (I recommend testing – any soil removed will have to be classified).</li> <li>The consultation must be as per ISEPP part 3, division 15; subdivision 2 Development in Rail Corridors, noting that whilst JHR P/L are not specifically referenced, we are the RIM on behalf of TfNSW and must be consulted during the draft REF stage.</li> </ul> </li> <li>Additionally, I believe you will encounter accreditation implications if you need to alter the structure of the bridge, refer to the Rail Safety National Law 2012 for more detail.</li> </ol>	<ul> <li>Section 7.2</li> <li>Section 7.2</li> <li>Section 7.2</li> <li>Section 7.2</li> <li>Section 7.2</li> <li>Noted</li> <li>Section 7.2</li> <li>Noted</li> <li>Section 6.10</li> <li>Section 7.2</li> <li>These provisions apply to Part 4 developments only. However, a draft of the REF would be provided to JHR – refer Section 7.2</li> </ul>
John Holland Rail on behalf of Transport for New South Wales (in their capacity as Rail Infrastructure Manager for the Country Regional Network) – 3 <sup>rd</sup> response	<ul> <li>The New South Wales Government's Transport for NSW is the land owner of the Country Regional Network (CRN) railway lines across NSW. As of 15 January 2012, John Holland Rail Pty Ltd (JHR) has been appointed to manage the CRN. As such JHR is responsible for reviewing developments, plans and policies adjoining the rail corridor to ensure any potential impacts of or on future rail operations are considered. Based on the alignment provided in your letter JHR requests that the following matters are addressed in the Environmental Assessment:</li> <li>Crossing of rail corridor: It appears the proposed bypass crosses the rail corridor immediately west of the Lachlan River crossing. With any crossing JHR should be consulted regarding the appropriate vertical and horizontal clearances and other engineering requirements.</li> <li>Boundary treatments: It appears in some locations the proposed bypass will directly adjoin the rail corridor. In these locations JHR requests details of the proposed method of separation, including fencing and/or landscaping treatments.</li> <li>Details of any excavation within 25 metres of the rail corridor: Should any excavation in excess of 2 metres be proposed within 25m of the rail corridor.</li> <li>Stormwater disposal: The proposal should ensure no additional stormwater flows toward the rail corridor: Should any readignment of the rail corridor.</li> <li>Any proposed alignment of the rail corridor: Should any realignment be proposed operational noise assessment as well as construction noise assessment will be required. Operational Noise must be assessed against the Rail Infrastructure Noise Guidelines (RING).</li> <li>Contaminated lands specialist to determine WH&amp;S risk, and pollution risk.</li> <li>Any access to the corridor to undertake vegetation/soil (etc.) assessment must be through 3rd party works. The third party access application can be completed online at:</li> </ul>	<ul> <li>Section 7.2</li> <li>Section 3.4.5</li> <li>Noted</li> <li>Noted</li> <li>None proposed</li> <li>Refer Section 6.10</li> <li>Noted</li> </ul>


## Table 5.1 – Summary of consultation responses from service providers and regulatory stakeholders

Respondent	Summary of response	Section of the REF addressed	
	https:lladobeformscentral.coml?f=BdUcAlOufOKcRRjta3sODA		
Heritage Council of New South Wales	<ul> <li>The REF should address the following issues:</li> <li>The heritage significance of the route and any impacts that the development may have upon this significance should be assessed. This assessment should include natural areas and places of Aboriginal, historic or archaeological significance. The assessment should also include a</li> </ul>	Section 6.5	
	<ul> <li>consideration of wider heritage impacts in the area surrounding the site;</li> <li>The Heritage Council maintains the State Heritage Inventory which lists items protected under the <i>Heritage Act 1977</i> and other statutory instruments. This register can be accessed at http://www.heritage.nsw.gov.au;</li> </ul>	Section 6.5	
	The legal standing of items listed on the State Heritage Register can also be provided by applying for a section 167 Certificate through the Heritage Division home page at the address given below; You should consult lists maintained by the Office of Environment & Heritage, the National Trust of Australia (NSW), the Australian Government under the <i>Environment Protection and Biodiversity Conservation Act 1999</i> and Cowra Shire Council in order to identify any identified items of heritage significance in the area affected by the proposal. Such items may have been identified in the Cowra Heritage Study but may not have proceeded to statutory listing on Cowra Local Environmental Plan. An example is Jerula homestead, cottage and private cemetery on Darby Falls Road. Please be aware that these lists are constantly evolving and that items with potential heritage significance may not yet be listed;	• Noted	
	Non-Aboriginal heritage items within the area affected by the proposal should be identified by field survey. This should include any buildings, works, relics (including relics underwater), gardens, landscapes, views, trees or places of non-Aboriginal heritage significance. A statement of significance and an assessment of the impact of the proposal on the heritage significance of these items should be undertaken. Any policies/measures to conserve their heritage significance with the guidelines in the <i>NSW Heritage Manual</i> . Field survey and assessment should be undertaken with historic sites experience.	• Section 6.5.2	
	<ul> <li>The proposal should have regard to any impacts on places, items or relics of significance to Aboriginal people. Where it is likely that the project will impact on Aboriginal heritage, adequate community consultation should take place regarding the assessment of significance, likely impacts and management/mitigation measures. For guidelines regarding the assessment of Aboriginal sites, please contact the Environmental Protection &amp; Regulation Group of the Office of Environment &amp; Heritage;</li> </ul>	Section 6.5.1	
	• The relics provisions in the Heritage Act 1977 require an excavation permit to be obtained from the Heritage Council, or an exception to be endorsed by the Heritage Council, prior to commencement of works if disturbance to a site with known or potential archaeological relics is proposed. Where possible, refer to archaeological zoning plans or archaeological management plans held by Cowra Shire Council. If any unexpected archaeological relics are uncovered during the course of work excavation should cease and an excavation permit, or an exception notification endorsement, obtained;	• Section 6.5.2	
	<ul> <li>If any exist, archaeological zoning plans or archaeological management plans should also be consulted;</li> <li>If approval is required under the <i>Heritage Act</i> 1977 due to the listing of an item or place on the State Heritage Register, or being subject to an Interim Heritage Order, the Heritage Council's approval must be sought prior to an approval being issued by the consent authority under the <i>Environmental Planning and Assessment Act</i> 1979 (except where application relates to Integrated Development or State Significant Infrastructure or State Significant Development Major Projects under Parts 4 or 5 of the <i>EP&amp;A Act</i> 1979). In accordance with section 67 of the <i>Heritage Act</i> 1977, any approval given by a consent authority is void if it is given before the Heritage Council's determination of the application has been notified to the consent authority.</li> </ul>	<ul> <li>None known to apply</li> <li>Section 7.2</li> </ul>	
NSW Office of Environment and Heritage	The Environmental Planning and Assessment Act 1979 (EP&A Act) requires that the REF should fully describe the proposal, the existing environment and impacts of the proposal. It is the responsibility of the proponent and consent		



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Respondent	Summary of response	Section of the REF addressed
	authority to adequately consider the requirements under the EP&A Act and the Environmental Planning and Assessment Regulation 2000. OEH can provide advice on the REF where it deals with and natural and cultural heritage conservation issues. OEH may also comment on the legitimacy of the conclusions reached regarding the significance of impacts by the proposed development to these components of the environment. This letter directs you primarily to our generic guidance material. However please note that it is up to the proponent (and later the consent/determining authority after appropriate consultation) to determine the detail and comprehensiveness of the surveys and level of assessment required to form legally defensible conclusions regarding the impact of the proposal. The scale and intensity of the proposed development should dictate the level of investigation. It is important that all conclusions are supported by adequate data. OEH Requirements In summary, the OEH's key information requirements for the proposal include an adequate assessment of:	
	<ol> <li>Impacts to Aboriginal cultural heritage objects; and</li> <li>Impacts on flora, fauna, threatened species, populations, communities and their habitats.</li> <li>This assessment should include consideration of direct and indirect impacts as a result of both construction and operation of the project. Assessment of any cumulative impacts of this and other developments in the area will be essential.</li> </ol>	<ul><li>Section 6.5</li><li>Section 6.2</li></ul>
	Flora, Fauna and Threatened Species A copy of our generic Environmental Impact Assessment requirements for biodiversity are included in Attachment 1. Associated guidance documents are referenced in Attachments 1 and Attachment 2. These guidelines address requirements under the EP&A Act and OEH's areas of responsibility relating to flora, fauna and threatened species, populations and ecological communities and their habitats. OEH is committed to the protection, appropriate management, and where necessary, rehabilitation of native vegetation. For these reasons, OEH considers that careful planning should precede any development that involves further vegetation. Cultural Heritage	Section 6.2
	The importance of protecting Aboriginal Cultural Heritage is reflected in the provisions under Part 6 of the NP&W Act 1974, as amended. That Act clearly establishes that Aboriginal objects and places are protected and may not be harmed, disturbed or desecrated without appropriate authorisation. Importantly, approvals under Parts 4 and 5 of the EP&A Act 1979 do not absolve the proponent of their obligations under the NP&W Act 1979. Under the NP&W Act 1974, it is the responsibility of each individual proposing to conduct ground disturbance works to ensure that they have conducted a due diligence assessment to avoid harming Aboriginal objects by the proposed activity. OEH has produced a generic due diligence process, which is not mandatory to follow, however any alternative process followed must be able to demonstrate their process was reasonable and practicable in attempts to avoid harm to Aboriginal objects. Consultation must also be in accordance with the Aboriginal cultural heritage consultation requirements for proponents 2010 (DECCW 2010) as set by OEH if impact to cultural heritage is unavoidable.	• Section 6.5
NSW Environment Protection Authority	The EPA is aware that the proposed route is an 8.4 kilometre section that will utilise approximately 5 kilometres of existing road (including widening and improvements) but would also involve the construction of approximately 3.4 kilometres of new road. With respect to licensing, the EPA requests that the status of the road construction be determined by the proponent with regards to Section 35 - Road Construction in Schedule 1 of the Protection of the Environment Operations Act 1997 (the POEO Act). If it is determined a licence is not required, the EPA will however be the Appropriate Regulatory Authority (ARA) in relation to any environmental pollution matters for the proposal as the work is being undertaken by, or on behalf of, a public authority, in this instance Cowra Council. Council must comply with the requirements of the POEO Act including, but not limited to:	
	<ul> <li>Section 115 and 116 (regarding disposal of waste and leaks, spillages and other escapes);</li> <li>Section 120 (regarding pollution of waters);</li> </ul>	<ul><li>Section 6.11</li><li>Section 6.7</li></ul>



## Table 5.1 – Summary of consultation responses from service providers and regulatory stakeholders

Respondent	Summary of response	Section of the REF addressed	
	<ul> <li>Section 124 and 126 (regarding operations that result in air pollution);</li> </ul>	Section 6.6	
	<ul> <li>Section 139 (regarding noise pollution); and</li> <li>Section 167 (regarding the appropriate maintenance and operation of plant</li> </ul>	Section 6.3	
	and equipment). Council should also be aware of Section 257 of the POEO Act which	<ul> <li>Section 6.10</li> </ul>	
	encompasses vicarious liability. The proposed works should not result in the pollution of land/waters so long as best management practices for erosion and sediment control are undertaken during construction activities, and appropriate remediation measures are implemented on a progressive basis. Environmental Impacts Requiring Consideration		
	Guidance Material enclosed:		
	<ul> <li>Noise and Vibration - identify potential noise and vibration impacts during both the construction and operational stages and identify mitigation strategies to be incorporated for both stages to minimise noise and vibration and comply with relevant legislation on noise control and any relevant NSW policies:</li> </ul>	Section 6.3	
	<ul> <li>Air Quality and Odour - identify potential air quality impacts (point source diesel emissions from plant and equipment and/or fugitive dust emissions) during the construction stage and identify mitigation strategies to minimise point and/or fugitive emissions;</li> </ul>	Section 6.6	
	<ul> <li>Land Contamination - identify if the soils in the area of the Proposal are contaminated and if so, identify any remedial and/or disposal actions that will be required/undertaken:</li> </ul>	Section 6.10	
	<ul> <li>Water Contamination - identify potential impacts to surface and groundwater during the construction and operational stages (including waterway crossings) and identify appropriate pollution control systems/measures to protect surface and groundwater resources, particularly erosion and sediment controls during ~he construction stage and the rehabilitation stage and the inclusion of permanent erosion and sediment controls where required;</li> </ul>	Section 6.7	
	<ul> <li>General Flooding Impacts - any developments should be designed and undertaken in accordance with the State Government's Flood Policy as outlined in the NSW Government Floodplain Development Manual 2005 (or any revision)</li> </ul>	Section 6.7	
	<ul> <li>Waste Management - identify options and strategies for waste minimisation; reuse and recycling across all activities during the construction strate and empropriate dispaced entires;</li> </ul>	Section 6.11	
	<ul> <li>Storage of Chemicals/Fuels - ensure adequate control measures are in place for storages to reduce the risk of spills contaminating waterways and land during the construction stage; and</li> </ul>	Section 6.10	
	<ul> <li>Incident Management Procedures - adequate procedures should to be established including notification requirements to the Appropriate Regulatory Authority and other relevant authorities for incidents that cause, or have the potential to cause material harm to the environment (Part 5.7 of the POEO Act).</li> </ul>	Section 6.11	
	It is recommended that priority should be given to achieving a high standard of erosion and sediment control and general site housekeeping throughout the construction period. Council, or any contractor engaged by Council, should develop and implement activities associated with the Proposal in accordance with relevant guidelines, particularly the EPA endorsed publication "Managing Urban Stormwater – Soils and Construction, 4th Edition" (Landcom, 2004) (or any revision) and the EPA produced addendum publications "Volume 2A: Installation of Services" and "Volume 20: Main Road Construction" (DECC, 2008) etc	Section 6.7	
NSW Transport Roads and Maritime Services Initial response dated 1 June 2015	The route proposed by Council has been reviewed. The bypass is located on existing and proposed public roads including a new bridge over the Lachlan River. The proposal will also involve new intersections or upgrades to existing intersections with State classified roads, being, Mid Western Highway (HW6), Olympic Highway (HW78) and Lachlan Valley Way (MR56). The proposed route also crosses Darbys Falls Road (MR576) which is a regional classified road. Roads and Maritime Services notes Council has engaged Geolyse to prepare an REF for this route only. Therefore, the comments you seek are confined to environmental and safety aspects of the route, as now proposed, and not in relation to the suitability of the route itself.	• Refer Section 6.4.2.6	



Respondent	Summary of response	Section of the REF addressed	
	<ul> <li>To assist in the development of an REF, Roads and Maritime Services provides the following comments:</li> <li>Mid Western Highway, Olympic Highway, Lachlan Valley Way, and Darbys Falls Road are classified roads. Under Section 138(2) of the Roads Act 1993 the concurrence of Roads and Maritime is required prior to a consent being issued for any new connections or upgrading of intersections to these roads.</li> <li>Proposed bypass route intersections with classified roads will need to be designed and constructed in accordance with Austroads Guide to Road Design and Roads and Maritime Supplements. To understand the impacts of and intersection requirements for the bypass route, a Traffic Study will need to be prepared which identifies vehicle types, volumes and origin/destination projected to access and travel the bypass. To assist you in the development of the Traffic Study, Roads and Maritime suggests the standard format for preparing traffic impact studies provided in Table 2.1 Section 2 of the RTA 's Guide to Traffic Generating Developments 2002.</li> <li>Intersections (private and public) with the bypass route will need to achieve Safe Intersection Sight Distance (SISD). Table 3.2 Part 4A of Austroads Guide to Road Design is attached which provides SISD minimum measurements. Intersections of the bypass route and the Olympic Highway.</li> <li>Consideration of, and adequate provision for, school bus stops need to be included in the design of the bypass route.</li> <li>Adequate vertical and horizontal clearances should be provided along the route to accommodate over-size and over-mass vehicles.</li> <li>Where the bypass route intersects with classified roads, traffic on the classified road will have priority over traffic on the proposed bypass road.</li> <li>90 degree bends in the route should be avoided by providing curves with larger radii to better accommodate heavy vehicles.</li> <li>Roads and Maritime Services welcomes the opportunity to provide assistance in the development of an REF. The proposed b</li></ul>		
NSW Transport Roads and Maritime Services Updated response dated 22 November 2016	<ul> <li>Roads and Maritime provides in-principle support for the proposed bypass, including the proposed at-grade intersections with the classified road network.</li> <li>As discussed with Council, at this time RMS does not provide concurrence under section 138(2) of the <i>Roads Act 1993</i> for the proposed intersections with the classified road network, at Lachlan Valley Way (MR56), the Mid Western Highway (HW6), Olympic Highway (HW78) and Darby Falls Road (MR576). I confirm that Council is not currently seeking concurrence and understands that concurrence will be subject to further consideration once the designs of the intersection treatments have advanced.</li> <li>To assist in progressing the bypass project, Council has also requested Roads and Maritime to comment on the following matters, in addition to giving in principle support:</li> <li>1) Factors that could affect future consideration of the proposed bypass route for gazettal as a classified road:</li> <li>Classified roads perform a higher function than local roads in terms of the regional movement of freight and people. Because of this higher function, it is important that the road environment provides a high level of road safety, traffic reliability and infrastructure integrity. In this regard, the following features of the proposed corridor and alignment have been identified that may require further consideration:</li> <li>The number and frequency of private accesses and local road intersections along some lengths of the proposed route, should such access to the bypass be retained, is consistent with an urban environment and low speed zone. Consideration should be given to</li> </ul>	Refer Section     6.4.2.6	



Table 5.1 – Summary of consultation responses from service providers and regulatory stakehole	ders
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Respondent	Summary of response	Section of the REF addressed
	<ul> <li>preserving a road corridor that allows adequate width to create service roads for accesses and minimises the number of intersections with the bypass route.</li> <li>The proposed horizontal alignment includes curves with radii that appear deficient for an 80 km/h alignment, in particular on Airport Road.</li> <li>The proposed vertical alignment includes grades that appear deficient for an 80 km/h alignment, particularly for heavy vehicles and on approach to intersections.</li> <li>Vertical clearances, in particular at the proposed intersection with Lachian Valley Way. Adequate vertical and horizontal clearances, should be allowed for to accommodate over-dimension vehicles.</li> <li>There does not appear to be aplanning scheme designed to ensure adjoining and nearby land uses are compatible with the proposed bypass route. Land use planning that provides compatible land-uses and appropriate controls to limit access to the route, would assist in preserving the amenity of the proposed route and in reducing the risk of land use conflict between neighbouring landholders and the bypass.</li> <li>It is not currently clear that the proposed route and in reducing the risk of land use conflict between neighbouring landholders and the bypass.</li> <li>It is not currently clear that the proposed oute and in reducing the risk of the route, and includes lengths which may be suitable for no more than a 50 km/h speed limit. In designing the proposed bypass, the travel suggest that it will be difficult to achieve an 80 km/h speed for no more than a 50 km/h speed limit. In designing the proposed dor future gazettal as a classified road, the level of safety, journey reliability, pavement quality and amenity to road users and adjacent landholders should dfer an improvement on the existing classified network. As discussed with Council, Roads and Maritime understand sthat Council may stage the development of the proposed bypass. In this regard Road and Maritime recommends that the next step should be the identification and pr</li></ul>	



## 5.3.2 ABORIGINAL STAKEHOLDER CONSULTATION

In line with the proposal to prepare an Aboriginal Cultural Heritage Assessment and with the OEH *Aboriginal Cultural Heritage Consultation Requirements for Proponents*, consultation with Aboriginal stakeholders is to occur on the following basis:

Step	Status
<ul> <li>Notification of proposal and registration of interest:</li> <li>Write to prescribed organisations;</li> <li>Advertise for interested parties;</li> <li>Register the respondents;</li> </ul>	Completed
Present/provide information to registered parties	Completed
Record any agreed outcomes	Completed
Provide proposed study methodology to registered parties	Completed
Consider any responses to the methodology noting any issues and decisions	Completed
Seek information on known objects or places of cultural value	Completed
Seek information on potential management options for known objects and places	Completed
Inspect subject area with nominated Registered Aboriginal Parties	Completed
Provide draft ACHA report to all stakeholders for review	Completed
Final report (including letters from Aboriginal parties) provided to OEH and Registered Aboriginal Parties.	Completed

Table 5.2 – Aboriginal stakeholder consultation

Source: Aboriginal Cultural Heritage Consultation Requirements for Proponents

## 5.3.3 LANDOWNER CONSULTATION

All land directly adjacent to the proposed alignment was identified and letters delivered/sent directly to these landowners. Directly affected residents were directed to obtain more information either from Council's website or by contacting Geolyse, and comments were sought on the potential impacts associated with the construction and operation of the bypass. Affected residents were also advised of a public meeting to be convened on the 6 May to discuss the environmental assessment. Councillors were separately written to and also invited to a briefing meeting to be held on the 6 May, prior to the public meeting.

A total of 140 letters were sent to affected land owners with comments sought within 28 days (by 20 May 2015) together with the placement of an advertisement in the local newspaper and listing of information on Council's website. A copy of the letter sent to affected residents and the list of recipients is provided in **Appendix G**. The consultation period was extended to the 21 May as copies of the minutes of the public meeting were sent out to attendees on the 14 May to assist in preparing submissions and seeking final responses within 7 days, i.e. 21 May. Within this 29 day period a total of 19 written submissions (letter and email) were received together with six phone calls. A further four letters and one phone call were received outside of this time period and the comments from these have also been included and addressed for completeness. A summary of all submissions received (written and verbal, in the form of a log) is provided in **Appendix H** together with a response to each matter and a cross reference to the area of the REF where the matter is addressed in detail (where relevant).

Minutes from the Councillor meeting held on the 6 May are provided in Appendix E.

Minutes from the public meeting held on the 6 May are provided in **Appendix F.** Draft minutes were circulated to meeting attendees on the 14 May seeking comments to be provided within seven days.

In general, the consultation process identified the following core matters of concern: environmental impacts in relation to noise (both construction and operation), detrimental impacts to land values, loss of amenity and impacts to traffic safety.



It is noted that a high level of concern by those affected land owners consulted during the preparation of this REF with the Council's original decision to adopt the route alignment. Given the engagement of Geolyse is to assess environmental impacts associated with the alignment (adopted by Council at their meeting of 22 July 2013), consideration of other alignment options or the process by which the route was selected are not addressed (beyond the summary of the route selection distilled from the GHD Bypass Study provided in **Section 2.4**) via this assessment.

Following preparation of the draft REF, and review by Council, a second period of public consultation occurred. During this 30 day period during a summary of the findings of the REF were presented to Councillors and senior staff and a second public meeting was held. The draft REF was also provided to a range of regulatory stakeholders for additional comment. A summary of matters raised by statutory regulators during this second round of consultation are provided in **Table 5.1**. Copies of submissions are provided in **Appendix D**.

A total of 14 written responses were received from members of the public during public exhibition period and these are summarised in **Appendix H**, together with a reference to the relevant section of the REF where matters raised are addressed.

# 5.4 FURTHER CONSULTATION

Further consultation would be required during concept and detailed design and prior to construction commencing with the following entities:

- Service providers;
- Land owners affected, or potentially affected, by acquisition;
- Heritage Council;
- John Holland Rail;
- NSW Roads and Maritime Services;
- NSW Department of Primary Industries (Fisheries); and
- NSW Department of Primary Industries (Water).



# **Assessment of Impacts**

## 6.1 LANDSCAPE CHARACTER AND VISUAL AMENITY

The following Landscape Character and Visual Impact Assessment has been prepared in accordance with Section 6 of the Roads and Maritime Services *Guidelines for landscape character and visual impact assessment* (RMS 2013).

## 6.1.1 EXISTING ENVIRONMENT

The extent of the area of the proposal that may be visible is defined in the Visual Envelope Map (VEM) in **Figure 3**. The VEM, also known as the 'visual catchment', is defined as the area within which a project can be seen at eye level above ground (RMS, 2013).

The visual catchment is primarily related to the existing landform, and secondarily to the existing natural and built features in the landscape. Therefore, boundaries are primarily defined by topography, and secondarily defined by the obscuring effects of natural and built features in the landscape.



Figure 3: Visual Envelope Map



## 6.1.1.1 Landscape Character Zones

The proposal area has been considered in the context of current land use zoning as per the Cowra LEP, and as such, the proposal has been separated into six separate zones. These zones represent the key viewpoints affected by the proposed bypass route. These zones are shown together in **Figure 4** and are described in **Table 6.1**. Maps of each separate zone are provided in **Appendix C**.



Figure 4: Character Zones within the VEM



Landscape Character	Zone	Location		Description and Views		
RESIDENTIAL/BUSINESS		а	Residential area north of Grenfell Road, and East of Killara Road.	<ul> <li>Dwelling and shed.</li> <li>Visually enclosed by garden trees, fencing and road corridor vegetation.</li> </ul>		
	1A	b	Residential area east of Airport Road, North of Boundary Road and West of Hartley Street.	<ul> <li>Approximately 30 dwellings including dwellings located on Grenfell Road, Airport Road, Waratah Street, Calare Street and Boundary Road.</li> <li>Generally visually enclosed by garden trees and fencing.</li> <li>Dwellings facing onto Boundary Road and Airport Road have high visibility of the proposal area.</li> </ul>		
	1B	a	Residential area north of the proposed bypass route, east of Fishburn Street, and south of the Golf Course.	<ul> <li>Approximately 23 dwellings, including dwellings located on Legh Street, Side Street, Fishburn Street, Front Street, Middle Street and Back Street.</li> <li>Yalbillinga Boori Care Centre on Side Street.</li> <li>Generally visually enclosed by fencing, and some garden trees.</li> <li>Dwellings on Back Street have high visibility of the proposal area.</li> </ul>		
		b	Residential area south of the proposed bypass route, and south of Bulkhead Road.	<ul> <li>Approximately 5 dwellings accessed from Bulkhead Road.</li> <li>Views towards the proposal area are partially to completely-obscured by infrastructure in the industrial area to the north, and some garden trees.</li> <li>Viewpoints will have moderate-low visibility of the proposal area.</li> </ul>		
	1C	α	Residential area east of the Lachlan River on the southern and eastern margin of the Cowra township.	<ul> <li>Approximately 70-80 dwellings accessed from Taragala Street and Fitzroy Avenue.</li> <li>Dwellings are generally enclosed by fencing, and views towards the proposal area are partially obscured by garden trees.</li> <li>Dwellings are located above the flood-plain and have slightly elevated views over the proposal area, especially along Taragala Street.</li> <li>Dwellings on the southern side of Taragala Street have high visibility of the proposal area.</li> <li>Dwellings on the northern side of Taragala Street without opposite dwellings have high visibility of the proposal area.</li> <li>Dwellings at the southern end of Fitzroy Avenue have high visibility of the proposal area.</li> <li>Views from dwellings at the northern end of Fitzroy Street are mostly obscured by backyard trees, and native vegetation opposite the railway line and buildings at the Rail Museum (low visibility)</li> </ul>		
		b	Residential/Business area west of the disused railway line from Fitzroy Street to Kendal Street.	<ul> <li>Approximately 8 dwellings accessed from Parkes Street, Fitzroy Street, and Brougham Street.</li> <li>It is noted that most street ends (i.e. end of Parkes St, Brougham St, and Vaux St) have businesses (i.e. Toyota, Self-Storage, Auto-Electrician) at the end of the street as opposed to residential viewpoints. In addition, visibility is further limited by the obscuring effect of residential and industrial buildings and vegetation on the eastern side of the railway line.</li> <li>Visibility of the proposal area is considered to be moderate from this location.</li> </ul>		



Landscape Character	Zone	Locat	ion	Description and Views				
						с	Residential area south of Brougham Street, west of Campbell Street, and east of the railway line.	<ul> <li>8 dwellings accessed from Brougham Street and Campbell Street.</li> <li>Two dwellings are immediately adjacent to Campbell Street and are accessed from Campbell Street.</li> <li>Views are partially obscured by garden trees and fencing.</li> <li>Most dwellings at this location have high visibility of the proposal, especially where immediately adjacent to Campbell Street, and where views are possible along Brougham Street and Parkes Street.</li> </ul>
		d	Residential area within industrial zone, located between the railway line and Campbell Street.	<ul> <li>4 dwellings accessed from, and facing onto Campbell Street.</li> <li>High visibility of the proposal area.</li> </ul>				
		е	Residential/Business area north-west of Kendal Street/Mid Western Highway.	<ul> <li>Approximately 30 dwellings and 4 businesses on Lynch Street, with views towards the proposal area.</li> <li>Residents immediately adjacent to Lynch Street (part of Mid Western Highway) from 10-20 Lynch Street are elevated above the road, and face towards the proposal area. Most viewpoints are obscured by road corridor vegetation and garden trees. However, high visibility of the proposal area is expected from 16-20 Lynch Street where viewpoints are not obscured.</li> <li>Views towards the proposal area from other dwellings and businesses along Lynch Street are partially obscured by road corridor vegetation, residential dwellings on Day Street and Pack Street (south of the railway line), and riparian vegetation along Waugoola Creek towards the north east.</li> <li>Visibility is considered to be moderate-high at this location.</li> </ul>				
		f	Residential/business area south east of the railway line, accessed from Campbell Street, and south of the Mid Western Highway.	<ul> <li>Approximately 8 dwellings and one earthworks business.</li> <li>Occupants of this area would be required to travel along the proposed bypass to access this area.</li> <li>Views towards the proposal area are partially obscured by garden trees.</li> <li>There are four dwellings facing onto Campbell Street at this location that would have high visibility of the proposal area.</li> </ul>				
INDUSTRIAL AREA	2A	а	Industrial zone north of the proposal area, along the Olympic Highway.	<ul> <li>Industrial businesses with scattered residential dwellings.</li> <li>Industrial businesses at this location mostly face towards the Olympic Highway.</li> <li>Three dwellings face onto Fishburn Street, and will have high visibility of the proposal area as viewpoints are only partially obscured by garden trees.</li> </ul>				
		b	Industrial zone south of the proposal area, south of the railway line, and north of Bulkhead Road.	<ul> <li>Industrial businesses accessed from Fishburn Street, Bulkhead Road, and Waratah Street.</li> <li>Mostly unobstructed views towards the proposal area.</li> <li>Visibility is considered to be high from this location.</li> </ul>				
	2B	а	Industrial building located immediately adjacent to the proposal area, at the south-eastern edge of Cowra.	<ul> <li>Industrial business accessed from Campbell Street.</li> <li>Mostly unobstructed views towards the proposal area.</li> <li>Visibility is considered to be high from this location.</li> </ul>				
	2C	а	Industrial zone located between the railway line and Campbell Street, north of Brougham Street.	<ul> <li>Two industrial businesses accessed from Campbell Street.</li> <li>Unobstructed views towards the proposal area; immediately adjacent to the proposed bypass route.</li> <li>Visibility is considered to be high from this location.</li> </ul>				



Landscape Character	Zone	Locat	ion	Description and Views
	3A	а	Grenfell Road	<ul> <li>T-intersection of Airport Road with Grenfell Road.</li> <li>Motorist's views approaching the intersection are partially obstructed by tree plantings.</li> <li>Visibility is considered to be moderate from this location</li> </ul>
	3B	а	Olympic Highway	<ul> <li>Proposed bypass route intersects with the Olympic Highway.</li> <li>Motorists will have a direct line of sight to the intersection.</li> <li>Views of the proposal area (excluding the intersection) are mostly obscured by road corridor vegetation and buildings between the Olympic Highway and the proposal area.</li> <li>Visibility is considered to be moderate from this location.</li> </ul>
RE AREA	3C	а	Lachlan Valley Way	<ul> <li>Proposed bypass route intersects with Lachlan Valley Way.</li> <li>Motorists will have a direct line of sight to the intersection</li> <li>Views of the proposal area (excluding the intersection) are mostly obscured by road corridor vegetation between Lachlan Valley Way and the proposal area.</li> <li>Visibility is considered to be moderate from this location</li> </ul>
INFRASTRUCTUF	3D	а	Disused Railway Line, Railway Museum, and part of Mid Western Highway.	<ul> <li>Proposed bypass route roughly follows the disused railway line through to the Rail Museum, and north east adjacent to the Great Western Highway.</li> <li>Viewpoints are limited along most sections of the railway line as it is no longer used.</li> <li>Viewpoints are possible from the Rail Museum, however most views are partially obscured by vegetation.</li> <li>Viewpoints of the proposal area are possible from railway heritage sites (refer – Section 6.5).</li> <li>Visibility is considered to be moderate from this location.</li> </ul>
	4A	а	Rural area west of Killara Road, north of Grenfell Road.	<ul> <li>Cropping land, scattered trees.</li> <li>High visibility towards intersection of proposed bypass route (along existing Airport Road) with Grenfell Road.</li> </ul>
REA	4B	а	Primary production (small lots), south of Boundary Road.	<ul> <li>Predominantly agricultural land (grazing) with scattered dwellings; 2 dwellings accessed from Boundary Road.</li> <li>Generally visually enclosed by garden trees and fencing.</li> <li>Dwellings facing onto Boundary Road have high visibility of the proposal area.</li> </ul>
	4C	а	Primary production land and riparian land near the Lachlan River.	<ul> <li>Land zoned for primary production and environmental management near the Lachlan River.</li> <li>Dense vegetation along the Lachlan River, scattered elsewhere.</li> <li>High visibility of the proposal area from cleared land surrounding the Lachlan River.</li> </ul>
RURAL A	4D	а	Predominantly primary production land east of the proposed bypass route.	<ul> <li>Primary production land used for cropping and grazing.</li> <li>Land is intersected by Waugoola Creek, flowing towards the Lachlan River.</li> <li>High visibility of the proposal area from cleared land surrounding the Lachlan River.</li> </ul>



Landscape Character	Zone	Location		Description and Views		
RECREATIONAL AREA	5A	а	Bellevue Hill Lookout, Bellevue Hill Reserve.	<ul> <li>Lookout point over the township of Cowra.</li> <li>The Lookout point is elevated above the township of Cowra, with distant views possible towards the proposal area.</li> <li>Visibility is considered to be moderate from this location.</li> </ul>		
	5B	а	Rest park off Mid Western Highway on Campbell Street.	<ul> <li>Small recreational park with toilet facilities and seating for travellers.</li> <li>Unobstructed views towards the proposal area, immediately adjacent to the park.</li> <li>Visibility is considered to be high from this location.</li> </ul>		
AIRPORT	6A	а	Airport, located west of Airport Road and south of Grenfell Road.	<ul> <li>One run-way airport, orientated NW-SE. Accessed from Airport Road.</li> <li>Views from the airport towards the proposal area are partially obscured by road corridor vegetation.</li> <li>Visibility is considered to be moderate-high from this location.</li> </ul>		



## 6.1.2 POTENTIAL IMPACTS

#### 6.1.2.1 Construction

Potential impacts to visual amenity during construction would be limited to the visual presence of the following:

- earthworks;
- stockpiles;
- machinery;
- ancillary compound areas;
- demarcation fencing; and
- construction activities

The above listed potential impacts to visual amenity are limited to the construction period and therefore those impacts are temporary. Measures to mitigate impacts to visual amenity during the construction period are provided in **Section 6.1.3**.

### 6.1.2.2 Operation

Permanent changes to the visual amenity resulting from construction activities would include the following:

- 8.4 kilometre heavy vehicle bypass that would be a two lane, two direction road.
- As part of the heavy vehicle bypass, 5 kilometres of existing roads would be upgraded and 3.4 kilometres of new roads would be created;
- Upgraded intersection at Mid Western Highway/Airport Road;
- Potential changes to the design and siting of the intersection of Airport and Boundary Roads;
- Upgraded intersection with Olympic Highway by way of a roundabout;
- New intersection with Lachlan Valley Way by way of a roundabout;
- A new bridge across the Lachlan River with an estimated 100 metre span and earthen abutments development on either bank;
- Upgraded intersection with Brougham Street/Darby Falls Way by way of a roundabout; and
- Upgraded intersection at Campbell Street/Mid Western Highway.

### 6.1.2.3 Landscape Character

The potential impact to landscape character zones from the proposed bypass route is determined based on the magnitude and sensitivity of the proposal, and applying the sensitivity/magnitude assessment matrix (refer – **Figure 5**). Results from the assessment matrix are provided in **Table 6.2**.

		MAGNITUDE	MAGNITUDE								
		High	Moderate	Low	Negligible						
NSITIVITY	High	High	High-Moderate	Moderate	Negligible						
	Moderate	High-Moderate	Moderate	Moderate -Low	Negligible						
	Low	Moderate	Moderate -Low	Low	Negligible						
SE	Negligible	Negligible	Negligible	Negligible	Negligible						

Figure 5: Landscape character and visual impact assessment matrix (Source: RMS, 2013)



Landscape Character Zone		Magnitude	Visual Sensitivity	Potential Impact
1A	а	<ul> <li>Low:</li> <li>The proposed bypass does not directly affect Killara Road.</li> </ul>	<ul> <li>Low:</li> <li>Existing views may include road infrastructure, however the dwelling is visually enclosed by garden trees and road corridor vegetation.</li> <li>Existing setting has low sensitivity to the proposed change (bypass).</li> </ul>	Low
	b	<ul> <li>High:</li> <li>The scale and use of the proposed bypass is greater than the existing Airport and Boundary Roads.</li> </ul>	<ul> <li>Moderate:</li> <li>Views from dwellings facing onto Airport and Boundary Road are partially obscured by garden trees and road corridor vegetation.</li> <li>Existing views from dwellings in this area include road infrastructure, therefore the existing dwellings have moderate sensitivity to the proposed change (bypass).</li> </ul>	High - Moderate
1B -	а	<ul> <li>High:</li> <li>The scale and use of the proposed bypass is greater than the existing Fishburn Street.</li> </ul>	<ul> <li>Moderate:</li> <li>Some dwellings in this area have backyards facing towards the proposal area with limited obscuring of views by fencing and scattered garden trees.</li> <li>Existing views from dwellings in this area include road infrastructure, therefore the existing dwellings have moderate sensitivity to the proposed change (bypass).</li> </ul>	High - Moderate
	b	<ul> <li>Low:</li> <li>The proposed bypass does not directly affect Bulkhead Road, but Bulkhead Road can be accessed from Fishburn Street where the proposed bypass would be located.</li> </ul>	<ul> <li>Low:</li> <li>Existing views may include road infrastructure, however views are partially to completely-obscured by industrial infrastructure and some garden trees.</li> <li>Existing setting has low sensitivity to the proposed change (bypass).</li> </ul>	Low
1C ·	a	<ul> <li>High:</li> <li>The proposed bypass will change the use of viewable cleared agricultural land.</li> <li>The scale and use of the proposed bypass is greater than the existing Campbell Street</li> </ul>	<ul> <li>Moderate:</li> <li>Most viewpoints towards the proposal are obscured by vegetation and fencing, however dwellings at the edge of the township have elevated positions over the floodplain.</li> <li>Existing views include cleared agricultural land, a disused railway line, the Rail Museum, and existing road infrastructure.</li> <li>Existing setting has moderate sensitivity to the proposed change (bypass).</li> </ul>	High-Moderate
	b	<ul> <li>Moderate:</li> <li>The scale and use of the proposed bypass is greater than the existing Campbell Street.</li> <li>Most streets in this zone are not directly affected by the proposed bypass route.</li> </ul>	<ul> <li>Low:</li> <li>Views are partially obscured by garden trees and fencing, and in addition street-ends are occupied by businesses (less sensitive receivers) than up street residential receivers.</li> <li>Residential/business area separated from proposal area by disused railway line.</li> <li>Existing views include road infrastructure.</li> <li>Existing setting has low sensitivity to the proposed change (bypass).</li> </ul>	Moderate – Low



Landscape Character Zone		Magnitude	Visual Sensitivity	Potential Impact
	С	<ul> <li>High:</li> <li>The scale and use of the proposed bypass is greater than the existing Campbell Street.</li> </ul>	<ul> <li>Moderate:</li> <li>Some dwellings in this area are accessed from Campbell Street and would have immediate views towards the proposed bypass.</li> <li>Existing views include road infrastructure, and are partially obscured by garden trees.</li> <li>Existing setting has moderate sensitivity to the proposed change (bypass).</li> </ul>	High – Moderate
	d	<ul> <li>High:</li> <li>The scale and use of the proposed bypass is greater than the existing Campbell Street.</li> </ul>	<ul> <li>High:</li> <li>All four dwellings are accessed from, and face onto Campbell Street and would have direct and immediate views towards the proposed bypass.</li> <li>Existing views include road infrastructure, and views are not obscured.</li> <li>Existing setting has high sensitivity to the proposed change (bypass).</li> </ul>	High Impact
	e	Low: • The proposed bypass does not directly affect Lynch Road.	<ul> <li>Low:</li> <li>Most viewpoints towards the proposed bypass route are obscured by vegetation and fencing, however dwellings with elevated positions along Lynch Street may have a more direct view of the proposed bypass.</li> <li>Existing views may include road infrastructure.</li> <li>Existing setting has low sensitivity to the proposed change (bypass).</li> </ul>	Low
	f	<ul> <li>High:</li> <li>The scale and use of the proposed bypass is greater than the existing Campbell Street.</li> </ul>	<ul> <li>Moderate:</li> <li>Some dwellings in this area are accessed from Campbell Street and would have direct and immediate views towards the proposed bypass.</li> <li>Existing views include road infrastructure, and are partially obscured by garden trees.</li> <li>Existing setting has moderate sensitivity to the proposed change (bypass).</li> </ul>	High – Moderate
	а	<ul> <li>High:</li> <li>The scale and use of the proposed bypass is greater than the existing Fishburn Street, however is an industrial zone.</li> </ul>	<ul> <li>Moderate:</li> <li>Some dwellings in this area are accessed from Fishburn Street and would have direct and immediate views towards the proposed bypass.</li> <li>The area is within an industrial zone.</li> <li>Existing views include road infrastructure, and are partially obscured by garden trees.</li> <li>Existing setting has moderate sensitivity to the proposed change (bypass).</li> </ul>	High – Moderate
	b	<ul> <li>Moderate:</li> <li>The scale and of the proposed bypass is greater than the existing Fishburn Street however, it is an industrial zone.</li> <li>Bulkhead Road and Waratah Street are not directly affected by the proposed bypass.</li> </ul>	<ul> <li>Low:</li> <li>Views are mostly unobstructed towards the proposed bypass, but the area is an industrial zone with only industrial businesses present.</li> <li>Existing views include road infrastructure.</li> <li>Existing setting has low sensitivity to the proposed change (bypass).</li> </ul>	Moderate – Low



Landscape Character Zone		Magnitude	Visual Sensitivity	Potential Impact
2B	а	<ul> <li>Moderate:</li> <li>The scale and use of the proposed bypass is greater than the existing Campbell Street however, it is an industrial zone.</li> </ul>	<ul> <li>Low:</li> <li>Views are mostly unobstructed towards the proposed bypass, but the area is an industrial zone with one business present that is currently disused.</li> <li>Existing views include road infrastructure.</li> <li>Existing setting has low sensitivity to the proposed change (bypass).</li> </ul>	Moderate – Low
2C	а	<ul> <li>Moderate:</li> <li>The scale and use of the proposed bypass is greater than the existing Campbell Street however, it is an industrial zone.</li> </ul>	<ul> <li>Low:</li> <li>Views are immediate and direct towards the proposed bypass, but the area is an industrial zone with only two businesses present.</li> <li>Existing views include road infrastructure.</li> <li>Existing setting has low sensitivity to the proposed change (bypass).</li> </ul>	Moderate – Low
3A	а	<ul> <li>Low:</li> <li>In this area, the proposed bypass only affects the existing T-intersection of Grenfell Road with Airport Road.</li> </ul>	<ul> <li>Low:</li> <li>Existing motorist views are of road infrastructure, therefore the existing setting has low sensitivity to the proposed change (bypass).</li> </ul>	Low
3B	а	<ul> <li>Low:</li> <li>In this area, the proposed bypass only affects the existing intersection of Airport Road/Fishburn Street with the Olympic Highway.</li> </ul>	<ul> <li>Low:</li> <li>Existing motorist views are of road infrastructure, therefore the existing setting has low sensitivity to the proposed change (bypass).</li> </ul>	Low
3C	а	<ul> <li>Moderate:</li> <li>In this area, the proposed bypass would result in a new intersection on Lachlan Valley Way.</li> </ul>	<ul> <li>Low:</li> <li>Existing motorist views are of road infrastructure, therefore the existing setting has low sensitivity to the proposed change (bypass).</li> </ul>	Moderate – Low
3D	a	<ul> <li>Moderate:</li> <li>In this area, the proposed bypass would result in a new road, and an increase in the scale of existing road infrastructure. However, these areas are zoned for rail and road infrastructure.</li> </ul>	<ul> <li>Low:</li> <li>The railway line is disused so views are not anticipated from the railway line.</li> <li>The Rail Museum has existing views towards the proposed bypass route but views are mostly obscured by vegetation.</li> <li>Existing motorist views are of road infrastructure, therefore the existing setting has low sensitivity to the proposed change (bypass).</li> </ul>	Moderate – Low
4A	а	<ul> <li>Low:</li> <li>The proposed bypass does not directly affect this rural land.</li> </ul>	<ul> <li>Low:</li> <li>Existing views from this rural land include road infrastructure, therefore the existing setting has low sensitivity to the proposed change (bypass).</li> </ul>	Low
4B	а	<ul> <li>Low:</li> <li>The scale and use of the proposed bypass is greater than the existing Boundary Road, however the proposal doesn't directly affect this rural land.</li> </ul>	<ul> <li>Low:</li> <li>Existing views from this rural land include road infrastructure, therefore the existing setting has low sensitivity to the proposed change (bypass).</li> </ul>	Low



Landscape Character Zone		Magnitude	Visual Sensitivity	Potential Impact
4C	а	<ul> <li>Moderate:</li> <li>In some of this area, the proposed bypass would result in a change to rural land use, however it is within close proximity to existing rail and road infrastructure.</li> </ul>	<ul> <li>Low:</li> <li>Existing views from this rural land include some road infrastructure and disused rail infrastructure.</li> <li>The existing setting has low sensitivity to the proposed change (bypass).</li> </ul>	Moderate – Low
4D	а	<ul> <li>Moderate:</li> <li>In some of this area, the proposed bypass would result in a change to land use, however it is within close proximity to existing rail and road infrastructure.</li> </ul>	<ul> <li>Low:</li> <li>Existing views from this rural land include some road infrastructure and disused rail infrastructure.</li> <li>The existing setting has low sensitivity to the proposed change (bypass).</li> </ul>	Moderate – Low
5A	а	<ul> <li>Low:</li> <li>The proposed bypass does not directly affect this recreational land.</li> </ul>	<ul> <li>Low:</li> <li>The views towards the proposed bypass would be distant.</li> <li>Existing views towards the proposed bypass would be distant, and views include road infrastructure</li> <li>The existing setting has low sensitivity to the proposed change (bypass).</li> </ul>	Low
5B	а	<ul> <li>High:</li> <li>The scale and use of the proposed bypass is greater than the existing Campbell Street.</li> </ul>	<ul> <li>Moderate:</li> <li>Views are immediate and direct towards the proposed bypass.</li> <li>Existing views from this recreational land include road infrastructure</li> <li>The existing setting has moderate sensitivity to the proposed change (bypass).</li> </ul>	High – Moderate
6A	a	<ul> <li>Low:</li> <li>The scale and use of the proposed bypass is greater than the existing Airport and Boundary Roads, however the area is zoned for a Business Park and Infrastructure (Air Transport Facilities).</li> </ul>	<ul> <li>Low:</li> <li>Existing views include road infrastructure, and viewers are infrequent (limited to users and employees at the airport).</li> <li>The existing setting has low sensitivity to the proposed change (bypass).</li> </ul>	Low



#### Visual Impact

Visual impacts were rated for six landscape character zones and the sub-zones within each character zone. The results of the visual impact assessment ranged from low to high potential impacts, as summarised in **Table 6.3**.

Landscape Character Zone		Magnitude	Sensitivity	Potential Impact
	1Aa	Low	Low	Low
	1Ab	High	Moderate	High – Moderate
	1Ba	High	Moderate	High – Moderate
	1Bb	Low	Low	Low
ESS	1Ca	High	Moderate	High – Moderate
NISL	1Cb	Moderate	Low	Moderate – Low
AL/BI	1Cc	High	Moderate	High – Moderate
NTI/	1Cd	High	High	High Impact
SIDE	1Ce	Low	Low	Low
RE	1Cf	High	Moderate	High – Moderate
	2Aa	High	Moderate	High – Moderate
<b>IIAL</b>	2Ab	Moderate	Low	Moderate – Low
USTR	2Ba	Moderate	Low	Moderate – Low
ARE	2Ca	Moderate	Low	Moderate – Low
Щ	3Aa	Low	Low	Low
JCTUF	3Ba	Low	Low	Low
ASTRU D/RAII	3Ca	Moderate	Low	Moderate – Low
INFR/ (ROA	3Da	Moderate	Low	Moderate – Low
A	4Aa	Low	Low	Low
ARE	4Ba	Low	Low	Low
SAL	4Ca	Moderate	Low	Moderate – Low
RUI	4Da	Moderate	Low	Moderate – Low
NAL AREA	5Aa	Low	Low	Low
RECREATIO	5Ba	High	Moderate	High – Moderate
AIRPORT	6Aa	Low	Low	Low

Table 6.3 – Summary of Visual Impacts



A summary of the findings from **Table 6.2** and **Table 6.3** are provided below:

Potential visual impacts to viewpoints in residential/business areas ranged from *low* to *high*. Influencing factors included the high magnitude of the proposed bypass (i.e. the increased scale and use relative to existing local roads, and changes to viewable agricultural land), and the proximity of sensitive receivers to the proposed bypass.

Potential visual impacts to viewpoints in industrial areas ranged from *moderate – low* to *high – moderate*. Influencing factors included the moderate magnitude of the proposed bypass in an industrial area (i.e. increased scale and use relative to existing local roads), and the presence of some residential receivers within close proximity to the proposed bypass route.

Potential visual impacts to viewpoints in infrastructure (road/rail) areas ranged from *low* to *moderate*. Influencing factors included the moderate magnitude of the proposed bypass in areas where there is no existing road infrastructure, and the low sensitivity due to the existing views of road and rail infrastructure.

Potential visual impacts to viewpoints in rural areas ranged from *low* to *moderate – low*. Influencing factors included the low-moderate magnitude of the proposed bypass (due to lack of direct effects on some rural areas), and the low sensitivity of rural areas due to existing views of rail and road infrastructure.

Potential visual impacts to viewpoints in recreational areas ranged from *low* to *high* – *moderate*. Influencing factors were the magnitude of the proposed bypass (in this instance, the level of direct effect on recreational land) and the sensitivity of recreational areas due to proximity to the proposed bypass route.

Potential impacts to viewpoints from the airport was *low*. This was influenced by the low magnitude of the proposed bypass in an area zoned for infrastructure and business purposes, and the low sensitivity of the area due to existing views of road infrastructure.

Applying a weighted score to each potential impact (i.e. low [1], moderate-low [2], high-moderate [3] and high [4]), and dividing the sum of all sub-zone weighted values by the total number of sub-zones per character zone reveals the relative level of visual impact in each zone. **Table 6.4** reveals that viewpoints from residential/business areas are subject to the highest level of visual impact, followed by recreational areas, industrial areas, infrastructure and rural areas, and the airport.

Landscape Character Zone	Total No. of Sub-Zones	Total Weighted Value	Total Weighted Value/ Total No. of Sub-Zones
Residential/Business	10	24	2.40
Industrial Area	4	9	2.25
Infrastructure (road/rail)	4	6	1.50
Rural Area	4	6	1.50
Recreational Area	2	4	2.0
Airport	1	1	1.0

 Table 6.4 – Potential Visual Impact Weighted Values

### 6.1.3 SAFEGUARDS AND MITIGATION MEASURES

Measures to manage impacts associated with landscape character and visual amenity matters are provided below.

- The detailed design process for the proposed heavy-vehicle bypass would consider opportunities to review the design to minimise impacts to landscape character and visual amenity, including but not limited to:
  - Detailed design to minimise vegetation removal to provide screening from surrounding locations (whilst also considering safety requirements);



- Detailed design to minimise the extent of cut and fill to limit the extent of change to the existing environment; and
- During construction, the following measures would be adopted to ensure that visual impacts are limited:
  - Site compounds would be located and designed to take account of views from nearby occupied properties and roads, and to minimise the removal of existing vegetation;
  - Site compound areas would be maintained in a tidy condition during construction to ensure unsightly views are not presented to passing motorists;
  - Site compound areas and stockpiles are to be restored to their original condition at completion
    of works;
  - All worksite areas would be maintained in a tidy condition to ensure unsightly view are not presented to passing motorists;
  - Prompt revegetation of disturbed areas, including cut and fill embankments (subject to sight line and clear zone requirements);
  - Retention of existing trees where possible, and planting where appropriate to screen views of the proposed bypass to adjoining residences; and
  - Topsoil removed by works would be separately stockpiled and used in stockpile areas for regeneration.

## 6.2 FLORA & FAUNA

An assessment of the ecological environment throughout the bypass route has been completed by DPM Envirosciences and the full report is attached to this document as **Appendix J**. A summary of the findings of the DPM assessment are provided in this section.

## 6.2.1 METHODOLOGY

The methodology involved an initial assessment of desktop resources including but not limited to:

- EPBC Protected Matters Search Tool;
- NSW BioNet;
- DPI Fisheries Records Viewer;
- Fish distribution maps;
- Murray-Darling Basin Authority Sustainable Rivers Audit 2: The ecological health of rivers in the Murray-Darling Basin at the end of the Millennium Drought (2008-2010);
- DotE EPBC Act Species Profiles and Threats Database (SPRAT);
- Office of Environment and Heritage Threatened Species Profiles;
- DPI Noxious Weed database to identify noxious weeds declared for the Cowra Local Government Area; and
- Cowra Heavy Vehicle Bypass Study Draft Report (GHD 2013).

Field survey was completed over a three day period from the 27-29 April 2015 and included the following specific assessment areas:

• Aquatic ecology – survey of a 300 metre reach of the Lachlan River centred on the location of the proposed road crossing including targeted search for fish, turtles, platypus as well as macroinvertebrates;



- Flora survey and assessment of vegetation communities along the length of the route excluding private property in the vicinity of chainages CH2600 to CH2900 and CH7500 to CH7850<sup>1</sup> utilising a hand held GPS device. Flora species were recorded for each assessment site, as well as whilst traversing the accessible length of the proposed Cowra Heavy Vehicle Bypass route. This included targeted searches for threatened flora species identified in Table 4 of Appendix J; and
- Fauna Fauna was opportunistically surveyed along the accessible length of the proposed bypass route. This comprised the majority of the proposed route, excluding private property in the vicinity of CH2600 to CH2900 and CH7500 to CH7850. Targeted searches were completed in four representative locations and included bird surveys, diurnal searches, ultrasonic bat detection, and opportunistic recording.

## 6.2.2 EXISTING ENVIRONMENT

### 6.2.2.1 Mapped sensitive biodiversity

The town of Cowra contains a range of sensitive terrestrial biodiversity as mapped by the LEP – refer **Figure 6**.



Figure 6: Terrestrial Biodiversity (Source: Cowra LEP 2012)

## 6.2.2.2 Vegetation Communities

The study area is flanked by broad open grazed and cropped farmlands, and partially by an urban fringe with its associated roads and infrastructure. Agricultural and roadside management practices have impacted and influenced the vegetation across the study area and have substantially removed much of the native composition and floristic structure from the landscape.

<sup>&</sup>lt;sup>1</sup> Private property in the vicinity of these chainages predominantly consists of planted exotic species and the significance of not assessing these areas is considered to be limited.



The study area is strongly dominated by agricultural pasturelands and associated grasslands. Small patches and narrow corridors of Yellow Box (*Eucalyptus melliodora*) Woodland are the remnants of original box-gum woodland of the area. The Lachlan River riparian corridor is vegetated with Floodplain Complex which has also been significantly cleared and confined by the prior land-use history of the locality.

Although a number of constituent species occur within the study area, no vegetation communities were detected that meet the definition of threatened ecological communities or endangered ecological communities.

### 6.2.2.3 Flora

Searches of the EPBC Act Protected Matters database and Atlas of NSW Wildlife identified the potential occurrence of three threatened flora species within 10 km of the study area. Of these, two are listed under both the EPBC Act and TSC Act. One species is listed under the TSC Act only. These species are identified in Table 4 of **Appendix J**, reproduced as **Table 6.5**.

Scientific	Common	on Status		Preferred habitat	Likelihood of	Data source	
name	name	EPBC Act	TSC Act		the study area		OEH 2015
Thesium australe	Austral toadflax	V	V	Shrubland, grassland or woodland, often on damp sites (DotE 2015a); often in association with kangaroo grass (Themeda triandra) (OEH 2013a).	Unlikely. 'May' occur within the broader search area, but not recorded. Targeted searches failed to detect this species.	✓	
Tylophora linearis	-	E	V	Dry scrub and open forest on low altitude sedimentary flats (DotE 2015b).	Unlikely. 'May' occur within the broader search area, but not recorded. Targeted searches failed to detect this species.	*	
Swainsona sericea	Silky swainson- pea	-	V	Natural temperate grassland and snow gum woodland on the Monaro plains; box-gum woodland in the Southern Tablelands and South West Slopes; sometimes in association with Cyprus pine (OEH 2013b).	Unlikely. Identifiable by foliage in autumn (OEH 2013); targeted searches failed to detect this species.		✓

Table 6.5 – Threatened flora, or their habitat, identified from the search area (within 10km)

Source: DPM, 2015

A total of 146 flora species were detected in the study area during the field survey from 27-29 April 2015. This comprised 82 native species and 64 introduced species (Appendix D of **Appendix J**). No threatened flora species were detected in the study area during the field survey, despite dedicated searches during suitable seasonal conditions. It is considered unlikely that the threatened flora species identified in **Table 6.5** would occur in the study area.

### 6.2.2.4 Fauna

Searches of the EPBC Act Protected Matters database and the Atlas of NSW Wildlife database identified the potential occurrence of 21 threatened fauna species within a search area extending 10 km from the study area. Of these species, 10 are listed under both the EPBC Act and TSC Act. The remaining 11 are listed under the TSC Act only. Ten of the fauna species identified from the search are listed as migratory under the EPBC Act. These are detailed in Table 5 of **Appendix J**, reproduced as **Table 6.6**.



Table 6.6 – Tl	hreatened and migratory	fauna species,	or their habitat,	identified from t	he search area
(within 10km)	)				

		Status			l ikalihaad of	Source	
Scientific name	Common name	EPB C Act	TSC Act	Preferred habitat	referred habitat occurrence in the Study area		OEH 2015 a
Amphibians	_			_	-		
Booroolong frog	Litoria booroolong ensis	E	E	On or under boulders and debris in and beside the rocky beds of mountain streams (Cogger 2014).	Unlikely. 'May' occur within the broader search area, but hasn't previously been recorded. No rocky beds, nor mountain streams, detected within the study area.	~	
Birds							
Anthochaer a phrygia	Regent honeyeater	E	E	Ironbark forest; also forests and woodlands of box, yellow gum, swamp mahogany and river oak (Morcombe 2003).	Potential. Western bank of the Lachlan River at the proposed CHVB crossing is co-dominated by river oak on the western bank; river oak abundant on the eastern bank (Appendix A). Nearby records from Wattamondara (15 km), Koorawatha (20 km), Bumbaldry (25 km) and Wyangala Dam (25 km) (OEH 2015a).	×	
Apus pacificus	Fork-tailed swift	Mi		Low to very high airspace over varied habitat, rainforest to semi-desert, most active just ahead of summer storm fronts (Morcombe 2003).	Unlikely. Species or species habitat 'likely' to occur within the broader search area, but hasn't previously been recorded. Unlikely to utilise resources of the study area.	~	
Ardea modesta	Great egret	Mi		Wetlands, flooded pastures, dams, estuarine mudflats, mangroves and reefs (Morcombe 2003). Nests in colonies located in wooded and shrubby swamps including mangrove forests, Melaleuca swamps and mixed eucalypt / acacia / lignum swamps (DotE 2015c).	Unlikely. Although known to occur in the search area, preferred habitat is unlikely to occur within the study area and was not encountered during field surveys 27-29 April 2015.	V	
Ardea ibis	Cattle egret	Mi		Moist pastures with tall grass; shallow open wetlands and margins, mudflats (Morcombe 2003). Avoids short grass (DotE 2015d).	Unlikely. Although known to occur in the search area, preferred habitat is unlikely to occur within the study area and was not encountered during field surveys 27-29 April 2015.	V	Ý
Botaurus poiciloptilus	Australasia n bittern	E	E	Freshwater wetlands, occasionally estuarine (Morcombe 2003). Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (Typha spp.) and spikerushes (Eleocharis spp.) (OEH 2014q).	Unlikely. The study area does not support tall, dense aquatic vegetation preferred by this species.	✓	✓



# Table 6.6 – Threatened and migratory fauna species, or their habitat, identified from the search area (within 10km)

Scientific Common			Likelihood of	Source			
Scientific name	Common name	EPB C Act	TSC Act	Preferred habitat	occurrence in the Study area	DotE 2015	OEH 2015 a
Circus assimilis	Spotted harrier		V	Open grasslands, spinifex, open shrublands, saltbush, very open woodlands, crops and similar low vegetation that allows the low 'harrying' mode of hunting (Morcombe 2003).	Potential.		~
Climacteris picumnus victoriae	Brown treecreepe r – eastern subspecies		V	Eucalypt forests and woodlands, scrubs of the drier areas, river-edge trees, timbered paddocks (Morcombe 2003).	Potential.		~
Falco subniger	Black falcon		V	Tree-lined watercourses and isolated stands of trees; hunts out over the low vegetation of surrounding plains, grasslands, saltbush and bluebush (Morcombe 2003).	Potential.		~
Gallinago hardwickii	Latham's snipe	Mi		Low vegetation around wetlands in shallows, sedges, reeds, heath, salt marsh, irrigated crops (Morcombe 2003).	Unlikely. Species or species habitat 'may' occur within the broader search area, but hasn't previously been recorded. Preferred habitat not evident within the study area.	~	
Haliaeetus Ieucogaster	White- bellied sea-eagle	Mi		Usually coastal, over islands, reefs, headlands, beaches and bays, estuaries, mangroves, seasonally flooded inland swamps, lagoons and floodplains; often far inland on large pools of major rivers (Morcombe 2003).	Unlikely. Species or species habitat 'likely' to occur within the broader search area, but hasn't previously been recorded. Preferred habitat not evident within the study area.	~	
Hieraaetus morphnoide s	Little eagle		V	Hilly country generating where it often soars on the updrafts generated by wind deflected up the slopes. Forests, woodlands, open scrublands, tree-lined watercourses of the interior (Morcombe 2003).	Potential.		~
Hirundapus caudacutus	White- throated needletail	Mi		High open spaces of sky above almost any habitat, including oceans (Morcombe 2003).	Unlikely. Species or species habitat 'may' occur within the broader search area, but hasn't previously been recorded. High open spaces are considered to be outside the study area.	V	
Ixobrychus flavicollis	Black bittern		V	Diverse wetlands, estuarine and littoral. Requires dense water- edge vegetation (Morcombe 2003).	Unlikely. Although the Lachlan River in the broader search area provides suitable habitat features, no suitable habitat was evident in the study area at the time of survey.		
Lathamus discolor	Swift parrot	E	E	Forests and woodlands with flowering trees (Morcombe 2003).	Potential.	<b>√</b>	<b>√</b>



# Table 6.6 – Threatened and migratory fauna species, or their habitat, identified from the search area (within 10km)

		Status			Likelihood of	Source	
Scientific name	Common name	EPB C Act	TSC Act	Preferred habitat	occurrence in the Study area	DotE 2015	OEH 2015 a
Leipoa ocellata	Malleefowl	V	E	Unburned mallee and woodland with abundant litter and low scrub.	Unlikely. Species or species habitat 'likely' to occur within the broader search area, but hasn't previously been recorded. Preferred habitat not evident within the study area.	1	
Lophoictinia isura	Square- tailed kite		V	Eucalypt woodland, open forest and heath-woodland (Morcombe 2003).	Potential.		~
Melithreptus gularis	Black- chinned honeyeater – eastern subspecies		V	Forests, woodland of eucalypts, paperbarks; tree-lined watercourses of arid regions (Morcombe 2003).	Potential.		~
Merops ornatus	Rainbow bee-eater	Mi		Open country of woodlands, open forest, semi-arid scrub, grasslands, clearings in heavier forests, farmlands (Morcombe 2003).	Potential.	✓	
Myiagra cyanoleuca	Satin flycatcher	Mi		Forests and woodlands, mangroves, coastal heath scrubs; in breeding season favours dense, wet gullies of heavy eucalypt forests (Morcombe 2003).	Potential.	✓	
Ninox connivens	Barking owl		V	Open country with stands of trees, tree-lined watercourses and paperbark swamps (Morcombe 2003).	Potential.		~
Polytelis swainsonii	Superb parrot	V	V	River red gum, box and similar forests, river-edge forest, nearby mallee, native cypress, farmlands (Morcombe 2003).	Potential.	~	~
Pomatosto mus temporalis	Grey- crowned babbler – eastern subspecies		V	Open forests, woodlands, road verges with grassy groundcover, sparse shrubbery (Morcombe 2003).	Potential.		✓
Rhipidura rufifrons	Rufous fantail	Mi		Wet sclerophyll forests, often in gullies with a dense shrubby understorey, including ferns. Sometimes recorded in drier sclerophyll forests and woodlands with a shrubby or heath understorey (DotE 2015e).	Unlikely. Species or species habitat 'may' occur within the broader search area, but hasn't previously been recorded. Preferred habitat not evident within the study area.	✓	
Rostratula australis	Australian painted snipe	E, Mi	E	Shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans (DotE 2015f).	Unlikely. Species or species habitat 'may' occur within the broader search area, but hasn't previously been recorded. Preferred habitat not evident within the study area.	✓	
Stictonella naevosa	Freckled duck		V	Densely vegetated freshwater lakes, swamps, creeks and floodwaters with thickets of melaleuca, casuarina, leptospermum (Morcombe 2003).	<b>Unlikely.</b> No preferred habitat was evident in the study area at the time of survey, nor is it likely to occur at other times of the year.		<b>✓</b>



Table 6.6 – Tl	hreatened and migratory	fauna species,	or their habitat,	identified from t	he search area
(within 10km)	)				

		Status			Likelihood of	Source	
Scientific name	Common name	EPB C Act	TSC Act	Preferred habitat	occurrence in the Study area	DotE 2015	OEH 2015 a
Nyctophilus corbeni	Corben's long-eared bat	V	V	Vegetation with distinct canopy and a dense, cluttered understorey layer; a wide variety of vegetation types including river red gum, black box, Allocasuarina, belah, mallee, open woodlands and savannahs (Churchill 2008). Most common in box, ironbark and cypress- pine vegetation along the western slopes and plains of NSW and southerm Queensland (OEH 2012a).	Unlikely. 'Likely' to occur within the broader search area, but hasn't previously been recorded. Vegetation structure of study area aligns poorly with that of the preferred habitat (i.e. distinct canopy and dense, cluttered understorey).	~	
Petaurus norfolcensis	Squirrel glider		V	Dry sclerophyll forest and woodland in south-eastern Australia (Strahan 1995). Large trees with abundant hollows, with a preference for large cavities that can house multiple gliders in a large nest, yet with a small entrance that protects the group from predators like goannas (NSW Scientific Committee 2008).	Unlikely. Riparian habitat at the proposed CHVB river crossing exhibits only scattered small hollows in river red gums on the western bank and neither small nor large hollows in specimens on the eastern bank (Appendix B). Other parts of the study area lack preferred, in-tact habitat.		~
Phascolarct os cinereus	Koala	V	V	In this instance west of the Great Dividing Range, the koala follows river red gum (Eucalyptus camaldulensis) forests that skirt the mosaic of rivers and watercourses (Strahan 1995). Also found within Melaleuca, Casuarina and woodland of other Eucalyptus species.	Unlikely. 'May' occur within the broader search area, but hasn't previously been recorded. Unlikely to reside within such exposed habitat affected by human visitation and traffic noise.	V	
Reptiles		-					
Aprasia parapulchell a	Pink-tailed worm- lizard	V	V	Found under weathered granite rocks and logs in (mostly) native grasslands (Cogger 2014).	Unlikely. 'May' occur within the broader search area, but not previously recorded. Native grassland observed within study area devoid of weathered granite rocks and logs.	✓	

Source: DPM, 2015

A total of 57 fauna species were detected in the study area during the field survey from 27-29 April 2015. This comprised four frog species, three reptile species, eight mammal species and 44 bird species – refer **Table 6.6**. No threatened or migratory fauna species were detected in the Study area during the field survey, despite dedicated searches. However, a number of threatened species are expected to utilise the Lachlan River as a movement corridor.

The Lachlan River riparian corridor represents a continuous, linear patch of habitat. A number of the threatened species identified in Table 5 of **Appendix J** would be expected to utilise this riparian corridor on occasion. The broader riparian corridor provides suitable foraging, breeding and nesting habitat for a diversity of birds, mammals, amphibians and reptiles. Hollow-bearing trees, such as mature river red gum (*Eucalyptus camaldulensis*) provide potential habitat for threatened birds and mammals along this broader corridor. However, riparian habitat in the immediate vicinity of the proposed bypass route crossing is less mature than most adjoining specimens in the broader corridor, exhibiting only scattered



small hollows in river red gums on the western bank and neither small nor large hollows in those specimens on the eastern bank.

Other parts of the study area provide fauna with opportunities for foraging and nesting and are represented by:

- agricultural pasturelands and associated grasslands;
- small patches and narrow corridors of yellow box (*E. melliodora*) woodland;
- an avenue of mixed native tree and shrub species planted along Boundary Road; and
- an avenue of mugga ironbark (*E. sideroxylon*) along Airport Road.

However, these areas are most likely to support common native species, predominately birds, which are more adapted to urban and peri-urban habitats.

### 6.2.2.5 Aquatic habitat

At the time of survey, the Lachlan River study reach was in a state of low flow (<watermark) and provided a mix of velocity/depth categories allowing for occupation and movement of both strong and weak swimming fishes. This included areas of slow deep (<0.3 m/s and >0.5 m), slow shallow (<0.3 m/s and <0.5 m), fast deep (>0.3 m/s and >0.7 m) and fast shallow (>0.3 m/s and <0.5 m) habitats.

Bed substrates of the study reach were dominated by gravel (80%) and sand (20%). Edge habitats provided marginally better substrate complexity with gravel (35%), sand (50%), silt (10%) and clay (5%). The stream bed was highly mobile, and as a result was devoid of macrophytes, detritus (leaves, twigs) and woody debris (sticks, branches, logs). Edge habitat attributes were more complex and included periphyton (little [1-10%]), filamentous algae (little), macrophytes (little), bank overhang vegetation (little), trailing bank vegetation (little) and blanketing silt (some).

Macrophytes occurred occasionally in the edge habitat, represented by common native species: giant sedge (*Cyperus exaltatus*), river clubrush (*Schoenoplectus validus*) and common rush (*Juncus usitatus*).

A total of 20 macroinvertebrate taxa were collected from the edge habitat in the Lachlan River study reach on 28 April 2015. This result is comparable to the number of taxa (mean 19, range 10-29) identified from 11 sites sampled in the 'slopes' zone of the Lachlan Valley in the second Sustainable Rivers Audit (MDBA 2012).

Aquatic surveys detected three macro-crustacean families: *Atyidae* (freshwater shrimp), *Palaemonidae* (freshwater prawns) and *Parastacidae* (freshwater crayfish). *Atyidae* were identified as *Paratya australiensis*, *Palaemonidae* were identified as *Macrobrachium* sp. and *Parastacidae* were identified as common yabby (*Cherax destructor*). Each of these species were predicted to occur within the study reach.

Searches of the NSW DPI Records Viewer (DPI 2015), EPBC Act Protected Matters database (DoE 2015), Atlas of NSW Wildlife database (OEH 2015) and the Sustainable Rivers Audit 2 (MDBA 2012) identified eight threatened fishes and one threatened invertebrate (the river snail) as having been recorded from the broader Lachlan River catchment (Table 6 of **Appendix J**). Of these species, three fishes are listed under both the EPBC Act and FM Act. The remaining five fishes and the river snail are listed under the FM Act only.

A distinct lack of fish activity was noted in the Lachlan River study reach at the time of survey, despite the high clarity, shallow waters and expected high detectability of fish. Only ten fishes were detected, nine of which were captured using backpack electrofishing techniques. This included the river blackfish – a nocturnal species that is becoming rare in the Lachlan River catchment; this species was not recorded from the Lachlan River catchment in the latest Sustainable Rivers Audit (MDBA 2012).

Four species of fish were detected within the study reach, comprising three native (Plates 1 to 3 of **Appendix J**) and one introduced species:

- Northern river blackfish (*Gadopsis marmoratus*)
- Mountain galaxias (*Galaxias olidus*)



- Carp gudgeon (*Hypseleotris* sp.)
- Common carp (*Cyprinus carpio*)\*

Each of these species has previously been recorded from the Lachlan catchment.

A search of the Atlas of NSW Wildlife database (OEH 2015) identified only one species of turtle from the search area. This is the eastern snake-necked turtle (*Chelodina longicollis*), a species commonly found throughout eastern Australia. No turtles were encountered during the field survey, although may occur within the study reach on occasion.

The platypus (*Ornithorhynchus anatinus*), protected under the NPW Act, has previously been recorded approximately 10 km upstream of the study reach. No platypus were detected during the field survey. The study reach lacks suitable breeding habitat for the platypus, with bank substrates dominated by apedal sands and unlikely to be suitable for burrow construction. However, it is likely that platypus would transit the study reach on occasion.

## 6.2.2.6 Critical habitat

Critical habitat is defined by the FM Act as the whole or any part of the habitat of an endangered species, population or ecological community that is critical to the survival of the species, population or ecological community. Critical habitat must be identified and declared by the Minister for Primary Industries. As of 13 May 2015, only the grey nurse shark critical habitat is identified on the Register of Critical Habitat (DPI 2015). No critical habitat occurs within the study area.

## 6.2.3 POTENTIAL IMPACTS

### 6.2.3.1 Flora

The key potential impacts to flora species associated with the project are identified as vegetation removal, impacts to threatened species and ecological communities and weed impacts.

The clearing of Floodplain Complex vegetation along the Lachlan River is considered minor in terms of vegetation loss, considering the degraded condition of vegetation within the proposed clearing footprint (dominated by exotic Willows) and the extent of vegetation remaining in adjoining, less degraded habitats.

No threatened flora species (listed under either the EPBC Act or TSC Act) were detected within the study area, despite dedicated searches during suitable seasonal conditions. It is unlikely that threatened flora species occur within the proposed impact areas.

No Threatened Ecological Communities (TECs) listed under the EPBC Act, nor EECs listed under the TSC Act, were detected within the study area. It is unlikely that TECs or EECs occur within the proposed impact areas. As such, no TECs, EECs (excluding those listed under the FM Act) or threatened flora species are expected to be impacted by the works.

Noxious weed species occurring within the study area that would be removed or otherwise managed as part of the works include black willow (*Salix nigra*), crack willow (*Salix fragilis*), blackberry (*Rubus fruticosus*), St John's wort (*Hypericum perforatum*), Silver-leaved nightshade (*Solanum elaeagnifolium*) and Blue heliotrope (*Solanum elaeagnifolium*) (Appendix D).

If left unmitigated, construction activities have the potential to introduce and promote the spread of weeds through the use of unclean machinery which can spread weed propagules.

### 6.2.3.2 Fauna

The key potential impacts to fauna species associated with the project are identified as habitat loss, connectivity and habitat fragmentation and impacts to threatened species.

Vegetation removal is discussed in **Section 6.2.3.1**. Six trees bearing small hollows were recorded within the study area and would require removal as part of the bypass works. This includes a river red



gum (*Eucalyptus camaldulensis*) on the western bank of the Lachlan River, two river red gums and three grey box (*E. microcarpa*) between the Lachlan River and the Mid Western Highway. Considering the limited vegetation removal required and the extent of similar vegetation in the broader area, particularly along the riparian corridor of the Lachlan River, impacts are considered to be minor.

The riparian corridor of the Lachlan River provides habitat for a diversity of fauna, and is likely to provide habitat for a number of threatened species, particularly birds (**Section 6.2.3.2**). The proposed works may temporarily fragment habitat available for wildlife along the banks of the Lachlan River through the removal of approximately 0.2 ha of Floodplain Complex vegetation. However, most of this area would be rehabilitated post-construction, including the bank beneath the bridge abutments. This would include replacing weedy species (such as willows and blackberry) with a mix of native tree and shrub species to help restore habitat connectivity.

Seven-part tests of significance have been undertaken for potentially impacted threatened species and are provided as Appendix G of **Appendix J**. The assessments determined that the proposal is highly unlikely to result in a significant impact on any of these fauna species.

## 6.2.3.3 Aquatic Ecology

Works within and along the banks of the Lachlan River have the potential to impact aquatic ecological values through:

- vegetation clearing, earthworks, and vehicle use within, or adjacent to, waterways;
- creation of barriers obstructing surface water flows and aquatic fauna passage;
- unmitigated sediment laden stormwater runoff entering waterways; and
- spills of contaminants such as fuels, oils or chemicals that could migrate into waters.

An area of approximately 0.06 ha of riverbed would be impacted by instream works. Additionally, riparian habitat of approximately 0.2 ha would be impacted. Loss of riparian vegetation would reduce edge habitat complexity, shelter and organic inputs into the stream reach. Weed management and site rehabilitation would assist in reducing impacts.

The installation of instream structures such as piers has the potential to affect local hydrology which may result in bank erosion, particularly during floods. Scour protection may need to be installed to minimise the risk of bank erosion, especially as willows are removed / managed from the river bank.

A coffer dam would likely be required for construction of individual bridge piers. Partial obstruction of flow by the coffer dams is unlikely to impede free fish passage. The coffer dams would require dewatering during installation. This has the potential to increase turbidity temporarily. The coffer dams also have the potential to capture fish, and these would need to be salvaged during the dewatering.

The installation of instream structures (piers) may directly impact aquatic habitat through dredging and / or reclamation. This may include the removal of large woody debris located within the footprint of piers and coffer dams. Works that involve dredging or reclamation require consultation with DPI (Fisheries). The direct impact of any dredging or reclamation on instream habitat is expected to be minimal, owing to the relatively small impact footprint and the prevalence of similar habitat extending both upstream and downstream of the proposed crossing location. Impacts would be localised and a small amount of large woody debris may need to be relocated from areas of disturbance.

Construction of the project has the potential to impact surface water quality through increased erosion of sediments left exposed following vegetation clearing. In the absence of suitable controls, mobilised sediments can lead to increased suspended sediment loads in waterways. This can in turn reduce light penetration and visibility, limiting plant growth and impede fish movement. Increased sedimentation can also affect water chemistry, reduce waterway depths, change drainage patterns and smother benthic flora and fauna.

Leaks or spills of hydrocarbon based fluids from construction equipment presents a potential risk. Hydrocarbons are toxic to aquatic flora and fauna at relatively low concentrations. Runoff of spilled fuels and oils into waterways is only likely to occur if spills occur in close proximity to the waterway, or if the



spill or leak is left uncontrolled. The severity and duration of impacts would depend on the type and quantity of any fuel or oil spilled, and the effectiveness of containment measures.

The existing box culvert crossing of Waugoola Creek would be augmented as part of the works. New box culverts would be installed as part of the widening of this crossing. These would be installed so as to maintain fish passage in accordance with the DPI (2013) policy and guideline.

Impacts to the following two threatened fish species and EEC may occur as a result of the proposal:

- Silver perch (*Bidyanus bidyanus*) Vulnerable (FM Act), Critically Endangered (EPBC Act);
- Murray Cod (*Maccullochella peelii*) Vulnerable (FM Act); and
- The aquatic ecological community in the natural drainage system of the lowland catchment of the Lachlan River (Lachlan River EEC) EEC (FM Act).

Seven-part tests of significance have been undertaken for these species and EEC and are provided as Appendix F of **Appendix J**. The assessments determined that the proposal is highly unlikely to result in a significant impact on either of these fish species or the Lachlan River EEC.

### 6.2.4 MITIGATION MEASURES

The following measures would assist in minimising the biodiversity impacts of the proposed bypass:

- A Soil and Water Management Plan (SWMP) would be developed prior to construction commencing as per the measures identified at **Section 6.7.3** and implemented during construction site establishment to minimise the likelihood of construction related activities mobilising sediments and leading to turbidity and sedimentation of waterways;
- Clearly defined access and work use areas for plant and equipment should be established, and all members of the construction crew made aware of these access and work area limits. Movement of plant and equipment should be restricted to these areas to minimise the potential for uncontrolled spills or leaks entering waterways;
- Under Section 199 of the FM Act, DPI (Fisheries) would be notified of any proposed reclamation
  or dredging as defined under the FM Act associated with installation of instream structures
  (temporary and permanent) and other structures and a Part 7 permit would be sought prior to the
  commencement of construction refer Section 7.2;
- Construction methods must allow for the free passage of fish downstream and upstream of the works areas at all times;
- Any dewatering of a coffer dam must consider:
  - Notifying DPI seven days prior to dewatering to organise potential fish salvage. A separate section 37 permit may be required for this purpose.
  - Water should be pumped a minimum 30 m away from the river and should not re-enter the river. If water is to re-enter the river, water quality parameters must not be significantly different to receiving waters (as measured upstream of disturbance areas);
- Only the minimum number of snags should be disturbed within wetted habitat;
- Utilise areas already impacted by previous clearing or disturbance and minimise clearing where feasible. Trimming of native trees would be preferred over removal where feasible;
- Trees should be removed in such a way as to not inadvertently damage surrounding vegetation. This would keep groundcover disturbance to a minimum;
- Where possible, native trees to be removed should be mulched and re-used in surrounding areas;
- Felling of hollow-bearing trees should be avoided where possible;
- An ecologist should be present during tree-felling to ensure that potential impacts on fauna are minimised;
- Revegetation of bare soil or cleared areas should be undertaken with locally-occurring native flora species typical of the original habitat to improve floristic structure and provide habitat for those native and threatened species with potential to occur in the study area;



- Declared noxious weeds should be managed according to the requirements stipulated by the *Noxious Weeds Act 1993*;
- Vehicles and machinery should be kept away from the banks of waterways where possible.
- Areas for vehicle and machinery maintenance, refuelling, and storage of fuels, lubricants, and batteries, should be bunded in accordance with Australian Standard AS 1940-2004 The storage and handling of flammable and combustible liquids. Refuelling during construction should be undertaken only within a designated bunded area;
- Maintenance and daily checks of plant and equipment should be undertaken to minimise the risk of hydrocarbon spills or leaks;
- Emergency spill kits should be made available and readily accessible for all plant and equipment at all times, and should include equipment for containment and clean-up of spills on dry soils/sediments as well as for water (e.g. floating booms);
- Any contaminant spills (including fuel, hydraulic fluid etc.) must be contained (where safe to do so) and immediately reported to the construction manager / environmental advisor to establish a plan for remediation;
- Watercourse crossings should be designed to maintain or enhance water flows, water quality, stream ecology and riparian vegetation. Impacts to the hydrologic, hydraulic and geomorphic functions of the stream should be minimised;
- Watercourse crossings should be designed in accordance with the NSW Office of Water (2012) Guidelines for Watercourse Crossings, which include:
  - minimising the construction footprint and the extent of proposed disturbance within the watercourse and riparian corridor
  - where practicable, avoiding structured native riparian vegetation
  - fully span the watercourse channel where possible



Figure 7: Bridge crossing over a watercourse (NSW Office of Water 2012)

- maintaining existing or natural hydrologic, hydraulic, geomorphic and ecological functions of the watercourse
- maintaining natural geomorphic processes by:
- accommodating natural watercourse functions
  - avoiding alterations to natural bankfull or floodplain flows, or increased water levels upstream;
  - avoiding changes to the gradient of the stream bed, except where necessary to address existing bed and bank degradation
  - avoiding increases in flow velocities by, for example, constricting flows
- protecting against scour by:
  - providing any necessary scour protection, such as rip-rap and vegetation
  - ensuring scour protection of the bed and banks downstream of the structure is extended for a distance of either twice the channel width, or 20 m whichever is the lesser



- stabilising and rehabilitating all disturbed areas including topsoiling, revegetating, mulching, conducting weed control and maintenance, to restore the integrity of the riparian corridor
- where culverts are installed on Waugoola Creek:
  - box culverts are preferred to pipes
  - culverts would be aligned with downstream channels
  - recessed wet cells should be incorporated within the invert at or below the stable bed level
- the culvert design should be certified by a suitably qualified engineer
- the design should ensure wet cells allow a minimum water depth of 0.2-0.5 m to encourage fish passage
- the design should minimise changes to the channels natural flow, width, roughness and baseflow water depth.



#### Figure 8: Conceptual road crossing facilitating fish passage (NSW Office of Water 2012)

## 6.3 NOISE AND VIBRATION

A specialist noise assessment has been prepared for the project by Blackett Acoustics – refer **Appendix L**.

A summary of relevant information from the noise assessment including the existing environment description and the conclusions and recommendations are provided in the following sections. The report provided at **Appendix L** provides reference to the noise and vibration criteria relevant to the proposal.

### 6.3.1 METHODOLOGY

In preparing the noise and vibration assessment the following guidelines were considered:

- NSW Interim Construction Noise Guidelines 2009 (ICNG), Department of Environment and Climate Change (now NSW Office of Environment and Heritage) – (hereafter referred to as the ICNG);
- NSW Road Noise Policy 2011 (EPA) (hereafter referred to as the RNP);
- NSW Industrial Noise Policy 2000 (EPA) (hereafter referred to as the INP);
- Roads and Maritime Services Noise Criteria Guideline (hereafter referred to as the NCG); and
- Roads and Maritime Services *Noise Mitigation Guideline* (hereafter referred to as the NMG).

The methodology for the noise assessment was to assess construction noise and vibration and operational noise impacts and identify appropriate mitigation/attenuation measures for the project.

Ambient noise monitoring was conducted using unattended noise loggers to characterise the existing noise environment and to establish the noise levels upon which to base the noise emission objectives.



Logging was completed at three locations along the length of the proposed bypass route. The logging was conducted between the 28 April 2015 and the 5 May 2015.

The assessment of traffic noise impact during the operational phase of the Cowra Bypass is based on guidance contained the RNP (EPA, 2011).

The RNP states that noise levels are to be assessed based on traffic volumes projected at a point in time 10 years after the opening of the project. For the purpose of this project, the future build scenario will be set at a point in time 20 years after the opening of the project.

For the purposes of carrying out this assessment it has been assumed that the proposed project would open in 2015; therefore, the future assessment year applicable to this project is 2035. All future calculations and modelling are based on the Annual Average Daily Traffic (AADT) traffic forecasts provided by Geolyse.

Detailed noise calculations have been carried out for four different scenarios as below:

- Existing Scenario (Year 2015) this has been modelled to allow for validation of the noise model against noise survey results during a survey conducted in April/May 2015.
- Year 2015 built scenario represents noise levels modelled with the traffic forecast for Year 2015, with the proposed bypass incorporated.
- Year 2035 no built scenario represents noise levels modelled with traffic forecast 20 years post opening, but without the proposed bypass.
- Year 2035 built scenario represents noise levels modelled with the traffic forecast for Year 2035, with the proposed bypass incorporated.

The following factors are considered during the assessment process:

- Traffic volume and likely proportions of heavy vehicles;
- Topographical information along and surrounding the entire project corridor;
- Land use surrounding the project;
- Vehicle speed;
- Different noise emission levels and source heights;
- Location of the noise sources on the motorway;
- Road surface types;
- Road gradient; and
- Attenuation from noise barriers (both natural and purpose built for the project).

#### 6.3.2 EXISTING ENVIRONMENT

As a result of the monitoring that was completed existing road traffic noise levels and existing background noise levels (also referred to as the Rating Background Level, or RBL) were derived. These are reflected in **Table 6.7** and **Table 6.8** respectively and shown in **Figure 9**.

Identified Receiver Location	Measured L <sub>AEQ</sub> Noise Level (dB(A))			
	Daytime LAEQ, 15hr	Night Time LAEQ, 9hr		
Location 1 – 119-121 Waratah Street	47.3	38.0		
Location 3 – 37 Campbell Street	50.5	41.4		

#### Table 6.7 – Summary of measured road traffic noise levels

Source: Blackett Acoustics, 2015



Table 6.8 – Summary	of Measured RBL Noise Levels
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Identified Receiver	Measured RBL Noise Level (dB(A))				
	Daytime	Evening	Night Time		
Location 1 – 119-121 Waratah Street	31	28	24		
Location 2 – 39 Fishburn Street	35	33	24		
Location 3 – 37 Campbell Street	37	31	25		

Source: Blackett Acoustics, 2015

Note: Background noise levels above are Rating Background Noise Levels based on procedures contained within the Industrial Noise Policy (INP), (EPA, 2000); and Daytime (7.00 am-6.00 pm), Evening (6.00 pm-10.00 pm) and Night time (10.00 pm-7.00 am).



Figure 9: Locations of noise logger

Together with the deployment of unattended noise loggers, traffic monitoring was simultaneously conducted at three locations along the bypass alignment, carried out for the duration of the noise monitoring period. This data was then split into five segments to reflect interactions with our major transport routes. The results of this monitoring is reflected in **Table 6.9**.



#### Table 6.9 – Traffic Volumes Recorded for Validation of Noise Model

Road Location	Time Period	AADT	Light	Heavy
Mid Western Hwy (west of Cowra)		2116	1981	135
		230	210	20
Segment 1 Mid Western Hwy to Olympic Hwy (Airport Road)		268	262	6
		33	33	0
Segment 2 Olympia Huw to Lephan Valley Way	Day	0	0	0
Segment 2 Olympic Hwy to Lachian Valley Way		0	0	0
Segment 3 Lachlan Valley Way to Mid Western Hwy (Campbell St)		171	169	2
		14	14	0
Mid Western Llung (cost of Course)		2693	2523	170
wild western nwy (east of Cowra)	Night	307	265	42

Source: Geolyse, 2015

Note: Daytime: 7.00am-10.00pm, Night Time: 10.00pm-7.00am

The forecasted traffic volumes for Year 2015 (with bypass), Year 2035 (without bypass) and Year 2035 (with bypass) are presented in **Table 6.10, Table 6.11** and **Table 6.12**.

#### Table 6.10 – Traffic Volumes, Year 2015 with bypass

Road Location	Time Period	AADT	Light	Heavy
Mid Western Huss (west of Course)	Day	2116	1981	135
Mid Western Hwy (west of Cowra)		230	210	20
Commont 4 Mid Monterry Live to Olympic Live (Airport Dood)		1055	948	107
Segment 1 Mid Western Hwy to Olympic Hwy (Airport Road)	Night	119	103	16
Segment 2 Olympic Hwy to Lachlan Valley Way		1353	1176	177
		152	120	32
Segment 3 Lachlan Valley Way to Mid Western Hwy (Campbell St)		1325	1176	150
		150	119	31
		2693	2523	170
	Night	307	265	42

#### Table 6.11 – Traffic Volumes, Year 2035 (No bypass)

Road Location	Time Period	AADT	Light	Heavy
Mid Western Hun (west of Cowra)	Day	3132	2932	200
Mid Western Hwy (west of Cowra)		340	310	30
Segment 1 Mid Western Huss to Olympic Huss (Airport Bood)	Day	347	339	8
Segment 1 Mid Western Hwy to Olympic Hwy (Airport Road)		43	43	0
Segment 2 Olympic Hwy to Lachlan Valley Way		0	0	0
		0	0	0
Comment 2 Looklon Valley Way to Mid Western Llury (Comment St)	Day	221	219	3
	Night	18	18	0


#### Table 6.11 – Traffic Volumes, Year 2035 (No bypass)

Road Location	Time Period	AADT	Light	Heavy
Mid Western Lluw (cost of Cours)	Day	3986	3734	252
Mid Western Hwy (east of Cowra)	Night	454	392	62

#### Table 6.12 – Traffic Volumes, Year 2035 (with Bypass)

Road Location	Time Period	AADT	Light	Heavy
Mid Western Hung (west of Course)	Day	3132	2932	200
Mid Western Hwy (west of Cowra)	Night	340	310	30
Segment 1 Mid Western Hwy to Olympic Hwy (Airport Road)		1561	1403	158
		117	151	26
Segment 2 Olympic Huw to Lachlan Valley Way	Day	2002	1740	262
Segment 2 Olympic Hwy to Lachian Valley Way		225	178	47
Segment 3 Lachlan Valley Way to Mid Western Hwy (Campbell St)		1962	1740	222
		223	177	46
Mid Western Hung (east of Cours)	Day	3986	3734	252
		454	392	62

Speed limits for the different segments are provided in Table 3.1 as per the GHD Bypass Study (p. 108).

Proposed road surface is detailed in **Section 3.3.1**.

A review of the bypass alignment and the surrounding area within 600 metres via aerial photographs identified potentially sensitive noise receivers. Figures 7-2 – 7-5 of **Appendix L** identify all receivers within 600 metres. The distance of 600 metres is adopted on the basis of advice within the RNP which defines a noise study area width for a new road as:

600 metres from the centre line of the outermost traffic lane on each side of the subject road'. This distance is based on the limit of accuracy of currently approved road traffic noise models.

## 6.3.3 CRITERIA

### 6.3.3.1 Noise

Table 6.13 sets out the criteria to be applied to particular types of project, road category and land use.

 Table 6.13 – Assessment Criteria for Operational Traffic Noise - Residences

Road Category Type of Project/ Land Use	Assessment Criteria		
	Daytime (7:00am-10:00pm)	Night Time (10:00pm-7:00am)	
Freeway/arterial/sub- arterial roads	Existing residences affected by noise from new freeway/arterial/sub- arterial roads	L <sub>Aeq,15hour</sub> 55dBA (external)	L <sub>Aeq,9hour</sub> 50dBA (external)

Source: Blackett Acoustics, 2015

Notwithstanding that the alignment utilises approximately five kilometres of existing roads, the proposed bypass is considered to represent a new road for the purposes of the noise assessment on the basis



that the Roads and Maritime Services Noise Criteria Guideline identifies at Section 5.2 the following circumstances to determine whether a road is a new road:

- A project proposes road construction in an undeveloped corridor;
- A road project changes the functional class of the road;
- A widening, curve straightening or adjustment of the corridor where the upgrade road pavement has been substantially realigned;

• A duplication where the new lanes have been substantially realigned from the existing corridor in which case the existing lanes are also assessed as a new road development type; and

A bypass where the upgraded road extends beyond the existing road corridor.

As a number of the above criteria apply to the project, the new road criteria has been adopted.

In applying Table 6.13, the predicted traffic noise level are to be assessed on two occasions:

- The noise level immediately after opening of the project is to be compared with the noise level under existing conditions immediately before opening; and
- The noise levels 10 years after opening is to be compared with the noise level at the same time period under a "no build" scenario that is, allowing for any organic traffic growth that would have occurred in the absence of the project.

In response to a submission during a public meeting on Wednesday, 6 May 2015, noise levels for 20 years after opening will be assessed instead of 10 years after opening.

In addition to the assessment criteria outlined in **Table 6.13**, any increase in the total traffic noise level at a location due to the proposed project or traffic-generating development must be considered.

Residences experiencing increases in total traffic noise level above the relative increase criteria in **Table 6.14** should be considered for mitigation.

Road Category Type of Project/ Land Use	Assessment Criteria		
	Daytime (7:00am-10:00pm)	Night Time (10:00pm-7:00am)	
Freeway/arterial/sub- arterial roads	Existing residences affected by noise from new freeway/arterial/sub- arterial roads	Existing traffic L <sub>Aeq,15hour</sub> +12dB (external)	Existing traffic L <sub>Aeq,9hour</sub> +12dB (external)

Table 6.14 – Relative Increase Criteria for Residential Land Uses

Source: Blackett Acoustics, 2015

Road traffic noise criteria for other (non-residential) noise sensitive receivers are summarised in Table 3-3 of **Appendix L**.

The ICNG presents the process to assess construction in NSW. The ICNG was developed by taking into consideration that construction is temporary, noisy and difficult to ameliorate. As such, the ICNG was developed to focus on applying a range of work practices most suited to minimising construction noise impacts, rather than focusing only on achieving a numeric noise level. The ICNG recommends that standard construction work hours should typically be as follows:

- Monday to Friday 7.00 am to 6.00 pm.
- Saturday 8.00 am to 1.00 pm.
- No work on Sundays or public holiday.

Construction activities for the Project are proposed to occur during the above recommended standard hours only.



**Table 6.15** recommends quantitative management noise goals at residences potentially impacted by construction activities.

Time of Day	Management Level LAEQ(15 min)	How to Apply
Recommended	Noise affected RBL + 10dBA	<ul> <li>The noise affected level represents the point above which there may be some community reaction to noise.</li> <li>Where the predicted or measured LAeq (15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level.</li> <li>The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.</li> </ul>
Monday to Friday 7am to 6pm Saturday 8am to pm No work on Sundays or public holidays	Highly noise affected 75dBA	<ul> <li>The highly noise affected level represents the point above which there may be strong community reaction to noise.</li> <li>Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking in to account:</li> <li>Times identified by the community when they are less sensitive to noise ( such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences</li> <li>If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.</li> </ul>
Outside recommended standard hours	Noise affected RBL + 5dBA	<ul> <li>A strong justification would typically be required for works outside the recommended standard hours.</li> <li>The proponent should apply all feasible and reasonable work practices to meet the noise affected level.</li> <li>Where all feasible and reasonable practices have been applied and noise is more than 5dBA above the noise affected level, the proponent should negotiate with the community.</li> </ul>

Table 6.15 – Construction Noise at Residences using Quantitative Assessment
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Source: Blackett Acoustics, 2015

In addition to the above criteria, where any work is conducted during the night time period (10.00pm-7.00 am), the EPA recommends that to protect against sleep disturbance,  $L_{A1,1min}$  noise levels should not exceed the background level by more than 15dBA at any residence. In practice, the  $L_{A1,1min}$  level can be represented by the maximum noise level.

During construction phase, impacts from vibration can be considered both in terms of effects on building occupants (human comfort) and the effects on the building structure (building damage). Of these considerations, the human comfort limits are the most stringent. Therefore, for occupied buildings, if compliance with human comfort limits is achieved, it follows that compliance would be achieved with the building damage objectives.

## 6.3.3.2 Vibration

The EPA's *Assessing Vibration: A Technical Guideline* provides acceptable values for continuous and impulsive vibration in the range 1-80Hz. Both preferred and maximum vibration limits are defined for various locations and are shown in Table 4-1 of **Appendix L**.

These limits relate to a long-term (15 hours for daytime), continuous exposure to vibration sources. Where vibration is intermittent, a Vibration Dose Value is calculated, and acceptable values are shown in Table 4-2 of **Appendix L**.

The dose value takes into account the degree of intermittency of the vibration. For this project, any vibration being generated would be generated for a significant part of any day, and the difference between an assessment using dose values and one using peak particle velocity is considered very small.

British Standard 7385 Part 2-1993 Evaluation and measurement for vibration in buildings part 2 (BS7385) sets guide values for building vibration based on the lowest vibration levels above which



damage has been credibly demonstrated. Guide values (or recommended limits) to ensure minimal risk of cosmetic damage to residential and industrial buildings are taken from BS7385.

For potential vibration impacts heritage to heritage buildings, the vibration levels identified within the German Standard *DIN 4150: Structural Vibration Part 3 - Effects of Vibration on Structures* (DIN4150) are used.

# 6.3.4 NOISE MODEL VALIDATION

The results of traffic noise measurements presented in Section 3 of **Appendix L** and model calculations for the same period, based on monitored traffic flows are compared in **Table 6.16**. Noise levels are shown to one decimal place to minimise rounding effects.

Table 6.16 – Measured and Calculated	Traffic Noise Levels - dBA
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Location	Measured Day	Predicted Day	Diff. Day	Measured Night	Predicted Night	Diff. Night
Location 1 - 119-121 Waratah St	47.3	46.5	0.8	38.00	40.00	2.0
Location 3 - 37 Campbell St	50.5	49.6	0.9	41.4	43.4	2.0

Source: Blackett Acoustics, 2015

Based on the results presented in **Table 6.16**, the following could be established:

- Location 1 Predicted daytime and night time noise levels are within the 2dBA range;
- Location 3 Predicted daytime and night time noise levels are within the 2dBA range; and
- Accordingly, no correction factor is required for both daytime and night time period along the entire length of the respective road alignments.

## 6.3.5 POTENTIAL IMPACTS

## 6.3.5.1 Road (operational) noise

For the year 2015 and year 2035 scenarios, façade noise levels were calculated at each building facade along the proposed bypass. The CadnaA program incorporates a procedure to determine the most-affected location on a facade, and this was used in each case.

For the built scenarios, the cumulative noise emission levels from the existing and new roads have been taken into considerations. This approach is consistent with the NCG and NMG.

Comparisons of the predicted noise levels between the two scenarios with the relevant time period base criteria were conducted.

**Table 6.17** presents a summary of the number of receiver locations where the principles of the NCG and NMG identified below are met and therefore qualify for consideration of noise mitigation.

- Does the total noise level predicted at the receiver exceed the controlling criterion from the NCG? The controlling criterion is based on either the RNP daytime LAeq, 15hr 55 dB(A) and night time LAeq, 9hr 50 dB(A) criteria for new roads or based on existing traffic LAeq noise levels plus 12 dB(A) which is the relative increase criteria (RIC) for residential land uses. The more stringent of the two established criteria will be the controlling criterion;
- Is the total noise level above the cumulative limit? When the total noise level in the build year is 5 dB(A) or more above the NCG criterion, it is considered to have exceeded the cumulative limit. Receivers where the exceedances occurs will qualify for consideration of noise mitigation; and
- Has the total noise level increased by more than 2.0dBA after the completion of the new road project?



 Table 6.17 presents the total number of receiver locations which qualify for consideration of noise mitigation in the year of opening (Yr2015) and 20 years after opening (Yr2035).

Table 6.17 – No. of Receiver Locations whic	n Qualify for Consideration of Noise Mitigation
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Scenario	Road Surface	Total Number of Receivers Qualify for Consideration of Noise Mitigation
Year 2015 built Scenario	14mm chip seal with 7mm scattered	84
Year 2035 built Scenario		125

Source: Blackett Acoustics, 2015

Properties which quality for consideration of noise mitigation in the 2015 scenario are depicted in Figures 7-2 - 7-5 of **Appendix L**.

Properties which quality for consideration of noise mitigation in the 2035 scenario are depicted in Figures 7-6 – 7-9 of **Appendix L**.

It is noted that the figures identified in **Table 6.17** is conservative on the basis that all buildings on adjacent land have been conservatively assumed to be used for residential purposes, even those located within industrial zoned land. Further analysis of the identified properties would be required to accurately determine the number of qualifying properties, noting that the final number would be expected to be lower than the figures quote in **Table 6.17**.

Given the number of receivers that potential would qualify for mitigation, further evaluation of potential noise impacts has been undertaken assuming adoption of a low noise pavement such as Open Graded Asphaltic Concrete (OGAC). The use of OGAC rather than dense graded asphalt can reduce traffic noise caused by surface/tyre interactions by up to 4dBA. However, it should be noted that OGAC has a limited life with respect to traffic noise reduction, because of the clogging of air voids over time. The correction applied for the use of OGAC adopted is -4dBA.

**Table 6.18** presents a summary of the number of receiver locations, with OGAC low noise pavement considered, which would still qualify for consideration of noise mitigations.

Scenario	Road Surface	Total Number of Receivers Qualify for Consideration of Noise Mitigation		
Year 2015 built Scenario	Open Graded Asphaltic	20		
Year 2035 built Scenario	Concrete	34		

Table 6.18 – No. of receiver locations which still qualify for consideration of noise mitigation after considering low noise pavement

Source: Blackett Acoustics, 2015

Based on the results presented in **Table 6.18**, the majority of the identified receivers which qualify for consideration of noise mitigation would achieve compliance with the established controlling noise criterion from the NCG with the inclusion of OGAC. However, there are still 20 receivers in year 2015 and 34 receivers in year 2035 which would require additional noise mitigation such as architectural treatment or noise barriers. As above, this number would be expected to further reduce as all buildings adjacent to the alignment have been assumed to be in use for residential purposes, even those in industrial zoned land.



Combining the use of low noise pavement with a 2.4 metre high sounds barrier located on the northern side of the bypass between chainage 5200 and 5700 would further reduce the number of properties qualifying for architectural treatment/mitigation in 2035 from 34 to 26. Chainage 5200-5700 has been considered for a noise barrier due to the number of qualifying properties in this location.

Architectural treatment/mitigation at the property for mitigation of noise usually depends on the level of exceedance over the target noise criteria. Typically the level of treatment is:

- 1-10dBA exceedance offer fresh air ventilation, sealing of wall vents and check window and door seals and replace where necessary; and
- >10dBA exceedance offer fresh air ventilation, sealing of wall vents and check window and door seals and replace where necessary. Offer (residences in suitable condition/fabric) to upgrade glazing and doors (if required) that are exposed to road noise from the new road.

Of the 26 remaining properties, all are within 1-10 dB(A) exceedance range (refer **Table 6.19**) and therefore qualify for the option 1 treatment level described above.

Receiver	Predicted level of exceedance (dB(A))
NCA B007	7
NCA B008	5
NCA B009	10
NCA B010	1
NCA B032	3
NCA B033	3
NCA B034	1
NCA B072	2
NCA B073	4
NCA B074	7
NCA B133	2
NCA B147	3
NCA B192	4
NCA B197	6
NCA C030	1
NCA C031	2
NCA C051	3
NCA C052	1
NCA C284	4
NCA C285	5
NCA C368	4
NCA C369	4
NCA C370	3
NCA C425	2
NCA C427	1
NCA C428	2

Table 6 40	I aval of ava	aadamaa faran	a alfia mran	artian avalit	ling for of	nronortu	tractmant
1 able 6.19 -	Level of exc	eedance for so	ecilic brob	erues quam	ving for al	-property	treatment

Source: Blackett Acoustics, 2015 (Table 8-3)



In all situations, the degree of mitigation provided would vary between receiver locations and would be determined on a case by case basis. The approach adopted by Council for the provision of mitigation would be in line with process outlined the Roads and Maritime Services NMG.

# 6.3.5.2 Construction Noise

Construction is expected to take more than 3 weeks and a quantitative assessment would be adopted. Construction work would take place during recommended standard hours only.

Project specific noise management levels have been derived by reference to background noise levels discussed in **Section 6.3.2** and by reference to three adopted Noise Catchment Areas (NCAs). These NCAs have been defined by reference to geographical location, level of noise exposure and location of conducted ambient noise monitoring. The specific construction noise management levels for residential receptors are presented in **Table 6.20**.

NCA	Daytime	Outside Recommended S	Standard Hours
		Evening	Night Time
1	41	35	35
2	45	35	35
3	47	35	35

Table 6.20 – Project Specific Noise Management Levels, LAeq,15min - dBA

Source: Blackett Acoustics, 2015

Note: Daytime (7.00am-6.00pm), Evening (6.00pm-10.00pm) and Night time (10.00pm-7.00am).

Typical construction activities and sound levels of typical construction equipment are listed in Table 9-2 of **Appendix L**, based on construction activities from similar projects, as design input to the project. The Table gives the sound power level based on the  $L_{Aeq (Lweq)}$  and  $L_{Amax (Lwmax)}$  sound power levels emitted by the equipment.

Using the assumed plant items and their associated sound power levels (with consideration given to the operational changes, intermittent processes and changes in distance of mobile plant), Table 9-3 of **Appendix L** presents a combined  $L_{Aeq}$  sound power level for each scenario and ranks the construction events with potential noise impacts in descending order.

**Table 6.21** presents a summary of the typical range of maximum  $L_{Aeq}$  noise levels that may be expected at each NCAs (without the implementation of any special noise mitigation) for each of the propose construction activities. The construction activities are presented in ascending ranked order from left to right of the tables.

NCA	Daytime	Range of	f Predicte	ed Range	of L <sub>Aeq,15</sub> mi	n Constru	uction No	ise Level	S	
	Managem ent Level	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5	Rank 6	Rank 7	Rank 8	Rank 9
1	41	30-83	29-82	28-81	27-80	25-78	24-77	9-62	5-58	5-53
2	45	30-74	29-73	28-72	27-71	27-71	24-68	9-53	5-49	5-44
3	47	42-83	41-82	40-81	29-80	39-80	36-77	21-62	17-58	12-53

Table 6.21 – Predicted LAeq, 15min Construction Noise Levels - dBA

Source: Blackett Acoustics, 2015

As can be seen from predicted noise levels presented in **Table 6.21**, in many receiver locations the noise management levels are expected to be exceeded at least during some stage during project construction. Noise management and mitigation would therefore need to be considered and implemented where reasonable and feasible, to minimise the acoustic impacts.



This should be assessed in detail in the Construction Noise and Vibration Management Plan (CNVMP) to be prepared by the contractor prior to commencement of works on site. At that stage, full details of the construction methodology, type and number of equipment on site would be better known.

## 6.3.5.3 Construction Vibration

Impacts from vibration can be considered both in terms of effects on building occupants (human comfort) and the effects on the building structure (building damage). Of these considerations, the human comfort limits are the most stringent. Therefore, for occupied buildings, if compliance with human comfort limits is achieved, it would follow that compliance would be achieved with the building damage objectives.

Ground vibration may potentially be caused by piling, rock hammering, drilling and ground compaction operations associated with construction of roads. Vibration levels generated during piling and ground compaction operations (including vibratory rolling) would depend on the exact equipment to be used and the type of ground.

Table 10-1 of **Appendix L** provides estimated vibration levels at a range of distances from piling, rock hammering, drilling and ground compaction operations. These vibration levels have been taken from Blackett Acoustics' database and are based on previous measurements on similar projects. The vibratory roller, impact piling and bored piling were measured in soft ground whilst the other equipment listed operates in rock.

The vibration criterion associated with building damage to residences (15 mm/s) is easily complied with, considering the typical distances that any construction activities would be occurring from residential buildings. The criterion based on DIN4150 depends on the frequency, but for normal construction activity the frequency would suggest even a higher criterion. Compliance with the criterion indicates that there is a low risk of building damage from the proposed construction works.

In respect of human comfort, the only activities with potential for affecting nearby residents is vibratory roller. A vibratory roller generates continuous vibration and it has been assumed that one may operate almost continuously for a full day during daytime hours. On this basis, depending upon the response of the particular ground type at the location, the daytime human comfort criterion would only be met at distances significantly greater than 50m.

## 6.3.6 MITIGATION MEASURES

## 6.3.6.1 Operational Road Noise

For receiver locations eligible for consideration of noise mitigation, the EPA recommends the following form of treatments (in order of preference) are:

- Road design and traffic management;
- Quiet pavement surface;
- In corridor noise barriers/mounds; and
- At property treatments or localised barriers/mounds.

A preliminary analysis has been undertaken to determine what noise control is considered "feasible and reasonable" and two of the above treatments, quiet pavement surface and in corridor noise barriers, have been considered in more detail.

The scenario that results in the lowest level of impact is the scenario that combines the use of a low noise pavement surface with development of a noise barrier between chainage 5200 and 5700 and the provision of at-property treatment for those remaining properties where adopted noise levels are not achieved. Further noise assessment would be carried out once detailed design proceeds and construction materials are determined to finalise exceedances and confirm the extent of properties for which mitigation would be required. It is conceivable, given that the bypass passes through some undeveloped and industrial areas, that quiet pavement types need not be utilised for the full extent of the route, however this would require further analysis.



The results of the noise assessment demonstrate that it is possible to mitigate the impacts of operational noise through a range of measures and that operational noise impacts associated with the bypass are acceptable.

## 6.3.6.2 Construction

Best practice mitigation and management measures has been used to minimise construction noise and vibration at noise sensitive receivers, thereby reducing the potential impacts. This would be described in a Construction Noise and Vibration Management Plan (CNVMP), to be prepared by the contractor for the project.

The CNVMP would consider the following issues as a minimum:

- a) identify nearby residences and other sensitive land uses;
- b) develop noise management levels consistent with the ICNG;
- c) assess the potential impact from the proposed construction methods;
- d) where management levels are exceeded examine of feasible and reasonable noise mitigation;
- e) develop reactive and proactive strategies for dealing with any noise complaints;
- f) identify a site contact person to follow up complaints; and
- g) noise monitoring.

In general, management of noise and vibration requires attention to the following:

- Construction hours;
- Noise and vibration monitoring on site and at sensitive receivers;
- Training and awareness;
- Consultation with potentially affected residents, including regular updates on the nature, timing and duration of anticipated works;
- Incident and emergency response; and
- Non-conformance, preventative and corrective action.
- Where appropriate the specific noise mitigation measures could include:
- Mitigation of specific noise sources may be possible by using portable temporary screens;
- Respite and/or restricted construction hours may be considered for extended periods of driven piling, rock breaking and other high noise generating activities;
- Maximising the offset distance between noisy plant items and sensitive receivers;
- Avoiding using noisy plant simultaneously and/or close together, adjacent to sensitive receivers;
- Orienting equipment away from sensitive receivers;
- Carrying out loading and unloading away from sensitive receivers;
- Using dampened tips on rock breakers (if any);
- Using noise source controls, such as the use of residential class mufflers, to reduce noise from all plant and equipment including bulldozers, cranes, graders, excavators and trucks;
- Selecting plant and equipment based on noise emission levels;
- Using alternative construction methods to minimise noise levels;
- Providing alternative arrangements with affected residents such as temporary relocation;
- Selecting site access points and roads as far as possible away from sensitive receivers;
- Using spotters, closed circuit television monitors, "smart" reversing alarms, or "squawker" type reversing alarms in place of traditional reversing alarms; or



• Design site compounds and site work methods to minimise the need for reversing, therefore minimising reversing alarm noise.

Education and training of site staff is necessary for satisfactory implementation of noise mitigation measures. Education and training strategies should focus on:

- Site awareness training / environmental inductions that include a section on noise mitigation techniques / measures to be implemented throughout the project.
- Ensuring work occurs within approved hours.
- Locating noisy equipment away from sensitive receivers.
- Using noise screens for mobile plant and equipment.
- Ensuring plant and equipment is well maintained and not making excessive noise.
- Turning off machinery when not in use.

### 6.3.6.3 Vibration

When vibratory rollers are brought to the site, ground-borne vibration levels would be measured to establish the minimum working separation between the equipment and nearby vibration sensitive receivers.

Continuous vibration monitoring would be carried out when a vibratory roller is operated within 30 m of a building, or as required. Where the measured vibration levels exceed the appropriate limit applying to the measurement, construction activities or equipment would be modified (e.g. using a lighter or smaller vibratory roller) to ensure ongoing compliance with the limits. Otherwise, arrangements would be made with the affected residents to allow the operations to continue without affecting the residents' comfort.

Vibration monitoring would be carried out in response to a complaint about construction vibration in a residence. The monitoring would be carried out within the residence on the floor either at the location where the complaint originated or mid-floor span in a typical room.

The above mitigation measures, and any other measures deemed feasible and reasonable, should be addressed by the contractor in the Construction Noise and Vibration Management Plan for the project.

# 6.4 TRAFFIC AND ACCESS

### 6.4.1 EXISTING ENVIRONMENT

The construction of the bypass would comprise approximately 8.4km of roadworks including the reconstruction of approximately 5.0km of existing roads and the construction of approximately 3.4km of new roads through a mixture of private and public lands along the proposed bypass route.

The most significant engineering component of the heavy vehicle bypass route is the construction of a new road bridge across the Lachlan River. GHD has developed concept alignment plans for the bypass route including the proposed bridge over the Lachlan River, which has a span of 100 metre between abutments on each side of the river.

The classification of existing roads within the proposed route of the heavy vehicle bypass is outlined in **Table 6.22**.

Road	Classification
Mid Western Highway (Grenfell Road)	Arterial Road
Airport Road	Local Road
Boundary Road	Local Road
Olympic Way	Arterial Road

Table 6.22 – Existing Road Classification



#### Table 6.22 – Existing Road Classification

Road	Classification
Fishburn Street	Local Road
Lachlan Valley Way	Arterial Road
Campbell Street	Local Road
Mid Western Highway	Arterial Road

An analysis of existing roadway conditions has been completed and is provided at Section 3.3 of **Appendix M**.

An analysis of existing roadway capacity and level and service has also been completed and is summarised in **Table 6.23**.

Table 6.23 – Existing Roadway Ca	pacity and Level of Service	
Boad	Loval of Comrise	Tur

Road	Level of Service	Two Way Hourly Capacity
Mid Western Highway (Grenfell Road)	Level of Service B	1,800 veh/hour
Airport Road	Level of Service B	900 veh/hour
Boundary Road	Level of Service B	900 veh/hour
Olympic Way	Level of Service B	1,600 veh/hour
Fishburn Street	Level of Service B	600 veh/hour
Lachlan Valley Way	Level of Service B	1,600 veh/hour
Campbell Street	Level of Service B	600 veh/hour
Mid Western Highway	Level of Service B	1,800 veh/hour

Annual Average Daily Traffic (AADT) is defined as the total volume of traffic passing a roadside observation point over a period of a year divided by the number of days in the year.

Cowra Shire Council has provided specific traffic count data at three (3) locations along the bypass route as indicated below:

- Mid Western Highway 120m west of the intersection with Airport Road;
- Airport Road 50m south of the intersection with the Mid Western Highway; and
- Campbell Street 30m east of Pack Street.

The traffic data was collected over the period from 24 April 2015 to 28 May 2015.

In addition, the GHD Bypass Report contained traffic data on the following roads:

- Olympic Way 110m south of the abattoir entry with data collected from 16 May 2012 to 1 July 2012. This count collected data on light vehicles only;
- Lachlan Valley Way 70m south of Old Boorowa Road with data collected from 16 May 2012 to 1 July 2012. This count collected data on light vehicles only; and
- Mid Western Highway 140m east of the railway line crossing with data collected from 16 November 2012 to 27 November 2012.

All traffic data collected and used for the preparation of this Traffic Study is attached in Appendix B of **Appendix M**.

Estimates of the existing AADT on the various roads along or impacted by the heavy vehicle bypass route are summarised in **Table 6.24**.



#### Table 6.24 – Existing AADT Traffic Volumes

Road	AADT
Mid Western Highway (Grenfell Road)	2,346 veh/day
Airport Road	301 veh/day
Campbell Street	185 veh/day
Olympic Way	975 veh/day
Lachlan Valley Way	1,546 veh/day
Mid Western Highway	3,000 veh/day

The estimates of AADT indicated in **Table 6.24** have been used as the basis for the allocation and assessment of traffic utilising the proposed Cowra heavy vehicle bypass.

Estimates of the existing peak hour traffic volumes on the various roads along or impacted by the heavy vehicle bypass route are summarised in **Table 6.25**.

Road	Observed Peak Hour	Peak Hour Traffic Volume
Mid Western Highway (Grenfell Road)	4.00pm to 5.00pm	204 veh/hour
Airport Road	4.00pm to 5.00pm	28 veh/hour
Campbell Street	4.00pm to 5.00pm	17 veh/hour
Olympic Way	3.00pm to 4.00pm	82 veh/hour
Lachlan Valley Way	3.00pm to 4.00pm	141 veh/hour
Mid Western Highway	3.00pm to 4.00pm	245 veh/hour

Table 6.25 – Existing Peak Hour Traffic Volumes

The estimates of peak hour traffic volumes indicated in **Table 6.25** have been used as the basis for the allocation and assessment of traffic utilising the proposed bypass.

## 6.4.2 POTENTIAL IMPACTS

It is considered that the construction of the Cowra heavy vehicle bypass won't be a significant attractor of additional heavy vehicles to use the highways into and out of Cowra in its own right. However, the provision of the bypass would allow for the significant redistribution of the travel routes used by heavy vehicles when passing through Cowra.

The various combinations of options that are available for heavy vehicles to bypass Cowra are numerous and include the following:

- 1. Mid Western Highway (Grenfell Road) to Mid Western Highway east bound.
- 2. Mid Western Highway (Grenfell Road) to Olympic Way south bound.
- 3. Mid Western Highway (Grenfell Road) to Lachlan Valley Way south bound.
- 4. Olympic Way to Mid Western Highway (Grenfell Road) west bound.
- 5. Olympic Way to Lachlan Valley Way south bound.
- 6. Olympic Way to Mid Western Highway east bound.
- 7. Lachlan Valley Way to Mid Western Highway (Grenfell Road) west bound.
- 8. Lachlan Valley Way to Olympic Way south bound.
- 9. Lachlan Valley Way to Mid Western Highway east bound.
- 10. Mid Western Highway to Mid Western Highway (Grenfell Road) west bound.



- 11. Mid Western Highway to Lachlan Valley Way south bound.
- 12. Mid Western Highway to Olympic Way south bound.

Only Combination No. 1 and No. 10 utilise the full 8.4km length of the proposed bypass route, whilst the remaining 10 combinations utilise various sections of the bypass route to avoid travelling through the CBD area of Cowra.

To assist in the allocation of the heavy vehicle and passenger and light vehicle traffic volumes to the various sections of the bypass route, the full length of the bypass route has been broken into segments as indicated below:

- Mid Western Highway (Grenfell Road) west of Cowra.
- Bypass Segment 1: Mid Western Highway (Grenfell Road) to Olympic Way via Airport Road and Boundary Road.
- Bypass Segment 2: Olympic Way to Lachlan Valley Way
- Bypass Segment 3: Lachlan Valley Way to Mid Western Highway via Campbell Street.
- Mid Western Highway east of Cowra.

To assist in the understanding of the various segments of the heavy vehicle bypass, the segments and the bypass usage details are indicated diagrammatically on **Figure 10** (Figure 2 of **Appendix M**)



Figure 10: Bypass route segments and usage allocations

The available daily traffic volumes have been allocated to each of the applicable segments of the bypass route to determine the base line traffic data on the applicable roads.

Additionally, a day/night split was determined to assist in the assessment of the potential noise impacts of the operation of the heavy vehicle bypass. The day time period was taken from 7.00am to 10.00pm and the night time period was taken from 10.00pm to 7.00am.

The daily traffic volume allocation with no bypass in operation i.e. Segment 2 is a missing link in the bypass, is indicated in **Table 6.26**.

Road Location	Time period	Average Daily Tra	ffic Volume	
		Total	Light	Неаvy
Mid Western Highway	Day Time	2116	1981	135
(west of Cowra)	Night Time	230	210	20
Bypass Segment 1	Day Time	268	262	6
Olympic Way Olympic Way (Airport Road)	Night Time	33	33	0
Bypass Segment 2	Day Time	NA	NA	NA
Olympic Way to Lachlan Valley Way	Night Time	NA	NA	NA
Bypass Segment 3	Day Time	171	169	2
Lachlan Valley Way to Mid Western Highway (Campbell Street)	Night Time	14	14	0
Mid Western Highway	Day Time	2693	2523	170
(east of Cowra)	Night Time	307	265	42

#### Table 6.26 – 2015 Available Daily Traffic Volumes (No Bypass)

Note: Day Time: 7.00am to 10.00pm Night Time: 10.00pm to 7.00am

The 2015 available daily traffic volumes with no bypass are indicated on Figure 3 of Appendix M.

An algorithm has been developed to allocate the heavy vehicle traffic volumes from each of the highways in accordance with the GHD heavy vehicle percentages in Table 4.1 of **Appendix M** and also allowing for the allocation of passenger and light vehicle traffic volumes to each of the segments of the overall bypass route.

The baseline traffic data for the operation of the heavy vehicle bypass route for the estimated 2015 traffic volume data is indicated in **Table 6.27**.

Road Location	Time period	Average Daily Tra	ffic Volume	
		Total	Light	Heavy
Mid Western Highway	Day Time	2116	1981	135
(west of Cowra)	Night Time	230	210	20
Bypass Segment 1	Day Time	1055	948	107
Mid Western Highway to Olympic Way	Night Time	119	103	16
Bypass Segment 2	Day Time	1353	1176	177
Olympic Way to Lachlan Valley Way	Night Time	152	120	32
Bypass Segment 3	Day Time	1326	1176	150
Mid Western Highway	Night Time	150	119	31
Mid Western Highway	Day Time	2693	2523	170
(east of Cowra)	Night Time	307	265	42

 Table 6.27 – 2015 Estimated Daily Traffic Volumes (With Bypass)

Note: Day Time: 7.00am to 10.00pm Night Time: 10.00pm to 7.00am

The 2015 estimated daily traffic volumes using the heavy vehicle bypass are indicated on Figure 4 of **Appendix M**.

The daily traffic volumes using the heavy vehicle bypass have been calculated for the year 2025 and year 2035. An estimation of the future traffic volumes can be made by applying a growth factor to the existing traffic volumes to account for the natural growth in traffic volumes over time.



The growth factor to be applied to the existing estimated traffic volumes using the heavy vehicle bypass is taken as 2% per annum.

By applying the 2% growth factor, the Year 2025 and Year 2035 traffic volumes using the heavy vehicle bypass are indicated in **Table 6.28** and **Table 6.29** respectively.

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Road Location	Time period	Average Daily Traffic Volume		
		Total	Light	Heavy
Mid Western Highway	Day Time	2582	2417	165
(west of Cowra)	Night Time	280	256	24
Bypass Segment 1	Day Time	1287	1157	130
Mid Western Highway to Olympic Way	Night Time	145	125	20
Bypass Segment 2 Olympic Way to Lachlan Valley Way	Day Time	1650	1434	216
	Night Time	185	146	39
Bypass Segment 3	Day Time	1618	1435	183
Mid Western Highway	Night Time	183	144	39
Mid Western Highway	Day Time	3285	3078	207
(east of Cowra)	Night Time	375	323	52

Note: Day Time: 7.00am to 10.00pm Night Time: 10.00pm to 7.00am

#### Table 6.29 – 2035 Estimated Daily Traffic Volumes (With Bypass)

Road Location	Time period	Average Daily Traffic Volume		
		Total	Light	Heavy
Mid Western Highway	Day Time	3132	2932	200
(west of Cowra)	Night Time	340	310	30
Bypass Segment 1	Day Time	1561	1403	158
Mid Western Highway to Olympic Way	Night Time	177	151	26
Bypass Segment 2 Olympic Way to Lachlan Valley Way	Day Time	2002	1740	262
	Night Time	225	178	47
Bypass Segment 3	Day Time	1962	1740	222
Mid Western Highway	Night Time	223	177	46
Mid Western Highway	Day Time	3986	3734	252
(east of Cowra)	Night Time	454	392	62

Note: Day Time: 7.00am to 10.00pm Night Time: 10.00pm to 7.00am

The 2025 and 2035 estimated daily traffic volumes using the heavy vehicle bypass are indicated on Figures 5 & 6 of **Appendix M**.

The assessment of the operation of any future traffic regulation devices on the heavy vehicle bypass route (i.e. intersection treatments, roundabouts etc.) would require the use of peak hour traffic volumes on each of the subject roads. The algorithm determined for the allocation of the daily traffic volumes has not been used for the allocation of the estimated peak hour traffic volumes using the bypass from the available traffic data.

As an alternative, the peak hour traffic volumes using the bypass route is estimated based on a comparison of the ratio between the existing peak hour traffic volumes indicated in Table 3.4 of **Appendix M** and the daily traffic volumes indicated in Table 3.3 of **Appendix M**.



The existing peak hour to daily traffic volume ratio ranges from 8.2% to 9.3%. For the purposes of this analysis, a conservative peak hour to daily traffic volume ratio of 10% has been adopted.

On this basis, the daily traffic volumes using the heavy vehicle bypass as indicated in Tables 4.3-4.5 of **Appendix M** have the 10% ratio factor applied to determine the peak hour traffic volumes using the bypass.

The corresponding peak hour traffic volumes for the Year 2015, Year 2025 and Year 2035 are indicated in **Table 6.30**, **Table 6.31** and **Table 6.32** respectively.

Road Location	Time period	Peak Hour Traffic Volume		
		Total	Light	Heavy
Mid Western Highway	Day Peak Hour	212	198	14
(west of Cowra)	Night Peak Hour	23	21	2
Bypass Segment 1	Day Peak Hour	106	95	11
Mid Western Highway to Olympic Way	Night Peak Hour	12	10	2
Bypass Segment 2 Olympic Way to Lachlan Valley Way	Day Peak Hour	136	118	18
	Night Peak Hour	15	12	3
Bypass Segment 3	Day Peak Hour	133	118	15
Lachian Valley Way to Mid Western Highway	Night Peak Hour	15	12	3
Mid Western Highway	Day Peak Hour	269	252	17
(east of Cowra)	Night Peak Hour	31	27	4

#### Table 6.30 – 2015 Estimated Peak Hour Traffic Volumes (With Bypass)

The 2015 peak hour traffic volumes using the heavy vehicle bypass are indicated on Figure 7 of **Appendix M**.

Table 6.31 – 2025 Estimated Peak Hour Traffic Volumes (With Bypass)

Road Location	Time period	Peak Hour Traffic Volume		
		Total	Light	Неаvy
Mid Western Highway	Day Peak Hour	258	242	16
(west of Cowra)	Night Peak Hour	28	26	2
Bypass Segment 1	Day Peak Hour	129	116	13
Mid Western Highway to Olympic Way	Night Peak Hour	15	13	2
Bypass Segment 2	Day Peak Hour	165	143	22
Lachlan Valley Way	Night Peak Hour	19	15	4
Bypass Segment 3	Day Peak Hour	162	144	18
Mid Western Highway	Night Peak Hour	18	14	4
Mid Western Highway	Day Peak Hour	329	308	21
(east of Cowra)	Night Peak Hour	37	32	5

The 2025 peak hour traffic volumes using the heavy vehicle bypass are indicated on Figure 8 of **Appendix M**.



Road Location	Time period	Peak Hour Traffic Volume		
		Total	Light	Heavy
Mid Western Highway	Day Peak Hour	313	293	20
(west of Cowra)	Night Peak Hour	34	31	3
Bypass Segment 1	Day Peak Hour	156	140	16
Mid Western Highway to Olympic Way	Night Peak Hour	18	15	3
Bypass Segment 2 Olympic Way to Lachlan Valley Way	Day Peak Hour	200	174	26
	Night Peak Hour	23	18	5
Bypass Segment 3	Day Peak Hour	196	174	22
Lachlan Valley Way to Mid Western Highway	Night Peak Hour	23	18	5
Mid Western Highway	Day Peak Hour	398	373	25
(east of Cowra)	Night Peak Hour	45	39	6

#### Table 6.32 – 2035 Estimated Peak Hour Traffic Volumes (With Bypass)

The 2035 peak hour traffic volumes using the heavy vehicle bypass are indicated on Figure 9 of Appendix M.

Bypass traffic has the potential to impact on the road network in three ways:

- Traffic Volume;
- Roadway Capacity; and
- Intersection Operation.

### 6.4.2.1 Traffic Volume

The potential impact of the traffic volumes using the heavy vehicle bypass is assessed by comparison of the initial operation of the bypass to the existing 2015 traffic volumes specifically on Airport Road and Campbell Street.

A comparison of the various daily traffic volumes (day time, night time, light, heavy etc.) on Airport Road and Campbell Street is indicated in **Table 6.33**.

Road	Existing Traffic Volume	Bypass Traffic Volume	Percentage Increase
Bypass Segment 1 Mid Western Highway to Olympic Way (Airport Road) Day Time Traffic Volume	268 veh/day	1055 veh/day	293.6%
Bypass Segment 1 Mid Western Highway to Olympic Way (Airport Road) Night Time Traffic Volume	33 veh/night	119 veh/night	260.6%
Bypass Segment 1 Mid Western Highway to Olympic Way (Airport Road) Day Time Light Traffic Volume	262 veh/day	948 veh/day	261.8%
Bypass Segment 1 Mid Western Highway to Olympic Way (Airport Road) Night Time Light Traffic Volume	33 veh/night	103 veh/night	212.1%

Table 6.33 – Comparison of Existing and Bypass Traffic Volumes



Table 6.33 –	Comparison	of Existing	and Bypass	<b>Traffic Volumes</b>

Road	Existing Traffic Volume	Bypass Traffic Volume	Percentage Increase
Bypass Segment 1 Mid Western Highway to Olympic Way (Airport Road) Day Time Heavy Traffic Volume	6 veh/day	107 veh/day	1,683%
Bypass Segment 1 Mid Western Highway to Olympic Way (Airport Road) Night Time Heavy Traffic Volume	0 veh/night	16 veh/night	Not Calculable
Bypass Segment 3 Lachlan Valley Way to Mid Western Highway (Campbell Street) Day Time Traffic Volume	171 veh/day	1323 veh/day	673.7%
Bypass Segment 3 Lachlan Valley Way to Mid Western Highway (Campbell Street) Night Time Traffic Volume	14 veh/night	150 veh/night	971.4%
Bypass Segment 3 Lachlan Valley Way to Mid Western Highway (Campbell Street) Day Time Light Traffic Volume	169 veh/day	1176 veh/day	595.8%
Bypass Segment 3 Lachlan Valley Way to Mid Western Highway (Campbell Street) Night Time Light Traffic Volume	14 veh/night	119 veh/night	750.0%
Bypass Segment 3 Lachlan Valley Way to Mid Western Highway (Campbell Street) Day Time Heavy Traffic Volume	2 veh/day	150 veh/day	7,400%
Bypass Segment 3 Lachlan Valley Way to Mid Western Highway (Campbell Street) Night Time Heavy Traffic Volume	0 veh/night	31 veh/night	Not Calculable

Whilst the percentage increases in the daily traffic volumes on Airport Road and Campbell Street for all bypass cases are very high, ranging from 212% to 7,400%, the impact of the bypass traffic is being compared to very low existing local street traffic volumes. The capacity of the roadway to cater for the additional traffic volume is assessed in **Section 6.4.2.2**.

# 6.4.2.2 Roadway Capacity

To further review the impacts of the daily traffic volumes indicated in **Section 6.4.2.1**, a comparison has been made with the actual traffic volume capacity of each road in its current configuration. Using the bypass peak hour traffic volumes for Segment 1 and Segment 3 as indicated in **Table 6.30** (with light and heavy vehicles combined) and the roadway capacity for Airport Road and Campbell Street as determined in **Section 6.4.1**, a comparison of the bypass peak hour traffic volume and the actual road capacity is indicated in **Table 6.34**.

The operational capacity indicated in **Table 6.34** is the percentage of the actual volume capacity that the road is functioning at.



#### Table 6.34 – 2015 Bypass Peak Hour Operational Capacity

Road	Bypass Peak Hour Traffic Volume	Existing Roadway Capacity at a Level of Service B	Operational Capacity
Bypass Segment 1 Mid Western Highway to Olympic Way (Airport Road)	118 veh/hour	900 veh/hour	13.1%
Bypass Segment 3 Lachlan Valley Way to Mid Western Highway (Campbell Street)	148 veh/hour	600 veh/hour	24.6%

Even under the existing roadway conditions (narrow bitumen carriageway, minimal shoulders etc), the peak hour traffic attracted to the bypass route only uses 13.1% of the peak hour capacity of Airport Road and 24.6% of Campbell Street at a Level of Service B.

Allowing for the growth in the peak hour heavy vehicle bypass traffic for the Year 2025 and Year 2035 as indicated in **Table 6.31** and **Table 6.32**, the operational capacity for Airport Road and Campbell Street is 19.3% and 36.5% respectively for the Year 2035 peak hour traffic volumes operating on the existing roadways.

### 6.4.2.3 Heavy vehicle bypass roadway configuration

The roadway configuration to be adopted for the design and construction of the Cowra heavy vehicle bypass would be based on the AUSTROADS Guide to Road Design and specifically the following parts:

- Part 3 Geometric Design
- Part 4A Unsignalised and Signalised Intersections
- Part 4B Roundabouts

The general roadway configuration would comprise a 3.5m travel lane in each direction with a 2.0m shoulder that includes 1m of bitumen seal on the shoulder.

Where the bypass route adjoins residential or industrial land uses, the bypass roadway adjacent to the residential or industrial land would incorporate a 3.0m wide parking lane outside the travel lane and concrete kerb and gutter would also be provided.

The implementation of the heavy vehicle bypass shall not preclude maintaining vehicular access to the driveways of any of the properties at any location along the bypass route.

The speed limits to be imposed on the roads forming the heavy vehicle bypass route would range from 60km/hr to 80km/hr and would be set on sections of the roadway as appropriate based on the adjoining land use and maintaining access to properties adjoining the bypass. Speeds recommended via the GHD Bypass Study are provided in **Table 3.1** however it is noted that final decisions on speed limits would be by Roads and Maritime Services.

The design and construction of five (5) major intersections would be required for the development of the heavy vehicle bypass and include:

- Mid Western Highway (Grenfell Road) and Airport Road
- Boundary Road and Olympic Way
- Bypass Route and Lachlan Valley Way
- Campbell Street and Darbys Falls Road
- Campbell Street and Mid Western Highway

Detailed commentary on the design parameters for each intersection is provided in Section 4.4.3 of **Appendix M** and summarised as follows:



- Mid Western Highway (Grenfell Road) and Airport Road
  - CHR Channelised Right Turn Lane from the Mid Western Highway into Airport Road
  - AUL Left Turn Lane from the Mid Western Highway into Airport Road
  - AUL Auxiliary Acceleration Lane for the left turn from Airport Road onto the Mid Western Highway

The detailed design of this intersection shall be carried out to the requirements of all relevant sections of the AUSTROADS Road Design Guide, the requirements and approval of Roads and Maritime and in accordance with the standards of Roads and Maritime and Cowra Shire Council.

- Boundary Road and Olympic Way
  - A large diameter (16m-20m) roundabout is proposed which should incorporate two (2) entry lanes, circulating lanes and exit lanes on all legs of the roundabout. The provision of two (2) lanes for all components of the roundabout would allow oversize heavy vehicles to negotiate the roundabout on occasions as necessary.
- Bypass Route and Lachlan Valley Way
  - A large diameter (16m-20m) roundabout is proposed which should incorporate two (2) entry lanes, circulating lanes and exit lanes on all legs of the roundabout. The provision of two (2) lanes for all components of the roundabout would allow oversize heavy vehicles to negotiate the roundabout on occasions as necessary.
- Campbell Street and Darbys Falls Road
  - A large diameter (14m-16m) roundabout is proposed which should incorporate two (2) entry lanes, circulating lanes and exit lanes on all legs of the roundabout. The provision of two (2) lanes for all components of the roundabout would allow oversize heavy vehicles to negotiate the roundabout on occasions as necessary.
- Campbell Street and Mid Western Highway
  - AUL Left Turn Lane from the Mid Western Highway into Campbell Street
  - Seagull Turn Lane and Acceleration Lane Right Turn Lane from the Mid Western Highway into Campbell Street and Right Turn and Acceleration Lane from Campbell Street onto the Mid Western Highway.

#### Refer Section 5 Table 5.1 and Table 6.37.

- Airport Road and Boundary Road
  - The existing intersection of Airport Road and Boundary Road forms a 90 degree angle bend and would not be appropriate for the operation of heavy vehicles along the bypass route.
  - Investigations are to be carried out during the detailed design of the bypass route roadway
    to acquire the adjacent property at this intersection so that a curved alignment with a larger
    radius can be provided to better accommodate the turning movement and operation of
    heavy vehicles at this section of the bypass.

### 6.4.2.4 Intersection Operation

Operation of the major intersections along the bypass route have been assessed using SIDRA Intersection Analysis modelling software. The intersection assessments have been carried out for the peak hour traffic volumes for the Year 2035 using traffic data from **Table 6.32** together with an evaluation of the estimated corresponding peak hour traffic volumes on Olympic Way and Lachlan Valley Way.

SIDRA modelling results are provided in Appendix D of **Appendix M**. The SIDRA modelling assessed the operation of the intersections for the parameters of Average Delay, Queue Length and the subsequent overall Level of Service for each leg of the intersection.

Each of the intersections, except for Darbys Falls Road has been assessed using SIDRA and the assessment has determined the following operational parameters:



- 1. The proposed upgrading to the intersection of the Mid Western Highway and Airport Road results in all traffic movements at the intersection operating efficiently at a Level of Service A for the estimated year 2035 peak hour traffic. The average delay ranges from 11.4 seconds to 14.0 seconds with the maximum queue length of 0.3 cars. The operation of the upgraded intersection has minimal impact on through traffic on the Mid- Western Highway and vehicles using Airport Road.
- 2. The proposed upgrading to the intersection of Olympic Way and Boundary Road results in all traffic movements at the intersection operating efficiently at a Level of Service A for the estimated year 2035 peak hour traffic. The average delay ranges from 4.8 seconds to 12.0 seconds with the maximum queue length of 0.4 cars. The operation of the upgraded intersection has minimal impact on through traffic on Olympic Way and vehicles using Boundary Road.
- 3. The proposed upgrading to the intersection of Lachlan Valley Way and the Bypass Route results in all traffic movements at the intersection operating efficiently at a Level of Service A for the estimated year 2035 peak hour traffic. The average delay ranges from 4.8 seconds to 12.2 seconds with the maximum queue length of 0.5 cars. The operation of the upgraded intersection has minimal impact on through traffic on Lachlan Valley Way and vehicles using the Bypass Route.
- 4. The proposed upgrading to the intersection of the Mid Western Highway and Campbell Street results in the Highway traffic movements at the intersection operating efficiently at a Level of Service A and the Campbell Street movements operating at a Level of Service B for the estimated year 2035 peak hour traffic. The average delay ranges from 11.8 seconds to 17.2 seconds with the maximum queue length of 0.6 cars.

The operation of the upgraded intersection has minimal impact on through traffic on the Mid Western Highway and a minor impact on vehicles using Campbell Street.

## 6.4.2.5 Road Network Hierarchy

Following the construction and operation of the Cowra heavy vehicle bypass, the functional classification of a number of the roads along the bypass route would change. Airport Road, Boundary Road, Fishburn Street and Campbell Street would see the roads classification under a functional road network hierarchy increase from the current Local Road status.

A comparison of the road classifications along the bypass route for the roads current status and for the operational bypass is indicated in **Table 6.35**.

Road	Existing Classification	Bypass Classification
Mid Western Highway (Grenfell Road)	Arterial Road	Arterial Road
Airport Road	Local Road	Sub-Arterial Road
Boundary Road	Local Road	Sub-Arterial Road
Olympic Way	Arterial Road	Arterial Road
Fishburn Street	Local Road	Sub-Arterial Road
Lachlan Valley Way	Arterial Road	Arterial Road
Campbell Street	Local Road	Sub-Arterial Road
Mid Western Highway	Arterial Road	Arterial Road

Table 6.35 – Bypass Road Classification

## 6.4.2.6 Roads and Maritime comments

Consultation with Roads and Maritime Services involved an initial written request for comment, followed by provision of a draft copy of the REF during the second phase of public consultation and a meeting at Council's offices and site visit on the 7 November 2016.



Roads and Maritime provided an initial written response, dated 1 June 2015. The matters raised via that correspondence are addressed in **Table 6.36**. Following receipt of the draft REF a meeting was convened between Council staff, Roads and Maritime officers and Geolyse, which included a site visit to the locations of proposed intersections between the bypass and existing classified roads. Roads and Maritime concurrence is required for work to classified roads prior to any work being carried out.

A second letter of comment was received from Roads and Maritime after that meeting and site visit and the content of that letter is addressed in **Table 6.37**.

Co	mment	Response
•	The route proposed by Council has been reviewed. The bypass is located on existing and proposed public roads including a new bridge over the Lachlan River. The proposal will also involve new intersections or upgrades to existing intersections with State classified roads, being, Mid Western Highway (HW6), Olympic Highway (HW78) and Lachlan Valley Way (MR56). The proposed route also crosses Darbys Falls Road (MR576) which is a regional classified road.	Noted
•	Roads and Maritime Services notes Council has engaged Geolyse to prepare an REF for this route only. Therefore, the comments you seek are confined to environmental and safety aspects of the route, as now proposed, and not in relation to the suitability of the route itself.	Noted
То	assist in the development of an REF, Roads and Maritime	Services provides the following comments:
•	Mid Western Highway, Olympic Highway, Lachlan Valley Way and Darbys Falls Road are classified roads. Under Section 138(2) of the Roads Act 1993 the concurrence of Roads and Maritime Services is required prior to a consent being issued for any new connections or upgrading of intersections to these roads.	Refer Section 7.2 – a copy of the draft REF would be provided to Roads and Maritime Services prior to finalisation and the concurrence of Roads and Maritime Services sought
•	Proposed bypass route intersections with classified roads will need to be designed and constructed in accordance with Austroads Guide to Road Design and Roads and Maritime Services Supplements. To understand the impacts of and intersection requirements for the bypass route, a Traffic Study will need to be prepared which identifies vehicle types, volumes and origin/destination projected to access and travel the bypass. To assist you in the development of the Traffic Study, Roads and Maritime Services suggests the standard format for preparing traffic impact studies provided in Table 2.1 Section 2 of the RTA 's Guide to Traffic Generating Developments 2002.	Noted -traffic study provided as Appendix M
•	Intersections (private and public) with the bypass route will need to achieve Safe Intersection Sight Distance (SISD). Table 3.2 Part 4A of Austroads Guide to Road Design is attached which provides SISD minimum measurements. Intersections with classified roads will need to provide for a 2 second reaction time. Careful attention needs to be given to providing SISD, in particular, at the intersection of the bypass route and the Olympic Highway.	To be addressed via detailed design – refer Section     6.4.3.1
•	Consideration of, and adequate provision for, school bus stops need to be included in the design of the bypass route.	• To be addressed via detailed design – refer Section 6.4.3.1
•	Adequate vertical and horizontal clearances should be provided along the route to accommodate over-size and over-mass vehicles.	• To be addressed via detailed design – refer Section 6.4.3.1

#### Table 6.36 – Roads and Maritime Services comments address



#### Table 6.36 – Roads and Maritime Services comments address

Comment	Response	
<ul> <li>Where the bypass route intersects with classified roads, traffic on the classified road will have priority over traffic on the proposed bypass road.</li> </ul>	• To be addressed via detailed design – refer Section 6.4.3.1	
<ul> <li>90 degree bends in the route should be avoided by providing curves with larger radii to better accommodate heavy vehicles.</li> </ul>	• To be addressed via detailed design – refer Section 6.4.3.1	
Roads and Maritime Services welcomes the opportunity to provide assistance in the development of an REF. The proposed bypass will interface with 3 state roads in 4 locations and is designed to attract heavy vehicles currently using the State road network. In this regard, it is important Council continues to engage with Roads and Maritime Services to ensure both Council and Roads and Maritime Service's obligations and objectives are understood and accommodated in this project. To this end, Roads and Maritime Services seeks further opportunities to discuss this project with Council and their representatives.	A copy of the draft REF will be provided to Roads and Maritime Services and concurrence sought prior to the REF being finalised.	

Source: Roads and Maritime Services, 2015

#### Table 6.37 – Roads and Maritime Services second round of comments address

Comment	Response
As discussed with Council, at this time RMS does not provide concurrence under section 138(2) of the <i>Roads Act</i> <i>1993</i> for the proposed intersections with the classified road network, at Lachlan Valley Way (MR56), the Mid Western Highway (HW6), Olympic Highway (HW78) and Darby Falls Road (MR576). I confirm that Council is not currently seeking concurrence and understands that concurrence will be subject to further consideration once the designs of the intersection treatments have advanced.	Noted and accepted
To assist in progressing the bypass project, Council has also requested Roads and Maritime to comment on the following matters, in addition to giving in principle support:	Noted – see below
1) Factors that could affect future consideration of the propose	ed bypass route for gazettal as a classified road:
• Classified roads perform a higher function than local roads in terms of the regional movement of freight and people. Because of this higher function, it is important that the road environment provides a high level of road safety, traffic reliability and infrastructure integrity. In this regard, the following features of the proposed corridor and alignment have been identified that may require further consideration:	Noted – see below
The number and frequency of private accesses and local road intersections along some lengths of the proposed route, should such access to the bypass be retained, is consistent with an urban environment and low speed zone. Consideration should be given to preserving a road corridor that allows adequate width to create service roads for accesses and minimises the number of intersections with the bypass route.	As noted in <b>Section 6.4.2.3</b> , where the bypass route adjoins residential or industrial land uses, the bypass roadway adjacent to the residential or industrial land would incorporate a 3.0 m wide parking lane outside the travel lane and concrete kerb and gutter would also be provided
<ul> <li>The proposed horizontal alignment includes curves with radii that appear deficient for an 80 km/h alignment, in particular on Airport Road.</li> </ul>	Proposed speed limits along the route alignment as per the GHD Options Study are identified in <b>Table 3.1 (page 11)</b> .
<ul> <li>The proposed vertical alignment includes grades that appear deficient for an 80 km/h alignment, particularly for heavy vehicles and on approach to intersections.</li> </ul>	As above



|--|

Comment	Response		
<ul> <li>Vertical clearances, in particular at the proposed intersection with Lachlan Valley Way. Adequate vertical and horizontal clearances should be allowed for to accommodate over-dimension vehicles.</li> </ul>	Noted – this would be addressed in detailed design.		
<ul> <li>There does not appear to be a planning scheme designed to ensure adjoining and nearby land uses are compatible with the proposed bypass route. Land use planning that provides compatible land- uses and appropriate controls to limit access to the route, would assist in preserving the amenity of the proposed route and in reducing the risk of land use conflict between neighbouring landholders and the bypass.</li> </ul>	Noted – this is outside of the scope of this REF but would be flagged for Council review at the point of their next LEP review.		
<ul> <li>It is not currently clear that the proposed 8.4 kilometre bypass route will be a convenient and efficient route and therefore, an attractive alternative to the existing State road routes for through traffic.</li> </ul>	Ensuring the alignment is convenient and efficient through careful design of intersections and setting of appropriate speeds would contribute to making the alignment attractive to users. A further consideration is that users travelling from south to west/west-south and south-east/east-south would find this a logical alternative to travelling through town as it a more direct route.		
• The identified constraints of the proposed corridor and concept alignment suggest that it will be difficult to achieve an 80 km/h speed for the larger part of the route, and includes lengths which may be suitable for no more than a 50 km/h speed limit. In designing the proposed bypass, the travel speed should be identified as part of the design brief so that the number, frequency and treatment types for accesses and intersections are designed accordingly, as well curves, crests, formation width and clear-zones.	Noted and would be addressed in concept/detailed design		
• In terms of designing a road that may be considered for future gazettal as a classified road, the level of safety, journey reliability, pavement quality and amenity to road users and adjacent landholders should offer an improvement on the existing classified network. As discussed with Council, Roads and Maritime understands that Council may stage the development of the proposed bypass. In this regard Road and Maritime recommends that the next step should be the identification and preservation of a road corridor that could accommodate such an alignment.	Noted – this would be considered by Council		
2) The level of detail required for Roads and Maritime to c treatments with classified roads:	consider granting concurrence for the proposed intersection		
• Concept plans are to be prepared for the bypass, including for each intersection of the proposed bypass with classified roads. Concept plans for each intersection with a classified road are to be accompanied by a road safety audit.	Noted – it is understood that this would be the next phase of the project		
All intersection treatments will need to be designed in accordance with <i>Austroads Guide to Road Design</i> and relevant Roads and Maritime supplements.	<ul> <li>Noted – to be addressed in concept and detailed design</li> </ul>		
• The proposed bypass intersection with Mid Western Highway (eastern end) will require a right turn acceleration lane on the highway. Careful planning of the location of the intersection and acceleration lane will need to occur to ensure the intersection complies with relevant <i>Austroads</i> requirements including sight distance, levels, grades and lane lengths.	Noted – to be addressed in concept and detailed design		
Intersection treatments are to be designed in accordance with the current sign-posted speed zones, unless otherwise agreed by Roads and Maritime.	<ul> <li>Noted – to be addressed in concept and detailed design</li> </ul>		



#### Table 6.37 – Roads and Maritime Services second round of comments address

Comment	Response		
<ul> <li>Intersection pavement design is to accommodate projected heavy vehicle traffic, including size, weight and number of turning movements.</li> </ul>	<ul> <li>Noted – to be addressed in concept and detailed design</li> </ul>		
Roads and Maritime appreciates the opportunity to provide comment in the development of the REF. The proposed bypass will interface with 3 State roads in 4 locations. Please continue to engage with Roads and Maritime to ensure both Council and Roads and Maritime's obligations and objectives are understood throughout the project.	Noted		

As noted in **Section 7.2**, and notwithstanding that Council is the roads authority for all affected roads, the concurrence of Roads and Maritime is required prior to the carrying out of any work that affects a classified road. It is understood that such concurrence would need to be informed by concept design of the bypass alignment and intersections, including the carrying out of a road safety audit.

Council would need to form a conclusion as to whether the concept and detailed design of the alignment was to provide for the potential future gazettal of the route as the classified highway alignment or as a local standard road performing the functions of a bypass, as this would influence the standard of design and construction.

# 6.4.3 MITIGATION MEASURES

## 6.4.3.1 Detailed Design

The following mitigation measures would be implemented during completion of detailed design:

- Consultation with emergency service authorities would be undertaken during development of the detailed design including NSW Rural Fire Service and Fire Rescue
- Intersections (private and public) with the bypass route would need to achieve Safe Intersection Sight Distance (SISD) as per table 3.2 Part 4A of Austroads Guide to Road Design. Intersections with classified roads would need to provide for a 2 second reaction time. Careful attention needs to be given to providing SISD, in particular, at the intersection of the bypass route and the Olympic Highway;
- There is to adequate provision of school bus stops in the design of the bypass alignment;
- Adequate vertical and horizontal clearances are be provided along the route to accommodate over-size and over-mass vehicles;
- Where the bypass route intersects with classified roads, traffic on the classified road would have priority over traffic on the proposed bypass road;
- Design is to avoid 90 degree bends in the route by providing curves with larger radii to better accommodate heavy vehicles – particular focus would be needed for the intersection of Boundary and Airport Roads and additional acquisition is likely to be required in this area to ensure that an appropriate radii curve is provided.

# 6.4.3.2 Construction

The following mitigation measures would be implemented during project construction:

- Vehicular property access would be maintained where possible including pre-schools, places of worship and all commercial premises;
- Pedestrian and cyclist access is to be maintained throughout construction;
- Provision of signposted outlining the pedestrians and cyclists diversion routes would be displayed during construction;
- There would be advance notification of any construction works that affect pedestrians and cyclists;



- Access to appropriate bus stop locations would be maintained during construction in consultation with bus operators; and
- Ongoing updates on locations and access to bus stops would be provided to the community during construction period to ensure that disruption is minimised.

# 6.5 HERITAGE

### 6.5.1 INDIGENOUS HERITAGE

### 6.5.1.1 Existing Environment

The following is extracted from the Access Archaeology and Heritage (AAH) Aboriginal heritage preliminary assessment.

The study area is located on the southern outskirts of Cowra. From the east, the route follows Campbell Street which departs the Mid Western Highway approximately 1.5km east of town. Campbell Street terminates ~2.6km to the south at a wool processing facility which is currently disused. The propose route continues to flank the south east and south of the town boundary, following the southern side of the Cowra rail line to the Lachlan River. The route crosses the Lachlan River immediately south of the rail bridge, crosses the Lachlan Valley Way and passes under the rail overpass to the northern side of the rail line. The route then passes between the rail line and the southern side of the Cowra Mission until meeting Fishburn Street, following on to Boundary Road. At the end of Boundary Road there is a right angle bend where the road becomes Airport Road, and the route then proceeds north to meet Grenfell Road.

The Cowra landscape is dominated by Soldiers Mountain, a formation of Silurian age granodiorite termed 'Cowra Granodiorite'. The area is geologically complex with nearby formations including the Ordovician Walli Basalts, Silurian 'Grants Corner' Granodiorite and 'Canowindra Volcanics'. In the Lachlan valley soils comprise quaternary gravels and sand with alluvium flanking the river corridor (Raymond et al, 1998). The local geology would have provided material suitable for hatchets in the abundant granodiorites, and materials for flaked stone artefacts from local gravel beds (pers obs).

The proposed study corridor is largely devoid of unmodified native vegetation, and used for a range of urban, transport and agricultural purposes. Historically, the vegetation of the drier slopes of the surrounding Cowra area would have been characterised by an Inland Greybox Woodland, which consisted primarily of Eucalyptus macrocarpa which is often found in association with Callitris glaucophylla (White Cypress pine), Brachychiton populneus (Kurrajong), and Eucalyptus melliodora (Yellow Box), and with Eucalyptus albens (White Box). Native grasses would have occurred beneath the tree canopy. Along the Lachlan River, the vegetation would have included a Riverine Woodland consisting of Eucalyptus camaldulensis (River Red Gum), Eucalyptus largiflorens (Black Box), Eucalyptus moluccana (Grey Box), Callitris galucophylla (White Cypress Pine) and Acacia dealbata (Silver Wattle) and various native grasses.

This vegetation community would have provided a variety of plant resources for food and tools or weapons. Eucalyptus species would have provided bark and wood for containers, shields and canoes, whilst the leaves from the long grasses would have been used for basket weaving. Acacia trees would have supplied seeds and sweet edible gum (Low 1992: 86). The river corridors would have provided ample opportunity to catch a variety of game including macropods, possums, echidna, birds, fish, reptiles (eg, goannas, turtles) and yabbies.

Based on investigations by AAH, the following statements can be made regarding the archaeological potential of the present subject area:

- As the topography of the subject contains level to gently sloping topography in proximity to water Open Artefact Scatters might be expected.
- It is **possible, although unlikely**, that **stone quarries** will occur if suitable sources of stone are present and accessible.



- Due to clearing, it is **likely** that scarred trees will occur in the subject area especially in the eastern end throughout Stage 1.
- It is possible that fresh water shell midden may occur near watercourses or billabongs.
- The occurrence of human burials is highly unlikely.

## 6.5.1.2 Aboriginal Community Consultation

Consultation in respect of the project was carried out in accordance with the provisions of the Office of Environment and Heritage (OEH) *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (ACHCRP 2010).

Notification involved a range of methods as detailed in Section 4 of **Appendix N**. At the end of the notification period four Aboriginal parties had registered with the project. A project proposal document was provided to these four parties seeking comment on the proposed investigation methods, however there was no response from any party.

An initial field inspection was carried out on the 5 & 6 June 2015 and this was attended by three of the four parties; the fourth party was advised a number of time of the location of the field survey party but did not attend.

Additional field work incorporating sub-surface testing was carried out by AAH and local Aboriginal representatives on the 13-18 February 2016 inclusive.

A draft Aboriginal Cultural Heritage Assessment document was provided to the Registered Aboriginal Parties and the Cowra Local Aboriginal Land Council. No comments were received from the YHAC, KND or Cowra LALC. Verbal comments were received from Neville Williams (WMG, MBTO) and Esther Cutmore (MBTO) on Friday 27 May 2016. These comments were to the effect that they considered the report to be of a high standard and were in agreement with the recommendations. Neville Williams requested it be noted that the area between the Cowra Mission and the railway line was used in historic times as a travelling stock route. This note was added to the information regarding the detailed assessment of this area

A final Aboriginal Cultural Heritage Assessment document has now been prepared and is appended to this report as **Appendix N**.

# 6.5.1.3 Potential Impacts

The field survey carried out on the 5 & 6 June 2015 identified a number of artefacts and potential archaeological deposits (PADs) as depicted on **Figure 11**. These are described as follows:

- Three Aboriginal heritage sites, all of which were isolated artefacts;
- Seven areas of Potential Archaeological Deposit (PAD), where concentrations of stone artefacts might be expected by surface visibility precluded comprehensive assessment;
- One potential site of historic interest

The potential site of historic interest is discussed in **Section 6.5.2**.





Figure 11: Identified artefacts and potential archaeological deposits

Based on the proposed bypass alignment sites indicated by Artefacts 1-3 would be disturbed by the proposed works. Individually these artefacts have low significance, but being protected by the National Parks and Wildlife Act (NSW) 1974 they require an Aboriginal Heritage Impact Permit prior to works proceeding.

Their presence, and the results of other regional projects indicate that further archaeological material is located in the proposed works corridor but cannot be seen due to poor surface visibility. Consequently, a full assessment of the potential impact on Aboriginal heritage of the proposed development could not be concluded based on the initial assessment. A further detailed assessment incorporating sub-surface testing was completed with field work carried out 13-18 February 2016 inclusive. A discussion of the results of this assessment as per Section 8 of Appendix N is provided as follows:

The archaeological survey component of this project was hampered by low visibility conditions, but nonetheless identified three surface Aboriginal stone artefacts and seven potential archaeological deposits. The results of the subsurface testing program indicate that while Aboriginal archaeological material is indeed present under the ground surface, it is heavily concentrated near the Lachlan River corridor. Only PADs 1, 2 and 3 exhibited cultural material of Aboriginal origin, with one isolated surface artefact at PAD 6. PADs 4, 5 and 7 were devoid of archaeological material at a density able to be detected using the methodology employed. If any Aboriginal sites occur in these locations they will take the form of very sparse scatters of small stone artefacts.

PAD 1 yielded four artefacts from 1.5m2 of excavated material, or an overall density of 2.67/m2. As the proposed route will be constructed over the existing graded track it is in an area of high disturbance and as a consequence will not have a high impact on the overall site at PAD 1.

PAD 2 yielded 1 artefact from 1m2 of excavation, albeit at considerable depth, or an overall density of 1.0/m2. The proposed location has undergone disturbance from the construction of infrastructure related to the Cowra power station, the rail corridor and associated tracks. The landform tested by this project is extensive, taking up the western side of the Lachlan River for several kilometres. Crossing this landform from east to west is a very low impact activity compared to the size of the landform, and as a consequence should be regarded as having very little impact on Aboriginal objects.



PAD 3 yielded 1 object identified as an Aboriginal implement, it being made of glass. This is unusual in the local area and may indicate a discrete location of archaeological research potential. The uptake of European materials for adaptation and use in a traditional Aboriginal manner was common, but occurred for only a brief period of time in the history of south east Australia. While the discovery of such an object in a survey is unusual, although not unheard of, discovery in a stratified context is unusual and the potential to record and observe a collection of contact artefacts insitu affords a rare opportunity. If the proposed route will be constructed as presently indicated, the location surrounding the probe from which the glass artefact was recovered should be subject to more extensive hand excavation, prior to development. While avoidance of the location in question would not be difficult, avoidance of the landform in which they were found would be more challenging. The test probes were placed at the northern end of an extensive levee deposit which extends south, becoming higher ~100m to the south. This entire levee has the same, if not greater, archaeological potential and would need to be investigated if the route was realigned in that direction. The levee tapers off further to the north, being absent on the northern side of the rail reserve.

Artefacts 1-3 recorded during surface survey will be disturbed by the proposed works. Individually these artefacts have low significance, but being protected by the National Parks and Wildlife Act (NSW) 1974 they require an Aboriginal Heritage Impact Permit prior to works proceeding.

## 6.5.1.4 Management Recommendations

Pursuant to the information provided within **Appendix N**, it is recommended that:

- 1) Artefacts 1, 2 and 3 will require an AHIP prior to development. The local Aboriginal community should be afforded the opportunity to salvage these objects should they so wish.
- 2) The area designated PAD 1 for this project is an Aboriginal site, in the form of a scatter of stone artefacts. The results of this project suggest its density is sparse to moderate. As the proposed bypass will be constructed mainly in the existing graded road corridor it will not have a high impact on the archaeological resources of the site. Permission to disturb PAD 1 should be included in an AHIP prepared for the project.
- 3) The area designated PAD 2 for this project is an Aboriginal site in the form of a sparse scatter of stone artefacts. The PAD area is extensive and the proposed bypass route will have a low overall impact. Permission to disturb PAD 2 should be included in an AHIP prepared for the project.
- 4) The Area designated PAD 3 for this project is an Aboriginal archaeological site in the form of a scatter of potential glass artefacts originating on a prior surface now some 250mm below the current surface of the levee deposit. Glass artefacts found in a stratified context are uncommon, and it is recommended that the feature identified in PAD 3/Transect1/Probe E be subject to salvage excavation to mitigate the impact of road construction on a potentially discrete archaeological feature. The salvage of this feature should be included in the overall AHIP sought for this project.
- 5) The area designated PAD 4 for this project is NOT a Potential Archaeological Deposit and requires no further archaeological assessment.
- 6) The area designated PAD 5 for this project is NOT a Potential Archaeological Deposit and requires no further archaeological assessment.
- 7) The area of PAD 6 crossed by the proposed route does not contain a scatter of artefacts of sufficient density to be detected by the methodology employed, but the presence of an artefact on the far track suggests the possibility that sparse stone artefacts may exist at the locality. Permission to disturb PAD 6 should be included in an AHIP prepared for the project.
- 8) The area designated PAD 7 for this project is NOT a Potential Archaeological Deposit and requires no further archaeological assessment.
- Subsequent to the issue of the project AHIP, ground breaking work at 2 and 3 should be monitored by personnel with experience in the identification of Aboriginal human remains and stone / glass artefacts.
- 10) If during construction remains are found suspected to be of human origin work must cease immediately and the site responsible personnel must immediately contact the local police and the NSW OEH. The find site must be isolated and all machinery and personnel moved a minimum of 50m away. Work may continue at an alternative project location.



- 11) The proponent should implement an 'Ad Hoc Archaeological Discovery' protocol, such as that attached to this report, or an alternative agreed plan formalised in the project AHIP.
- 12) If the proposed route is realigned prior to construction it must be subject to further assessment for its potential to disturb Aboriginal heritage.

The proponent, their employees and agents are reminded that it is an offence under the National Parks and Wildlife Act (NSW) 1974 to destroy, deface or otherwise disturb an Aboriginal Object without first obtaining the consent of the Director General of the NSW NPWS.

Subject to the implementation of the above recommendations, it is considered that the project may proceed without resulting in significant impacts to matters of Aboriginal Heritage.

## 6.5.2 NON-INDIGENOUS HERITAGE

## 6.5.2.1 Existing Environment

A search of the following available resources has been completed to inform this heritage assessment, including:

- State heritage register;
- Cowra Local Environmental Plan 2012;
- Railcorp/Transport for NSW Section 170 heritage register;
- Australia's National Heritage List; and
- Australian Heritage Database.

**Table 6.38** contains the local heritage items identified within 500 metres of the proposed alignment, pursuant to Schedule 5 of the Cowra LEP. Local heritage items in the locality are identified in **Figure 12**.

Area	Item	Address	Property Title	Heritage Level	LEP #
Cowra	Rail bridge over Lachlan River	Blayney-Harden railway line		State	18
Cowra	Cowra Railway Station and yard group	Lynch Street (Blayney- Harden railway line)	State		19
Cowra	Brougham Park— entrance gates	Brougham Street	Lot 701, DP 93234	Local	127
Cowra	"Jerula"-homestead	Darbys Falls Road	Lot 1, DP 807046	Local	111

Table 6.38 – Local Heritage items within 500 metres of the proposed alignment

Source: Cowra LEP 2012, Schedule 5 Environmental Heritage





Figure 12: LEP Heritage Items (Source: NSW LPI)

Two items listed under the NSW Heritage Act on the State Heritage Register are located within 500 metres of the proposed alignment (refer – **Table 6.39**). The relationship between the proposed bypass route and stage heritage register curtilage is depicted in **Figure 13** and **Figure 14**. The state heritage register defines the boundary of the rail bridge as:

The boundary is the area on which the bridge is located including supports, embankments, track formation and structure and extends for a distance of approximately 20 metres in all directions from the structure.

Figure 14 depicts this boundary in more detail and in the context of the adopted concept alignment.

Area	Item	Address	SHR#
Cowra	Cowra Railway Station and yard group	Blayney-Harden railway, Cowra, NSW 2794	01122
Cowra	Cowra rail bridge over Lachlan River	Blayney-Harden railway, Cowra, NSW 2794	01031

Table 6.39 – Items listed under the NSW Heritage Act

Source: NSW Heritage Register

The boundary of the railway station and yard group is defined by the state heritage register as:

The listing boundary is in 3 parts. Firstly the Examiners hut is bounded by a line approximately 5 m away from the structure on all sides. Secondly the station complex is bounded by a line running along the railway boundary on the eastern side turning west on the north side incorporating the water stand and tank, then turning south and incorporating the carpark and park area following the property boundary to a point where it turns south east to include the (sic) railway institute. The boundary then turns north behind the Institute until the entry road which it follows until the southern end of the platform. The boundary around the locomotive roundhouse includes all buildings and structures in the area presently leased by the Lachlan Valley Railway Co-op Society Ltd. The residence is bounded by its yard boundary to three sides and by the tracks to the east.



#### The statement of significance for the rail bridge states:

Cowra was reached by rail in 1886, the line extending from Young. The bridge built in 1886 is one of the original iron lattice Whitton bridges and is an important surviving element from the most significant period of railway development. It is an excellent example in an important railway town. The building of such a relatively large structure on this cross country line reflects the importance that the railway administration gave to this line to provide an outlet for coal from Lithgow, and produce from central NSW, to reach the south and Victoria and vice versa.

The bridge is a member of the most significant group of colonial bridges in New South Wales. Collectively, as items of railway infrastructure, they contributed significantly to the history and development of New South Wales. Each bridge is an imposing structure at its site. In terms of contemporary bridge technology the wrought iron lattice bridge was among the best for major bridgeworks.

#### The statement of significance for the railway station and yards states:

Cowra was reached by rail in 1886 from Young and linked to Blayney in 1888, forming the first cross country line. The station complex forms an interesting and complete group of buildings that illustrate the importance of the location through the development of the site, particularly the station building. Many periods of construction in varying styles are evident within the group and in the station buildings making the present structures unique. The complex forms an important civic group on one of the major approaches to Cowra having a strong relationship to the town and the nearby locomotive facilities. The station building is a significant civic structure within the town. The Institute building is one of the few remaining in the state and is of high significance for its social value in illustrating the importance of the families. The examiners hut is a rare early example of such a building and is of high significance. The forecourt parking area (although the surface treatment has altered from the original) and grounds are of significance due to their connecting the streetscape and to the station complex. The site is in close proximity to the Cowra Locomotive Depot which is one of the few active remaining locomotive depots in the state. This association enhances the significance of both groups of structures.





Figure 13: State Heritage Curtilage

Additionally an initial field survey was completed by Access Archaeology and Heritage on the 5 & 6 June 2015. As a result of this survey, an item of potential heritage significance was identified, that being a concrete water tank and associated drain located on the western bank of the Lachlan River, thought to be associated with the former Cowra Power Station.

This feature is a large, round concrete tank set into the western bank of the Lachlan River, on the south side of the rail bridge. To the north of the tank is a drain running back into the Lachlan River. Neville Williams and Esther Cutmore considered this feature to be the pump station for water to be supplied to the power station. Mr Williams relayed the story that in the mid-20th century, after the water as used in the power station the drain (or a drain) returned hot water to the river, and children would swim in the warm water downstream as it mixed with the cold water of the river.

# 6.5.2.2 Potential Impacts

Database searches have identified four significant items proximal to the bypass alignment. The two locally significant items are considered sufficiently separated from the alignment to ensure that impacts to their heritage significance would be minimal. Additionally, one item, a concrete tank (hereafter referred to as the potential heritage item), has been identified via field survey which has potential heritage significance due to its possible connection with the former Cowra power station. It is noted that neither the potential heritage item nor the power station buildings are on state or local heritage registers and therefore they are not covered by the protective provisions of the *Heritage Act 1977*.

The two state significant heritage items are located in close proximity to the alignment and have the potential to be impacted by the project. The concrete tank identified via field survey is located within the proposed alignment and would either need to be removed to facilitate the project or the alignment altered to avoid impact.

Generally, a statement of heritage impact (SOHI) is prepared to assist in the review and approval process when there is a perception that a proposed project could impact upon the heritage values of an item or site. The purpose of a SOHI is to explain how the heritage value of an item might be affected by



the proposal. Impact may be positive when an item is to be conserved or enhanced, or impact may be detrimental if the site is to be disturbed or destroyed.

A preliminary assessment of heritage impact seeks to identify whether the disturbance or destruction of an item or site could reasonably be expected to result in a negative impact to assessed heritage values. It then identifies any requirement for additional information in order to inform a more detailed SOHI to further address the guidelines of the NSW Heritage Manual in reference to specific project plans.

The accepted guidelines specify that the following statements are addressed in a SOHI in response to a proposed project:

The following aspects of the proposal respect or enhance the heritage significance of the study area for the following reasons.

The following aspects of the proposal could detrimentally impact on heritage significance. The reasons are explained as well as the measures to be taken to minimise impacts.

The following sympathetic solutions have been considered and discounted for the following reasons.

The boundary of state heritage curtilage for the *Cowra Railway Station and Yard Group* is approximately 60 metres from the proposed alignment and the alignment intersects the boundary of state heritage curtilage for the *Cowra Rail Bridge over Lachlan River*, as the batter to the eastern abutment is shown via the adopted concept alignment to extend to the north beneath the bridge – refer **Figure 14**. As per **Section 6.7**, a number of refined concept bridge designs have been considered in response to potential hydraulic impacts from the GHD concept. Bridge design options B and C propose adoption of evenly spaced support piers with one metre diameter with two alternative road levels. **Section 6.7** recommends utilisation of a bridge design is necessary to develop the final arrangement it is expected that the extent of fill proposed via the concept alignment would be significantly reduced via the adoption of the Option C bridge design. Additionally, the Option C arrangement adopts a significantly lower road level than the Option A and B arrangement, thereby ensuring that impacts to the rail bridge are minimised.



Figure 14: Extent of impact to state heritage curtilage



It is a recommendation of this REF that concept and detailed design of the bridge should take account of the proximity to the rail bridge and railway station and yards and seek to develop a design that avoids impact to these items. Subject to impacts being adequately avoided, consent would not be required under the Heritage Act. If impacts are not avoidable an addendum to this REF would be required – refer **Section 7.2**.

In addition to the above, it is anticipated that detailed design could avoid the need to impact the potential historic feature located on the western bank of the river. As this item is not a listed heritage item, and does not relate to a listed heritage item, it is not protected by legislative provisions. It does however have some (albeit limited) significance which could arguably justify its retention. If however the detailed design could not, with best endeavours, retain the structure, it is considered that the loss of the item would not be of significance. In this scenario, archival recording of the item would be a reasonable method to ensure details of the item are retained.

Due to the distance between the listed state heritage items in **Table 6.39** and the proposed alignment, there is potential for the proposal to adversely impact the heritage items as a result of construction vibration. Controls to ensure impacts are minimised would be incorporated into a CNVMP prior to construction commencing – refer **Section 6.3.6.3**.

There is the potential for the disturbance of unexpected archaeological relics during work due to the need to excavate the road surface. Section 139 of Division 9 of Part 6 of the Heritage Act 1977 states:

(1) A person must not disturb or excavate any land knowing or having reasonable cause to suspect that the disturbance or excavation will or is likely to result in a relic being discovered, exposed, moved, damaged or destroyed unless the disturbance or excavation is carried out in accordance with an excavation permit.

## 6.5.2.3 Safeguards and Management Measures

### Detailed design

- As far as is practicable, detailed design of the proposed bridge should limit the impact to the state heritage significance of the adjacent Lachlan River rail bridge;
- As far as is practicable, detailed design of the proposed bridge should limit the impact to the potential heritage item located on the western bank of the river; and
- Based on the significance of the Lachlan River rail bridge, and once detailed design of the proposed bridge has progressed, a specific SOHI should form part of any future planning process with regard to the bypass work, specifically the proposed bridge, that impacts the rail bridge refer **Section 7.2**.

### **Pre-Construction**

- Provision of contact number of suitably qualified heritage specialist to the construction project manager;
- Prepare a CNVMP to ensure that the potential for impacts to heritage item as a result of construction vibration is appropriately mitigated; and
- If, as per the detailed design safeguards listed above, the potential heritage items cannot be retained without impact, it is recommended that it be subject to an archival recording involving the preparation of measured drawings (plans and cross section) and photography.

### Construction

- Limit proposed work to the identified construction footprint in order to limit the possibility of encountering non-Aboriginal 'objects' in unassessed areas;
- Avoid using multiple vibratory equipment in one area at any one time;
- Where vibratory rollers are brought to the site, ground borne vibration levels would be measured to establish the minimum working separation between the equipment and nearby vibration sensitive receivers, including heritage buildings;



- Continuous vibration monitoring would be carried out when a vibratory roller is operating within 30 metres of a building or sensitive structure, or as required. Where the measured vibration levels exceed the appropriate limit applying to the measurement, construction activities or equipment would be modified (e.g. using a lighter or smaller vibratory roller) to ensure ongoing compliance with the limits. Otherwise, arrangements would be made with the affected residents to allow the operations to continue without affecting the residents' comfort;
- Investigate the use of non-vibratory rollers where practical and feasible (only if required); and
- Should any 'objects', relics or other heritage features be identified during the course of construction, work in the area should cease and the item be cordoned off. A qualified heritage specialist is to attend the site to determine the nature of the find and the Office of Environment and Heritage is to be contacted to discuss how to proceed.

# 6.6 AIR QUALITY

A quantitative Air Quality assessment has been completed for the project by Air Noise Environment Pty Ltd and is provided as **Appendix K**. The findings of the assessment are summarised in this section.

## 6.6.1 METHODOLOGY AND ASSESSMENT FRAMEWORK

The assessment of the proposed bypass has considered the potential for environmental impacts associated with both the construction and operation of the roadway.

For the construction phase of the project, the review has considered the potential for adverse impacts on air quality as a result of construction activities. In particular, the potential impacts of nuisance dust emissions are considered and appropriate mitigation measures for incorporation into the development recommended.

The assessment of emissions to air from vehicles utilising the bypass roadway during the operational phase are assessed through predictive air dispersion modelling. Emissions from vehicles expected to utilise the roadway are estimated based on the NSW motor vehicle fleet. In order to assess the potential impacts associated with these emissions, air dispersion modelling has been undertaken using the Austroads model developed by the Victorian Environmental Protection Agency

## 6.6.2 EXISTING ENVIRONMENT

A review of existing land uses along the proposed route has identified a total of 63 sensitive receptors within 100 m of the alignment. For the purposes of the assessment, this air quality review has not incorporated a site inspection. Rather, potential sensitive receptors (residences, schools, medical facilities) have been identified through a review of current aerial photography. It is therefore possible that some of these receptors, which are located in predominantly industrial areas, are in fact not used for residential purposes. To be conservative, where the land use is not clear, the assessment has considered to be sensitive (i.e., residential).

Figure 2.2 of **Appendix K** (reproduced as **Figure 15**) presents the proposed alignment of the Cowra Heavy Vehicle Bypass Road along with the identified sensitive receptors within 100 m of the alignment. Previous experience suggests that impacts beyond this distance from the roadway are extremely unlikely. Despite this, the assessment of potential impacts includes consideration of all receptors within 250 metres of the roadway alignment (being the maximum distance from the roadway for which the model is validated).




Figure 15: Bypass alignment including sensitive receptors within 100m (Source: ANE)

### 6.6.3 POTENTIAL IMPACTS

#### 6.6.3.1 Construction phase

The NSW EPA identify nuisance dust impacts as occurring when annual average dust (insoluble solids) deposition levels exceed 4 g/m<sup>2</sup>/month with unacceptable levels. In assessing the impact of dust emissions from a specific project or construction activity, the NSW EPA uses a level of 2 g/m<sup>2</sup>/month as an acceptable increase over existing dust deposition levels for residential areas.

The construction of the Cowra Heavy Vehicle Bypass is expected to involve a number of activities with the potential for emissions to air including:

- Clearing of vegetation and moving topsoil;
- Bulk earth works including construction of embankments and cuttings;
- Trenching for installation of structures and services;
- Road construction including surfacing; and
- Operation of construction equipment.

The major emissions to air expected for the above activities relate to dust emissions. These dust emissions typically have a significant component of larger size fraction particulate matter. For receptors near to the activities, these larger particles have the potential to result in discomfort for local residents and workers in the area and may result in nuisance dust impacts due to deposition onto surfaces (including window sills, furniture, clothes, vehicles and floors).

The quantity of emissions from the construction works are dependent on a range of factors including the characterisation of the soil materials (eg silt and moisture content), the construction methods adopted, local wind conditions and the presence and density of vegetation in the area. It is noted however, that these impacts are likely to be temporary and localised, and best practice management and mitigation measures can adequately address relevant goals for dust deposition and control and minimise potential impacts – refer **Section 6.6.4**.



## 6.6.3.2 Operation phase

Table 4.1 of **Appendix K** (reproduced as **Table 6.40**) presents air quality criteria for air pollutants considered in the assessment based on the requirements of the 'Approved Methods for the Modelling and Assessment of Air Pollutants in NSW' (2005).

Compound	Air Quality Goal	Averaging Time	Units
PM <sub>10</sub>	50	24-hour	µg/m₃
Nitrogen Dioxide	246 62	24-hour Annual	μg/m₃ μg/m₃
Carbon Monoxide	10	8-hour	µg/m₃

#### Table 6.40 – NSW EPA Air Quality Goals

Source: Air Quality Review (ANE, 2015)

Predictions of the dispersion of emissions from the Cowra bypass have been completed using the Austroads modelling software. Austroads is a line source air quality model developed by the EPA Victoria (Australia) based on the algorithms utilised by Caline 4 as developed by the California Department of Transportation (Caltrans).

The Austroads model is based on the steady state Gaussian dispersion of contaminants under a given wind condition. In the case of the roadway emissions near to the Cowra heavy vehicle bypass, this could result in a significant degree of conservatism in the modelled concentrations, particularly for maximum predicted concentrations which typically occur during calm meteorological conditions. Validation studies of the (Caline 4) (which provides the basis for Austroads) identified over-predictions of contaminant concentrations during calm periods. These over-predictions were noted to be related to the low probability of achieving steady-state conditions (assumed by the Gaussian model) during near calm winds.

Predictions of meteorological parameters for the year 2012 for the Cowra region were undertaken using TAPM (Version 4.04). In accordance with the requirements of the NSW EPA modelling methodology, the selected year of meteorological data is compared with historical data for the Cowra area to confirm its representativeness of the area.

To allow analysis for the potential impacts of the proposed Cowra Heavy Vehicle Bypass combined with existing ambient background concentrations, a cumulative analysis has been completed. For the purposes of the assessment, existing background concentrations have been derived from the default rural concentrations adopted in the Tool for Roadside Air Quality (TRAQ) model. These concentrations were based on an analysis of 5 years of monitoring data from all stations in the NSW monitoring network operated by the EPA. For each hour of meteorological data considered in the modelling, the existing ambient concentrations presented in Table 4.3 of **Appendix K** are added to the contribution from the proposed Cowra Heavy Vehicle Bypass to provide predicted cumulative receptor concentrations.

Table 4.4 (reproduced as **Table 6.41**) and Figures 4.2 to 4.5 of **Appendix K** present a summary of the maximum predicted receptor concentration for the proposed Cowra Heavy Vehicle Bypass. It is noted that the data presented in Table 4.4 (reproduced as **Table 6.41**) represents the highest concentration predicted across the modelling domain and does not necessarily relate to a sensitive receptor. Despite this, for all pollutants, maximum predicted cumulative receptor concentrations are significantly below the air quality goals. Further, the contribution of emissions from vehicles using the proposed Cowra Heavy Vehicle Bypass Road (shown in brackets) are, with the exception of NO2, insignificant in terms of the predicted cumulative concentrations. For NO2, maximum predicted receptor concentration contributions as a result of the proposed bypass road represent less than 25 % of the air quality goal even assuming all light and heavy vehicles use the bypass (Scenario 2).

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Scenario	Scenario Description		Maximum Predicted Concentrations			
			Carbon Monoxide	Nitrogen Dioxide		PM <sub>10</sub>
			8 Hour Average mg/m³	1 Hour Average μg/m³	Annual Average µg/m³	24 Hour Average μg/m³
1	Assumes all heavy vehicle traffic use	2018	0.35 (0.01)	19.2 (14.5)	6.0 (1.3)	22.1 (0.3)
Bypass road	2028	0.36 (0.02)	28.4 (23.7)	6.8 (2.1)	22.3 (0.5)	
2	Assumes all traffic (LGV and HGV) use Bypass Road	2018	0.39 (0.05)	39.4 (34.7)	8.0 (3.3)	23.0 (1.2)
Ву		2028	0.75 (0.41)	59.0 (54.3)	10.1 (5.4)	23.6 (1.8)
Air quality goals		10	246	62	50	

Source: ANE, 2015

## 6.6.4 MITIGATION MEASURES

#### 6.6.4.1 Construction

Mitigation measures to be considered during development of detailed construction plans include:

- Provide hardstands or similar sealed surfaces in compound areas and work sites to minimise the potential for dust emissions;
- Where possible, retain existing ground cover undisturbed;
- Place and maintain all disturbed areas, stockpiles and handling areas in a manner that minimises dust emissions (including windblown, traffic-generated or equipment generated emissions);
- Implement site specific controls including (but not limited to) watering, road sweeping and removal of accumulated material from environmental controls;
- Restore disturbed areas progressively at the completion of local works;
- Where visible dust emissions occur as a result of increased wind speeds, dust generated works should cease until appropriate additional controls are implemented;
- All plant and equipment should be maintained in good working order in accordance with the manufacturer's instructions;
- Construction equipment and plant should be maintained in good working order, and maintenance would be carried out where emissions are unacceptable; and
- Equipment, plant and construction vehicles would be turned off when not in use.

It is recommended that deposited dust monitoring be undertaken at selected receptor locations throughout the construction works to provide a regular assessment of performance in controlling emissions. Where deposited dust levels exceed the air quality goals, dust management measures should be reviewed and improved as necessary to achieve acceptable amenity for nearby uses.

#### 6.6.4.2 Operation

The review of emissions from vehicles using the proposed bypass road concludes that compliance with the air quality goals would be achieved. It is noted that this assessment has also considered a worst-case extremely conservative scenario where all heavy vehicles and cars currently accessing the town of Cowra are also assumed to use the bypass road (i.e. assumed not to travel into Cowra).



## 6.7 WATER

### 6.7.1 EXISTING ENVIRONMENT

#### 6.7.1.1 Surface Water

The proposal area is within the Lachlan catchment. The land along the proposed alignment occurs on the Upper Lachlan Channels and Floodplains and the Eugowra Floodplains. Surface waters in the proposal area are ultimately captured by the Lachlan River, with surface waters draining into the Lachlan River via Waugoola Creek at the eastern extent of the proposed alignment.

The proposed alignment crosses Waugoola Creek and the Lachlan River; both are identified in the LEP as sensitive watercourses (refer – **Figure 16**). The proposed alignment also crosses land identified in the LEP as Flood Planning Areas, which are considered to be flood-prone land (refer – **Figure 17**).



Figure 16: Sensitive Watercourses





#### Figure 17: Flood Planning Areas

### 6.7.1.2 Groundwater

The Cowra LEP identifies parts of the proposal area as containing groundwater vulnerable land (refer – **Figure 18**).



Figure 18: Groundwater vulnerable land

The groundwater depth in the Cowra Shire is variable and available data indicates it is generally close to the surface but varies depending on the lithology and structure, system interactions and recharge rate (SMEC, 2006).



A search of the NSW Office of Water (NOW) online groundwater database for the locality was carried out and identified 83 bores within 500 metres of the proposal area. The locations of these bores are provided in **Figure 19** and available bore log details are provided in **Appendix B** (noting that not all bores around the Shell Depot have available logs). Of the 83 registered bores, 24 bores recorded standing water levels (SWL). The highest SWL was 2.20 metres and the lowest 20.00 metres, with an average SWL of 6.01 metres. The highest water bearing zone was recorded at 2.00 metres.

It is noted that 63 of the 83 registered bores are concentrated near the Shell Depot (34 Brougham Street), and they are all monitoring bores. Of the 63 registered monitoring bores at this location, SWL are provided for 24 bores and the upper limit of the WBZ is recorded for 15 bores.





## 6.7.2 POTENTIAL IMPACTS

## 6.7.2.1 Construction

#### Surface Water

Potential impacts to surface water during construction may include:

• Potential sedimentation from run-off of excavated or disturbed soil during construction and resulting impacts to the water quality of the nearby drainage lines and river.

#### Groundwater

Potential impacts to groundwater during construction may include:

- Groundwater contamination due to spills of chemicals or fuels.
- Interaction with groundwater



## 6.7.2.2 Operation

#### Flooding

Primary impacts to surface water associated with the ongoing operation of the proposal would be potential impacts to flood behaviour due to the introduction of the proposed bridge over the Lachlan River. Potential secondary impacts include the introduction of fill to develop the concept vertical alignment and the changes to the crossing arrangement of Campbell Street at Waugoola Creek.

Notwithstanding the lack of detail provided in the concept design (essentially a finished road level has been adopted but no detail on the bridge design has been provided) the concept road centre line was provided to SMEC for analysis against the flood model prepared for the 2006 Cowra Floodplain Risk Management Plan. The output from this analysis is provided in **Appendix I**. The intent of the modelling was to determine whether the introduction of an additional bridge across the Lachlan River would impact flood behaviour, specifically through any increase in flood levels.

A validation of the model results was required to check the performance of the MIKE-11 model. The validation was undertaken by re-running the MIKE11 model (with existing conditions – no changes) and comparing flood level results with the previous version of MIKE-11. The model runs indicated that the 1%AEP flood levels along the Lachlan River were within +-0.02m and were therefore the latest version of MIKE-11 was appropriate to be used for the current study. However, the 1% AEP flood levels at the Waugoola Creek cross sections experienced a difference in levels of +-0.8m which is a significant change. This was due to backwater from the Lachlan River but was deemed not to have any hydraulic impact on the Lachlan River model results.

As no details were available of the river's invert levels, soffit levels, piers, and abutments to the bridge, assumptions were made for the bridge geometry based on the 2m contours, and design strings supplied. Three options for the bridge design were reviewed by the model:

- Option A (as per the GHD concept plan) assumed the following:
  - Road horizontal and vertical alignment as per the **GHD Drawings**;
  - A bridge span of 107 metres;
  - Deck thickness of 1 metre;
  - Bridge handrail 1.3 metre high
- Option B (conceived by Geolyse) assumed the following:
  - Road horizontal and vertical alignment as per Option A;
  - Deck thickness of 1.0 metres
  - Pier spacing of 18 metres (including through river)
  - Pier width 1 metre
  - Bridge handrail 1.3 metre high
- Option C (conceived by Council) assumed the following:
  - Reduced road level (by comparison to Options A and B) of 286.23 AHD at bridge crossing;
  - Deck thickness of 1.0 metres
  - Pier spacing of 18 metres (including through river)
  - Pier width 1 metre
  - Bridge handrail 1.3 metre high

**Figure 20** depicts the assumed bridge geometry adopted for Option A in the updated MIKE-11 model, **Figure 21** depicts the assumed geometry for Option B and **Figure 22** depicts the assumed geometry for Option C. Adopted Bridge Geometry



# Figure 20: Assumed bridge geometry adopted for the current study (Option A) Source: SMEC, 2015

The proposed road alignment potentially affected the MIKE-11 cross sections at Lachlan River and at Waugoola Creek. The proposed road alignment was superimposed onto the MIKE-11 cross sections for the Lachlan River and Waugoola Creek to check whether they would have an impact on the flood extent. The 1% AEP existing flood levels showed that the road alignment adjacent to the Waugoola Creek cross sections was well above the flood extent. The Waugoola Creek cross sections were therefore unaltered.

Model runs incorporating the two bridge options included the full range of different sized flood events including the 5%, 2%, 1%, 0.5% Annual Exceedance Probability (AEP) and Probable Maximum Flood (PMF) events.





Figure 21: Assumed bridge geometry adopted for the current study (Option B) Source: SMEC, 2015







The modelling indicated an insignificant change in flood levels in the Lachlan River downstream of the proposed road crossing site for all three bridge design options.

However, the levels in the Lachlan River upstream of the proposed road increased by up to 2.33m for the 1% AEP event for Option A, 1.39 m for the 1% AEP event for Option B and 1.07 m for the 1% AEP event for Option C. All options also increased flood levels for the 5%, 2%, 1%, 0.5% AEP and PMF events as outlined in **Appendix I.** Option C therefore has the least impact on surrounding areas and it is recommended that the option C design parameters be adopted for the project.

SMEC also note in their assessment that the backwater resulting from the development of the bridge has the potential to impact on a number of properties to the south and SMEC recommend that floodmaps highlighting these increases in levels should be prepared prior to detailed design of the Cowra bypass. This recommendation has been reflected in **Section 6.7.3.1**.

In addition to the recommendation to prepare floodmaps, Geolyse also undertook analysis to determine the extent of likely impact to residential properties as a result of the introduction of the proposed bridge. Geolyse carried out a review of ground levels in the area compared to the computed flood levels resulting from the three bridge options. Results of these findings for the three bridge design options is provided in **Geolyse Drawings EV01-EV03**. These drawings have been produced by Geolyse utilising the data provided by SMEC and by reference to ground level data available from Google Earth.

The review of ground and modelled flood levels shows that while the proposed bridge increases flood levels, subject to adoption of Option C, the increased flood levels are not expected to impact on properties along the Lachlan River and Waugoola Creek. The increases in flood levels are less with a piered roadway and bridge structure (Options B is less than Option A and Option C has the least impact of all three options). The absence of detailed survey makes the conclusions derived from this exercise reasonable but subject to final confirmation in conjunction with detailed design of the bridge and further modelling.

In larger events, flooding along Waugoola Creek is governed as a backwater from the Lachlan River and the impact on flood levels along this creek is governed by the proposed bridge and crossing of the Lachlan River rather than the road adjacent to Waugoola Creek (Refer to Figure 4 of **Appendix I** for the location of cross sections and Appendix A of **Appendix I** for a plot of the cross sections with the proposed road).

The proposed upgraded road crossing at Waugoola Creek (Campbell Street) is located beyond the extent of the existing model and it was not practical to extrapolate the cross sections to this point to provide reliable results; it was therefore not included in the model. The generally flat nature of the landscape between the Mid Western Highway and model chainage 1480 in Waugoola Creek enables extrapolation of the flood levels provided in Appendix C of the SMEC report to determine likely flood levels at the Campbell Street crossing by reference to indicative ground levels. This indicates that the increased flood levels caused by higher flood levels in the Lachlan River should not impact on properties in this location.

Equally, maintaining existing flows across the Campbell Street crossing of Waugoola Creek via an engineering solution, would ensure water from higher in the Waugoola Creek catchment (north) would discharge through the creek to the river at levels consistent with the current arrangement and result in no greater impact to the locality.

It is also noted, in all three bridge design options, that increases to flood levels (afflux) extend to beyond the upstream end of the model. The assessment of the extent of afflux and flood affected properties upstream of the model area can only be made by extending the model upstream. Whilst **Geolyse Drawings EV01-EV03** provides reasonable confidence that the changes are not likely to be significant, subject to adoption of Option C, further assessment of the bridge would be required to enable more



accurate assessment of the extent of impact from the bridge on flood behaviour. The bridge design and hydraulic modelling would likely require an iterative process which would optimise the bridge design and minimise impacts on flood behaviour.

It is clear from the modelling and the information provided via **Geolyse Drawings EV01-EV03** that the proposed alignment would need to adopt as a minimum a bridge cross section similar or better than the Option C arrangement in order to ensure that impacts associated with the project do not detrimentally impact on residential properties located to the south.

There is confidence that an iterative bridge design, with a goal of minimising the cross section of the bridge, would provide an arrangement that would not detrimentally impact on residential properties nor pose a significant risk to life as a result of any increased flood levels.

#### Groundwater

Groundwater impacts associated with the operation of the road would be limited to the possibility of chemicals spilled during vehicle accidents leaching into the soil environment. This is no greater impact than would exist for existing roads in the locality and the overall level of impact would remain unchanged.

### 6.7.3 SAFEGUARDS AND MITIGATION MEASURES

#### 6.7.3.1 Prior to Detailed Design

Preparation of floodmaps highlight increases in levels.

#### 6.7.3.2 Detailed design

- The bridge design option must be developed to ensure that impacts to properties to the south are minimised; and
- Further flood modelling is to be undertaken during detailed design to confirm impacts to surrounding land uses, specifically residential land uses to the south of the proposed bridge location and areas along Waugoola Creek. The modelling is to be extended far enough upstream to assess the extent of the afflux caused by the proposed bridge and roadway section.

#### 6.7.3.3 Pre-Construction

- A Soil and Water Management Plan (SWMP) would be prepared as part of the CEMP in accordance with the requirements of Roads and Maritime contract specification G38 prior to the commencement of construction. The SWMP would also address the following:
  - Roads and Maritime Code of Practice for Water Management, the Roads and Maritime Erosion and Sedimentation Procedure
  - The NSW Soils and Construction Managing Urban Stormwater Volume 1 "the Blue Book" (Landcom, 2004) and Volume 2 (DECC, 2008).
  - Roads and Maritime Technical Guideline: Temporary Stormwater Drainage for Road Construction, 2011.
  - Roads and Maritime Technical Guideline: Environmental Management of Construction Site Dewatering, 2011.

The SWMP would detail the following as a minimum:

- Identification of catchment and sub-catchment areas, high risk areas and sensitive areas.
- Sizing of each of the above areas and catchment.
- The likely volume of run-off from each road sub-catchment.
- Direction of flow of on-site and off-site water.
- Separation of on-site and off-site water.



- The direction of run-off and drainage points during each stage of construction.
- The locations and sizing of sediment traps such as sump or basin as well as associated drainage.
- Dewatering plan which includes process for monitoring, flocculating and dewatering water from site (i.e. sediment basin and sumps).
- The staging plans, location, sizing and details of creek alignment and realignment controls for scour protection and bank and bed stabilisation including those used during construction and long term.
- A mapped plan identifying the above.
- Include progressive site specific Erosion and Sedimentation Control Plans (ESCPs). The ESCP is to be updated at least fortnightly.
- A process to routinely monitor the BOM weather forecast.
- Preparation of a wet weather (rain event) plan which includes a process for monitoring
  potential wet weather and identification of controls to be implemented in the event of wet
  weather. These controls are to be shown on the ESCPs.
- Provision of an inspection and maintenance schedule for ongoing maintenance of temporary and permanent erosion and sedimentation controls
- The Soil and Water Management Plan would include a contingency plan for any acid sulfate soils or salinity identified during the construction phase;
- A contingency plan would be prepared in preparation for a potential flood event during construction and would outline evacuation procedures. The plan would include:
  - Evaluation of what flood event would trigger the plan.
  - Evacuation procedures.
  - A map indicating the area that is flood prone and the locations where to evacuate.
- All stockpiles would be designed, established, operated and decommissioned in accordance with the Roads and Maritime Stockpile Site Management Guideline, 2011; and
- A Stabilisation Plan is to be prepared and included in the SWMP. The stabilisation plan is to include but not be limited to the following:
  - Identification and methodology of techniques for stabilisation of site.
  - Identification of area on site for progressive stabilisation.
  - Stabilisation is to be undertaken of areas, including stockpiles and batters, exposed for a duration of 2 weeks or greater. For example covering with geotextile fabric, stabilised mulch, soil binder or spray grass.
  - Identification of areas on site for progressive permanent stabilisation such as implementation of landscaping.

## 6.7.3.4 Construction

The following measures would be implemented to mitigate potential sedimentation and contamination of the catchment during construction:

- Controls are to be implemented at exit points to minimise tracking soil and particulates onto pavement surfaces;
- Any material transported onto pavements would be swept and removed at the end of each working shift and prior to rainfall;
- Emergency wet and dry spill kits would be kept on site at all times and all staff would be made aware of the location of the spill kit and trained in its use;
- All refuelling and storage of fuels, chemicals and liquids are to be within an impervious bunded area within the construction compound, sited a minimum of 50 metres away from;
  - Rivers, creeks or any areas of concentrated water flow.



- Flooded areas.
- Slopes above 10%.
- The vehicles refuelling process would include a person attending the refuelling facility / vehicle and a spill kit on the vehicle;
- Installation of standard erosion and sediment control measures to be implemented based on best industry practice with reference to NSW Department of Housing's *Managing Urban Stormwater* – *Soils and Construction* (the "Blue Book") Volume 2 (Landcom, 2004);
- Erosion and sedimentation controls are to be checked and maintained on a regular basis and after a rain event of 10mm or greater (including clearing of sediment from behind barriers) and records kept and provided on request;
- Erosion and sediment control measures only to be removed once the area is restabilised;
- Vehicle wash down and/or cement truck washout is to occur in a designated bunded area and least 50 metres away from water bodies and surface water drains;
- Any fuel, oils or other liquids stored on site would be stored in an appropriately sized impervious bunded at least 120% larger than the greatest container and in an area least 50 metres away from water bodies;
- Retention of existing groundcover around the disturbed areas to minimise sediment movement; and
- Ensure the design and construction materials would withstand flooding.

## 6.8 LAND USE

### 6.8.1 EXISTING ENVIRONMENT

A number of land uses are identified within the vicinity of the proposal. Land zones within 500 metres of the proposed alignment are identified in **Table 6.42**, including the percentage of the area each zone occupies. **Figure 23** displays the land zoning surrounding the proposed alignment.

Land Zone Code	Zone Description	Area (ha)	Percentage of Total Area (%)
B2	Local Centre	9.75	1.06
В7	Business Park	35.71	3.89
E3	Environmental Management	59.90	6.53
IN1	General Industrial	11.93	1.30
IN2	Light Industrial	81.06	8.83
R1	General Residential	139.41	15.19
R5	Large Lot Residential	139.10	15.15
RE1	Public Recreation	43.50	4.74
RE2	Private Recreation	5.62	0.61
RU1	Primary Production	214.49	23.37
RU4	Rural Small Holdings	61.46	6.70
SP2	Infrastructure	1.41	0.15
W2	Recreational Waterways	114.61	12.49

Table 6.42 – Land Zones within 500 metres of proposed alignment

The land zones intersected by the proposed alignment include the following:

- R5 Large Lot Residential
- RU4 Rural Small Holdings



- E3 Environmental Management
- W2 Recreational Waterways
- IN2 Light Industrial
- RU1 Primary Production
- R1 General Residential
- RE1 Public Recreation

Road construction is permitted with consent in all zones intersected by the proposed alignment.



Figure 23: Land zoning surrounding the proposed heavy vehicle bypass

## 6.8.2 POTENTIAL IMPACTS

Potential impacts on property and land use by the project would include:

- Property acquisition;
- Severance and sterilisation of land;
- Changes in property access;
- Impacts on future development potential of land within the project and adjoining areas;
- Impacts on urban settlement patterns and future development potential of adjoining land;
- Impacts to services;
- Short term restricted access to commercial properties and services without alternative vehicular access during construction;
- Short term noise impacts during the construction period and long term noise impacts during operation refer **Section 6.3**; and
- Improved vehicular access to commercial properties and services along the proposed bypass.

#### Property acquisition

Land acquisition would be required to facilitate construction however the precise amount of acquisition would not be confirmed until the detailed design has been completed. Based on the concept alignment an area of approximately 14 hectares would require acquisition and approximately 44 lots would be



affected. **Table 6.43** provides a summary of lots affected by the concept alignment. The total area of acquisition appears high due to a number of large acquisition areas through rural land to the south. There are also a high number of very minor acquisitions in the eastern extent that are likely be unnecessary once detailed design is completed. Direct negotiation would be required between Council and individual land owners prior to acquisition occurring or acquisition via another method, such as compulsory purchase, instigated. Acquisition would be completed prior to the commencement of construction.

LOT	DP	SECTION	ADDRESS	AREA (sq. m)
264	752948	-	Lachlan Valley Way Cowra	823
1	909348	-	Parkes Street Cowra	12,161
372	752948	-	Lachlan Valley Way Cowra	1,201
7010	1060400	-	Campbell Street Cowra	4,547
2258	1158739	-	Campbell Street Cowra	316
53	1105722	-	34 Brougham Street Cowra	843
413	728842	-	8 Fishburn Street Cowra	7,330
1	585103	-	4 Campbell Street Cowra	169
412	728842	-	8 Fishburn Street Cowra	4,064
2	156637	-	4 Campbell Street Cowra	200
390	752948	-	Lachlan Valley Way Cowra	576
278	750377	-	12 Campbell Street Cowra	203
1	156637	-	8 Campbell Street Cowra	201
8	791736	-	46 Boundary Road Cowra	10
10	1244	3	71 Brougham Street Cowra	384
2	791736	-	70 Boundary Road Cowra	10
3	791736	-	68 Boundary Road Cowra	10
7	791736	-	48 Boundary Road Cowra	10
5	1013135	-	Young Road Cowra	4,638
4	829459	-	1 Fishburn Street Cowra	5,355
6	778638	-	119-121 Waratah Street Cowra	274
8	808158	-	71 Airport Road Cowra	240
7	771133	-	67 Airport Road Cowra	261
9	808158	-	81 Airport Road Cowra	225
4	83569	-	12 Campbell Street Cowra	582
1	871960	-	Mid Western Highway Cowra	2,740
7011	93227	-	Main Street Cowra	121
1	758300	42	Pack Street Cowra	1,502
7012	93227	-	Main Street Cowra	500
2	758300	23	Campbell Street Cowra	576
1	758300	23	Campbell Street Cowra	4,470
3	758300	40	7 Day Street Cowra	2,282
1	75894	-	7 Day Street Cowra	669
4	60699	-	7 Day Street Cowra	1,519

#### Table 6.43 – Land Acquisition

#### Table 6.43 – Land Acquisition

LOT	DP	SECTION	ADDRESS	AREA (sq. m)
5	662449	-	Main Street Cowra	682
1	377815	-	Main Street Cowra	37
1	519943	-	1 Campbell Street Cowra	16,878
210	752948	-	Lachlan Valley Way Cowra	1,304
2	519943	-	Elouera Road Cowra	62,770
				140,683

Source: Cowra Cadastre (Cowra Council) and Six Maps

It should be noted that the above acquisition areas are determined on the basis of a proposed 40 metre road corridor through greenfield areas, however it is conceivable a reserve of 20 or 30 metres may be acceptable. Through existing established areas, the concept alignment is generally contained within the confines of existing road reserves. It is expected that detailed design would avoid impacts to a significant proportion of the properties identified in **Table 6.43**. It is also noted that a significant portion of the acquisition area is centred in less than 10 of the total 44 lots.

Through the above measures the areas of acquisition and number of lots affected would be expected to significantly reduce beyond the figures identified in **Table 6.43**.

All acquisitions would be in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991* and the Roads and Maritime Land Acquisition Information Guide (February 2012) and would occur prior to construction.

Figure 24 - Figure 28 provide details of acquisition in the context of current property boundaries.



Figure 24: Concept acquisition – Fishburn Street





Figure 25: Concept acquisition – Lachlan River - East





Figure 26: Concept acquisition – Campbell Street - South





Figure 27: Concept acquisition – Campbell St - central





Figure 28: Concept acquisition – Campbell Street - North

The determination of areas of acquisition has been derived from the direct overlay of the adopted alignment over the current cadastral boundaries using GIS software. This would be subject to further refinement during detailed design, which may alter the final acquisition requirements and estimates.

#### Severance and sterilisation of land

Land use severance is the creation of a physical barrier between a property and an existing road access to that property. It is not anticipated that any severance would occur on the basis that all land for acquisition would occur on the edge of properties with no residual land parcels remaining.

Land use sterilisation refers to where the project severs a property into fragments of a size or shape that makes the ongoing use of that land unviable. In these cases, the land use can no longer be used for its current purpose and has no development potential. It is not anticipated that land use sterilisation would occur along the bypass route on the basis that acquisition areas are generally small, either in land area or as a proportion of the lot from which the acquisition is proposed.

#### Changes in property access

Changes in property access would occur for properties along the full length of the route. All property accesses would be provided in accordance with Austroads standards to ensure the safety of vehicles and residents when entering and leaving properties. Where the bypass route adjoins residential or industrial land uses, the bypass roadway adjacent to the residential or industrial land would incorporate a 3.0 metre wide parking lane outside the travel lane and concrete kerb and gutter would also be provided.

Direct consultation with affected property owners would occur to discuss access needs and ensure that arrangements are adequately addressed through detailed design – refer **Section 7.2**.

It is not anticipated that the proposal would result in any changes to internal farm access arrangements, on the basis that all acquisition would occur on the edge of existing properties with no land severance occurring.

#### Impacts on future development potential of land within the project and adjoining areas

Construction of the proposed heavy vehicle bypass would result in some changes in land use to sections of the proposed alignment, by transforming the land use to accommodate a major arterial road. These areas include:

• Currently undeveloped rural areas in use for primary production (cropping or grazing purposes);



- Areas zoned RE1 Public Recreation;
- Areas zoned IN2 Light Industrial;
- Areas zoned R5 Large Lot Residential that is currently only subject to local traffic along Boundary Road and Airport Road; and
- Areas zoned E3 Environmental Management
- Areas zoned R1 General Residential that currently or could in the future accommodate residents.

The impact of acquisition to current and future land use of rural land is expected to be minimal due to acquisition representing a small percentage of overall lot sizes.

Impacts to public recreation land as a result of acquisition is expected to be minimal on the basis that it would be unlikely to significantly change the current land use. Some relocation of infrastructure, such as the picnic area in Europa Park, may be required.

Impacts to industrial zoned land are generally limited to edge effects (that is, minor acquisition to the portion of properties fronting the new road) and are not considered likely to significantly impact the land use potential. Positive impacts are conceivable on the basis of improved connectivity for industrial lots in these areas.

Changes to traffic movements and acquisition is unlikely to change the land use potential of R5 zoned land in the western extent of the bypass (primarily Boundary and Airport Roads) on the basis that they are able to continue to be used for their current purpose.

The development of the bypass and acquisition of land is unlikely to impact on the environmental management land in the Campbell Street locality due to the very small amount of acquisition required and the generally passive nature of the current use of the land.

Impacts to R1 zoned land is limited to two small areas located in the eastern extent of the alignment, to the south of Darby Falls Road (Parkes Street and east of Campbell Street). As the Campbell Street area is undeveloped it is not considered that the impact of the bypass would be significant. The possibility of changes to future access arrangements is conceivable. The land use potential of properties on Parkes Street would remain unchanged although impacts to access arrangements are possible. This is considered in more detail in **Section 6.4**.

# Impacts on urban settlement patterns and future development potential of adjoining land

The bypass alignment is generally located on the periphery of the town of Cowra and, as stated previously, utilises existing road reserves for the greater proportion of the alignment length. Approximately 3.4 kilometres of new road would be required in the centre of the alignment.

The project would remove a large proportion of heavy vehicle highway traffic from Kendal Street which would have positive impacts for land use and internal movements due to improvements in amenity, local network efficiencies and safety for pedestrians.

There is the possibility for a loss of trade for commercial land uses within Kendal Street, however, improvements to the amenity of Kendal Street may also all create different commercial opportunities, which could change the development potential of Cowra. Impacts to businesses are discussed in more detail in **Section 6.9.3**.

#### Impacts to Services

Impacts to services located throughout the alignment is possible.



# Short term restricted access to commercial properties and services without alternative vehicular access during construction

Within the commercial (IN1 – General Industrial and IN2 – Light Industrial) portions of the alignment, a range of business properties have the potential to be affected , including those identified in **Table 6.44** below.

Lot/DP	Address	Access
Lot 1 DP585103	4 Campbell Street Cowra	Accessed from Campbell Street. No alternative access.
Lot 2 DP156637	6 Campbell Street Cowra	Accessed from Campbell Street. No alternative access.
Lot 1 DP156637	8 Campbell Street Cowra	Accessed from Campbell Street. No alternative access.
Lot 4 DP83569	12 Comphell Street Course	Accessed from Campbell Street. No alternative access.
Lot 278 DP750377	12 Campbell Street Cowra	Accessed from Campbell Street. No alternative access.
Lot 1 DP918324	18 Campbell Street Cowra	Accessed from Campbell Street. No alternative access.
Lot 53 DP1105722	34 Brougham Street Cowra	Accessed from Campbell Street or Brougham Street.
Lot 1 DP519943	1 Campbell Street Cowra	Accessed from Campbell Street. No alternative access.
Lot 109 DP654371	Young Road Cowra	Accessed from southern side of Fishburn Road.
Lot B DP107830	7391 Lachlan Valley Way Cowra	Accessed via Bulkhead Road (via Fishburn Street or Lachlan Valley Way) or from the western side of Lachlan Valley Way.
Lot 5 DP1013135	Young Road Cowra	Accessible from northern side of Fishburn Road. Alternative access on Eastern side of Young Road.
Lot 1 DP529468	Lachlan Valley Way Cowra	Accessed via Bulkhead Road (via Fishburn Street or Lachlan Valley Way) or from the western side of Lachlan Valley Way.
Lot 1 DP818852	Bulkhead Road Cowra	Accessible via Bulkhead Road (via Fishburn Street or Lachlan Valley Way), from the western side of Lachlan Valley Way, or directly from Fishburn Road.
Lot 4 DP562110	Lachlan Valley Way Cowra	Accessed via Bulkhead Road (via Fishburn Street or Lachlan Valley Way) or from the western side of Lachlan Valley Way.
Lot 3 DP811033	Fishburn Street Cowra	Accessed from Fishburn Street. No alternative access.

#### Table 6.44 – Vehicular accessibility to affected businesses

It is noted that of the 15 lots identified as being potentially affected, 8 have no alternative access. Arrangements would be necessary during construction to ensure that property access is maintained.

# Short term noise impacts during the construction period and long term noise impacts during operation

This is addressed in detail in **Section 6.3**.

# *Improved vehicular access to commercial properties and services along the proposed bypass*

The development of the bypass has the potential to improve vehicle access and connectivity.

It is also conceivable that properties would benefit from improved exposure that would have positive economic and viability impacts.

## 6.8.3 SAFEGUARDS AND MITIGATION MEASURES

#### **Pre-Construction**

• During the detailed design phase, the alignment would be reviewed and rationalised to minimise the extent of acquisition required;



- Adequate investigations would be completed during detailed design to ensure all service locations are known and avoided where possible;
- Where disruption to services is planned, affected property owners would be notified a minimum of two weeks in advance and the details of this notice would be provided within a CEMP; and
- Implementation of community consultation strategy aimed at providing sufficient information to local residents to mitigate possible impacts.

#### Construction

- Council and contractors would work closely with affected and nearby land owners and occupants to ensure that disruption from construction work is minimised;
- Property access must be maintained at all times. A minimum of two weeks before any unavoidable disruption to access, consultation must be carried out with affected property owners;
- Local residents must be notified a minimum of two weeks before work starts and must be kept regularly informed of construction activities during the construction process and informed of changed conditions including likely disruptions to access;
- A complaints-handling procedure and register must be included in the CEMP;
- Where possible, residents must be provided with a minimum of two weeks' notice before any interruptions to utility services may be experienced as a result of utilities relocation;
- Noise impacts would be managed in accordance with a construction noise and vibration management sub plan as part of the CEMP;
- Dust suppression would be maintained throughout construction;
- All equipment would be well maintained to reduce unnecessary noise and air quality impact;
- Ensure any proposed road closure (part or full) is communicated to the public including business owners not less than two (2) weeks before any proposed closure to enable alternative arrangements during construction periods (such as business closure during affected periods); and
- Where possible, provision of alternative access to affected business and services who rely on vehicular access and/or prioritisation of construction to reduce impact to these businesses.

## 6.9 SOCIO-ECONOMIC CONSIDERATIONS

#### 6.9.1 APPROACH TO ASSESSMENT

The study area for the purposes of this assessment are the areas of Cowra directly and indirectly affected by the proposed bypass.

The study area was profiled by examining data available from the 2011 census and from comments received during the GHD consultation process for the 2013 Bypass Study.

Direct economic data of businesses was not available for review.

The assessment also drew on other available resources including:

- Roads and Traffic Authority and University of Sydney, 2012, *Economic Evaluation of Town Bypasses- Final report;*
- Bureau of Transport and Communications Economics, 1994, Working Paper 11: The effects on small towns of being bypassed by a highway: A Case Study of Berrima and Mittagong;
- University of Sydney, 2009, The Karuah Highway Bypass: Economic and Social Impacts: The 5 year report.



## 6.9.2 EXISTING ENVIRONMENT

As at the 2011 census Cowra township had a recorded population of 8,107 people and of these 86.8% are employed either full or part time. Technicians and trades workers formed the highest proportion of occupation type at 15.8% closely followed by labourers at 15.7% and professionals at 13.3%. Sales workers make up 11.3% of the workforce.

The education sector was the largest single employer, employing 6.1% of the workforce with cafes, restaurants and takeaway food services being the next highest employer at 4.7%.

The majority of the community (89.9%) lived in separate private dwellings of which 64.4% owned or owned with a mortgage. 30% of residents rented their dwelling. 63.2% of households were family units and 33.9% were single or lone person households. In Cowra 40.2% of households had a weekly household income of less than \$600 and 2.5% of households had a weekly income of more than \$3,000.00.

### 6.9.3 POTENTIAL IMPACTS

Potential economic impacts associated with the project are identified as follows:

- Impacts to local business as a result of the loss of passing trade;
- Impacts to local business as a result of improved connectivity and improved exposure;
- Impacts to property values of properties along the alignment route (not addressed);
- Potential socio-economic impacts associated with the project are identified as follows; and
- Improvements in amenity in Kendal Street and improved liveability as a result.

#### 6.9.3.1 Impacts to local business as a result of the loss of passing trade

In 1993 the, then, Roads and Traffic Authority commissioned preparation of a report entitled "*Economic Evaluation of Town Bypasses*". This was prepared by Bruno Parolin of the University of New South Wales and reviewed in 2012. The original report, released in 1996, considered a number of bypasses that had been undertaken, specifically along the Hume Highway, and assessed the extent of economic impact associated with their development. The original report formed the following conclusions:

As a proportion of the estimated total economic output of the affected communities the reduction in gross annual turnover at affected businesses is relatively small.

The reduction in employment due to the impact of a town bypass varied, although was much smaller than predicted.

Several businesses within the affected towns made compensatory adjustments in response to the diversion of traffic.

There was no correlation made directly as a result of the town bypass on business closure.

The economic impacts of a bypass tend to be of short-term duration, within the first year of the bypass opening.

The objectives of the 2012 review report were as follows:

Review the current literature on the economic impact on town bypasses in Australia and overseas (completed May 2011).

Re-evaluate the findings of the previous study concentrating on a small number of case studies.

Identify areas for further study where gaps in previous research exist.

The conclusions of the 2012 review report were as follows:

Application of the methodology to the re-evaluation of the original study at the three case study towns highlights that in the longer-term these communities do recover to varying degrees from the negative impacts



of bypass roads as documented in the original study, even the smallest community, and as anticipated in the original study and in the review of literature. This is an indication that the methodology used in the original study and in the present study is appropriate and sufficient for monitoring long term impacts of bypass roads.

To a large extent the findings of this study mirror those identified in the review of literature – that in the longer term highway bypasses do not have adverse economic impacts on towns that are bypassed and that in most cases bypasses have resulted in economic development benefits for towns which have been bypassed. The findings highlight that the most significant economic benefits of being bypassed have occurred at the medium sized town of Yass and not at the largest centre (Goulburn) as expected from the review of literature.

The conclusion to be made from the above findings is that degree of dependence on highway generated trade is a more critical variable than population size in understanding post bypass economic change at the case study communities.

The findings of the present study indicate that proximity to a larger centre is in fact of benefit to highway related businesses, especially at the medium and smaller places, and influential in post bypass economic change – a contrary finding to that reported in the review of literature.

Whether the economic benefits to towns that have been bypassed or are to be bypassed in the future, and that are not in close proximity of a larger centre or have no service centre, will be similar to those of the case study communities remains a topic for future research.

While the above information is relevance, these studies and bypasses were projects that proposed bypasses for both heavy and light vehicles. As the project seeks only to bypass heavy vehicles around the town, it is considered that the impacts associated with this project are likely to be less than those encountered in the above examples.

# 6.9.3.2 Impacts to local business as a result of improved connectivity and improved exposure

Cowra is a somewhat unique example in the context of bypasses of smaller towns in that it provides opportunities for business properties along the route to benefit as a result of improved connectivity and exposure to passing trade. Land owners who are adaptive to the change have the potential to change the use of the land to a use that is more appropriate to the siting on a transport route. Business such as logistics companies or heavy vehicle maintenance facilities could benefit from the bypass.

#### 6.9.3.3 Impacts to property values of properties along the alignment route

Outside the scope of this assessment.

# 6.9.3.4 Improvements in amenity in Kendal Street and improved liveability as a result

The recent improvement works to Kendal Street coupled with the removal of a large proportion of heavy vehicles is considered likely to be result in improved amenity in the central business district and this is considered likely to have flow on liveability improvements for the town as a whole.

The Karuah Report (UoS, 2009) found that the majority of residents felt that the liveability of the town was improved as a result of the bypass as a result of a reduction of noise impacts and improvements in amenity in the CBD. It is anticipated that these same positive impacts are likely as a result of this project.

#### 6.9.4 MITIGATION MEASURES

The RTA/UNSW (1996) report identified a number of alleviating strategies that are considered pertinent to reducing the extent of impacts potentially likely to occur as a result of the project:

• Initiatives to reduce loss of highway-generated trade (e.g. the development of service centres to offset potential job losses in the town centre);



- Business adjustment initiatives (e.g. increased promotions and advertising; greater emphasis on local trade by improving service, quality and opening hours; seeking of Government assistance);
- Post-bypass reporting (focusing on the after effects of the bypass);

Another measure identified in the RTA/UNSW report was:

• Main street improvements (e.g. streetscape and building beautification, tree planting, provision of additional parking spaces and provision of pedestrian thresholds).

As this has largely already occurred in Cowra via the recently completed Kendal Street improvement works this specific measure is omitted from the measures to be implemented.

In addition to the above, the following mitigation measures would be applied:

- A Communication Plan would be prepared and included in the CEMP. The Communication Plan would include (as a minimum):
  - requirements to provide details and timing of proposed activities to affected residents,
  - Contact name and number for complaints and
  - Procedure to notify adjacent land users for changed conditions during the construction period such as traffic, pedestrian or driveway access.

The communications plan would be prepared in accordance with G36 requirements and Roads and Maritime Community Engagement and Communications Manual (2012c).

- A complaints handling procedure and register would be included in the CEMP and maintained for the duration of the project;
- Residents would be informed prior to any interruptions to utility services that may be experienced as a result of utilities relocation;
- Road users, pedestrians and cyclists would be informed of changed conditions, including likely disruptions to access during construction; and
- Fencing with material attached (eg shade cloth) would be provided around the construction compounds and other areas to screen views of the construction compounds from adjoining properties.

## 6.10 SOILS

#### 6.10.1 EXISTING ENVIRONMENT

The proposal area crosses three different soil landscapes, predominantly the Lachlan soil landscape east of the Lachlan River, and the Koorawatha soil landscape west of the Lachlan River. The Manildra soil landscape occurs at the eastern extent of the proposal area. **Figure 29** shows the spatial relationship of each soil landscape with the proposal area, and **Table 6.45** outlines the soil, geology and landform characteristics of the region.





Figure 29: Regional soil landscapes

Soil Landscape	Geology	Topography	Soils in Proposal Area	
Manildra	Soils are derived <i>in situ</i> and from colluvial-alluvial deposits of parent rock, including: • Shale • Arenite • Biotite porphyry • Siltstone • Greywacke	Undulating low hills with elevations ranging from 340- 604 metres. Slopes generally range from 6-10%. Local relief varies from 20 to 80 metres.	<ul> <li>Mid-slope:</li> <li>Yellow podzolic soils.</li> <li>Low to moderate erosion hazard, minor problems when disturbed.</li> <li>Drainage lines:</li> <li>Yellow and red solodic soils.</li> <li>Moderate to high erosion hazard; minor to moderate gullying in some drainage lines.</li> <li>Low lying areas:</li> <li>Alluvial sands and loams</li> <li>Low to moderate erosion hazard, minor gullying when cleared. Rapidly drained.</li> </ul>	
Lachlan	Soils are derived from alluvium, i.e. granite materials along the Lachlan River.	Alluvial plans and terraces with local relief <20 metres. Slopes range from level to 3%. Terraces are often found beside deeply incised river channels with back plains.	<ul> <li>Floodplain:</li> <li>Prairie soils.</li> <li>Low erosion hazard; minor gullying.</li> <li>Depression: <ul> <li>Alluvial soils (loam)</li> <li>Low erosion hazard, highly permeable.</li> </ul> </li> <li>River Terrace: <ul> <li>Non-calcic brown soils.</li> <li>Low erosion hazard.</li> </ul> </li> </ul>	

Table 6.45 – Regional geology, topography and soil landscapes



Soil Landscape	Geology	Topography	Soils in Proposal Area
Koorawatha- Billimari	Soils are derived from alluvium, from porphyry (Canowindra Porphyry) and shale lenses.	Gentle undulating rises, with level plains adjacent to drainage lines. Local relief from 10-20 metres. Very gently slopes range from 1- 3% except in proximity to drainage lines where terrain is level.	<ul> <li>Lower Slope:</li> <li>Yellow podzolic soils.</li> <li>High erosion hazard.</li> <li>Prior Stream Channels:</li> <li>Non-calcic browns soils and red brown earths.</li> <li>High erosion hazard; minor gully and rill erosion.</li> </ul>

Source: eSPADE (2015)

#### 6.10.1.1 Soil Contamination

A review of the *List of NSW contaminated sites notified to the EPA as of 6 March 2015* provided on the EPA website (EPA, 2015a) on Friday 24 April 2015 identified four sites within Cowra. One of these sites is located near the proposal area, namely the Shell Depot at 34 Brougham Street. The activity that caused contamination at the site is recorded as 'other petroleum' and the site status is 'under assessment' (EPA, 2015a).

A search of the *EPA contaminated sites land record* (EPA, 2015b) on Friday 24 April 2015 identified two sites within the Cowra LGA, including the Shell Depot. The other site is not located within or near the proposal area. Two notices have been issued for the Shell Deport, including an 'Agreed Voluntary Remediation Proposal' (Notice No. 26091) issued on 20 Oct 2006, and a 'Declaration of Remediation Site' (Declaration No. 21076) issued on 16 May 2005 (EPA, 2015b).

Notice No. 26091 describes the land to which the voluntary proposal relates as:

- Part Lot 3 and Lot 5 on DP 758300 (34 Brougham Street, Cowra, NSW, 2794)
- The section of Campbell Street adjacent to the Shell Depot site; and
- Lot 7010 on DP 1060400 (Crown Land between Campbell Street and Waugoola Creek adjacent to the Shell Depot Site) (EPA, 2006).

Notice No. 26091 describes the contamination at the site as:

Soil and groundwater at the site are contaminated with substances in such a way as to present a significant risk of harm. The substances of concern ("the contaminants") include:

- Volatile aromatic compounds including benzene, toluene, ethylbenzene and xylenes (BTEX).
- Total petroleum hydrocarbons in the C<sub>8</sub>-C<sub>38</sub> fraction (TPH).
- Lead (EPA, 2005).

Declaration No. 21076 describes the land to be a remediation site under the *Contaminated Land Management Act 1997* as:

The premises that are located at 34 Brougham Street, Cowra, NSW, comprising part Lot 3 and Lot 5, Section 5 within DP758300. The site is currently used as a fuel depot (EPA, 2005).

Declaration No. 21076 describes the nature of the substances causing the contamination as:

Contaminants in the groundwater at the site and contaminants which have moved from the site include phase separated fuel product. The chemical component of the fuel product include benzene, toluene, ethylbenzene and xylenes ("BTEX") and total petroleum hydrocarbons ("TPHs") (EPA, 2005).

## 6.10.2 POTENTIAL IMPACTS

Potential impact on soils identified during the construction phase of the proposal would include:



- Disturbance and exposure to contaminated soils and/or groundwater;
- Soil contamination via spills from vehicles during the construction phase;
- Creation of dust;
- Soil erosion and sedimentation; and
- Soil contamination from vehicle or machinery activities such as refuelling, washing, movement, emissions, and spills.

### 6.10.3 SAFEGUARDS AND MITIGATION MEASURES

The following mitigation measures would be implemented to minimise impact to the soils onsite.

- Those measures outlined in **Section 6.7.3** are to be implemented and maintained;
- Standard erosion and sediment control measures to be implemented based on best practice for the operation of the road and with reference to NSW Department of Housing's *Managing Urban Stormwater – Soils and Construction* (The "Blue Book");
- Appropriate erosion and sediment control measures would be installed prior to construction, and maintained throughout the construction period. Details of erosion and sediment control would be supplied with the engineering drawings for the road and would be installed and maintained to Council's requirements;
- Confine areas disturbed for construction purposes to minimum necessary;
- Provide spill containment equipment;
- Establish drainage path and containment for any run-off;
- A Contamination Management Plan (CMP) would be prepared in accordance with the Contaminated Land Act 1997 and relevant EPA Guidelines. This plan would be form part of the CEMP and would include at a minimum:
  - Contaminated Land Legislation and guidelines including any relevant licenses and approvals to be obtained.
  - Identification of locations of known or potential contamination and preparation of a map showing these locations.
  - Identification of rehabilitation requirements, classification, transport and disposal requirements of any contaminated land within the construction footprint.
  - Contamination management measures including waste classification and reuse procedures and unexpected finds procedures.
  - A procedure for dewatering and disposal of potentially contaminated liquid waste.
  - In the event that indications of contamination are encountered (known and unexpected, including visual indicators), work in the area would immediately cease until a contamination assessment can be prepared to advise on the need for remediation or other action, as deemed appropriate.
  - A process for reviewing and updating the plan.
- An asbestos management plan would be prepared as part of the CEMP and would be in accordance with NSW EPA guidelines (including the waste guidelines) and relevant industry codes of practice. The asbestos management plan would include but not be limited to:
  - Identification of potential asbestos on site.
  - Procedures to manage and handle any asbestos.
  - Outline the mitigation measures for encountering asbestos.
  - Procedures for disposal of asbestos in accordance with NSW EPA guidelines (including the waste guidelines) and relevant industry codes of practice.
- When conducting soil disturbance works proximal to areas where contaminated soils are considered likely to be present, or where suspected soil contamination is encountered (i.e. as



indicated by hydrocarbon odours or staining), the following controls should be implemented and incorporated into the CEMP:

- Suspect materials should be segregated and placed into uniquely-identified stockpiles pending off-site disposal at a licenced waste disposal facility, and appropriately bunded to prevent spreading of materials.
- Stockpiles of suspected contaminated soil should be covered with plastic sheeting to prevent rainfall infiltration and/or soil migration during windy conditions.
- Appropriate personal protective equipment (PPE) would be worn to prevent exposure to suspected contaminated soils and appropriate hygiene protocols adopted, as specified in the CEMP.
- Soils suspected to be contaminated should be tested prior to off-site disposal for waste classification. Records of the analysis, waste classification and waste disposal dockets would be recorded and retained.
- Groundwater, if encountered within shallow excavations and considered to be contaminated, would be managed by tanker truck extraction and off-site disposal at a licensed liquid waste disposal facility.

## 6.11 WASTES

## 6.11.1 POTENTIAL IMPACTS

The proposal would result in the generation of a variety of wastes during the construction phase including:

- Green mulch and vegetation from tree removal;
- Reclaimed asphalt;
- General construction waste;
- Fuels, oils, liquids and chemicals; and
- Paper and cardboard.
- Any waste generated during the operation of the work would be restricted to:
- Vehicle oil and grease from maintenance vehicles;
- Green waste from tree removal; and
- Litter from road users.

## 6.11.2 SAFEGUARDS AND MITIGATION MEASURES

Ensure the CEMP embodies all of the following mitigation measures for the management of construction waste.

## 6.11.2.1 Pre-construction

- The following resource management hierarchy principles would be followed:
  - Avoid unnecessary resource consumption as a priority
  - Avoidance would be followed by resource recovery (including reuse of materials, reprocessing, and recycling and energy recovery).
  - Disposal would be undertaken as a last resort (in accordance with the Waste Avoidance and Resource Recovery Act, 2001). Avoid unnecessary resource consumption;
- A Resource and Waste Management Plan (RWMP) would be prepared, which would include the following (as a minimum):



- The type, classification and volume of all materials to be generated and used on site including identification of recyclable and non-recyclable waste in accordance with EPA Waste Classification Guidelines
- Quantity and classification of excavated material generated as a result of the proposal (Refer Roads and Maritime Waste Management Fact sheets 1-6, 2012)
- Interface strategies for cut and fill on site to ensure re-use where possible
- Strategies to 'avoid', 'reduce', 'reuse' and 'recycle' materials.
- Classification and disposal strategies for each type of material.
- Destinations for each resource/waste type either for on-site reuse or recycling, offsite reuse or recycling, or disposal at a licensed waste facility.
- Details of how material would be stored and treated on-site.
- Identification of available recycling facilities on and off site.
- Identification of suitable methods and routes to transport waste.
- Procedures and disposal arrangements for unsuitable excavated material or contaminated material.
- Site clean-up for each construction stage;
- Procurement would endeavour to use materials and products with a recycled content where that material or product is cost and performance effective;
- All wastes would be managed in accordance with the *Protection of the Environment Operations Act 1997*; and
- Suitable waste disposal locations would be identified and used to dispose of litter and other wastes on-site. Suitable containers would be provided for waste collection.

#### 6.11.2.2 Construction

- Cleared weed free vegetation would be chipped and reused onsite as part of the proposed landscaping and to stabilise disturbed soils where possible;
- A dedicated concrete washout facility that is impervious would be provided during construction so that runoff from the washing of concrete machinery, equipment and concrete trucks can be collected and disposed of at an appropriate waste facility;
- All wastes would be managed in accordance with the Protection of the Environment Operations Act 1997;
- Types of waste collected, amounts, date/time and details of disposal are to be recorded in a waste register.
- All wastes would be managed in accordance with the Protection of the Environment Operations Act 1997;
- Works sites would be maintained, kept free of rubbish and cleaned up at the end of each working day;
- Suitable waste disposal locations would be identified and used to dispose of litter and other wastes on-site. Suitable containers would be provided for waste collection.

## 6.11.2.3 Operation

The following operational mitigation measures would be required for the proposal once construction is complete:

- Operational green waste to be collected or recycled for composting in the immediate locality;
- Disposal of operational waste such as oils and greases at appropriate facilities; and
- Road user litter to be collected by relevant maintenance body for recycling or disposal at relevant facility.

## 6.12 HAZARDS

## 6.12.1 POTENTIAL IMPACTS

### 6.12.1.1 Natural Hazards

Flooding is identified as a natural hazards that may impact parts of the proposal area, including:

Parts of the alignment are identified in the Cowra LEP as being within a Flood Planning Area (refer – **Figure 17** and **Section 6.7**). Specifically, the proposed road level approaching the new bridge, and the bridge itself, would be at the same level as the Lachlan Valley Way, which is within an area affected by flooding in the 20 year, 50 year, 100 year and 200 year events.

None of the alignment is known to be mapped as bush fire prone land.

#### 6.12.1.2 Infrastructure

The proposal is within close proximity to hazardous infrastructure (electricity) and infrastructure that if damaged, may pose a hazard through the disruption of essential basic services; including reticulated sewerage system pump station.

Infrastructure within the vicinity of the proposed works is identified on plans for the proposed heavy vehicle bypass (refer – **Drawing C014**).

#### 6.12.1.3 Hazardous materials

Hazardous materials may include; grease, oil, diesel fuel, lubricant, petrol, gases, bitumen and paints. The potential impacts generated by hazardous material would be limited to their transport and use during the construction period.

#### 6.12.1.4 Contamination

There is one known contaminated site located within the concept alignment – refer Section 6.10.

## 6.12.2 SAFEGUARDS AND MITIGATION MEASURES

#### Pre-Construction

- Identification of hazards and risks associated with the construction phase of the proposal are to be detailed in the CEMP prior to works commencing. All relevant Environmental Work Method Statements (EWMS) would be included as part of the CEMP to ensure works are conducted appropriately;
- Apply those measures outlined in **Section 6.7.3**
- Refer **Section 7.2** for additional consultation/approvals necessary prior to construction.

#### Construction

The following mitigation measures would be implemented for the management of hazardous materials during the construction phase of the proposal:

- Identification of hazards and risks associated with the construction phase of the proposal are to be detailed in the CEMP prior to works commencing. Include all relevant EWMS as part of the CEMP to ensure works are conducted appropriately;
- working near overhead power lines in accordance with Occupational Health and Safety Act 2000 and WorkCover NSW Work Near Overhead Powerlines Code of Practise (2006);
- storage, handling and use of hazardous materials in accordance with the Occupational Health and Safety Act 2000 and WorkCover NSW Guideline for Storage and Handling of Dangerous Goods (2005);



- quantity of materials would be kept to minimum to avoid the risk of severity of any incidents;
- activities with the potential for spills (refuelling, maintenance of equipment, mixing or cutting of oil and bitumen) would be undertaken either off site or in bunded areas;
- other potentially hazardous activities such as loading bitumen surfacing equipment, handling hazardous chemicals and washing construction equipment would be completed off site or in bunded areas;
- incident management procedures would be tool boxed prior to the start of construction works;
- preparation of a safety management plan detailing risk management, statement of responsibilities, occupational health and safety training and incident management; and
- should storage of hazardous materials be required, these would be kept in a secure, bunded storage compound, preferably off-site.

## 6.13 CLAUSE 228 FACTORS

Clause 228 of the *Environmental Planning and Assessment Regulation 2000* identifies those factors that must be taken into account concerning the impact of an activity on the environment. Cowra Shire Council would make a determination under Part 5 of the *Environmental Planning and Assessment Act, 1979* in accordance with the cl.228 factors.

This assessment would be completed by Cowra Shire Council through reference to *Best Practice Guidelines for Part 5 of the Environmental Planning and Assessment Act 1979 – Is an EIS Required?* (Department of Planning 1995).

For general consideration to assist in Cowra Shire Council determination, **Appendix A** lists those factors and provides a preliminary assessment of impacts against the general factors.

# **Mitigation Measures**

## 7.1 SUMMARY OF SAFEGUARDS AND MITIGATION MEASURES

Environmental safeguards outlined in this document would be incorporated into the detailed design phase of the proposal and during construction and operation of the proposal. These safeguards would minimise any potential adverse impacts arising from the proposed work on the surrounding environment. All safeguards described in this REF and the decision report would be incorporated into the contractor's CEMP. These are summarised in **Table 7.1**.

Section	Impact	Environmental Safeguards
6.1	Landscape Character and Visual Amenity	<ul> <li>The detailed design process for the proposed heavy-vehicle bypass would consider opportunities to review the design to minimise impacts to landscape character and visual amenity.</li> <li>Site compounds would be located and designed to take account of views from nearby occupied properties and roads, and to minimise the removal of existing vegetation.</li> <li>Site compound areas would be maintained in a tidy condition during construction to ensure unsightly views are not presented to passing motorists.</li> <li>Site compound areas and stockpiles are to be restored to their original condition at completion of works.</li> <li>All worksite areas would be maintained in a tidy condition to ensure unsightly view are not presented to passing motorists.</li> <li>Prompt revegetation of disturbed areas, including cut and fill embankments (subject to sight line and clear zone requirements).</li> <li>Retention of existing trees where possible, and planting where appropriate to screen views of the proposed bypass to adjoining residences.</li> <li>Topsoil removed by works would be separately stockpiled and used in stockpile areas for regeneration.</li> </ul>
6.2	Flora and Fauna	<ul> <li>An Erosion and Sediment Control (ESC) Plan would be developed for the Cowra Heavy Vehicle Bypass and implemented during construction site establishment to minimise the likelihood of construction related activities mobilising sediments and leading to turbidity and sedimentation of waterways.</li> <li>Clearly defined access and work use areas for plant and equipment should be established, and all members of the construction crew made aware of these access and work area limits. Movement of plant and equipment should be restricted to these areas to minimise the potential for uncontrolled spills or leaks entering waterways.</li> <li>Under Section 199 of the FM Act, DPI (Fisheries) would be notified of any proposed reclamation or dredging as defined under the FM Act associated with installation of instream structures (temporary and permanent) and other structures.</li> <li>Construction methods must allow for the free passage of fish downstream and upstream of the works areas at all times.</li> <li>Any dewatering of a coffer dam must consider:         <ul> <li>Notifying DPI seven days prior to dewatering to organise potential fish salvage. A separate section 37 permit may be required for this purpose.</li> <li>Water should be pumped a minimum 30 m away from the river and should not re-enter the river. If water is to re-enter the river, water quality parameters must not be significantly different to receiving waters (as measured upstream of disturbance areas).</li> </ul> <li>Only the minimum number of snags should be disturbed within wetted habitat.</li> <li>Utilise areas already impacted by previous clearing or disturbance and minimise clearing where feasible. Trimming of native trees would be preferred over removal where feasible.</li> <li>Trees should be removed in such a way as to not inadvertently damage surrounding vegetation. This would keep groundcover disturbance to a minimum.</li> <li>Where possible, native trees to be removed should</li></li></ul>

Table 7.1 – Summary of Safeguards and Management Measures for the Site



Section	Impact	Environmental Safeguards
Section	Impact         Impact         Impact	<ul> <li>Environmental Safeguards</li> <li>Revegetation of bare soil or cleared areas should be undertaken with locally-occurring native flora species typical of the original habitat to improve floristic structure and provide habitat for those native and threatened species with potential to occur in the study area.</li> <li>Declared noxious weeds should be managed according to the requirements stipulated by the <i>Noxious Weeds A1993</i>.</li> <li>Vehicles and machinery should be kept away from the banks of waterways where possible.</li> <li>Areas for vehicle and machinery maintenance, refuelling, and storage of fuels, lubricants, and batteries, should be bunded in accordance with Australian Standard <i>AS 1940-2004 The storage and handling of flammable and combustible liquids</i>. Refuelling during construction should be undertaken only within a designated bunded area.</li> <li>Maintenance and daily checks of plant and equipment should be undertaken to minimise the risk of hydrocarbon spills or leaks.</li> <li>Emergency spill kits should be made available and readily accessible for all plant and equipment at all times, and should include equipment for containment and clean-up of spills on dry soils/sediments as well as for water (e.g. floating booms).</li> <li>Any contaminant spills (including fuel, hydraulic fluid etc.) must be contained (where safe to do so) and immediately reported to the construction manager/environmental advisor to establish a plan for remediation.</li> <li>Watercourse crossings should be designed in accordance with the NSW Office of Water (2012) Guidelines for Watercourse Crossings, which include:         <ul> <li>minimising the construction forport and the extent of proposed disturbance within the watercourse and riparian vegetation</li> <li>avoiding atterations to natural bankfull of floodplain flows, or increased water levels upstream</li> <li>avoiding changes to the gradient of the stream bed, except where necessary to add</li></ul></li></ul>
		<ul> <li>where culverts are installed on Waugoola Creek:         <ul> <li>box culverts are preferred to pipes</li> <li>culverts would be aligned with downstream channels</li> <li>recessed wet cells should be incorporated within the invert at or below the stable bed level</li> </ul> </li> <li>the culvert design should be certified by a suitably qualified engineer the design should ensure wet cells allow a minimum water depth of 0.2-</li> </ul>
		<ul> <li>D.5 m to encourage fish passage</li> <li>The design should minimise changes to the channels natural flow, width, roughness and base-flow water depth.</li> </ul>
6.3	Noise	<ul> <li>Construction Noise and Vibration</li> <li>In order to minimise the impacts, it is recommended that a Construction Noise and Vibration Management Plan be prepared by the contractor prior to undertaking works on site. This would be based on the proposed construction methodology, activities and details of plant and equipment available at the</li> </ul>



Section	Impact	Environmental Safeguards
		<ul> <li>time, to review the impacts and identify management and mitigation measures that can be implemented where feasible and reasonable.</li> <li>Operational Road Noise</li> <li>In the context of adoption of the OGAC road surface type, provision of architectural treatment is recommended to 34 identified receiver locations for the 2035 road traffic scenario.</li> </ul>
6.4	Traffic and Access	<ul> <li>Detailed Design</li> <li>The following mitigation measures would be implemented during completion of detailed design:</li> <li>Consultation with emergency service authorities would be undertaken during development of the detailed design including NSW Rural Fire Service and Fire Rescue</li> <li>Construction</li> </ul>
		<ul> <li>The following mitigation measures would be implemented during project construction:</li> <li>Vehicular property access would be maintained where possible including preschools, places of worship and all commercial premises.</li> <li>Pedestrian and cyclist access is to be maintained throughout construction.</li> <li>Provision of signposted outlining the pedestrians and cyclists diversion routes would be displayed during construction.</li> <li>There would be advance notification of any construction works that affect pedestrians and cyclists.</li> <li>Access to appropriate bus stop locations would be maintained during construction in consultation with bus operators.</li> <li>Ongoing updates on locations and access to bus stops would be provided to the community during construction period to ensure that disruption is minimised.</li> </ul>
6.5	Heritage	<ul> <li>Pre-Construction</li> <li>Provision of contact number of suitably qualified heritage specialist to the construction project manager</li> <li>Construction</li> <li>The following mitigating measures are recommended during construction to minimise the likelihood of impacting:</li> <li>Limit proposed work to the identified construction footprint in order to limit the possibility of encountering non-Aboriginal 'objects' in unassessed areas.</li> <li>Avoid using multiple vibratory equipment in one area at any one time.</li> <li>Investigate the use of non-vibratory rollers where practical and feasible.</li> <li>Should any 'objects' or other heritage features be identified during the course of construction, work in the area should cease and the item be cordoned off. The qualified heritage specialist is to attend the site to determine the nature of the find and the Office of Environment and Heritage are to be contacted to discuss how to proceed.</li> </ul>
6.6	Air Quality	<ul> <li>Provide hardstands or similar sealed surfaces in compound areas and work sites to minimise the potential for dust emissions;</li> <li>Where possible, retain existing ground cover undisturbed;</li> <li>Place and maintain all disturbed areas, stockpiles and handling areas in a manner that minimises dust emissions (including windblown, traffic-generated or equipment generated emissions);</li> <li>Implement site specific controls including (but not limited to) watering, road sweeping and removal of accumulated material from environmental controls;</li> <li>Restore disturbed areas progressively at the completion of local works;</li> <li>Where visible dust emissions occur as a result of increased wind speeds, dust generated works should cease until appropriate additional controls are implemented;</li> <li>All plant and equipment should be maintained in good working order in accordance with the manufacturer's instructions;</li> <li>Construction equipment and plant should be maintained in good working order, and maintenance would be carried out where emissions are unacceptable; and</li> <li>Equipment, plant and construction vehicles would be turned off when not in use.</li> <li>It is recommended that deposited dust monitoring be undertaken at selected receptor locations throughout the construction works to provide a regular assessment of performance in controlling emissions. Where deposited dust</li> </ul>

#### Table 7.1 – Summary of Safeguards and Management Measures for the Site


Impact

Section

			levels exceed the air quality goals, dust management measures should be reviewed and improved as necessary to achieve acceptable amenity for nearby uses.
6.7	Water	Pre •	-Construction Further flood modelling including a detailed afflux assessment would be undertaken during detailed design to confirm impacts to surrounding land
		•	<ul> <li>A Soil and Water Management Plan (SWMP) would be prepared as part of the CEMP in accordance with the requirements of Roads and Maritime contract specification G38 prior to the commencement of construction. The SWMP would also address the following: <ul> <li>Roads and Maritime Code of Practice for Water Management, the Roads and Maritime Erosion and Sedimentation Procedure</li> <li>The NSW Soils and Construction – Managing Urban Stormwater Volume 1 "the Blue Book" (Landcom, 2004) and Volume 2 (DECC, Roads and Maritime).</li> <li>RMS Technical Guideline: Temporary Stormwater Drainage for Road Construction, 2011.</li> <li>Roads and Maritime Technical Guideline: Environmental Management of Construction Site Dewatering, 2011.</li> </ul> </li> </ul>
		•	<ul> <li>The SWMP would detail the following as a minimum:</li> <li>Identification of catchment and sub-catchment areas, high risk areas and sensitive areas</li> <li>Sizing of each of the above areas and catchment</li> <li>The likely volume of run-off from each road sub-catchment</li> <li>Direction of flow of on-site and off-site water.</li> </ul>
			<ul> <li>Separation of on-site and on-site water</li> <li>The direction of run-off and drainage points during each stage of construction</li> <li>The locations and sizing of sediment traps such as sump or basin as well as associated drainage</li> </ul>
			<ul> <li>Dewatering plan which includes process for monitoring, flocculating and dewatering water from site (i.e. sediment basin and sumps)</li> <li>The staging plans, location, sizing and details of creek alignment and realignment controls for scour protection and bank and bed stabilisation including those used during construction and long term.</li> <li>A mapped plan identifying the above</li> </ul>
			<ul> <li>Include progressive site specific Erosion and Sedimentation Control Plans (ESCPs). The ESCP is to be updated at least fortnightly.</li> <li>A process to routinely monitor the BOM weather forecast</li> <li>Preparation of a wet weather (rain event) plan which includes a process</li> </ul>
			<ul> <li>for monitoring potential wet weather and identification of controls to be implemented in the event of wet weather. These controls are to be shown on the ESCPs.</li> <li>Provision of an inspection and maintenance schedule for ongoing maintenance of temporary and permanent erosion and sedimentation controls.</li> </ul>
		•	The Soil and Water Management Plan would include a contingency plan for any acid sulfate soils or salinity identified during the construction phase
		•	A contingency plan would be prepared in preparation for a potential flood event during construction and would outline evacuation procedures. The plan would include: - Evaluation of what flood event would trigger the plan. - Evacuation procedures. - A man indicating the area that is flood prope and the locations where to
		•	All stockpiles would be designed, established, operated and decommissioned in accordance with the Roads and Maritime Stockpile Site Management
		•	<ul> <li>A Stabilisation Plan is to be prepared and included in the SWMP. The stabilisation plan is to include but not be limited to the following:</li> <li>Identification and methodology of techniques for stabilisation of site.</li> <li>Identification of area on site for progressive stabilisation.</li> <li>Stabilisation is to be undertaken of areas, including stockpiles and batters, exposed for a duration of 2 weeks or greater. For example covering with geotextile fabric, stabilised mulch, soil binder or spray grass.</li> </ul>
			<ul> <li>Identification of areas on site for progressive permanent stabilisation such as implementation of landscaping.</li> </ul>

#### Table 7.1 – Summary of Safeguards and Management Measures for the Site

**Environmental Safeguards** 



#### Table 7.1 – Summary of Safeguards and Management Measures for the Site

Section	Impact	Environmental Safeguards	
		<ul> <li>Construction</li> <li>Controls are to be implemented at exit points to minimise tracking soil and particulates onto pavement surfaces.</li> <li>Any material transported onto pavements would be swept and removed at the end of each working shift and prior to rainfall</li> <li>Emergency wet and dry spill kits would be kept on site at all times and all staff would be made aware of the location of the spill kit and trained in its use.</li> <li>All refuelling and storage of fuels, chemicals and liquids are to be within an impervious bunded area within the construction compound, sited a minimum of 50 metres away from: <ul> <li>Rivers, creeks or any areas of concentrated water flow.</li> <li>Flooded areas.</li> <li>Slopes above 10%.</li> </ul> </li> <li>The vehicles refuelling process would include a person attending the refuelling facility / vehicle and a spill kit on the vehicle</li> <li>Roads and Maritime Environmental Incident Classification and Management Procedure is to be followed in the event of an incident.</li> <li>Installation of standard erosion and sediment control measures to be implemented based on best industry practice with reference to NSW Department of Housing's <i>Managing Urban Stormwater – Soils and Construction</i> (the "Blue Book") Volume 2 (Landcom, 2004).</li> <li>Erosion and sediment control measures only to be removed once the area is restabilised.</li> <li>Vehicle wash down and/or cement truck washout is to occur in a designated bunded area and least 50 metres away from water bodies and surface water drains.</li> <li>Any fuel, oils or other liquids stored on site would be stored in an appropriately sized impervious bunded at least 120% larger than the greatest container and in an area least 50 metres away from water bodies.</li> </ul>	
6.8	Land use and acquisition	<ul> <li>Pre-Construction</li> <li>During the detailed design phase, the alignment would be reviewed and rationalised to minimise the extent of acquisition required;</li> <li>Adequate investigations would be completed during detailed design to ensure all service locations are known and avoided where possible;</li> <li>Where disruption to services is planned, affected property owners would be notified a minimum of two weeks in advance and the details of this notice would be provided within a CEMP; and</li> <li>Implementation of community consultation strategy aimed at providing sufficient information to local residents to mitigate possible impacts.</li> <li>Construction</li> <li>Council and contractors would work closely with affected and nearby land owners and occupants to ensure that disruption from construction work is minimised;</li> <li>Property access must be maintained at all times. A minimum of two weeks before any unavoidable disruption to access, consultation must be carried out with affected property owners;</li> <li>Local residents must be notified a minimum of two weeks before work starts and must be kept regularly informed of construction activities during the construction process and informed of changed conditions including likely disruptions to access;</li> <li>A complaints-handling procedure and register must be included in the CEMP;</li> <li>Where possible, residents must be provided with a minimum of two weeks' notice before any interruptions to utility services may be experienced as a result of utilities relocation;</li> <li>Noise impacts would be managed in accordance with a construction noise and vibration management sub plan as part of the CEMP;</li> <li>Dust suppression would be well maintained to reduce unnecessary noise and air quality impact;</li> </ul>	



Table 7.1 –	Summary of Safeguard	s and Management Measure	s for the Site

Section	Impact	Environmental Safeguards
		<ul> <li>Ensure any proposed road closure (part or full) is communicated to the public including business owners not less than two (2) weeks before any proposed closure to enable alternative arrangements during construction periods (such as business closure during affected periods); and</li> <li>Where possible, provision of alternative access to affected business and services who rely on vehicular access and/or prioritisation of construction to reduce impact to these businesses.</li> </ul>
6.9	Socio-Economic	<ul> <li>Initiatives to reduce loss of highway-generated trade (e.g. the development of service centres to offset potential job losses in the town centre)</li> <li>Business adjustment initiatives (e.g. increased promotions and advertising; greater emphasis on local trade by improving service, quality and opening hours; seeking of Government assistance).</li> <li>Post-bypass reporting (focusing on the after effects of the bypass).</li> <li>A Communication Plan would be prepared and included in the CEMP. The Communication Plan would include (as a minimum):         <ul> <li>requirements to provide details and timing of proposed activities to affected residents,</li> <li>Contact name and number for complaints and</li> <li>Procedure to notify adjacent land users for changed conditions during the construction period such as traffic, pedestrian or driveway access.</li> <li>The communications plan would be prepared in accordance with G36 requirements and Roads and Maritime Community Engagement and Communications Manual (2012c).</li> </ul> </li> <li>A complaints handling procedure and register would be included in the CEMP and maintained for the duration of the project.</li> <li>Residents would be informed prior to any interruptions to utility services that may be experienced as a result of utilities relocation.</li> <li>Road users, pedestrians and cyclists would be informed of changed conditions, including likely disruptions to access during construction.</li> <li>Fencing with material attached (eg shade cloth) would be provided around the construction compounds and other areas to screen views of the construction compounds from adjoining properties.</li> </ul>
6.10	Soils	<ul> <li>Those measures outlined in Section 6.7.3 are to be implemented and maintained.</li> <li>Standard erosion and sediment control measures to be implemented based on best practice for the operation of the road and with reference to NSW Department of Housing's <i>Managing Urban Stormwater – Soils and Construction</i> (The "Blue Book").</li> <li>Appropriate erosion and sediment control measures would be installed prior to construction, and maintained throughout the construction period. Details of erosion and sediment control would be supplied with the engineering dravings for the road and would be installed and maintained to Council's requirements.</li> <li>Confine areas disturbed for construction purposes to minimum necessary;</li> <li>Provide spill containment equipment; and</li> <li>Establish drainage path and containment for any run-off.</li> <li>A Contamination Management Plan (CMP) would be prepared in accordance with the Contaminated Land Act 1997 and relevant EPA Guidelines. This plan would be form part of the CEMP and would include at a minimum:         <ul> <li>Contaminated Land Legislation and guidelines including any relevant licences and approvals to be obtained.</li> <li>Identification of locations of known or potential contamination and preparation of a map showing these locations</li> <li>Identification and sampling procedure for landfill seepage (leachate)</li> <li>A procedure for dewatering and disposal of potentially contaminated liquid waste</li> <li>In the event that indications of contamination are encountered (known and unexpected, including odorous or visual indicators), work in the area would immediately cease until a contamination assessment can be prepared to advise on the need for remediation or other action, as deemed appropriate.</li> </ul> </li> </ul>



#### Table 7.1 – Summary of Safeguards and Management Measures for the Site

Section	Impact	Environmental Safeguards	
		<ul> <li>When conducting soil disturbance works proximal to areas where contaminated soils are considered likely to be present, or where suspected soil contamination is encountered (i.e. as indicated by hydrocarbon odours or staining), the following controls should be implemented and incorporated into the CEMP:         <ul> <li>Suspect materials should be segregated and placed into uniquely-identified stockpiles pending off-site disposal at a licenced waste disposal facility, and appropriately bunded to prevent spreading of materials;</li> <li>Stockpiles of suspected contaminated soil should be covered with plastic sheeting to prevent rainfall infiltration and/or soil migration during windy conditions;</li> <li>Appropriate personal protective equipment (PPE) would be worn to prevent exposure to suspected contaminated soils and appropriate hygiene protocols adopted, as specified in the CEMP; and</li> <li>Soils suspected to be contaminated should be tested prior to off-site disposal for waste classification. Records of the analysis, waste classification and waste disposal dockets would be recorded and retained.</li> </ul> </li> <li>Groundwater, if encountered within shallow excavations and considered to be contaminated, would be managed by tanker truck extraction and off-site disposal at a licensed liquid waste disposal facility.</li> </ul>	
6.11	Wastes	<ul> <li>Pre-construction</li> <li>The following resource management hierarchy principles would be followed: <ul> <li>Avoid unnecessary resource consumption as a priority</li> <li>Avoidance would be followed by resource recovery (including reuse of materials, reprocessing, and recycling and energy recovery)</li> <li>Disposal would be undertaken as a last resort (in accordance with the Waste Avoidance and Resource Recovery Act, 2001).Avoid unnecessary resource consumption;</li> </ul> </li> <li>A Resource and Waste Management Plan (RWMP) would be prepared, which would include the following (as a minimum);</li> <li>The type, classification and volume of all materials to be generated and used on site including identification of recyclable and non-recyclable waste in accordance with EPA Waste Classification Guidelines</li> <li>Quantity and classification of excavated material generated as a result of the proposal (Refer Roads and Maritime Waste Management Fact sheets 1-6, 2012)</li> <li>Interface strategies for cut and fill on site to ensure re-use where possible</li> <li>Strategies to 'avoid', 'reduce', 'reuse' and 'recycle' materials.</li> <li>Classification and disposal strategies for each type of material.</li> <li>Destinations for each resource/waste type either for on-site reuse or recycling, offsite reuse or recycling, or disposal at a licensed waste facility.</li> <li>Details of how material would be stored and treated on-site.</li> <li>Identification of available recycling facilities on and off site.</li> <li>Identification of suitable methods and routes to transport waste.</li> <li>Procedures and disposal arrangements for unsuitable excavated material or contaminated material.</li> <li>Site clean-up for each construction stage.</li> <li>Procurement would endeavour to use materials and products with a recycled content where that material or product is cost and performance effective.</li> <li>All wastes would be managed in accordance with the <i>Protection of the Environment Operations Act 1997</i>.</li> <li>Suit</li></ul>	



Section	Impact	Environmental Safeguards
		<ul> <li>Types of waste collected, amounts, date/time and details of disposal are to be recorded in a waste register.</li> <li>All wastes would be managed in accordance with the Protection of the Environment Operations Act 1997.</li> <li>Works sites would be maintained, kept free of rubbish and cleaned up at the end of each working day.</li> <li>Suitable waste disposal locations would be identified and used to dispose of litter and other wastes on-site. Suitable containers would be provided for waste collection.</li> <li>Operation</li> <li>The following operational mitigation measures would be required for the proposal once construction is complete:</li> <li>Operational green waste to be collected or recycled for composting in the immediate locality;</li> <li>Disposal of operational waste such as oils and greases at appropriate facilities; and</li> <li>Road user litter to be collected by relevant maintenance body for recycling or disposal at relevant facility.</li> </ul>
6.12	Hazards	<ul> <li>Pre-Construction</li> <li>Identification of hazards and risks associated with the construction phase of the proposal are to be detailed in the CEMP prior to works commencing. All relevant Environmental Work Method Statements (EWMS) would be included as part of the CEMP to ensure works are conducted appropriately.</li> <li>Construction</li> <li>The following mitigation measures would be implemented for the management of hazardous materials during the construction phase of the proposal:</li> <li>Identification of hazards and risks associated with the construction phase of the proposal are to be detailed in the CEMP prior to works commencing. Include all relevant EWMS as part of the CEMP to ensure works are conducted appropriately;</li> <li>Working near overhead power lines in accordance with Occupational Health and Safety Act 2000 and WorkCover NSW Work Near Overhead Powerlines Code of Practise (2006);</li> <li>Storage, handling and use of hazardous materials in accordance with the Occupational Health and Safety Act 2000 and WorkCover NSW Guideline for Storage and Handling of Dangerous Goods (2005);</li> <li>Quantity of materials would be kept to minimum to avoid the risk of severity of any incidents;</li> <li>Activities with the potential for spills (refuelling, maintenance of equipment, mixing or cutting of oil and bitumen) would be undertaken either off site or in bunded areas;</li> <li>Incident management procedures would be tool boxed prior to the start of construction works;</li> <li>Preparation of a safety management plan detailing risk management, statement of responsibilities, occupational health and safety training and incident management; and</li> </ul>

#### Table 7.1 – Summary of Safeguards and Management Measures for the Site

## 7.2 LICENSING AND APPROVALS

- Under Section 138(2) of the Roads Act 1993 the concurrence of Roads and Maritime Services is
  required prior to a consent being issued by the roads authority (in this case, Cowra Council) for
  any new connections or upgrading of intersections involving classified roads. It is understood that
  concept design of the intersections and alignment, including a road safety audit, would be
  necessary as a precursor to the granting of concurrence (noting, that these components may be
  completed separately);
- An application for a road occupancy license (if required) should be submitted to the Roads and Maritime Services regional traffic management officer at least 14 days prior to the proposed occupancy;



- Prior to construction commencing the proponent or the contractor is required to gain a Part 7
  permit pursuant to the *Fisheries Management Act 1994* for dredging or reclamation within an
  identified waterway (Lachlan River and Waugoola Creek). Detailed design of the bridge and creek
  crossing would be required to determine the extent of dredging or reclamation required. It is
  recommended that detailed design take every opportunity to minimise the extent of dredging or
  reclamation required;
- Prior to construction commencing the proponent or the contractor is required to gain in principle approval and construction approval from the applicable Rail Infrastructure Manager for the Country Regional Network in relation to the . The capacity to gain these approvals are directly influenced by the need to progress detailed design of the proposed Lachlan River bridge. In conjunction with this, a structural assessment of the existing rail bridge is to be carried out to the satisfaction of the JHR Engineering Manager;
- The Road Rail Interface Agreement between TfNSW and Council would need to be updated and the timing of this would need to be confirmed with JHR (or applicable Rail Infrastructure Manager);
- A geotechnical investigation is to be undertaken in relation to any proposed excavation within 25 metres of the rail corridor, with the details to be provided to the relevant Rail Infrastructure Manager;
- Once detailed design of the bridge over the Lachlan River has progressed, further assessment, including additional consultation with the Heritage Council would be required, to determine the extent of impact to the state significant Lachlan River Rail Bridge. In the event further assessment is required, an addendum to this REF would also be required. Given the proximity of the proposed work to the rail bridge, approval in accordance with Section 57(e & h) of the Heritage Act 1977 is highly likely to be required. If approval is required under the Heritage Act 1977 due to the listing of an item or place on the State Heritage Register, or being subject to an Interim Heritage Order, the Heritage Council's approval must be sought prior to an approval being issued by the consent authority under the Environmental Planning and Assessment Act 1979 (except where application relates to Integrated Development or State Significant Infrastructure or State Significant Development Major Projects under Parts 4 or 5 of the EP&A Act 1979). In accordance with section 67 of the Heritage Act 1977, any approval given by a consent authority is void if it is given before the Heritage Council's determination of the application has been notified to the consent authority.;
- Once concept and detailed design of the bridge over the Lachlan River has progressed, further modelling and assessment of the extent of impact on flood behaviour, including a detailed afflux assessment, is to be completed;
- Once concept and detailed design of the bridge over the Lachlan River has progressed, an
  assessment is to be carried out for inclusion in the CEMP to consider the potential for impact on
  groundwater and surface water, and the likely dewatering requirements for the coffer dam and
  proposed excavation for piers. The final solution may require licencing or approval from DPI
  Water;
- Seek an Aboriginal Heritage Impact Permit, undertaken in line with the Aboriginal Cultural Heritage Consultation Requirements for Proponents; and
- Prior to the bypass being used by restricted access vehicles, it would need to be added to the NSW Restricted Access Vehicle Route, subject to the authorisation of Roads and Maritime Services.



# Conclusion

## 8.1 JUSTIFICATION

The proposed bypass have been assessed against the objects of the EP&A Act and the principles of ecologically sustainable development and justification for the proposed work has been provided.

The benefits of carrying out the proposed road upgrade include improvement of amenity for users of the central business district and improved safety for road users. The 'do nothing' approach would not achieve the objectives of the project.

Further assessment of some matters is required as detailed design progresses, however, to the extent possible, it is determined that identified short term impacts likely as a result of the project are typically short lived and manageable. Based on assessment of the current design, a number of longer term impacts are also anticipated however the impacts of these are also generally considered to be acceptable, noting that additional assessment would be required as detailed design progresses to ensure that impacts anticipated at this preliminary stage are consistent or reduced.

The particular areas where additional investigations are required are discussed in more detail as follows.

## 8.1.1 HYDROLOGY

As noted in **Section 6.7**, the impact of the introduction of a new bridge on flood behaviour has been modelled by SMEC, utilising the model developed for the preparation of the 2006 Floodplain Risk Management Plan. SMEC were asked to model three bridge design options including the original cross section provided by GHD in their concept alignment design (Option A), a lower profile design with inriver piers rather than abutments (Option B) and a low profile design which also adopted a lower road height (Option C). All three options would result in minor upstream impacts and varying degrees of downstream impacts. Adoption of the Option C concept design would result in an increase in the 1% flood level by up to 1.07 metres. Analysis of finished floor levels for dwellings in the area to the south of the proposed bridge location (considered to have the highest potential for affectation) was carried out (refer **Geolyse Drawings EV01-EV03**) as a result of which it was concluded that the extent of impact to flood behaviour via introduction of a proposed bridge would not significantly impact flood behaviour such that it would result in a risk to surrounding properties.

This is an initial conclusion based on concept information and would require further detailed analysis (informed by modelling updated survey data and detailed bridge design) to ensure that the impacts are manageable and consistent with the expectations at this stage of the project.

## 8.1.2 OPERATIONAL NOISE

Noise impacts associated with the operational use of the bypass would result in a number of properties that would fail to achieve the adopted noise management levels, rising in the 2035 build scenario.

In order to mitigate these impacts a range of approaches has been considered that would reduce the number of non-compliant properties including the use of quiet pavements and the development of a noise barrier. Those remaining properties that are non-compliant would qualify for at-property treatment which could include offer fresh air ventilation, sealing of wall vents and check window and door seals and replace where necessary. Levels of mitigation would vary between properties dependent on the extent of non-compliance and would be individually negotiated between Council and the property owner.

Whilst some longer term impacts may remain, these are considered to be offset by anticipated improvements to noise levels at those properties along the existing highway alignment and the improvements to the amenity and liveability of the main street.



On the basis of the above, compliance with the relevant guidelines is achievable and the development may proceed.

## 8.1.3 ABORIGINAL HERITAGE

The initial Aboriginal heritage due diligence assessment of the concept alignment identified a number of artefacts of Aboriginal heritage significance located within the alignment, together with a number of sites that require further investigation to determine their significance – refer **Figure 11**. Detailed investigations including sub-surface testing was subsequently carried out and a draft Aboriginal Cultural Heritage Assessment report prepared. That report contains a number of recommendations to manage potential impacts to items and locations of Aboriginal heritage significance.

This includes the need to gain an Aboriginal Heritage Impact Permit prior to construction commencing.

On the basis that an AHIP would be gained to facilitate disturbance, relocation or impact to identified sites it is considered that the project may proceed.

## 8.1.4 JUSTIFICATION SUMMARY

The proposal as described within this REF meets the project objective but would still result in some environmental impacts. The majority of these impacts are related to construction and are short lived and manageable. Those longer term impacts are considered to be, on balance, outweighed by the overall benefits of the project. The successful implementation of the controls summarised in **Section 7.1** would ensure impacts are appropriately managed.

## 8.2 OBJECTS OF THE EP&A ACT

Object	Comment
5(a)(i) To encourage the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment.	The proposal design, impact mitigation and management measures detailed in this REF allow for the proper management, development and conservation of natural and artificial resources. The main objective of the proposal is to improve road user safety and amenity within the Cowra CBD.
5(a)(ii) To encourage the promotion and co-ordination of the orderly economic use and development of land.	The proposal aligns with the strategic framework for the region as reflected in the Cowra Land Use Strategy 2009 and achieves the project objectives to improve the amenity of the CBD. The GHD Bypass Study confirmed via a cost/benefit analysis, that the adopted alignment is the most cost effective alternative.
5(a)(iii) To encourage the protection, provision and co- ordination of communication and utility services.	Any utilities affected by the proposal would be relocated where necessary. Any disruption to utility services would be discussed with service providers and potentially affected users prior to work commencing.
5(a)(iv) To encourage the provision of land for public purposes.	The proposal would be used for public purposes.
5(a)(v) To encourage the provision and co-ordination of community services and facilities.	The proposal would result in improvements to amenity and road user safety in the Cowra CBD, thereby improving the liveability of the town.
5(a)(vi) To encourage the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats.	The proposal has been designed to minimise impacts on the environment, including threatened species, populations and ecological communities and their habitats. Additional measures would be developed as required to manage and offset impacts during and after construction and incorporated into a CEMP.
5(a)(vii) To encourage ecologically sustainable development.	Ecologically sustainable development is considered in <b>Sections 8.2.1– 8.2.4</b> below.

#### Table 8.1 – Objects of the EP&A Act



#### Table 8.1 – Objects of the EP&A Act

Object	Comment
5(a)(viii) To encourage the provision and maintenance of affordable housing.	Not relevant to the project.
5(b) To promote the sharing of the responsibility for environmental planning between different levels of government in the State.	Not relevant to the project.
5(c) To provide increased opportunity for public involvement and participation in environmental planning and assessment.	Consultation has been carried out with potentially affected regulatory stakeholders and the community and the content of any submissions considered in the preparation of this REF.

#### Source: Environmental Planning and Assessment Act 1979

The National Strategy for Ecological Sustainable Development (NSESD) (Department of Environment and Heritage 1992) defines Ecologically Sustainable Development (ESD) as:

using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased (refer website)

The concept of ESD gives formal recognition to environmental and social considerations in decisionmaking to ensure the current and future generations can enjoy an environment that functions as well as or better than the environment they inherit.

The core objectives of the NSESD are:

- To enhance individual and community well-being and welfare by following a path of economic development that safeguards the welfare of future generations;
- To provide for equity within and between generations; and
- To protect biological diversity and maintain essential ecological processes and life-support systems.

As outlined in Schedule 2 of the Environmental Planning and Assessment Regulation 2000, the four principles of ESC are listed below and discussed in the following sections:

- Precautionary principle;
- Intergenerational equity;
- Conservation of biological diversity and ecological integrity; and
- Improved valuation and pricing of environmental resources.

## 8.2.1 PRECAUTIONARY PRINCIPLE

The precautionary principle states where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a justification for not implementing mitigation measures or strategies to avoid potential impact.

The potential impact from the proposal has been identified in the environmental assessment section of this report (refer to **Section 6**) and all mitigation measures summarised in **Section 7.1**. Before starting construction, Cowra Shire Council or the construction contractor is to prepare a Construction Environmental Management Plan (CEMP) incorporating all mitigation measures and including all relevant Cowra Shire Council Environmental Work Method Statements (EWMS).

## 8.2.2 INTERGENERATIONAL EQUITY

The second principle of ESD is intergenerational equity, such that the present generation should ensure the health, diversity and productivity of the environment are equal to or better for future generations.



The proposal would ensure existing road infrastructure meets safety requirements for the travelling public. All work would be carried out in accordance with the environmental safeguards in **Section 7.1** to mitigate potential impact associated with noise and vibration, socio-economic considerations, traffic and transport, drainage and water quality, air quality, greenhouse gas emissions, climate change, Aboriginal and non-Aboriginal heritage, topography, soils, waste and hazardous materials.

# 8.2.3 CONSERVATION OF BIOLOGICAL DIVERSITY AND ECOLOGICAL INTEGRITY

The third principle of ESD is conservation of biological diversity and ecological integrity such that ecosystems, species and genetic diversity within species are maintained.

The proposed road improvements would not result in any significant impact to native vegetation.

The mitigating measures for protecting biodiversity at the site are provided in Section 6.2.4.

## 8.2.4 IMPROVED VALUATION, PRICING AND INCENTIVE MECHANISMS

The final principle of ESD is improved valuation and pricing of environmental resources which establishes the need to determine economic values for services provided by the natural environment such as the atmosphere's ability to receive gaseous emissions, cultural values and visual amenity. The principle is designed to improve methods of carrying out valuation of environmental costs and benefits and use this information when making decisions.

The NSW Government Construction Environmental Management System model has been developed to facilitate the achievement of improved environmental performance by the construction industry. The model applies to all major projects (with a value exceeding \$10 million) and this would include this project. Any contractor engaged to complete the project would need to have an acceptable corporate environmental management system that complies with the documentation requirements of AS/NZS 14001:2004 Environmental Management Systems. This model aims to use the principles of ESD to provide a systematic approach to the management of environmental impact of the construction industry.

## 8.3 CONCLUSION

Cowra Shire Council is committed to providing its services in an environmentally responsible manner and managing or eliminating any risks that may lead to an adverse impact on the environment. The continued commitment to achieving the four principles of ESD translates to a Local Government body that aims to reduce or prevent negative impact of economic and social activities on the environment while allowing for the sustainable, equitable development of society.

The proposed Cowra Heavy Vehicle Bypass is subject to assessment under Part 5 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 of conservation agreements and plans of management under the NPW Act, joint management and biobanking agreements under the TSC Act, wilderness areas, critical habitat, impacts on threatened species, populations and ecological communities and their habitats and other protected fauna and native plants.

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 in respect of noise and vibration, Aboriginal heritage and changes to flood behaviour. Mitigation measures as detailed in this REF would ameliorate or minimise these expected impacts. The proposal would also improve amenity and safety within the Cowra CBD. On balance the proposal is considered justified.



Subject to the implementation of recommended mitigation measures and further assessment as detailed design progresses, 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 to be sought for the proposal from the Minister for Planning under Part 5.1 of the EP&A Act. The proposal is unlikely to affect threatened species, populations or ecological communities or their habitats, within the meaning of the *Threatened Species Conservation Act 1995* or *Fisheries Management Act 1994* and therefore a Species Impact Statement is not required. The proposal is also unlikely to affect Commonwealth land or have an impact on any matters of national environmental significance.



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# Drawings

## **Plates**





Plate 1: Airport Road looking south



Plate 2: Looking east across Lachlan Valley Way





Plate 3: Looking west towards proposed river crossing location



Plate 4: Alignment to be located in adjacent paddock





Plate 5: Looking south along Campbell Street



Plate 6: Intersection of Brougham St and Darby Falls Way (looking north)





Plate 7: Campbell Street crossing of Waugoola Creek (looking north)



Plate 8: Europa Park and approach to Mid Western Highway intersection